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y un método de preparación

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71. SOLICITANTE Gum Base Co. spa.

DOMICILIO Linete, Italia

74. APODERADO Dilia Rodriguez D'Alemaun

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ANEXOS

- ☒ Comprobante de pago de la tasa de presentación de la solicitud
- ☐ Comprobante de pago por reivindicación de prioridad
- ☐ Documento que acredita la existencia y representación legal cuando el solicitante sea persona Jurídica
- ☐ Poderes, si fuera el caso
- ☐ Documento de cesión del inventor al solicitante o a su causante
- ☐ Declaraciones
- ☒ Copia de la solicitud Internacional. (Resumen, descripción, reivindicación, Dibujos).
- ☒ Traducción de la solicitud internacional al castellano. (Resumen, descripción, reivindicación, Dibujos)
- ☐ Copia del examen preliminar efectuado por la IPEA
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- ☒ Otros
 1. Copia de la publicación internacional WO 02/051258 A2
 2. Solicitud PCT
 3. Reporte de búsqueda internacional
 4. Copia WO 99/26485
 5. Copia WO 99/17618
 6. Solicitud de patente europea 0427 505 A2
 7. Búsqueda internacional patente 4,405,647
 8. Búsqueda patente US6,322,828 B1
 9. Búsqueda patente 4,588,592
 10. Búsqueda patente 4,161,544
 11. Búsqueda patente 4,948,595
 12. Búsqueda patente A61K 9/68
 13. Búsqueda patente 4,698,223
 14. Búsqueda patente 4,753,805
 15. Patente 2,290,120
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11) FIGURA CARACTERÍSTICA:

12) Solicitud concesión de la patente,

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(54) Title: CHEWING GUM IN POWDER FORM AND A METHOD OF PREPARATION

(57) Abstract: The subject of the invention is a novel chewing gum in tablet form which can be produced by direct compression of a gum formulation in powder form; the chewing gum thus obtained is characterized by a pleasant chewability which remains unchanged throughout the chewing period without hardening like most conventional chewing gums. The chewing gum in powder form is produced by a method which comprises the following steps: a) mixing of a soft basic gum, i.e. gum base, with at least one sweetener and, optionally, at least one other typical chewing-gum ingredient, at a temperature of between about 35 and 75 °C; b) cooling of the mixture thus obtained to a temperature of between about 0 and -40 °C and preferably between -10 and -40 °C; c) grinding and subsequent screening of the mixture thus obtained to a particle size of less than about 10 mesh; d) optional mixing of the powder thus obtained with at least one anti-agglutination agent; e) optional compression of the mixture thus obtained.

WO 03/084338 A1

CHEWING GUM IN POWDER FORM AND A METHOD OF PREPARATION

INTRODUCTION

The subject of the present invention is a novel chewing gum in tablet form, which can be produced by direct compression of a gum formulation in powder form; the chewing gum thus obtained is characterized by a pleasant chewability which remains unchanged throughout the chewing period without hardening like most conventional chewing gums.

BACKGROUND OF THE INVENTION

Examples of chewing gums in compressed form produced by direct compression of mixtures in powder form have been known in the art for several years and various types are available commercially. However, the compressed-powder gums which are currently available are unpleasant to chew because to avoid technical difficulties in the production process they have been produced from hardbasic gums. It is in fact known that it is much easier to grind and compress hard and dry materials and that the compression of powders is more complex the softer they are; up to now, the need to have starting mixtures or materials which are sufficiently hard or dry to be granulated and compressed easily has led to the production of chewing gums which are hard and friable, with the risk of some of the gum accidentally being swallowed.

Various chewing gums produced by the compression of powdered ingredients are described in the literature. As early as 1942, United States patent US-2,290,120 described, for example, the preparation of chewing gums by cold grinding of basic gum and glucose syrup (at about -20°C) and subsequent mixing and compression thereof; however, the basic gums used in this patent contain natural gums which, owing to their known

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limitations with regard to performance, quality of supply, and technical problems of use, have now been almost completely abandoned and replaced by other, synthetic ingredients.

United States patent US-4,753,805 describes the granulation and subsequent compression of a chewing-gum composition having a moisture percentage of between 2 and 8%, with the use of various technological coadjuvants such as anti-agglutination agents and granulation coadjuvants (alkali-metal phosphates, alkaline-earth metal phosphates, maltodextrins, or mixtures thereof).

European patent EP-0221850 describes chewing-gum formulations which are suitable for being formed into tablets and which are produced by mixing the basic gum with dry ingredients, including the aromatic portion, without the plasticization due to the oils of the flavourings, subsequent cooling of the mixture to above the freezing point of water (5-10°C), dry granulation, and compression.

United States patent US-4,000,321 describes a chewing gum with characteristics of softness during chewing and light weight. This result is achieved by cold granulation of a chewing-gum mixture, followed by spontaneous adhesion by heating of the granulate. A chewing gum which contains bubbles and which cannot be mixed with other ingredients is thus obtained.

WO 99/2503 describes a process which provides for the preparation of a chewing-gum mass in powder form in which the basic gum is cooled to a temperature of between 0 and -35°C; the mass thus cooled is then granulated, supplemented with the necessary additives and active ingredients, and then compressed.

United States patent US-4,588,592 describes a method of preparing chewing gums containing from 70 to 95% by weight of granulated sugar. The granulated sugar, previously heated to a temperature of between 51 and 93°C, is mixed with the basic gum at a temperature of between 54 and 121°C. The product thus obtained can then be used as it is or transformed into a granular product, after cooling to a temperature of between -6 and -40°C.

US-4,161,544 describes a method of preparing chewing gum which provides for sugars to be mixed with a basic gum, heated to a temperature of 60-120°C; the temperature is then reduced to between 30 and -5°C and the mass thus obtained is granulated. The method in question provides for the use of "bulking agents" such as gum arabic, pectin, or other similar additives; as is well known, these ingredients are soluble in water and, as such, will be ingested after brief chewing, together with the sugars, thus leaving a bolus of harder consistency; the object proposed is thus achieved only partially, providing chewing which is extremely variable over time.

Finally, International patent application WO 01/19206 describes a particularly laborious method of preparing chewing gum, requiring a pretreatment of the basic gum mixture which is reduced to pellets of relatively small particles which in turn are then cooled to extremely low temperatures, i.e. below -40°C, by the addition of dry ice. Even when operation takes place in special, greatly dehumidified environments (with consequent greater economic expense and reduced practicality), this selection easily leads to the formation and accumulation of condensation on the dry ice intimately

mixed with the gum composition, with the formation of lumps and agglutinations.

As mentioned above, however, the methods described in the above-mentioned patent documents have considerable drawbacks such as, for example, the production of chewing gum with poor chewability.

DESCRIPTION OF THE INVENTION

A method has now been discovered which permits the production of a chewing gum in powder form which is transformed, simply by compression, into a gum tablet with chewability and softness characteristics similar to or better than those of good-quality, conventionally-produced chewing gums, particularly with regard to optimal palatability throughout the chewing period.

A further advantage of the present invention is the ability to produce pharmaceutical or medicated chewing gums containing one or more active ingredients which are sensitive to heat; in fact, in contrast with conventional techniques, the mixing of the gum in powder form with the active ingredients and its subsequent transformation into the finished product does not require heating.

Another advantage offered by the process of the present invention is that it allows to produce a chewing gum in various forms and shapes other than the conventional ones, including tablets and micropellets of less than 0.8 grams (which would be very hard to produce with traditional means) simply by replacing the punches in a press.

A method for manufacturing miniature chewing gums is disclosed in WO 02/094032, filed by Wrigley, and it is substantially based in the extrusion of the chewing gum in the liquid filled chamber of a so-called "underwater

pellettizer", as for instance that manufactured by Gala Industries and disclosed in WO 01/2137.

The method according to WO 02/094032 presents however a drawback which cannot be neglected: due to the technical characteristics of the underwater pellettizer, the amount of bulk sweetener in the chewing gum must be kept quite low; consequently, in case a sweet chewing gum is desired, the gum center extruded by the underwater pellettizer has to be surrounded by a coating which comprises at least 50% by weight of the coated chewing gum and which contains the necessary amount of bulk sweetener, as for instance disclosed in WO 02/094032, also filed by Wrigley.

On the contrary, the method according to the present invention permits to manufacture micropellet chewing gums independently of the amount of bulk sweetener requested.

Another advantage which will become clear from the following description is that the chewing-gum formulation in powder form can be packaged, dispatched, and preserved, even for prolonged periods of time, without losing its properties, in fact remaining completely in the granulated state.

Finally, another advantage offered by the present invention is that it is possible to produce a chewing gum in various forms other than the conventional forms and shapes, simply by replacing the punches in a tablet press.

In contrast with the prior art described in the literature, in order to prepare the powdered chewing-gum mixture, it is not necessary to use exclusively dry ingredients or to mix frozen ingredients in powder form without liquid ingredients or other forms of plasticization such as, for example, liquid

flavourings, to avoid softening the mixture. In fact, one of the main characteristics of the present invention is the fact that it is possible to operate initially in accordance with the usual preparation method which is used for the preparation of conventional chewing gums (that is, those which are not in powder form).

Moreover, the method according to the present invention can be implemented without the aid of granulation coadjuvants such as, for example, alkali-metal phosphates, alkaline-earth metal phosphates, maltodextrins, or mixtures thereof, and/or without the aid of "bulking agents" such as, for example, gum arabic or pectin.

Another advantage of the following preparation method consists in the complete use and recovery of the product which thus permits an absence of processing losses or waste.

One of the elements which characterize the present invention is the use of "soft" basic gums which give rise to products having a pleasant chewing profile, comparable with, if not better than, that of conventional products. It has in fact been discovered that, in contrast with the prior art, it is possible to produce complete chewing-gum mixtures in powder form, ready to be compressed and thus also comprising the flavouring portion in the desired percentage, with the use of soft starting basic gums.

The method for the production of chewing gum in powder form according to the present invention is characterized in that it comprises the following steps:
a) mixing of a soft basic gum, i.e. a gum base, with at least one sweetener and, optionally, at least one other

typical chewing-gum ingredient, at a temperature of between about 35 and 75°C,

b) cooling of the mixture thus obtained to a temperature of between about 0 and -40°C and, preferably, between -10 and -40°C,

c) grinding and subsequent screening of the mixture thus obtained to a particle size of less than about 10 mesh,

d) optional mixing of the powder thus obtained with at least one anti-agglutination agent,

e) optional compression of the mixture thus obtained.

The mixing (step a) is preferably performed at a temperature of between about 40 and 50°C for a period of about 10-30 minutes, preferably 20 minutes.

The grinding (step c) is preferably performed until particles having a size of less than about 10 mesh and preferably less than 14 mesh are obtained.

Within the scope of the present invention, "soft basic gum" is intended to define a basic gum characterized by a penetration index, in 1/10 mm, which is greater than about 15 and, preferably, greater than 18 (measured in accordance with the "Standard method for Needle Penetration of Petroleum Waxes", ASTM D1321-97).

In particular, the soft basic gum preferably used for the implementation of the present invention will have the following qualitative/quantitative composition:

- from about 8 to 16% of one of more elastomers, preferably selected from the group comprising polyisobutylene, isobutylene/isoprene copolymer, and vinyl acetate/vinyl laurate copolymer,
- from about 12 to 19% of polyvinyl acetate,
- from about 14 to 30% of resin preferably to be selected from the group comprising vegetable resin

esters, resins produced by synthesis, and/or terpene resins,

- from about 10 to 22% of hydrogenated or partially hydrogenated vegetable oils,
- from about 0 to 7% of waxes selected from the group comprising vegetable waxes, waxes derived from petroleum, and/or synthetic waxes,
- from about 5 to 9% of emulsifiers and technological assistants, more precisely, but not exclusively, glycerol monostearate, acetylated monoglycerides, lecithin, sugar esters and triacetin,
- from about 15 to 40% of inert mineral fillers,
- up to about 0.1% of antioxidants.

The soft basic gum may be mixed in the usual manner with one or more polyols or with sugar, with or without the presence of polyol syrups or glucose syrup, with or without the presence of intensive sweeteners, and with or without the presence of liquid flavourings and other additives such as food acids, softeners, etc.

The selection of the specific ingredients does not alter the principle of the invention and is appropriate for the use of the product, particularly when the gum mixture in powder form is marketed as such and the purchaser intends to enrich it with further flavourings in powder form, intensive sweeteners, or dietary, functional, pharmaceutical, or cosmetic active ingredients, before forming tablets.

If the sweeteners and the other typical chewing-gum ingredients usable in step a) of the present invention are used in the solid state, they normally have a particle size of less than 200 μm and preferably less than 150 μm .

The term "typical chewing-gum ingredients" is intended to define intensive sweeteners, flavourings and other

additives. In particular, intensive sweeteners typically used are aspartame, acesulfame and salts and derivatives thereof, saccharine, neohesperidin dihydrochalcone, sucralose, neotame, thaumatococine, monelline etc. The term "flavourings" is intended to define any mixture of natural or synthetic aromatic oils or of individual active flavouring ingredients, taken individually or in combination, refreshing substances, etc., in solution or carried by a suitable vehicle by means of one or more of the known techniques.

The additives usable in the present invention are all of those commonly used in the production of conventional chewing gum and thus comprise colorants, food acids, softeners, flavourings, etc.

As is known in the art, the basic gum may be mixed with the use of preheated gum or gum at ambient temperature, according to its format, i.e., the use of 8-10 kg blocks of basic gum in fact requires preheating which is not necessary for formats which can be metered in pellets or drops. The basic gum is thus mixed with the ingredients selected as described above at a conventional temperature of between 35 and 75°C, most preferably between 40 and 55°C, for a period of time of between 10 and 30 minutes, with the use of one of the techniques known in the art. Upon completion of this mixing, the mixture is discharged and conditioned at a temperature of between -40 and 0°C. In particular, it is possible to operate discontinuously with prolonged cooling to temperatures between -30 and 0°C and, preferably between -15 and -25°C; alternatively, it is possible to use methods which ensure continuous cooling to temperatures of between -40 and -10°C.

The mixture is then ground by means of a blade mill. A percentage of the mass will be obtained with a satisfactory particle size straight away, whereas the portion with a particle-size greater than that desired is subsequently ground in a mill, optionally cooled to a temperature of between -40 and 0°C, and then recycled, thus achieving a 100% yield. Should it also be necessary to have a lower particle-size limit, the portion separated can be entirely reprocessed, thus also permitting complete recovery of the product in this case; the powder thus obtained preferably has a particle size greater than 100 mesh and, even more preferably, greater than 80 mesh.

Anti-agglutination agents such as, for example, metal salts of fatty acids, precipitated silica, sugar esters, polyols of the type most suitable for compression, for example, isomalt and xylitol, are added to the powder thus obtained.

Additionally one or more intensive sweeteners such as aspartame, acesulfame and salts and derivatives thereof, saccharine, neohesperidin dihydrochalcone, sucralose, neotame, thaumatococine, monelline etc., aromatic active ingredients or flavourings in powder form or carried by encapsulation etc., food acids, or other additives with specific functional and pharmaceutical or nutritional active ingredients such as vitamins, amino-acids, polypeptides or other substances with functional or cosmetic activity may also be added at this stage.

The chewing-gum mixture in powder form thus obtained has the advantage that it can be used directly or can be packaged, stored and dispatched to a purchaser who can thus simply proceed with tablet-forming, possibly preceding this operation with an additional mixing with

further flavourings in powder form, encapsulated flavourings etc., and/or dietary, functional, pharmaceutical or cosmetic active ingredients, as required. The pharmaceutical industry is in fact not normally equipped with the machinery used for processing chewing gums, and can give form and consistency to the finished product solely by compression of a powder. Up to now, these limitations have led to an underestimation of the potentialities of chewing gum as a release vehicle.

The final stage of the processing consists in forming into tablets or pills in a very wide selection of formats and dimensions by a tablet or a pill press or a tablet-forming machine; the tablets or pills thus obtained may therefore be packaged straight away in the desired format, i.e. in blister packs, sticks, etc. or sugar-coated, optionally also incorporating one or more flavourings, sweeteners and active ingredients in the coating, and then packaged.

A particular embodiment of the present invention is represented by chewing gums obtained by coating micropellets obtainable through the described process. Such coated micropellet chewing gums having a gum center surrounded by a coating and a total weight of less than 1.2 grams, preferably less than 0.8 grams, even more preferably less than 0.5 grams and/or a diameter lower than 10mm, preferably lower than 8mm.

The coating will essentially consist of bulk sweeteners and it may comprise up to about 55%, preferably up to 45% by weight of the coated chewing gum; more than about 80% by weight of the preferred coating will normally consist of bulk sweeteners, more preferably from 85 to 95%.

The micropellets used as gum centers will normally contain from about 60 to 90% by weight of basic gum and from about 5 to 25% by weight of bulk sweeteners, preferably from 10 to 20% of bulk sweeteners, together with customary ingredients (such as intensive sweeteners, flavourings, anti agglutination agents and vegetable extracts). A preferred embodiment of the gum center which can be used for manufacturing the micropellet chewing gums according to the invention is disclosed in example 10 (and table 3).

Further aspects of the invention will become clear from the following experimental and comparative sections which should not, however, be considered as limiting of the invention.

EXPERIMENTAL SECTION

Example 1

The following description refers to the preparation of a gum in powder form having the qualitative composition given in Example 1 in Table 1.

Initially, 29.3 parts by weight, which was the entire quantity of basic gum, was mixed, in a sigma mixer, heated to a temperature of between 40 and 50°C, with 13.47 parts of sorbitol in powder form, which was one third of the sorbitol quantity, and with 6.7 parts of mannitol. After a few minutes, a second portion of sorbitol in powder form, again of one third of the total was added, together with 0.4 parts of intensive sweeteners, mixing was continued for a few minutes, and the remaining sorbitol was then added, together with 2.2 parts selected from flavourings in liquid and powder form, homogenization of the mixture being continued for a further few minutes.

It is useful to point out that the quantity of flavouring which is in powder form could also be added after grinding.

10-30 minutes after the start of the mixing, the mixture thus obtained was discharged and left to condition at a temperature of about -20°C.

After a period of about 24 hours, the chewing-gum mixture thus treated was ground in a blade mill with a 4 mm² grating and the ground material was screened.

After screening, a mixture which had a particle size of less than 10 mesh and 60% of which had a particle size of less than 14 mesh was obtained.

3.5 parts of anti-agglutination mixture and 17.5 parts of isomalt of the type commonly marketed for applications in the tablet-forming field were added to 79 parts of the chewing-gum mixture in powder form thus obtained. The chewing-gum mixture in powder form was then compressed.

The method described above may also be applied to the preparation of gums in powder form having a composition other than that of Example 1, such as the compositions of Examples 2-8 of Tables 1 and 2.

Example 6

The following description refers to the preparation of a gum in powder form having the qualitative composition given in Example 6 in Table 2. In the first step, 27 parts of soft basic gum, 36.8 parts of sorbitol, 5.3 parts of mannitol, 8.8 parts of isomalt, 2.3 parts of sorbitol syrup, 0.3 parts of intensive sweetener, 0.3 parts of liquid flavouring, and 0.2 parts of additive were mixed by methods similar to those described in the preceding example. In this example, the term "additives" means a plasticizer selected from those

commonly used in chewing gum, in view of the low percentage of liquid flavouring used.

The mixture was discharged, conditioned, ground and, in the final step, 3 parts of anti-agglutination mixture and 16 parts of vegetable extracts were added to 81 parts of the mixture in powder form thus obtained. The chewing-gum mixture thus obtained could then be compressed.

Example 8

The following description refers to the preparation of a gum in powder form having the qualitative composition given in Example 8 in Table 2. A method similar to that of the preceding example was used but, in this example, the quota of isomalt, which was equal to 21.5 parts, was composed of 6.5 parts of conventional isomalt for chewing gum, which was added in the first mixing step, and by 15 parts of isomalt of a type suitable for compression, which was added to the mixture in powder form, in the second step.

Example 10

The following description refers to the preparation of a gum in powder form having a quantitative composition given in Example 10 in (Table 3). A method similar to that of previous examples was used. Chewing gums obtained under this example are particularly suited to be coated in order to obtain products with a weight lower than 1.2 grams, preferably lower than 0.8 grams, even more preferably less than 0.5 grams. It is worth of note that the softness characteristics of the basic gum are such that the chewing gum tablets thus obtain have pleasant chewing properties substantially identical to that of conventional chewing gums also when using high percentages of gum base.

The preferred coating for surrounding the compressed chewing gum obtained according to the present example will have the following by weight composition:

- Intensive sweetener 1.4 %
 - Flavour 3.5 %
 - Colour (preferably TiO_2) 1.6 %
 - Bulk sweetener (preferably maltitol) 87.5 %
 - Other additives (preferably arabic gum) 6.0 %
- Total 100.0 %

Table 1

	Example No. 1	Example No. 2	Example No. 3	Example No. 4	Example No. 5
Basic gum	29,3	48,5	48,0	29,5	30,8
Sorbitol	40,4	47,5	46,5	39,7	50,3
Mannitol	6,7			6,9	4,4
Isomalt	17,5			17,0	7,0
Citric acid				0,6	-
Additive				0,5	0,6
Intensive sweetener	0,4			0,3	0,3
Liquid flavouring	0,6			1,0	1,6
Flavouring in powder form	1,6			2,0	
Plasticizer			1,5		
Anti-agglutination mix	3,5	4,0	4,0	2,5	5,0
Total	100,0	100,0	100,0	100,0	100,0

Table 2

	Example No. 6	Example No. 7	Example No. 8		Example No. 9
Basic gum	27,0	32,1	25,3	Basic gum	20,2
Sorbitol	36,8	37,8	32,2	Glucose syrup	2,9
Mannitol	5,3	5,8	5,6	Sucrose	71,2
Isomalt	8,8	4,1	21,5		--
Sorbitol syrup	2,3	2,5	2,1		--
Citric acid			0,7		--
Additives	0,2	0,1	0,1	Additives	1,0
Intensive sweetener	0,3	0,3	0,3		--
Liquid flavouring	0,3	1,3	0,4	Liquid flavouring	0,7
Flavouring in powder form		2,0	0,7	Flavouring in powder form	--
Anti- agglutination mix	3,0	3,0	8,4	Anti- agglutination mix	4,0
Vegetable extracts	16,0	11,0	2,7	Active ingredient	--
Total	100,0	100,0	100,0	Total	100,0

Table 3

	Example No. 10
Basic Gum	70.0
Sorbitol	--
Mannitol	--
Isomalt	18.0
Sorbitol syrup	--
Citric acid	--
Additives	--
Intensive sweetener	0.2
Liquid flavouring	0.4
Flavouring in powder form	6.4
Anti agglutination mix	5.0
Vegetable extracts	--
Total	100.0

According to requirements, it is thus possible to add one or more intensive sweeteners such as aspartame, acesulfame and salts and derivatives thereof, saccharine, neohesperidin dihydrochalcone, sucralose, etc., aromatic active ingredients or flavourings in powder form or carried by encapsulation, etc., food acids, or other additives with specific functions, and pharmaceutical active ingredients or nutritional active ingredients such as vitamins, amino-acids, polypeptides, or other substances with functional or cosmetic activity.

Naturally, the addition of flavourings, encapsulated or otherwise carried, and the addition of heat-sensitive active ingredients takes place after the grinding in the stabilization step carried out with the use of one or more anti-agglutination agents known in the art and commonly used for this purpose, such as, for example, magnesium stearate, silica, talc, polyols of the type

most suitable for compression, for example, isomalt, xylitol, etc.

After being formed into tablets or pills, the chewing gum thus obtained can thus also be sugar-coated as a normal chewing-gum or confectionery product, including intensive sweeteners, flavourings and active ingredients as described above in the coating.

COMPARATIVE SECTION

Despite constant attempts to apply instrument-based assessment methods to the study of chewing gum and the identification of its properties, the determining factor in the assessment of the chewing properties of a chewing gum is still subjective assessment by the chewer. The typical chewing sensation in fact includes the perception, prolonged over time, of odour, flavour, taste, colour, consistency, palatability and aftertaste.

Although qualitative and quantitative analytical methods exist for establishing the residual content of flavouring, active ingredients, and sweeteners or sugar in a chewing gum at a specific moment during chewing, there is not yet a method of assessing the perception of the pleasantness of the release of the flavouring and of the sweetness or the duration of both.

There are also objective parameters which may enable individual properties of the chewing gum to be assessed but, at the moment, there is no technique which is sufficiently sophisticated and complete to assess the combination of chewing properties defined as a whole in English as "mouth feel", which consists of a perception of various factors such as softness, resilience, slipperiness, and consistency of the bolus, which constitute the palatability of a chewing gum.

In order to assess the innovative aspects of the present invention, sensory assessment by a panel of chewers was therefore used and, in parallel, at least one significant parameter was assessed by performing a test measurement by means of a penetrometer.

The sensory assessment of the performance of a chewing gum and of the basic gum used to prepare it is generally based on three consecutive stages, referred to as (a) the first biting or chewing stage, (b) the intermediate biting or chewing stage, and (c) the final biting or chewing stage. To look at the assessment of a gum in greater detail, the first stage (a) or "first bite" corresponds to the first seconds of chewing in which the chewing gum is placed in the mouth and bitten into. At this stage, the chewing gum should respond to quite precise requirements such as the correct degree of compliance under the teeth, and should avoid breaking up into minute parts which might even involuntarily be ingested, which typically occurs with commercially-available compressed chewing gums. At the same time, however, in order for chewing to be pleasant from the very first moments, the chewing gum should not be particularly hard or stiff, which is another property that is lacking in currently available products of this type.

The second stage (b), known as the "intermediate" stage, is of longer duration and corresponds to the period of 30-60 seconds during which most of the sugar or sweeteners go into solution owing to the effect of the saliva and the product simultaneously releases most of the flavour. In this stage, it is particularly important for chewing to be uniform, in other words, for the physical drop in consistency due to the

dissolving to be slight and not too noticeable, thus maintaining so-called "linear" behaviour.

The third or "final" stage (c) starts about one minute after the start of chewing and continues throughout the remaining time for which the gum is chewed. After most of the sugar or sweeteners have dissolved, a flavouring portion and a residue of sugars are still present and the gum is partially hydrated. During this stage, the characteristics of the basic gum are fundamental since it represents almost the whole of the residual bolus. With gums of a particular firmness which are used because they are more easily broken up, even if the intrinsic hardness is not perceived in the first two stages, possibly by virtue of some expedients, it will inevitably become apparent at this stage, rendering chewing difficult and unpleasant and, as such, not at all appealing.

Amongst the various parameters indicative of the performance of a chewing gum which can be measured objectively, that which relates to the chewing stage (a) or "first bite" is certainly indicative, though not exhaustively, of the quality of the product. The force necessary for a tooth initially to penetrate a sugar-coated pill or a tablet is in fact proportional to the hardness of the pill or tablet and can therefore give a measurement of how pleasant chewing may be. For tablets, hardness is proportional to friability and to the tendency to crumble during the first bites. The harder the product is, and hence the easier it is to grind and compress, the more marked will be its tendency to break up into minute bits which might even be ingested involuntarily. To demonstrate this, some measurements have been made on commercially-available products, experimental test pieces, and samples

available commercially at trade fairs, with the use of a penetrometer (Sommer & Runge KG, Berlin) which is commonly used in the industry for assessing the hardness of plastic materials such as waxes which, as is well known, are also ingredients used in the preparation of the basic gum.

The measurements made, which were performed in parallel with sensory assessments, gave results indicative of the superior chewing characteristics of the samples produced in accordance with the present invention. Table 4 gives the results obtained for two commercial products, indicated as brand A and brand B, respectively, a product distributed at a trade fair, indicated as brand C, and two samples produced in accordance with the present invention.

Table 4

	Sensory assessment upon: "first bite"	Penetration index (values in 1/10 mm)
Brand A*	Hard and friable in the mouth	1 - 3
Brand B*	Hard and friable in the mouth	3 - 3.5
Brand C*	Very hard and markedly friable in the mouth	1.5 - 3
Example 6	Soft. Not friable	6 - 7.5
Example 8	Quite soft. Not friable	6 - 7.5

*: The products indicated as BRAND A, B and C are compressed powder chewing gums corresponding respectively to:

BRAND A: Golnatur Propol-young, "Gum Tech"®, lemon taste marketed by D. ULRICH SpA, Torino.

BRAND B: "Vitermine vitamine erbe e minerali Gola", mint taste, marketed by GUABER, Fano, Italia.

BRAND C: Compressed chewing gum tablets made with Satin® I gum base manufactured by L.A. Dreyfus Company.

As can be seen, the experimental measurement confirms the judgement with regard to the sensory assessment of the specific parameter.

The performance claimed in the present invention is achieved with the use of "soft" gums which give rise to products with a pleasant chewing profile which is comparable with, if not better than, that of conventional products.

It is important to stress that the values given above are significant only to the above examples and variations in the composition of the basic gum may lead to appreciably different results. Although basic gums having formulations other than that given above are used conventionally for the preparation of high-quality chewing-gum products by conventional methods in conventional formats, i.e., sticks, or dragées, they do

not have the characteristics of softness possessed by basic gums with the formulation given above.

In particular, it can easily be shown that high-quality basic gums in which only two of the categories of ingredients indicated above differ from those of the gums of the present invention have clearly different characteristics in terms of softness. Two basic gums, identified as gum 1 and gum 2, given by way of example in Table 5, have the following differences in comparison with the formulation described above.

Table 5

	gum 1	gum 2	gum 3
waxes selected from the group comprising vegetable waxes and waxes derived from petroleum or produced by synthesis	30 - 32 %	30 - 32 %	0 - 7 %
inert mineral filler products	10 - 12 %	10 - 12 %	15 - 40 %

To confirm what has been stated and the difference described, a test measurement by penetrometer was also used in this case to assess the consistency and hardness of the basic gum samples, by comparing the two samples described above with a third identified as: gum 3 which had a formulation corresponding to that described above. The results are given in Table 6.

Table 6

	gum 1	gum 2	gum 3
Penetration in 1/10 mm (values of three readings)	8 / 9.5 / 9.5	10.5 / 9.5 / 9.5	21 / 21.5 / 22
Penetration in 1/10 mm (calculated average of three readings)	9	9.8	21.5

A further parameter commonly used by the industry to characterize a basic gum is the softening point. This measurement, which is performed by the so-called "ring & ball" technique, provides for the measurement of the initial softening temperature of the basic gum and the temperature at which it actually passes through, with the use of a standard body, once the softening point is reached. Two temperatures and the respective interval are thus obtained and provide extremely useful information on the characteristics of the gum. In the specific case of the gums given by way of example, the temperatures measured are given in Table 7.

Table 7

	gum 1	gum 2	gum 3
Initial softening temperature (°C)	77	78	47
Softening Point (°C)	79	79	56
Softening interval (°C)	2	1	9

It is clear from the data set out above that the difference between the examples, gum 1 and gum 2, on the one hand and gum 3, on the other, is not only in the macroscopic difference in the absolute values of the softening temperatures which would themselves be a significant indicator; in fact, the extent of the softening interval is also in direct correlation with the characteristics of greater plasticity and softness in gum 3 in comparison with the greater stiffness of gum 1 and gum 2.

It is thus clear that the use of a soft basic gum is a particularly important parameter for the production of chewing gums in powder form which have palatability characteristics comparable with, if not better than, those of conventional chewing gums.

CLAIMS

1. Method of producing chewing gum in powder form, constituted substantially by the following steps:
 - a) mixing of a soft basic gum with at least one sweetener and, optionally, at least one other typical chewing-gum ingredient, at a temperature of between about 35 and 75°C
 - b) cooling of the mixture thus obtained to a temperature of between about 0 and -40°C,
 - c) grinding and subsequent screening of the mixture thus obtained to give a powder having a particle size less than about 10 mesh,
 - d) optional mixing of the powder thus obtained with at least one anti-agglutination agent,
 - e) optional mixing of the powder thus obtained with one or more of sweeteners, flavourings, colourings, food acids, or other additives,
 - f) optional compression of the mixture thus obtained.
2. Method according to Claim 1, characterized in that the cooling is performed to a temperature of between about -10 and -40°C.
3. Method according to Claim 1, characterized in that step c) is performed to give a powder having a particle size of less than about 14 mesh.
4. Method according to Claim 1, characterized in that the soft basic gum is characterized by a penetration index, in 1/10 mm, which is greater than about 15 and, preferably, greater than 18.
5. Method according to Claim 1, characterized in that the soft basic gum has the following composition by weight: from about 8 to 16 % of at least one elastomer, from about 12 to 19% of polyvinyl acetate, from about 14 to 30% of resin, from about 10 to 22% of at least one hydrogenated and/or partially hydrogenated

vegetable oil, from about 0 to 7% of wax, from about 5 to 9% of at least one emulsifier and/or a technological assistant, from about 15 to 40% of inert mineral fillers, and up to about 0.1% of antioxidant, in which the sum of the various components amounts to 100.

6. Method according to Claim 5, characterized in that the elastomer is selected from polyisobutylene, isobutylene/isoprene copolymer, and vinyl acetate/vinyl laurate copolymer.

7. Method according to Claim 5, characterized in that the resin is selected from vegetable resin esters, resins produced by synthesis, and/or terpene resins.

8. Method according to Claim 5, characterized in that the wax is selected from vegetable waxes, waxes derived from petroleum, and/or synthetic waxes.

9. Method according to Claim 5, characterized in that the emulsifier is selected from glycerol monostearate, sugar esters, and lecithin, and the technological assistant is selected from acetylated monoglycerides and triacetin.

10. Method according to Claim 1, characterized in that, if the sweetener and the other ingredient of step a) are used in the solid state, they have a particle size of less than about 200 μm .

11. Method according to Claim 1, characterized in that the sweetener of step a) is selected from sucrose or glucose syrup, or one or more polyols such as, for example sorbitol, mannitol, lactitol, isomalt, xylitol, or syrups thereof.

12. Method according to Claim 1, characterized in that the typical chewing-gum ingredient is selected from: intensive sweeteners, flavourings, one or more additives, colourings, or mixtures thereof.

13. Method according to Claim 12, characterized in that the intensive sweetener is selected from : aspartame, acesulfame and salts and derivatives thereof, saccharine, neohesperidin dihydrochalcone, sucralose, neotame, thaumatococine and monelline or mixtures thereof.

14. Method according to Claim 1, characterized in that the anti-agglutination agent is selected from magnesium stearate, silica, talc, sugar esters and/or polyols.

15. Method according to Claim 1, characterized in that it is performed in the absence of granulation coadjuvants such as alkali-metal phosphates, alkaline-earth metal phosphates, maltodextrins or mixtures thereof, and/or in the absence of bulking agents such as, for example, gum arabic or pectin.

16. Method according to any one of Claims 1-15, characterized in that the powder obtained in step (d) is mixed with at least one pharmaceutical, cosmetic and/or nutritional active ingredient and/or with at least one of sweeteners, flavourings, colourings, and other additives, prior to being subjected to the compression step.

17. Chewing gum in powder form obtainable by the method according to any one of Claims 1-16.

18. Compressed chewing gum obtainable by the method according to any one of Claims 1-17.

19. Chewing gum in powder form characterized by containing, as a starting material, a soft basic gum having a penetration index, in 1/10 mm, which is greater than about 15.

20. Chewing gum in powder form characterized by containing, as a starting material, a soft basic gum having a penetration index, in 1/10 mm, which is greater than about 18.

21. Chewing gum in powder form according to claims 19 and 20 characterized by being in compressed form.

22. Compressed chewing gum according to claims 18 or 21 characterized by containing from about 60 to 90% of the total weight of basic gum and from about 5 to 25% of the total weight of bulk sweeteners.

23. Compressed chewing gum according to claim 22 characterized by containing from about 60 to 90% of the total weight of basic gum and from about 10 to 20% of the total weight of bulk sweeteners.

24. Compressed chewing gum according to claims 18-23 characterized by having a weight lower than about 1.2 grams, preferably lower than 0.8 grams, even more preferably less than 0.5 grams.

25. Compressed chewing gum according to claims 18-24 characterized by having a diameter lower than about 10 mm, preferably lower than 8 mm.

26. A coated chewing gum product comprising a gum center and a coating, characterized in that the gum center is a compressed chewing gum according to claims 18-25.

27. A coated chewing gum product according to claim 26, characterized in that the coating comprises up to about 55 by weight of the coated chewing gum.

28. A coated chewing gum product according to claim 27, characterized in that the coating comprises up to about 45% by weight of the coated chewing gum.

29. A coated chewing gum product according to claims 26- 28, characterized in that more than about 80% by weight of the coating consists of bulk sweeteners, preferably from 85 to 95%.

**GOMA DE MASCAR EN FORMA DE POLVO Y UN MÉTODO DE
PREPARACIÓN**

INTRODUCCIÓN

El objeto de la presente invención es una goma de mascar novedosa en forma de tableta, que puede ser producida mediante compresión directa de una formulación de goma en forma de polvo; la goma de mascar así obtenida se caracteriza por una masticabilidad agradable la cual permanece inmodificable a través del periodo de masticación sin endurecerse como la mayoría de las gomas de masticar convencionales.

ANTECEDENTE DE LA INVENCION

Ejemplos de goma de mascar en forma comprimida producida mediante compresión directa de mezclas en forma de polvo han sido conocidos en la técnica durante varios años y varios tipos están comercialmente disponibles. Sine embargo, las gomas en polvo comprimidas que actualmente están disponibles no son placenteras al masticar ya que para evitar dificultades técnicas en el proceso de producción ellas se han producido a partir de gomas de

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base dura. Es un hecho conocido que es mucho más fácil para moler y comprimir materiales duros y secos y que la compresión de los polvos es más compleja en los materiales suaves de lo que ellos son; hasta ahora, la necesidad para tener mezclas de partida o materiales que son suficientemente duros o secos para ser granulados y comprimidos fácilmente a guiado a la producción de gomas de masticar que son duras y deleznable, con el riesgo de que alguna parte de la goma sea tragada accidentalmente.

Varias gomas de mascar producidas por la compresión de los ingredientes en polvo se describen en la literatura. Desde 1942, la patente Estadounidense US-2,290,120 describió, por ejemplo, la preparación de gomas de mascar mediante molido en frío de goma básica y jarabe de glucosa (a aproximadamente -20° C) y la mezcla y compresión posterior de estas; sin embargo, las gomas básicas utilizadas en esta patente contienen gomas naturales que, debido a sus conocidas limitaciones con respecto al desempeño, calidad del suministro y problemas técnicos de uso, han sido ahora casi completamente abandonadas y remplazadas por otros, ingredientes sintéticos.

La patente Estadounidense US-4,753,805 describe la granulación y compresión posterior de una composición de goma de mascar que tiene un porcentaje de humedad de entre 2 y 8%, con el uso de varios coadyuvantes tecnológicos tales como agentes de anti-aglutinación y coadyuvantes de granulación (fosfatos de metal alcali, fosfatos de metales de tierras alcalinas, maltodextrinas, o mezclas de estos).

La solicitud de patente Europea EP-0221850 describe formulaciones de goma de mascar que son adecuadas por estar formadas en tabletas y que son producidas mediante la mezcla de goma básica con ingredientes secos, que incluyen la porción aromática, sin la plastificación debido a los aceites de los saborizantes, enfriado posterior de la mezcla sobre el punto de congelamiento del agua (5-10° C), granulación seca y compresión.

La patente Estadounidense US-4,000,321 describe una goma de mascar con características de suavidad durante el masticado y peso liviano. Este resultado se alcanzó mediante la granulación en frío de una mezcla de goma de mascar, luego de adhesión espontánea mediante calentamiento del granulado. Se obtiene así una goma de



mascar que contiene burbujas y que no puede ser mezclada con otros ingredientes.

La WO 99/2503 describe un proceso que prevé la preparación de una masa de goma de mascar en forma de polvo en el que la goma básica se enfría a una temperatura entre 0 y -35° C; la masa así enfriada es luego granulada suplida con los aditivos necesarios e ingredientes activos, y luego comprimida.

La patente Estadounidense US-4,588,592 describe un método para preparar gomas de masticar que contiene entre 70 a 95% por peso de azúcar granulada. El azúcar granulada, calentada previamente a una temperatura entre 51 y 93° C, se mezcla con la goma básica a una temperatura entre 54 y 121° C. El producto así obtenido puede ser luego utilizado como este es o transformado en un producto granular, después de enfriamiento a una temperatura entre -6 y -40° C.

La US-4,161,544 describe un método para preparar goma de mascar que provee los azúcares a ser mezclados con la goma básica, calentado a una temperatura de 60-120° C; la temperatura es luego reducida a entre 30 y -5° C y la

masa así obtenida se granula. El método en cuestión prevé el uso de "agentes de masificación" tales como goma arábica, pectina, u otros aditivos similares; como es bien conocido, éstos ingredientes son solubles en agua y, tales como, serán ingeridos después de masticación breve, junto con los azúcares dejando así un bolo de consistencia más dura; el objeto propuesto se alcanza así solo parcialmente, suministrando una masticación que es extremadamente variable durante el tiempo.

Finalmente, la solicitud de patente Internacional WO 01/19206 describe un método particularmente laborioso para preparar goma de mascar, que requiere un pretratamiento de la mezcla de goma básica que es reducido a pelotillas de relativamente pequeñas partículas que en cambio son luego enfriadas a temperaturas extremadamente bajas, es decir por debajo de -40°C , mediante la adición de hielo seco. Aún cuando la operación tiene lugar en especial, en ambientes deshumidificados grandemente (con el correspondiente costo económico más grande y sentido práctico reducido), esta selección guía fácilmente a la formación y acumulación de condensación en el hielo se con

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íntimamente mezclado con la composición de la goma, con la formación de masas y aglutinaciones.

Como se mencionó anteriormente, sin embargo, los métodos descritos en los documentos de patente mencionados anteriormente tienen considerables desventajas tales como, por ejemplo, la producción de goma de mascar con pobre masticabilidad.

DESCRIPCIÓN DE LA INVENCION

Se ha descubierto ahora un método que permite la producción de una goma de mascar en forma de polvo que es transformada, simplemente mediante compresión, en una tableta de goma con masticabilidad y suavidad características similares a o mejor que aquellas gomas de buena calidad, producidas convencionalmente, particularmente con respecto a una palatabilidad óptima a través del periodo de masticación.

Una ventaja adicional de la presente invención es la habilidad para producir gomas masticables farmacéuticas o medicadas que contienen uno o más ingredientes activos que son sensibles al calor; de hecho, en contraste con

las técnicas convencionales, la mezcla de la goma en forma de polvo con los ingredientes activos y su posterior transformación en el producto terminado no requiere de calentamiento.

Otra ventaja ofrecida por el proceso de la presente invención es que este permite producir una goma de masticar en varias formas y tamaños diferente a los convencionales, que incluye tabletas y micro pelotillas de menos de 0,8 gramos (que serían muy difícil de producir con los medios tradicionales) simplemente remplazando las perforaciones en una prensa.

Un método para fabricar gomas de mascar en miniatura se describe en la WO 02/094032, presentado por Wrigley, y esta se basa sustancialmente en la extrusión de la goma de mascar en la cámara llenada con líquido del llamado "peletizador subacuático ", como por ejemplo aquel fabricado por Gala Industries y descrito en la WO 01/2137.

El método de acuerdo con la WO 02/094032 presenta sin embargo una desventaja que no puede ser omitida: debido a las características técnicas del peletizador

subacuático, la cantidad de endulzante de masa en la goma de mascar se debe mantener completamente baja, por lo tanto, en el caso de una goma de mascar dulce se desea, el centro de la goma extruido mediante un peletizador subacuático tiene que ser rodeado por una cubierta que comprende al menos 50% por peso de la goma de mascar cubierta y que contiene la cantidad necesaria de endulzante de masa, como por ejemplo redescrive en la WO 02/094032, también presentada por Wrigley.

Por el contrario, el método de acuerdo con la presente invención permite fabricar micro pelotillas de goma de mascar independientemente de la cantidad de endulzante de masa requerido.

Otra ventaja que llegará a ser clara de la siguiente descripción es que la formulación de goma de mascar en forma de polvo puede ser empacada, enviada, y preservada, aún durante periodos prolongados de tiempo, sin perder sus propiedades, en el hecho que queda completamente en el estado granulado.

Finalmente, otra ventaja ofrecida por la presente invención es que es posible producir una goma de mascar

en varias otras formas que las formas convencionales y tamaños, simplemente mediante remplazar las perforaciones en una tableta de presión

En contraste con la técnica anterior descrita en la literatura, con el fin de preparar la mezcla de goma de mascar en polvo, no es necesario utilizar exclusivamente ingredientes secos o mezclar ingredientes congelados en forma de polvo sin ingredientes líquidos u otras formas de plastificado tales como, por ejemplo, saborizantes líquidos, para evitar suavizar la mezcla. De hecho, una de las principales características de la presente invención es el hecho de que es posible operar inicialmente de acuerdo con el método de preparación usual que se utiliza para la preparación de las gomas de mascar convencionales (que es aquellas que no están en forma de polvo).

Por otra parte, el método de acuerdo con la presente invención puede ser implementado sin la ayuda de coadyuvantes de granulación tales como, por ejemplo, fosfatos de metal alcali, fosfatos de metales de tierras alcalinas, maltodextrinas, o mezclas de éstos, y/o sin la

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ayuda de "agentes de masificación" tales como, por ejemplo, goma arábica o pectina.

Otra ventaja del siguiente método de preparación consiste en el uso completo y recuperación del producto lo que permite así una ausencia de pérdidas en el proceso o desperdicios.

Uno de los elementos que caracteriza la presente invención es el uso de gomas básicas "suaves" que eleva los productos que tienen un perfil de masticación placentero comparable con, sino mejor que, los productos convencionales. De hecho se ha descubierto que en contraste con la técnica anterior, es posible producir mezclas de goma de mascar completas en forma de polvo, listas para ser comprimidas y así también comprimir la porción saborizante en el porcentaje deseado, con el uso de gomas básicas de partida suaves.

El método para la producción de goma de mascar en forma de polvo de acuerdo con la presente invención se caracteriza en que esta comprende las siguientes etapas:

- a) la mezcla de una goma básica suave, es decir una base de goma, con al menos un endulzante y, opcionalmente, al menos otro ingrediente de goma de mascar típico, a una temperatura entre aproximadamente 35 y 75° C,
- b) Enfriar la mezcla así obtenida a una temperatura de entre aproximadamente 0 y -40° C y, preferiblemente entre -10 y -40° C,
- c) Moler y posteriormente tamizar la mezcla así obtenida para un tamaño de partícula de menos de aproximadamente malla 10,
- d) Opcionalmente mezclar el polvo así obtenido con al menos un agente de anti-aglutinación,
- e) Compresión opcional de la mezcla así obtenida.

La mezcla (etapa a) se desarrolla preferiblemente a una temperatura entre aproximadamente 40 y 50° C durante un periodo de aproximadamente 10-30 minutos, preferiblemente 20 minutos.

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El tamizado (etapa c) se desarrolla preferiblemente hasta partículas que tengan un tamaño de menos de aproximadamente malla 10 y preferiblemente menos de malla 14

Dentro de la alcance de la presente invención, se pretende definir una goma básica caracterizada por un índice de penetración, en 1/10 mm, que es más grande que cerca de 15 y preferiblemente más grande que 18 (medido de acuerdo con el "método estándar para penetración de aguja de ceras de petróleo", ASTM D1321-97).

En particular, la goma básica suave preferiblemente utilizada para la implementación de la presente invención tendrá la siguiente composición cualitativa/cuantitativa:

-De cerca de 8 a 16% de uno o más elastómeros, preferiblemente seleccionado del grupo que comprende poliisobutileno, copolímero de isobutileno/isopreno, y copolímero de acetato de vinilo/laurato de vinilo,

-De cerca de 12 a 19% de acetato de polivinilo

- De cerca de 14 a 30% de resina preferiblemente a ser seleccionada del grupo que comprende esteres de resina vegetal, resinas producidas por síntesis y/o resinas de terpeno,
- De cerca de 10 a 22% de aceites vegetales hidrogenados o parcialmente hidrogenados ,
- De cerca de 0 a 7% de cera seleccionada del grupo que comprenden ceras vegetales, ceras derivadas de petróleo y/o ceras sintéticas,
- De cerca de 5 a 9% de emulsificadores y asistentes tecnológicos más precisamente pero no exclusivamente, monoestearato de glicerol, monoglicéridos acilatos, lecitina, ésteres de azúcar y triacetina,
- De cerca de 15 a 40% de llenadores de mineral inerte,
- Hasta cerca de 0,1% de antioxidantes.

La selección de los ingredientes específicos no altera el principio de la invención y es apropiado para el uso de l producto, particularmente cuando la mezcla de la goma en forma de polvo es y es puesta tal y como lo propone el comparador para enriquecerla con saborizantes adicionales en forma de polvo, endulzantes intensivos, o ingredientes dietarios, funcionales, farmacéuticos, o cosméticos, antes de formar las tabletas.

Si los endulzantes y los otros ingredientes de goma de mascar típicos utilizables en las etapas a) de la presente invención son utilizados en el estado sólido ellos normalmente tienen un tamaño de partícula de menos de 200µm y preferiblemente menos de 150µm.

El término "ingredientes de goma de mascar típicos" se pretende definir endulzantes intensivos, saborizantes y otros aditivos. En particular, endulzantes intensivos típicamente utilizados son aspartame, acesulfame y sales y derivados de estos, sacarina, neoesperidin dihidrocalcona, sucralosa, neotame, taumatina, moneilina, etc. El término "saborizantes" se pretende definir cualquier mezcla de aceites aromáticos naturales o

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sintéticos o de ingredientes saborizantes activos individuales, tomados individualmente o en combinación, sustancias refrescantes, etc. en solución o llevados mediante un vehículo adecuado por medio de una o más de las técnicas conocidas.

Los aditivos utilizables en la presente invención son todos aquellos utilizados comúnmente en la producción de la goma de mascar convencional y comprende así los colorantes, ácidos alimenticios, suavizantes, saborizantes, etc.

Como es conocido en la técnica, la goma básica puede ser mezclada con el uso de goma precalentada o goma a temperatura ambiente, de acuerdo con este formato, es decir, el uso de bloques de 8-10 kg de goma básica que de hecho requiere precalentamiento el cual no es necesario para los formatos que pueden ser medidos en pelotillas o gotas. La goma básica es así mezclada con los ingredientes seleccionados como se describió anteriormente a una temperatura convencional de entre 35 y 75° C, más preferiblemente entre 40 y 55° C, durante un periodo de tiempo de entre 10 y 30 minutos, con el uso de una de las técnicas conocidas en el arte. Una vez la

terminación de esta mezcla, la mezcla se descarga y se acondiciona a una temperatura de entre -40 y 0° C. En particular, es posible operar discontinuamente con enfriamiento prolongado a temperaturas entre -30 y 0° C y preferiblemente entre -15 y -25° C; alternativamente, es posible utilizar métodos que aseguren el enfriamiento continuo a temperaturas entre -40 y -10° C.

La mezcla es luego molida por medios de un molino de cuchilla. Un porcentaje de la masa se obtendrá inmediatamente con un tamaño de partícula satisfactorio, mientras la porción con un tamaño de partícula mayor que el deseado es molido posteriormente en un molino, opcionalmente enfriado a temperatura entre -40 a 0° C, y luego reciclado, alcanzando así un 100% de rendimiento. Debería también ser necesario tener un límite de tamaño de partícula inferior, la porción separada puede ser reprocesada completamente, permitiendo así completar la recuperación del producto en este caso; el polvo obtenido así preferiblemente tiene un tamaño de partícula más grande de malla 100, y aún más preferiblemente, mayor que malla 80.

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Los agentes de anti granulación tales como, por ejemplo, sales de metal de ácidos grasos, sílice precipitada, ésteres de azúcar, polioles del tipo más adecuado para compresión , por ejemplo, isomalt y xilitol, se agregan al polvo así obtenido.

Adicionalmente uno o más de los endulzantes intensivos tales como aspartame, acesulfame y sales y derivados de estos, sacarina, neoesperidin y dihidrocalcona, sucralosa, neotame, taumatina, monelina, etc., ingredientes activos aromáticos o saborizantes en forma de polvo o portadores mediante encapsulación, etc., ácidos grasos, u otros aditivos con ingredientes activos funcionales específicos y farmacéuticos o nutricionales tales como vitaminas, aminoácidos, polipéptidos u otras sustancias con actividad funcional o cosmética también pueden ser agregados en esta etapa.

Esta mezcla de goma de mascar en forma de polvo así obtenida tiene la ventaja de que esta puede ser usada directamente o puede ser empacada, almacenada y enviada a un comprador quien puede así simplemente proceder con la formación de la tableta, posiblemente precediendo esta operación con una mezcla adicional con saborizantes

adicionales en forma de polvo, saborizantes encapsulados, etc., y/o ingredientes activos dietarios, funcionales, farmacéuticos o cosméticos, según se requiera. La industria farmacéutica de hecho no está normalmente equipada con una maquinaria utilizada para el procesamiento de las gomas de mascar, y puede dar forma y consistencia al producto terminado únicamente mediante la compresión de un polvo. Hasta ahora, estas limitaciones han guiado a una subestimación de las potencialidades de la goma de mascar como un vehículo de liberación.

La etapa final del procesamiento consiste en la formación de tabletas o píldoras en una selección muy amplia de formatos y dimensiones mediante la presión para formar tableta o una píldora o una máquina formadora de tabletas; las tabletas o píldoras así obtenidas pueden por lo tanto ser empacadas de inmediato en el formato deseado, es decir en paquetes de ampollas, barras, etc., o cubiertas de azúcar, opcionalmente también incorporar uno o más saborizantes, endulzantes o ingrediente activo en la cubierta, y luego empacada.

Una modalidad particular de la presente invención se representa mediante las gomas de mascar obtenidas por

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recubrimiento de micro pelotillas obtenibles a través del proceso descrito. Tales gomas de mascar de micro pelotillas recubiertas tienen un centro de goma rodeado por una cubierta y un peso total de menos de 1,2 gramos, preferiblemente menos de 0,8 gramos, aún más preferible menos de 0,5 gramos y/o un diámetro inferior a 10 mm, preferiblemente menos de 8 mm.

El recubrimiento consistirá esencialmente de endulzantes de masa y este puede comprender hasta cerca de 55%, preferiblemente hasta el 45% por peso de la goma de mascar cubierta; más que cerca del 80% por peso de la cubierta preferida normalmente consistirá de endulzantes de masa, más preferiblemente de 85 a 95% por peso.

Las micro pelotillas utilizadas como centros de goma normalmente contendrán cerca de 60 a 90% por peso de goma básica y de cerca de 5 a 25% por peso de endulzantes de masa, preferiblemente de 10 a 20% de endulzantes de masa, junto con los ingredientes acostumbrados (tales como endulzantes intensivos, saborizantes, agentes anti aglutinación y extractos vegetales). Una modalidad preferida del centreo de goma que puede ser utilizado para fabricar las gomas de mascar de micro pelotilla de

acuerdo con la invención se describen en el ejemplo 10 (y tabla 3).

Aspectos adicionales de la invención serán claros a partir de la siguiente sección experimental y comparativa que no deberá, sin embargo, ser considerada como limitante de la invención.

SECCIÓN EXPERIMENTAL

Ejemplo 1

La siguiente descripción se refiere a la preparación de una goma en forma de polvo que tiene una composición cualitativa dada en el ejemplo 1 en la tabla 1.

Inicialmente, 29,3 partes por peso, que fue la cantidad completa de goma básica, se mezcló, en un mezclador sigma, calentada a una temperatura de entre 40 y 50° C, con 13,47 partes de sorbitol en forma de polvo, que fue una tercera parte de la cantidad de sorbitol, y con 6,7 partes de manitol. Después de unos pocos minutos, una segunda porción de sorbitol en forma de polvo, de nuevo de una tercera parte del total se agregó, junto con 0,4 partes de endulzante intensivo, la mezcla se continuó

durante unos pocos minutos, y el sorbitol restante se agregó luego, junto con 2,2 partes seleccionadas de saborizantes en forma líquida y en polvo, la homogenización de la mezcla se continuó durante pocos minutos adicionales.

Es útil señalar que la cantidad de saborizante que está en forma de polvo también debe ser agregado después de molido.

10-30 minutos después de iniciar la mezcla, la mezcla sí obtenida fue descargada y dejada para condicionarse a una temperatura de -20° C.

Después de un periodo de cerca de 24 horas, la mezcla de goma de mascar así tratada fue molida en un molino de cuchillas con una rejilla de 4 mm² y el material molido fue tamizado.

Después de tamizado, una mezcla que tiene un tamaño de partícula de menos de malla 10 y 60% del cual tiene un tamaño de partícula de malla 14 se obtuvo

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3,5 partes de mezcla de anti-aglutinación y 17,5 partes de isomalt del tipo comúnmente comercializado para aplicaciones en el campo de la formación de tabletas se agregaron a 79 partes de la mezcla de goma de mascar en forma de polvo así obtenida. La mezcla de goma de mascar en forma de polvo fue luego comprimida.

El método descrito anteriormente también puede ser aplicado a la preparación de gomas en forma de polvo que tiene una composición diferente de aquella del ejemplo 1, tal como las composiciones de los ejemplos 2-8 de las tablas 1 y 2.

Ejemplo 6

La siguiente descripción se refiere a la preparación de una goma en forma de polvo que tiene una composición cualitativa dada en el ejemplo 6 en la tabla 2. En la primera etapa, 27 partes de goma básica suave, 36,8 partes de sorbitol, 5,3 partes de manitol, 8,8 partes de isomalt, 2,3 partes de jarabe de sorbitol, 0,3 partes de endulzante intensivo, 0,3 partes de saborizante líquido, y 0,2 partes de aditivo se mezclaron mediante métodos similares a aquellos descritos en el ejemplo precedente.

En este ejemplo, el término "aditivos" significa un plastificador seleccionado de aquellos comúnmente utilizados en goma de mascar, en vista del bajo porcentaje de saborizante líquido utilizado.

La mezcla se descargó, se acondicionó, se molió y, en la etapa final, 3 partes de mezcla de anti-aglutinación y 16 partes de extractos vegetales se agregaron a 81 partes de la mezcla en forma de polvo así obtenida. La mezcla de goma de mascar así obtenida pudo luego ser comprimida.

Ejemplo 8

La siguiente descripción se refiere a la preparación de una goma en forma de polvo que tiene una composición cualitativa dada en el ejemplo 8 en la tabla 2. Un método similar a aquel del ejemplo precedente fue utilizado pero, en este ejemplo, la cuota de isomalt, que fue igual a 21,5 partes, se compuso de 6,5 partes de isomalt convencional para goma de mascar, que se agregó en la primer etapa de mezclado, y por cinco partes de isomalt de un tipo adecuado para compresión, que fue agregado a la mezcla en forma de polvo en la segunda etapa.

Ejemplo 10

La siguiente descripción se refiere a la preparación de una goma en forma de polvo que tiene una composición cuantitativa dada en el ejemplo 10 en (tabla 3). Un métodos similar a aquel de los ejemplos previos se utilizó. Las gomas de mascar obtenidas bajo este ejemplo son particularmente adecuadas para ser cubiertas con el fin de obtener productos con un peso inferior de 1,2 gramos, preferiblemente menos de 0,8 gramos, aún más preferiblemente menos de 0,5 gramos. Es valioso anotar que las características de suavidad de la goma básica son tales que las tabletas de goma de mascar así obtenidas tienen propiedades de masticación placenteras sustancialmente idénticas a aquellas de las gomas de mascar convencionales también cuando se usan con altos porcentajes de base de goma.

La cubierta preferida para rodear la goma de mascar comprimida obtenida de acuerdo con el presente ejemplo tendrá la siguiente composición por peso:

- Endulzante intensivo 1,4%
- sabor 3,5%

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- Color (preferiblemente TiO₂) 1,6%
 - Endulzante de masa (preferiblemente maltitol) 87,5%
 - Otros aditivos (preferiblemente goma arabiga) 6,0%
- Total 100.0%

Tabla 1

	Ejemplo No.1	Ejemplo No.2	Ejemplo No.3	Ejemplo No.4	Ejemplo No.5
Goma básica	29,3	48,5	48,0	29,5	30,8
Sorbitol	40,4	47,5	46,5	39,7	50,3
Manitol	6,7			6,9	4,4
Isomalt	17,5			17,0	7,0
Acido cítrico				0,6	
Aditivo				0,5	0,6
Endulzante intensivo	0,4			0,3	0,3
Saborizante líquido	0,6			1,0	1,6
Saborizante en forma de polvo	1,6			2,0	
Plastificador			1,5		
Mezcla antiaglutinación	3,5	4,0	4,0	2,5	5,0
Total	100,0	100,0	100,0	100,0	100,0

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Tabla 2

	Ejemplo No.6	Ejemplo No.7	Ejempl o No.8		Ejemplo No.9
Goma básica	27,0	32,1	25,3	Goma básica	20,2
Sorbitol	36,8	37,8	32,2	Jarave de glucosa	2,9
Manitol	5,3	5,8	5,6	Sucrosa	71,2
Isomalt	8,8	4,1	21,5		--
Jarave de sorbitol	2,3	2,5	2,1		--
Acido citrico			0,7		--
Aditivos	0,2	0,1	0,1	Aditivos	1,0
Endulzante intensivo	0,3	0,3	0,3		--
Saborizante líquido	0,3	1,3	0,4	Saborizantes líquidos	0,7
Saborizante en forma de polvo		2,0	0,7	Saborizantes en forma de polvo	--
Mezcla de anti- aglutinación	3,0	3,0	8,4	Mezcla anti- aglutinación	4,0
Extracto vegetales	16,0	11,0	2,7	Ingrediente activo	--
Total	100,0	100,0	100,0	Total	100,0

Tabla 3

	Ejemplo No.10
Goma básica	70,0
Sorbitol	--
Manitol	--
Isomalt	18,0
Jarabe sorbitol	--
Acido cítrico	--
Aditivos	--
Endulzante intensivo	0,2
Saborizante líquido	0,4
Saborizante en forma de polvo	6,4
Mezcla anti-aglutinación	5,0
Extractos vegetales	--
Total	100,0

De acuerdo con los requerimientos, es así posible agregar uno o más endulzantes intensivos tales como aspartame, acesulfame y sales y derivados de estos, sacarina, neoesperidin dihidrocalcona, sucralosa, etc., ingredientes activos aromáticos o saborizantes en forma de polvo o llevados mediante encapsulación, etc., ácidos alimenticios, u otros aditivos con funciones específicas, e ingredientes activos farmacéuticos o ingredientes activos nutricionales tales como vitaminas, aminoácidos,

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polipeptidos, u otras sustancias con actividad cosmética o funcional.

Naturalmente, la adición de saborizantes, encapsulados o llevados de otra forma, y la adición de ingredientes activos sensibles al calor tiene lugar después de moler en la etapa de estabilización llevada a cabo con el uso de uno o más agentes de anti-aglutinación conocidos en la técnica y comúnmente utilizados para este propósito, tales como, por ejemplo, estearato de magnesio, sílice, talco, polioles del tipo más adecuado para compresión, por ejemplo, isomalt, xilitol, etc.

Después de ser formado en tabletas o píldoras, la goma de mascar así obtenida puede así también ser recubierta con azúcar como una goma de mascar normal o producto de confitería, que incluye endulzantes intensivos, saborizantes e ingredientes activos como se describió anteriormente en el recubrimiento.

SECCIÓN COMPARATIVA

A pesar de los intentos constantes para aplicar métodos de evaluación basados en instrumentos para el estudio de

la goma de mascar y la identificación de sus propiedades, el factor determinante en la evaluación de las propiedades de masticación de una goma de mascar es aún una evaluación subjetiva por el masticador. La sensación de masticación típica de hecho incluye la percepción, prolongada durante el tiempo, de olor, sabor, gusto, color, consistencia, palatabilidad y regusto.

Aunque existen métodos analíticos cualitativos y cuantitativos para establecer el contenido residual de sabor, ingredientes activos, y endulzantes o azúcar en una goma de mascar en un momento específico durante el masticado, no hay aún un método de evaluación de la percepción del agrado de la liberación del saborizante y de la dulzura o la duración de ambos.

También hay parámetros objetivos que pueden permitir propiedades individuales de la goma de mascar a ser evaluada pero, en el momento, no hay una técnica que sea suficientemente sofisticada y completa para evaluar la combinación de las propiedades de masticado definidas como un todo en Inglés "sensación de boca", que consiste de una percepción de varios factores tales como dulzura,

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resistencia, deslizamiento, y consistencia del bolo, que constituye la palatabilidad de una goma de mascar.

Con el fin de evaluar los aspectos innovadores de la presente invención, la evaluación sensorial mediante un panel de masticadores por lo tanto fue utilizado y, en paralelo, al menos un parámetro significativo se evaluó mediante el desarrollo de un ensayo de medición por medio de un penetrómetro.

La evaluación sensorial del desempeño de una goma de mascar y de la goma básica utilizada para preparar esta generalmente se basa en tres etapas consecutivas, referidas como (a) el primer mordisco de la etapa de masticado, (b) el mordisco intermedio o etapa de masticado, y (c) la mordida final o etapa de masticado. Para ver la evaluación de la goma en mayor detalle, la primera etapa (a) o "primera mordida" corresponde a los primeros segundos de masticación en el que la goma de mascar es colocada en la boca y mordida. En esta etapa, la goma de mascar debe responder a requerimientos absolutamente exactos tales como el grado correcto de conformidad bajo los dientes, y debe evitar romperse en partes diminutas que puedan aún ser ingeridas

involuntariamente, lo que ocurre típicamente con las gomas de mascar comprimidas comercialmente disponibles. Al mismo tiempo, sin embargo, con el fin de que la masticación sea placentera desde los primeros momentos, la goma de mascar no debe ser particularmente dura o tiesa, que es otra propiedad que falta en los productos disponibles actualmente de este tipo.

La segunda etapa (b), conocida como la etapa "intermedia", es de más larga duración y corresponde, al periodo de 30-60 segundos durante el cual la mayoría de endulzantes o el azúcar va dentro de una solución debido al, efecto de la saliva y a la mayor liberación de sabor simultánea del producto. En esta etapa, es particularmente importante para la masticación ser uniforme, en otras palabras para la gota física en la debida consistencia para que la disolución sea ligera y no muy notable, manteniendo así el llamado comportamiento "lineal".

La tercera etapa o "final" (c) empieza cerca de un minuto después de empezar la masticación y continúa a través del tiempo restante durante el cual la goma es masticada. Después que la mayoría del azúcar o los endulzantes se han disuelto, una porción saborizante y un residuo de

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azúcares aún están presentes y la goma es parcialmente hidratada. Durante esta etapa, las características de la goma básica son fundamentales ya que esta representa casi la totalidad del bolo residual.

Con las gomas de una firmeza particular que son utilizadas debido a que ellas son más fácilmente rompibles, aún si la dureza intrínseca no es percibida en las dos primeras etapas, posiblemente por virtud de algunos expedientes, inevitablemente serán aparentes en esta etapa, haciendo la masticación difícil y no placentera y, tal como, no abrogan en absoluto.

Entre los varios parámetros indicativos del desempeño de una goma de mascar que puede ser medido objetivamente, que se relaciona a la etapa de masticado (a) "primera mordida" es ciertamente indicativo, aunque no exhaustivamente de la calidad del producto. La fuerza necesaria para una mordida inicialmente para penetrar una píldora cubierta de azúcar o una tableta es un hecho proporcional a la dureza de la pastilla o tableta y puede por lo tanto dar una medida de cuan placentero puede ser el masticado. Para las tabletas, la dureza es proporcional a la delesnabilidad y la tendencia a

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desmenuzarse durante las primeras mordidas. El producto más duro es, y por lo tanto es más fácil moler y comprimir, la tendencia más marcada será a romperse en diminutas piezas que pueden ser aún ingeridas involuntariamente. Para demostrar esto, se han hecho algunas medidas en productos disponibles comercialmente, en ferias comerciales, con el uso de un penetrómetro (Sommer & Runge KG, Berlin) que es comúnmente utilizado en la industria para evaluar la dureza de los materiales plásticos tales como ceras que, como es bien conocido, también son ingredientes utilizados en la preparación de la goma básica.

Las mediciones hechas, que fueron desarrolladas en paralelo con evaluaciones sensoriales, dio resultados indicativos de características de masticado superior de las muestras producidas de acuerdo con la presente invención. La tabla 4 dio los resultados obtenido para dos productos comerciales, indicados como marca A y marca B, respectivamente, un producto distribuido en una feria comercial, indicado como marca C y dos muestras producidas de acuerdo con la presente invención.

Tabla 4

	Evaluación sensorial sobre: "primera mordida"	Índice de penetración (valores en 1/10 mm)
Marca A*	Duro y deleznable en la boca	1 - 3
Marca B*	Duro y deleznable en la boca	3 - 3,5
Marca C*	Muy duro y marcadamente deleznable en la boca	1,5 - 3
Ejemplo 6	Suave y no deleznable	6 - 7,5
Ejemplo 8	Completamente suave no deleznable	7 - 7,5

*: Los productos indicados como marca A, B y C son gomas de mascar de polvo comprimido que corresponden respectivamente a:

MARCA A: Golnatur Propol-young, "Gum Tech"[®], sabor de limón comercializado por ULRICH SpA, Torino.

MARCA B: "Vitermine Vitamine erbe e minerali Gola", sabor a menta, comercializado por GUABER, funo, Italia.

MARCA C: tabletas de goma de mascar comprimidas hechas con Satin[®] base de goma I fabricado por L.A. Dreyfus Company.

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Como se puede ver, la medición experimental confirma el juicio con respecto a la evaluación sensorial del parámetro específico.

El desempeño reivindicado en la presente invención se alcanza con el uso de gomas "suaves" que elevan los productos con un perfil de masticación placentero que es comparable con sino mejor que aquel de los productos convencionales.

Es importante recalcar que los valores dados anteriormente son significativos solo a los ejemplos anteriores y variaciones en la composición de la goma básica que puede guiar a resultados apreciablemente diferentes. Aunque las gomas básicas tiene otras formulaciones diferentes a las dadas anteriormente son utilizadas convencionalmente para la preparación de goma de mascar de lata calidad mediante métodos convencionales en formatos convencionales, es decir, barras, o grageas, ellas no tienen las características de suavidad poseídas por las gomas basitas con la formulación dada anteriormente.

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En particular, puede ser visto fácilmente que las gomas básicas de alta calidad en las que solo dos de las categorías de ingredientes indicados anteriormente difiere de aquellos de las gomas de la presente invención tienen características claramente diferentes en términos de suavidad. Dos gomas básicas identificadas como goma 1 y goma 2, dadas por vía de ejemplo en la tabla 5, tienen las siguientes diferencias en comparación con la formulación descrita anteriormente.

Tabla 5

	Goma 1	Goma 2	Goma 3
Ceras seleccionadas del grupo que comprende ceras vegetales derivadas de petróleo o producidas por síntesis	30-32%	30-32%	0-7%
Productos de llenador mineral inerte	10-12%	10-12%	15-40%

Para confirmar lo que se ha establecido y la diferencia descrita, una medición de ensayo mediante penetrómetro

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también se utilizo en este caso para evaluar la consistencia y dureza de las muestras de goma básica, al comparar las dos muestras descritas anteriormente con una tercera identificada como: goma 3 que tiene una formulación que corresponde a aquella descrita anteriormente. Los resultados se dan en la tabla 6.

Tabla 6

	Goma 1	Goma 2	Goma 3
Preparación en 1/10 m (valores de tres lecturas	8 / 9,5 / 9,5	10,5 / 9,5 / 9,5	21 / 21,5 /22
Penetración en 1/10 mm (promedio calculado de tres lecturas)	9	9,8	21,5

Un parámetro comúnmente utilizado por la industria para caracterizar una goma básica es el punto de suavidad. Esta medida, que es desarrollada por la llamada técnica "anillo y bola", prevé la medida de la temperatura de suavizado inicial de la goma básica y la temperatura a la cual esta pasa actualmente a través con el uso de un

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cuerpo estándar, una vez el punto de suavidad se alcanza. Dos temperaturas y el respectivo intervalo son así obtenidos y suministran información extremadamente útil sobre las características de la goma. En el caso específico de las gomas dadas por vía del ejemplo, las temperaturas medidas se dan en la tabla 7.

Tabla 7

	Goma 1	Goma 2	Goma 3
Temperatura de suavidad inicial (° C)	77	78	47
Punto de suavidad (° C)	79	79	56
Intervalo de suavidad (° C)	2	1	9

Es claro a partir de los datos establecidos anteriormente que la diferencia entre los ejemplo, goma 1 y goma 2, sobre aquellos de un parte y la goma 3, en la otra, no solo están en la diferencia macroscópica en los valores absolutos de las temperaturas de suavidad que pudieran ellas mismas ser un indicador significativo; de hecho, el alcance del intervalo de suavidad también está en

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correlación directa con las características de mayor plasticidad y suavidad en la goma 3 en comparación con la mayor suavidad de la goma 1 y la goma 2.

Así es claro que el uso de una goma básica es un parámetro particularmente importante para la producción de gomas de mascar en forma polvo que tienen características de palatabilidad comparables con sino mejores que, aquellas de las gomas de mascar convencionales.

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REIVINDICACIONES

1. Método para producir goma de mascar en forma de polvo, constituido sustancialmente por las siguientes etapas:
 - a) mezclar una goma básica suave con al menos un endulzante y, opcionalmente, al menos otro ingrediente de goma de mascar típico, a una temperatura entre cerca de 35 y 75°C
 - b) Enfriar la mezcla así obtenida a una temperatura entre cerca de 0 y -40° C,
 - c) Moler y posteriormente tamizar la mezcla así obtenida para dar un polvo que tiene un tamaño de partícula menor de cerca de malla 10,
 - d) Mezclar opcionalmente el polvo así obtenido con al menos un agente de anti-aglutinación,
 - e) Mezclar opcionalmente el polvo así obtenido con uno o más endulzantes, saborizantes, colorantes, ácidos alimenticios, u otros aditivos,

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f) La compresión opcional de la mezcla así obtenida.

2. Método de acuerdo con la reivindicación 1, caracterizado en que el enfriamiento se desarrolla a una temperatura de entre cerca de -10 y 40° C.

3. El método de acuerdo con la reivindicación 1, caracterizado en que la etapa c) se desarrolla para dar un polvo. que tiene un tamaño de partícula de menos de cerca de malla 14.

4. Método de acuerdo con la reivindicación 1, caracterizado en que la goma básica suave se caracteriza por un índice de penetración, en 1/10 mm que es más grande que cerca de 15 y, preferiblemente, más grande que 18.

5. Método de acuerdo con la reivindicación 1, caracterizado en que la goma básica suave tiene la siguiente composición por peso: de cerca de 8 a 16% de la menos un elastómero, de cerca de 12 a 19% de acetato de polivinilo, de cerca de 14 a 30% de resina, de cerca de 10 a 22% de al menos

b¹

un aceite vegetal hidrogenado y/o parcialmente hidrogenado, de cerca de 0 a 7% de cera, de cerca de 5 a 9% de al menos un emulsificador y/o un asistente tecnológico, de cerca de 15 a 40% de llenadores de mineral inerte y hasta cerca de 0,1% de antioxidante, en el que las cantidades varios componentes suma 100.

6. Método de acuerdo con la reivindicación 5, caracterizado en que el elastómero se selecciona de polisobutileno, copolímero de isobutileno/isopreno, y copolímero de acetato de vinilo/laborato de vinilo.
7. Método de acuerdo con la reivindicación 5, caracterizado en que la resina se selecciona de ésteres de resina vegetal, resinas producidas por síntesis, y/o resinas de terpeno.
8. Método de acuerdo con la reivindicación 5, caracterizado en que la cera se selecciona a partir de ceras vegetales, ceras derivadas de petróleo, y/o ceras sintéticas.

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9. Método de acuerdo con la reivindicación 5, caracterizado en que el emulsificador se selecciona a partir de monoestearato, esteres de azúcar y lecitina, y el asistente tecnológico se selecciona a partir de monoglicéridos acilados y triacetina.
10. Método de acuerdo con la reivindicación 1, caracterizado en que, si el endulzante y el otros ingrediente de la etapa a) son utilizados en estado sólido, ellos tienen un tamaño de partícula de menos de cerca de 200µm.
11. método de acuerdo con la reivindicación 1, caracterizado en que el endulzante de la etapa a) se selecciona de sucrosa o jarabe de glucosa, o uno o más polioles tales como, por ejemplo, sorbitol, manitol, lactitol, isomalt, xilitol, o jarabes de estos.
12. Método de acuerdo con la reivindicación 1, caracterizado en que el ingrediente de goma de mascar se selecciona de endulzantes intensivos,



saborizantes, uno o más aditivos, colorantes, o mezclas de estos.

13. Método de acuerdo con la reivindicación 12, caracterizado en que el endulzante intensivo se selecciona: aspartame, acesulfame y sales y derivados de estos, sacarina, neoesperidina dihidrocalcona, sucralosa, neotame, taumatina y monelina o mezclas de estos.

14. Método de acuerdo con la reivindicación 1, caracterizado en que el agente de anti-aglutinación se selecciona de estearato de magnesio, sílice, talco, ésteres de azúcar y/o polioles.

15. Método de acuerdo con la reivindicación 1, caracterizado en que este redesarrolla en la ausencia de coadyuvantes de granulación tales como fosfatos de metal alcali, fosfato de metal de tierras alcalinas, maltodextrinas o mezclas de estos, y/o en la ausencia de agentes masificantes tales como, por ejemplo, goma arábica o pectina.

16. Método de acuerdo con una cualquiera de las reivindicaciones 1-15, caracterizado en que el polvo obtenido en la etapa (d) se mezcla con al menos un ingrediente activo cosmético y/o nutricional y/o con al menos uno de endulzantes, saborizantes, colorantes, y otros aditivos, antes de ser sometido a la etapa de compresión.
17. La goma de mascar en forma de polvo obtenible por el método de acuerdo con una cualquiera de las reivindicaciones 1-16.
18. La goma de mascar comprimida obtenible mediante el método de acuerdo con una cualquiera de las reivindicaciones 1-17.
19. La goma de mascar en forma de polvo caracterizada porque contiene, como un material de partida, una goma básica suave que tiene un índice de penetración en 1/10 mm, que es más mayor que cerca de 15.
20. La goma de mascar en forma de polvo caracterizado porque contiene, como material de partida, una

goma básica suave que tiene un índice de penetración, en 1/10 mm, que es mayor que cerca de 18.

21. Goma de mascar en forma de polvo de acuerdo con las reivindicaciones 19 y 20 caracterizada porque está en forma comprimida.

22. Goma de mascar comprimida de acuerdo con las reivindicaciones 18 ó 21 caracterizada porque contiene cerca de 60 a 90% del peso total de goma básica y de cerca de 5 a 25% del peso total de endulzante de masa.

23. La goma de mascar comprimida de acuerdo con la reivindicación 22 caracterizada porque contiene cerca de 60 a 90% del peso total de la goma básica y de cerca de 10 a 20% del peso total del endulzante de masa.

24. La goma de mascar comprimida de acuerdo con las reivindicaciones 18-23 caracterizada porque tiene un peso inferior de cerca de 1,2 gramos,

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preferiblemente menos de 0,8 gramos, aún más preferiblemente menor de 0,5 gramos.

25. La goma de mascar comprimida de acuerdo con las reivindicaciones 18-24 caracterizado porque tiene un diámetro más bajo de cerca de 10 mm, preferiblemente más bajo de 8 mm.

26. Un producto de goma de mascar recubierto que comprende un centro de goma y una cubierta, caracterizado en que el centro de la goma es una goma de mascar comprimida de acuerdo con las reivindicaciones 18-25.

27. un producto de goma de mascar recubierto de acuerdo con la reivindicación 26, caracterizado en que el recubrimiento comprende hasta cerca de 55 por peso de la goma de mascar recubierta.

28. Un producto de goma de mascar recubierto de acuerdo con la reivindicación 27, caracterizado en que el recubrimiento comprende hasta cerca de 45% por peso de la goma de mascar recubierta.

29. Un producto de goma de mascar recubierto de acuerdo con las reivindicaciones 26-28, caracterizado en que mas de cerca del 80% por peso de la cubierta consiste de endulzantes de masa, preferiblemente de 85 a 95%.

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

PCT/EP 03 / 03598
International Application No.

04 APR 2003
International Filing Date (04 04 2003)

EUROPEAN PATENT OFFICE
PCT INTERNATIONAL APPLICATION
Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference
(if desired) (12 characters maximum) 03 AP 26 E

Box No. I TITLE OF INVENTION Chewing gum in powder form and a method of preparation	
Box No. II APPLICANT ☐ This person is also inventor	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)	
GUM BASE CO. SPA Via Nerviano 25 20020 LAINATE (MILANO) Italy	
Telephone No.	
Facsimile No.	
Teleprinter No.	
Applicant's registration No. with the Office	
State (that is, country) of nationality: IT	State (that is, country) of residence: IT
This person is applicant for the purposes of: ☐ all designated States ☒ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box	
Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)	
SOZZI Giuseppe Via Re Umberto 45 20020 Lainate (Milano) Italy	
This person is: ☐ applicant only ☒ applicant and inventor ☐ inventor only (If this check-box is marked, do not fill in below.)	
Applicant's registration No. with the Office	
State (that is, country) of nationality: IT	State (that is, country) of residence: IT
This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box	
☒ Further applicants and/or (further) inventors are indicated on a continuation sheet.	
Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE	
The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: ☒ agent ☐ common representative	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)	
PISTOLESI ROBERTO Dragotti & Associati Srl Galleria San Babila 4/C 20122 Milano Italy	
Telephone No. 02 799340	
Facsimile No. 02 784427	
Teleprinter No.	
Agent's registration No. with the Office	
☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.	

CONFIRMATION COPY

Continuation of Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S) <i>If none of the following sub-boxes is used, this sheet should not be included in the request.</i>	
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This person is: ☐ applicant only ☒ applicant and inventor ☐ inventor only <i>(If this check-box is marked, do not fill in below.)</i>	
Applicant's registration No. with the Office	
State <i>(that is, country)</i> of nationality: IT	State <i>(that is, country)</i> of residence: IT
This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box	
Name and address: <i>(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)</i>	
This person is: ☐ applicant only ☐ applicant and inventor ☐ inventor only <i>(If this check-box is marked, do not fill in below.)</i>	
Applicant's registration No. with the Office	
State <i>(that is, country)</i> of nationality:	State <i>(that is, country)</i> of residence:
This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box	
Name and address: <i>(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)</i>	
This person is: ☐ applicant only ☐ applicant and inventor ☐ inventor only <i>(If this check-box is marked, do not fill in below.)</i>	
Applicant's registration No. with the Office	
State <i>(that is, country)</i> of nationality:	State <i>(that is, country)</i> of residence:
This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box	
Name and address: <i>(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)</i>	
This person is: ☐ applicant only ☐ applicant and inventor ☐ inventor only <i>(If this check-box is marked, do not fill in below.)</i>	
Applicant's registration No. with the Office	
State <i>(that is, country)</i> of nationality:	State <i>(that is, country)</i> of residence:
This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box	
Name and address: <i>(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)</i>	
This person is: ☐ applicant only ☐ applicant and inventor ☐ inventor only <i>(If this check-box is marked, do not fill in below.)</i>	
Applicant's registration No. with the Office	
State <i>(that is, country)</i> of nationality:	State <i>(that is, country)</i> of residence:
This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box	
☐ Further applicants and/or (further) inventors are indicated on another continuation sheet.	

Box No. V DESIGNATION OF STATES

Mark the applicable check-boxes below; at least one must be marked.

The following designations are hereby made under Rule 4.9(a):

Regional Patent

- ☒ **AP** ARIPO Patent: GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, MZ Mozambique, SD Sudan, SL Sierra Leone, SZ Swaziland, TZ United Republic of Tanzania, UG Uganda, ZM Zambia, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT (if other kind of protection or treatment desired, specify on dotted line)
- ☒ **EA** Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ **EP** European Patent: AT Austria, BE Belgium, BG Bulgaria, CH & LI Switzerland and Liechtenstein, CY Cyprus, CZ Czech Republic, DE Germany, DK Denmark, EE Estonia, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, SI Slovenia, SK Slovakia, TR Turkey, and any other State which is a Contracting State of the European Patent Convention and of the PCT **HU, RO**
- ☒ **OA** OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GQ Equatorial Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

- | | | |
|--|---|--|
| ☒ AE United Arab Emirates | ☒ GM Gambia | ☒ NZ New Zealand |
| ☒ AG Antigua and Barbuda | ☒ HR Croatia | ☒ OM Oman |
| ☒ AL Albania | ☒ HU Hungary | ☒ PH Philippines |
| ☒ AM Armenia | ☒ ID Indonesia | ☒ PL Poland |
| ☒ AT Austria | ☒ IL Israel | ☒ PT Portugal |
| ☒ AU Australia | ☒ IN India | ☒ RO Romania |
| ☒ AZ Azerbaijan | ☒ IS Iceland | ☒ RU Russian Federation |
| ☒ BA Bosnia and Herzegovina | ☒ JP Japan | |
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| ☒ CR Costa Rica | ☒ LT Lithuania | ☒ TR Turkey |
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| ☒ CZ Czech Republic | ☒ LV Latvia | |
| ☒ DE Germany | ☒ MA Morocco | ☒ TZ United Republic of Tanzania |
| ☒ DK Denmark | ☒ MD Republic of Moldova | ☒ UA Ukraine |
| ☒ DM Dominica | ☒ MG Madagascar | ☒ UG Uganda |
| ☒ DZ Algeria | ☒ MK The former Yugoslav Republic of Macedonia | ☒ US United States of America |
| ☒ EC Ecuador | ☒ MN Mongolia | |
| ☒ EE Estonia | ☒ MW Malawi | ☒ UZ Uzbekistan |
| ☒ ES Spain | ☒ MX Mexico | ☒ VC Saint Vincent and the Grenadines |
| ☒ FI Finland | ☒ MZ Mozambique | ☒ VN Viet Nam |
| ☒ GB United Kingdom | ☒ NO Norway | ☒ YU Yugoslavia |
| ☒ GD Grenada | | ☒ ZA South Africa |
| ☒ GE Georgia | | ☒ ZM Zambia |
| ☒ GH Ghana | | ☒ ZW Zimbabwe |

Check-boxes below reserved for designating States which have become party to the PCT after issuance of this sheet:

- | | | |
|--------------------------------|--------------------------------|--------------------------------|
| ☐ | ☐ | ☐ |
| ☐ | ☐ | ☐ |

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation (including fees) must reach the receiving Office within the 15-month time limit.)

Supplemental Box

If the Supplemental Box is not used, this sheet should not be included in the request.

- I. If, in any of the Boxes, except Boxes Nos. VIII(i) to (v) for which a special continuation box is provided, the space is insufficient to furnish all the information: in such case, write "Continuation of Box No." (Indicate the number of the Box) and furnish the information in the same manner as required according to the captions of the Box in which the space was insufficient, in particular:
 - (i) If more than two persons are to be indicated as applicants and/or inventors and no "continuation sheet" is available: in such case, write "Continuation of Box No. III" and indicate for each additional person the same type of information as required in Box No. III. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below;
 - (ii) If, in Box No. II or in any of the sub-boxes of Box No. III, the indication "the States indicated in the Supplemental Box" is checked: in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be), indicate the name of the applicant(s) involved and, next to (each) such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent) for the purposes of which the named person is applicant;
 - (iii) If, in Box No. II or in any of the sub-boxes of Box No. III, the inventor or the inventor/applicant is not inventor for the purposes of all designated States or for the purposes of the United States of America: in such case, write "Continuation of Box No. II" or "Continuation of Box No. III" or "Continuation of Boxes No. II and No. III" (as the case may be), indicate the name of the inventor(s) and, next to (each) such name, the State(s) (and/or, where applicable, ARIPO, Eurasian, European or OAPI patent) for the purposes of which the named person is inventor;
 - (iv) If, in addition to the agent(s) indicated in Box No. IV, there are further agents: in such case, write "Continuation of Box No. IV" and indicate for each further agent the same type of information as required in Box No. IV;
 - (v) If, in Box No. V, the name of any State (or OAPI) is accompanied by the indication "patent of addition," or "certificate of addition," or if, in Box No. V, the name of the United States of America is accompanied by an indication "continuation" or "continuation-in-part": in such case, write "Continuation of Box No. V" and the name of each State involved (or OAPI), and after the name of each such State (or OAPI), the number of the parent title or parent application and the date of grant of the parent title or filing of the parent application;
 - (vi) If, in Box No. VI, there are more than five earlier applications whose priority is claimed: in such case, write "Continuation of Box No. VI" and indicate for each additional earlier application the same type of information as required in Box No. VI.
2. If, with regard to the precautionary designation statement contained in Box No. V, the applicant wishes to exclude any State(s) from the scope of that statement: in such case, write "Designation(s) excluded from precautionary designation statement" and indicate the name or two-letter code of each State so excluded.

Continuation of Box No. IV

DRAGOTTI GIANFRANCO
MICHELOTTI GIULIANO
FERRONI FILIPPO
DE ROS ALBERTO
AGOSTINI AGOSTINO

all of

Dragotti & Associati Srl
Galleria San Babila 4/C
20122 Milano
Italy

Box No. VI PRIORITY CLAIM

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The priority of the following earlier application(s) is hereby claimed:

Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country or Member of WTO	regional application: regional Office	international application: receiving Office
item (1) (5/4/2002) 05 APR 2002	02425209.0	EP		
item (2)				
item (3)				
item (4)				
item (5)				

☐ Further priority claims are indicated in the Supplemental Box.

The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of this international application is the receiving Office) identified above as:

☐ all items ☒ item (1) ☐ item (2) ☐ item (3) ☐ item (4) ☐ item (5) ☐ other, see Supplemental Box

* Where the earlier application is an ARIPO application, indicate at least one country party to the Paris Convention for the Protection of Industrial Property or one Member of the World Trade Organization for which that earlier application was filed (Rule 4.10(b)(ii)):

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) (if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):

ISA /

Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority):

Date (day/month/year)

Number

Country (or regional Office)

11/12/2002

EP02425209

EPO

Box No. VIII DECLARATIONS

The following declarations are contained in Boxes Nos. VIII (i) to (v) (mark the applicable check-boxes below and indicate in the right column the number of each type of declaration):

Number of declarations

- | | | | |
|---|--|---|--------|
| ☐ Box No. VIII (i) | Declaration as to the identity of the inventor | : | |
| ☐ Box No. VIII (ii) | Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent | : | |
| ☐ Box No. VIII (iii) | Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application | : | |
| ☐ Box No. VIII (iv) | Declaration of inventorship (only for the purposes of the designation of the United States of America) | : | FOLLOW |
| ☐ Box No. VIII (v) | Declaration as to non-prejudicial disclosures or exceptions to lack of novelty | : | |

Box No. IX CHECK LIST; LANGUAGE OF FILING

This international application contains:	This international application is accompanied by the following item(s) (mark the applicable check-boxes below and indicate in right column the number of each item):	Number of items
(a) In paper form, the following number of sheets:	1. ☒ fee calculation sheet	1
request (including declaration sheets) : 6	2. ☐ original separate power of attorney	
description (excluding sequence listings and/or tables related thereto) : 25	3. ☐ original general power of attorney	
claims : 4	4. ☐ copy of general power of attorney; reference number, if any:	
abstract : 1	5. ☐ statement explaining lack of signature	
drawings :	6. ☐ priority document(s) identified in Box No. VI as item(s):	
Sub-total number of sheets : 36	7. ☐ translation of international application into (language):	
sequence listings :	8. ☐ separate indications concerning deposited microorganism or other biological material	
tables related thereto :	9. ☐ sequence listings in computer readable form (indicate type and number of carriers)	
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(b) ☐ only in computer readable form (Section 801(a)(i))	(iii) ☐ together with relevant statement as to the identity of the copy or copies with the sequence listings mentioned in left column	
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Figure of the drawings which should accompany the abstract:	Language of filing of the international application: English	

Box No. X SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

Milan, April 4, 2003

Roberto Pistolesi

For receiving Office use only		2. Drawings: ☐ received: ☐ not received:
1. Date of actual receipt of the purported international application: (04 04 2003) 04 APR 2003		
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:		
4. Date of timely receipt of the required corrections under PCT Article 11(2):		
5. International Searching Authority (if two or more are competent): ISA /	6. ☐ Transmittal of search copy delayed until search fee is paid	

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Date of receipt of the record copy by the International Bureau:



DRAGOTTI & ASSOCIATI SRL
Galleria San Babila, 4/C
20122 Milano
ITALIE

Nr. der Anmeldung - Application N° - Demande de brevet n°

PCT/EP 03/ 03598

Tag des Eingangs - Date of Receipt - Date de réception

04/04/2003 **TELECOPY**

Aktenzeichen des Anmelders/Anwalts - Applicant's/Agent's file
reference - Cote du dossier du déposant ou du mandataire

03 AP 26 E

Applicant:

Datum / Date

10 04 2003

GUM BASE CO. SPA

Betreff: Empfangsbestätigung
Re. Receipt for documents
Objet: Récépissé de documents

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A. Anmeldeunterlagen / Items making up
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Anzahl / N° of copies / Nombre
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Antrag
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Beschreibung
Description



Ansprüche
Claim(s)
Revendication(s)



Zeichnung(en)
Drawing(s)
Dessin(s)



Zusammenfassung
Abstract
Abrégé



Vertretenvollmacht
Authorisation of representative(s)
Pouvoir de mandataire



Prioritätsdokument(s)
Priority document(s)
Document(s) de priorité



Scheck
Cheque
Chèque



Antrag zur Belastung des laufenden Konto
Request to charge deposit account
Demande de débit de compte-courant



Andere Unterlagen
Other Documents
Autres documents

- fee calculation sheet
- confirmation copy

Die genannten Unterlagen sind am obengenannten Tag eingegangen; die Anmeldung hat die ebenfalls oben angeführte Anmeldenummer erhalten.

The said items were received on the date indicated above and the application has been assigned the above indicated application number.

Les documents mentionnés ont été reçus à la date indiquée ci-dessus et le numéro de demande de brevet indiqué ci-dessus a été attribué à la demande.



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PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 03 AP 26 E	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, Item 5 below.	
International application No. PCT/EP 03/03598	International filing date (day/month/year) 04/04/2003	(Earliest) Priority Date (day/month/year) 05/04/2002
Applicant GUM BASE CO. SPA		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 6 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

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☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☐ Unity of invention is lacking (see Box II).

4. With regard to the title,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No.

☐ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

☐ None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 03/03598

76

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A23G3/30 A61K9/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A23G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 4 000 321 A (MOCHIZUKI KEIZO ET AL) 28 December 1976 (1976-12-28) cited in the application column 4, line 24 - line 40 column 3, line 42 - column 4, line 20 column 7, line 40 - line 44 column 2, line 53 - column 3, line 19; example 1 column 4, line 5 - line 10 -/-	1-4, 10-12, 15-25 26-29

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

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- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- *Z* document member of the same patent family

Date of the actual completion of the international search

15 July 2003

Date of mailing of the international search report

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Name and mailing address of the ISA

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Fax (+31-70) 340-3018

Authorized officer

Guyon, R

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 03/03598

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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(74) Agent: RICCARDI, Sergio; Via M. Melloni, 32, I-20129
Milano (IT).

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For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.

(54) Title: A PROCESS FOR THE PREPARATION OF MEDICATED CHEWING GUMS CONTAINING ACTIVE PRINCIPLES
BEING LABILE TO THE HUMIDITY

(57) Abstract: The invention concerns a process for the preparation of medicated chewing gums, containing active principles being
labile to the humidity. Such a process is characterized in that the cold-ground gum is introduced in a mixer-dryer together to a
dehydrated substance and rotatably placed under vacuum at a temperature comprised of 15-20°C.

"A process for the preparation of medicated chewing gums containing active principles being labile to the humidity"

The present invention concerns a process for the preparation of medicated chewing gums, particularly a process for the preparation of base gum suitable as component for medicated chewing gums containing active principles being labile to the humidity.

The base gum of chewing gums is a mixture comprising generally elastomers, resins, plasticizers, insoluble adjuvants, food antioxidants. All the base gums addressed to the preparation of chewing gums must be, of course, consistent with the rules for the direct preparations for food use, and in the specific case of the medicated chewing gums, the problems generated for the presence of active principle must be taken into consideration.

For the production of the chewing gums there are two different approaches, the first one uses heat, while the second one consists of a cold-pressure technique of powders. In such a case the base gum is therefore powdered and then mixed with one or more active principles, sweeteners, flavours and other various components in order to obtain an homogenous mixture. The obtained mixture is then passed through a tableting machine for the production of the tablets.

The base gum powder obtained in the grinding step before being mixed with other components for the production of the finished gum is unloaded in suitable containers and let in the open air for variable times. In view of the fact that the grinding step occurred with a cold treatment and the ground gum comes out at a temperature below 0°C, the low temperature generates condensation of the humidity, present in the air, on the powder. The base gum slowly reaches the room temperature and the final humidity level has a value comprised of 1-3%, which is variable in a range being dependent on how long the ground and cold gum is let in the open air and on the humidity level which is present in the particular moment.

Until now this final humidity level value in the gum can not be further lowered according to the known techniques, thereby the medicated gums containing active principles being labile to the humidity are more difficult to be obtained. As a matter of fact a process for the production of chewing gums which are obtained by pressure and are comprised of active principles being labile to the humidity is not known.

It was surprisingly found that through a post-grinding treatment and a certain dwelling time of the base gum it is possible to reduce further the amount of the humidity of the base gum.

An object of the present invention is therefore to provide a process for the preparation of the base gum which allows an active principle being labile to the humidity to be included in the final medicated gum.

The above indicated object is reached by providing the process as recited in claim 1. Further advantages of the invention are obtained through the characteristics recited in the dependent claims.

The process according to the present invention comprises the following steps:

- a) powdering the base gum in a grinding chamber;
 - b) reducing the amount of the humidity of the ground gum;
 - c) mixing the obtained powder with one or more active principles and suitable additives until the mixture is becoming homogeneous; and
 - d) pressing the obtained mixture in to tablets of desired size;
- characterized in that in step b) the ground gum is introduced in a mixer-dryer together with a dehydrated substance and rotatably placed under vacuum at a temperature of 15-20°C.

According to the present invention the humidity level of the base gum of step b) as measured with Karl Fischer apparatus is comprised between 0.01 and 0.1%.

The term "base gum" is intended as meaning a starting product of a mixture comprising generally elastomers, resins, plasticizers, insoluble adjuvants, food antioxidants.

Advantageously the dehydrated substance is anhydrous silica precipitate in amount of 2% by weight.

According to an embodiment of the present invention the regulation of the temperature is carried out through circulation of a fluid in the cold jacket, preferably water and ethylene glycol at a temperature of 15-20°C.

Advantageously the dwelling time in the mixer-dryer is of 2-3 hours.

Preferably the active principles being labile to the humidity and mixed with the gum are selected from the group consisting of ascorbic acid, sodium ascorbate, acetylsalicylic acid, acetylcysteine.

Preferably the additives mixed with the gum are selected from the group

The mixing step c) is preferably carried out in a rotary powder mixer, selected between biconic mixer, "V" mixer or cubic mixer.

The so obtained mixture is preferably pressed with a rotary tableting machine which transforms into tablets of size of 8-28 mm.

5 Some illustrative embodiments now follow by way of not limitative example.

Example A

Preparation of base gum

The base gum, sold by GUM BASE S.p.A. of Lainate (Milano, Italy), is introduced in a loading hopper of a hammer mill, from which it is then passed to the grinding chamber. The cold-grinding is so carried out according to the prior art and at the outlet the ground base gum with granule sizes below 3mm is obtained.

The gum, at the outlet of the mill, is immediately sealed in a polythene bag in order to avoid the condensation of the room humidity. The gum is then introduced in a mixer-dryer together with 2% by weight of anhydrous silica precipitate. Vacuum is then carried out in the apparatus which is rotated.

A fluid (consisting of water and ethylene glycol), the temperature of which is regulated between 15 and 20°C, is contemporaneously circulated in the apparatus jacket.

The apparatus rotates and the ground gum is mixed with the silica; contemporaneously the gum takes heat from the fluid circulating in the apparatus jacket and the humidity possibly adsorbed during treatments is evaporated and taken away by the applied vacuum. After 2/3 hours of operation, the gum temperature reaches a value of 15-20°C; at this time the machine is stopped, the gum is unloading in to double polythene bag and placed in a cardboard container. Between the two bags a sachet containing silica gel as dehydrating substance, is introduced.

The so obtained humidity level in the gum is comprised between 0.01-0.1% as measured with Karl Fischer apparatus.

Example n.1

In a "biconical" mixer the following powders are introduced:

30	Base gum ground and obtained in Example A	mg 1050	Gum
	Ascorbic acid	mg 206	Active Principle
	Sodium ascorbate	mg 331	Active Principle
	Aspartame	mg 7	Sweetener

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	Sorbitol	mg	150	Sweetener
	Isomalt	mg	41	Sweetener
	Anhydrous Silica Precipitate	mg	40	antiadherent
	Talc	mg	40	antiadherent
5	Magnesium Stearate	mg	30	Lubricant
	Powdered Orange flavour	mg	60	Flavourant
	Powdered Tangerine Flavour	mg	40	Flavourant
		mg	2000	

- 10 All the above ingredients are mixed for 20 minutes and the obtained powder is pressed with a tableting machine obtaining gums of 2 g. The humidity of the tablets just produced and measured with the Karl Fischer apparatus is 0.22%. Such a result allowed a product which is stable for two years to be obtained.

Example n.2

- 15 In a "biconical" mixer the following powders are introduced:

	Base gum ground and obtained in Example A	mg	1065	Gum
	Coated Salicic acid	mg	516	Active Principle
	Aspartame	mg	6	Sweetener
	Potassium Acesulphame	mg	4	Sweetener
20	Betacyclodextrin	mg	74	Sweetener
	Silica Precipitate	mg	40	antiadherent
	Talc	mg	40	antiadherent
	Powdered Spearmint Flavour	mg	50	Flavourant
	Ammonium glycyrrhizate	mg	5	Flavourant
25		mg	1800	

All the above ingredients are mixed for 20 minutes and the obtained powder is pressed with a tableting machine obtaining gums of 1.8 g.

- 30 The humidity of the tablets just produced and measured with the Karl Fischer apparatus is 0.11%. Such a result allowed a product which is stable for two years to be obtained.

Example n.3

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	Base gum ground and obtained in Example A	mg 690	Gum
	Acetyl cysteine	mg 100	Active Principle
	Aspartame	mg 3	Sweetener
	Potassium Acesulphame	mg 2	Sweetener
5	Betacyclodextrin	mg 130	Audiuvant
	Anhydrous Silica Precipitate	mg 35	antiadherent
	Talc	mg 35	antiadherent
	Powdered Orange flavour	mg 100	Flavourant
	Ammonium glycerinizate	mg 5	Flavourant
10	Magnesium stearate	mg 30	Lubrificant
	Xilitol	mg 70	Sweetener
		mg 1200	

All the above ingredients are mixed for 20 minutes and the obtained powder is
15 pressed with a tableting machine obtaining gums of 1.2 g. The humidity of the
tablets just produced and measured with the Karl Fischer apparatus is 0.19%. Such a
result allowed a product which is stable for two years to be obtained

CLAIMS

1. A process for the preparation of medicated gums comprising the step of:
 - a) making in powder form the base gum in a grinding chamber;
 - b) reducing the amount of humidity of the ground gum;
 - 5 c) mixing the obtained powder with one or more active principles and suitable additives in order to obtain a homogenous mixture; and
 - d) pressing the obtained mixer in to tablets of desired sizes,characterized in that in step b) the ground gum is introduced in a mixer-dryer together with a dehydrated substance and rotatably placed under vacuum at a
10 temperature of 15-20°C.
2. The process according to claim 1 wherein the humidity level of the base gum obtained by step b) as measured with Karl Fischer apparatus is comprised of 0.01-0.1%.
3. The process according to claim 1 or 2 wherein the dehydrated substance is
15 anhydrous silica precipitate.
4. The process according to anyone of the preceding claims wherein the dehydrated substance is anhydrous silica precipitate in amount of 2% by weight.
5. The process according to anyone of the preceding claims wherein the regulation of the temperature is carried out through circulation in the cold jacket of a fluid at a
20 temperature of 15-20°C.
6. The process according to claim 5 wherein the fluid is ethylene glycol and water.
7. The process according to anyone of the preceding claims wherein the dwelling time in the mixer-dryer is of 2-3 hours.
8. The process according to anyone of the preceding claims wherein the active
25 principles mixed with the gum are selected from the group consisting of ascorbic acid, sodium ascorbate, acetylsalicylic acid, acetylcysteine.
9. The process according to anyone of the preceding claims wherein the additives mixed with gum are selected from the group consisting of sweeteners, flavours, lubricants, antiadherents, fillers.
- 30 10. The processing according to anyone of the preceding claims wherein the mixing step b) is carried out in a rotary powder mixer, preferably selected between biconic mixer, "V" mixer or cubic mixer and the pressuring step c) is carried out in a rotary tabletting machine.

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(54) Title: A PROCESS FOR THE PREPARATION OF MEDICATED CHEWING GUMS CONTAINING ACTIVE PRINCIPLES BEING LABILE TO THE HUMIDITY

(57) Abstract: The invention concerns a process for the preparation of medicated chewing gums, containing active principles being labile to the humidity. Such a process is characterized in that the cold-ground gum is introduced in a mixer-dryer together to a dehydrated substance and rotatably placed under vacuum at a temperature comprised of 15-20°C.

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B. FIELDS SEARCHED

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 737 366 A (GERGELY GERHARD ET AL) 12 April 1988 (1988-04-12) column 1, line 52 - column 2, line 9 column 2, line 49 - line 58 column 3; example 1	1
A	US 4 514 422 A (YANG ROBERT ET AL) 30 April 1985 (1985-04-30) column 1, line 7 - line 10 column 2, line 51 - line 54 column 5, line 12 - line 15 column 5, line 46 - line 61 claim 1	1
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-/-		

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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90

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

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(34) Title: CHEWING GUM CONTAINING TREHALOSE (57) Abstract Chewing gums containing trehalose and methods of making such gums are disclosed. In one embodiment, the gum comprises about 5 % to about 95 % gum base, about 0.1 % to about 10 % flavoring agent and trehalose, the trehalose being part or all of the bulk sweetener in the gum. The trehalose provides the gum with unique properties, and the gum is non-cariogenic. In other embodiments, the trehalose is codried with other sweeteners or coevaporated with a plasticizing syrup to produce unique sweetening ingredients and syrups for gum. The trehalose may also be provided in the form of a rolling compound on the gum, or used to form a hard coating for a coated pellet gum.		

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5

CHEWING GUM CONTAINING TREHALOSE

BACKGROUND OF THE INVENTION

10 The present invention relates to improved compositions of chewing gum. More particularly, the invention relates to improving chewing gum by the use of specific bulking agents in sucrose and non-sucrose chewing gum products to give improved texture, moisture absorption properties, and improved shelf life

15 properties. The improved chewing gum compositions may also be used in a variety of chewing gum products such as confectionery coated chewing gum products.

20 In recent years, efforts have been devoted to replace sugar, particularly sucrose, and sugar syrups normally found in chewing gum with other carbohydrates and non-carbohydrates. Non-sugar or sugar-free chewing gum, which is growing in popularity, uses sugar alcohols or polyols to replace sugar and sugar syrups. The most popular polyols are sorbitol, mannitol and

25 xylitol. New polyols are being developed using new technology to replace these polyols. New polyols have various unique properties which can improve the taste, texture and shelf life properties of chewing gum for consumers.

30

The polyols have the advantage of not contributing to dental caries of consumers, as well as

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5 being able to be consumed by diabetics. However,
polyols have the disadvantage of causing gastro-
intestinal disturbances if consumed in too great of a
quantity. Therefore it would be a great advantage to
be able to use a carbohydrate or carbohydrate-like food
10 ingredient for chewing gum that would act as a bulking
agent, but not contribute to dental caries nor cause
gastro-intestinal disturbances.

One such bulking agent is called trehalose.
This bulking agent, or bulk sweetener, is not approved
15 for use in food products or in chewing gum in the U.S.
or in any country. Although a sugar, trehalose does
not contribute to dental caries, nor does it cause
significant gastro-intestinal disturbances. Thus, this
ingredient's use in chewing gum could be a definite
20 improvement.

The manufacture of trehalose is disclosed in
several patent documents: EPO Patent Publication Nos.
0 677 587 and 0 693 558; and U.S. Patent No. 5,565,341.
The enzymes used to produce trehalose have been
25 patented extensively by Hayashibara of Japan. Relevant
patent documents include Patent Publication Nos. EPO
0 709 461; 0 697 461; 0 695 804; 0 688 866; 0 691 407;
0 688 867; 0 674 005; 0 671 470; 0 628 630; 0 619 951;
and 0 606 573. Trehalose derivatives also have been
30 described by Hayashibara in EPO Patent Publication Nos.
0 714 905 and 0 480 640. A compound similar to
trehalose is neotrehalose, which is an isomer, and is
disclosed in U.S. Patent No. 5,604,211 and European
Patent Publication Nos. 0 486 315 and 0 558 213.
35 Another compound similar to trehalose, called
trehalulose, is disclosed in U.S. Patent No. 5,229,276
and EPO Patent Publication No. 0 794 259. A high
trehalose content syrup and its use in various food

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5 products, including chewing gum, is disclosed in EPO
Patent Publication No. 0 739 986.

10 The use of trehalose with aspartame in foods
has been disclosed in Japanese Published Application
No. 94-276997 and in U.S. Patent Nos. 5,510,137 and
5,026,566. The use of trehalose in chewing gum has
been disclosed in Japanese Published Application No.
95-203859. Trehalose has been known to be an effective
15 stabilizer in foods as well as medicines. U.S. Patent
No. 4,891,319 discloses trehalose and its use to
stabilize proteins and biological macro-molecules.
U.S. Patent No. 5,149,653 discloses a method of
preserving viruses. European Patent Publication No.
0 415 567 discloses the use of trehalose to help
20 stabilize organic compounds.

SUMMARY OF THE INVENTION

25 The present invention is a method of
producing chewing gum with a new bulk sweetener,
specifically trehalose, as well as the chewing gum so
produced. The bulk sweetener may be added to sucrose-
type gum formulations, replacing a small or large
quantity of sucrose. The formulation may be a low- or
high- moisture formulation containing low or high
30 amounts of moisture-containing syrup. The bulk
sweetener, trehalose, may also be used in low- or non-
sucrose gum formulations replacing sorbitol, mannitol,
other polyols, or carbohydrates. Non-sucrose
formulations may include low- or high-moisture, non-
35 sucrose chewing gums.

The bulk sweetener, trehalose, may be com-
bined with other bulk sweeteners for use in chewing
gum, including but not limited to sucrose, dextrose,
fructose, maltose, maltodextrin, xylose, as well as

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5 sugar alcohols including but not limited to sorbitol,
mannitol, xylitol, maltitol, lactitol, hydrogenated
isomaltulose and hydrogenated starch hydrolysates such
as Lycasin. The bulk sweetener, trehalose, may be
combined in the gum formulation or co-dried or blended
10 with the other bulk sweeteners prior to use in the gum
formulation. Co-drying may be done by various methods
of spray drying, fluid bed coating, coacervation, and
other granulating or agglomerating techniques. The
bulk sweetener, trehalose, may also be combined with
15 high potency sweeteners including, but not limited to,
thaumatin, aspartame, acesulfame K, sodium saccharin,
glycyrrhizin, alitame, cyclamate, stevioside and
dihydrochalcones.

20 This sweetener, trehalose, when used as a
bulking agent, gives chewing gum an improved texture,
an improved shelf life and unique flavor/ sweetness
quality. Even though trehalose is very similar to
sucrose, it has unique physical properties different
than sucrose including non-cariogenicity, giving a
25 highly consumer-acceptable chewing gum product.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Trehalose is a carbohydrate bulking agent
that is similar to sucrose. Trehalose is an isomer of
30 sucrose obtained by isomerization of maltose, and its
sweetness intensity is about 50% of that of sucrose.
Like sucrose, trehalose is a non-reducing disaccharide,
but has two glucose molecules bound in an α , α -1,1
linkage.

35 Trehalose is being produced by Hayashibara
Co., Ltd. of Japan and is available under the trade
name of TREHAOSE from Hayashibara USA, Inc. of
Amarillo, Texas. Crystalline trehalose is a dihydrate,
but may be available in an anhydrous form or as a

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5 liquid syrup. Trehalose is well established for food and pharmaceutical applications in Japan, but is not yet approved for food use by the USFDA. Approval is being sought in the US and EU as a novel food ingredient.

10 Although a sugar, trehalose has some unique features that gives it an advantage over other sugars. In various cariogenicity tests, trehalose does not support the growth of S-Mutans and is considered non-cariogenic. It is believed that trehalose may be used
15 at a low level with sugar to be effectively non-cariogenic. Other features of trehalose show it is very non-hygroscopic, is very heat and acid stable, prevents starch retrogradation, and prevents protein denaturation. This last property is unique to
20 trehalose, and allows it to be used in the pharmaceutical and medical field to stabilize pharmaceuticals, vaccines, diagnostics, and organs for transplant.

25 In food applications, trehalose may be used to improve retention of moisture, flavor, and texture, and stabilize color. Trehalose has a melting point of 97°C and is very moisture stable at a relative humidity of less than 95%. Any of the crystalline powder forms or syrup forms of trehalose may be used in chewing gum
30 and the term trehalose and trehalose solid/ syrup herein refers to all forms.

35 The special properties of trehalose to retain moisture or flavor offers some unique advantages in chewing gum. Trehalose may act as an absorbent or encapsulating agent to entrap flavors and sweeteners in a chewing gum formula. An aqueous solution of trehalose mixed with a flavor or sweetener and dried, can entrap the flavor or sweetener to reduce the loss of volatile flavor components or reduce sweetener loss

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5 due to degradation. Trehalose is known to form a
stable glassy state and when used in gum may retain
flavor and moisture during storage of the gum product.
Since trehalose also has properties to stabilize
10 proteins, some high intensity sweeteners such as
thaumatin or aspartame may be stabilized when used with
trehalose in a chewing gum formulation.

Trehalose may be added to chewing gum in its
crystalline/solid form or may be dissolved in water.
Its solubility in water is about 40% at room tempera-
15 ture, but increases with increased temperature to over
70% at 70°C. Trehalose may be used in chewing gum as a
texture and flavor modifier, bulking agent, and may
improve texture, flavor, and shelf life properties.
Trehalose may replace solids like sucrose, dextrose or
20 lactose when used in its powder form, or may replace
syrops when used in its liquid or syrup form. At
levels of about 0.5% to about 25%, trehalose may
replace part of the solids in sugar gum or, as a
liquid, all or part of the syrup in sugar gum. At
25 higher levels of about 25% to about 90% of the gum
formulation, trehalose may replace all of the solids in
a chewing gum formulation. A preferred range of
trehalose is about 5% to about 50%, and more preferably
about 10% to about 40%, of the gum composition.

30 Unique chewing gum formulations can be
obtained when all bulk sweeteners are replaced with
trehalose powder and syrup. The slightly lower
sweetness intensity allows for use of unique flavor
combinations. High intensity sweeteners may be added
35 to increase sweetness to obtain a sweetness more
typical of chewing gum formulations. Chewing gum
formulations with trehalose may contain a very low
amount of moisture in the gum formulation, i.e., below
about 2%, or may contain a medium amount of moisture,

- 7 -

5 about 2-5%, and may even be a soft gum formulation containing 5% moisture or more. The very low hygroscopicity of trehalose yields a very non-hygroscopic all trehalose chewing gum product that is very shelf stable.

10 Although trehalose is similar to sucrose, its unique non-cariogenic properties suggest it may be used in chewing gum formulations containing non-sucrose ingredients. Non-sucrose ingredients are alditols such as sorbitol, mannitol, xylitol, lactitol, hydrogenated
15 isomaltulose, maltitol and hydrogenated starch hydrolysates. These alditols are used in a variety of combinations to develop unique chewing gum formulations. Trehalose may be used to replace the individual alditols or combinations of alditols. With
20 partial replacement of one or more alditols, trehalose can be used at levels of about 0.5-25%. If trehalose replaces a large amount or most of the alditols, this level may be about 25% to about 90% of the gum formulation.

25 Some sucrose-free chewing gum formulations contain high levels of glycerin and are very low in moisture, i.e., less than about 2%. Trehalose solids or syrup may replace part or all of the glycerin used in these types of formulations. At higher moisture
30 levels (more than 2%) in sucrose-free gum, a liquid sorbitol (70% sorbitol, 30% water) is used. Trehalose solids or trehalose syrup may replace part or all of the sorbitol liquid. New sucrose-free syrups like aqueous hydrogenated starch hydrolysates, such as
35 Lycasin, may also be replaced in part or totally by trehalose solids or syrup. The same product advantages found with hydrogenated starch hydrolysates syrups, such as improved product shelf life, improved texture

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5 and improved aspartame stability, may also be found with the use of trehalose solids or syrup.

Recent advances use hydrogenated starch hydrolysates (HSH) and glycerin preblended and co-evaporated to reduce moisture in some sugar-free gum formulations. Trehalose solids and/or syrup may be used to replace part or all of the HSH/glycerin blends in chewing gum formulations. Aqueous trehalose solids and/or trehalose syrup may also replace HSH in the preblend with glycerin and be co-evaporated with glycerin to obtain a low moisture, non-crystallizable blend. Combinations of trehalose solids/syrup with alditols like sorbitol, maltitol, xylitol, lactitol and mannitol in aqueous form may also be blended with glycerin and co-evaporated for use in low-moisture, sucrose-free gum.

In a similar manner, trehalose solids/syrup preblended in glycerin and co-evaporated may be used in conventional sugar chewing gum formulations. Trehalose may be combined with other sugars like dextrose, sucrose, lactose, maltose, invert sugar, fructose and corn syrup solids to form a liquid mix to be blended with glycerin and co-evaporated. Trehalose solids/syrup may also be mixed with syrup and blended with glycerin and co-evaporated for use in a sugar chewing gum formulation.

Trehalose bulk sweetener may also be co-dried with a variety of sugars such as sucrose, dextrose, lactose, fructose and corn syrup solids and used in a sugar-containing gum formulation. Trehalose may be co-dried with a variety of alditols such as sorbitol, mannitol, xylitol, maltitol, hydrogenated isomaltulose and hydrogenated starch hydrolysates and used in a sucrose-free gum formulation. Co-drying refers to methods of co-crystallization and co-precipitation of

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5 trehalose with other sugars and alditols, as well as
co-drying by encapsulation, agglomeration and
absorption with other sugars and alditols.

Co-drying by encapsulation, agglomeration and
absorption can also include the use of encapsulating
10 and agglomerating agents. Trehalose may be mixed with
other sugars or alditols prior to being codried by
encapsulation or agglomeration, or may be used alone
with the encapsulating and agglomerating agents. These
agents modify the physical properties of the bulk
15 sweetener and control its release from chewing gum.
Since trehalose is highly soluble in water as noted
earlier, controlling the release of trehalose modifies
the texture and flavor of the chewing gum.

Physical modifications of the bulk sweetener
20 by encapsulation with another substrate will slow its
release in chewing gum by reducing the solubility or
dissolution rate. Any standard technique which gives
partial or full encapsulation of the bulk sweetener can
be used. These techniques include, but are not limited
25 to, spray drying, spray chilling, fluid-bed coating and
coacervation. These encapsulation techniques that give
partial encapsulation or full encapsulation can be used
individually or in any combination in a single step
process or multiple step process. Generally, delayed
30 release of bulk sweetener is obtained in multistep
processes like spray drying the bulk sweetener and then
fluid-bed coating the resultant powder.

The encapsulation techniques here described
are standard coating techniques and generally give
35 varying degrees of coating from partial to full coat-
ing, depending on the coating composition used in the
process. Also, the coating compositions may be
susceptible to water permeation to various degrees.
Generally, compositions that have high organic solubil-

ity, good film-forming properties and low water solubility give better delayed release of the bulk sweetener. Such compositions include acrylic polymers and copolymers, carboxyvinyl polymer, polyamides, polystyrene, polyvinyl acetate, polyvinyl acetate phthalate, polyvinyl-pyrrolidone, and waxes. Although all of these materials are possible for encapsulation of the bulk sweetener, only food-grade material should be considered. Two standard food-grade coating materials that are good film formers but not water soluble are shellac and Zein. Others which are more water soluble, but good film formers, are materials like agar, alginates, a wide range of cellulose derivatives like ethyl cellulose, methyl cellulose, sodium hydroxymethyl cellulose, and hydroxypropylmethyl cellulose, dextrin, gelatin, and modified starches. These ingredients, which are generally approved for food use, also give a delayed release when used as an encapsulant. Other encapsulants like acacia or maltodextrin can also encapsulate trehalose but may increase the release rate of the bulk sweetener.

The amount of coating or encapsulating material on the bulk sweetener also controls the length of time for its release from chewing gum. Generally, the higher the level of coating the slower the release of the bulk sweetener during mastication. The release rate is generally not instantaneous, but gradual over an extended period of time.

Another method of giving a delayed release of the bulk sweetener is agglomeration of the bulk sweetener with an agglomerating agent which partially coats the bulk sweetener. This method includes the step of mixing the bulk sweetener and agglomerating agent with a small amount of water or solvent. The mixture is prepared in such a way as to have individual

5 wet particles in contact with each other so that a partial coating can be applied. After the water or solvent is removed, the mixture is ground and used as a powdered, coated bulk sweetener.

10 Materials that can be used as the agglomerating agent are the same as those used in encapsulation mentioned previously. However, since the coating is only a partial encapsulation and the bulk sweetener is very water soluble, some agglomerating agents are more effective in delaying the sweetener release than
15 others. Some of the better agglomerating agents are the organic polymers like acrylic polymers and copolymers, polyvinyl acetate, polyvinylpyrrolidone, waxes, shellac, and Zein. Other agglomerating agents are not as effective in giving the bulk sweetener a
20 delayed release as are the polymers, waxes, shellac and Zein, but can be used to give some delayed release. These other agglomerating agents include, but are not limited to, agar, alginates, a wide range of cellulose derivatives like ethyl cellulose, methyl cellulose,
25 sodium hydroxymethyl cellulose, hydroxypropylmethyl cellulose, dextrin, gelatin, modified starches, vegetable gums like guar gum, locust bean gum, and carrageenin. Even though the agglomerated bulk sweetener is only partially coated, when the quantity
30 of coating is increased compared to the quantity of the bulk sweetener, the release of the bulk sweetener can be delayed for a longer time during mastication.

The bulk sweetener may be coated in a two-step process or multiple step process. The bulk
35 sweetener may be encapsulated with any of the materials as described previously and then the encapsulated bulk sweetener can be agglomerated as described previously to obtain an encapsulated/agglomerated/bulk sweetener

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5 product that could be used in chewing gum to give a delayed release of bulk sweetener.

10 In another embodiment of this invention, trehalose bulk sweetener may be absorbed onto another component which is porous and become entrapped in the matrix of the porous component. Common materials used for absorbing the bulk sweetener include, but are not limited to, silicas, silicates, pharmasorb clay, spongelike beads or microbeads, amorphous sugars like spray-dried dextrose, sucrose, alditols, amorphous
15 carbonates and hydroxides, including aluminum and calcium lakes, vegetable gums and other spray dried materials.

20 Depending on the type of absorbent material and how it is prepared, the amount of bulk sweetener that can be loaded onto the absorbent will vary. Generally materials like polymers, spongelike beads or microbeads, amorphous sugars and alditols and amorphous carbonates and hydroxides absorb about 10% to about 40% of the weight of the absorbent. Other materials like
25 silica and pharmasorb clays may be able to absorb about 20% to about 80% of the weight of the absorbent.

30 The general procedure for absorbing the bulk sweetener onto the absorbent is as follows. An absorbent like fumed silica powder can be mixed in a powder blender and an aqueous solution of the bulk sweetener can be sprayed onto the powder as mixing continues. The aqueous solution can be about 5% to 30% solids, and higher solid levels may be used if temperatures up to 90°C are used. Generally water is the
35 solvent, but other solvents like alcohol could also be used if approved for use in food. As the powder mixes, the liquid is sprayed onto the powder. Spraying is stopped before the mix becomes damp. The still free-flowing powder is removed from the mixer and dried to

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5 remove the water or other solvent, and ground to a specific particle size.

After the bulk sweetener is absorbed onto an absorbent or fixed onto an absorbent, the fixative/sweetener can be coated by encapsulation. Either full or partial encapsulation may be used, depending on the coating composition used in the process. Full encapsulation may be obtained by coating with a polymer as in spray drying, spray chilling, fluid-bed coating, coacervation, or any other standard technique. A partial encapsulation or coating can be obtained by agglomeration of the fixative/sweetener mixture using any of the materials discussed above.

Another form of encapsulation is by entrapment of an ingredient by fiber extrusion or fiber spinning into a polymer. Polymers that can be used for extrusion are PVAC, hydroxypropyl cellulose, polyethylene and other types of plastic polymers. A process of encapsulation by fiber extrusion is disclosed in U.S. Patent No. 4,978,537, which is hereby incorporated by reference. The water insoluble polymer may be preblended with the bulk sweetener prior to fiber extrusion, or may be added after the polymer is melted. As the extrudate is extruded, it results in small fibers that are cooled and ground. This type of encapsulation/entrapment generally gives a very long, delayed release of an active ingredient.

The four primary methods to obtain a modified release of the bulk sweetener are: (1) encapsulation by spray drying, fluid-bed coating, spray chilling and coacervation to give full or partial encapsulation, (2) agglomeration to give partial encapsulation, (3) fixation or absorption which also gives partial encapsulation, and (4) entrapment into an extruded compound. These four methods, combined in any usable

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5 manner which physically modifies the release or
dissolvability of the bulk sweetener are included in
this invention.

10 The trehalose bulk sweetener may be combined
with other ingredients within the encapsulated,
agglomerated, absorbed, or entrapped matrix. Other
ingredients such as high intensity sweeteners, flavors,
medicants, pharmaceuticals, other bulking agents, or
other types of active ingredients may be combined with
the trehalose bulk sweetener to release with the bulk
15 sweetener. In some instances, the trehalose bulk
sweetener may also have a stabilizing effect on any of
the ingredients noted above. For example, if a high
intensity protein sweetener such as aspartame was
combined with trehalose before encapsulation, trehalose
20 may improve the stability of aspartame in the treatment
process or when the encapsulated matrix is added to a
chewing gum formulation.

Other methods of treating the trehalose bulk
sweetener to physically isolate the sweetener from
25 other chewing gum ingredients may also have some effect
on its release rate and its effect on chewing gum
flavor and texture. The bulk sweetener may be added to
the liquid inside a liquid center gum product. The
center fill of a gum product may comprise one or more
30 carbohydrate syrups, glycerin, thickeners, flavors,
acidulants, colors, sugars and sugar alcohols in con-
ventional amounts. The ingredients are combined in a
conventional manner. The bulk sweetener is dissolved
in the center-fill liquid and the amount of bulk
35 sweetener added to the center-fill liquid may be about
0.1% to about 20% by weight of the entire chewing gum
formula. This method of using the bulk sweetener in
chewing gum can allow for a lower usage level of the
bulk sweetener, can give the bulk sweetener a smooth

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5 release rate, and can reduce or eliminate any possible reaction of the bulk sweetener with gum base, flavor components or other components, yielding improved shelf stability.

10 Another method of isolating the trehalose bulk sweetener from other chewing gum ingredients is to add trehalose to the dusting compound of a chewing gum. A rolling or dusting compound is applied to the surface of chewing gum as it is formed. This rolling or
15 dusting compound serves to reduce sticking to machinery as it is formed, reduces sticking of the product to machinery as it is wrapped, and sticking to its wrapper after it is wrapped and being stored. The rolling compound comprises trehalose bulk sweetener alone or in combination with mannitol, sorbitol, sucrose, starch,
20 calcium carbonate, talc, other orally acceptable substances or a combination thereof. The rolling compound constitutes from about 0.25% to about 10.0%, but preferably about 1% to about 3% of weight of the chewing gum composition. The amount of trehalose
25 sweetener added to the rolling compound is about 0.5% to 100% of the rolling compound or about 0.005% to about 5% of the chewing gum composition. This method of using trehalose bulk sweetener in the chewing gum can allow a lower usage level of the bulk sweetener,
30 can give the bulk sweetener a more controlled release rate, and can reduce or eliminate any possible reaction of the bulk sweetener with gum base, flavor components, or other components, yielding improved shelf stability. The low hygroscopicity of trehalose also improves
35 shelf-life stability of a gum product by allowing trehalose to act as a flavor and moisture retainer.

Another method of isolating trehalose sweetener is to use it in the coating/panning of a pellet chewing gum. Pellet or ball gum is prepared as

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5 conventional chewing gum, but formed into pellets that
are pillow shaped or into balls. The pellets/balls can
be then trehalose coated or panned by conventional
panning techniques to make a unique trehalose-coated
10 pellet gum. The bulk sweetener is very stable and
highly water soluble, and can be easily added to a
sugar solution prepared for sugar panning. Because of
its excellent crystallization properties, trehalose can
be used alone for panning of pellet gum. Trehalose may
15 also be combined with sucrose in solution as the
coating on pellet gum. Trehalose can also be added as
a powder blended with other powders often used in some
types of conventional panning procedures. Using
trehalose sweetener isolates the sweetener from other
20 gum ingredients and modifies its release rate in
chewing gum. Levels of use of trehalose may be about
1% to about 100% in the coating and about 0.5% to about
50% of the weight of the chewing gum product. The
weight of the coating may be about 20% to about 50% of
the weight of the finished gum product.

25 Conventional panning procedures generally
coat with sucrose, but recent advances in panning have
allowed the use of other carbohydrate materials to be
used in the place of sucrose such as trehalose. Other
components added to trehalose include, but are not
30 limited to, dextrose, maltose, xylitol, lactitol,
hydrogenated isomaltulose and other new alditols or a
combination thereof. These materials may be blended
with panning modifiers including, but not limited to,
gum arabic, maltodextrins, corn syrup, gelatin,
35 cellulose type materials like carboxymethyl cellulose,
or hydroxymethyl cellulose, starch and modified
starches, vegetable gums like alginates, locust bean
gum, guar gum, and gum tragacanth, insoluble carbonates
like calcium carbonate or magnesium carbonate and talc.

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5 Antitack agents may also be added as panning modifiers
which allow the use of a variety of carbohydrates and
sugar alcohols to be used in the development of new
panned or coated gum products. Flavors may also be
added with the trehalose coating and with the trehalose
10 bulk sweetener to yield unique product characteristics.

The previously described encapsulated,
agglomerated, absorbed, or extruded trehalose bulk
sweetener may readily be incorporated into a chewing
gum composition. The remainder of the chewing gum
15 ingredients are noncritical to the present invention.
That is, the coated particles of bulk sweetener can be
incorporated into conventional chewing gum formulations
in a conventional manner. The trehalose bulk
sweeteners may be used in a sucrose-free or sucrose
20 containing chewing gum to modify the sweetness thereof.
The coated bulk sweetener may be used in either regular
chewing gum or bubble gum.

In general, a chewing gum composition typic-
ally comprises a water-soluble bulk portion, a water-
25 insoluble chewable gum base portion and typically
water-insoluble flavoring agents. The water-soluble
portion dissipates with a portion of the flavoring
agent over a period of time during chewing. The gum
base portion is retained in the mouth throughout the
30 chew.

The insoluble gum base generally comprises
elastomers, resins, fats and oils, waxes, softeners and
inorganic fillers. Elastomers may include poly-
isobutylene, isobutylene-isoprene copolymer and styrene
35 butadiene rubber, as well as natural latexes such as
chicle. Resins include polyvinylacetate and terpene
resins. Fats and oils may also be included in the gum
base, including tallow, hydrogenated and partially
hydrogenated vegetable oils, and cocoa butter. Com-

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5 monly employed waxes include paraffin, microcrystalline and natural waxes such as beeswax and carnauba.

According to the preferred embodiment of the present invention, the insoluble gum base constitutes between about 5 to about 95% by weight of the gum. More preferably the insoluble gum base comprises between 10 and 50% by weight of the gum and most preferably about 20 to about 35% by weight of the gum.

The gum base typically also includes a filler component. The filler component may be calcium carbonate, magnesium carbonate, talc, dicalcium phosphate or the like. The filler may constitute between about 5 and about 60% by weight of the gum base. Preferably, the filler comprises about 5 to about 50% by weight of the gum base.

Gum bases typically also contain softeners, including glycerol monostearate and glycerol triacetate. Further, gum bases may also contain optional ingredients such as antioxidants, colors and emulsifiers. The present invention contemplates employing any commercially acceptable gum base.

The water-soluble portion of the chewing gum may further comprise softeners, sweeteners, flavoring agents and combinations thereof. As used herein, the term "bulking and sweetening agents" generically includes sugars, sugar alcohols and syrups thereof. Softeners are added to the chewing gum in order to optimize the chewability and mouth feel of the gum. Softeners, also known in the art as plasticizers or plasticizing agents, generally constitute between about 0.5 to about 15.0% by weight of the chewing gum. Softeners contemplated by the present invention include glycerin, lecithin and combinations thereof. Further, aqueous sweetener solutions such as those containing sorbitol, hydrogenated starch hydrolysates, corn syrup

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5 and combinations thereof may be used as softeners and binding agents in gum.

As mentioned above, the trehalose solids/syrup bulk sweetener of the present invention will most likely be used in gum formulations containing sucrose
10 or other sugars. However, sucrose-free formulations are also within the scope of the invention. Sugar sweeteners generally include saccharide-containing components commonly known in the chewing gum art which comprise, but are not limited to, sucrose, dextrose,
15 maltose, dextrin, dried invert sugar, fructose, levulose, galactose, corn syrup solids and the like, alone or in any combination.

The trehalose solids/syrup bulk sweetener of the present invention can also be used in combination
20 with sugarless sweeteners. Generally sugarless sweeteners include components with sweetening characteristics but which are devoid of the commonly known sugars and comprise, but are not limited to, sugar alcohols such as sorbitol, mannitol, xylitol, hydro-
25 genated starch hydrolysates, maltitol and the like, alone or in any combination.

Depending on the particular sweetness release profile and shelf-stability needed, the trehalose solid/syrup bulk sweeteners of the present invention
30 can also be used in combination with coated or uncoated high-potency sweeteners or with high-potency sweeteners coated with other materials and by other techniques.

A flavoring agent may be present in the chewing gum in an amount within the range of from about
35 0.1 to about 10.0 weight percent and preferably from about 0.5 to about 3.0 weight percent of the gum. The flavoring agents may comprise essential oils, synthetic flavors, or mixture thereof including, but not limited to, oils derived from plants and fruits such as citrus

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5 oils, fruit essences, peppermint oil, spearmint oil,
clove oil, oil of wintergreen, anise, and the like.
Artificial flavoring components are also contemplated
for use in gums of the present invention. Those
skilled in the art will recognize that natural and
10 artificial flavoring agents may be combined in any
sensorally acceptable blend. All such flavors and
flavor blends are contemplated by the present in-
vention.

Optional ingredients such as colors,
15 emulsifiers and pharmaceutical agents may be added to
the chewing gum.

In general, chewing gum is manufactured by
sequentially adding the various chewing gum ingredients
to a commercially available mixer known in the art.
20 After the ingredients have been thoroughly mixed, the
gum mass is discharged from the mixer and shaped into
the desired form such as by rolling into sheets and
cutting into sticks, extruding into chunks or casting
into pellets.

25 Generally, the ingredients are mixed by first
melting the gum base and adding it to the running
mixer. The base may also be melted in the mixer
itself. Color or emulsifiers may also be added at this
time. A softener such as glycerin may also be added at
30 this time, along with syrup and a portion of the bulk-
ing agent/sweetener. Further portions of the bulking
agent/sweetener may then be added to the mixer. A
flavoring agent is typically added with the final
portion of the bulking agent. A high-intensity
35 sweetener is preferably added after the final portion
of bulking agent and flavor have been added.

The entire mixing procedure typically takes
from five to fifteen minutes, but longer mixing times
may sometimes be required. Those skilled in the art

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5 will recognize that many variations of the above described procedure may be followed.

Examples

10 The following examples of the invention and comparative examples are provided by way of explanation and illustration.

15 The formulas listed in Table 1 comprise various sugar-type formulas in which trehalose can be added to gum after it is dissolved in water and mixed with various aqueous solvents.

TABLE 1

	(WEIGHT PERCENT)							
	EX. 1	EX. 2	EX. 3	EX. 4	EX. 5	EX. 6	EX. 7	EX. 8
SUGAR	55.6	56.6	55.6	47.0	53.0	53.0	55.6	47.0
BASE	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2
CORN SYRUP	12.9	1.9	8.9	2.9	6.9	6.9	0.0	2.9
PEPPER-MINT FLAVOR	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
GLY-CERIN	1.4	1.4	1.4	0.0	0.0	0.0	1.4	0.0
LIQUID/TREHALOSE BLEND	10.0	20.0	14.0	30.0	20.0	20.0	22.9	30.0

25 EXAMPLE 1

Trehalose powder can be added directly to the gum.

EXAMPLE 2

30 An 80 gram portion of trehalose can be dissolved in 120 grams of water at 40°C making a 40% solution and added to gum.

EXAMPLE 3

Trehalose syrup at 60% solids at 60°C can be added directly to the gum.

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5 EXAMPLE 4

A blend of 80 grams of trehalose and 120 grams of water is mixed at 40°C. To this is added 100 grams of glycerin to give a mixture of 27% trehalose, 40% water, and 33% glycerin, and added to gum.

10 EXAMPLE 5

To 140 grams of trehalose syrup at 70% solids is added 60 grams of glycerin to give a 70% trehalose syrup with 30% glycerin, and added to gum.

15 EXAMPLE 6

To 140 grams of trehalose syrup of 70% solids is added 60 grams of propylene glycol giving a 70% trehalose syrup with 30% glycerin and added to gum.

20 EXAMPLE 7

To 140 grams of trehalose syrup at 70% solids is added 89 grams of corn syrup and blended giving a mixture of 61% trehalose syrup and 39% corn syrup.

EXAMPLE 8

25 To a 200 gram quantity of corn syrup is added 100 grams of glycerin. To this mixture is added 75 grams of trehalose and blended at 50°C. This mixture is added to gum.

30 In the next examples of sugar gum formulations, trehalose can be dissolved in water and emulsifiers can be added to the aqueous solution. Example solutions can be prepared by dissolving 15 grams of trehalose in 70 grams water and in examples 35 10-14, adding 15 grams of emulsifiers of various hydrophilic-lipophilic balance (HLB) values to the solution. The mixtures can then be used in the following formulas.

104

5

TABLE 2
(WEIGHT PERCENT)

10

	<u>EX. 9</u>	<u>EX. 10</u>	<u>EX. 11</u>	<u>EX. 12</u>	<u>EX. 13</u>	<u>EX. 14</u>
SUGAR	50.7	50.7	50.7	50.7	50.7	50.7
BASE	19.2	19.2	19.2	19.2	19.2	19.2
CORN SYRUP	12.9	12.9	12.9	12.9	12.9	12.9
GLY-CERIN	1.4	1.4	1.4	1.4	1.4	1.4
DEX-TROSE MONOHY-DRATE	9.9	9.9	9.9	9.9	9.9	9.9
PEPP. FLAVOR	0.9	0.9	0.9	0.9	0.9	0.9
BULK SWEET-ENER/ EMUL-SIFIER/ WATER MIXTURE	5.0	5.0	5.0	5.0	5.0	5.0
	None	HLB-2	HLB-4	HLB-6	HLB-9	HLB-12

15

EXAMPLES 15-20

The same as the formulations made in Examples 9-14, respectively, except that the flavor can be mixed together with the aqueous bulk sweetener solution and emulsified before adding the mixture to the gum batch.

25

Trehalose bulk sweetener can also be blended into various base ingredients. A typical base formula is as follows:

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5		<u>WEIGHT PERCENT</u>
	Polyvinyl acetate	27
	Synthetic rubber	13
	Paraffin Wax	13
	Fat	3
10	Glycerol Monostearate	5
	Terpene Resin	27
	Calcium Carbonate Filler	<u>12</u>
		100%

15 The individual base components can be
softened prior to their addition in the base manufac-
turing process. To the presoftened base component,
trehalose can be added and mixed, and then the pre-
softened base/bulk sweetener blend can be added to make
20 the finished base. In the following examples,
trehalose can be mixed first with one of the base
ingredients, and the mixed ingredient can then be used
in making a base. The ingredients blended with
trehalose can then be used at the levels indicated in
25 the typical base formula above.

EXAMPLE 21

The terpene resin used to make the base is 80%
polyterpene resin and 20% trehalose.

EXAMPLE 22

30 The polyvinyl acetate used to make the base is 80%
low M.W. polyvinyl acetate and 20% trehalose.

Trehalose may also be added to an otherwise
complete gum base.

35 EXAMPLE 23

5% trehalose can be mixed with 95% of a gum base
having the above listed typical formula. The
trehalose can be added near the end of the

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- 25 -

5 process, after all the other ingredients are added.

10 The samples of finished base made with trehalose added to different base components can then be evaluated in a sugar-type chewing gum formulated as follows:

TABLE 3

(WEIGHT PERCENT)

(For Examples 21, 22, and 23)

15	Sucrose	55.2
20	Base	19.2
	Corn Syrup	13.4
	Glycerine	1.4
25	Dextrose Monohydrate	9.9
30	Peppermint Flavor	<u>0.9</u>
		100%

35 The theoretical level of trehalose bulk sweetener is 1% in the finished gum.

The following Tables 4 through 11 are examples of gum formulations that demonstrate formula variations in which trehalose or trehalose syrup may be used.

40 Examples 24-28 in Table 4 demonstrates the use of trehalose in low-moisture sucrose formulations showing less than 2% theoretical moisture:

TABLE 4
(WEIGHT PERCENT)

		<u>EX. 24</u>	<u>EX. 25</u>	<u>EX. 26</u>	<u>EX. 27</u>	<u>EX. 28</u>
	SUCROSE	57.9	53.9	48.9	25.0	0.0
	GUM BASE	19.2	19.2	19.2	19.2	19.2
	CORN ^a SYRUP	6.0	6.0	6.0	6.0	6.0
	DEXTROSE MONOHY- DRATE	10.0	10.0	10.0	10.0	10.0
	LACTOSE	0.0	0.0	0.0	5.0	5.0
	GLYCERIN ^b	5.0	5.0	5.0	8.9	8.9
	FLAVOR	0.9	0.9	0.9	0.9	0.9
	TREHALOSE	1.0	5.0	10.0	25.0	50.0

^aCorn Syrup is evaporated to 85% solids, 15% moisture

^bGlycerin and syrup may be blended and co-evaporated

Examples 29-33 in Table 5 demonstrate the use of trehalose in medium-moisture sucrose formulations having about 2% to about 5% moisture.

Examples 34-38 in Table 6 demonstrate the use of trehalose in high-moisture sucrose formulations having more than about 5% moisture.

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TABLE 5
(WEIGHT PERCENT)

		<u>EX. 29</u>	<u>EX. 30</u>	<u>EX. 31</u>	<u>EX. 32</u>	<u>EX. 33</u>
5						
10	SUCROSE	52.5	48.5	43.5	25.0	0.0
	GUM BASE	19.2	19.2	19.2	19.2	19.2
15	CORN SYRUP ^a	15.0	15.0	15.0	18.5	18.5
	DEXTROSE MONOHYDRATE	10.0	10.0	10.0	10.0	10.0
20	GLYCERIN ^b	1.4	1.4	1.4	1.4	1.4
	FLAVOR	0.9	0.9	0.9	0.9	0.9
25	TREHALOSE	1.0	5.0	10.0	25.0	50.0

^aCorn Syrup is evaporated to 85% solids, 15% moisture

^bGlycerin and syrup may be blended and co-evaporated

TABLE 6
(WEIGHT PERCENT)

		<u>EX. 34</u>	<u>EX. 35</u>	<u>EX. 36</u>	<u>EX. 37</u>	<u>EX. 38</u>
35						
	SUCROSE	50.0	46.0	41.0	25.0	0.0
40	GUM BASE	24.0	24.0	24.0	24.0	24.0
	CORN SYRUP	24.0	24.0	24.0	24.6	24.6
45	GLYCERIN	0.0	0.0	0.0	0.4	0.4
	FLAVOR	1.0	1.0	1.0	1.0	1.0
50	TREHALOSE	1.0	5.0	10.0	25.0	50.0

Examples 39-43 in Table 7 and Examples 44-53 in Tables 8 and 9 demonstrate the use of trehalose in low- and high-moisture gums that are sucrose-free.

Low- moisture gums have less than about 2% moisture, and high-moisture gums have greater than 2% moisture.

5

TABLE 7
(WEIGHT PERCENT)

		<u>EX. 39</u>	<u>EX. 40</u>	<u>EX. 41</u>	<u>EX. 42</u>	<u>EX. 43</u>
10	BASE	25.5	25.5	25.5	25.5	25.5
	SORBITOL	50.0	46.0	41.0	26.0	0.0
	MANNITOL	12.0	12.0	12.0	12.0	13.0
15	GLYCERIN	10.0	10.0	10.0	10.0	10.0
	FLAVOR	1.5	1.5	1.5	1.5	1.5
20	TREHALOSE	1.0	5.0	10.0	25.0	50.0

TABLE 8
(WEIGHT PERCENT)

		<u>EX. 44</u>	<u>EX. 45</u>	<u>EX. 46</u>	<u>EX. 47</u>	<u>EX. 48</u>
25	BASE	25.5	25.5	25.5	25.5	25.5
	SORBITOL	50.0	46.0	41.0	26.0	0.0
30	LIQUID SORBITOL*	10.0	10.0	10.0	10.0	11.0
	MANNITOL	10.0	10.0	10.0	10.0	10.0
35	GLYCERIN	2.0	2.0	2.0	2.0	2.0
	FLAVOR	1.5	1.5	1.5	1.5	1.5
40	TREHALOSE	1.0	5.0	10.0	25.0	50.0

*Sorbitol Liquid contains 70% sorbitol, 30% water

TABLE 9
(WEIGHT PERCENT)

		<u>EX. 49</u>	<u>EX. 50</u>	<u>EX. 51</u>	<u>EX. 52</u>	<u>EX. 53</u>
45	BASE	25.5	25.5	25.5	25.5	25.5
50	SORBITOL	50.0	46.0	41.0	26.0	0.0
	HSH SYRUP*	10.0	10.0	10.0	10.0	10.0
55	MANNITOL	8.0	8.0	8.0	8.0	9.0
	GLYCERIN**	4.0	4.0	4.0	4.0	4.0
	FLAVOR	1.5	1.5	1.5	1.5	1.5
60	TREHALOSE	1.0	5.0	10.0	25.0	50.0

* Hydrogenated starch hydrolyzate syrup

** Glycerin and HSH syrup may be blended or co-evaporated

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5 Table 10 shows chewing formulations that can
be made with various other types of sugars.

5

TABLE 10
(WEIGHT PERCENT)

		<u>EX. 54</u>	<u>EX. 55</u>	<u>EX. 56</u>	<u>EX. 57</u>	<u>EX. 58</u>	<u>EX. 59</u>
10	GUM BASE	19.2	19.2	19.2	19.2	19.2	19.2
	SUCROSE	44.5	24.5	39.5	19.5	29.5	19.5
15	GLYCERIN	1.4	1.4	1.4	1.4	1.4	1.4
	CORN SYRUP	14.0	14.0	14.0	14.0	14.0	14.0
	DEXTROSE	5.0	5.0	-	-	10.0	5.0
20	LACTOSE	5.0	5.0	10.0	10.0	-	-
	FRUCTOSE	5.0	5.0	10.0	10.0	10.0	5.0
25	INVERT SUGAR	-	-	-	-	10.0	10.0
	MALTOSE	-	-	-	-	-	-
	CORN SYRUP SOLIDS	-	-	-	-	-	-
30	PEPPERMINT FLAVOR	0.9	0.9	0.9	0.9	0.9	0.9
35	TREHALOSE	5.0	25.0	5.0	25.0	5.0	25.0
40		<u>EX. 60</u>	<u>EX. 61</u>	<u>EX. 62</u>	<u>EX. 63</u>	<u>EX. 64</u>	<u>EX. 65</u>
	GUM BASE	19.2	19.2	19.2	19.2	19.2	19.2
	SUCROSE	29.5	19.5	29.5	19.5	37.5	22.5
45	GLYCERIN	1.4	1.4	1.4	1.4	1.4	1.4
	CORN SYRUP	14.0	14.0	14.0	14.0	11.0	11.0
50	DEXTROSE	10.0	5.0	10.0	5.0	10.0	5.0
	LACTOSE	-	-	-	-	-	-
	FRUCTOSE	10.0	5.0	10.0	5.0	5.0	5.0
55	INVERT SUGAR	10.0	10.0	-	-	5.0	5.0
	MALTOSE	-	-	10.0	10.0	-	-
60	CORN SYRUP SOLIDS	-	-	-	-	5.0	5.0
	PEPPERMINT FLAVOR	0.9	0.9	0.9	0.9	0.9	0.9
65							

5 TREHALOSE 5.0 25.0 5.0 25.0 5.0 25.0

Any of the sugars may be combined with
trehalose and co-dried to form unique combinations such
as:

EXAMPLE 66

Dextrose and trehalose can be dissolved in water
in a 2:1 ratio dextrose:trehalose and co-dried or
co-precipitated and used in the formulas in
Table 10.

EXAMPLE 67

Trehalose and sucrose can be dissolved in water in
a 1:1 ratio and co-dried or co-precipitated and
used in the formulas in Table 10.

EXAMPLE 68

Trehalose, sucrose and dextrose can be dissolved
in water in a 1:1:1 ratio and co-dried or co-
precipitated and used in the formulas in Table 10.

EXAMPLE 69

Trehalose, sucrose, dextrose and fructose can be
dissolved in water at 25% of each ingredient and
co-dried, and used in the formulas in Table 10.

EXAMPLE 70

Trehalose, dextrose, fructose and lactose can be
dissolved in water at 25% of each ingredient and
co-dried, and used in the formulas in Table 10.

EXAMPLE 71

Trehalose, dextrose, maltose and corn syrup solids
can be dissolved in water at 25% of each
ingredient and co-dried, and used in the formulas
in Table 10.

EXAMPLE 72

Trehalose, sucrose, dextrose, maltose and fructose
can be dissolved in water at 20% of each

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5 ingredient and co-dried, and used in the formulas
in Table 10.

Multiple combinations of trehalose with other
sugars can be made in solution to form liquid
10 concentrates that do not need to be co-dried, such as:

EXAMPLE 73

Trehalose, corn syrup and glycerin can be
dissolved in water at a ratio of 1:1:1, evaporated
to a thick syrup and used in the formulas in Table
15 10.

EXAMPLE 74

Trehalose, dextrose, fructose and invert syrup may
be dissolved in water at 25% of each ingredient
and evaporated to a thick syrup and used in the
20 formulas in Table 10.

EXAMPLE 75

Trehalose, dextrose, maltose and corn syrup solids
may be dissolved in water at 25 % of each
component and evaporated to a thick syrup and used
25 in the formulas in Table 10.

EXAMPLE 76

Glycerin is added to Example 74 at a ratio of 4:1
syrup to glycerin and evaporated to a thick syrup,
and used in the formulas in Table 10.

30 EXAMPLE 77

Glycerin is added to Example 75 at a ratio of 2:1
syrup to glycerin and evaporated to a thick syrup,
and used in the formulas in Table 10.

35 Multiple combinations and combinations of two
or three sugars can also be made by melting the sugars
together at about 110°C, cooling, and grinding to form
powder blends such as:

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5 EXAMPLE 78

Trehalose and dextrose are blended at a ratio of 1:1 and melted at 110°C. The blend is cooled, ground, and used in formulas in Table 10.

10 EXAMPLE 79

Trehalose, dextrose, and fructose at a ratio of 1:1:1 are blended and melted at 110°C. The melted blend is cooled, ground, and used in formulas in Table 10.

15 Table 11 shows chewing gum formulations that are free of sucrose. These formulations can use a wide variety of non-sugar alditols.

TABLE 11
(WEIGHT PERCENT)

		<u>EX. 80</u>	<u>EX. 81</u>	<u>EX. 82</u>	<u>EX. 83</u>	<u>EX. 84</u>	<u>EX. 85</u>
20	GUM BASE	25.5	25.5	25.5	25.5	25.5	25.5
25	GLYCERIN	2.0	2.0	2.0	2.0	2.0	2.0
	SORBITOL	44.0	34.0	34.0	29.0	28.0	-
30	MANNITOL	-	10.0	10.0	10.0	10.0	6.0
	SORBITOL LIQUID*	17.0	17.0	-	-	-	-
	LYCASN	-	-	17.0	12.0	8.0	10.0
	MALTITOL	-	-	-	10.0	-	-
	XYLITOL	-	-	-	-	15.0	15.0
40	LACTITOL	-	-	-	-	-	-
	HYDROGENATED ISOMALTULOSE	-	-	-	-	-	-
45	FLAVOR	1.5	1.5	1.5	1.5	1.5	1.5
	TREHALOSE	10.0	10.0	10.0	10.0	10.0	40.0

* Sorbitol Liquid contains 70% sorbitol, 30% water

5

		TABLE 11 (Cont'd)					
		(WEIGHT PERCENT)					
		EX. 86	EX. 87	EX. 88	EX. 89	EX. 90	EX. 91
10	GUM BASE	25.5	25.5	25.5	25.5	25.5	25.5
	GLYCERIN	8.0	8.0	8.0	2.0	3.0	2.0
	SORBITOL	32.0	27.0	22.0	31.0	10.0	-
15	MANNITOL	8.0	8.0	8.0	-	-	-
	SORBITOL LIQUID*	5.0	-	-	-	-	-
20	LYCASIN	-	5.0	5.0	5.0	10.0	10.0
	MALTITOL	-	5.0	-	-	-	-
25	XYLITOL	-	-	-	15.0	-	-
	LACTITOL	10.0	10.0	10.0	-	-	-
	HYDROGENATED ISOMALTULOSE			-	-	10.0	10.0
30	25.0 21.0						
	FLAVOR	1.5	1.5	1.5	1.5	1.5	1.5
	TREHALOSE	10.0	10.0	10.0	10.0	25.0	40.0

35

* Sorbitol Liquid contains 70% sorbitol, 30% water

Any of the alditols can be combined with trehalose and co-dried to form unique combinations, such as:

40

EXAMPLE 92

Trehalose and sorbitol can be dissolved in water in a ratio of 2:1 sorbitol:trehalose and co-dried and used in formulas in Table 11.

45

EXAMPLE 93

Trehalose, sorbitol and mannitol can be dissolved in water at a ratio of 1:1:1, co-dried, and used in appropriate formulas in Table 11.

EXAMPLE 94

50

Trehalose, mannitol and xylitol can be dissolved in water at a ratio of 1:1:1, co-dried, and used in appropriate formulas in Table 11.

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5 EXAMPLE 95

Trehalose, sorbitol and lactitol can be dissolved in water at a ratio of 1:1:1, co-dried, and used in appropriate formulas in Table 11.

EXAMPLE 96

10 Trehalose, hydrogenated isomaltulose and sorbitol can be dissolved in water at a ratio of 1:1:1, co-dried, and used in appropriate formulas in Table 11.

EXAMPLE 97

15 Trehalose and hydrogenated isomaltulose can be dissolved in water at a ratio of 1:1, co-dried, and used in appropriate formulas in Table 11.

EXAMPLE 98

20 Trehalose, sorbitol, maltitol and xylitol may be blended at 25% of each ingredient and dissolved in water, co-dried, and used in appropriate formulas in Table 11.

25 Multiple combinations of trehalose with the various alditols can be made in solution to form liquid concentrates that do not need to be co-dried, such as:

EXAMPLE 99

30 Trehalose, sorbitol, maltitol and Lycasin brand hydrogenated starch hydrolysates may be dissolved in water at 25% of each ingredient, evaporated to a thick syrup and used in the appropriate formulas in Table 11.

EXAMPLE 100

35 Trehalose, xylitol, sorbitol, and Lycasin can be dissolved in water at 25% of each ingredient, evaporated to a thick syrup, and used in the formulas in Table 11.

EXAMPLE 101

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5 Trehalose, sorbitol, lactitol and Lycasin can be dissolved in water at 25% of each ingredient, evaporated to a thick syrup, and used in the formulas in Table 11.

EXAMPLE 102

10 Trehalose, Lycasin and glycerin can be dissolved in water at a ratio of 1:1:1, evaporated to a thick syrup and used in the formulas in Table 11.

EXAMPLE 103

15 Glycerin is added to Example 99 at a ratio of 4:1 syrup to glycerin, evaporated to a thick syrup, and used in formulas in Table 11.

EXAMPLE 104

20 Glycerin is added to Example 100 at a ratio of 4:1 syrup to glycerin, evaporated to a thick syrup, and used in the formulas in Table 11.

EXAMPLE 105

25 Glycerin is added to Example 101 at a ratio of 4:1 syrup to glycerin, evaporated to a thick syrup, and used in formulas in Table 11.

Multiple combinations of one or two alditols with trehalose can be made by melting the trehalose and alditols together at about 110°C, cooling, and grinding to form powder blends, such as:

30 EXAMPLE 106

Trehalose and sorbitol are blended at a 1:1 ratio and melted at 110°C. The blend is cooled, ground and used in formulas in Table 11.

EXAMPLE 107

35 Trehalose, sorbitol and xylitol are blended at a 1:1:1 ratio and melted at 110°C. The blend is cooled, ground and used in formulas in Table 11.

5 High-intensity sweeteners such as aspartame, acesulfame K, or the salts of acesulfame, cyclamate and its salts, saccharin and its salts, alitame, sucralose, thaumatin, monellin, dihydrochalcone, stevioside, glycyrrhizin, and combinations thereof may be used in
10 any of the Examples listed in Tables 4, 5, 6, 7, 8 9, 10 and 11. Since trehalose has less sweetness than some of the other sugars used in conventional sugar gum, and some of the alditols in sugar-free gum, a high-intensity sweetener may be need to obtain the
15 proper level of sweetness.

High-intensity sweeteners may also be modified to control their release in chewing gum formulations containing trehalose. This can be controlled by various methods of encapsulation,
20 agglomeration, absorption, or a combination of methods to obtain either a fast or slow release of the sweetener. Sweetener combinations, some of which may be synergistic, may also be included in the gum formulations containing trehalose.

25 The following examples show the use of high-intensity sweeteners in chewing gum formulations with trehalose.

EXAMPLE 108

30 Aspartame at a level of 0.2% may be added to any of the formulas in Tables 4 through 11 by replacing 0.2% of the trehalose.

EXAMPLE 109

35 Alitame at a level of 0.03% may be added to any of the formulas in Tables 4 through 11 by replacing 0.03% of the trehalose.

EXAMPLE 110

Sucralose at a level of 0.07% may be added to any of the formulas in Tables 4 through 11 by replacing 0.07% of the trehalose.

5 EXAMPLE 111

Thaumatococcus at a level of 0.02% may be added to any of the formulas in Tables 4 through 11 by replacing 0.02% of the trehalose.

10 EXAMPLE 112

Glycyrrhizin at a level of 0.4% may be added to any of the formulas in Tables 4 through 11 by replacing 0.4% of the trehalose.

High-intensity sweeteners may also be combined with other high-intensity sweeteners, with or without encapsulation, agglomeration or absorption, and used in chewing gum. Examples are:

15 EXAMPLE 113

Aspartame and acesulfame K at a 1:1 ratio may be added to any of the formulas in Tables 4 through 11 at a level of 0.15% by replacing 0.15% of the trehalose.

20 EXAMPLE 114

Aspartame and alitame at a ratio of 9:1 aspartame: alitame may be added to any of the formulas in Tables 4 through 11 at a level of 0.1% by replacing 0.1% of the trehalose.

25 EXAMPLE 115

Aspartame and thaumatococcus at a ratio of 9:1 aspartame:thaumatococcus can be added to any of the formulas in Tables 4 through 11 at a level of 0.1% by replacing 0.1% of the trehalose.

30 EXAMPLE 116

Sucralose and alitame in a ratio of 3:1 sucralose: alitame can be added to any of the formulas in Tables 4 through 11 at a level of 0.5% by replacing 0.5% of the trehalose.

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EXAMPLE 117

Alitame and glycyrrhizin in a ratio of 1:12
alitame:glycyrrhizin can be added to any of the
formulas in Tables 4 through 11 at a level of 0.1%
by replacing 0.1% of the trehalose.

EXAMPLE 118

Aspartame and glycyrrhizin in a ratio of 1:14
aspartame:glycyrrhizin can be added to any of the
formulas in Tables 4 through 11 at a level of 0.3%
by replacing 0.3% of the trehalose.

As discussed above, trehalose ingredients
that are available are crystalline trehalose and
trehalose syrup. These materials may be used
exclusively in a variety of chewing gum formulations,
as in Tables 12 and 13.

TABLE 12
(WEIGHT PERCENT)

	<u>EX. 119</u>	<u>EX. 120</u>	<u>EX. 121</u>	<u>EX. 122</u>	<u>EX. 123</u>
GUM BASE	19.2	30.5	35.5	30.5	30.0
GLYCERIN	2.0	2.0	7.0	7.0	2.0
TREHALOSE CRYSTALLINE*	67.8	56.0	51.0	46.0	45.5
TREHALOSE SYRUP*	10.0	10.0	5.0	15.0	20.0
FLAVOR	1.0	1.5	1.5	1.5	2.5

*Trehalose Crystalline and Trehalose Syrup may also be
preblended and coevaporated to reduce moisture.

5

TABLE 13
(WEIGHT PERCENT)

		EX. 124	EX. 125	EX. 126	EX. 127	EX. 128	EX. 129
10	GUM BASE	25.5	25.5	25.5	25.5	50.0	70.0
	GLYCERIN	2.0	2.0	7.0	15.0	2.0	1.0
15	TREHALOSE CRYSTALLINE	51.0	61.0	51.0	43.0	45.5	24.0
	TREHALOSE SYRUP	20.0	10.0	15.0	15.0	---	2.0
20	FLAVOR	1.5	1.5	1.5	1.5	2.5	3.0

Trehalose Crystalline and Trehalose Syrup may also be preblended and coevaporated to reduce moisture.

25

The formulation in Table 12 and 13 do not contain other sugars or alditols. These formulations will give unique texture and flavor attributes. These formulations may also contain high-intensity, artificial sweeteners, from about 0.02% to about 0.1% for sweeteners like alitame, thaumatin, and dihydrochalcone, and from about 0.1% to about 0.3% for sweeteners like aspartame, sucralose, acesulfame, and saccharin. The formulations in Tables 12 and 13 without the other types of sugars and alditols will also have good non-cariogenic properties.

30

35

40

It should be appreciated that the compositions and methods of the present invention are capable of being incorporated in the form of a variety of embodiments, only a few of which have been illustrated and described above. The invention may be embodied in other forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive, and the scope of the invention, therefore, indicated by the appended claims rather than by the foregoing description. All

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- 5 changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

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5 WE CLAIM:

1. A chewing gum composition comprising:

a) about 5% to about 95% gum base;

b) about 0.1% to about 10% of a

10 flavoring agent, and

c) about 5% to about 95% trehalose,

|| the trehalose comprising the only bulking and
sweetening agent in the gum.

15 2. The chewing gum composition of claim 1 wherein the trehalose is in the form selected from the group consisting of crystalline trehalose, trehalose syrup and mixtures thereof.

20 3. A chewing gum product including trehalose wherein the trehalose is used as a dusting agent on the surface of the gum.

25 4. A coated chewing gum product comprising a gum pellet coated with a hard coating, the hard coating comprising trehalose.

30 5. A method of making chewing gum comprising the steps of:
a) coevaporating an aqueous solution comprising trehalose and a plasticizing agent to form a syrup, and

b) mixing the syrup with gum base, bulking agents and flavoring agents to produce a gum
35 composition.

6. A chewing gum composition sweetened at least in part by aspartame, the gum composition containing an effective amount of trehalose to

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5 stabilize the aspartame against degradation into non-sweetening derivatives.

7. A method of making chewing gum comprising the steps of:

10 a) codrying a solution containing trehalose and another sweetener selected from the group consisting of sugar sweeteners, alditol sweeteners and high-potency sweeteners, and

15 b) mixing the codried trehalose/sweetener with gum base and flavoring agents to produce a gum composition.

8. A liquid-filled chewing gum product wherein the liquid fill comprises trehalose.

20 9. A chewing gum composition comprising:
a) about 5% to about 95% gum base;
b) about 0.1% to about 10% of a flavoring agent; and

25 c) about 5% to about 95% bulking and sweetening agents, the bulking and sweetening agents comprising trehalose and the gum having less than 2% moisture.

30 10. The chewing gum composition of claim 9 wherein the trehalose comprises about 5% to about 50% of the gum composition.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/21531**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(6) :A23G 3/30

US CL :426/3,5,6

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 426/3,5,6

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONEElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
NONE**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 203859 A (OKA ET AL) 08 August 1995 (08-08-95), see abstract.	1, 2, 9, 10
X	JP 154493 A (MIHASHI ET AL) 17 June 1997 (17-06-97), see abstract.	4
A	US 4,518,581 A (MIYAKE ET AL) 21 May 1985 (21-05-85).	none
A	US 5,510,137 A (OKADA ET AL) 23 April 1996 (23-04-96).	none

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

Special categories of cited documents:	
A document defining the general state of the art which is not considered to be of particular relevance	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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(54) Title: CHEWING GUM CONTAINING ARABINOGALACTAN (57) Abstract Chewing gums containing arabinogalactan and methods of making such gums are disclosed. In one embodiment, the gum comprises about 5 % to about 95 % gum base, about 0.1 % to about 10 % flavoring agent and arabinogalactan, the arabinogalactan being part of the bulking agent in the gum. The arabinogalactan provides the gum with unique properties, and the gum is non-cariogenic. In other embodiments, the arabinogalactan is codried with sweeteners or coevaporated with a plasticizing syrup to produce unique sweetening ingredients and syrups for gum. The arabinogalactan may also be provided in the form of a rolling compound on the gum, or used with sugars or polyols to form a hard coating for a coated pellet gum.		

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Chewing Gum Containing Arabinogalactan

BACKGROUND OF THE INVENTION

The present invention relates to improved compositions of chewing gum. More particularly, the invention relates to improving chewing gum by the use of specific bulking agents in sugar and non-sugar chewing gum products to give improved texture, moisture absorption properties, and improved shelf life properties. The improved chewing gum compositions may also be used in a variety of chewing gum products such as confectionery coated chewing gum products.

In recent years, efforts have been devoted to replace sugar and sugar syrups normally found in chewing gum with other carbohydrates and non-carbohydrates. Non-sugar or sugar-free chewing gum, which is growing in popularity, uses sugar alcohols or polyols to replace sugar and sugar syrups. The most popular polyols are sorbitol, mannitol and xylitol. New polyols are being developed using new technology to replace these polyols. New polyols have various unique properties which can improve the taste, texture and shelf life properties of chewing gum for consumers.

The non-sugar polyols have the advantage of not contributing to dental caries of consumers, as well as being able to be consumed by diabetics. However, all polyols have the disadvantage of causing gastro-intestinal disturbances if consumed in too great of a quantity. Therefore it would be a great advantage to be able to use a carbohydrate or carbohydrate-like food ingredient for chewing gum that would act as a bulking agent, but not contribute to dental caries nor cause gastro-intestinal disturbances.

One such bulking agent is arabinogalactan, also referred to as larch gum. Although arabinogalactan is found in most plant life, the various species of larch trees are most useful for commercial production. Arabinogalactan, a carbohydrate polymer of galactose and arabinose is GRAS approved for use in food products in the U.S. Although a

carbohydrate, arabinogalactan is a natural gum that may not contribute to dental caries, nor it may not cause gastrointestinal disturbances. Thus, this ingredient's use in chewing gum could be a definite improvement.

Arabinogalactan is a natural water soluble polymer that has the highest water solubility and the lowest viscosity of the natural carbohydrate polymers, including gum arabic. These characteristics make arabinogalactan useful in a wide variety of applications including coatings, detergents, encapsulation, foods, personal care products, and pharmaceuticals.

As an encapsulating agent, use of arabinogalactan to coat food acidulents to make them more water soluble is disclosed in U.S. Patent No. 3,716,374. A gelatin type jelly desert that uses an encapsulated flavor made by spray drying with arabinogalactan is disclosed in U.S. Patent No. 3,264,114. In U.S. Patent No. 4,228,198, arabinogalactan is added to a sweetening composition containing thaumatin, monellin, or saccharin to enhance sweetness and suppress aftertaste.

SUMMARY OF THE INVENTION

The present invention is a method of producing chewing gum with arabinogalactan, as well as the chewing gum so produced. The bulking agent may be added to sucrose-type gum formulations, replacing a small or large quantity of sucrose. The formulation may be a low- or high-moisture formulation containing low or high amounts of moisture-containing syrup. The bulking agent, arabinogalactan, may also be used in low- or non-sugar gum formulations replacing sorbitol, mannitol, other polyols, or carbohydrates. Non-sugar formulations may include low- or high-moisture, sugar-free chewing gums.

The bulking agent, arabinogalactan, may be combined with other bulking agents for use in chewing gum, including but not limited to sucrose, dextrose, fructose, maltose, maltodextrin, xylose, as well as sugar alcohols including but not limited to sorbitol, mannitol, xylitol, maltitol, lactitol, hydrogenated isomatulose and hydrogenated starch hydrolyzates such as

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Lycasin. The bulking agent, arabinogalactan, may be combined in the gum formulation or co-dried or blended with the other bulk sweeteners prior to use in the gum formulation. Co-drying may be done by various methods of spray drying, fluid bed coating, coacervation, and other granulating or agglomerating techniques. The bulking agent, arabinogalactan, may also be combined with high potency sweeteners including, but not limited to, thaumatin, aspartame, acesulfame K, sodium saccharin, glycyrrhizin, alitame, cyclamate, stevioside and dihydrochalcones.

This material, when used as a bulking agent, gives chewing gum an improved texture, an improved shelf life and unique flavor/sweetness quality. Even though arabinogalactan is a carbohydrate, it is not cariogenic, nor does it cause gastro-intestinal disturbances, giving a highly consumer-acceptable chewing gum product.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Arabinogalactan is a carbohydrate polymer of galactose and arabinose. Arabinogalactan is a naturally occurring polysaccharide extracted from the Larch tree, and has the highest solubility and lowest viscosity of any known natural hydrocolloid.

Larch trees are the most useful for commercial production of arabinogalactan and are a most abundant renewable resource in North America. Arabinogalactan is available from Larex, Incorporated, 2852 Patton Road, St. Paul, Minnesota, under the tradename L'Extra™ as a food grade material. It is also available for other applications under the tradenames LARA-Print™, LARACare™, and Cellsep™. The material is available as a spray-dried powder or as a liquid of 50% concentration.

Arabinogalactan is permitted as a direct food additive and is FEMA-GRAS in flavor systems. Arabinogalactan is not a sweetener, but is considered a flavor enhancer. It has no noticeable sweetness itself, but when incorporated in compositions with a protein sweetener, such as thaumatin or

monellin, saccharin, or cyclamate, it enhances the overall sweetness of the composition and reduces any unpleasant aftertaste.

As noted previously, arabinogalactan is a highly branched polymer of arabinose and galactose having galactose units and arabinose units in the approximate ratio of six to one. Arabinogalactan is used in food as an emulsifier, stabilizer, binder, or bodying agent for essential oils, and is used in non-nutritive sweeteners, flavor bases, non-standardized dressings and pudding mixes.

It has been reported that arabinogalactan is non-digestible and thus could have a very low caloric value. As it is considered a high fiber material along with its high water solubility and low viscosity at high concentrations, arabinogalactan makes an excellent bulking agent for chewing gum. Because of its binding and film forming properties, arabinogalactan also makes an excellent additive to sugar and polyol coatings for chewing gum products.

Arabinogalactan may be added to chewing gum in its powder form or may be dissolved in water. Its solubility in water is above 50% at room temperature, but increases further with increased temperature.

Arabinogalactan may be used in chewing gum as a texture and flavor modifier, bulking agent, and may improve texture, flavor, and shelf life properties. Arabinogalactan may replace solids like sucrose, dextrose or lactose when used in its powder form, or may replace syrups when used in its liquid or syrup form. At levels of about 0.5% to about 25%, arabinogalactan may replace part of the solids in sugar gum or, as a liquid, all or part of the syrup in sugar gum. At higher levels of about 25% to about 70% of the gum formulation, arabinogalactan may replace all of the solids in a chewing gum formulation.

Unique chewing gum formulations can be obtained when all bulk sweeteners are replaced with arabinogalactan powder and syrup. The low sweetness intensity allows for use of unique flavor combinations such as

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savory flavors. High intensity sweeteners may be added to increase sweetness to obtain a sweetness more typical of chewing gum formulations. Chewing gum formulations with arabinogalactan may contain a very low amount of moisture in the gum formulation, i.e., below about 2%, or may contain a medium amount of moisture, about 2-5%, and may even be a soft gum formulation containing 5% moisture or more.

Arabinogalactan's non-cariogenic properties suggest it may be used in chewing gum formulations containing non-sugar ingredients. Non-sugar ingredients are alditols such as sorbitol, mannitol, xylitol, lactitol, hydrogenated isomaltulose, maltitol and hydrogenated starch hydrolyzates. These alditols are used in a variety of combinations to develop unique sugarless chewing gum formulations. Arabinogalactan may be used to replace the individual alditols or combinations of alditols. With partial replacement of one or more alditols, arabinogalactan can be used at levels of about 0.5-25%. If arabinogalactan replaces a large amount or most of the alditols, this level may be about 25% to about 90% of the gum formulation.

Some sugar-free chewing gum formulations contain high levels of glycerin and are very low in moisture, i.e., less than about 2%.

Arabinogalactan solids or syrup may replace part or all of the glycerin used in these types of formulations. At higher moisture levels (more than 2%) in sugar-free gum, a liquid sorbitol (70% sorbitol, 30% water) is used.

Arabinogalactan solids or arabinogalactan syrup may replace part or all of the sorbitol liquid. New sugar-free syrups like hydrogenated starch hydrolyzates, such as Lycasin, may also be replaced in part or totally by arabinogalactan solids or syrup. The same product advantages found with hydrogenated starch hydrolyzates syrups, such as improved product shelf life, improved texture and improved aspartame stability, may also be found with the use of arabinogalactan solids or syrup.

Recent advances use hydrogenated starch hydrolyzates (HSH) and glycerin preblended and co-evaporated to reduce moisture in some sugar-

free gum formulations. Arabinogalactan solids and/or syrup may be used to replace part or all of the HSH/glycerin blends in chewing gum formulations. Aqueous arabinogalactan solids and/or arabinogalactan syrup may also replace HSH in the preblend with glycerin and be co-evaporated with glycerin to obtain a low moisture, non-crystallizable blend. Combinations of arabinogalactan solids/syrup with alditols like sorbitol, maltitol, xylitol, lactitol and mannitol in aqueous form may also be blended with glycerin and co-evaporated for use in low-moisture, sugar-free gum.

In a similar manner, arabinogalactan solids/syrup preblended in glycerin and co-evaporated may be used in conventional sugar chewing gum formulations. Arabinogalactan may be combined with other sugars like dextrose, sucrose, lactose, maltose, invert sugar, fructose and corn syrup solids to form a liquid mix to be blended with glycerin and co-evaporated. Arabinogalactan solids/syrup may also be mixed with syrup and blended with glycerin and co-evaporated for use in a sugar chewing gum formulation.

Arabinogalactan bulking agent may also be co-dried with a variety of sugars such as sucrose, dextrose, lactose, fructose and corn syrup solids and used in a sugar-containing gum formulation. Arabinogalactan may be co-dried with a variety of alditols such as sorbitol, mannitol, xylitol, maltitol, hydrogenated isomaltulose and hydrogenated starch hydrolyzates and used in a sugar-free gum formulation. Co-drying refers to methods of co-crystallization and co-precipitation of arabinogalactan with sugars and alditols, as well as co-drying by encapsulation, agglomeration and absorption with sugars and alditols.

These techniques include, but are not limited to, spray drying, spray chilling, fluid-bed coating and coacervation. These encapsulation techniques that give partial encapsulation or full encapsulation can be used individually or in any combination in a single step process or multiple step process. Generally, delayed release is obtained in multistep processes like spray drying the arabinogalactan and then fluid-bed coating the resultant powder.

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Like gum arabic, arabinogalactan can be used alone to encapsulate or partially encapsulate sugars and polyols, high intensity sweeteners, and natural and synthetic flavors. High intensity sweeteners such as aspartame, alitame, acesulfame K, salts of acesulfame, cyclamate and its salts, saccharin and its salts, sucralose, thaumatin, monellin, dihydrochalcone, stevioside, glycyrrhizin, and combinations thereof may be encapsulated in arabinogalactan. When added to chewing gum, a fast release sweetener is obtained. Also, fast release flavors may result when encapsulated in arabinogalactan.

The arabinogalactan may be added to the liquid inside a liquid center gum product. The center fill of a gum product may comprise one or more carbohydrate syrups, glycerin, thickeners, flavors, acidulants, colors, sugars and sugar alcohols in conventional amounts. The ingredients are combined in a conventional manner. The arabinogalactan bulking agent is dissolved in the center-fill liquid and the amount of arabinogalactan added to the center-fill liquid may be about 0.1% to about 20% by weight of the entire chewing gum formula. This method of using the bulking agent in chewing gum can allow for a lower usage level of the bulking agent, can give the bulking agent a smooth release rate, and can reduce or eliminate any possible reaction of the bulking agent with gum base, flavor components or other components, yielding improved shelf stability.

Another method of using the arabinogalactan bulking agent is to add arabinogalactan to the dusting compound of a chewing gum. A rolling or dusting compound is applied to the surface of chewing gum as it is formed. This rolling or dusting compound serves to reduce sticking to machinery as it is formed, reduces sticking of the product to machinery as it is wrapped, and sticking to its wrapper after it is wrapped and being stored. The rolling compound comprises arabinogalactan alone or in combination with mannitol, sorbitol, sucrose, starch, calcium carbonate, talc, other orally acceptable substances or a combination thereof. The rolling compound constitutes from

about 0.25% to about 10.0%, but preferably about 1% to about 3% of weight of the chewing gum composition. The amount of arabinogalactan added to the rolling compound is about 0.5% to 100% of the rolling compound or about 0.005% to about 5% of the chewing gum composition. This method of using arabinogalactan in the chewing gum can allow a lower usage level of the bulking agent.

Another method of using the arabinogalactan bulking agent is to use it in the coating/panning of a pellet chewing gum. Pellet or ball gum is prepared as conventional chewing gum, but formed into pellets that are pillow shaped or into balls. The pellets/balls can be then sugar coated or panned by conventional panning techniques to make a sugar-coated pellet gum. The bulking agent is very stable and highly water soluble, and can be easily added to a sugar solution prepared for sugar panning.

Arabinogalactan may be combined with sucrose, dextrose, maltose, xylitol, lactitol, hydrogenated isomaltulose, erythritol, maltitol and other new alditols in a solution to make a sugar coated pellet gum or a polyol coated pellet gum. Arabinogalactan can also be used alone in solution in an initial gumming stage where aqueous arabinogalactan is applied as a coating and then a powdered arabinogalactan is added to dry the solution, as may be done in some types of "soft" panning procedures. Levels for the use of arabinogalactan in the coating may be about 0.5 to about 40% in a sugar or polyol hard coating, or may be about 5% to 100% of dry solids in the solution or as dry powder used in the soft panning process. This process may then continue with other materials by alternating liquid and powder applications. The amount of arabinogalactan applied may be about 0.1% to 40% of the weight of the chewing gum product, where the coating may be about 10% to 50% of the weight of the finished pellet product.

Like gum arabic, arabinogalactan has many properties that make it an excellent coating and panning modifier. A panning modifier can improve the hardness of the coating to make it tougher, increase stickiness of coating to

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improve adhesion to the gum surface, especially edges, and gives additional film strength to improve shelf life of the product by protecting the gum core. Other panning modifiers which may be used in combination with arabinogalactan are gum arabic, maltodextrin, corn syrup, corn syrup solids, 5 gelatin, cellulose type materials like carboxymethyl cellulose or hydroxymethyl cellulose, starch and modified starches, vegetable gums like alginates, locust bean gum, guar gum, and gum tragacanth. Other types of panning modifiers that reduce tack or act as fillers may also be used, such as insoluble carbonates like magnesium carbonate or calcium carbonate and talc. These antitack agents allow the use of a variety of carbohydrates and sugar alcohols to be used in the development of newly panned and coated gum products.

Flavors and high intensity sweeteners may also be added with the pellet coating to yield unique product characteristics. When liquid or encapsulated flavors are added to a coating, they can behave like an antitack 15 agent. Use of arabinogalactan can increase tackiness and help cover the flavor and allow a continuation of the sugar or polyol coating process. Also arabinogalactan with its binding properties may help bind the flavor in the coating. High intensity sweeteners can also be entrapped and stabilized in the coating with the use of arabinogalactan. High intensity sweeteners may 20 be applied from the dissolved coating solution, or may be applied with the powder charge addition. Sweeteners may be encapsulated and blended with the powder charge to increase stability of the high intensity sweetener.

In general, a chewing gum composition typically comprises a water-soluble bulk portion, a water-insoluble chewable gum base portion and 25 typically water-insoluble flavoring agents. The water-soluble portion dissipates with a portion of the flavoring agent over a period of time during chewing. The gum base portion is retained in the mouth throughout the chew.

The insoluble gum base generally comprises elastomers, resins, fats 30 and oils, waxes, softeners and inorganic fillers. Elastomers may include

polyisobutylene, isobutylene-isoprene copolymer and styrene butadiene rubber, as well as natural latexes such as chicle. Resins include polyvinylacetate and terpene resins. Fats and oils may also be included in the gum base, including tallow, hydrogenated and partially hydrogenated vegetable oils, and cocoa butter. Commonly employed waxes include paraffin, microcrystalline and natural waxes such as beeswax and carnauba. According to the preferred embodiment of the present invention, the insoluble gum base constitutes between about 5 to about 95% by weight of the gum. More preferably the insoluble gum base comprises between 10 and 50% by weight of the gum and most preferably about 20 to about 35% by weight of the gum.

The gum base typically also includes a filler component. The filler component may be calcium carbonate, magnesium carbonate, talc, dicalcium phosphate or the like. The filler may constitute between about 5 and about 60% by weight of the gum base. Preferably, the filler comprises about 5 to about 50% by weight of the gum base.

Gum bases typically also contain softeners, including glycerol monostearate and glycerol triacetate. Further, gum bases may also contain optional ingredients such as antioxidants, colors and emulsifiers. The present invention contemplates employing any commercially acceptable gum base.

The water-soluble portion of the chewing gum may further comprise softeners, sweeteners, flavoring agents and combinations thereof. Softeners are added to the chewing gum in order to optimize the chewability and mouth feel of the gum. Softeners, also known in the art as plasticizers or plasticizing agents, generally constitute between about 0.5 to about 15.0% by weight of the chewing gum. Softeners contemplated by the present invention include glycerin, lecithin and combinations thereof. Further, aqueous sweetener solutions such as those containing sorbitol, hydrogenated starch hydrolysates, corn syrup and combinations thereof may be used as softeners

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and binding agents in gum. An aqueous solution of arabinogalactan can also be used as a softener and binding agent in gum.

As mentioned above, the arabinogalactan bulking agent of the present invention will most likely be used in sugarfree gum formulations. However, sugar formulations are also within the scope of the invention. Sugar sweeteners generally include saccharide-containing components commonly known in the chewing gum art which comprise, but are not limited to, sucrose, dextrose, maltose, dextrin, dried invert sugar, fructose, galactose, corn syrup solids and the like, alone or in any combination.

The arabinogalactan bulking agent of the present invention can also be used in combination with other sugarless sweeteners. Generally sugarless sweeteners include components with sweetening characteristics but which are devoid of the commonly known sugars and comprise, but are not limited to, sugar alcohols such as sorbitol, mannitol, xylitol, hydrogenated starch hydrolysates, maltitol, lactitol, hydrogenated isomaltulose and the like, alone or in any combination.

Depending on the particular sweetness release profile and shelf-stability needed, the arabinogalactan bulking agent of the present invention can also be used in combination with coated or uncoated high-potency sweeteners or with high-potency sweeteners coated with other materials and by other techniques.

A flavoring agent may be present in the chewing gum in an amount within the range of from about 0.1 to about 10.0 weight percent and preferably from about 0.5 to about 3.0 weight percent of the gum. The flavoring agents may comprise essential oils, synthetic flavors, or mixture thereof including, but not limited to, oils derived from plants and fruits such as citrus oils, fruit essences, peppermint oil, spearmint oil, clove oil, oil of wintergreen, anise, and the like. Artificial flavoring components are also contemplated for use in gums of the present invention. Those skilled in the art will recognize that natural and artificial flavoring agents may be combined

in any sensorally acceptable blend. All such flavors and flavor blends are contemplated by the present invention.

Optional ingredients such as colors, emulsifiers and pharmaceutical agents may be added to the chewing gum.

5 In general, chewing gum is manufactured by sequentially adding the various chewing gum ingredients to a commercially available mixer known in the art. After the ingredients have been thoroughly mixed, the gum mass is discharged from the mixer and shaped into the desired form such as by rolling into sheets and cutting into sticks, extruding into chunks or casting into
10 pellets.

Generally, the ingredients are mixed by first melting the gum base and adding it to the running mixer. The base may also be melted in the mixer itself. Color or emulsifiers may also be added at this time. A softener such as glycerin may also be added at this time, along with syrup and a portion of the
15 bulking agent/sweetener. Further portions of the bulking agent/sweetener may then be added to the mixer. A flavoring agent is typically added with the final portion of the bulking agent. A high-intensity sweetener is preferably added after the final portion of bulking agent and flavor have been added.

The entire mixing procedure typically takes from five to fifteen minutes,
20 but longer mixing times may sometimes be required. Those skilled in the art will recognize that many variations of the above described procedure may be followed.

After the chewing gum center has been manufactured and shaped, as described above, the sugar or polyol coatings can be applied. Pellet or ball
25 gum is prepared as conventional chewing gum, but formed into pellets that are pillow-shaped or ball-shaped. The pellets or balls can then be coated or panned by conventional panning techniques to make a unique, coated pellet gum. The sugar or polyols used in the coatings are very stable and highly water soluble, and can be easily added to water to make a solution prepared
30 for panning. Sugars or polyols may be combined with other polyols or sugars,

or used alone in solution as the coating on pellet gum. Sugar or polyols can also be added as a powder blended with other powders often used in some types of conventional panning procedures. Sugars or polyols can also be used with panning modifiers and other panning materials to improve product quality. Antitack agents may also be added as panning modifiers, which allow the use of a variety of carbohydrates and sugar alcohols to be used in the development of new panned or coated gum products.

The coating is initially present as a liquid syrup which contains from about 30 to about 80 or 85 weight percent of the coating ingredients previously described herein, and from about 15 to 20 to about 70 weight percent of a solvent such as water. In general, the hard coating process is carried out in a rotating pan. Sugar or sugarless gum center tablets to be coated are placed into the rotating pan to form a moving mass.

The material or syrup which will eventually form the hard coating is applied or distributed over the gum center tablets. Flavoring agents may be added before, during and after applying the syrup to the gum centers. Once the coating has dried to form a hard surface, additional syrup additions can be made to produce a plurality of coatings or multiple layers of hard coating.

In the hard coating panning procedure, syrup is added to the gum center tablets at a temperature range of from about 100°F. to about 250°F. Preferably, the syrup temperature is from about 150°F. to about 200°F. throughout the process in order to prevent the polyol in the syrup from crystallizing. The syrup may be mixed with, sprayed upon, poured over, or added to the gum center tablets in any way known to those skilled in the art.

Each component of the coating on the gum center tablets may be applied in a single hard layer or in a plurality of hard layers. In general, a plurality of layers is obtained by applying single coats, allowing the layers to dry, and then repeating the process. The amount of solids added by each coating step depends chiefly on the concentration of the coating syrup. Any number of coats may be applied to the gum center tablet. Preferably, no

more than about 75 coats are applied to the gum center tablets. More preferably, less than about 60 coats are applied and most preferably, about 30 to about 60 coats are applied. In any event, the present invention contemplates applying an amount of syrup sufficient to yield a coated chewing gum product containing about 10 to about 65 weight percent coating. Preferably, the final product will contain from about 20 to about 50 weight percent hard coating.

Those skilled in the art will recognize that in order to obtain a plurality of hard coated layers, a plurality of premeasured aliquots of coating syrup may be applied to the gum center tablets. It is contemplated, however, that the volume of aliquots of syrup applied to the gum center tablets may vary throughout the coating procedure.

The present invention contemplates that a flavoring agent may be added to the syrup, or applied to the gum center tablets while the syrup coating is drying or after the coating has dried. Furthermore, the flavoring agent may be applied anywhere within the sequence of coats, for example, after the third, twelfth, eighteenth, etc., coats.

Once a coating of syrup is applied to the gum center tablets, the present invention contemplates drying the wet syrup in an inert medium. A preferred drying medium comprises air. Preferably, forced drying air contacts the wet syrup coating in a temperature range of from about 80° to about 115°F. More preferably, the drying air is in the temperature range of from about 90° to about 105°F. The invention also contemplates that the drying air possess a relative humidity of less than about 15 percent. Preferably, the relative humidity of the drying air is less than about 8 percent.

The drying air may be passed over and admixed with the syrup coated gum centers in any way commonly known in the art. Preferably, the drying air is blown over and around the syrup coated gum center at a flow rate, for large scale operations, of about a 2800 cubic feet per minute. If lower quantities of material are being processed, or if smaller equipment is used, lower flow rates

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would be used. If a flavoring agent is applied after a syrup coating has been dried, the present invention contemplates drying the flavoring agent with or without the use of a drying medium.

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A wide range of changes and modifications to the embodiments of the invention described above will be apparent to persons skilled in the art. For example, while the invention is described with respect to hard-coated chewing gum, it will be appreciated that the process is applicable to coating other food products, such as candies, in which a coating with arabinogalactan would have utility.

Examples

The following examples of the invention and comparative examples are provided by way of explanation and illustration.

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The formulas listed in Table 1 comprise various sugar-type formulas in which arabinogalactan can be added to gum after it is dissolved in water and mixed with various aqueous solvents.

TABLE 1
(WEIGHT PERCENT)

	<u>EX. 1</u>	<u>EX. 2</u>	<u>EX. 3</u>	<u>EX. 4</u>	<u>EX. 5</u>	<u>EX. 6</u>	<u>EX. 7</u>	<u>EX. 8</u>
SUGAR	55.6	56.6	55.6	47.0	53.0	53.0	55.6	47.0
BASE	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2
CORN SYRUP	12.9	1.9	8.9	2.9	6.9	6.9	0.0	2.9
PEPPER-MINT FLAVOR	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
GLY-CERIN	1.4	1.4	1.4	0.0	0.0	0.0	1.4	0.0
LIQUID/ARABI-NOGA-LACTAN BLEND	10.0	20.0	14.0	30.0	20.0	20.0	22.9	30.0

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EXAMPLE 1

Arabinogalactan powder can be added directly to the gum.

EXAMPLE 2

An 80 gram portion of arabinogalactan can be dissolved in 120 grams of water at 40°C making a 40% solution and added to gum.

EXAMPLE 3

Arabinogalactan syrup at 50% solids can be added directly to the gum.

EXAMPLE 4

A blend of 80 grams of arabinogalactan and 120 grams of water is mixed at 40°C. To this is added 100 grams of glycerin to give a mixture of 27% arabinogalactan, 40% water, and 33% glycerin, and added to gum.

EXAMPLE 5

To 140 grams of arabinogalactan syrup at 40% solids is added 60 grams of glycerin to give a 70% arabinogalactan syrup with 30% glycerin, and added to gum.

EXAMPLE 6

To 140 grams of arabinogalactan syrup at 40% solids is added 60 grams of propylene glycol giving a 70% arabinogalactan syrup with 30% propylene glycol and added to gum.

EXAMPLE 7

To 140 grams of arabinogalactan syrup at 40% solids is added 89 grams of corn syrup and blended giving a mixture of 61% arabinogalactan syrup and 39% corn syrup.

EXAMPLE 8

To a 200 gram quantity of corn syrup is added 100 grams of glycerin. To this mixture is added 75 grams of arabinogalactan and blended at 50°C. This mixture is added to gum.

In the next examples of sugar gum formulations, arabinogalactan can be dissolved in water and emulsifiers can be added to the aqueous solution.

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Example solutions can be prepared by dissolving 15 grams of arabinogalactan in 70 grams water and adding 15 grams of emulsifiers of various hydrophilic-lipophilic balance (HLB) values to the solution. The mixtures can then be used in the following formulas. Example 9 uses a mixture of arabinogalactan and water with no emulsifier. The HLB value of the emulsifiers used in Examples 10-14 are listed in Table 2.

TABLE 2
(WEIGHT PERCENT)

	<u>EX. 9</u>	<u>EX. 10</u>	<u>EX. 11</u>	<u>EX. 12</u>	<u>EX. 13</u>	<u>EX. 14</u>
SUGAR	50.7	50.7	50.7	50.7	50.7	50.7
BASE	19.2	19.2	19.2	19.2	19.2	19.2
CORN SYRUP	12.9	12.9	12.9	12.9	12.9	12.9
GLYCERIN	1.4	1.4	1.4	1.4	1.4	1.4
DEXTROSE MONOHY- DRATE	9.9	9.9	9.9	9.9	9.9	9.9
PEPP. FLAVOR	0.9	0.9	0.9	0.9	0.9	0.9
BULKING AGENT EMUL- SIFIER/ WATER MIXTURE	5.0	5.0	5.0	5.0	5.0	5.0
	None	HLB=2	HLB=4	HLB=6	HLB=9	HLB=12

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EXAMPLES 15-20

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The same as the formulations made in Examples 9-14, respectively, except that the flavor can be mixed together with the aqueous arabinogalactan solution and emulsified before adding the mixture to the gum batch.

The following Tables 3 through 10 are examples of gum formulations that demonstrate formula variations in which arabinogalactan or arabinogalactan syrup may be used.

Examples 21-24 in Table 3 demonstrates the use of arabinogalactan in low-moisture sugar formulations showing less than 2% theoretical moisture:

TABLE 3
(WEIGHT PERCENT)

	EX. 21	EX. 22	EX. 23	EX. 24
SUGAR	57.9	53.9	48.9	25.0
GUM BASE	19.2	19.2	19.2	19.2
CORN ^a SYRUP	6.0	6.0	-	-
DEXTROSE MONOHYDRATE	10.0	10.0	10.0	10.0
LACTOSE	0.0	0.0	0.0	5.0
GLYCERIN ^b	5.0	5.0	11.0	14.9
FLAVOR	0.9	0.9	0.9	0.9
ARABINO-GALACTAN	1.0	5.0	10.0	25.0

^aCorn Syrup is evaporated to 85% solids, 15% moisture

^bGlycerin and syrup may be blended and co-evaporated

Examples 25-28 in Table 4 demonstrate the use of arabinogalactan in medium-moisture sugar formulations having about 2% to about 5% moisture.

Examples 29-32 in Table 5 demonstrate the use of arabinogalactan in high-moisture sugar formulations having more than about 5% moisture.

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TABLE 4
(WEIGHT PERCENT)

	<u>EX. 25</u>	<u>EX. 26</u>	<u>EX. 27</u>	<u>EX. 28</u>
SUGAR	52.5	48.5	43.5	25.0
GUM BASE	19.2	19.2	19.2	19.2
CORN SYRUP ^a	15.0	15.0	13.0	12.5
DEXTROSE MONOHY- DRATE	10.0	10.0	10.0	10.0
GLYCERIN ^b	1.4	1.4	3.4	7.4
FLAVOR	0.9	0.9	0.9	0.9
ARABINO- GALACTAN	1.0	5.0	10.0	25.0

5 ^aCorn Syrup is evaporated to 85% solids, 15% moisture

^bGlycerin and syrup may be blended and co-evaporated

TABLE 5
(WEIGHT PERCENT)

	<u>EX. 29</u>	<u>EX. 30</u>	<u>EX. 31</u>	- <u>EX. 32</u>
SUGAR	50.0	46.0	41.0	25.0
GUM BASE	24.0	24.0	24.0	24.0
CORN SYRUP	24.0	24.0	24.0	24.6
GLYCERIN	0.0	0.0	0.0	0.4
FLAVOR	1.0	1.0	1.0	1.0
ARABINO- GALACTAN	1.0	5.0	10.0	25.0

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Examples 33-36 in Table 6 and Examples 37-44 in Tables 7 and 8 demonstrate the use of arabinogalactan in low- and high-moisture gums that are sugar-free. Low- moisture gums have less than about 2% moisture, and high-moisture gums have greater than 2% moisture.

TABLE 6
(WEIGHT PERCENT)

	<u>EX. 33</u>	<u>EX. 34</u>	<u>EX. 35</u>	<u>EX. 36</u>
BASE	25.5	25.5	25.5	25.5
SORBITOL	50.0	46.0	41.0	21.0
MANNITOL	12.0	12.0	12.0	12.0
GLYCERIN ^b	10.0	10.0	10.0	15.0
FLAVOR	1.5	1.5	1.5	1.5
ARABINO- GALACTAN	1.0	5.0	10.0	25.0

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TABLE 7
(WEIGHT PERCENT)

	<u>EX. 37</u>	<u>EX. 38</u>	<u>EX. 39</u>	<u>EX. 40</u>
BASE	25.5	25.5	25.5	25.5
SORBITOL	50.0	46.0	31.0	6.0
LIQUID SORBITOL*	10.0	10.0	20.0	30.0
MANNITOL	10.0	10.0	10.0	10.0
GLYCERIN	2.0	2.0	2.0	2.0
FLAVOR	1.5	1.5	1.5	1.5
ARABINO- GALACTAN	1.0	5.0	10.0	25.0

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*Sorbitol Liquid contains 70% sorbitol, 30% water

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TABLE 8
(WEIGHT PERCENT)

	<u>EX. 41</u>	<u>EX. 42</u>	<u>EX. 43</u>	<u>EX. 44</u>
BASE	25.5	25.5	25.5	25.5
SORBITOL	50.0	44.0	35.0	15.0
HSH SYRUP*	10.0	10.0	10.0	10.0
MANNITOL	8.0	8.0	8.0	8.0
GLYCERIN**	4.0	6.0	10.0	15.0
FLAVOR	1.5	1.5	1.5	1.5
ARABINO- GALACTAN	1.0	5.0	10.0	25.0

* Hydrogenated starch hydrolyzate syrup
** Glycerin and HSH syrup may be blended or co-evaporated

Table 9 shows sugar chewing formulations that can be made with various types of sugars.

TABLE 9
(WEIGHT PERCENT)

	<u>EX. 45</u>	<u>EX. 46</u>	<u>EX. 47</u>	<u>EX. 48</u>	<u>EX. 49</u>	<u>EX. 50</u>
GUM BASE	19.2	19.2	19.2	19.2	19.2	19.2
SUCROSE	44.5	24.5	39.5	19.5	29.5	19.5
GLYCERIN	1.4	6.4	1.4	6.4	1.4	6.4
CORN SYRUP	14.0	14.0	14.0	14.0	14.0	14.0
DEXTROSE	5.0	5.0	-	-	10.0	5.0
LACTOSE	5.0	5.0	10.0	10.0	-	
FRUCTOSE	5.0	5.0	10.0	10.0	10.0	5.0
INVERT SUGAR	-	-	-	-	10.0	10.0
MALTOSE	-	-	-	-	-	-
CORN SYRUP SOLIDS	-	-	-	-	-	-
PEPPERMINT FLAVOR	0.9	0.9	0.9	0.9	0.9	0.9
ARABINO- LACTAN	5.0	20.0	5.0	20.0	5.0	20.0

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TABLE 9 (Cont'd)
(WEIGHT PERCENT)

	<u>EX. 51</u>	<u>EX. 52</u>	<u>EX. 53</u>	<u>EX. 54</u>	<u>EX. 55</u>	<u>EX. 56</u>
GUM BASE	19.2	19.2	19.2	19.2	19.2	19.2
SUCROSE	29.5	19.5	29.5	19.5	37.5	22.5
GLYCERIN	1.4	6.4	1.4	6.4	1.4	6.4
CORN SYRUP	14.0	14.0	14.0	14.0	11.0	11.0
DEXTROSE	10.0	5.0	10.0	5.0	10.0	5.0
LACTOSE	-	-	-	-	-	-
FRUCTOSE	10.0	5.0	10.0	5.0	5.0	5.0
INVERT SUGAR	10.0	10.0	-	-	5.0	5.0
MALTOSE	-	-	10.0	10.0	-	-
CORN SYRUP SOLIDS	-	-	-	-	5.0	5.0
PEPPERMINT FLAVOR	0.9	0.9	0.9	0.9	0.9	0.9
ARABINOGA- LACTAN	5.0	20.0	5.0	20.0	5.0	20.0

Table 10 shows chewing gum formulations that are free of sugar.
These formulations can use a wide variety of other non-sugar alditols.

TABLE 10
(WEIGHT PERCENT)

	<u>EX. 57</u>	<u>EX. 58</u>	<u>EX. 59</u>	<u>EX. 60</u>	<u>EX. 61</u>	<u>EX. 62</u>
GUM BASE	25.5	25.5	25.5	25.5	25.5	25.5
GLYCERIN	8.0	8.0	8.0	8.0	8.0	2.0
SORBITOL	38.0	28.0	28.0	23.0	22.0	10.0
MANNITOL	-	10.0	10.0	10.0	10.0	6.0
SORBITOL LIQUID	17.0	17.0	-	-	-	-
LYCASIN	-	-	17.0	12.0	8.0	20.0
MALITTOL	-	-	-	10.0	-	-
XYLITOL	-	-	-	-	15.0	15.0
LACTITOL	-	-	-	-	-	-
PALATINIT	-	-	-	-	-	-
FLAVOR	1.5	1.5	1.5	1.5	1.5	1.5
ARABINO- GALACTAN	10.0	10.0	10.0	10.0	10.0	20.0

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TABLE 10 (Cont'd)
(WEIGHT PERCENT)

	<u>EX. 63</u>	<u>EX. 64</u>	<u>EX. 65</u>	<u>EX. 66</u>	<u>EX. 67</u>	<u>EX. 68</u>
GUM BASE	25.5	25.5	25.5	25.5	25.5	25.5
GLYCERIN	8.0	8.0	8.0	2.0	8.0	2.0
SORBITOL	32.0	27.0	22.0	31.0	10.0	10.0
MANNITOL	8.0	8.0	8.0	-	-	-
SORBITOL LIQUID	5.0	-	-	-	-	-
LYCASIN	-	5.0	5.0	5.0	10.0	20.0
MALITITOL	-	5.0	-	-	-	-
XYLITOL	-	-	-	15.0	15.0	-
LACTITOL	10.0	10.0	10.0	-	-	-
PALATINIT	-	-	10.0	10.0	10.0	10.0
FLAVOR	1.5	1.5	1.5	1.5	1.5	1.5
ARABINO-GALACTAN	10.0	10.0	10.0	10.0	20.0	20.0

High-intensity sweeteners such as aspartame, acesulfame K, or the salts of acesulfame, cyclamate and its salts, saccharin and its salts, alitame, sucralose, thaumatin, monellin, dihydrochalcone, stevioside, glycyrrhizin, and combinations thereof may be used in any of the Examples listed in Tables 3, 4, 5, 6, 7, 8, 9 and 10. Since arabinogalactan has less sweetness than some of the sugars used in sugar gum, and some of the alditols in sugar-free gum, a high-intensity sweetener may be need to obtain the proper level of sweetness.

High-intensity sweeteners may also be modified to control their release in chewing gum formulations containing arabinogalactan. This can be controlled by various methods of encapsulation, agglomeration, absorption, or a combination of methods to obtain either a fast or slow release of the sweetener. Sweetener combinations, some of which may be synergistic, may also be included in the gum formulations containing arabinogalactan.

The following examples show the use of high- intensity sweeteners in chewing gum formulations with arabinogalactan.

EXAMPLE 69

5 Aspartame at a level of 0.2% may be added to any of the formulas in Tables 3 through 10 by replacing 0.2% of the arabinogalactan.

EXAMPLE 70

 Alitame at a level of 0.03% may be added to any of the formulas in Tables 3 through 10 by replacing 0.03% of the arabinogalactan.

EXAMPLE 71

10 Sucralose at a level of 0.07% may be added to any of the formulas in Tables 3 through 10 by replacing 0.07% of the arabinogalactan.

EXAMPLE 72

 Thaumatococcus at a level of 0.02% may be added to any of the formulas in Tables 3 through 10 by replacing 0.02% of the arabinogalactan.

15 **EXAMPLE 73**

 Glycyrrhizin at a level of 0.4% may be added to any of the formulas in Tables 3 through 10 by replacing 0.4% of the arabinogalactan.

 High-intensity sweeteners may also be combined with other high-intensity sweeteners, with or without encapsulation, agglomeration or
20 absorption, and used in chewing gum. Examples are:

EXAMPLE 74

 Aspartame and acesulfame K at a 1:1 ratio may be added to any of the formulas in Tables 3 through 10 at a level of 0.15% by replacing 0.15% of the arabinogalactan.

25 **EXAMPLE 75**

 Aspartame and alitame at a ratio of 9:1 aspartame: alitame may be added to any of the formulas in Tables 3 through 10 at a level of 0.1% by replacing 0.1% of the arabinogalactan.

EXAMPLE 76

Aspartame and thaumatin at a ratio of 9:1 aspartame:thaumatin can be added to any of the formulas in Tables 3 through 10 at a level of 0.1% by replacing 0.1% of the arabinogalactan.

EXAMPLE 77

Sucralose and alitame in a ratio of 3:1 sucralose: alitame can be added to any of the formulas in Tables 3 through 10 at a level of 0.5% by replacing 0.5% of the arabinogalactan.

EXAMPLE 78

Alitame and glycyrrhizin in a ratio of 1:12 alitame:glycyrrhizin can be added to any of the formulas in Tables 3 through 10 at a level of 0.1% by replacing 0.1% of the arabinogalactan.

EXAMPLE 79

Aspartame and glycyrrhizin in a ratio of 1:14 aspartame:glycyrrhizin can be added to any of the formulas in Tables 3 through 10 at a level of 0.3% by replacing 0.3% of the arabinogalactan.

As noted earlier, the gum formulas can be prepared as stick or tab products in the sugar or sugarless type formulations. These formulas can also be made in a pellet or pillow shape pellet or a round ball or any other shape of product for coating/panning. However, gum formulas are generally adjusted to a higher level of gum base to give a more consumer acceptable size of gum bolus.

Keeping this in mind, if a coating of about 25% of the total product is added to a pellet core as sugar or polyols, the gum base in the pellet core should also be increased by 25%. Likewise, if a 33% coating is applied, the base levels should also be increased by 33%. As a result, gum centers are usually formulated with about 25% to about 40% gum base with a corresponding decrease in the other ingredients except flavor. Generally flavors increase with the level of gum base as the base tends to bind flavors into the gum and more flavor is needed to give a good flavorful product.

However flavors can also be added to the coating to give increased flavor impact and more flavor perception.

Some typical sugar type gum center formulations are shown in Table 11.

TABLE 11
(WEIGHT PERCENT)

	EX. 80	EX. 81	EX. 82	EX. 83	EX. 84	EX. 85
SUGAR	52.0	49.0	48.0	44.0	41.0	39.0
GUM BASE	26.0	30.0	35.0	26.0	30.0	35.0
CORN SYRUP	20.0	19.0	15.0	18.0	17.0	14.0
GLYCERIN	1.0	1.0	1.0	1.0	1.0	1.0
PEPPERMINT FLAVOR	1.0	1.0	1.0	1.0	1.0	1.0
DEXTROSE MONOHYDRATE	-	-	-	10.0	10.0	10.0

Formulations with or without arabinogalactan can also be made similar to those found in Tables 1-5 for low, medium, and high moisture formulas. Higher levels of base may be used with a corresponding decrease in other ingredients. Also, other sugars may be used in the gum center as found in Table 9.

Arabinogalactan can then be used in the coating formula on the various pellet gum formulations. The following Table 12 shows some sugar and dextrose type formulas:

TABLE 12
(DRY WEIGHT PERCENT)

	EX. 86	EX. 87	EX. 88	EX. 89	EX. 90	EX. 91
SUGAR	97.1	95.4	94.1	96.9	95.1	93.6
ARABINO- GALACTAN	2.0	3.0	4.0	2.0	3.0	4.0
TITANIUM DIOXIDE	0.5	1.0	1.0	-	-	-
CALCIUM CARBONATE	-	-	-	0.5	1.0	2.0
FLAVOR	0.3	0.5	0.8	0.5	0.8	0.3
WAX	0.1	0.1	0.1	0.1	0.1	0.1

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TABLE 12 (Cont'd)
(DRY WEIGHT PERCENT)

	<u>EX. 92</u>	<u>EX. 93</u>	<u>EX. 94</u>	<u>EX. 95</u>
DEXTROSE MONOHYDRATE	97.8	95.4	97.2	94.5
ARABINO-GALACTAN	1.5	3.0	1.5	3.0
TITANIUM DIOXIDE	0.5	1.0	-	-
CALCIUM CARBONATE	-	-	1.0	2.0
FLAVOR	0.3	0.5	0.2	0.4
WAX	0.1	0.1	0.1	0.1

5 The above formulations are made by making a syrup by dissolving the sugar and arabinogalactan in solution at about 75% solids at boiling, and suspending titanium dioxide or calcium carbonate in this syrup. Flavor is not mixed with the hot syrup, but added at low levels with one or more coats. After the final coats are applied and dried, wax is applied to give a smooth polish.

10 The above process gives a hard shell coating. Often a dry charge of powdered sugar or dextrose monohydrate may be used. This gives a somewhat softer coating. A dry charge may be used to build up a coating, but then finished with a straight syrup to obtain a hard shell. Table 13 gives these types of formulas.

TABLE 13
(DRY WEIGHT PERCENT)

	EX. 96	EX. 97	EX. 98	EX. 99	EX. 100	EX. 101
SUGAR	77.5	81.4	-	-	87.5	-
DEXTROSE MONOHYDRATE	-	-	77.5	88.3	-	87.1
POWDER SUGAR*	20.0	15.0	-	-	-	-
POWDER DEXTROSE*	-	-	20.0	10.0	-	-
ARABINO-GALACTAN POWDER	2.0	3.0	2.0	3.0	8.0	8.0
ARABINO-GALACTAN SOLUTION	-	-	-	-	4.0	4.0
FLAVOR	0.4	0.5	0.4	0.6	0.4	0.8
WAX	0.1	0.1	0.1	0.1	0.1	0.1

5 * Powder and/or crystalline sugar may be used.

 In Examples 96-99, arabinogalactan is blended in the sugar syrup. In Examples 100 and 101, arabinogalactan powder is dry charged after a arabinogalactan solution is applied in the first stages of coating, then this is followed by a hard shell coating of sugar solution or dextrose solution.

10 Arabinogalactan may also be used in coating of sugarless gum centers. Like sugar gum centers, the base formulation can be increased in proportion to the amount of coating applied to the center. Formulations with and without arabinogalactan similar to those found in Tables 6, 7 or 8 for low and high moisture gum can be used to make gum centers. Generally, the
15 base level may be increased to 30-46% with the other ingredients proportionally reduced. Some typical gum formulas are in Table 14.

TABLE 14
(WEIGHT PERCENT)

	EX. 102	EX. 103	EX. 104	EX. 105	EX. 106	EX. 107	EX. 108
GUM BASE	35.0	35.0	30.0	30.0	30.0	40.0	30.0
CALCIUM CARBONATE	-	-	5.0	10.0	15.0	-	-
SORBITOL	43.3	45.3	46.3	40.3	44.8	41.7	46.5
MANNITOL	10.0	10.0	5.0	10.0	-	8.0	10.0
GLYCERIN	-	8.0	2.0	-	8.0	2.0	2.0
SORBITOL LIQUID	10.0	-	10.0	8.0	-	6.0 ^a	10.0 ^a
FLAVOR	1.5	1.5	1.5	1.5	2.0	2.0	1.3
HIGH INTENSITY SWEETENER	0.2	0.2	0.2	0.2	0.2	0.3	0.2

5 a) Lycasin brand hydrogenated starch hydrolyzate used instead of sorbitol liquid

10 In the above center formulations, the high intensity sweetener used is aspartame. However other high intensity such as alitame, acesulfame K, salts of acesulfame, cyclamate and its salts, saccharin and its salts, sucralose, thaumatin, monellin, dihydrochalcone, stevioside, glycyrrhizin and combinations thereof may be used in any of the examples with the level adjusted for sweetness.

15 Lycasin and other polyols such as maltitol, xylitol, lactitol and hydrogenated isomaltulose may also be used in the gum center formulations at various levels similar to those shown in Table 10. The texture may be adjusted by varying glycerin or sorbitol liquid. Sweetness of the center formulation can also be adjusted by varying the level of high intensity sweetener.

20 Arabinogalactan is especially useful in sugarless coatings with xylitol, sorbitol, maltitol, lactitol, hydrogenated isomaltulose and erythritol. Arabinogalactan acts as a binder, film former, hardener of the coated pellet. The following table gives formulas for a xylitol coating:

TABLE 15
(DRY WEIGHT PERCENT)

	<u>EX. 109</u>	<u>EX. 110</u>	<u>EX. 111</u>	<u>EX. 112</u>	<u>EX. 113</u>	<u>EX. 114</u>
XYLITOL	94.8	92.4	90.7	90.1	89.9	88.8
ARABINO- GALACTAN	4.0	6.0	7.0	8.5	8.5	10.0
FLAVOR	0.5	0.5	0.7	0.7	0.9	0.5
TITANIUM DIOXIDE	0.5	0.9	-	0.5	0.5**	0.5**
TALC	0.1	0.1	0.1	0.1	0.1	0.1
WAX	0.1	0.1	0.1	0.1	0.1	0.1
COLOR*	-	-	1.4	-	-	-

5 * Lake color dispersed in xylitol solution

 ** Calcium carbonate used in place of titanium dioxide

The above formulas are used to coat pellets by applying a xylitol/
arabinogalactan solution in multiple coats and air drying. Color or whitener is
also mixed in the solution. After pellets have been coated and dried, talc and
wax are added to give a polish.

10 Like xylitol, erythritol coating also requires a binder, film former, and
hardener in the coating to make an acceptable product. The following
formulations can be made:

TABLE 16
(DRY WEIGHT PERCENT)

	<u>EX. 115</u>	<u>EX. 116</u>	<u>EX. 117</u>	<u>EX. 118</u>	<u>EX. 119</u>	<u>EX. 120</u>
ERYTHRITOL	93.8	91.5	89.2	90.1	88.4	86.8
ARABINO- GALACTAN	5.0	7.0	8.5	8.5	10.0	12.0
FLAVOR	0.5	0.4	0.7	0.7	0.9	0.5
TITANIUM DIOXIDE	0.5	0.9	-	0.5	0.5	0.5
TALC	0.1	0.1	0.1	0.1	0.1	0.1
WAX	0.1	0.1	0.1	0.1	0.1	0.1
COLOR	-	-	1.4*	-	-	-

* Lake color dispersed in erythritol solution

The above formulas are used to coat pellets by applying a erythritol/ arabinogalactan solution in multiple coats and air drying. Color or whitener is also mixed in the solution. After pellets have been coated and dried, talc and wax are added to give a polish.

10

For coating formulas based on sorbitol, maltitol, lactitol, and hydrogenated isomaltulose, arabinogalactan can be used as a binder and film former, and a crystallization modifier to help facilitate coating. Generally these polyols are more difficult to coat using only a straight syrup, but with proper technique a good smooth hard shell can be made. However, it may be preferable to add a dry charge to quicken the drying process before the pellets get too sticky. The following formulations may be used.

TABLE 17
(DRY WEIGHT PERCENT)

	EX. 121	EX. 122	EX. 123	EX. 124	EX. 125	EX. 126
SORBITOL	96.8	94.9	92.1	88.8	78.1	69.5
SORBITOL POWDER	-	-	-	10.0	20.0	25.0
ARABINO- GALACTAN	2.0	4.0	6.0	2.0	3.0	4.0
FLAVOR	0.5	0.4	0.7	0.5	0.3	0.7
TITANIUM DIOXIDE	0.5	0.5	1.0	0.5	0.4	0.6
TALC	0.1	0.1	0.1	0.1	0.1	0.1
WAX	0.1	0.1	0.1	0.1	0.1	0.1

5 Sorbitol powder is used to dry charge in the early stages of coating. Sorbitol, arabinogalactan, and whitener is blended into a syrup and applied to pellets. After all coating is applied and dried, talc and wax are added to give a polish.

10 In a similar manner, coatings with maltitol, lactitol, and hydrogenated isomaltulose may be made in the coating formulas in Table 17 by replacing sorbitol with any one of the other polyols and sorbitol powder with the polyol powder. Like sorbitol, the other polyols may become sticky during the coating and drying process, so the dry powder charge may be needed to give the proper drying. In the later stages of the coating process, less arabinogalactan
15 could be used and a more pure polyol syrup could be used to give a smooth surface. Also, the dry charge would only be used in the early stages of the coating process.

20 In addition to dry charging with the specific polyol, other ingredients may be added to the dry charge to help absorb moisture. These materials could be inert such as talc, calcium carbonate, magnesium carbonate, starches, gums like arabinogalactan, gum talha, gum arabic or other moisture absorbing materials. Also, powdered sweeteners or flavors could be added with the dry charge.

Some polyols such as sorbitol, maltitol, lactitol, or hydrogenated isomaltulose are not sufficiently sweet compared to sugar or xylitol, so high intensity sweeteners may be added to the coating, such as aspartame, acesulfame K, salts of acesulfame, cyclamate and its salts, saccharin and its salts, alitame, sucralose, thaumatin, monellin, dihydrochalcone, glycyrrhizin, and combinations thereof. If a hot syrup is applied, heat may degrade the sweetener so only stable sweeteners should be used. Generally high intensity sweeteners are added with the polyol/arabinogalactan solution to obtain an even distribution in the coatings.

Liquid flavors generally are not added throughout the coating but at specific points throughout the process. When flavor is added, less air is used for drying until the flavor coating is covered by the next coatings and dried. Flavors may be various spearmint, peppermint, wintergreen, cinnamon, and fruit flavors to yield a wide variety of flavored chewing gum products.

It should be appreciated that the compositions and methods of the present invention are capable of being incorporated in the form of a variety of embodiments, only a few of which have been illustrated and described above. The invention may be embodied in other forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive, and the scope of the invention, therefore, indicated by the appended claims rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

I CLAIM:

1. A chewing gum composition comprising:
a) about 5% to about 95% gum base
b) about 0.1% to about 10% of a flavoring agent, and
5 c) about 5% to about 95% bulking and sweetening agents,
the bulking and sweetening agents comprising arabinogalactan.

2. The chewing gum composition of claim 1 wherein the
arabinogalactan is in the form selected from the group consisting of powder
arabinogalactan, arabinogalactan syrup and mixtures thereof.

10 3. A chewing gum product including arabinogalactan wherein the
arabinogalactan is used as a dusting agent on the surface of the gum.

4. A coated chewing gum product comprising a gum pellet coated
with a hard coating, the hard coating comprising arabinogalactan.

15 5. The method of Claim 4 wherein the arabinogalactan comprises
0.5 to 40% of the hard coating.

6. The method of Claim 4 wherein the hard coating further
comprises a polyol selected from the group consisting of xylitol, lactitol,
maltitol, hydrogenated isomaltulose, erythritol and mixtures thereof.

20 7. The method of Claim 4 wherein the hard coating further
comprises a flavor.

8. The method of Claim 4 wherein the hard coating further
comprises a high potency sweetener.

25 9. The method of Claim 4 wherein the hard coating further
comprises a sugar selected from the group consisting of sucrose, dextrose,
maltose and mixtures thereof.

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10. The method of Claim 4 wherein the hard coating further comprises a coating modifier.

11. A method of making chewing gum comprising the steps of:

- a) coevaporating an aqueous solution comprising arabinogalactan and a plasticizing agent to form a syrup, and
- b) mixing the syrup with gum base, bulking agents and flavoring agents to produce a gum composition.

12. A chewing gum composition sweetened at least in part by aspartame, the gum composition containing an effective amount of arabinogalactan to stabilize the aspartame against degradation into non-sweetening derivatives.

13. A method of making chewing gum comprising the steps of:

- a) codrying a solution containing arabinogalactan and a sweetener selected from the group consisting of sugar sweeteners, alditol sweeteners and high-potency sweeteners, and
- b) mixing the codried arabinogalactan/sweetener with gum base and flavoring agents to produce a gum composition.

14. A liquid filled chewing gum product wherein the liquid fill comprises arabinogalactan.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/18382

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :A23G 3/30

US CL :426/3, 5, 6

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 426/3, 5, 6

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONEElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X — Y	US 4,824,681 A (SCHOBEL ET AL) 25 April 1989 (25.04.89), see entire document.	1, 2, 12 — 11, 13
X — Y	US 4,822,622 A (DOKUZOVIC ET AL) 18 April 1989 (18.04.89), see entire document.	1, 2, 12 — 11, 13
X — Y	US 4,384,004 A (CEA ET AL) 17 May 1983 (17.03.83), see entire document.	1, 2, 12 — 11, 13
X	US 5,458,890 A (WILLIFORD ET AL) 17 October 1995 (17.10.95), see entire document.	3
X	US 4,867,989 A (SILVA ET AL) 19 September 1989 (19.09.89),	4-10

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

	Special categories of cited documents:		
"A"	document defining the general state of the art which is not considered to be of particular relevance	"I"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"B"	earlier document published on or after the international filing date	"K"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"T"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed	"A"	document member of the same patent family

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INTERNATIONAL SEARCH REPORT

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,292,329 A (OGAWA ET AL) 29 September 1981 (29.09.81), see entire document.	14
Y	WO 92/08370 A (YATKA ET AL) 29 May 1992 (29.05.92), see entire document.	11, 13
Y	WO 91/15941 A (YATKA) 31 October 1991 (31.10.91), see entire document.	11, 13
A	US 4,228,198 A (BURGE ET AL) 14 October 1980 (14.10.80).	
X	US 4,867,989 A (SILVA ET AL) 19 September 1989 (19.09.89), see entire document.	4-10

Form PCT/ISA/210 (continuation of second sheet)(July 1992)*



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Chewing gum composition and its production.

A reduced calorie, high base content chewing gum composition is disclosed which possesses a greater, more intense initial flavour impact of increased duration. Its preparation utilizes highly fractionated or rectified flavour oils from which are removed some terpene components, e.g. the monoterpene and sesquiterpene components, resulting in an enhanced and sustained flavour release from the gum base. The "deterpenated" oils have a lesser affinity for the gum base allowing for the use of higher gum base levels for the reduction of calories without the flavour oils being trapped therein. The sustained flavour release is also improved by the complete or partial renewal of several bitter tasting components previously associated with the oils.

EP 0 427 505 A2

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CHEWING GUM COMPOSITION AND ITS PRODUCTION

To reduce calories in chewing gum it is often necessary to replace the soluble sugar and/or sugar alcohol bulking agents with low calorie alternatives. The soluble sugar and sugar alcohol bulking agents not only impart necessary sweetness but also a discontinuity to the gum base which results in a softer more pleasant chew and mouth feel.

5 Flavor release from chewing gum is influenced by many factors, the most important of which are the type and amount of gum base and the type and amount of flavor. The composition of the flavor, if varied, may result in a change of flavor release characteristics. The gum base on the other hand, acts as a trap for the flavor. The stronger the affinity of the flavor components for the gum base, the slower will be the flavor release from the gum.

10 The problem of slow or delayed flavor release from chewing gum becomes acute when gum base content is high. The current trend and popularity of low or reduced calorie chewing gum products necessitates the use of high gum base levels. An increase of gum base levels requires an appreciable increase of flavor levels in the gum. This increase, however, does not solve the problem of slow flavor release and delayed initial flavor impact upon chewing. Moreover, an appreciable increase in the flavor ingredient may result in excessive softening of the gum giving a poor chew and texture. Good flavor impact and sustained flavor release are desirable attributes in any chewing gum, especially in reduced calorie, high base content chewing gums.

The present invention relates generally to an improved low calorie, high base content chewing gum composition with an increased flavor intensity, duration, and method for its preparation. More specifically, 20 the present invention relates to the use of specially extracted or fractionated flavour oils which bring about an enhanced and sustained flavour release in chewing gum compositions with high gum base preparations. In particular, the present invention concerns the use of highly fractionated terpeneless and sesquiterpeneless mint oils in high gum base content gum compositions with results in superior flavour release attributes.

25 U.S. Patent No. 3,887,282 to Rockland et al. discloses a process for the preparation of terpeneless essential oils whereby the oil is distilled to remove non-volatile materials. The volatile components are adsorbed onto a solid alumina adsorbent which has been pre-treated with ethyl acetate that alters the relative affinity of the adsorbent for the terpenes and for the oxygenated components of the oil. The terpenes are separated from the desired constituents of the oil by elution of the adsorbent with a 30 terpenophilic solvent.

According to one aspect of the present invention, there is provided a low calorie, high base content chewing gum composition with improved flavour intensity and duration, comprising:-

- (a) a gum base in an amount of from 50% to 90% by weight of the composition;
- (b) a flavour oil from which some or all of the terpene components originally present have been removed;
- 35 (c) an intense sweetener in an amount of from 0.01% to 3.0% by weight of the composition; and
- (d) a bulking agent in an amount of from 10% to 40% by weight of the composition.

According to another aspect of the present invention, there is provided a process for producing a low calorie, high base chewing gum composition with improved flavour intensity and duration, the process comprising:-

- 40 (a) admixing a melted soft PVA-based chewing gum base with a bulk sweetening agent until a uniform mixture is formed;
- (b) optionally admixing a filler and/or a colourant until a uniform mixture is formed;
- (c) admixing an artificial intense sweetener until a uniform mixture is formed;
- (d) slowly admixing a flavouring oil from which some or all of the terpene components originally present 45 have been removed;
- (e) mixing until a homogeneous mass is formed; and
- (f) cooling the resulting mix to form a chewing gum and recovering the product.

The flavour oil is preferably a mint oil. Preferably the terpenes which are removed from the flavour oil are removed by extraction or fractionation.

50 Reference will be made later herein to the drawings, in which:-

Figure 1 is a graph depicting the flavour release rates of standard peppermint gum (A) with two gum compositions (B + C) made with fractionated and terpeneless peppermint oils of the present invention;

Figure 2 is a graph comparing the overall degree of liking as expressed by a test panel over time for the same three gum compositions comprised of standard peppermint oil (A) and fractionated mint oils (B + C) of the present invention;

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Figure 3 is a graph comprising the change in flavour intensity over time that occurs in a gum with standard peppermint oil (A) and a specially fractionated peppermint oil with a lower menthonic fraction (D); and

Figure 4 is a graph comprising the overall degree of liking as expressed by a taste panel over time for a gum with standard peppermint oil (A) and one with a specially fractionated peppermint oil with a lower menthonic fraction (D).

Although any suitable flavour oils may be employed, mint oils are preferred, and much of the following description relates to mint oils, although many of the matters mentioned in relation to mint oils are applicable to other flavour oils. The mint oils that impart the flavour of interest can be fractionated or rectified by vacuum distillation or on a spinning band column. The fractionation removes the "heads" and "tails" of the oil components which are essentially monoterpenes and sesquiterpenes. The removal of these compounds from the oil reduces the affinity of the flavour oil for the gum base and, therefore, better up front flavour impact, greater sustained flavour release and improved taste are made possible.

The reduced calorie chewing gum compositions of the present invention can be prepared as a variety of gum products such as stick gum, slabs, chunk, balls, ropes, tablets and/or centre-filled gum products. In order to produce a reduced calorie or low calorie gum, it is advisable and necessary to increase the gum base to high levels thereby reducing the otherwise caloric components such as carbohydrates and bulk sweeteners.

Most reduced or light calorie chewing gum compositions generally contain about 25% by weight of a water-insoluble gum base, inert fillers or texturizing agents in amounts of at least 40% by weight up to 90% or more, a water-soluble flavouring agent and water-soluble sweeteners such as sucrose and corn syrup or, in sugarless gum, sorbitol, mannitol and artificial sweeteners. Also incorporated within the gum base may be plasticizers or softeners to improve consistency and texture of the gum.

The gum base of reduced or light calorie chewing gum generally contains a natural rubber gum base, a synthetic rubber gum base and/or mixtures thereof. When synthetic gum bases are utilized, the preferred elastomer component has been the styrene-butadiene copolymer (SBR). Gum base is noncaloric and insoluble. A chewing gum composition high in gum base content may also thus be reduced in calories.

Previous attempts to produce such high gum base content low calorie chewing gum compositions have resulted in products with a hard, tight, rubbery chew and poor texture.

The type and amount of gum base employed will vary greatly depending on various factors such as the intended bulk sweetener content of the final product, the type of base used and other components used to make the final product. The chewing gum compositions of the present invention preferably contain a soft polyvinyl acetate (PVA) gum base. In general, gum base amounts of 50% to 85% by weight of the final chewing gum composition are acceptable for use in the chewing gum compositions of the present invention with preferred amounts being from 55% to 85% and more preferred amounts being from 60% to 70% by weight.

Soft PVA gum bases are defined as providing a hydrophilic chew character to the chewing gum, which, when formulated into a chewing gum, results in a composition that absorbs moisture to swell and soften in the mouth. This results in a pleasant, moist chew.

Preferably, the gum base used in this invention may be any water insoluble gum base having polyvinyl acetate as an ingredient together with a natural or synthetic elastomer or mixtures thereof. Such gum bases are known in the art and an example of such a soft PVA-containing gum base is found in U.S. Patent No. 4,490,395 which is hereby incorporated by reference. Illustrative examples of natural elastomers in gum bases include, without limitation, substances of vegetable origin such as chicle, jelutong, gutta percha and crown gum. Examples of synthetic elastomers include, without limitation, isobutylene-isoprene copolymers, styrene-butadiene copolymers, polyethylene, polyisobutylene and mixtures thereof.

The elastomer content employed is in an amount of from 0.5 to 20%, and preferably 2.5% to 15% by weight of the gum base. When the total amount of elastomer is below 0.5% the base composition lacks elasticity, chewing texture, and cohesiveness whereas at amounts above about 20% the formulation is hard and rubbery and maintains a tight chew.

The gum base composition contains elastomer solvents to aid in softening the polymer components. Such elastomer solvents comprise methyl, glyceryl or pentaerythritol esters of rosins or modified rosins, such as hydrogenated, dimerized or polymerized rosins or mixtures thereof. Examples of elastomer solvents suitable for use herein include the pentaerythritol ester of partially hydrogenated wood rosin, pentaerythritol ester of wood rosin, glyceryl ester of partially dimerized rosin, glyceryl ester of polymerized rosin, glyceryl ester of tall oil rosin, glyceryl ester of wood rosin, and partially hydrogenated wood rosin and partially hydrogenated methyl ester of wood rosin; terpene resins including polyterpene and polymers of alpha-pinene or beta-pinene and mixtures thereof. The elastomer solvents may be employed in amounts

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ranging from 2% to about 55% and preferably from 4% to 18% by weight of the gum base. Amounts below about 2% cause the chew characteristic to be hard and result in inconsistent flavor release. Amounts above 55% cause a soft product to form which destroys the chew characteristic.

Vinyl polymers, and in particular polyvinyl acetate (PVA) serve as excellent gum bases. The preferred PVA has a molecular weight of at least 2,000. Such materials are commercially available in various molecular weights which can be successfully used. Preferably, any PVA utilized in the present invention will have a medium molecular weight of 35,000 to 55,000 and blends of low and medium molecular weight PVA's are acceptable. The polyvinyl acetate is employed in amounts of 5% to about 45% by weight and preferably 7% to 35% by weight. These materials when used in such high amounts aid in extending the elastomer mixture while maintaining product integrity and also provide a hydrophilic soft chew. Amounts below about 5% cause the base to be unstable. Amounts above 45% cause segregation of gum constituents to occur.

Glyceryl monostearate may be used as a suitable emulsifier. When absent, the formulation usually has a poorer stability and lacks acceptable texture. It is believed that the glyceryl monostearate aids in bringing the normally immiscible constituents together in such a way that they form a single finely dispersed stable system. This emulsifier also simplifies the incorporation of flavors into the final base and aids in retaining finely divided solvents within the gum base complex. The glyceryl monostearate is employed in amounts of 1% to 15% and preferably 3% to 8%. Additional emulsifiers may also be included, notably lecithin, fatty acid and monoglycerides, diglycerides and triglycerides, propylene glycol monostearate and mixtures thereof. Such materials may be used in the amount of 1% to 25% by weight.

The gum base formulation generally also employs wax material. The waxes have been found to soften the polymer elastomer mixture and improve elasticity of the chew character. The waxes employed are preferably microcrystalline wax, paraffin wax and combinations thereof. Useful amounts are from 2% to 25% by weight and preferably from 2.5% to 20% by weight of the gum base composition. Preferably these waxes are used in combination in amounts of 5% to 20% microcrystalline wax and 3% to 15% paraffin wax.

A variety of additional ingredients such as plasticizers or softeners may optionally be added. These materials are optional and not essential in the present formulation. Such materials include hydrogenated vegetable oils, lanolin, stearic acid, sodium stearate, potassium stearate, glyceryl triacetate, acetylated monoglycerides, glycerin and the like and mixtures thereof. Such materials when incorporated into the gum base obtain a variety of desirable texture and consistency properties. These individual materials are generally employed in amounts of up to 30%, preferably 1% to 25% by weight and most preferably in amounts of from 1.5% to 12% by weight of the gum base composition. Because of the low molecular weight of these compounds, they are able to penetrate the fundamental structure of the base making it plastic and less viscous.

The bulk sweetening agent may be selected from a wide range of water-soluble agents. Without being limited to particular sweeteners, representative illustrations encompass monosaccharides, disaccharides, and polysaccharides such as xylose, ribose, glucose, mannose, galactose, fructose, dextrose, polydextrose, cellulose, sucrose, maltose, partially hydrolyzed starch or corn syrup solids, palatinit and sugar alcohols such as sorbitol, xylitol, mannitol, maltitol and mixtures thereof.

In general, the amount of bulk sweetener may vary with the desired amount of sweetness selected for a particular chewing gum composition and should be a quantity adequate to provide sufficient discontinuity to the gum base. This amount will normally be less than about 50% by weight when using an easily extractable sweetener. The water-soluble bulk sweeteners described above are preferably used in amounts of at least 5% to 35% by weight, and most preferably from 10% to 25% by weight of the final chewing gum composition. The artificial intense sweetener may be selected from water-soluble artificial sweeteners and dipeptide-based sweeteners, including mixtures thereof. Without being limited to particular sweeteners, representative illustrations encompass the soluble saccharine salts, i.e., sodium or calcium saccharine salts, the free acid form of saccharin, cyclamate salts, acesulfame-K and the like, dipeptide sweeteners such as L-aspartyl-L-phenylalanine methyl ester and materials described in U.S. Patent No. 3,192,131 and the like, and chlorosucrose compounds.

The intense sweetener is added in an amount greater than 0.01% by weight in order to provide longer lasting sweetness to the chewing gum composition. Amounts of up to 5.0% by weight are acceptable, and amounts up to 2.5% by weight are preferred. Amounts up to 1.00% by weight are most preferred, and most preferably between 0.10% to 0.80% by weight of intense sweetener will be used. This quantity of intense sweetener in combination with less than 50% bulk sweetener unexpectedly provides a chewing gum composition having longer lasting sweetness. The sweetener is administered in either the free form, the encapsulated form or in mixtures thereof to provide a consistent delivery of longer lasting sweetness.

Encapsulated delivery systems for the sweetening agents comprise a hydrophobic matrix of fat or wax

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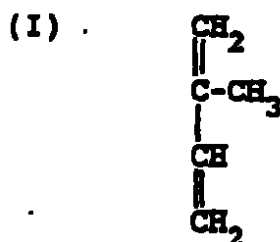
surrounding a sweetener or flavoring component. The fats may be selected from any number of conventional materials such as fatty acids, glycerides, polyglycerol esters, sorbitol esters, and mixtures thereof. Examples of fatty acids include hydrogenated and partially hydrogenated vegetable oils such as palm oil, palm kernel oil, peanut oil, rapeseed oil, rice bran oil, soybean oil, cottonseed oil, sunflower oil, safflower oil and mixtures thereof. Other fatty acid oils are contemplated. Glycerides which are useful include mono-, di- and triglycerides.

Useful waxes are chosen from among the group consisting of natural or synthetic waxes and mixtures thereof. Non-limiting examples include paraffin wax, petrolatum, carbowax, microcrystalline wax, beeswax, caruba wax, candellila wax, lanolin, bayberry wax, sugarcane, spermaceti wax, rice bran wax and combinations thereof.

The fats and waxes may be used individually or in combination in amounts varying from 10 to 70% by weight of the delivery system, and preferably in amounts of 40 to 58% by weight. When used in a combination, the fat and wax are preferably present in a ratio of about 70:10 to about 85:15 of fat to wax.

Typical encapsulated flavor or sweetener delivery systems are disclosed in U.S. Patent No. 4,587,870 and U.S. Patent No. 4,722,845 which are hereby incorporated by reference. The chewing gum composition of this invention may additionally include the conventional additives or coloring agents such as titanium dioxide; emulsifiers such as lecithin and glycerol monostearate; and fillers such as dicalcium phosphate, aluminum hydroxide, alumina, aluminum silicates, talc, calcium carbonate and combinations thereof. The total amount of fillers present is generally up to about 10% by weight. The colorants useful in the present invention include the pigments that may be incorporated in amounts of up to about 6% by weight and preferably up to about 1% by weight. A preferred pigment is titanium dioxide, also the colorants may include other dyes suitable for food, drug and cosmetic applications, and known as the FD&C dyes and the like. The materials acceptable for the foregoing spectrum of use are preferably water soluble. Illustrative examples include the indigo dye, known as FD&C Blue No. 2, which is the disodium salt of the 5,5-indigotindisulfonic acid. Similarly, the dye known as FD&C Green No. 1, comprises a triphenylmethane dye and is the monosodium salt of 4-[4-N-ethyl-p-(sulfobenzylamino)diphenylmethylene]-1-(N-ethyl-p-sulfoniumbenzyl)-2,5-cyclohexadienimine]. A full recitation of all FD&C and D&C colorants and their corresponding chemical structures may be found in the Kirk-Othmer Encyclopedia of Chemical Technology, Third Edition, in Volume 6 at pages 581-595, which text is accordingly incorporated herein by reference.

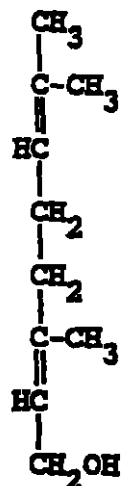
The flavor oil that is incorporated into the high gum base composition has been fractionated or rectified using standard distillation equipment to remove the terpene components that possess the high affinity for the gum base and cause the flavors to be trapped therein. This is carried out through standard distillation procedures using a vacuum distillation apparatus or a spinning band column. Terpenes themselves are simple, non-saponifiable lipids which are multiples of the isoprene molecule (C_5H_8) whose molecular formula (I) is set forth below.



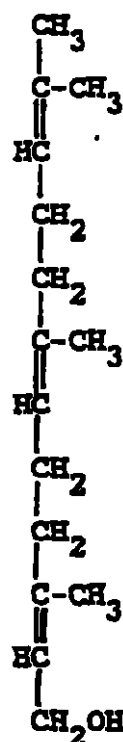
Monoterpenes (II) are basically comprised of two of the above isoprene units whereas sesquiterpenes (III) are comprised of three of these units.

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(II)



(III)



Standard deterpenation, which results in removal of most of the "head" (monoterpene) fraction from the essential oil is also beneficial in providing enhanced flavor release. The benefit, however is less than when the fractionation of the oil is from the "head" as well as the "tail" fractions.

An additional type of fractionation of peppermint oil was done by extensive distillation or rectification whereby more of the head and tail as well as specific middle fractions were removed. It is evident that repeated distillations in this manner removed not only the mono- and sesquiterpenes but the menthonic fraction as well in a number of the mint flavor oils.

The major constituents of the "menthonic" fraction are menthone, its isomer iso-menthone, and menthofuran. Menthone has been traditionally understood to be an essential component of peppermint oil. Reducing the oil to more than 50% of the menthone and iso-menthone content as well as removal of the major portion of menthofuran has resulted in an improved quality oil. The improved oil possessed a clean mentholic sensation without the heavy herbal and resinous character. The oil had a reduced bitter taste and it would appear that the removed menthonic fraction and the tail fraction seem to contribute to the unpleasant bitter taste of peppermint.

Flavoring oils of particular utility in the practice of the present invention are those of the mint variety such as peppermint, spearmint and corn mint (*mentha arvensis*). The amount of deterpenated flavor oil employed is normally a matter of preference but it has been found that amounts ranging from approximately 0.1% to approximately 4.0% by weight of the final chewing gum composition are usable with amounts of 0.3% to 3.0% by weight being preferred. The mint oils of the present invention can be utilized as the sole flavorant or can be combined with other standard single distillation mint oils.

A method for forming the chewing gum of the invention includes melting the gum base and mixing the gum base in a kettle with a portion of the bulk sweetening agent until a uniform mixture is formed. The balance of the sweetening agent, flavor, artificial intense sweetener and other conventional ingredients, if any, are added next with continued mixing until a homogeneous mass is formed. The product is recovered from the kettle and shaped to form stick, slab, chunk, ball, rope, shredded, tablet and/or center-filled gum products.

An illustrative process involves first melting the gum base at a temperature from about 70° C to about 120° C and mixing the gum base in the kettle with 2/3 or 3/4 of the sweetening ingredients for 2-8 minutes. To this mixture, optional fillers or colorants are added and mixing is continued for 1-4 minutes. The remaining sweetening ingredients are added and while mixing is continued, the flavoring agent is added slowly. The mixing is continued until a homogeneous mass is formed. The gum is discharged from the kettle and formed into its desired shapes such as sticks, slabs, chunks, balls, ropes, shredded, tablets

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and/or center-filled.

The following examples serve to provide further appreciation of the invention but are not meant in any way to restrict the effective scope of the claims. All percentages throughout the specification are by weight % of the final composition unless otherwise indicated.

Example 1:

Three peppermint flavored high-base chewing gums were prepared according to standard gum making procedures disclosed herein and known in the art in the following formulations:

Ingredient	A	B	C
Gum base	85.00%	85.0%	85.0%
Polyols	28.23	28.23	28.23
Softeners	5.20	5.20	5.20
Aspartame	0.35	0.35	0.35
Encapsulated Aspartame	0.92	0.92	0.92
Peppermint oil:			
Low rectification, standard oil	1.80	-	-
High rectification	-	1.80	-
High rectification & deterpination	-	-	1.80
Spray-dried peppermint flavor	0.40	0.40	0.40

The gum samples were chewed for 15 minutes and were rated by experienced and expert testers for flavor intensity and flavor, liking at 1, 5, and 15 minutes of the chewing period. The intensity and flavor liking ratings of the gums on chewing are shown in Figures 1-4.

As shown in Figure 1, sample C which contains highly fractionated and deterpenated peppermint oil resulted in higher intensity flavor, i.e. higher flavor release throughout the chewing period. A sustained flavor release was attained even after 30 minutes chew. Sample B, which contained highly rectified oil but was not fully deterpenated, had higher flavor release than the control sample, (A). Both samples B and C were also rated higher in liking than the control in the later stage of the chew period (Figure 2). The inventive highly fractionated oils resulted in very pleasant and less bitter tasting gums than the unfractionated oil.

The peppermint oil in sample C was specially fractionated to remove the monoterpenes fraction, "heads" and the major portion of the "tail" fraction, which contains the sesquiterpene compounds and their derivatives. Sample B, on the other hand, contained a moderately fractionated oil with approximately 50% removal of the monoterpene and tail sesquiterpene fraction. Sample A was redistilled to conform with USP specification, whereby only a small fraction of the oil was removed.

Example 2:

A high base chewing gum was prepared with a lower-menthone fraction oil as follows:

Ingredient	D
Gum base	85.00%
Polyol	28.23
Softeners	5.20
Aspartame	0.35
Encapsulated Aspartame	0.92
Highly rectified & deterpinated peppermint oil with low menthonic fraction	1.80
Spray-dried peppermint flavor	0.40

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As shown in Figures 3 and 4, the gum made with the lower menthone peppermint oil was rated superior by the expert taste panel and was considered better tasting, less bitter, cleaner and possessed more mentholic flavor, having higher and more sustained flavor release than the control gum, A.

Figure 1 shows that the highly rectified and deterpenated oil is more liked and has higher flavor intensity on chewing. The flavor intensity is more sustained, i.e. the drop in intensity from initial impact to the latter chew is less, in the gums with higher rectification and more deterpenated oils (B, C). Figures 2 and 3 show lower intensity and lower liking ratings for the standard rectified oil (A) than for the highly fractionated and lower menthone oil (D).

Gas chromatographic analyses were performed on oils used in the preceding examples. The results are in Table 1. The data show the fractions of peppermint oil which were affected. The oils B, C, and D of the present invention are considerably lower in the "head fraction," which includes the non-oxygenated monoterpenes (limonene, alpha-pinene, beta-pinene, sabinene, terpinolene), cineole, and 3-octanol. They are also lower in the "tail fraction," which includes pulegone, germacrene and other sesquiterpenes.

Table 1

Comparative gas chromatographic analyses of the peppermint oils.					
Component	A (%)	B (%)	C (%)	D (%)	E (%)
Isobutyraldehyde	0.04	0	0	0	0
Isovaleraldehyde	0.19	0	0	0	0
A-Pinene	0.73	0	0.10	0	0
B-Pinene	0.95	0	0.25	0	0.02
Sabinene	0.45	0	0.12	0	0.01
Myrcene	0.20	0	0.07	0	0.02
A-Terpinene	0.34	0	0	0	0.07
L-Limonene	1.49	0.11	0.68	0	0.30
1,8-Cineole	4.84	0.37	2.89	0	1.81
Cis-Occimene	0.30	0.08	0.17	0	0.08
G-Terpinene	0.68	0.20	0.54	0	0.31
P-Cymene	0.18	0	0.15	0	0.05
Terpinolene	0.15	0.14	0.11	0	0.14
3-Octanol	0.24	0.14			
1-Octen-3-ol	9.17	0.11	0.17	0	0.09
trans-Sabinene Hydrate	1.04	1.04	0.12	0.18	0.98
L-Menthone	19.33	23.13	22.28	10.84	23.80
Menthofuran	1.84	2.02	1.95	0.50	2.30
Iso-menthone	2.83	3.30	3.11	2.04	3.18
B-Bourbonene	0.45	0.35	0.43	0.81	0.42
Linalool	0.22	0.23	0.18	0.32	0.33
Menthyl Acetate	5.14	5.15	4.59	7.54	4.42
Neo-menthol	4.04	5.04	5.75	6.48	5.31
B-Caryophyllene	1.82	0.89	1.37	2.07	0.80
Terpinen-4-ol	1.13	1.43	1.82	1.05	1.17
L-Menthol	41.11	51.35	46.87	63.57	46.77
Pulegone	1.25	1.09	1.48	1.83	1.38
Germacrene-D	2.12	0.37	1.92	0.70	1.89
Piperitone +	0.99	0.84	0.82	0.82	0.58
Viridiflorol	0.37	0.18	0.10	0	0.18
A : Standard peppermint oil					
B : Highly fractionated and terpeneless oil					
C : Moderate fractionation					
D : Special fractionation & lower menthone fraction					
E : Terpeneless oil, standard deterpenation, "head" fraction cut only.					

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The lower menthone oil, as shown in Table 1, not only has very low "head" and "tail" fractions, but also was tailored to reduce the amount of other components which are not disturbed in traditional distillations and processing of peppermint oil, e.g. 3-octanol, 1-octen-3-ol, menthofuran, and iso-menthone. The monoterpenes in this oil were completely removed, while in the highly fractionated oil (B) traces of them remained.

As will become clear to one skilled in the art, many processing parameters, flavor agents and other embodiments of the present invention may be varied or changed to a minor degree and these minor modifications should not be regarded as a departure from the invention as described herein. All such embodiments are intended to fall within the spirit and scope thereof as defined by the following claims.

Claims

1. A low calorie, high base content chewing gum composition with improved flavour intensity and duration, comprising:-
 - (a) a gum base in an amount of from 50% to 90% by weight of the composition;
 - (b) a flavour oil from which some or all of the terpene components originally present have been removed;
 - (c) an intense sweetener in an amount of from 0.01% to 3.0% by weight of the composition; and
 - (d) a bulking agent in an amount of from 10% to 40% by weight of the composition.
2. A composition according to claim 1, wherein the gum base comprises polyvinyl acetate (PVA) and a natural or synthetic elastomer selected from chicle, jelutong, gutta percha, crown gum, isobutylene-isoprene copolymer, styrene-butadiene copolymer, polyethylene, polyisobutylene and mixtures thereof.
3. A composition according to claim 1 or 2, wherein the gum base is present in an amount of from 50% to 70% by weight of the composition.
4. A composition according to claim 1, 2 or 3, wherein the flavour oil is a mint oil.
5. A composition according to claim 4, wherein the terpenes have been removed from the mint oil by extraction or fractionation.
6. A composition according to claim 5, wherein the terpenes which have been removed are monoterpenes and/or sesquiterpenes.
7. A composition according to claim 4, 5 or 6, wherein the mint oil is selected from peppermint, spearmint, corn mint and mixtures thereof.
8. A composition according to any preceding claim, wherein the flavour oil is present in an amount of from 0.1% to 4.0% by weight of the composition.
9. A composition according to claim 8, wherein the flavour oil is present in an amount of from 0.3% to 3.0% by weight of the composition.
10. A composition according to any preceding claim, wherein the bulking agent is selected from xylose, ribose, glucose, mannose, galactose, fructose, dextrose, polydextrose, cellulose, sucrose, maltose, partially hydrolyzed starch or corn syrup solids, palatinit, sorbitol, xylitol, mannitol, maltitol and mixtures thereof.
11. A composition according to any preceding claim, wherein the bulking agent is present in an amount of from 10% to 25% by weight of the composition.
12. A composition according to any preceding claim wherein the intense sweetener is selected from sodium or calcium saccharin salts, the free-acid form of saccharin, cyclamate salts, chlorosucrose derivatives, dipeptide compounds, acesulfame-K and mixtures thereof.
13. A composition according to claim 12, wherein the dipeptide compound is L-aspartyl-L-phenylalanine methyl ester.
14. A composition according to any preceding claim, wherein the intense sweetener is present in an amount of from 0.01% to 0.60% by weight of the composition.
15. A process for producing a low calorie, high base chewing gum composition with improved flavour intensity and duration, the process comprising:-
 - (a) admixing a melted soft PVA-based chewing gum base with a bulk sweetening agent until a uniform mixture is formed;
 - (b) optionally admixing a filler and/or a colourant until a uniform mixture is formed;
 - (c) admixing an artificial intense sweetener until a uniform mixture is formed;
 - (d) slowly admixing a flavouring oil from which some or all of the terpene components originally present have been removed;
 - (e) mixing until a homogeneous mass is formed; and
 - (f) cooling the resulting mix to form a chewing gum and recovering the product.
16. A process according to claim 15, wherein the soft PVA chewing gum base is present in an amount of

from 50% to 90% by weight of the chewing gum composition and the artificial intense sweetener is present in an amount of from 0.01% to 3.00% by weight of the composition.

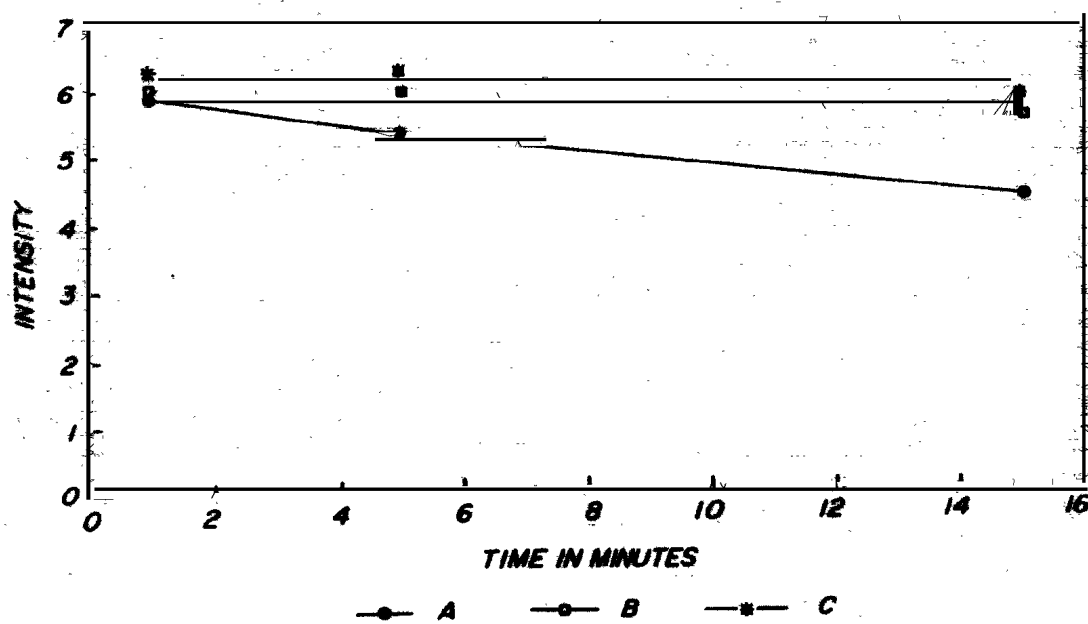
17. A process according to claim 15 or 16, conducted to produce a chewing gum composition according to any one of claims 1 to 14.

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Claims for the following Contracting State: ES

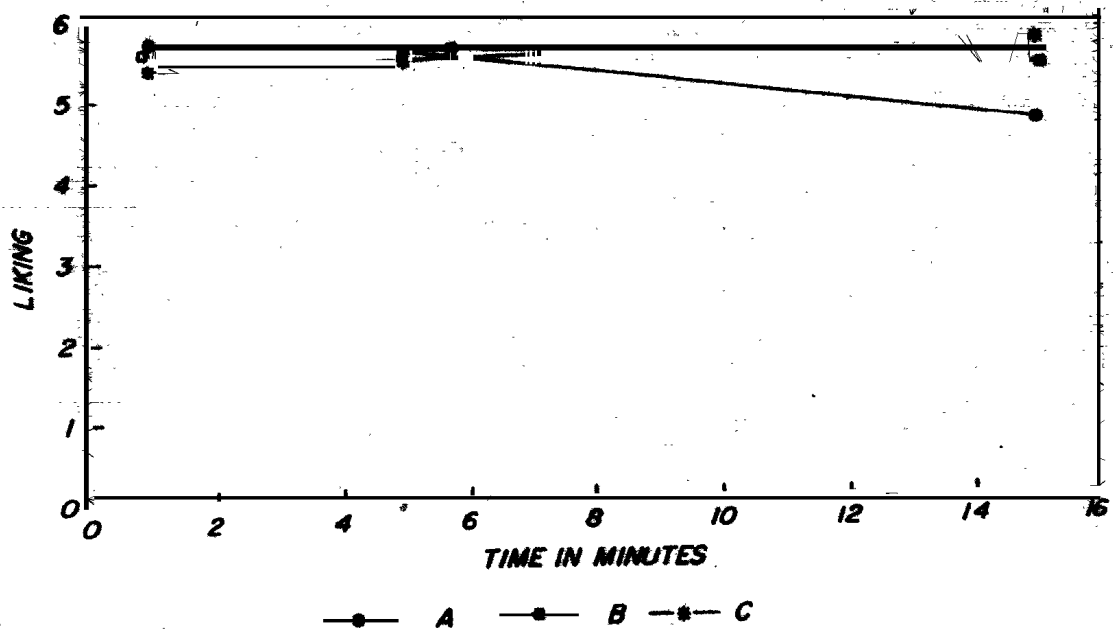
1. A process for producing low calorie, high base content chewing gum composition with improved flavour intensity and duration, which process comprises blending:-
 - 10 (a) a gum base in an amount of from 50% to 90% by weight of the composition;
 - (b) a flavour oil from which some or all of the terpene components originally present have been removed;
 - (c) an intense sweetener in an amount of from 0.01% to 3.0% by weight of the composition; and
 - (d) a bulking agent in an amount of from 10% to 40% by weight of the composition.
2. A process according to claim 1, wherein the gum base comprises polyvinyl acetate (PVA) and a natural
 15 or synthetic elastomer selected from chicle, jelutong, gutta percha, crown gum, isobutylene-isoprene copolymer, styrene-butadiene copolymer, polyethylene, polyisobutylene and mixtures thereof.
3. A process according to claim 1 or 2, wherein the gum base is present in an amount of from 50% to 70% by weight of the composition.
4. A process according to claim 1, 2 or 3, wherein the flavour oil is a mint oil.
- 20 5. A process according to claim 4, wherein the terpenes have been removed from the mint oil by extraction or fractionation.
6. A process according to claim 5, wherein the terpenes which have been removed are monoterpenes and/or sesquiterpenes.
7. A process according to claim 4, 5 or 6, wherein the mint oil is selected from peppermint, spearmint, corn
 25 mint and mixtures thereof.
8. A process according to any preceding claim, wherein the flavour oil is present in an amount of from 0.1% to 4.0% by weight of the composition.
9. A process according to claim 8, wherein the flavour oil is present in an amount of from 0.3% to 3.0% by weight of the composition.
- 30 10. A process according to any preceding claim, wherein the bulking agent is selected from xylose, ribose, glucose, mannose, galactose, fructose, dextrose, polydextrose, cellulose, sucrose, maltose, partially hydrolyzed starch or corn syrup solids, palatinit, sorbitol, xylitol, mannitol, maltitol and mixtures thereof.
11. A process according to any preceding claim, wherein the bulking agent is present in an amount of from 10% to 25% by weight of the composition.
- 35 12. A process according to any preceding claim, wherein the intense sweetener is selected from sodium or calcium saccharin salts, the free-acid form of saccharin, cyclamate salts, chlorocucrose derivatives, dipeptide compounds, acesulfame-K and mixtures thereof.
13. A process according to claim 12, wherein the dipeptide compound is L-aspartyl-L-phenylalanine methyl ester.
- 40 14. A process according to any preceding claim, wherein the intense sweetener is present in an amount of from 0.01% to 0.80% by weight of the composition.
15. A process for producing a low calorie, high base chewing gum composition with improved flavour intensity and duration, the process comprising:-
 - 45 (a) admixing a melted soft PVA-based chewing gum base with a bulk sweetening agent until a uniform mixture is formed;
 - (b) optionally admixing a filler and/or a colourant until a uniform mixture is formed;
 - (c) admixing an artificial intense sweetener until a uniform mixture is formed;
 - (d) slowly admixing a flavouring oil from which some or all of the terpene components originally present have been removed;
 - 50 (e) mixing until a homogeneous mass is formed; and
 - (f) cooling the resulting mix to form a chewing gum and recovering the product.
16. A process according to claim 15, wherein the soft PVA chewing gum base is present in an amount of from 50% to 90% by weight of the chewing gum composition and the artificial intense sweetener is present in an amount of from 0.01% to 3.00% by weight of the composition.
- 55 17. A process according to claim 15 or 16, conducted in accordance with a process according to any one of claims 1 to 14.

FIG-1 FLAVOR RELEASE PEPPERMINT OILS



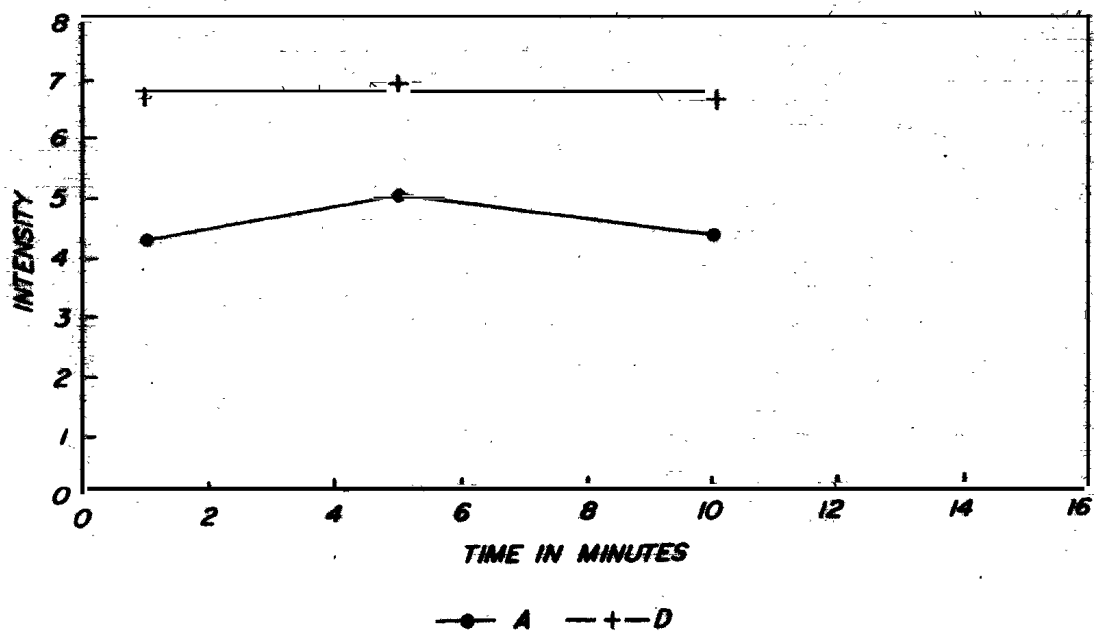
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FIG-2 FLAVOR RELEASE PEPPERMINT OLS



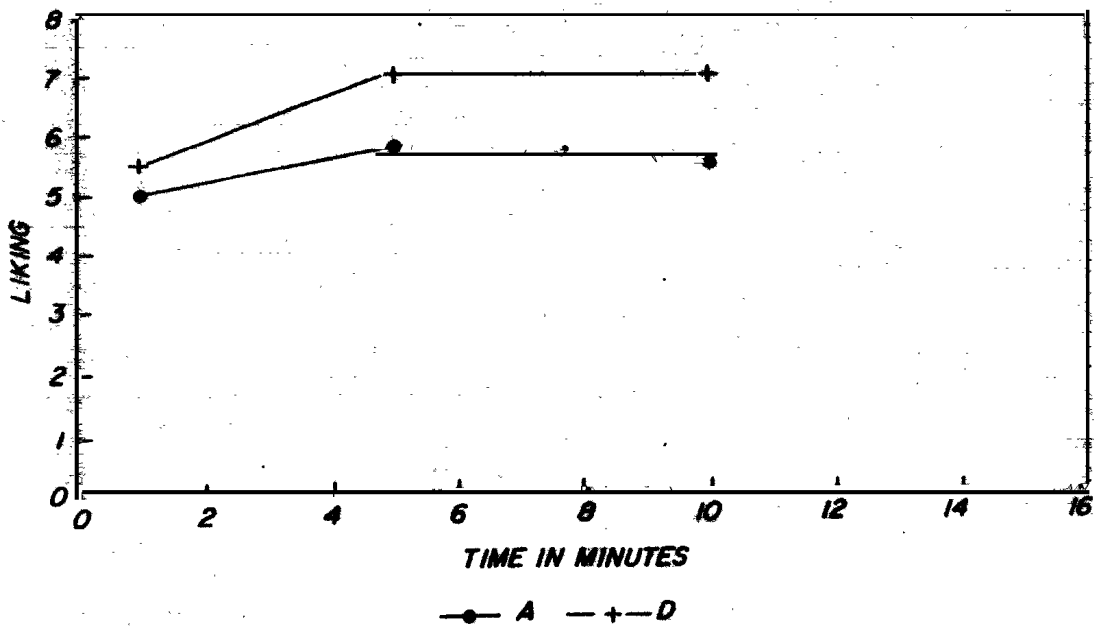
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FIG-3 FLAVOR RELEASE PEPPERMINT OILS



EP 0 427 506 A2

FIG-4 FLAVOR RELEASE PEPPERMINT OILS





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⑪ Publication number: **0 427 505 A3**

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㉖ **Chewing gum composition and its production.**

㉗ A reduced calorie, high base content chewing gum composition is disclosed which possesses a greater, more intense initial flavour impact of increased duration. Its preparation utilizes highly fractionated or rectified flavour oils from which are removed some terpene components, e.g. the monoterpene and sesquiterpene components, resulting in an enhanced and sustained flavour release from the gum base. The "deterpenated" oils have a lesser affinity for the gum base allowing for the use of higher gum base levels for the reduction of calories without the flavour oils being trapped therein. The sustained flavour release is also improved by the complete or partial renewal of several bitter tasting components previously associated with the oils.

EP 0 427 505 A3

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Patent OfficeEUROPEAN SEARCH
REPORT

Application Number

EP 90 31 2125

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A,D	US-A-3 867 262 (ROCKLAND ET AL) * column 4, line 25 - column 5, line 2 * - - -	1,4,7	A 23 G 3/30
A	GB-A-8 612 01 (COLGATE PALMOLIVE COMPANY) * page 1, lines 38 - 79 * - - -	1,4-7	
A,P	EP-A-0 349 186 (WARNER LAMBERT) * page 4, line 42 - page 6, line 5 * * Table III * - - -	1-4,7-17	
A	US-A-4 060 602 (HAAS ET AL) * column 3, lines 50 - 60 * * column 4, lines 19 - 50 * - - -	1,8,9	
A	US-A-4 246 287 (MUSSINAN ET AL) * abstract; example 5 * - - - - -	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			A 23 G C 11 B
The present search report has been drawn up for all claims			
Place of search		Date of completion of search	Examiner
The Hague		18 April 91	LEPRETRE F.G.M.J.
CATEGORY OF CITED DOCUMENTS			
X: particularly relevant if taken alone		E: earlier patent document, but published on, or after the filing date	
Y: particularly relevant if combined with another document of the same category		D: document cited in the application	
A: technological background		L: document cited for other reasons	
O: non-written disclosure		&: member of the same patent family, corresponding document	
P: intermediate document			
T: theory or principle underlying the invention			

United States Patent [19]
Fisher et al.

[11] 4,405,647
[45] Sep. 20, 1983

- [54] METHOD OF COMPACTING CHEWING GUM BASE
- [75] Inventors: E. Eugene Fisher, Elgin; R. Ray Estes, Downers Grove, both of Ill.; Orrin D. Lokken; Elmer G. Paguette, both of Madison, Wis.
- [73] Assignee: Wm. Wrigley Jr. Company, Chicago, Ill.
- [21] Appl. No.: 273,361
- [22] Filed: Jun. 15, 1981
- [51] Int. Cl.³ A23G 3/30
- [52] U.S. Cl. 426/4; 426/5; 426/454; 426/294; 426/295
- [58] Field of Search 426/96, 3-6, 426/518, 473, 453, 294, 295
- [56] References Cited
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[57] ABSTRACT

A tacky substance such as a chewing gum base is formed into a compact body. The tacky substance is first comminuted within a bed consisting of a powdered solid, such as a bulking agent, turbulently suspended within a gaseous medium at room temperature. The tacky substance is subjected to repeated mechanical impact within the powdered solid to pulverize it into particles which are then immediately coated by the powdered solid in order to prevent cohesion between the particles. The coated particles are classified to identify those suitable for tableting and the suitable particles are then fed into a tablet press to form a compact body.

17 Claims, 5 Drawing Figures

METHOD OF COMPACTING CHEWING GUM BASE

BACKGROUND OF THE INVENTION

1 Field of the Invention

This invention relates in general to a method of comminuting and then tableting a tacky substance such as a chewing gum base, in order to form a compact body

2 Description of the Prior Art

Prior known methods of compacting tacky substances, including solids and viscous liquids not directly tabletable because of their tackiness, require special preparation to allow pulverizing or comminuting the tacky substance. For example, U.S. Pat. No. 2,290,120, which issued July 14, 1942, discloses the preparation of a chewing gum product requiring refrigeration or freezing of the chewing gum base in order to render it relatively rigid to permit comminution to particles of a desired size. This pulverization step can also be accomplished by introducing hydrolyzable components into polymer chains and then hydrolyzing to cause disintegration of the large molecules.

However, none of the prior known methods is well-adapted to convenient or economical mass production of compacted products.

SUMMARY OF THE INVENTION

In general, the present invention provides a simple and economical method of compacting tacky substances which are not directly tabletable. According to the present invention, a tacky substance is comminuted within a fluidized bed consisting of a powdered solid turbulently suspended within a gaseous medium, preferably at room temperature. The tacky substance is subjected to repeated mechanical impact within the powdered solid to pulverize it into particles which are then immediately coated by the powdered solid in order to prevent cohesion between the particles. Coated particles are periodically classified to identify those suitable for tableting. Finally, the suitable coated particles are tableted to form a compact body.

Accordingly, it is an object of the present invention to conveniently and economically form non-tacky tabletable granulates from tacky substances.

Another object of the present invention is to economically produce chewing gum using conventional tableting machinery.

Other objects and advantages of the present invention will become apparent from the following description, which discloses a preferred method.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view, with parts broken away and parts in section, of a blending apparatus employed in the preferred method of the present invention;

FIG. 2 is a schematic illustration of particles of the turbulently suspended powdered solid and the tacky substance which are contained within the blending apparatus illustrated in FIG. 1;

FIG. 3 is a schematic illustration of a vibrating belt sieving system used in the preferred method of the present invention for classifying coated particles of the tacky substance; and

FIGS. 4 and 5 are side elevational views illustrating a simple test procedure for identifying coated particle sizes which are readily flowable in tableting machinery.

DESCRIPTION OF THE PREFERRED METHOD

In general, according to the preferred method of the present invention, a fluidized bed consisting of a finely divided or powdered solid, turbulently suspended within a gaseous medium preferably at room temperature, is conveniently provided through use of a conventional blending apparatus, a hammermill or an "Osterizer" blender which are all well-known in the art. The solid comprises an ultimately edible substance such as a low molecular carbohydrate having less than 20 carbon atoms, a corresponding alcohol, a bulking agent or other physiologically inert substance, but preferably consists of xylitol, mannitol, a polymer of glucose or sorbitol. The gaseous medium is an inert gas such as air or nitrogen.

A tacky substance processed in accordance with the present invention is any masticatory solid or viscous liquid not directly tabletable because of its tackiness; a list of tacky substances appears in Title 21 of the U.S. Code of Federal Regulations at Section 121.1059. The tacky substance is introduced, preferably in pellet form, into the fluidized bed for comminution. The pellets are broken up by repeated impact with the powder-coated, rapidly-rotating blades of the blending apparatus and, to a certain extent, by the powdered solid itself to produce progressively smaller particles. The powdered solid particles adhere to and coat the tacky substance particles immediately upon their formation in order to prevent cohesion between the tacky substance particles and, in addition, adhesion between those particles and the walls of the blending apparatus.

The coated particles of tacky substance are periodically classified, preferably by sifting or sieving, to identify those sizes which are suitable for tableting. The coated particles may be further classified to determine which fractions are readily flowable in a commercially available tablet press or other continuous compressing means. The selected particles are then tableted in a known manner to form a compact body. The method of the present invention is well-suited for economical mass production of compact articles.

The strikingly instantaneous attraction of the fluidized powder particles to the newly formed surfaces of the tacky substance particles is partially explained by the substantial difference in surface energies of the particles. A chewing gum base particle has a low surface energy, typical of hydrocarbon systems, in the range of 20 ergs per square centimeter. A fluid bed particle has a higher surface energy, preferably above 30 ergs per square centimeter. Typically, a fluid bed carbohydrate particle has a surface energy in the range of 40 to 50 ergs per square centimeter while a clay particle has an even higher surface energy in the 100 ergs per square centimeter range. The difference in surface energies between the tacky substance particles and the fluid bed particles, along with electrostatic charges, contribute to the attraction between these particles to establish a resultant combination with a stabilized, equalized surface energy value.

With specific reference to the drawings, reference numeral 10 in FIG. 1 generally indicates a known blending means, such as a commercially available Osterizer blender, for the powdered fluidized bed. The blending apparatus has an outer shell 11 and a top cover 12 for containment of the finely divided, powdered solid particles indicated by reference numeral 13. A rapidly revolving chopper blade 14 rotates at speeds up to ap-

proximately 17,000 rpm in order to maintain the fine powder particles 13 suspended and fluidized in the gaseous medium, preferably air, within the blending means. The top cover 12 is further equipped with a normally covered opening 15 for introduction of charging materials into the blender.

The tacky substances to be prepared for tableting is introduced through opening 15 into the processing Osterizer blender 10 in relatively large pieces or pellets indicated by reference numeral 16 in FIGS. 1 and 2. The pellets 16 are rapidly cut up by impact with the rotating surfaces 17 of the chopper blade 14. The pellets 16 are also subjected to repetitive impacts by the turbulently agitated fine powder particles 13 whirled about the interior of the blending means 10 in a fluidized state. As the tacky substance pellets 16 are disintegrated into smaller particles 18 (FIG. 2), the particles 18 are instantly coated by the fine powder particles 13 in order to prevent cohesion between the particles 18 themselves or adhesion with the Osterizer blender 10.

As the tacky substance particles 16 are comminuted and coated in this manner, the resultant material within the blending apparatus 10 becomes non-uniform in size. In order to obtain coated particles of sizes suitable for tableting, the resultant material is periodically fed to a known vibrating screen belt schematically illustrated in FIG. 3. The resultant material, generally illustrated by reference numeral 19 in that figure, is periodically removed from the blender 10 and is then deposited on a vibrating screen belt 21, trained for orbital movement about pulleys 22 and 23, for isolation of particles 24, which are too fine for tableting. A second vibrating screen belt 26, trained for orbital movement about pulleys 27 and 28, receives the material 29 from belt 21 to separate a second, coarser fraction of particles 31 which are of sizes suitable for tableting in conventional tableting machinery (not shown). The still coarser material 32, which is not isolated by belts 21 or 26, is collected for reprocessing. Alternatively, the non-uniform material from the blending apparatus 10 may be classified using a conventional sieving apparatus such as a vertical stack of vibrating screens of progressively increasing mesh sizes or a rotating screen drum (not shown) or other types of centrifugal or air sifting devices.

FIGS. 4 and 5 illustrate a simple test procedure found useful for determining which fractions of the material from the blender 10 are readily flowable in conventional tableting apparatus, the flowable material providing better tablets than non-flowable material. In this test, a heap of material 33 is placed on a plate 34 (FIG. 4) and the heap is pushed with a blade 36 so that the material piles up against the blade. When the blade is removed, if the frictional and dimensional characteristics of the material are ideally suitable for tableting, the material will flow back substantially evenly to form a pile 37 (FIG. 5) with similar slopes 38, 39 on each side. Material passing this test is referred to as "noncaking" material.

The present invention is further illustrated by the following examples in which the proportions are indicated in parts by weight (hereinafter "pbw").

EXAMPLE NO. 1

155 pbw of powdered sucrose was placed in the blender and fluidized. 60 pbw of adhesive chewing gum base which does not markedly adhere to tooth and denture surfaces, such as disclosed in U.S. Pat. No. 3,984,574, issued Oct. 5 1976, was then added, approxi-

mately 10 pbw at a time. The total blending time was 2½ minutes. The mixture was then screened through a No. 20 mesh screen to recover the excess sucrose, leaving granules on the screen for further processing.

Next, 70 pbw of tableting grade sucrose, commercially identified as "DiPac," and 10 pbw of water were first blended in a Hobart mixer with a wire whip. The granules left on the No. 20 mesh screen were then added to the Hobart mixer. Toward the end of the mixing period, 2 pbw of magnesium stearate was added as a lubricant for tableting.

The granulation from the Hobart mixer was then screened progressively first through a 20 mesh screen and then through a 12 mesh screen. The part retained on the 12 mesh screen was dried and readily tableted in a conventional manner.

The tablets had a mottled appearance because the sucrose coating became perforated during tableting. Smaller granules would reduce this effect and provide a more uniform appearance. The tablets were hard with shiny surfaces and were pleasant to chew.

EXAMPLE NO. 2

5 pbw colloidal silica (the commercially available Cabot brand "Cab-O-Sil") and 3 pbw powdered xylitol were placed in an Osterizer blender set at a speed sufficient to maintain the bed in a fluidized condition. The Osterizer blender speed necessary to maintain the bed fluidized will vary with the density and the surface area of the finely divided powder, as will be apparent to those skilled in the art. 50 pbw chewing gum base identified in Example No. 1 was added in small increments while maintaining the Osterizer blender at about 17,000 rpm. The grinding time was 1½ minutes.

The base was sieved to a desired particle size remaining on a 20 mesh screen and the oversize particles were recycled. 47 pbw of the fraction representing the 20 mesh size was then added to a slurry of 47 pbw of powdered xylitol. Next, 6 pbw of water was added and mixed to coat the particles. Finally, 2 pbw of magnesium stearate tableting lubricant was added. The final mixture was then dried and tableted by conventional methods.

A chewing gum made by tableting the above final mixture provides a quick burst of cooling sensation which is pleasant to taste. The base coalesces nicely into a chewable mass.

EXAMPLE NO. 3

150 pbw powdered xylitol and 3 pbw calcium carbonate were used to form a fluid bed in the manner described in Example No. 2. 50 pbw of chewing gum base identified in Example No. 1 was then added. Granules obtained in a manner similar to that described in Example No. 2 were tableted to form a pleasant and tasty chewing gum product.

EXAMPLE NO. 4

3 pbw "Cab-O-Sil" colloidal silica constituted the fluid bed. 50 pbw chewing gum base identical to that used in Example No. 1 was added gradually during a period of 1½ minutes while the blender was running. The product obtained was then granulated by normal methods after adding syrup, sugars, softeners and flavors as required to achieve the desired texture and flavor in the tabletable granulation. Tableting of this granulation was accomplished by conventional methods. A

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tableting aid (talcum powder) for a punch lubricant was incorporated in the granulation.

EXAMPLE NO. 5

50 pbw colloidal Koalin and 3 pbw of cornstarch provided the fluidized bed for grinding the chewing gum base.

After 50 pbw chewing gum base was added to the fluidized bed for comminution, sieving was accomplished with a rotary screen sieving apparatus to isolate the desired fraction. In this example, 20 pbw of the granules on a 50 mesh screen was added to a syrup of 70 pbw molten xylitol. To this mix was added 10 pbw of powdered xylitol. Upon cooling, granules were formed which, when dried, were tableted using a conventional tableting apparatus. 2 pbw of cornstarch was added as a tableting aid late in the granulating step.

The tablets, which were pleasant to chew, could be coated by pre-compression, pan-coating or by other conventional means if a coated appearance is preferred.

EXAMPLE NO. 6

15 pbw cornstarch was placed in the Osterizer blender and fluidized by adjusting the speed of the chopper blade 14. 50 pbw chewing gum base was then gradually added to the fluid bed grinder through the opening 15 (FIG. 1) in the top cover. The grinding of the base upon impacting yielded particles of chewing gum base with a thin coating of the starch fluid bed material, this coating rendering the chewing gum base substantially non-tacky and tabletable by a conventional tableting apparatus to permit formation of a commercially acceptable chewing gum product containing desired sweeteners, softeners and flavors.

EXAMPLE NO. 7

A fluidized bed was established using 90 pbw of a finely comminuted calcium carbonate. 15 pbw of a viscous liquid polymer identified as Shell Catalog No. 815 Epon resin was introduced into the fluid bed. While adjusting the speed of the chopper blade 14 to maintain fluidity of the bed, the resin was ground for one minute. The resultant granules were substantially non-tacky and could be tableted.

EXAMPLE NO. 8

A fluid bed of 5 pbw of "Cab-O-Sil" silica was established. To this was added was added 15 pbw of Shell Catalog No. 815 Epon resin. Running chopper blade 14 to maintain the bed in a fluid condition yielded semi-tacky granules for use as such or for further compounding into other products.

EXAMPLE NO. 9

A fluid bed of 100 pbw powdered xylitol was established in the blender. 20 pbw of honey was added. Operation of chopper blade 14 followed by sieving to appropriate particle size produced a relatively non-tacky substance. Upon compression, the xylitol coating on the honey particles ruptured to render a very soft and pliable tablet. The granules of coated honey can be added to other preparations or chewed as produced.

EXAMPLE NO. 10

The chewing gum base identified in Example No. 1 was formed into pellets, which were melted at temperature above the base softening point until the base pellets became uniformly soft and flowable. This molten base

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was added to a fluid bed of powdered xylitol to be cooled and ground up with the base. After less than a minute of grinding in the fluid bed by chopper blade 14, a calcium carbonate tableting aid was added. Upon cooling and sieving to appropriate particle size, a granular product was obtained which, when fed to a tableting press, resulted in tablets of slightly mottled appearance. This product had a pleasant texture and was receptive to usual flavors, colors and softeners.

EXAMPLE NO. 11

A fluid bed comprising 150 pbw of powdered sucrose was established in the blender 10. To this was added corn syrup consisting of 39 pbw dextrose equivalent and 15.0% water. The speed of the blender blade 14 was adjusted to maintain the fluid bed. After cooling and sieving, irregular non-tacky granules resulted. The desired sieve fraction of these granules yielded a hard, non-tacky tablet.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A method of compacting chewing gum base comprising the steps of

providing a fluidized bed consisting of a powdered solid turbulently suspended within a gaseous medium, the weight ratio of said powdered solid to said gum base being at least two to one;

comminuting said gum base into particles within said bed, said powdered solid serving to coat said particles to prevent cohesion therebetween,

periodically classifying said coated particles to identify sizes thereof suitable for tableting; and

tableting said identified particles to form a compact body

2. The method of claim 1 wherein said powdered solid is turbulently suspended within a gaseous medium at room temperature.

3. The method of claim 1 and the additional step of periodically classifying said coated particles to identify fractions thereof which are readily flowable in a tableting means.

4. The method of claim 1 and the additional step of breaking up said tacky substance into pellets prior to comminution within said bed.

5. The method of claim 1 wherein said powdered solid is turbulently agitated within a blending means, said blending means having a rapidly rotatable blade operable to disintegrate said tacky substance.

6. The method of claim 1 wherein said gaseous medium is an inert gas.

7. The method of claim 1 wherein said coated particles are classified by sifting to identify sizes thereof suitable for tableting.

8. The method of claim 1 wherein said coated particles are classified by sieving to identify sizes thereof suitable for tableting.

9. The method of claim 1 wherein said tacky substance is a chewing gum base.

10. The method of claim 1 wherein said solid is an edible substance.

11. The method of claim 10 wherein said solid is a carbohydrate derivative having less than 20 carbon atoms.

12. The method of claim 10 wherein said solid is selected from the group consisting of low molecular carbohydrates and carbohydrate alcohols.

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- 13. The method of claim 10 wherein said solid consists essentially of xylitol.
- 14. The method of claim 10 wherein said solid consists essentially of mannitol.
- 15. The method of claim 10 wherein said solid consists essentially of a polymer of glucose.

- 16. The method of claim 10 wherein said solid consists essentially of sorbitol.
- 17. The method of claim 1 wherein said tacky substance and said solid have substantially different surface energies.

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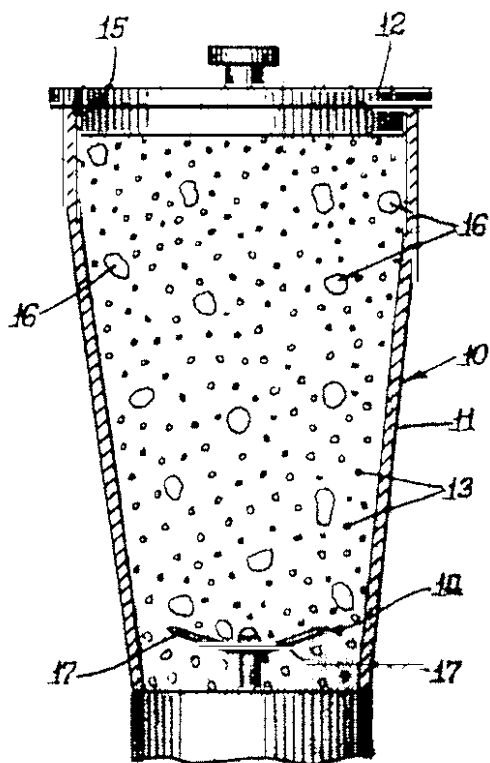


Fig. 1

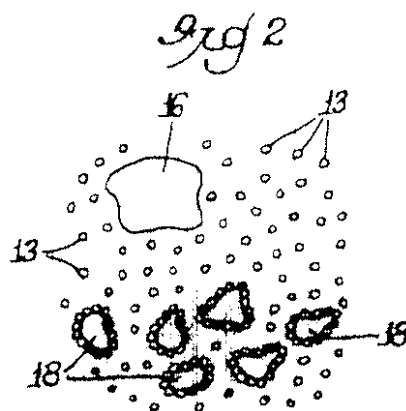


Fig. 2



Fig. 4

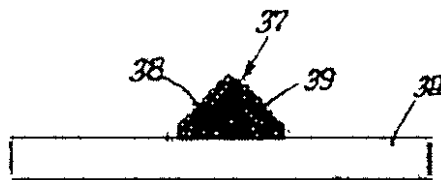


Fig. 5

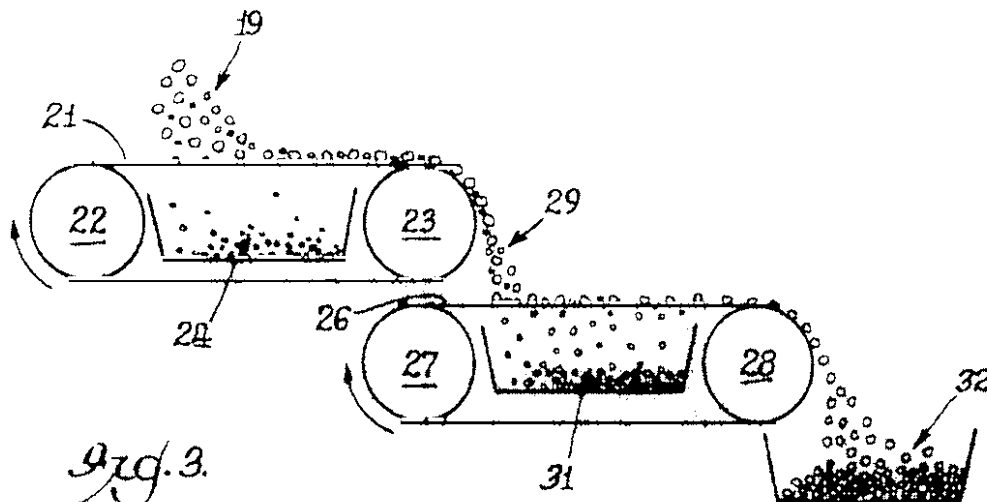


Fig. 3

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UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO 4,405,647
DATED September 20, 1983
INVENTOR(S) E. Eugene Fisher, et al.

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Under Inventors "Elmer G. Paquette"
should be --Elmer G. Paquette--

Under References Cited "Laval, Jr."
should be --Laval, Jr.--

Col. 5, line 48, delete "was added"
[second occurrence]

Signed and Sealed this

Ninth Day of October 1984

[SEAL]

Attest:

Attesting Officer

GERALD J. MOSENGHOFF

Commissioner of Patents and Trademarks

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Commissioner of Patents and Trademarks



US006322828B1

(12) **United States Patent**
Athanikar et al.

(10) **Patent No.:** **US 6,322,828 B1**
(45) **Date of Patent:** **Nov. 27, 2001**

(54) **PROCESS FOR MANUFACTURING A
PHARMACEUTICAL CHEWING GUM**

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(*) **Notice:** Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 0 days.

(21) **Appl. No.:** **09/394,217**

(22) **Filed:** **Sep. 13, 1999**

(51) **Int. Cl.⁷** **A23G 3/30; A61K 9/68**

(52) **U.S. Cl.** **426/3; 424/48; 424/440;**
424/441; 426/285; 426/454

(58) **Field of Search** **426/3, 5, 285,**
426/454; 424/48, 440, 441

(56) **References Cited**

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4,803,082	* 2/1989	Cherukuri et al.	426/3 X

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Primary Examiner—Arthur L. Corbin

(74) *Attorney, Agent, or Firm*—Workman, Nydegger &
Seeley

(57) **ABSTRACT**

The present invention provides a process for preparing a chewing gum tablet, in which a chewing gum composition is cooled to a temperature at which the composition is brittle, and the composition is ground while brittle to form a fine powder. In a preferred process, the composition is cooled by mixing with a coolant, such as solid carbon dioxide, and the mixture is granulated to a powder. The powder can be mixed with a pharmaceutical active ingredient capable of topical absorption in the buccal cavity or in the mucous layer of the upper or lower intestinal tract, and formed into a tablet. Preferably, the mixture of the powder, pharmaceutical active ingredient, and other additives such as coating agents, binders, additional active ingredients, and sweeteners, are granulated in a fluidized bed granulator prior to forming the mixture into a tablet. The resulting tablet provides a dosage form of the pharmaceutical active ingredient having a more accurate and uniform dose of the active ingredient.

32 Claims, No Drawings

PROCESS FOR MANUFACTURING A PHARMACEUTICAL CHEWING GUM

FIELD OF THE INVENTION

The present invention relates to processes for producing chewing gum tablets as dosage forms for pharmaceutical therapeutic agents, and in particular to a process for making a pharmaceutical chewing gum dosage form having a more accurate and uniform dose of the pharmaceutical active ingredient.

BACKGROUND

Pharmaceutical therapeutic agents, such as drugs, are formulated in a variety of dosage forms, depending upon the target absorption site of the drug, the intended time profile for absorption, the solubility characteristics of the drug, the susceptibility of the drug to various forms of attack in vivo, such as enzymatic degradation and organ uptake, and other considerations well-known to those skilled in the art. A large number of drugs are formulated in orally ingestible dosage forms for delivery into the gastrointestinal tract, where they are absorbed into the blood stream and carried to various organs or tissues where the pharmacological action is exerted. Typically, such dosage forms are capsules or tablets, which may further be provided with various coatings, to assist in passage through the gastrointestinal tract, or to provide a delayed or extended release profile. When more rapid therapeutic action is desired, or when the therapeutic agent is particularly susceptible to chemical or enzymatic attack in the gastrointestinal tract, a preferred route of delivery is injection into the blood stream, and the corresponding dosage form is an injectable liquid or solution. Still other drugs are delivered topically to the skin, eyes, and various mucosal tissues, in dosage forms such as ointments, creams, gels and lotions.

A number of therapeutically useful drugs are capable of buccal absorption; i.e., absorption in the oral cavity, either sublingually or throughout the oral mucosal wall, or by dissolution in the saliva and absorption in the throat, esophagus, or upper gastrointestinal tract. For drugs having significant buccal and/or upper and lower gastrointestinal tract absorption, oral dosage forms taking advantage of the absorption, such as lozenges, chewable tablets, and chewing gum, are particularly advantageous. Such dosage forms permit more rapid therapeutic action compared to per-oral (swallowed) dosage forms, and the topically absorbed therapeutic agent also partially escapes liver metabolism.

The chewing gum dosage form is particularly attractive due to its ease of administration and the generally acceptable or even pleasant qualities of chewing gum. These attractive properties can significantly improve patient compliance with the dosage regimen. Thus, for example, U.S. Pat. No. 4,971,079 is directed to chewing gum compositions having an anti-nicotine therapeutic effect, for use in facilitating cessation of smoking. Likewise, U.S. Pat. No. 5,922,347 is directed to chewing gum compositions containing acetylsalicylic acid, a well-known anti-inflammatory and analgesic compound.

The conventional chewing gum processing technology involves melting a gum base in, for example, a sigma blender, and adding components such as sweeteners and flavorants to the melt. The melted mass is then extruded, rolled into sheets, and cut to the desired shape on the rollers. This conventional technology, however, suffers from several disadvantages, when applied to the preparation of pharmaceutical chewing gum dosage forms. For example, the

elevated temperatures used in the melt can adversely affect the chemical stability of the therapeutic agent contained therein. In addition, the melting and mixing process of the highly viscous gum mass makes controlling the accuracy and uniformity of the drug dose difficult, and this difficulty is further exacerbated by the lack of a precise form, shape or weight of the dosage form. Further, the gum processing technology is not easily adapted to incorporate the stringent sanitary manufacturing conditions required for production of pharmaceutical products, and the concomitant process validation and control measures. In addition, conventional gum processing technology is generally poorly suited for high-speed, more economical, production.

Several patents are directed to improved methods of processing chewing gums, in order to overcome some of the disadvantages described above. U.S. Pat. No. 4,000,321, for example, is directed to a process for preparing chewing gum, in which a chewing gum composition is cooled to -15°C . to facilitate fragmentation, and the cooled composition is pulverized with a crusher, hammer mill, pelletizer or turbomill. The pulverized product is then melted to cause the pulverized pieces to co-adhere, forming a chewing gum reportedly having low specific gravity and a soft chewing texture. The process, however, suffers from all of the disadvantages associated with heating, process speed, poorly defined dosage forms and weights described above, and is not well-suited for making a pharmaceutical chewing gum dosage form.

U.S. Pat. No. 4,753,805 is directed to a chewing gum composition in the form of a tablet having a low moisture content. The tablet is produced by grinding a chewing gum composition, blending the ground composition with a compression aid, and compressing the granulated product to form a tablet. Grinding of the chewing gum composition, typically a difficult process because of the tendency for the gum to stick to the grinding apparatus, is accomplished by the use of 2-8% by weight of a grinding aid such as an alkaline metal phosphate, an alkaline earth metal phosphate, or a maltodextrin. The use of such grinding aids, however, is disadvantageous. The metal phosphate salts are highly alkaline, and such alkalinity may be incompatible with acidic ionizable therapeutic agents, for example. In addition, the grinding aid remains in the composition and ultimately in the chewing gum tablet, and the presence of a large amount of metal phosphate in the dosage form is potentially problematic from therapeutic and safety perspectives.

Thus, there is a need for processes to produce dosage forms of buccally absorbable therapeutic agents which do not suffer from the disadvantages of conventional pharmaceutical chewing gum formulations.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a process for preparing chewing gum dosage forms of therapeutic agents topically effective toward the gastrointestinal tract having improved dose accuracy and uniformity.

It is also an object of the present invention to provide a process for preparing chewing gum dosage forms of therapeutic agents topically effective toward the gastrointestinal tract having a precise and well-defined form, shape and weight.

It is also an object of the present invention to provide a process for preparing chewing gum dosage forms of therapeutic agents topically effective toward the gastrointestinal tract, wherein the therapeutic agent is not subjected to elevated temperatures.

It is further an object of the present invention to provide processes for preparing chewing gum dosage forms of therapeutic agents topically effective toward the gastrointestinal tract capable of being carried out in high-speed, efficient manufacturing processes.

It is still a further object of the present invention to provide chewing gum dosage forms of therapeutic agents topically effective toward the gastrointestinal tract.

The foregoing objects and other advantages are achieved by the process of the present invention, in which a chewing gum composition is cooled to a temperature at which the composition is brittle, and the composition is ground while brittle to form a fine powder. In a preferred process, the composition is cooled by mixing with a coolant, such as solid carbon dioxide, and the mixture is ground to a powder. The powder can be mixed with a pharmaceutical active ingredient capable of buccal and/or upper or lower gastrointestinal tract topical absorption (i.e., topically effective toward the gastrointestinal tract), and formed into a tablet. Preferably, the mixture of the powder, pharmaceutical active ingredient, and other additives such as coating agents, binders, additional active ingredients, and sweeteners, are granulated in a fluidized bed granulator prior to forming the mixture into a tablet. The resulting tablet provides an improved dosage form of the pharmaceutical active ingredient.

Thus, in one aspect, the present invention provides a process for preparing a chewing gum tablet, the process including the steps of cooling a chewing gum composition to a temperature at which the composition is brittle, grinding the cooled chewing gum composition, and forming the ground chewing gum composition into a tablet.

In another aspect, the present invention provides a process for preparing a chewing gum tablet, the process including the steps of providing a mixture including a chewing gum composition and solid carbon dioxide, grinding the mixture to form a powder, removing the solid carbon dioxide from the powder, and forming the powder into a tablet.

In another aspect, the present invention provides a process for preparing a dosage form of an active ingredient topically effective toward the gastrointestinal tract, the process including the steps of providing a mixture including a chewing gum composition and solid carbon dioxide, grinding the mixture to form a powder, removing the solid carbon dioxide from the powder, mixing the powder with a composition including the active ingredient to form an active ingredient-containing powder, granulating the active ingredient-containing powder in a fluidized bed granulator, and compressing the granules into a tablet to form a dosage form containing the active ingredient.

In another aspect, the present invention provides a chewing gum dosage form of an active ingredient topically effective toward the gastrointestinal tract, the dosage form including a gum base and an active ingredient and being formed of a plurality of compressed granules containing the gum base and active ingredient.

These and other objects and features of the present invention will become more fully apparent from the following description and appended claims, or may be learned by the practice of the invention as set forth hereinafter.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is directed to processes for improved production of pharmaceutical chewing gum dosage forms. The processes of the present invention enable

production of chewing gum tablets without the disadvantages of heating the therapeutic agent, and without problems associated with inaccuracy and non-uniformity of therapeutic agent doses characteristic of conventional chewing gum processes. The present invention achieves these and other significant advantages by a process in which a chewing gum composition is cooled to a brittle temperature, ground while at a brittle temperature to form a powder, and formed into a tablet. The pharmaceutical therapeutic agent, or active ingredient, is readily mixed with the powdered gum composition prior to tablet formation, to produce a uniform and accurate mixture, from which a well-defined and precise tablet dosage form can be prepared by tabletization.

In one step of the process of the present invention, a chewing gum composition is cooled to a temperature at which the composition is brittle. The chewing gum composition can be any chewing gum composition, such as conventional compositions known in the art. In general, such compositions include a chewing gum base, to which may be added flavorants, sweeteners, colorants, and other ingredients known in the art. The chewing gum base is typically a natural or synthetic elastomer, such as rubber, chicle, lechi caspi, jelutong, polyisobutylene, an isobutylene-isoprene copolymer, a styrene-butadiene copolymer, or other suitable gum base known in the art. In order to facilitate the subsequent grinding step, the chewing gum composition is preferably in the form of chips, pellets, or other relatively small particles.

The chewing gum composition is cooled to a temperature at which the composition is brittle. It should be appreciated that even a mildly cooled chewing gum composition will possess some degree of brittleness; however, to be suitable for the process of the present invention, the composition is cooled to a temperature at which the composition is sufficiently brittle such that the brittleness is maintained during the subsequent grinding step without adhesion to the grinding apparatus. The appropriate temperature is determined in part by the specific composition of the chewing gum, and is easily determined empirically by observing the properties of the cooled chewing gum composition. Thus, for example, a chewing gum composition cooled to a temperature sufficiently low can be ground in, for example, a mill grinder, without the composition sticking to the grinder parts. Preferably, the temperature will be less than -15°C ., more preferably less than -30°C ., and still more preferably less than about -40°C .

The cooling can be carried out by any of a variety of cooling processes. The chewing gum composition can be frozen in a conventional freezer apparatus capable of reaching the very low temperatures needed to achieve the requisite brittleness. Preferably, however, the chewing gum composition is cooled by contacting with a coolant. The coolant can be any substance capable of cooling the chewing gum composition to the desired temperature and can be, for example, a cryogenic liquid such as liquid nitrogen, a cold solid such as solid carbon dioxide, or a cold gas such as the gaseous boil-off from a cryogenic liquid. The coolant should be chosen so that the coolant does not interact adversely with the chewing gum composition or with the mixing or grinding apparatuses used in the present process. In addition, the coolant should not produce a substance upon warming that suffers from such adverse interactions, or that leaves a residue that adversely affects subsequent processing or presents potential safety hazards when the chewing gum tablet is chewed. For example, a coolant such as water ice, even if cooled to a sufficiently low temperature, would not be preferred, as any water ice that melts will form liquid water,

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which is absorbed by the chewing gum composition. Likewise, a coolant such as a hydrocarbon slush would not be preferred, since any hydrocarbon residue remaining in the chewing gum composition would present potential safety hazards when the chewing gum tablet is consumed.

In accordance with the present invention, and in a particularly preferred aspect, it has been surprisingly found that by mixing a chewing gum composition with solid carbon dioxide (dry ice), the chewing gum composition can be cooled to a brittle temperature without the undesirable effects discussed above. At the sublimation temperature, -78.5°C ., solid carbon dioxide is sufficiently cold to ensure that the chewing gum composition is suitably brittle. Of course, the solid carbon dioxide can be cooled to an even lower temperature, if desired. Upon warming, the solid carbon dioxide sublimates to form carbon dioxide gas, which does not react with the chewing gum composition, is not absorbed by the composition, and does not interact adversely with processing apparatuses. Further, the gaseous, non-reactive nature of the sublimation product ensures that no undesirable and potentially hazardous residue of the coolant remains in the chewing gum tablet product. Preferably, the solid carbon dioxide coolant is provided in pelletized form to facilitate further processing steps.

Alternatively, the steps of cooling the chewing gum composition and grinding the composition can be combined into a single step by, for example, cooling the grinding apparatus itself, such as by contacting the grinding apparatus with a coolant. For example, in this alternative aspect, the grinding apparatus can be placed in a cooling jacket of liquid nitrogen or other cold liquid. For more efficient cooling, in this embodiment, the chewing gum composition is preferably pre-cooled, although the pre-cooling need not be to a temperature as low as the brittle temperature. It should be appreciated that even in the preferred embodiment, wherein the chewing gum composition is cooled by mixing with a coolant, it may also be advantageous to cool the grinding apparatus as well.

If desired, the chewing gum composition can be mixed with an anti-caking agent prior to the grinding step, and the use of an anti-caking agent is preferred. Such anti-caking agents are known in the art. A preferred anti-caking agent is precipitated silicon dioxide. In a preferred embodiment in which the chewing gum composition is mixed with solid carbon dioxide and an anti-caking agent prior to grinding, the anti-caking agent helps to prevent agglomeration of the subsequently ground chewing gum particles, upon sublimation of the solid carbon dioxide.

If a coolant, such as solid carbon dioxide, and other components, such as an anti-caking agent are used, the chewing gum composition and other substances can be combined using a conventional mixing apparatus, such as a vented V-blender.

The chewing gum composition, and other components such as coolant and anti-caking agent, are ground to form a fine powder. The grinding can be carried out using any conventional grinding apparatus, such as a mill grinder. In a preferred embodiment, a mixture of a chewing gum composition, solid carbon dioxide, and precipitated silica is provided, and the mixture is introduced into a mill grinder. In this embodiment, the mixture is ground to a fine powder, and the solid carbon dioxide remains present during the grinding process. It has been surprisingly found that by co-grinding the chewing gum composition and solid carbon dioxide, the chewing gum composition can be ground into a fine powder, without any adverse adhesion to the grinding apparatus.

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The desired properties of the ground chewing gum composition are better achieved when the composition is kept at a very low temperature throughout the grinding process. Thus, in a particularly preferred process, a mixture of chewing gum composition, solid carbon dioxide and precipitated silica is ground in a mill grinder in a first grinding step, additional solid carbon dioxide and precipitated silica are added to the ground composition, and the composition is further ground in a second grinding step. This two-step grinding process advantageously keeps the chewing gum composition at a very low temperature. Although not wishing to be bound by theory, it is further believed that the presence of the solid carbon dioxide particles, in addition to providing the necessary cooling, also serves to enhance the efficiency of the grinding process. It should be appreciated that although a two-step grinding process is described herein, the number of steps is not particularly limited. Thus, a process in which additional solid carbon dioxide and/or precipitated silica are added in multiple steps, or even in a slow, continuous stream, may also be used if desired.

After the composition is ground to a powder, the coolant can be removed by, for example, allowing the coolant to evaporate. Using the preferred coolant of solid carbon dioxide, the coolant is removed simply by allowing the solid carbon dioxide to sublime, releasing harmless carbon dioxide gas and leaving no undesirable contaminants. The ground composition can be stored such that the carbon dioxide gas can escape, as for example in loosely closed plastic bags. Alternatively, the carbon dioxide can be removed more rapidly by processing the ground composition in a fluidized bed reactor.

Once the coolant has been removed from the powder, the powder can be mixed with other ingredients as desired, before forming the powder into a tablet. Such ingredients can be any ingredient known to be incorporated into chewing gum and not incompatible with tablet formation, such as coating agents, binders, lubricants, sweeteners and the like. Preferably, a pharmaceutical active ingredient topically effective toward the gastrointestinal tract is added in an amount such that the tablet ultimately formed includes a therapeutically effective dose of the active ingredient. As used herein, the term "topically effective toward the gastrointestinal tract" means having significant absorption in the buccal cavity and/or the mucous layer of the upper and/or lower gastrointestinal tract. The active ingredient can be any active ingredient having such topical absorption, such as, for example, gastrointestinal anti-infective drugs, anti-diarrheal drugs, anti-cholic drugs, cardiovascular drugs such as nitroglycerin, and calcium channel blocking agents such as nifedipine.

Such ingredients can be combined with the powder by blending, in for example, a sigma mill, or a high shear mixer. If a conventional blending apparatus is used, the powder mixture should include sufficient amounts of binder to enable effective processing of the mixture. Such binders, well-known in the art, are typically aqueous, and the large amounts of aqueous binder necessary to enable tabletization from a blended mixture are not preferred, as the mixture tends to swell and to develop a disadvantageous stickiness that makes tabletization less efficient. However, although not preferred, such blending processes can still be used in the process of the present invention.

In a preferred process, it has been surprisingly found that the powdered chewing gum composition produced by the process described above can be combined with other ingredients, such as coating agents, binders, sweeteners and active ingredients, in a fluidized bed reactor. The use of a

fluidized bed reactor is particularly advantageous, as the process partially rebuilds the powder into granules, as well as coats the powder particles and/or granules with a coating agent, thereby minimizing undesired particle agglomeration. In this embodiment, the temperature of the process should be controlled. If the temperature is too low, the mixture (the "blend") will stick because of a low evaporation rate as the binding solution is sprayed on the blend. The granules that develop are then too large for subsequent tabletization. If the temperature is too high, the blend can soften, with the same disadvantageous results. With these considerations in mind, one skilled in the art can readily determine the appropriate process temperature by observing and optimizing the properties of the granules produced. To reduce the processing time, the fluid bed granulator can be pre-heated to the chosen processing temperature prior to adding the powder mixture. After granulation, the granulate can be discharged onto screens, and any granules that are too large can be removed.

In a preferred process, the powder mixture, containing the powdered chewing gum composition, active ingredient, and other additives, is weighed into individual "charges" for the fluid bed granulator. After processing as described above, and screening, the individual charges are then preferably recombined and mixed in a V-blender, and the resultant "cross-blend" is then discharged across a screen to again remove any granules that are too large. It is particularly advantageous to sample the cross-blend discharge by taking multiple samples from the discharge stream, for analysis of the active ingredient. Thus, the discharge mixture can be stored while the multiple samples are analyzed, to insure that the desired level and uniformity of level of active ingredient are present. If necessary, additional active ingredient can then be added.

The discharge mixture is again placed in a V-blender, and any additional active ingredient added. In addition, an anti-adherent is preferably added at this time, along with any other desired excipients or inactive ingredients. A preferred anti-adherent is talc. The mixture can then be discharged, again screened, and staged for compression.

Compression to form tablets can be carried out by any conventional process, such as a punching process. Of course, the punching process should be monitored for signs of sticking to the punches, and the apparatus cleaned, and/or coated with additional anti-adherent as needed.

In another aspect, the present invention is directed to chewing gum dosage forms of a pharmaceutical active ingredient topically effective toward the gastrointestinal tract, the dosage form being a tablet formed of compressed granules of a gum base and the active ingredient. The granules forming the tablet can be of a size convenient for tabletization, typically from about 15 to about 30 mesh size, and preferably about 20 to about 25 mesh size. The tablets can be produced by any of the methods described above. Advantageously, the tablet does not contain any residue of a grinding aid, such as an alkaline phosphate.

The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

What is claimed and desired to be secured by United States Letters Patent is:

1. A process for preparing a chewing gum tablet, the process comprising:

- (a) cooling a chewing gum composition to a temperature at which the composition is brittle;
- (b) grinding the cooled chewing gum composition to form a chewing gum powder;
- (c) mixing the chewing gum powder with a composition comprising a pharmaceutical therapeutic active ingredient to form an active-containing powder;
- (d) granulating the active-containing powder to form active-containing granules; and
- (e) forming the active-containing granules into a tablet.

2. The process of claim 1, wherein the step of cooling the chewing gum composition comprises contacting the composition with a coolant, wherein the coolant is a non-reactive substance capable of cooling the chewing gum composition to the brittle temperature.

3. The process of claim 2, wherein the coolant is solid carbon dioxide.

4. The process of claim 1, wherein the step of grinding the cooled chewing gum composition is carried out in the presence of a coolant in contact with the chewing gum composition, wherein the coolant is a non-reactive substance.

5. The process of claim 4, wherein the coolant is solid carbon dioxide.

6. The process of claim 1, wherein the steps of cooling and grinding are carried out by mixing the chewing gum composition with solid carbon dioxide and grinding the chewing gum and solid carbon dioxide mixture.

7. The process of claim 6, wherein the chewing gum composition is mixed with solid carbon dioxide and an anti-caking agent.

8. The process of claim 1, wherein the cooling and grinding steps are carried out by:

- (i) providing a mixture of the chewing gum composition, solid carbon dioxide, and an anti-caking agent;
- (ii) grinding the mixture in a first grinding step;
- (iii) adding additional amounts of solid carbon dioxide and anti-caking agent to the ground mixture; and
- (iv) further grinding the mixture in a second grinding step.

9. The process of claim 8, wherein the anti-caking agent is precipitated silicon dioxide.

10. The process of claim 1, wherein the chewing gum composition is cooled to a temperature below -30°C .

11. The process of claim 1, wherein the chewing gum composition is cooled to a temperature below about -40°C .

12. The process of claim 1, wherein the step of granulating is carried out in a fluid bed granulator.

13. The process of claim 12, further comprising coating the active-containing powder in the fluid bed granulator with a coating agent.

14. The process of claim 1, wherein the active ingredient is topically effective toward the gastrointestinal tract.

15. The process of claim 1, wherein the active-containing granules have an average size of about 15 mesh to about 30 mesh.

16. A process for preparing a chewing gum tablet, the process comprising:

- (a) providing a mixture comprising a chewing gum composition and solid carbon dioxide;
- (b) grinding the mixture to form a chewing gum powder;
- (c) removing the solid carbon dioxide from the chewing gum powder;
- (d) mixing the chewing gum powder with a composition comprising a pharmaceutical therapeutic active ingredient to form an active-containing powder;

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- (e) granulating the active-containing powder in a fluidized bed granulator to form active-containing granules; and
(f) forming the active-containing granules into a tablet.
17. The process of claim 16, wherein the mixture in step (a) further comprises an anti-caking agent.
18. The process of claim 17, wherein the anti-caking agent is precipitated silicon dioxide.
19. The process of claim 17, wherein the grinding step comprises:
(i) grinding the mixture in a first grinding step;
(ii) adding additional amounts of solid carbon dioxide and anti-caking agent to the ground mixture; and
(iii) further grinding the ground mixture in a second grinding step to form the chewing gum powder.
20. The process of claim 16, wherein the step of removing the solid carbon dioxide from the chewing gum powder comprises storing the chewing gum powder for a sufficient time such that substantially all of the solid carbon dioxide sublimates.
21. The process of claim 16, wherein the step of removing the solid carbon dioxide from the chewing gum powder comprises processing the chewing gum powder and the solid carbon dioxide in a fluid bed granulator.
22. The process of claim 16, wherein the chewing gum powder is mixed with a coating agent prior to the step of granulating.
23. The process of claim 16, wherein the active ingredient is topically effective toward the gastrointestinal tract.
24. The process of claim 16, wherein the active-containing granules have an average size of about 15 mesh to about 30 mesh.
25. A process for preparing a dosage form of a pharmaceutical therapeutic active ingredient, the process comprising:
(a) providing a mixture comprising a chewing gum composition, an anti-caking agent, and solid carbon dioxide;
(b) grinding the mixture to form a chewing gum powder;

- (c) removing the solid carbon dioxide from the chewing gum powder;
(d) mixing the chewing gum powder with a composition comprising the pharmaceutical therapeutic active ingredient to form an active-containing powder;
(e) granulating the active-containing powder in a fluidized bed granulator to form active-containing granules; and
(f) compressing the active-containing granules into a tablet to produce a dosage form containing the active ingredient.
26. The process of claim 25, wherein the anti-caking agent is precipitated silicon dioxide.
27. The process of claim 25, wherein the grinding step comprises:
(i) grinding the mixture in a first grinding step;
(ii) adding additional amounts of solid carbon dioxide and anti-caking agent to the ground mixture; and
(iii) further grinding the ground mixture in a second grinding step to form the chewing gum powder.
28. The process of claim 25, wherein the step of removing the solid carbon dioxide from the chewing gum powder comprises storing the chewing gum powder for a sufficient time such that substantially all of the solid carbon dioxide sublimates.
29. The process of claim 25, wherein the step of removing the solid carbon dioxide from the chewing gum powder comprises processing the chewing gum powder and the solid carbon dioxide in a fluid bed granulator.
30. The process of claim 25, wherein the composition in step (d) further comprises a coating agent.
31. The process of claim 25, wherein the composition in step (d) further comprises at least one additive selected from the group consisting of binders, coating agents, sweeteners, and additional active ingredients.
32. The process of claim 25, wherein the active-containing granules have an average size of about 15 mesh to about 30 mesh.

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United States Patent [19]
Elias

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[45] **Date of Patent:** May 13, 1986

[34] **CHEWING GUM PRODUCT AND
COMPOSITION AND PROCESS FOR THE
PREPARATION THEREOF**
[75] **Inventor:** Ronald J. Elias, Mount Laurel, N.J.
[73] **Assignee:** Fleer Corporation, Philadelphia, Pa.
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[52] **U.S. Cl.** 426/3
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426/96

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[57] **ABSTRACT**

A shaped chewing gum product made from a composition in the form of a semifluid conglomerate consisting essentially of an intimate mixture of substantially dry granulated sugar, the predominant particle size of which is between about 210 microns and about 850 microns, and substantially dry chewing gum base, with coloring and flavoring additives incorporated therein. The chewing gum product may contain different coloring and/or flavoring additives which are distinctly, visually and/or gustatively discernable in the product.

37 Claims, No Drawings

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CHEWING GUM PRODUCT AND COMPOSITION AND PROCESS FOR THE PREPARATION THEREOF

BACKGROUND OF THE INVENTION

The present invention relates to a novel chewing gum product and to a composition and process for making the same. More specifically, the present invention relates to the preparation of a novel chewing gum product having desirable chewing quality from a substantially dry, semifluid batch material which may be readily formed into any desired shape. The batch material may include a plurality of different coloring and/or flavoring additives, with the additives being distinctly discernable in the finished product.

In U.S. Pat. No. 3,262,784, which is commonly assigned with the present application, there is described a chewing gum product composed of dry, finely divided sugar and essentially water-free chewing gum base, with conventional chewing gum flavoring and coloring additives incorporated therein. In preparing this patented product, dry powdered sugar (preferably of a particle size such that at least about 95% passes through an 80 mesh screen) is mixed with essentially moisture-free chewing gum base until the powdered sugar is completely dispersed in the chewing gum base. The resulting product is a dry, non-tacky, friable, free-flowing material which is formed into a desired shape under relatively high compressive force, in a conventional tableting machine. The compressed, finished chewing gum product is disclosed as having excellent chewing qualities, and possessing other desirable properties, including resistance to moisture and oxidative-deterioration and enhanced flavor characteristics, as compared to conventional chewing gum products.

The substantial elimination of water from the gum product of U.S. Pat. No. 3,262,784, as briefly described above, represents a significant departure from the approach generally employed in making chewing gum products. Chewing gums, including adult chewing gum and bubble gum, are typically prepared by mixing heated chewing gum base, an aqueous sugar syrup (principally corn syrup or glucose), dry sugar (sucrose or dextrose) and a flavoring additive. The aqueous syrup has generally been regarded by those skilled in the art as a necessary component insofar as conventional commercial manufacture is concerned. The batch material discharged from the mixing vessel is a tough, taffy- or dough-like mass containing from 3 to 5 percent, by weight, of moisture, and is formed into the finished product by extrusion or rolling, and scoring or cutting. Moreover, conventional chewing gum products are sensitive to atmospheric moisture, requiring wrapping of each individual piece in a moisture-resistant wrapper, or providing the pieces with a moisture-resistant coating. Conventional chewing gum products also possess poor resistance to oxidative-deterioration.

SUMMARY OF THE INVENTION

In accordance with one aspect of the present invention, there is provided a composition, in the form of a semifluid conglomerate consisting essentially of an intimate mixture of substantially dry granulated sugar, and substantially dry chewing gum base. The predominant particle size of the granulated sugar used in the practice of this invention is between about 210 microns and about 850 microns. A minor amount, i.e. generally less

than ten percent, of particles whose size is less than 210 microns or greater than 850 microns, may be tolerated. This composition is employed as the batch material in making the novel chewing gum product of this invention. The particle size of the sugar component of the composition of this invention is significantly larger than the powdered sugar used in making the chewing product of the above-mentioned U.S. Pat. No. 3,262,784 the latter having an average particle size of about 75 microns. The use of relatively larger size sugar particles gives rise to certain desirable characteristics in the composition of this invention, not possessed by the patented composition. For example, the composition of the present invention is a semifluid, relatively cohesive conglomerate having a consistency similar to wet, shaved coconut, which enables the production of gum products in a variety of shapes and sizes by various forming operations commonly employed in the manufacture of chewing gum and confectionary products. By contrast, the non-tacky, friable, free-flowing composition of the above-mentioned patent requires a compression forming operation employing, for example, a tableting machine, as previously noted, generally operated at a pressure of about five to ten tons. Thus, the size and shape of the final product produced according to U.S. Pat. No. 3,262,784 is relatively limited, unless special presses are utilized.

According to another aspect of the present invention, there is provided novel shaped chewing gum products made from the above-described composition. The chewing gum product of the present invention may have incorporated therein different coloring and/or flavoring additives, which are distinctly discernable in the finished product. The batch material employed in the above-mentioned patent is not adaptable to the production of such multi-colored and multi-flavored products. This is because the smaller particle size of the powdered sugar component employed therein permits different coloring or flavoring additives to merge together upon blending, thus preventing the discernment of distinct colors and flavors in the finished product.

The chewing gum product of the present invention also has longer lasting flavor as compared with the product of U.S. Pat. No. 3,262,784. This flavor enhancement is due to the slow solubility rate of the relatively large particle size of the sugar component used in the product of this invention.

Another desirable property of the product of the present invention is its relatively low density, generally between 0.5 and 1.0 g./cc., which imparts thereto a unique, spongy chewing quality not possessed by chewing gum products commercially available heretofore.

The chewing gum product described herein also shares certain desirable properties in common with the product of U.S. Pat. No. 3,262,784, in that it is resistant to deterioration due to moisture loss and oxidation, as compared to conventional chewing gum.

According to a further aspect of the present invention, there is provided a process for making a shaped chewing gum product by mixing substantially dry molten chewing gum base with substantially dry granulated sugar, within the above-noted particle size range, to provide a batch material in the form of a semifluid or flowable conglomerate of sugar particles coated with chewing gum base, and subjecting the batch material to a forming operation in a mold to produce a shaped product of desired configuration and size.

The process of the present invention is decidedly more efficient than that disclosed in the above-mentioned patent. In the latter process, powdered sugar must be added in increments to the chewing gum base, and care must be taken not to add too great an amount of sugar at any one time. In addition, it is disclosed in the above-mentioned patent that attempts to add chewing gum base to the sugar were unsuccessful. No such restrictions are applicable to the process of the present invention. The granulated sugar and chewing gum base may be mixed en masse, with chewing gum base being added to the granulated sugar. Indeed, addition of the chewing gum base to the sugar is the preferred manner for carrying out the present process, in order to prevent sticking of the gum base to the walls of the mixer.

In a modification of the process just described, which is also within the scope of the present invention, a plurality of separate batch materials may be prepared, each having a different coloring additive incorporated therein, and combined to form a master batch material which is molded into a final product. The various coloring additives are distinctly visually discernable in the finished product, imparting a multi-colored appearance thereto. This modified process may also be used with different flavoring additives to produce a final product in which the various flavoring additives are distinctly gustatively discernable imparting a multi-flavored taste thereto. Various combinations of different coloring and flavoring additives may be used, if desired.

Other details, objects and advantages of the present invention will become apparent from the following detailed description thereof.

DETAILED DESCRIPTION OF THE INVENTION

The two principal components of the chewing gum product of the present invention are chewing gum base and granulated sugar. The chewing gum base employed is essentially free of water, i.e. it contains no more than about 1% by weight of water. Any gum base normally used in making chewing gum, including adult chewing gum and bubble gum, may be used in practicing this invention. As is well known, chewing gum base is composed of natural and/or synthetic gums or elastomers, plasticizers and film-forming extenders. Examples of natural gums or elastomers are natural rubber, chicle, lechi caspi and jelutong, and typical synthetic elastomers are polyisobutylene, isobutylene-isoprene copolymer, and butadiene-styrene copolymer. Suitable plasticizers include oleaginous or fatty materials, such as cocoa butter and hydrogenated vegetable oils. Film-forming extenders are usually synthetic resins, examples of which are polyvinyl acetate and ester gums, including esters of rosin and hydrogenated esters of rosin, such as the glycerol esters of hydrogenated rosin, and the like. In addition, in compounding chewing gum base, small amounts of an emulsifier, such as glycerol monostearate, and an antioxidant, such as butylated hydroxyanisole and butylated hydroxytoluene, may be used. The principal difference between bubble gum base and adult chewing gum base is in the elastomer content of each, the former generally averaging about 8 to 14% of elastomer and the latter generally averaging about 3 to 8% of elastomer, the balance in both cases being made up essentially of film-forming extender resin and plasticizer. A suitable bubble gum base for use in the present invention comprises, by weight, 10.0 percent butadiene-styrene copolymer, 42.0 percent glycerol

ester of hydrogenated rosin, 20.9 percent calcium carbonate, 6.25 percent paraffin wax, 9.5 percent cocoa butter, 10.3 percent hydrogenated vegetable oil and 1.05 percent glycerol monostearate. A representative adult chewing gum base comprises 16.0 percent chicle, 10.0 percent lechi caspi, 1.9 percent butadiene-styrene copolymer, 1.6 percent natural rubber, 24.8 percent glycerol ester of hydrogenated rosin, 21.2 percent calcium carbonate, 14.1 percent paraffin wax, 0.5 percent cocoa butter, 1.3 percent hydrogenated vegetable oil, 1.0 percent glycerol monostearate, 2.6 percent starch and 5.0 percent microcrystalline wax. Of course, other gum base formulations may also be used. However, the preferred gum base for use in the present invention is bubble gum.

Unlike the manufacture of conventional chewing gum, which requires the use of an aqueous sugar syrup, typically corn syrup or glucose, as a substantial part of the sweetener component, the present invention employs only dry, granulated sugar, i.e. sugar containing no more than one percent, by weight, of water. The term "granulated sugar" is used herein to refer to any sugar the predominant particle size of which is between about 210 microns and about 850 microns. Sugars which may be used in the practice of the present invention include sucrose, dextrose, (anhydrous or the monohydrate), mannitol or sorbitol, or a combination thereof, in dry granular form, having the the aforementioned particle size. Any water of crystallization associated with the sugar, as in dextrose monohydrate, will not interfere with obtaining a batch material having the properties described above. Other dry, granular sugars may be used, such as spray-dried glucose, lactose and fructose, or a combination thereof. Because of the greater expense of fructose, it is preferred that, when used, it constitute only a minor proportion of the sugar content, advantageously less than about 15% of the final product.

Coloring and flavoring additives may be incorporated in the product if desired, as is common in chewing gum manufacture. The color, when used, will be a certified vegetable or synthetic dye. The coloring agent may be added as a powder or as a liquid concentrate. Any water associated with the color is negligible as far as the overall chewing gum composition is concerned. Typical flavors include peppermint, fruit extracts, and the like. The flavoring agent may be added in the form of a powder or liquid (oil). Such additives may be preliminarily incorporated in the chewing gum base or subsequently added thereto during mixing with the sugar. In addition, small amounts of other additives may be incorporated in the product, as by introduction initially in the chewing gum base, by mixing in with the sugar or by mixing into the final batch material. Such additives may include, for example, waxes, such as microcrystalline wax and paraffin wax; solid fats; calcium carbonate, and the like, which serve to control chewing and other properties of the product.

The proportions of the principal ingredients, i.e. granulated sugar and chewing gum base, may vary over relatively broad ranges. In general, the product may contain, by weight, from about 70 to about 95 percent sugar and from about 5 to about 30 percent chewing gum base. Preferably, the product contains, by weight, from about 80 to about 90 percent sugar and from about 10 to about 20 percent gum base. Any flavoring additive is added to taste in accordance with recognized practice. The same applies to the coloring additive. The

amount of coloring and/or flavoring additives incorporated in the finished product is relatively small, generally comprising, by weight, from about 0.4 to about 2.0 percent thereof. The other amounts of the possible additives referred to above are essentially incidental as far as the final product is concerned. Thus, the product may be considered as consisting essentially of the chewing gum base and granulated sugar. The specific proportions of components selected may depend upon various factors which will occur to those skilled in the art, especially the nature of the particular chewing gum base and the nature of the granulated sugar employed.

The batch material employed in the present invention is conveniently prepared using conventional chewing gum mixing apparatus. A sigma blade mixer equipped with a steam-heated jacket is suitable for this purpose. An appropriate amount of granular sugar is placed in the mixer and heated to a temperature between about 125° F. to about 200° F., and preferably between about 180° F. and about 190° F. Molten chewing gum base, along with any coloring or flavoring additive is then introduced into the mixer. The chewing gum base is rendered molten by heating to a temperature of about 130° F. to about 250° F. As previously noted, the sugar goes into the mixer before the chewing gum base, in order to prevent sticking of the gum base to the walls of the mixer.

During mixing, the components of the batch material are subject to a combined pulling, kneading and rubbing action by virtue of the revolving sigma blades, so that the sugar particles are pushed into the chewing gum base and the mass is continuously being broken into pieces and the pieces recombined and pressed together. Mixing is continued for a time sufficient for the formation of the previously described semifluid conglomerate, made up of sugar particles coated with the chewing gum base. A suitable mixing time for a batch material weighing approximately one hundred pounds and having a sugar content of approximately eighty-five percent is on the order of five minutes. Appropriate mixing times for larger or smaller batches, or batches of different sugar content may readily be determined by trial.

The batch material is discharged from the mixer while it is still hot, its temperature generally being in the neighborhood of about 190° F. to about 200° F. Of course, the temperature may vary depending on the initial temperature of the sugar and gum base.

The batch material may undergo various forming operations to produce the final product. Generally, forming operations involving the application of light pressure are preferred to ensure the production of a relatively low density products. Such operations include forming a molded product in a mold or framed plate, forming a sheeted product on a conveyor belt, or forming a particulate product of various particle sizes by applying the batch material and comminuting it while cold.

The molding operation is conveniently carried out using conventional confectionary molds. The batch material is transferred while hot to the molds and allowed to cool to form the finished chewing gum product. Charging of the molds with the batch material may be done manually, or it may be automated, using equipment well known to those skilled in the art.

Alternatively, the batch material may be applied while hot to a conveyor belt, forming a sheet, which is then scored vertically and horizontally, as in the manufacture of stick chewing gum. The batch material is

conveniently formed into continuous sheets sixteen inches wide by and about one and one half inch thick. The dimensions of the scored portions of the sheet may vary, depending, or, upon the criteria of the product and/or the suitability of the conventional packaging equipment.

Because the batch material is subjected only to relatively light pressure in the aforesaid forming operations, the resultant product has a density considerably lower than that of conventional chewing gum, and lower than the density of the chewing gum product of the above-mentioned U.S. Pat. No. 3,262,784, as well. In general, the density of the finished product is between 0.5 and 1.0 g./cc., and typically toward the middle of that range, giving the product its desirable spongy chewing quality.

The batch material may also be converted to a particulate product. This may be accomplished by cooling the batch material, e.g. to a temperature of about 20°-40° F., and comminuting the batch material into particles of various sizes. Suitable comminuting apparatus for this purpose are well known to those skilled in the art. The particles may be graded to a desired particle size, and packaged as such.

The following examples further describes the manner and process of making the present invention and set forth the best mode contemplated for carrying out the invention, but are not to be construed as limiting the invention.

EXAMPLE I

127.5 pounds of granular sucrose having an average particle size of approximately 375 microns (less than 8% passed through a 100 mesh (U.S.) screen) was placed in a Baker Perkins sigma blade mixer equipped with a steam-heated jacket. The sugar was heated to a temperature of approximately 200° F. and the steam was turned off. In a separate vessel bubble gum base was melted at a temperature of approximately 200° F. An aliquot of 20.8 pounds of the gum base was added to the mixer containing the sugar. At the same time 1.5 pounds of N & A (natural and artificial) liquid tutti-frutti flavor and approximately 0.22 pounds of FD&C yellow #5 lake was added. Mixing was carried out until a semifluid conglomerate of the sugar particles coated with the gum base was obtained, which required approximately five minutes. The resultant batch material was removed from the mixer while still hot and charged manually into confectionery molds. After the molded product cooled to room temperature, the individual pieces were removed from the molds ready for packaging.

EXAMPLE II

The procedure of Example I was repeated except that the bubble gum base was replaced by an adult stick gum base, and the batch size was scaled down to 2000 grams.

The resulting batch material yielded a final product having the characteristics described hereinabove.

EXAMPLE III

A first batch material was prepared in the manner described in Example I, with the exception of a scaled down batch size of 2000 grams.

A second batch material was prepared as described in Example I, except that FD&C Red #40 lake was substituted for the FD&C Yellow #5 lake, and the batch size was 2000 grams.

The two batch materials were mixed together until a uniform master batch was obtained.

The master batch was formed into a final product as described in Example I. The red and yellow coloring additives were distinctly visually discernable in the final product.

EXAMPLE IV

A first batch material was made according to the procedure of Example I except the batch size was 2000 grams.

A second batch material was prepared as described in Example I, except that the tutti frutti flavor was replaced by cherry flavor except the batch size was 2000 grams.

The two batch materials were blended until a uniform master batch was obtained.

The master batch was formed into a final product as described in Example I. The cherry and tutti frutti flavoring additives were distinctly gustatively discernable in the final product.

While the invention has been described in the terms of a presently preferred embodiment, many other embodiments will be readily apparent to those skilled in the art. The invention is therefore not limited to the embodiment described but is capable of variations and modifications without departing from the spirit and scope of the appended claims.

What is claimed is:

1. A chewing gum composition in the form of a flowable conglomerate consisting essentially of, by weight, from about 70 to about 95 percent of substantially dry granulated sugar, the predominant particle size of which is between about 210 and about 850 microns, intimately mixed with from about 5 to about 30 percent of substantially dry chewing gum base.
2. A composition according to claim 1, wherein said sugar is selected from the group of sucrose, dextrose, sorbitol, mannitol or a combination thereof.
3. A composition according to claim 1, wherein the gum base is selected from the group of bubble gum or adult chewing gum.
4. A composition of matter according to claim 1, which additionally contains at least one additive selected from the group of a coloring additive or a flavoring additive.
5. A composition according to claim 4, in the form of a shaped chewing gum product.
6. A product according to claim 5, which includes a plurality of different coloring additives, said coloring additives being distinctly visually discernable in said product.
7. A product according to claim 5, which includes a plurality of different flavoring additives, said flavoring additives being distinctly gustatively discernable in said product.
8. A composition according to claim 1, wherein the sugar is sucrose and the chewing gum base is bubble gum.
9. A composition according to claim 8, which additionally contains at least one additive selected from the group of a coloring additive or a flavoring additive.
10. A composition according to claim 9, in the form of a shaped chewing gum product.
11. A product according to claim 10, which includes a plurality of different coloring additives, said coloring additives being distinctly visually discernable in said product.

12. A product according to claim 10, which includes a plurality of different flavoring additives, said flavoring additives being distinctly gustatively discernable in said product.

13. A composition of matter in the form of a flowable conglomerate consisting essentially of an intimate blend of substantially dry granulated sugar, selected from the group consisting of sucrose, dextrose, sorbitol, mannitol or a combination thereof, the predominant particle size of said sugar being between about 210 microns and about 850 microns, substantially dry chewing gum base selected from the group of bubble gum or adult chewing gum, and at least one additive selected from the group of a coloring additive or a flavoring additive, said composition containing, by weight, from about 80 to about 90 percent of said sugar, from about 10 to about 20 percent of said chewing gum base and from about 0.4 to about 2.0 percent of said additive.

14. A composition according to claim 13, wherein the sugar is sucrose and the chewing gum base is bubble gum.

15. A process for making a shaped chewing gum product, said process comprising:

- (a) preparing a batch material by mixing substantially dry, molten chewing gum base with substantially dry granulated sugar for a time sufficient for the formation of a flowable conglomerate of said sugar particles coated with said chewing gum base; the predominant particle size of said sugar being between about 210 microns and about 850 microns, and said sugar being heated to a temperature between about 125° F. and about 200° F.; and
- (b) forming said batch material into a shaped chewing gum product.

16. A process according to claim 15, wherein said chewing gum base is rendered molten by heating to a temperature of about 130° F. to about 250° F.

17. A process according to claim 15, wherein said batch material contains, by weight, from about 70 to about 95 percent sugar and from about 5 to about 30 percent chewing gum base.

18. A process according to claim 15, wherein the sugar is selected from the group of sucrose, dextrose, sorbitol, mannitol or a combination thereof, and the chewing gum base is selected from the group of bubble gum and adult chewing gum.

19. A process according to claim 15, wherein the sugar is sucrose and the chewing gum base is bubble gum.

20. A process according to claim 15, wherein said batch material contains at least one additive selected from the group of a coloring additive or a flavoring additive.

21. A process according to claim 15, wherein the forming step involves molding said batch material into a molded chewing gum product.

22. A process according to claim 15, wherein the forming step involves sheeting said batch material and horizontally and/or vertically scoring the resultant sheet.

23. A process according to claim 15, wherein the forming step involves cooling said batch material and comminuting said cooled batch material into discrete particles.

24. A process for making a shaped chewing gum product, said process comprising:

- (a) heating substantially dry granulated sugar to a temperature between about 125° F. to about 200°

F.; said sugar being selected from the group of sucrose, dextrose, sorbitol, mannitol or a combination thereof, the predominant particle size of said sugar being between about 210 microns and about 850 microns;

(b) adding to said heated sugar substantially dry molten chewing gum base, selected from the group of bubble gum or adult chewing gum, and at least one additive selected from the group of a coloring additive, or a flavoring additive;

(c) mixing said sugar said chewing gum base and said additive for a time sufficient for the formation of a flowable conglomerate of said sugar particles coated with said chewing gum base, said additive being uniformly distributed throughout said conglomerate, the resulting mixture comprising, by weight, from about 80 to about 90 percent said sugar from about 10 to about 20 percent of said chewing gum base and from about 0.5 to about 2.0 percent of said additive; and

(d) forming said mixture into a shaped chewing gum product.

25. A product made according to the process of claim 24.

26. A process according to claim 25, wherein the sugar is sucrose and the chewing gum base is bubble gum.

27. A product made according to the process of claim 26.

28. A process for preparing a shaped, multi-colored chewing gum product, said process comprising:

(a) preparing a first batch material by mixing substantially dry, molten chewing gum base with substantially dry granulated sugar and a first coloring additive, for a time sufficient for the formation of a flowable conglomerate of said sugar particles coated with said chewing gum base, said first coloring additive being uniformly distributed throughout said conglomerate;

(b) preparing a second batch material by mixing substantially dry, molten chewing gum base with substantially dry granulated sugar and a second coloring additive, for a time sufficient for the formation of a flowable conglomerate of said sugar particles coated with said chewing gum base, said second coloring additive being uniformly distributed throughout said conglomerate;

(c) combining said first batch material and said second batch material into a master batch material; and

(d) forming said master batch material into a shaped chewing gum product characterized in that the first and second coloring additives are distinctly visually discernable in said product, thereby imparting a multi-colored appearance to said product.

29. A process according to claim 25, wherein at least one flavoring additive is incorporated in the master batch material.

30. A product made according to the process of claim 29.

31. A process according to claim 29, wherein the sugar is sucrose and the chewing gum base is bubble gum.

32. A product made according to the process of claim 31.

33. A process for preparing a shaped, multi-flavored chewing gum product, said process comprising:

(a) preparing a first batch material by mixing substantially dry, molten chewing gum base with substantially dry granulated sugar and a first flavoring additive, for a time sufficient for the formation of a flowable conglomerate of said sugar particles coated with said chewing gum base, said first flavoring additive being uniformly distributed throughout said conglomerate;

(b) preparing a second batch material by mixing substantially dry, molten chewing gum base with substantially dry granulated sugar and a second flavoring additive, for a time sufficient for the formation of a flowable conglomerate of said sugar particles coated with said chewing gum base, said second flavoring additive being uniformly distributed throughout said conglomerate;

(c) combining said first batch material and said second batch material into a master batch material; and

(d) forming said master batch material into a shaped chewing gum product characterized in that the first and second flavoring additives are distinctly gustatively discernable in said product, thereby imparting a multi-flavored taste to said product.

34. A process according to claim 33, wherein at least one flavoring additive is incorporated in the master batch material.

35. A product made according to the process of claim 33.

36. A process according to claim 33, wherein the sugar is sucrose and the chewing gum base is bubble gum.

37. A product made according to the process of claim 36.

* * * * *

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UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 4,588,592

DATED : May 13, 1986

INVENTOR(S) : Ronald J. Elias

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

--24--. Claim 26, column 9, line 26, "25" should be

--wherein--. Claim 36, column 10, line 47, "whwerein" should be

Signed and Sealed this
Eleventh Day of November, 1986

Attest:

DONALD J. QUIGG

Attesting Officer

Commissioner of Patents and Trademarks

172

United States Patent [19]

[11] 4,000,321

Mochizuki et al.

[45] Dec. 28, 1976

- [54] **PROCESS FOR THE PREPARATION OF CHEWING GUM**
- [75] **Inventors:** Ketsu Mochizuki, Kawasaki; Fumio Yokomichi, Yokohama, both of Japan
- [73] **Assignee:** Meiji Seika Kaisha, Ltd., Japan
- [22] **Filed:** May 8, 1975
- [21] **Appl. No.:** 575,522
- [30] **Foreign Application Priority Data**
May 17, 1974 Japan 49-54586
- [52] **U.S. Cl.** 426/5; 426/3
- [51] **Int. Cl.²** A23G 3/30; A23G 3/00
- [58] **Field of Search** 426/3-6
- [56] **References Cited**
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Primary Examiner—Jeanette M. Hunter
Attorney, Agent, or Firm—McGlew and Tuttle

[57] ABSTRACT

A process for the preparation of chewing gum, comprises the steps of:

forming a chewing gum composition by mixing a chewing gum base with sweeteners, flavorings, and colorants in accordance with the desired taste and appearance characteristics desired;

cooling the chewing gum composition to a temperature of at least below -15°C ;

crushing or grinding the refrigerated composition to obtain minute fragments or finely ground pieces of the composition; and

heating the minute fragments to cause them to adhere together, and to form an integrated chewing gum element thereof.

16 Claims, No Drawings

PROCESS FOR THE PREPARATION OF CHEWING GUM

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates in general to the preparation of chewing gum and, in particular, to a new and useful method of preparing chewing gum wherein a chewing gum composition is cooled to a temperature below -15°C and it is crushed or ground to form minute fragments and the fragments are subsequently warmed to cause them to adhere into a chewing gum unit.

2. Description of the Prior Art

The present invention is particularly related to a process for preparing chewing gum which is light in weight and low in specific gravity and which exhibits a soft chewing impression when it is chewed. Many processes are known for preparing chewing gum which is lightweight and low in specific gravity and which give a soft chewing impression when chewed, including one in which foaming agents are added to a chewing gum composition in the presence of water, and it is heated to temperatures in the range of from 110°C to 160°C . This method tends to harm the desired flavor and taste of the chewing gum products. In another method, for preparing aerated chewing gum, a foaming agent and a gelatine are used as mixing agents with a chewing gum base which is foamed. The disadvantage of this method is that the foaming agents and gelatine make it difficult to obtain chewing gum having a good flavor and taste. In addition, these methods both have the disadvantage that in order to obtain a desired fixed homogeneous texture of the products, the foaming conditions must be controlled very accurately by maintaining operating conditions such as temperature, etc., at a precise level, and this renders the quality control difficult.

A still further method provides chewing gum of low specific gravity which is prepared by feeding air through chewing gum materials which are being kneaded by applying the air through air supplying stirring rods in order to incorporate minute air bubbles into the texture thereof. In such a method, the quality control necessary to attain the final products of a desired fixed homogeneous texture is very difficult to obtain. With this method, mechanical transformations are imparted to the chewing gum and special devices are necessary therefor. With still other methods, the chewing gum is ground after a base is prepared by conventional processes, and known additives for the chewing gum, such as sweeteners, flavorings, colorings, etc., are applied. In some instances, the granules or powder is tabletted together with powder alcohol or powdered milk or cream into a multi-layered product. However, since the tableting process is conducted at the final stage, it is difficult to obtain final products having lightweight, low specific gravity, and a soft chewing impression when chewed.

SUMMARY OF THE INVENTION

In accordance with the present invention, a chewing gum is provided which is formed by mixing a chewing gum base with the desired sweeteners, corn syrups, starches, flavorings or colorants in order to form a chewing gum composition which is thereafter refrigerated or cooled to a temperature below freezing up to about -15°C or lower. The refrigerated composition is

then crushed or ground to obtain minute fragments of finely ground pieces of the composition and, thereafter, these fragments are heated or warmed to temperatures which cause them to adhere together and form an integrated body.

When conventional chewing gum composition which is prepared by conventional processes is refrigerated at temperatures around -15°C or lower, and preferably -20°C or lower, it can be finely crushed or ground to obtain minute fragments or finely ground pieces. When these minute fragments or pieces are leaved together with other powdery or massive materials as they are warmed or heated ambiently up to room temperature, an integrated body is formed due to the cross-linking or self-adhesion of the chewing gum matter and the integrated body incorporates therein minute air bubbles.

Either of the following methods can be employed to integrate the minute fragments or pieces of the mixture:

a. the refrigerated minute fragments or pieces may be warmed after an optional application of light pressure, if necessary by placing it in a mold or on a framed plate or by placing it on a conveyor belt or the like; or

b. the minute particles may be coated over pieces of edible materials which form centers using a rotating coating device, such as a revolving pan or drum, and thereafter, the coated materials may be warmed.

By an extremely simple process, as described above, there are obtained chewing gum products having a lightweight, low specific gravity and a desired fixed homogeneous texture which exhibits a soft chewing impression when chewed.

Accordingly, it is an object of the invention to provide a chewing gum method of manufacture for forming chewing gum which is of lightweight, low specific gravity and gives a desired soft chewing impression when chewed.

A further object of the invention is to provide a chewing gum which is formed by cooling a chewing gum mixture to a temperature below -15°C and, thereafter, breaking the refrigerated material into small pieces which are subsequently permitted to warm and to become adhered together.

A further object of the invention is to provide a simple and inexpensive method for forming chewing gum.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The process of the invention is described in detail as follows:

First, a chewing gum composition is prepared by appropriately kneading a chewing gum base which is obtained in a conventional manner with materials, such as sugar, glucose, corn syrup or the like and also with optional additives, such as flavorings, colorants and so on. The chewing gum composition is then cooled or refrigerated to a temperature below minus 15°C and, preferably, not higher than -20°C , at which temperature it is finely ground or crushed. Suitable temperatures for the crushing or grinding of the chewing gum composition are, in general, about -15°C or lower and preferably about -20°C or lower. The temperature depends upon the kinds and proportions of the components of the chewing gum base and the chewing gum composition. In a typical embodiment, the chewing gum composition is finely crushed or ground while

refrigerating it to the above-described temperatures and by spraying thereon or by immersing it into a liquefied gas refrigerant, such as liquid carbon dioxide, liquid nitrogen, or similar material.

The chewing gum composition may also be refrigerated to a temperature lower than the temperatures mentioned above and using a high speed refrigerator or a band-type tunnel continuous refrigerator which uses ammonia or Freon (a trade mark of E.I. duPont de Nemours & Co. Inc.) or the like as a refrigerant. In this case, the crushing or grinding of the composition is carried out while maintaining it at a temperature within the above-mentioned temperature ranges. A hammer mill, crusher, pelletizer, turbomill or similar device may be used for the crushing or grinding.

The minute fragments or finely ground pieces are either premixed with powdery or massive materials, such as herbs, coffee, cocoa, nuts, candied fruits, candies or the like, and subjected to a subsequent step where they are warmed to the normal room temperature or they are warmed to normal room temperature directly and permitted to become self-adhered and integrated.

A typical arrangement for effecting the self-adhesion and integration comprises layering the minute fragments or pieces in a mold or on a framed plate or plate conveying belt or the like, and subsequently, allowing the fragments to stand either at normal room temperature or under forced draught at or above normal temperatures.

A typical detailed manufacturing process would be carried out as follows:

After a chewing gum composition is refrigerated to below -15°C or even lower, and it is crushed or ground to form minute particles, the minute fragments or finely ground pieces are warmed to room temperature from the refrigerated state and they become cross-linked or self-adhered together to form an integrated body which incorporates minute air bubbles in the texture between the particles. This provides a chewing gum product having a light, soft chewing impression when chewed.

When the fragments or finely ground pieces are molded in a mold or a framed plate, the final products with a desired appearance or shape are obtained. When using a plate, a conveying belt or similar apparatus on which the fragments or pieces are layered, the integrated products are cut with a knife or a similar sharp device, such as a lattice-shape cutter, a stamping cutter, circular blade cutter, etc. In order to ensure good unity of the products, if the fragments or pieces of the chewing gum composition are such that they do not adhere together, or adhere with other materials to be mixed therewith, they are appropriately applied with light pressure manually or mechanically before they are warmed to the normal room temperature to thereby promote the cross-linking or adhering of the chewing gum. This is, of course, an auxiliary step to improve the unity of the product and, in principle, the integration step is carried out merely by permitting the refrigerated fragments or pieces to warm to the normal room temperature and become adhered together. The resulting chewing gum product contains a sufficient quantity of minute air bubbles and has a desired fixed homogeneous and consistent texture.

A chewing gum product obtained by the process of the invention has a specific gravity of from 0.7 to 0.8 and this corresponds to about 50% to 70% with respect to that of conventional stick chewing gums which lies in

a range of from 1.2 to 1.3. From the point of view of texture, in conventional chewing gums, such as stick or panned piece chewing gums, as well as those of the prior art processes, visco-elastic materials constitute a principal ingredient of the chewing gum base. Such a base comprises natural gums or resins, such as chicle or the like, or synthetic resins, such as polyvinyl acetate or similar materials, which are strongly combined together to form a net-like structure in the texture of the chewing gum. The structure of the inventive chewing gum, however, is such that the ground pieces adhere together through a visco-elastic adhesion on a point-to-point adhesion basis with air bubbles in between. As a consequence, the chewing gum of the invention, when chewed, gives initially a light, soft, less visco-elastic and crisp impression and, as the chewing proceeds, with attendant ingredient elution by the saliva and elevation of the temperature of the mouth, the chewing gum exhibits properties peculiar to chewing gums in general. Thus, they show a different chewing process from that found in existing chewing gum products as well as in those lightweight, low specific gravity products of the prior art methods.

The needle penetration of the chewing gum, according to the process of the invention, is 15.8 mm/5 sec., while that of the commercially available stick gum is 2.9 mm/5 sec. This proves that the chewing gum of the invention is softer than conventional chewing gums. The measurement of the needle penetration was conducted with the use of a penetrometer as described in the Japanese Industrial Standard (JIS). A 100 g weight is applied to a 1 mm diameter needle for the total load of 150 g acting on the specimen and the penetrated length of the needle into the gum during 5 seconds is measured at 20°C . In addition, a panel test was performed by a panel of 15 expert panelists in order to determine a significant difference in hardness between the chewing gum product by the typical process and that of the present invention in respect to a conventional type stick gum product. Scoring was made on the basis of the following criteria:

- 1 — Hard
- 2 — Slightly hard
- 3 — Moderate
- 4 — Slightly soft
- 5 — Soft

The results are set forth in the following table:

Score	Number of Panelists (total 15)	
	Chewing gum of the present invention	Conventional stick gum substrate
5	8	0
4	7	0
3	0	0
2	0	1
1	0	14

The above table indicates that all of the panelist judged the chewing gum of the typical embodiment of the present invention to be "slightly soft" or "soft", and judge the conventional stick gum product to be "slightly hard" or "hard", which is indicative of the significant differences in hardness.

The present invention may be produced by a modification of the basic process. One example of such a modification is a process as described in Example 3 herein to be set forth following, wherein a chewing gum

powder, held at an appropriate low temperature, is sprinkled over and coated on a spherical jelly particle as a center and using a coating device, such as a revolving pan or the like. This is followed by a coating with a gum solution and powdered sugar, and then by warming to a normal room temperature to effect self-adhesion of the chewing gum matter and integration of the components. Candies, other chewing gum pieces, nuts, candied fruit pieces and the like can be substituted as centers for the spherical jelly particles. Chocolate and similar materials may also be used in place of, or in addition to the gum solution and the powdered sugar.

EXAMPLE 1

A chewing gum composition was prepared by kneading 220 g of a chewing gum base obtained in a conventional manner, together with 590 g of sugar, 70 g of glucose and 100 g of corn syrup. This chewing gum composition was cooled to a normal room temperature and cut into 10 mm cubes after rolling. The cubes were then ground at a temperature of about -15°C or even lower into a powder with the grain size of the order of all passing through a 325 mesh sieve. The powder was immediately layered into a mold of 2.5 cm long $\times$ 2.5 cm wide to 1 cm deep and then allowed to stand at 20°C for 2 hours to effect self-adhesion and integration. Thus, molded chewing gum of hexahedron shape was obtained by releasing from the mold of that shape.

EXAMPLE 2

A chewing gum powder was prepared in the same manner as in Example 1. 100 g of this chewing gum powder was mixed with 8 g of fragments of hard candy. The mixture was foiled by the same self-adhesion and integration step as in Example 1. The molded chewing gum of hexahedron shape with fragments of hard candy therein was obtained by releasing the materials from the mold.

EXAMPLE 3

A chewing gum powder was prepared in the same manner as in Example 1. Jellies were molded into spherical particles of 2 g/particle in a room and kept at 10°C . 200 g of the chewing gum powder was sprinkled over the spherical jelly particles in a revolving pan to coat the same under temperatures kept below -10°C . After the coating was completed, 10 g of a gum solution prepared from corn syrup, sugar, gum arabic and water and 20 g of powdered sugar were sprinkled over the coated jelly particles and this process was repeated several times to assure uniform coating. The content of the mold was then emptied into a container and allowed to stand at 20°C for 10 hours to effect self-adhesion of the chewing gum matter and, consequently, integration. The chewing gum of a ball-shape with jellies as centers was obtained.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A process for the preparation of chewing gum, comprising mixing a chewing gum base with additives to produce a chewing gum composition of desired taste, color and flavor, cooling the chewing gum com-

position to temperatures below -15°C , forming the cooled chewing gum composition into minute fragments, and placing the minute fragments together in a pile and warming the fragments to cause them to become self-adhered together as they thaw and form an integrated chewing gum product with air spaces therebetween and without compressing them together so as to destroy the air spaces.

2. A process according to claim 1, including adding additional flavoring material to the minute fragments before permitting them to stand for a period of time to adhere together.

3. A process according to claim 2, wherein the material added to the minute fragments is selected from the group consisting of, herbs, coffee, cocoa, nuts, candied fruits, candies and mixtures thereof.

4. A process according to claim 1, wherein said minute fragments are formed by pulverizing the cooled composition and including adding the minute fragments into a mold before they are permitted to stand and become adhered together at room temperature.

5. A process according to claim 4, wherein said chewing gum composition is cooled by spraying thereon or directing it into a liquefied gas refrigerant.

6. A process according to claim 1, wherein the cooled chewing gum composition is pulverized by a pulverizer such as crusher, hammer mill, pelletizer or turbomill.

7. A process according to claim 1, wherein said additives are selected from the group consisting of sugar, glucose, corn syrup, flavorings, colorants and mixtures thereof.

8. A process for the preparation of chewing gum product, comprising mixing a chewing gum base with additives to produce a chewing gum composition of desired taste, color and flavor, cooling the chewing gum composition to temperatures below -15°C , forming the cooled chewing gum composition into minute fragments, coating a confection material with the cooled fragments, followed by coating with powdered sugar and gum solution, chocolate, or the like, and warming the resulting product to effect self-adhesion of the chewing gum matter.

9. A process according to claim 8, wherein said confection material is selected from the group consisting of candies, jellies, candied fruits and chewing gum pieces.

10. A process according to claim 8, wherein said minute fragments are formed by pulverizing the cooled composition.

11. A process according to claim 10, wherein said chewing gum composition is cooled by spraying thereon or directing it into a liquefied gas refrigerant.

12. A process according to claim 8, wherein the cooled chewing gum composition is ground by a pulverizer such as a crusher, hammer mill, pelletizer or turbomill.

13. A process according to claim 8, wherein said coating is carried out with a rotating coating device.

14. A process according to claim 8, wherein said coating is carried out in a rotating coating device which is a revolving pan or drum.

15. A chewing gum prepared by the process of claim 1.

16. A chewing gum product prepared by the process of claim 8.

* * * * *

United States Patent [19]

Kaul

[11] 4,161,544

[45] Jul. 17, 1979

[34] PROCESS FOR MAKING A POURABLE MATERIAL FOR CHEWING GUM

[76] Inventor: Dieter Kaul, Vonskuhlen 6, 2200 Elmhorn, Fed. Rep. of Germany

[21] Appl. No.: 894,878

[22] Filed: Mar. 9, 1978

[30] Foreign Application Priority Data

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[31] Int. Cl.² A23G 3/30

[32] U.S. Cl. 426/3; 426/3

[38] Field of Search 426/3, 5

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Primary Examiner—Jeanette M. Hunter

Attorney, Agent, or Firm—Allison C. Collard; Thomas M. Galgano

[57] ABSTRACT

Process for making a pourable material for chewing gum by adding to a dry base of chewing gum heated to about 60°–120° C., dry sugar materials, polysaccharides, natural gums and swelling agents, or mixtures thereof, mixing the mass at this temperature for about 1–15 minutes, subsequently cooling the mixture to a temperature of from 30–minus 5° C. and continuing the mixing for about 1–15 minutes.

11 Claims, No Drawings

PROCESS FOR MAKING A POURABLE MATERIAL FOR CHEWING GUM

The invention relates to a process for making a pourable-non-caking material for chewing gum and a device for carrying out the process. The invention also relates to chewing gum made from this material in compressed form.

Up to the present, materials for chewing gum are conventionally made by using syrup, especially glucose syrup as an additive. The addition of syrup, which essentially influences the consistency of chewing gum products, results in masses which can only be made into shapes of very limited range by the use of extrusion presses or rollers with subsequent cutting or otherwise separating of the mass. More particularly, it is not possible to compress the masses into tablets or figures.

For overcoming this disadvantage, a process has already been proposed for making a chewing gum material leading to a crumbling, pulverulent mixture, which can be shaped by simple compression and can be mixed with other finely dispersed substances or liquids. However, this known chewing gum material is hard, and will, therefore, not yield a satisfactory end product. Furthermore, this mass has to be subjected to a special grinding process before being compressed, because it consists of larger or small agglomerates.

It is the object of the present invention to provide a process and device which will overcome the shortcomings of the known chewing gum materials.

More particularly, it is an object of the invention to provide a pourable powder for making chewing gum with simple means and at low expenses, which will remain pourable at normal temperatures even after storage, without forming agglomerates.

It is another object of the invention to provide materials which can be easily compressed into various shapes.

Other objects and advantages of the process and device of the invention will become apparent from the following detailed description.

The above objects can be accomplished according to the invention, by starting from a dry base material heated to a temperature of 60°-120° C. and adding thereto dry sugar materials such as saccharose, dextrose, xylitol, mannitol, and sorbitol, polysaccharides, natural gums and swelling agents, mixing the ingredients at the aforementioned temperature for about 1-15 minutes, thereafter cooling the mixture to about 30-minus 5° C. and continuing the mixing operation for another 1-15 minutes.

The polysaccharides maybe starch, physically or chemically modified starch, for instance, surface-treated starch, amyliated starch, esterified or etherified starch, or partly chemically or enzymatically degraded starch having a DE-value of maximally 40; also cellulose, cellulose derivatives, e.g., methylated or carboxylated cellulose, as well as partly hydrolysed cellulose. The natural gums may be gum arabic or pectines. Useful swelling agents are tragacanth, guar gum, carob gum, carragana, alginic acids, alginates, gelatine or agar agar.

It is, of course, possible to use mixtures of the above named compounds. The invention also comprises the possibility of using the substances or their mixtures with an addition of glucose syrup, dissolved or dispersed in water and subsequently subjected to spray drying or roller drying. The amount of glucose syrup should be

such that the DE-value of the dry mixture is maximally 40. The device for carrying out the process of the invention may consist of a speed mixer of known design which can be used at the temperature of 60°-120° C., and which has an rpm of 6000; for the subsequent mixing at a temperature of 30-minus 5° C., a cooling mixer of known design may be used which is supposed to run at 150 rpm. The two mixers may be combined into a single mixer with adjustable rpm having a heating and a cooling unit. The mixing operations may also be carried out in a kneading device with appropriate heating and cooling means. The product made according to the invention is especially intended to serve for the production of compressed chewing gum in pressure molds, where it is to be formed into tablets, lozenges, figures, sticks, granulates, and the like.

In the following, the invention will be more fully described in a number of examples, which are given by way of illustration and not of limitation. All percentages are by weight.

EXAMPLE 1

a) Base	20%
b) Glucose syrup DE 40	9%
c) guar gum	0.50%
d) Starch (degraded by Oxidation)	20%
e) Powdered Sugar	49.70%
f) Flavoring	0.80%

The chewing gum base (commercial quality) is passed into a speed mixer of known design which is first heated to 60° C. After the base has become plastic, glucose syrup is added first and then the mixture of substances c, d, and e is added. The mass is mixed for 5 minutes and conveyed to a cooling mixer of known design. As soon as a temperature of 50° C. has been reached, flavoring agent is added, whereupon the mass is cooled down to 20° C., with coarse crumbs being formed first, which disintegrate and form a pourable powder when room temperature is reached. The powder is conveyed to a tableting machine over a vibrating screen (mesh about 1 mm) and compressed to the desired shape. The portion of the chewing gum powder, which does not pass the screen, is returned to the speed mixer and processed with the next batch.

EXAMPLE 2

a) Base	20%
b) Glucose syrup	9.50%
c) Carob gum	0.50%
d) Amylopectin Starch	19.20%
e) Powdered Sugar	50.0%
f) Flavoring	0.8%

The operations are carried out as in Example 1, with the exception that the speed mixer has a wall temperature of 70° C. and the mixing time is 2 minutes.

EXAMPLE 3

a) Base	20%
b) Glucose Syrup DR 40	1%
c) Malasse Dextrin DE 8	21.50%
d) Tragacanth	0.50%
e) Powdered Sugar	49.20%

-continued

f) Flavorings	0.80%
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Processing is carried out as in Example 1.

EXAMPLE 4

a) Base	25.0%
b) Gum Arabic	1%
c) Native Potato starch	12%
d) Dextrose	41.20%
e) Flavoring	0.80%

The base is passed into a sigma-kneader of known design with heating and cooling devices, which is first heated up to 60° C. (wall temperature). After the mass has become plastic, a mixture of gum arabic and potato starch is added, which is kneaded at 60° C. for 10 minutes and then cooled down to 35° C. Next flavoring is added and finally the dextrose. Obtained is a crumbly mass, which is transferred to a cooling mixer where it is cooled to 10° C. There results a hygroscopic powder which is rapidly packaged—if possible, maintaining the temperature of 10° C.—or is further processed.

While only several embodiments of the present invention have been described, it will be obvious to those persons of ordinary skill in the art that many changes and modifications may be made thereto without departing from the spirit and scope of the invention.

What is claimed is:

1. A process for making a pourable material for chewing gum, which comprises the steps of:
 - adding to a dry base of chewing gum heated to about 60° to 120° C. dry sugar materials, polysaccharides, natural gums and swelling agents;
 - mixing and crushing the mass at this temperature for about 1-15 minutes;
 - subsequently cooling the mixture to a temperature ranging from 30-minus 5° C., and continuing the mixing for about 1-15 minutes, so as to produce a pourable powder for making chewing gum, which will remain pourable at normal temperatures even after storage without forming agglomerates.

2. The process according to claim 1, wherein as sugar materials saccharose, dextrose, xylit, or mannit and sorbit are added.

3. The process according to claim 1, wherein as polysaccharides starch, physically or chemically modified starch, and partly chemically or enzymatically degraded starch having a DE-value of maximally 40 are added.

4. The process according to claim 2, wherein the polysaccharides added are cellulose, derivatives of cellulose, and partly hydrolyzed cellulose.

5. The process according to claim 1, wherein as natural gums gum arabic and pectines are used.

6. The process according to claim 1, wherein as swelling agents tragacanth, guar gum, carob gum, carragans, alginic acids, alginates, gelatine or agar agar are used.

7. The process according to claim 1, wherein mixtures of sugar materials, polysaccharides, natural gums and swelling agents are used as additions to the dry gum base.

8. The process according to claim 1, wherein glucose syrup dissolved or dispersed in water is added to the mass, which is subsequently subjected to spray or roller drying.

9. The process according to claim 8, wherein the DE-value of the dry mixture is adjusted to maximally 40.

10. Chewing gum material in compressed form and in the shape of tablets, figures, sticks, and granulates, when produced by the process according to claim 1.

11. A process for making a pourable powder for making chewing gum, which comprises the steps of:

- adding to a dry base of chewing gum heated to about 60° to 120° C. and received in a speed mixer operated at 300 to 600 rpm, dry sugar materials, polysaccharides, natural gums and swelling agents; and
- mixing the mass in the speed mixer at this temperature for about 1-15 minutes while said speed mixer is operated at 300-6000 rpm;
- subsequently cooling the mixture to a temperature ranging from 30-minus 5° C., in a cooling speed mixer while continuing the mixing thereof for about 1-15 minutes while said cooling speed mixer is operated at 20-150 rpm, so as to produce a pourable powder for making chewing gum, which will remain pourable at normal temperatures even after storage without forming agglomerates.

United States Patent [19]

Patel et al.

[11] Patent Number: 4,948,595

[45] Date of Patent: Aug. 14, 1990

[54] **SPEARMINT ENHANCED PEPPERMINT
FLAVORED CHEWING GUM WITH
IMPROVED STABILITY**

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[51] Int. Cl.³ A23G 3/30

[52] U.S. Cl. 426/3; 426/651;
426/534

[58] Field of Search 426/3-6,
426/650, 651, 534, 535

[56] **References Cited**

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4,476,142 10/1984 Netherwood et al. 426/3
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[57] **ABSTRACT**

The present invention includes a method of enhancing the flavor of a peppermint flavored chewing gum by the addition of a minor amount of a flavor enhancer consisting of spearmint flavor and methyl salicylate combined with a peppermint flavoring agent to form the peppermint flavor mixture for the chewing gum. The amount of spearmint flavor and methyl salicylate comprises about 0.1 to about 2 of the total mixture of peppermint flavor mixture added to the chewing gum. In addition, the ratio of spearmint flavor to methyl salicylate is between about 10:1 to about 2:1.

18 Claims, No Drawings

SPEARMINT ENHANCED PEPPERMINT FLAVORED CHEWING GUM WITH IMPROVED STABILITY

BACKGROUND OF THE INVENTION

The present invention relates to chewing gum and methods for producing it. More particularly, the invention relates to an enhancement of the flavor profile of peppermint flavored chewing gum.

Of all the flavors incorporated into chewing gum, mint flavors have been some of the most popular. Most widely used have been peppermint and spearmint as well as blends of the two. Typically, peppermint and spearmint flavors are added to chewing gum in the form of essential oils. Peppermint oil is derived by distillation of the aerial parts of the perennial herb *Mentha piperita* L. Oil of Coriander, derived from *Mentha arvensis* L. var *piperascens*, can also be blended with peppermint oil. Oil of Spearmint is derived from distillation of several species and varieties of the genus *Mentha*. The principle species and varieties are *Mentha spicata* L. and *Mentha verticillata*, and *Mentha cordata*.

The flavor profiles of these mints in chewing gum are somewhat complex in nature. Accordingly, much research has been carried out to optimize the flavor effects of these mints. For example, U.S. Pat. No. 4,613,513 discloses a process wherein essential oils such as spearmint oil and peppermint oil are treated with a small amount of a mild oxidizing agent, a Fehlings solution, to remove harsh flavor notes. Similarly, U.S. Pat. No. 4,708,880 describes a process wherein harsh flavor notes are removed from peppermint and spearmint oil by treatment with a peroxide-acid reagent.

A flavor enhancer for mint flavored chewing gums is described in European Patent Application No. 87810165. This reference discloses a flavor enhancer comprising a derivative of soy which is reported to reduce the bitter or harsh flavor notes perceived after substantial chewing.

European Patent Application No. 87810601 discloses a method of enhancing the perceived breath freshening effects of a mint flavored chewing gum. The disclosed composition includes peppermint and/or spearmint oil with a specified menthol content; a spray dried peppermint and/or spearmint oil; and spray dried menthol.

A series of patents including U.S. Pat. Nos. 4,456,621, 4,440,790, 4,476,142, and 4,478,864 all teach a method of enhancing the flavor of peppermint gum. The flavor is improved by reacting maleic anhydride with menthofuran, an oxidative contributor, found in peppermint oil.

SUMMARY OF THE INVENTION

The present invention includes a method of enhancing the flavor of a peppermint flavored chewing gum by the addition of a minor amount of spearmint flavor and methyl salicylate to the chewing gum. The invention also includes the peppermint flavored chewing gum with spearmint flavor and methyl salicylate added in a minor amount. The chewing gum of the present invention includes a gum base, a sweetener, a peppermint flavoring agent, and a peppermint flavor enhancer consisting of a combination of spearmint flavor and methyl salicylate. The amount of spearmint flavor and methyl salicylate ranges from about 0.1% to about 2% of the total peppermint flavor mixture added to the base gum.

Furthermore, the ratio of the spearmint flavor to methyl salicylate is between about 10:1 to 2:1.

In accordance with a preferred embodiment, the blend of the methyl salicylate and spearmint flavor is about 0.4% of the total peppermint flavor mixture added to the gum. In addition, the peppermint flavoring agent is preferably a blend of natural or synthetic peppermint. Also, the peppermint flavor mixture, i.e., combined peppermint flavoring agent and the spearmint oil and methyl salicylate are included in the gum at a level of about 1.5 weight percent of the chewing gum.

At the relatively low level at which the mixture of spearmint flavor and methyl salicylate is used in the present invention, it should not contribute a spearmint taste to the chewing gum. However, it has been found that at this low level, the blend contributes to the overall flavor of the peppermint flavored chewing gum in such a way as to enhance the peppermint flavor of the chewing gum. In particular, the enhancement has been described as making the peppermint taste stronger, fuller, sweeter and cooler.

It has also been found that the addition of a small amount of spearmint flavor and methyl salicylate may increase the shelf stability of the flavor of a peppermint flavored chewing gum. While not wishing to be bound by any particular theory, it is currently believed that the added blend retards the oxidation of the synthetic or natural peppermint which in turn retards the aging of the gum from a flavor standpoint.

As used in this specification and the appended claims, the term "peppermint flavored chewing gum" is intended to refer to a chewing gum which has peppermint as its dominant flavor.

Unless otherwise noted all percentages in this specification and appended claims are percentages by weight.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The peppermint flavored chewing gum of the present invention includes a gum base, a sweetener, a peppermint flavoring agent with a minor amount of spearmint flavor and methyl salicylate.

Chewing gum bases generally comprise a combination of elastomers and resins together with plasticizers and inorganic fillers.

The gum base may contain natural gums and/or synthetic elastomers and resins. Natural gums include both elastomers and resins. Suitable natural gums include, but are not limited to, chicle, jelutong, sorva, nispero, niger gutta, massaranduba belata, and chiquibul.

When no natural gums are used, the gum base is referred to as "synthetic" and the natural gums are replaced with synthetic elastomers and resins. Synthetic elastomers may include polyisoprene, polyisobutylene, isobutylene-isoprene copolymer, styrene butadiene rubber, and the like. Of these, polyisoprene, isobutylene and isobutylene-isoprene copolymer are preferred, with the copolymer being the most preferred. A copolymer obtained from Exxon Corp. under the designation "butyl rubber" is suitable for use in the most preferred embodiment.

The amount of elastomer used in the gum base can typically be varied between about 10 and about 20 percent depending on the specific elastomer selected and on the physical properties desired in the final gum base. For example, the viscosity, softening point, elasticity can be varied.

Resins used in gum bases include polyvinyl acetate, polyethylene, ester gums, (resin esters of glycerol) and polyterpenes. Of these, ester gums, polyethylene, and polyvinyl acetate are preferred, with a combination of polyvinyl acetate and ester gums being most preferred. A polyvinyl acetate obtained from MONSANTO under the designation "Gelva" is a suitable polyvinyl acetate for use in the most preferred embodiment.

As with the elastomer, the amount of resin used in the gum base can be varied depending on the particular resin selected and on the physical properties desired in the final gum base.

Preferably, the gum base also includes plasticizers selected from the group consisting of fats, oils, waxes, and mixtures thereof. The fats and oils can include tallow, hydrogenated and partially hydrogenated vegetable oils, and cocoa butter. Commonly employed waxes include paraffin, microcrystalline and natural waxes such as beeswax and carnauba. The amount of plasticizer used can vary between about 10 and 40 percent.

The most preferred embodiment uses a mixture of paraffin wax and partially hydrogenated vegetable oil and glycerol monoacetate.

The gum base preferably includes a filler component. A filler component is preferably selected from the group consisting of calcium carbonate, magnesium carbonate, talc, dicalcium phosphate and the like. The filler may constitute between about 5 to about 60 percent by weight of the gum base. The filler may comprise about 5 to about 50 percent by weight of the gum base.

Further, gum bases may also contain optional ingredients such as antioxidants, colors, and emulsifiers.

These ingredients of the gum base can be combined in a conventional manner. In particular, the elastomer, resins, plasticizers and the filler, are typically softened by heating and then mixed for a time sufficient to insure a homogeneous mass. The mass can be formed into slabs, or pellets and allowed to cool before use in making chewing gum. Alternatively, the molten mass can be used directly in a chewing gum making process.

Typically, the gum base constitutes between about 5 to about 95 percent by weight of the gum. More preferably, the insoluble gum base comprises between 10 and 50 percent by weight of the gum and most preferably about 20 to about 35 percent by weight of the gum.

In general, a chewing gum composition typically comprises a water soluble bulk portion added to the water insoluble chewable gum base portion. The flavoring agents are typically water insoluble. The water soluble portion dissipates with a portion of the flavoring agent over a period of time during chewing, while the gum base portion is retained in the mouth throughout the chew.

In the most preferred embodiment, the invention is used in a sugarless chewing gum. Generally sugarless sweeteners include components with sweetening characteristics but are devoid of the commonly known sugars and comprise but are not limited to high-potency sweeteners and/or sugar alcohols. Suitable high-potency sweeteners include aspartame, althame, salts of acesulfame, saccharin and its salts, cyclamic acid and its salts, glycyrrhizin, sucralose, thaumatin, and monellin, as well as combinations thereof.

Suitable sugar alcohols include sorbitol, mannitol, xylitol, hydrogenated starch hydrolyzates, maltitol, and the like, as well as combinations thereof. Preferably, the sugarless gum comprises a combination of a high-potency sweetener with a sugar alcohol, most prefer-

bly aspartame with sorbitol. In a preferred embodiment, the water soluble portion is a mixture of sorbitol at about 50 percent, mannitol at about 8 percent, and Lycosin at about 7 percent of the final chewing gum mixture.

In an alternative embodiment, the invention is used in a sugar based peppermint flavored chewing gum. The water soluble portion of the chewing gum may further comprise softeners, sweeteners, flavoring agents and combinations thereof. Softeners are added to the chewing gum in order to optimize the chewability and mouth feel of the gum. Softeners, also known in the art as plasticizers or plasticizing agents, generally constitute between about 0.5 to about 15.0 percent by weight of the chewing gum. The softeners contemplated by the present invention include glycerin, lecithin, and combinations thereof. Further, aqueous sweetener solutions such as those containing sorbitol, hydrogenated starch hydrolyzates, corn syrup and combinations thereof may be used as softeners and binding agents in gum. Preferably, the chewing gum contains about 9 percent glycerine.

Sugar sweeteners generally include saccharide containing components commonly known in the chewing gum art which comprise but are not limited to sucrose, dextrose, maltose, dextrin, dried invert sugar, fructose, levulose, galactose, corn syrup solids, and the like, alone or in any combination.

According to the present invention, the chewing gum includes a peppermint flavoring agent to give the gum a peppermint taste. Typically, the overall peppermint flavor mixture content of the chewing gum will be in the range of about 0.1 to about 2.0 weight percent of the gum. Preferably, the flavor mixture will be about 1.5 weight percent.

The peppermint flavoring agents may comprise either natural or synthetic peppermint oils, and preferably blends of natural and synthetic. The peppermint flavor mixture usually comprises from about 98 to about 99.9 weight percent of the flavor mixture and from about 0.1 to about 2 weight percent peppermint flavor enhancer. In a preferred embodiment, the peppermint flavor mixture is a blend of 99.6 weight percent peppermint flavoring agent and 0.4 weight percent peppermint flavor enhancer.

The peppermint flavor enhancer is a blend of spearmint flavor and methyl salicylate. The peppermint flavor enhancer should range from about 0.033% to about 0.5% methyl salicylate and 0.1% to about 1.5% spearmint flavor agent of the weight percent of the total peppermint flavor mixture. In the preferred embodiment of this invention, the spearmint flavor comprises spearmint oil. The ratio of spearmint flavor to methyl salicylate can vary between about 10 to 1 to about 2 to 1. Preferably, the ratio of spearmint flavor to methyl salicylate is 3 to 1.

The active ingredient imparting flavor to the spearmint oil is L-carvone. In this invention's most preferred embodiment, the L-carvone should constitute about 55% of the spearmint oil. The ratio of L-carvone to methyl salicylate can range from about 5 to 1 to about 1 to 1. Outside this range, there is a decline in the peppermint flavor quality.

Additionally, menthol constitutes about 50% of the peppermint oil; therefore, the ratio of menthol to L-carvone is also significant. The minimum ratio of menthol to L-carvone at which a noticeable difference in the taste of the peppermint flavor would be observed is

about 60 to 1 and the maximum ratio showing an effect would be about 500 to 1. It should be stressed that in the preferred embodiment, the L-carvone to methyl salicylate should be maintained in the range listed above.

Other, flavoring agents and adjuvants can also be added to the chewing gum of the present invention. For example, oils of anise, eucalyptus, clove and cinnamon. Also, flavor chemicals such as furanones which give a caramel flavor note can be added. Those skilled in the art will recognize that natural and artificial flavoring agents may be combined in any sensorially acceptable blend. All such flavors and flavor blends which result in a peppermint flavored gum as contemplated by the present invention.

Optional ingredients such as colors, emulsifiers, and pharmaceutical agents may be added to the chewing gum.

In general, chewing gum is manufactured by sequentially adding the various chewing gum ingredients to a commercially available mixer known in the art. After the ingredients have been thoroughly mixed, the gum mass is discharged from the mixer and shaped into the desired form such as by rolling into sheets and cutting into sticks, extruding into chunks or casting into pellets.

Generally, the ingredients are mixed by first melting the gum base and adding it to the running mixer. The base may also be melted in the mixer itself. Color or emulsifiers may also be added at this time. Most of the sorbitol bulking agent is added first. Then a softener such as glycerin may also be added at this time along with hydrogenated starch hydrolyzate and a portion of bulking agent. The remaining portion of the bulking agent may then be added to the mixer. A flavoring agent is typically added after the final portion of the bulking agent.

The entire mixing procedure typically takes from ten to twenty minutes, but longer mixing times may sometimes be required. Those skilled in the art will recognize that many variations of the above described procedure may be followed.

EXAMPLES

EXAMPLES 1 AND 2

Examples 1 and comparative Example 2 were carried out to make a taste comparison between peppermint flavored chewing gum with a minor amount of spearmint flavor and methyl salicylate and a peppermint flavored chewing gum without the blend. Example 1 was performed as an example of the preferred embodiment of this invention. Example 1 and comparative Example 2 had the following formulae based on the total weight percent of the chewing gum:

	Wt. % Ex. 1	Wt. % Ex. 2
Base	24.4000	24.4000
Sorbitol	30.0000	30.0000
Mannitol	1.0000	1.0000
Glycerin	1.8000	1.8000
Lyxalin	6.8000	6.8000
Lecithin	0.2000	0.2000
Color	0.0500	0.0500
10% Salt Solution	0.0500	0.0500
Aspartame	0.2000	0.2000
Peppermint Flavor	1.4940	1.5000
Spearmint Flavor	0.0045	—
Methyl Salicylate	0.0015	—

-continued

	Wt. % Ex. 1	Wt. % Ex. 2
Total	100.0000	100.0000

The peppermint flavoring agent in comparative Example 2 consisted of 1.5 parts by weight of the chewing gum. The composition of the flavor mixture in Example 1 also consisted 1.5 parts by weight of the total chewing gum, but was composed of 0.3% spearmint oil, 0.1% methyl salicylate and 99.6% peppermint flavoring agent and a ratio of spearmint oil to methyl salicylate of 3 to 1.

The formulae above were made into batches of chewing gum by conventional means.

Upon comparing the formula of Example 1 to that of the gum without the added blend of comparative Example 2, taste experts found that the gum of Example 1 had more sweetness, cooling, and a more deep full bodied peppermint flavor.

EXAMPLES 3 AND 4

Example 3 and comparative Example 4 also were performed in order to make a taste comparison between the peppermint flavored chewing gum of comparative Example 4 and gum with the added blend of spearmint oil and methyl salicylate which was composed of 1.5 and 0.5 weight percent of the total peppermint mixture respectively. Examples 3 and 4 had the following formulae based on the total weight of the gum.

	Wt. % Ex. 3	Wt. % Ex. 4
Base	24.4000	24.4000
Sorbitol	30.0000	30.0000
Mannitol	1.0000	1.0000
Glycerin	1.8000	1.8000
Lyxalin	6.8000	6.8000
Lecithin	0.2000	0.2000
Color	0.0500	0.0500
10% Salt Solution	0.0500	0.0500
Aspartame	0.2000	0.2000
Peppermint Flavor	1.4900	1.5000
Spearmint Flavor	0.0225	—
Methyl Salicylate	0.0075	—
Total	100.0000	100.0000

Again, expert taste panelists taste tested and compared the gum of Example 3 which had a 3 to 1 spearmint flavor/methyl salicylate ratio to comparative Example 4 which did not have the added blend. Upon sensory evaluation, the experts found that the gum with the blend had a cooler, stronger and sweeter peppermint flavor.

EXAMPLES 5-8

Examples 5 through 8 were conducted to determine the effects upon the peppermint flavor of chewing gum by the addition of different ratios of spearmint oil and methyl salicylate while maintaining a constant ratio of peppermint flavoring agent. In Examples 5, 6, 7 and 8 the peppermint flavoring agent was maintained at 98% while the ratio of the blend was varied. The ratio of spearmint oil (S/O) to methyl salicylate (M/S) in the example and the weight percent of the two substances in the peppermint flavor mixture are shown in the following tables:

	Ratio	Wt. % S/O	Wt. % M/S
Example 5	1/3	0.5	1.5
Example 6	3/1	1.5	0.5
Example 7	4/0	2.0	0.0
Example 8	2/2	1.0	1.0

A panel of chewing gum experts taste tested the 4 compositions of these examples to evaluate the differences in taste between various blends added to the peppermint flavor mixture and found that Example 6 had the best flavor quality giving higher cooling and sweetness. Additionally, the panel of gum experts found upon comparing Example 5 to Example 8, that both Examples had a slightly bitter, spicy flavor quality. Moreover, the panelists found, upon comparing Examples 5, 6, 7 and 8, that the Examples with the blend had a cooler, stronger and sweeter flavor than Example 7 without methyl salicylate.

EXAMPLE 9-11

Example 9 through 11 were conducted to determine the effect upon the oxidation of the peppermint flavor by the addition of the spearmint oil/methyl salicylate blend. The stability of 3 different peppermint flavors was tested to determine how the aging of the gum might be affected by the oxidation of the peppermint flavor. The flavor mixture of example 9 consisted of only natural peppermint. The flavor mixture of example 10 consisted of a composition of both natural and synthetic peppermint. Example 11 was comprised of a blend of 98% natural and synthetic peppermint, 1.5% spearmint oil and 0.5% methyl salicylate. Storage conditions were set at 100° F. to accelerate the aging of each flavor. The samples stored at 100° F. were then compared after a period of 38 days to samples stored at 40° F.

The flavor of Example 11 was found by panel experts to have the least change in aroma due to the oxidation of the peppermint.

In summary, a relatively simple and inexpensive method for enhancing the flavor of a peppermint flavored chewing gum has been described. Although specific embodiments and examples have been described herein, it should be borne in mind that these have been provided by way of explanation and illustration and that the present invention is not limited thereby. Certainly modifications which are within the ordinary skill in the art to make are considered to lie within the scope of the invention as defined by the following claims, including all equivalents.

I claim:

1. A peppermint-flavored chewing gum comprising:
gum base;
sweetener; and
peppermint flavor mixture comprising:
a peppermint flavoring agent; and
peppermint flavor enhancer present in an amount between about 0.1 and about 2 weight percent of the peppermint flavor mixture, wherein the peppermint flavor enhancer consists of a blend of spearmint flavor and methyl salicylate; and wherein the ratio of spearmint flavor to methyl salicylate is between about 10:1 to about 2:1.

2. The chewing gum of claim 1 wherein the ratio of spearmint flavor to methyl salicylate is 3:1.

3. The chewing gum of claim 2 wherein the spearmint flavor is comprised of about 55% L-carvone.

4. The chewing gum of claim 3 wherein the ratio of L-carvone to methyl salicylate is from about 5:1 to about 1:1.

5. The chewing gum of claim 2 wherein the ratio of L-carvone to methyl salicylate is 3:2.

6. The chewing gum composition of claim 1 wherein the peppermint flavor mixture comprises from about 99.9 to 98 weight percent peppermint flavoring agent.

7. The chewing gum composition of claim 6 wherein the peppermint flavor mixture comprises about 99.6% peppermint flavoring agent and about 0.4% peppermint flavor enhancer.

8. The chewing gum in claim 1 wherein the peppermint flavor mixture comprises about 0.1% to about 2% peppermint flavor enhancer.

9. The chewing gum of claim 1 wherein the sweetener is a high-potency sweetener selected from the group consisting of aspartame, alitame, salts of acesulfame, saccharin and its salts, cyclamic acid and its salts, glycyrrhizin, sucralose, thaumatin, and monellin, as well as combinations thereof.

10. The chewing gum of claim 9 further comprising a sugar alcohol selected from the group consisting of sorbitol, mannitol, maltitol, xylitol, hydrogenated starch hydrolysates, and mixtures thereof.

11. A method of making chewing gum comprising the steps of:

- providing a quantity of chewing gum base;
- adding a water soluble portion comprising at least a sweetener;
- adding a peppermint flavoring mixture comprising:
a peppermint flavoring agent; and
peppermint flavor enhancer present in an amount between about 0.1 and about 2 weight percent of the peppermint flavor mixture, wherein the peppermint flavor enhancer consists of a blend of spearmint flavor and methyl salicylate, and wherein the ratio of spearmint flavor to methyl salicylate is between about 10:1 to about 2:1.
- mixing said gum base, water soluble portion and peppermint flavoring mixture until a homogeneous mass is achieved.

12. The method of claim 11 wherein the ratio of spearmint flavor to methyl salicylate is 3 to 1.

13. The method of claim 12 wherein the spearmint flavor is comprised of about 55% L-carvone.

14. The method of claim 13 wherein the ratio of L-carvone to methyl salicylate is from about 5 to 1 to about 1 to 1.

15. The method of claim 14 wherein the ratio of L-carvone to methyl salicylate is 3 to 2.

16. The method of claim 11 wherein the peppermint flavor mixture comprises about 0.1% to about 2% peppermint flavor enhancer.

17. The method of claim 11 wherein the peppermint flavor mixture comprises from about 99.9 to 98 weight percent peppermint flavoring agent.

18. The method of claim 17 wherein the peppermint flavor mixture comprises about 99.6% peppermint flavoring agent and about 0.4% peppermint flavor enhancer.

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Int. Cl. 2:

A 61 K 9/68

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30. 8. 78

Unionspriorität:

⑫ ⑬ ⑭

—

Bezeichnung:

Neuartige Tablette und das Verfahren zur Herstellung eines solchen Presslings

⑰

Anmelder:

Nordström, Rebbe, Dr.; Voss, Gunther M.; 8081 Breitbrunn

⑱

Erfinder:

gleich Anmelder

DE 28 08 160 A 1

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3/80

P A T E N T A N S P R Ü C H E

1. TABLETTE, DADURCH GEKENNZEICHNET, DASS SIE AUS EINEM KAUGUMMIGRANULAT HERGESTELLT IST.
2. KAUGUMMITABLETTE NACH ANSPRUCH 1, DADURCH GEKENNZEICHNET, DASS IN DAS KAUGUMMIGRANULAT WIRKSUBSTANZEN EINGEARBEITET WURDEN.
3. KAUGUMMITABLETTE NACH ANSPRUCH 1, DADURCH GEKENNZEICHNET, DASS DAS KAUGUMMIGRANULAT MIT EINEM ÖBLICHEN TABLETTEN-GRANULAT, DEM WIRKSUBSTANZEN ZUGESETZT WURDEN, GEMEINSAM VERPRESST WIRD.
4. KAUGUMMITABLETTE NACH ANSPRUCH 1, DADURCH GEKENNZEICHNET, DASS DEM GRANULAT ÄTHERISCHE ÖLE ZUGESETZT WURDEN.
5. KAUGUMMITABLETTE NACH ANSPRUCH 1, DADURCH GEKENNZEICHNET, DASS SICH DAS KAUGUMMIGRANULAT IN EINER ODER MEHREREN SCHICHTEN BEFINDET UND DASS ES WEITERE SCHICHTEN AUS ÖBLICHEN, VORZUGSWEISE MIT WIRKSUBSTANZEN ANGEREICHERTEN GRANULATEN GIBT.

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ORIGINAL INSPECTED

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6. KAUGUMMITABLETTE NACH ANSPRUCH 1, DADURCH GEKENNZEICHNET, DASS SIE ALS MANTELTABLETTE HERGESTELLT WURDE, WOBEI ENTWEDER DER MANTEL AUS KAUGUMMIGRANULAT BESTEHT ODER DER KERN UND DER REST JEWEILS AUS ÖBLICHEN, VORZUGSWEISE MIT WIRKSUBSTANZEN ANGEREICHERTEN GRANULATEN BESTEHT.
7. VERFAHREN ZUR HERSTELLUNG EINER KAUGUMMITABLETTE NACH ANSPRUCH 1 BIS 6, DADURCH GEKENNZEICHNET, DASS EINE ÖBLICHE KAUGUMMIMASSE, DER BEKANNTEN VISCOSITÄTEN, ZUM ZWECK DER GRANULATHERSTELLUNG GEKÖHLT WIRD.
8. VERFAHREN ZUR HERSTELLUNG EINER KAUGUMMITABLETTE NACH ANSPRUCH 1 BIS 6, DADURCH GEKENNZEICHNET, DASS DIE FÜR DIE GRANULATION VORGESEHENE MASSE WIE EIN "NASSGRANULAT" ZERRIEBEN ODER DURCHGEDRÜCKT WIRD, UNTER KONTINUIERLICHER ZUGABE EINER TROCKENEN UND TRENNENDEN SUBSTANZ.
9. VERFAHREN ZUR HERSTELLUNG EINER KAUGUMMITABLETTE NACH ANSPRUCH 1 BIS 6, DADURCH GEKENNZEICHNET, DASS FÜR DIE HOMOGENE VERPRESSUNG DES GRANULATES KEINE TRENN- UND SCHMIERMITTEL ZUGESETZT WERDEN.

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GUNTHER MEINHARD VOSS UND DR. CAI GUSTAV RABBE NORDSTRÖM
BREITBRUNN/AMMERSEE

NEUARTIGE TABLETTE UND DAS VERFAHREN ZUR HERSTELLUNG
EINES SOLCHEN PRESSLINGS.

DIE ERFINDUNG BETRIFFT EINE NEUARTIGE VERABREICHUNGSFORM,
DIE GANZ ODER TEILWEISE, AUS EINER KAUGUMMIMASSE BESTEHT,
SOWIE DAS VERFAHREN IHRER HERSTELLUNG.

SEIT LANGEM BESTEHT DER WUNSCH, EINE PHARMAKOLOGISCHE
EXAKTE, VOLL REPRODUZIERBARE, VERABREICHUNGSFORM, FÜR DIE
ORALE ABSORPTION VON PHARMAKA ZU FINDEN.

DIES IST VON BESONDERER BEDEUTUNG, WENN MAN DIE, IM VER-
GLEICH ZU DER BEKANNTEN RESORPTION AUS DEM MAGEN-DARMTRAKT,
VERHÄLTNISSMÄSSIG SCHNELLE RESORPTION ÜBER DIE ORALEN SCHLEIM-
HÄUTE VOR AUGEN HÄLT. WEITERHIN IST ZU BEMERKEN, DASS VON
MENSCH ZU MENSCH SEHR ÄHNLICHE VERHÄLTNISSE BEI DER ORALEN
RESORPTION BESTEHEN, IM GEGENSATZ ZUR RESORPTION AUS DEM
MAGEN- UND DARMTRAKT.

ES WURDE NUN VERSUCHT, EINE TABLETTE AUS KAUGUMMIMASSE ZU
SCHAFFEN, DIE ALLE PHARMAKOLOGISCHE ANFORDERUNGEN ERFÜLLT.

KAUGUMMIMASSEN GIBT ES IN DEN VERSCHIEDENSTEN ABFORMUNGEN,
WIE STREIFEN, KISSEN, DRAGEES, VOM STRANG EXTRUDIERT, ALS
KERN-MIT EINER HARTZUCKERDECKE UMGEBEN, FLÜSSIG GEFÜLLT,
ODER SOGAR ALS ZIGARETTEN-IMITATION.

DIE KAUGUMMIBASEN EMPFEHLEN SICH IN HOHEM MASSE ZUR WIRK-
STOFFAUFNAHME UND BESONDERS LANG ANHALTENDEN WIRKSTOFFAB-
GABE. DIE GESCHILDERTEN UND HEUTE BEKANNTEN DARBIETUNGS-
FORMEN GARANTIEREN JEDOCH NICHT EXAKT DIE BEI DER TABLETTEN-
HERSTELLUNG GEFORDERTEN MASS- UND GEWICHTSGENAUIGKEITEN
DER ARZNEIMITTELHERSTELLUNG.

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ES WURDE NUN GEFUNDEN, DASS MAN, UM VON KAUGUMMIMASSEN FERTIGE, ZUR ABFORMUNG PRÄPARIERTE KAUGUMMIMASSEN, DIE THERMOPLASTISCH REAGIEREN EIN, FÜR DIE VERPRESSUNG AUF EXZENTER- ODER ROTATIONSPRESSEN ERFORDERLICHES GRANULAT AUS KAUGUMMIMASSE ERHALTEN KANN, WENN MAN DIE FERTIGE GRUNDMASSE MIT ALLEN INGREDIENZEN, VORHER AUF CA. 20 MM PLATTENSTÄRKE AUSWALZT UND AUF ETWA MINUS 10 GRAD CELSIUS HERUNTERRÜHLT. DIE KAUGUMMIMASSE WIRD HART UND SPRÖDE UND EIN FEINSTBRUCH AUF GEEIGNETEN MASCHINEN, ZUM BEISPIEL WALZENSTUHL, HAMMERSCHLAGMÖHLE, IST MÖGLICH.

EINE SO HERGESTELLTE TABLETTE HAT VIELE VORTEILE: ES KÖNNEN DIE FÜR EINE TABLETHERSTELLUNG ÖBLICHEN ANLAGEN, Z.B. WERKZEUGE WIE OBER- UND UNTERSTEMPEL EINSCHLIESSLICH MATRIZE, HERSTELLUNGSMASCHINEN UND VERPACKUNGSSTATIONEN BENUTZT WERDEN. WEITERHIN IST ES MIT DIESER TABLETTE MÖGLICH, WIRKSTOFFE SO ZU VERNETZEN, DASS EIN RETARDIERENDER EFFEKT BEIM KAUFEN ENTSTEHT. EINER SOLCHEN VERWENDUNG, D.H., UNTERBRINGUNG VON WIRKSTOFFSUBSTANZEN IN KAUGUMMIMASSEN UND DEREN BISHER BEKANNTEN ABFORMUNGEN, STAND DIE NICHT GENÜGENDE EXAKTE UND REPRODUZIERBARE DOSIERUNG ENTGEGEN.

EINE WEITERE METHODE IST DAS DURCHREIBEN DER NOCH WARMEN KAUGUMMIMASSE MITTELS EINER NASSGRANULIERMASCHINE, Z.B. ALEXANDERWERK-GRANULIERMASCHINE, HUTTGRANULIERER O.Ä., UM EIN GRANULAT ZU ERHALTEN. IN BEIDEN, OBEN ERWÄHNTEN FÄLLEN, IST ES WICHTIG, DAS SONST ÜBLICHE, FÜR DIE VERPRESSUNG VON GRANULAT ZU TABLETTER ERFORDERLICHE TRENN- UND/ODER SCHMIERMITTEL, NICHT UNTERZUMISCHEN. DIE KAUGUMMITABLETTE WÜRD NACH DER KOMPRESSIION SONST AUSEINANDER BRÜCKELN. UM EIN VORZEITIGES ZUSAMMENBACKEN DES PER NASSGRANULATION HERGESTELLTEN KAUGUMMIGRANULATES ZU VERHINDERN, EMPFIEHLT SICH DIE HINZUGABE (KONTINUIERLICH AN DER LOCHWALZE ODER -SCHEIBE ODER IN DIE FERTIGE CHARGE) GEEIGNETER "VERBINDUNGSSUBSTANZEN", Z.B. SACCHAROSE, XYLIT, SORBIT.

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UM EIN EINWANDFREIES ABLÖSEN UND HERAUSSTOSSEN DER TABLETTE (NACH DER KOMPRESSION) ZU GEWÄHRLEISTEN, KANN DAS KAUGUMMI-GRANULAT MITTELS DER PRESSKAMMERBESCHICHTUNG HERGESTELLT WERDEN, VORZUGSWEISE UNTER EINSATZ DES PRESSKAMMERBESCHICHTUNGSVERFAHRENS P 27 17 438.5 .

INFOLGE DER SPEZIELLEN VORBEHANDLUNG DER KAUGUMMIMASSE, UM ZU EINEM PRESSFÄHIGEN GRANULAT ZU GELANGEN, UNTER ZUHILFENAHME DER INTERMITTIERENDEN MATRIZEN- UND WERKZEUG-BESCHICHTUNG (BZW. SCHMIERUNG), KÖNNEN ALLE BEKANNTEN FORMEN EINER TABLETTE HERGESTELLT WERDEN, WIE MANTELTABLETTE UND SCHICHTTABLETTE, WOBEI AUCH ÜBLICHE GRANULATE MIT ODER OHNE WIRKSTOFFE, UNTER EINBEZIEHUNG DES KAUGUMMIGRANULATES, VERWENDUNG FINDEN.

DURCH DIE VORLIEGENDE TABLETTE LÄSST SICH AUCH EIN VÖLLIG NEUER EFFEKT REALISIEREN: BITTERE, ARZNEILICHE WIRKSTOFFE, Z.B. IN EINEM DRAGEE UNTERGEBRACHT, LASSEN DEN "ABLAUF" VON SÜSS NACH BITTER ERWARTEN. BEI EINSATZ EINES GESÜSSTEN KAUGUMMIGRANULATES IN VERBINDUNG MIT EINEM ÜBLICHEN GRANULAT (ALS SCHICHT- ODER MANTELTABLETTE), WOBEI DER "KERN" AUS DEM GESÜSSTEN KAUGUMMIGRANULAT BESTEHEN KÖNNTE), HIER Z.B. MIT BITTER (ODER UNANGENEHM-) SCHMECKENDEN, ARZNEILICHEN WIRKSTOFFEN VERSEHEN, WIRD DEN UMGEKEHRTEN EFFEKT, BZW. "ABLAUF" ERGEBEN, D.H., ERST WERDEN DIE BITTERSTOFFE AN DEN GESCHMACKSPAPPILLEN WAHRGENOMMEN, MIT EINER, IMMER STÄRKER WERDENDEN SÜSSEN ÜBERLAGERUNG (DES GESÜSSTEN KAUGUMMIGRANULATES).

909835/0324

United States Patent [19]
Perfetti et al.

[11] **Patent Number:** 4,698,223
[45] **Date of Patent:** Oct. 6, 1987

[54] **NO-CALORIE, NON-CARIOGENIC
CHEWING GUM COMPOSITION**

[75] **Inventors:** Giorgio Perfetti; Giuseppe Sassi, both
of Linate, Italy

[73] **Assignee:** Guma Base Co., S.p.A., Italy

[21] **Appl. No.:** 671,839

[22] **Filed:** Nov. 15, 1984

[30] **Foreign Application Priority Data**

May 29, 1984 [IT] Italy 21143 A/84

[51] **Int. Cl.⁴** A23G 3/30

[52] **U.S. Cl.** 426/4; 426/6

[58] **Field of Search** 426/3-6

[56] **References Cited**

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3,984,574 10/1976 Comollo 426/4
4,241,091 12/1980 Stroz et al. 426/4
4,352,822 10/1982 Cherkuri et al. 426/4

4,357,354 11/1982 Kehoe et al. 426/3
4,357,355 11/1982 Koch et al. 426/4
4,387,108 6/1983 Koch et al. 426/4
4,490,393 12/1984 Cherkuri et al. 426/3

FOREIGN PATENT DOCUMENTS

0019014 2/1980 Japan 426/4

Primary Examiner—Jeanette Hunter

Attorney, Agent, or Firm—Sughrue, Mion, Zinn,
Macpeak, and Seas

[57] **ABSTRACT**

A chewing gum composition comprises up to 99% by weight of a completely sugar-free base gum. Such a chewing gum is calorie-free and non-cariogenic. Furthermore it has been found to be substantially non-adhesive to the teeth, particularly to dental prostheses. The gum also contains up to 3% flavorings and up to 4% glycerol.

10 Claims, No Drawings

NO-CALORIE, NON-CARIOGENIC CHEWING GUM COMPOSITION

DESCRIPTION

The present invention relates to a no-calorie, non-cariogenic chewing gum which does not adhere to the teeth, particularly to dental prostheses.

Conventionally a chewing gum is constituted by a base gum, a sugar matrix and flavoring.

A base gum, which essentially acts as a carrier for the flavouring, is in most cases formulated in dependence on the characteristics of a desired, predetermined sugar matrix, account always being taken of the fact that, once mixed with the various sugars, sugar syrups, glycerol and flavorings, the resulting chewing gum must be soft to chew and have as linear a mastication property as possible. By linear mastication is meant that consistency characteristic of the final chewing gum whereby the mastication force is constant or substantially constant in time. Furthermore, a base gum must necessarily be insoluble in water.

For the said reasons it is well known that a base gum always has a complex formulation and, from an analytical point of view, the components thereof are known only in broad outline. In talking of base gum compositions it would be more appropriate to define them by recipes of ingredients and those ingredients which should be chosen from those which are allowable by established standards and regulations, which generally differ from country to country.

A base gum is generally in the form of a rather stiff, solid substance the characteristics whereof may, to some extent, be indicated by its degree of penetration, measured, for example, in accordance with the ASTM D 1321 standards, and by its softening point. The base gums used until now to make chewing gums generally have a degree of penetration between 10 and 25 (measured in accordance with the standards mentioned above) and a softening point between 70° and 82° C.

The sugar matrix and the flavoring ingredients, in addition to providing their intrinsic characteristics, are particularly important for their known plasticising effect on the base gum. The chewability of the finished product (chewing gum) is thus due basically to the sugar matrix and the flavoring ingredients and consequently, an expert who formulates chewing gums should achieve the optimum balance between the quantities and qualities of the base gum, the sugar matrix and the flavoring ingredients used, in order to prolong the said characteristic of linear masticability.

In the present state of the art, the constant and basic teaching is that it is essential to use a sugar matrix and flavorings to plasticise a corresponding base gum in chewing gum formulations: the base gum generally comprises no more than 25 to 35% by weight of the weight of the finished product, the rest being constituted by the sugar matrix and a certain percentage of flavoring.

The calories and the energy-giving and cariogenic properties of chewing gums are at present attributed to the sugar matrix.

The suggestion for replacing sugars by substitute no-calorie sweeteners have resulted, on the one hand, in a reduction in the plasticity of the chewing gum and, on the other hand, in a reduction in the time for which the plasticity lasts. The consequent economic harm to chewing gum manufacturers is clear in that, in some

cases, they would have to withdraw the unsold product a short time after it had been put on sale since the product would become brittle and no longer chewable.

The use of specific plasticisers, in countries in which this is allowed, has not in any case overcome the disadvantage definitively since the duration of the optimum masticability characteristic of a chewing gum, including either a sugar matrix or other sweeteners, such as sorbitol, is due essentially to the degree of crystallisation of the sugar (or of the sorbitol) and the moisture loss.

A further disadvantage due to the presence of substitute sweeteners for the sugars lies in the known difficulty of metering these substitutes and hence the difficulty in obtaining a finished product with satisfactory organoleptic qualities.

The problem at the root of the present invention is that of providing a chewing gum which is both non-cariogenic and calorie-free and the composition whereof overcomes the disadvantages of the prior art explained above.

This problem is solved according to the present invention by a chewing gum which does not have a sugar matrix and which comprises, in percentages by weight: from 8 to 15% of an elastomer selected from the group comprising polyisobutylenes and isobutylene-isoprene copolymers, from 10 to 30% of hydrogenated or partially-hydrogenated animal or vegetable oils, from 10 to 35% of inert mineral fillers, from 8 to 25% of polyvinyl acetate with a degree of polymerisation of from 100 to 4000, from 4 to 9% of fatty acid mono- and di-glycerides, from 15 to 25% of resin, from 2 to 6% of natural gum, from 4 to 12% of wax and up to 0.5% of antioxidants.

The preferred elastomers for the composition of a base gum of the invention comprise a suitable mixture of polyisobutylene with a molecular weight of between 6000 and 15,000, polyisobutylene with a molecular weight of between 6000 and 15,000 and an isobutylene-isoprene copolymer. Preferably the elastomer used for the base gum of the invention is a mixture comprising 30% by weight of isobutylene-isoprene and 70% by weight of polyisobutylene with a molecular weight of 6000-15,000.

The resins used in the base gum composition of the invention are chosen from the group comprising glycerol esters of colophony resin, glycerol esters of polymerised colophony resin, glycerol esters of hydrogenated colophony resin and methyl esters of partially-hydrogenated colophony resin.

The natural gum preferably used in the base gum composition of the invention is the so-called chicla gum.

In addition to the desired characteristic of being calorie-free and non-cariogenic, a chewing gum having the said composition does not adhere to the teeth, particularly to dental prostheses.

In accordance with a further characteristic of the invention, the chewing gum composition includes up to 1.5% of a sweetener of the aspartame type.

Further characteristics and advantages achieved by the invention will become apparent from the following description of several examples of chewing gum formulations according to the invention, in which all the percentages are given by weight if not otherwise indicated.

Conventional methods and equally conventional apparatus were used to prepare a base gum from the following recipe:

elastomer	10.13%
vegetable oil	20.41%
mineral filler (talc)	21%
polyvinyl acetate	16.5%
mono-, di-glycerides of fatty acids	5.94%
resins	16.54%
natural chicle-type gum	5%
microcrystalline wax	4.23%
antioxidants	0.05%

The elastomer used in the recipe was a mixture of 30% of an isobutylene-isoprene copolymer and 70% of polyisobutylene with a molecular weight of between 6000 and 15,000.

The vegetable oil used in the recipe comprised 36% by weight of cottonseed oil and 64% of palm oil.

The resin used in the composition comprised 54% glycerol esters of hydrogenated colophony rosin, 15% glycerol esters of polymerized colophony rosin and 31% methyl esters of partially-hydrogenated colophony rosin.

This base gum had a softening point of 56° C. and a degree of penetration of 32 measured in accordance with the ASTM D 1321 Standards.

Chewing gum was made from this base gum, in the form of small sheets with the formulations given in the following table.

EX-AM- PLE	BASE GUM	GLYCERINE	SWEETENER (Aspartame)	FLAVORING
1	99%	—	—	oil 1%
2	97%	—	—	oil 1.5% powder 1.5%
3	96.8%	—	0.8%	oil 2.4%
4	92.8%	4%	0.8%	oil 1.2% powder 1.2%
5	92.8%	12%	1.6%	oil 2.4%
6	98%	—	0.8%	oil 1.2%

The quality of a chewing gum is, for the most part, evaluated on the basis of an experimental masticability test and a plasticity test. The masticability test results in an average value from among a series of subjective evaluations of the consistency of the gum sheet carried out by direct chewing, for a predetermined time, by a corresponding series of operators. The plasticity test is carried out by establishing the number of bends through 90° and subsequent straightenings which the sheet can withstand before it starts to crack. This test is generally carried out at a substantially constant temperature with reference to 10 bends as the plasticity evaluation index. In chewing gums at present available on the market, it has been found that the results of the plasticity tests are strictly correlated with the water contents of the chewing gum sheets. In this respect, it has been found that sheets with a moisture content of 3% have the optimum plasticity. When the moisture content falls to 2% (either by evaporation or by crystallization) the sheet does not withstand more than six or seven bends and as such is judged brittle and not commercially acceptable.

Sheets of chewing gums according to the invention and of a sample chewing gum at present available commercially were subjected to the conventional mastic-

bility and plasticity tests. The sample chewing gum had the following standard formulation;

conventional base gum	20%
glucose syrup, 45 Baume degrees	19%
powdered sugar	60%
glycerol (excellent)	0.5%
flavorings	0.5%

The sample chewing gum had a water content of 3%. The tests carried out on the sheets of chewing gum "immediately after production", or freshly produced, gave results which were entirely comparable with regard to their consistency (masticability test) and their linear mastication, in the sense of uniformity of the mastication force. They also had more than satisfactory characteristics of plasticity in that the sample chewing gum started to crack after 32 bends while the chewing gum of the invention showed no sign of cracking after 40 bends.

All the sheet chewing gums were then subjected to an accelerated ageing process in a climatized chamber kept at a temperature of 40° C. and a relative humidity of 35% to 40%. The stay time in the climatized chamber was 72 hours, corresponding to a period of storage under normal ambient conditions (average Italian climate) of 1 year.

The sample sheet started to crack after only 6 bends and was initially unacceptable in the masticability test. In fact it broke initially into several pieces; only as mastication continued and moisture was absorbed from the oral cavity (salivation) did it partially re-acquire its initial plasticity and consistency.

The chewing gum sheets of the invention, on the contrary, had the same consistency and the same high plasticity as in the previous tests.

We claim:

1. A non-cariogenic, no-calorie chewing gum composition, including, in percentages by weight, from 92% to 99% of a base gum, up to 3% of flavorings and up to 4% of glycerol, and wherein the base gum is sugarfree and comprises, in percentages by weight:

from 8 to 15% of an elastomer selected from the group consisting of polyisobutylenes and isobutylene-isoprene copolymers,
from 10 to 30% of hydrogenated or partially-hydrogenated animal or vegetable oils,
from 10 to 39% of inert mineral fillers,
from 8 to 25% of polyvinyl acetate with a degree of polymerization of from 100 to 400,
from 4 to 9% of fatty acid mono- and di-glycerides,
from 15 to 25% of resins,
from 2 to 6% of natural gum,
from 4 to 12% of wax and
up to 0.05% of antioxidants.

2. A composition as defined in claim 1, wherein the said elastomer in the base gum comprises 30% by weight of isobutylene-isoprene and 70% by weight of polyisobutylene with a molecular weight of between 6000 and 15000.

3. A composition as defined in claim 1, wherein the said resins in the base gum comprise one or more members selected from the group consisting of glycerol esters of colophony rosin, glycerol esters of polymerized colophony rosin, glycerol esters of hydrogenated colophony rosin, and methyl esters of partially-hydrogenated colophony rosin.

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4. A composition as defined in claim 1, including up to 1.5% by weight of a sweetener of the aspartame type.

5. A composition as defined in claim 1, wherein the base gum comprises, in percentages by weight:

elastomer	10.35%
vegetable oil	20.41%
mineral filler (talc)	21%
polyvinyl acetate	16.5%
mono-, di-glycerides of fatty acids	5.94%
resins	16.54%
natural gum	5%
microcrystalline wax	4.23%
antioxidant	9.05%

6. A composition as defined in claim 5, wherein the vegetable oil comprises a mixture of cottonseed oil and palm oil.

7. A composition as defined in claim 6, wherein the mixture comprises 36% by weight of cottonseed oil and 64% by weight of palm oil.

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8. A composition as defined in claim 5, wherein the resins in the base gum comprise one or more members selected from the group consisting of glycerol esters of colophony resin, glycerol esters of hydrogenated colophony resin, glycerol esters of polymerized colophony resin and methyl esters of partially-hydrogenated colophony resin.

9. A composition as defined in claim 8, wherein the base gum comprises a mixture of glycerol esters of hydrogenated colophony resin, glycerol esters of polymerized colophony resin and methyl esters of partially-hydrogenated colophony resin.

10. A composition as defined in claim 9, wherein the resin mixture comprises, in percentages by weight:

glycerol esters of hydrogenated colophony resin	54%
glycerol esters of polymerized colophony resin	15%
methyl esters of partially-hydrogenated colophony resin	31%

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United States Patent [19]
Cherukuri et al.

[11] **Patent Number:** **4,753,805**
[45] **Date of Patent:** **Jun. 28, 1988**

[54] **TABLETTED CHEWING GUM
COMPOSITION AND METHOD OF
PREPARATION**

4,370,350 1/1983 Fisher et al. 426/5
4,405,647 9/1983 Fisher et al. 426/5
4,493,849 1/1985 Carroll et al. 426/3

[75] **Inventors:** **Sabraman R. Cherukuri, Towaco;
Kishanayya Bikkina, Edison, both of
N.J.**

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0017691 10/1980 European Pat. Off. .
2808160 8/1979 Fed. Rep. of Germany 426/5

[73] **Assignee:** **Warner-Lambert Company, Morris
Plains, N.J.**

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[21] **Appl. No.:** **835,131**

Derwent Abstract No. 68-79913 for Belgium 686,750,
published Feb. 15, 1967.

[22] **Filed:** **Feb. 28, 1986**

Derwent Abstract No. 81-73892D for DE 3,010,836,
published Oct. 1, 1981.

Related U.S. Application Data

AT 350,728, published Jun. 11, 1979.

[63] **Continuation-in-part of Ser. No. 575,610, Jan. 31, 1984,
abandoned.**

LU 74297, published Aug. 11, 1977.

[51] **Int. Cl.⁴** **A23G 3/30**

Primary Examiner—Jennette Hunter

[52] **U.S. Cl.** **426/3; 426/548;
426/804; 426/454**

**Attorney, Agent, or Firm—Daniel A. Scola, Jr.; Henry
C. Jennette; Gary M. Nath**

[58] **Field of Search** **426/3, 5, 454, 804,
426/548**

[57] **ABSTRACT**

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,290,120 7/1942 Thomas 426/3
3,262,784 7/1966 Bucher 426/5
4,000,321 12/1976 Mochizuki et al. 426/5
4,139,589 2/1979 Beringer et al. 426/5
4,161,344 7/1979 Kaul 426/3

A tableted chewing gum composition having a moisture
content of about 2 to about 8% by weight comprising a
blended mixture of chewing gum granules comprising
gum base, a grinding aid, a sweetening agent and a
modified maltodextrin compression aid, wherein said
grinding aid is selected from the group consisting of
alkali metal and alkaline earth metal phosphates, malto-
dextrins and mixtures thereof.

16 Claims, No Drawings

TABLETTED CHEWING GUM COMPOSITION
AND METHOD OF PREPARATION

This application is a continuation-in-part of U.S. Ser. No. 575,610 filed Jan. 31, 1984 now abandoned.

This invention relates to a tableted chewing gum composition having a moisture content of about 2% to about 8% by weight of the total chewing gum tablet, and a method for producing the same. More particularly the tableted chewing gum compositions comprise a blend of chewing gum granules and a compression aid which is formed into tablets having a moisture content of about 2% to about 8% by weight of the tablet chewing gum composition.

Conventional chewing gum compositions are difficult to form into chewing gum tablets because of their moisture content. Traditional chewing gum compositions contain about 2% to about 8% by weight of water. As a consequence, attempts to grind the chewing gum compositions using readily available and standard techniques known in the art, have been unsuccessful. Generally the chewing gum will jam the grinding machine, sticking to blades, screens and other surfaces. Traditional moisture levels cause caking and balling of the gum, thereby preventing the formation of gum granules necessary for tableting. In attempting to tablet chewing gum compositions having a moisture content greater than 2% by weight, various other problems occur, e.g. adherence to the punch press, compaction in the punch press hopper, poor flow in the feeder section and difficulties with compressibility. Attempts to make tableted chewing gums have therefore concentrated on alleviating moisture from the composition prior to grinding and formation of granulation. Heretofore the art has not disclosed a successful means of tableting gums containing such traditional amounts of moisture using conventional gum-making equipment.

Attempts have been made to chill or freeze the chewing gum composition to facilitate grinding and alleviate the problems mentioned above. U.S. Pat. No. 4,000,321 discloses a chewing gum which is extracted and subsequently cooled to temperatures of -15° to -20° C. for the purpose of comminuting it to a granular material. German Pat. No. 2,808,160 utilizes a low temperature in order to provide granulation suitable for tableting. Similarly, U.S. Pat. Nos. 4,161,544, 4,370,330 and European Patent Application No. 17-691 (1980) use a freezing temperature to facilitate comminution of chewing gum compositions to granular materials suitable for compaction into a tablet.

U.S. Pat. No. 3,262,784 discloses a gum tablet which requires as much as 93.7% sweetener. U.S. Pat. No. 4,405,647 discloses the comminution of chewing gum in a fluidized bed in the presence of a sweetener or inert constituent, e.g., a silicate.

The prior art has therefore basically followed two pathways in attempting to successfully make chewing gum tablets. The first pathway was to alleviate the moisture problem by freezing the chewing gum compositions. While this technique is feasible, it requires equipment other than conventional tableting equipment and requires careful control of humidity during the tableting process. The second pathway focused on changing the conventional formulations and methods to produce granulations having less than 2% by weight of moisture.

The art has recognized the difficulty encountered due to moisture in attempting to form gum granulations

suitable for tableting and as a result, there have been no successful chewing gum tablets produced having moisture content of about 2% or greater using a conventional formulation.

In the normal course of developing formulations and in the routine production of tablets, processing problems occur. Sometimes the fault lies with the formula, sometimes with the compression equipment, and sometimes with a combination of these reasons. Capping, lamination, picking and sticking, compressibility and flowability are the most common processing problems. These problems are generally encountered with any tableting process, but are further complicated, as mentioned above, when attempting to tablet conventional chewing gum compositions due to the high moisture content (e.g. 2% by weight or more, as mentioned above).

Capping is the term used in the tableting art to describe the partial or complete separation of the top or bottom of a tablet from the main body. This will occur if the tablet does not release completely from the tablet punch face. Lamination is the separation of a tablet into two or more distinct layers. Lamination is generally a result of poor granulation and compaction. The cause of both these problems is generally ascribed to the entrapment of air among the granules, which does not escape during compression but afterward when the pressure is released. Granulations of the prior art which are light or too dry or powdery are prone to this difficulty. A certain percentage of water is sometimes essential to good compaction and the tableting art has taught the use of hygroscopic substances to help maintain the proper moisture content. As will be described further herein, the instant inventive tableted chewing gum compositions make use of a grinding aid which insures a free-flowing granulation and a compression aid which lubricates the compaction into a tablet. Similarly, the problem of lamination is also avoided by the instant compositions due to the free-flowing of the particles both in the tableting machine hopper and in the punch apparatus itself. This facilitates proper compaction of the granulation into tablet form.

Picking describes the removal of material from the surface of the tablet and its adherence to the face of the punch. It is particularly prevalent in small enclosed areas of engravings which are difficult to cut cleanly and polish smoothly. Sticking describes the adhesion of granulation to the die wall. When this occurs, the lower punches fail to move freely, resulting in strain on the punch heads and other machinery parts. This term is also often used to refer to the build-up of material on the punch faces. Conventional moisture amounts are often responsible for these problems.

It is evident that there is a need in the art for a tableted chewing gum composition and method for tableting the same which uses conventional prior art compositions and which does not suffer from the disadvantages due to moisture described in the art.

It has surprisingly been found that a conventional chewing gum composition having a moisture content of about 2% to about 8% by weight can be granulated utilizing a grinding aid and subsequently blending the resultant granulation with a compression aid. More particularly this invention concerns a tableted chewing gum composition having a moisture content of about 2 to about 8% by weight comprising a blended mixture of chewing gum granules comprising gum bases, a grinding aid, a sweetening agent and a compression aid,

wherein said grinding aid is selected from the group consisting of alkali metal or alkaline earth metal phosphates, maltodextrins and mixtures thereof.

Additionally, this invention relates to a process of producing a chewing gum tablet having a water content of about 2 to about 8% by weight which comprises:

- (i) preparing a chewing gum composition comprising gum base and a sweetener;
- (ii) grinding the chewing gum composition by utilizing a grinding aid selected from the group consisting of alkali metal phosphates, alkaline earth metal phosphates, maltodextrins and mixtures thereof to form a granulation;
- (iii) blending the granulation with a compression aid;
- (iv) compressing the resultant granulation to form a tablet.

It has been discovered that materials which are naturally very fine in particle size, when used as grinding aids, tend to cause capping problems during tableting. Additionally, starches and carbohydrates such as polyhydric alcohols and the like are useful as grinding aids, but tend to react with medicaments which may be added to the gum granulation. The instant invention has determined that the alkaline earth metal phosphates and alkali metal phosphates prevent caking and balling of "high", i.e., 2 to 8%, moisture-containing chewing gum compositions during grinding. Additionally, it has been discovered that maltodextrin enhances the grinding of "high" moisture-containing chewing gum compositions by absorbing moisture to allow lubrication in the gum as it separates into granules.

The inventive compositions thus achieve a chewing gum tablet using conventional moisture levels in the gum and on conventional equipment. The prior art powdered, dry tablet is thus avoided. The resultant gum tablets thus contain the moisture necessary to facilitate the release of flavor sweetener and other additives such as medicaments.

The inventive chewing gum compositions and methods require the use of the compression aid to alleviate the problems associated with moisture contents of 2% by weight or greater. Additionally, this invention requires the use of a grinding aid to facilitate the formation of the granulation, which is later to be tableted. The use of the grinding aid and the compression aid are critical to the practice of this invention because they allow for the formation of tableted chewing gum compositions having a moisture content of greater than 2% by weight, and preferably about 2% to about 8% by weight of the tableted chewing gum. As previously discussed, moisture present in these amounts caused a variety of problems when attempting to use conventional chewing gum formulations and techniques form a chewing gum tablet. The use of the grinding aid to facilitate formation of a chewing gum granulation, which granulation is subsequently blended with the compression aid, allows for chewing gum tablets to be formed having the moisture content mentioned above.

The grinding aid is generally present in the chewing gum composition in amounts of about 0.2% to about 5% by weight of the tableted chewing gum composition, and preferably about 1.5% to about 4% by weight. The most preferred range is about 1% to about 2% by weight. The grinding aid must be finely divided, preferably having a mesh size of about 80 or less, and is preferably water soluble, although water solubility is not critical to its function in the inventive method and compositions.

The grinding aids useful in this invention are selected from the group consisting of alkali metal phosphates, alkaline earth metal phosphates, maltodextrins and mixtures thereof.

Those alkali metal phosphates useful include the calcium phosphate, dicalcium phosphate, tricalcium phosphate, as well as mixtures thereof. Potassium and magnesium phosphate are also useful.

Modified maltodextrin having a bulk density of about 3 to about 17 lbs/cu.ft. in combination with dicalcium phosphate is preferred as the grinding aid.

The chewing gum granulation can have a particle size of about 4 to about 30 mesh. Particles of less than 30 mesh present a high surface area for coverage by the grinding aid. Additionally, there will generally be a wide distribution of particle size when fines are used. This will result in segregation during tableting. Furthermore, the fine particles do not compact well in the tableting process. At a particle size of greater than 4 mesh the particles do not feed well into the tableting press.

In the grinding process, the grinding aid is added continuously and the feed rates of the chewing gum composition and grinding aid are adjusted to obtain the proper weight percent of grinding aid in the chewing gum composition. The chewing gum composition granules of the instant invention can be formed using standard grinding techniques known in the art. The granulation should have good flow properties for precise volumetric feeding of the material to the die cavity. It should also have good compressibility to form the tablet and once the tablet is formed it should be easily ejected from the die.

Traditionally, the problems associated with tablet manufacture include the flow of the granulation, the adhesion of material to the punches and dies, and the release of the completed tablet from its mold. The art has often generally used the term "lubricant" to refer to substances useful in ameliorating these difficulties. The problems of granulation flow, adhesion and tablet release are quite different and require distinct solutions. As such, the terms lubricant, glidant and anti-adherent are used herein to define the specific function and purpose of each material used in solving these problems. The compression aid is present in amounts of about 0.25 to about 15%, preferably about 2% to about 15% by weight of the tableted chewing gum composition and is comprised of one or more of these materials.

By the term lubricant is meant agents that act between surfaces in relative motion to prevent friction and wear. In the manufacture of tableted chewing gum compositions, lubricants are used to prevent excess wear on dies and punches. True lubricant action is particularly required immediately after compression of the tablet within the die to reduce the friction between the inner die wall and the tablet edge during the ejection cycle. The absence of a lubricant at this stage may cause straining of the press parts and tablets formed thereby may be damaged. Additionally, lubricants help avoid the problem of capping as discussed previously.

The lubricants useful as a component of the compression aid in the inventive compositions and method are among those well known in the art. Representative examples may be selected from the group consisting of metallic stearates, hydrogenated vegetable oil, partially hydrogenated vegetable oils, animal fats (e.g. triglycerides), polyethylene glycols, polyoxyethylene monostearates and mixtures thereof. Of particular usefulness are

magnesium stearate, calcium stearate and mixtures thereof. Hydrogenated cottonseed oil, solid vegetable oil, hydrogenated soya oil and mixtures thereof are the preferred oil lubricants. In general, the lubricant or mixture of lubricants is present in the composition in amounts of about 0.25 to about 2% by weight based on the tableted chewing gum composition. If oil lubricants are used, it is preferred they be present in amounts of about 0.4% to about 1% by weight of the tableted chewing gum composition.

To solve the problems associated with granulation flow, e.g., the free flow of granulation particles in the tableting machine hopper and in the punch itself, a glidant is used in the inventive compositions. Glidants reduce interparticulate friction and assure smooth and uniform flow of materials from larger apertures to smaller apertures in the tablet press. Fluidity of the granulating blend is not only important as to the direct effect on uniformity of die fill, and thus uniform tablet weight, but also plays a role in proper homogeneity. The contribution a glidant makes toward improving fluidity depends on the chemical nature of the glidant relative to that of the chewing gum granulation, i.e. on the presence of unsaturated valencies or bonds which have potential chemical interaction; and upon physical factors such as size and shape distribution of both the glidant particles and the chewing gum granulation.

For any particular system there is usually an optimum concentration above which the glidant may start to act as an anti-glidant. The optimum level depends on several factors, one of which is the moisture level of the chewing gum granulation. In the instant invention, the tableted chewing gum composition is to have a moisture content of about 2% to about 8% by weight. The amount of glidant present in the tableted chewing gum composition is from about 0.5% to about 5% by weight of the tableted chewing gum composition. Those glidants useful are selected from the group consisting of alkali metal salts, talc, starch, polyhydric alcohols and mixtures thereof. Preferably the glidant is selected from the group consisting of calcium carbonate, mannitol, sorbitol and mixtures thereof present in amounts of about 1% to about 2.5% by weight of the tableted chewing gum composition.

Anti-adherents function to prevent tablet granulations from sticking to the faces of the punches and the die walls, but most importantly, prevent adherence of chewing gum granules from adhering to one another, a phenomenon known as blocking. Anti-adherents may be added to the chewing gum composition while the composition is in the hopper, or subsequent to grinding. The anti-adherent is selected from the group consisting of silicates, silicon dioxide, talc and mixtures thereof present in amounts of about 0.2% to about 1% by weight of the tableted chewing gum composition and preferably about 0.3 to about 0.6% by weight. Generally the anti-adherent is a finely divided, low bulk density powder which is preferably water insoluble. The preferred anti-adherents are fumed silica and talc. The term fumed silica is meant to include pyrogenic silica, micron sized silica and hydrated silica.

It is apparent from the above discussion of the three individual components of the compression aid, that certain materials may be useful in more than one component. However, frequently one material may function well in one mechanism, e.g., hydrogenated vegetable oil as a lubricant, but will be ineffective or detrimental toward another mechanism, e.g., hydrogenated vegeta-

ble oil may tend to actually retard the flow characteristics of certain solids, making it a poor glidant. Thus, when selecting the specific combination of compression aid components, attention should be given to maximize the advantages of each component and to prevent unnecessary cancellation of one component's effectiveness.

In the practice of this invention any conventional chewing gum composition of the prior art may be used providing it has a moisture content of about 2% to about 8% by weight of the chewing gum composition. Such chewing gum compositions generally comprise a gum base, sweetener, and a softener.

As is well known in the art, the gum base comprises natural or synthetic rubbers or elastomers. The elastomers, of course, are not vulcanized. Illustrative, non-limiting examples of gums or elastomers useful as gum bases are natural rubber, chicle, lechi caspi, jelutong, polyisobutylene, isobutylene-isoprene copolymers, styrene-butadiene copolymers and mixtures thereof. The gum base can comprise 14% to about 50% by weight and preferably about 20% to about 35% by weight based on the total chewing gum composition.

The gum base may contain elastomer solvents to aid in softening the gum or elastomer component. Illustrative, non-limiting examples of such elastomer solvents are the methyl, glycerol or pentaerythritol esters of rosin or modified rosin, such as hydrogenated, dimerized or polymerized rosin or mixtures thereof. Examples of the rosins useful in the preparation of gum bases include the pentaerythritol ester of partially hydrogenated wood rosin, pentaerythritol ester of wood rosin, glycerol ester of partially dimerized rosin, glycerol ester of polymerized wood rosin, glycerol ester of tall oil rosin, glycerol ester of wood rosin and partially hydrogenated wood rosin, as well as partially hydrogenated methyl ester of rosin such as polymers of α -pinene or β -pinene. Terpene rosins, including polyterpene and mixtures thereof are also useful. The elastomer solvent can be employed in an amount ranging from about 10% to about 75% by weight of the gum base, preferably about 45% to about 70% by weight.

Corn syrup can serve as a source of moisture and it can be utilized at about 8% to about 30% by weight, preferably about 15% to about 20% by weight. The specific amount of corn syrup will depend on the overall formulation of the gum composition and is controlled to provide a moisture content of about 2% to about 8% as is customary in the art. As used in the specification and claims the item "corn syrup" means corn syrup and fructose syrups, as well as simple syrup.

The chewing gum compositions of this invention will generally include a sweetening agent. The sweetening agent may be selected from a wide range of materials including water-soluble agents, water-soluble artificial sweeteners, and dipeptide based sweeteners, including mixtures thereof. Without being limited to particular sweeteners, representative illustrations encompass:

A. Water-soluble sweetening agents such as monosaccharides, disaccharides and polysaccharides such as xylose, ribose, glucose, mannose, galactose, fructose, dextrose, sucrose, sugar, maltose, partially hydrolyzed starch, or corn syrup solids and sugar alcohols such as sorbitol, xylitol, mannitol and mixtures thereof.

B. Water-soluble artificial sweeteners such as the soluble saccharin salts, i.e., sodium or calcium saccharin salts, cyclamate salts, acesulfam-K and the like, and the free acid form of saccharin.

C. Dipeptide based sweeteners such as L-aspartyl-L-phenylalanine methyl ester and materials described in U.S. Pat. No. 3,492,131 and the like.

In general, the amount of sweetener will vary with the desired amount of sweeteners selected for a particular chewing gum. This amount will normally be 0.001% to about 90% by weight when using an easily extractable sweetener. The water-soluble sweeteners described in category A above, are preferably used in amounts of about 25% to about 75% by weight, and most preferably from about 50% to about 65% by weight of the final chewing gum composition. In contrast, the artificial sweeteners described in categories B and C are used in amounts of about 0.005% to about 5.0% and most preferably about 0.05% to about 2.5% by weight of the final chewing gum composition. These amounts are ordinarily necessary to achieve a desired level of sweetness independent from the flavor level achieved from flavor oils. While water may be added, independently, with dry sweeteners, it will generally be added as part of a corn syrup.

In order that the chewing gum composition have an acceptable texture it is preferred that a softening agent be included in the composition. Softening agents as used herein refers to emulsifiers, plasticizers, softeners and the like. Illustrative, nonlimiting examples of suitable emulsifiers include lecithin, fatty acid and monoglycerides, di- and triglycerides, propylene glycol monostearate, glycerol monostearate and mixtures thereof. Such materials may be used in amounts of about 1% to about 25% by weight.

A variety of different ingredients such as plasticizers or softeners including hydrogenated vegetable oil, lanolin, lecithin, stearic acid, sodium stearate, potassium stearate, glyceryl triacetate, glycerine and the like as well as natural waxes, petroleum waxes, such as polyethylene waxes, paraffin waxes and microcrystalline waxes may also be incorporated into the gum base to obtain a variety of desirable textures and consistency properties. These materials are generally employed in amounts of up to 30% by weight and preferably in amounts of about 1% to about 25% by weight, and more preferably about 3% to about 70% by weight of the chewing gum composition.

The chewing gum compositions of this invention can additionally include the conventional adjunctives such as coloring agents, flavoring agents, fillers, plasticizers, bulking agents, emulsifiers, softeners and mixtures thereof. The coloring agents include titanium dioxide and the well known food dyes of the art. The fillers include but are not limited to aluminum hydroxide, alumina, aluminum silicates, calcium carbonate, and mixtures thereof. The use of fillers is optional and they may be used in varying amounts. Preferably, the amount of fillers when used will vary from about 4% to about 30% by weight of the final chewing gum composition.

Flavoring agents well known to the chewing gum art can be added to the chewing gum compositions of this invention. Both synthetic flavoring agents and natural flavoring agents derived from plants, leaves, flowers, fruits, etc. and combinations thereof are useful. These flavoring agents are generally liquids. However, they can also be used as spray dried solids. The use of flavoring agents having other distinct physical forms such as powdered flavorings, beaded flavorings and encapsulated flavorings are within the scope of this invention. Illustrative non-limiting examples of flavoring agents

include spearmint oil, cinnamon oil, oil of wintergreen (methylsalicylate) and peppermint oils. Synthetic and natural fruit flavors useful as flavoring agents include such flavorings as citrus oil, e.g., lemon, orange, lime and grapefruit; fruit essences including apple, strawberry, cherry, banana, pineapple; and the various flavorings such as aldehydes and esters including cinnamyl acetate, cinnamaldehyde, citral diethyl acetal, dihydrocavryl acetate, eugenyl formate, p-methylamisol, and so forth. Generally any flavoring or food additives such as those described in *Chemicals Used In Food Processing*, pub 1274 by the National Academy of Sciences, pages 49-53 and 63-258 may be used.

The term "flavoring agent" as used in the specification and claims means any of the natural and synthetic flavorings used in the chewing gum art and in particular those flavoring agents heretofore described.

The amount of flavoring agent employed is normally a matter of preference and will be determined by such factors as flavor type and the strength desired. In general, amounts of about 0.05% to about 3.0% by weight of the overall chewing gum composition are used, preferably about 0.3% to about 1.5%, more preferably about 0.7% to about 1.2% by weight.

While the chewing gum composition will include flavoring agents, it is within the scope of this invention to add additional flavoring agents to the chewing gum composition granules immediately prior to tableting. Preferably, the additional flavoring agent is in a dry form, e.g., spray dried flavoring or encapsulated flavoring. However, liquid flavoring can be added if it is first blended with the dry components of the lubricating system.

As used in the specification and claims the term "chewing gum composition" means the afore-described prior art gum compositions comprising a gum base, sweetener and softening agent as well as other adjunctives known to the chewing gum art. These chewing gum compositions generally have a moisture content of at least 2% to about 8% by weight of the compositions, preferably about 2% to about 6% by weight, more preferably about 2% to about 4% by weight.

Typical chewing gum compositions for use in the practice of this invention are set forth in Table I.

TABLE I

Component	Percent by Weight
Gum base	14 to 30
Sweeteners	0.001 to 90
Softening Agent	1.0 to 25

In preparing the tableting formulation the composition of the compression aid and flavorings is determined and the balance is made up of the chewing gum granulation.

The chewing gum compositions made from the instant process may be of the sugar or sugarless variety and may be formulated into regular or non-adhering chewing gum pieces. Bubble gum, stick gum, center-filled and other gum piece forms well known to the art are contemplated.

While the invention has been described in terms of tableting a conventional chewing gum composition, it is preferred that the chewing gum composition of this invention include medicaments, the resultant tablet being a medicated chewing gum tablet.

The medicament is added to the gum granules along with the compression aid. Pharmaceutical drugs or

other active agents are added in a number of forms including encapsulation, but they are preferably added in a dry state. Active agents may themselves be granulated and added in this form to the tableted chewing gum composition.

Liquid, water soluble drugs can be added to a solution of modified maltodextrin and spray dried. Liquid, oil soluble drugs and active agents can be blended with the compression aid components prior to mixing with the gum granules. In that event the liquid drug or active agent should not exceed more than 30% by weight of the compression aid, preferably not more than 20% by weight.

The advantage of the tableted gum composition of this invention as a means for dispensing drugs medicaments and other active agents is that the component is trapped between granules and not within the gum composition. Hence, it is readily bioavailable and nearly completely released upon chewing of the gum. The prior art has heretofore focused on adding medicaments to the gum composition during blending of the chewing gum ingredients into the melted gum base. This results in slow or incomplete release of the medicament since it remains trapped to a large extent in the gum base. The instant gum granulation and moisture content allows for better release of the medicament during mastication. The term "active agent" as used in the specification and claims means any drug, medicament, or other substance taken for its medicinal or dietary properties.

Illustrative, non-limiting examples of active agents which can be incorporated in the gum tablets of this invention include benzocaine, phenolphthaline, laxatives, lobeline sulfate (no smoking aid), calcium carbonate or magnesium carbonate as antacids, aspirin, fluorides for tooth decay prevention, nicotine as a smoking substitute, vitamins, minerals, caffeine, citrated caffeine, caffeine sodium benzoate, caffeine hydrochloride, appetite suppressants, etc. Other active agents which are beneficial to promoting health are contemplated.

Where the active agent is a dry powder it may be added in as much as equal parts by weight as the compression aid. Preferably, however, the active agent comprises about 1 to 5% by weight of the tablet, more preferably about 2% to about 4%, e.g., 3%. For example, where Vitamin C is the active agent it may be added at about 60 mg per tablet. For diet tablets the chewing gum tablet may contain about 5 mg. of benzocaine and 75 mg of methylcellulose. Breath deodorizing tablets, for example, may contain about 1 mg. of chlorophyll per tablet.

In general, the process of preparing chewing gum compositions comprises adding to a suitable gum kettle a melted blend of gum base and corn syrup and mixing until homogeneous. Usually a homogeneous mass is obtained in about six (6) minutes at a temperature of about 55° to about 65° C. Sugar, dextrose, malto dextrin and color are usually then blended into the homogeneous mass for approximately two (2) minutes. Flavor is added next and mixed until sufficiently homogeneous.

In the process of the inventive compositions, a chewing gum composition containing a grinding aid is made using those general methods of preparation commonly known to the art to produce chewing gum compositions with a moisture content of about 2% to about 8% by weight. The chewing gum composition is then formed into sheets or ropes as is commonly practiced in the art and may be aged for about twenty four hours. The composition is then ground into a granulation to form

gum granules at room temperature. Grinding is accomplished using any suitable grinder, for example, a Fritzmill.

The following examples serve to provide further appreciation of the invention but are not meant in any way to restrict the effective scope of the invention. All percentages throughout the specification are by weight of the tableted chewing gum composition unless otherwise indicated.

EXAMPLE I

A chewing gum composition having the following formulation was prepared.

Component	Percent by Weight
Gum base	21
Corn syrup	17
Lecithin	0.2
Glycerin	0.45
Coloring	0.1
Flavoring	0.25
Low density maltodextrin	1.0
Sugar	59.4
	100.00%

The gum base, corn syrup and lecithin were blended together in a kettle at about 82°-94° C. for two minutes to obtain a homogeneous mixture. The remaining components were added to this mixture and blended for about five minutes. The gum composition was discharged into kettles and formed into ropes which were conditioned for 24 hours. The moisture content of the chewing gum was 3% by weight. The chewing gum composition was then ground into granules in a Fritzmill using 2% by weight based on the chewing gum composition of dicalcium phosphate as the grinding aid.

The granules formed had a particle size of about 4 to 20 mesh. There was no sticking or compacting during grinding, and no gum composition adhered to the equipment.

EXAMPLE II

Example I was repeated substituting 2% of modified maltodextrin having a bulk density of about 4 lbs/cu.ft. as the grinding aid. The results were substantially the same as those achieved in Example I except that the granules appeared to be more free flowing.

EXAMPLE III

The gum granules prepared in Example II were tableted using the formulations set forth in Table II.

TABLE II

Component	Tableting Formulation							
	Run No.							
	1	2	3	4	5	6	7	8
Gum granules	98.5	97.5	95.5	95.5	95	93.0	94.0	95.0
Mg stearate	1.0	1.5	1.5	1.5	1.5	1.5	1.5	1.0
Fumed silica	0.5	0.5	0.5	0.5	0.5	1.0	1.0	0.5
Fat(I)	—	0.5	0.5	0.5	0.5	—	—	—
Modified maltodextrin	—	—	2.0	2.0	2.0	1.5	1.5	1.5
powdered								
flavoring	—	—	—	—	0.5	2.0	2.0	2.0
Fat(II)	—	—	—	—	—	0.5	—	—
Total	100	100	100	100	100	100	100	100

(I) powdered hydrogenated coconut oil
(II) powdered hydrogenated vegetable oil

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The granules were blended with the remaining constituents at room temperature for about 15 minutes in a Patterson Kelly Blender and tableted in a Stokes tableting machine.

The results of these runs were as follows:

Run No.	Remarks
1.	Flow problems in tableting machine; sticking in punch die.
2.	Good flow; sticking in punch; fatty taste.
3.	Good flow; good die punch release; no fatty taste; low flavor.
4.	Same as Run No. 3.
5.	Good flow; good release; high flavor
6.	Same as Run No. 5, but with improved flavor.
7.	Good flow; good release; good flavor.
8.	Good flow; good release; good flavor.

The results of Run Nos. 7 and 8 demonstrate that where modified maltodextrin is used, the powdered triglycerides (hydrogenated oils) are not required as compression aids.

EXAMPLE IV

A chewing gum composition was formulated having the following composition:

Component	Weight Percent
Gum base	22
Corn syrup	18
Leucidin	0.4
Glycerin	0.05
Flavor	1.4
Sugar	57.55

The gum base, corn syrup and softeners were blended as in Example I at about 82° to 94° C. for two minutes. The remaining ingredients were added to this mixture and blended for about five minutes. Following the procedure of Example II the gum was formed into granules using modified maltodextrin as the grinding aid. The moisture content of the chewing gum composition was 3.33% by weight.

The following formulation was used to prepare chewing gum tablets using the procedure of Example III.

Component	Weight Percent
Gum granules	95.5
Mg stearate	1.5
Fumed silica	0.5
Modified maltodextrin	2.0
Hydrogenated cottonseed oil	0.5

The material was free flowing in the tableting machine hopper and feeder and did not stick in the mold.

EXAMPLE V

A sugar free formulation was used to prepare a chewing gum base as follows.

Component	Weight Percent
Gum base	24.0
Glycerin	0.5
Leucidin	0.5
Dicalcium phosphate	8.0
Sorbito liquid	14.0
Sorbitol	52.0

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-continued

Component	Weight Percent
Sodium saccharin	500 ppm
Flavor	1.4
Color	0.1

The gum base and softener were blended for 2 minutes at 82° to 94° C. and the mannitol and sorbito liquid (sorbitol solution) were added with continued blending for two minutes. Then sorbitol, flavor and sodium saccharin were added with mixing for an additional six minutes. The moisture content of the chewing gum was 2% by weight. The gum composition was granulated as in Example II, using dicalcium phosphate instead of maltodextrin as the grinding aid, and tableted using the following tableting composition:

Component	Weight Percent
Gum granules	95.0
Flavoring (powdered)	2.0
Fumed silica	1.0
Powdered hydrogenated vegetable oil	0.5
Mg stearate	1.5
	100.0

EXAMPLE VI

Example V was repeated using the following tableting composition:

Component	Weight Percent
Gum granules	93.0
Flavoring (powdered)	2.0
Fumed silica	1.0
Powdered hydrogenated cotton seed oil	0.5
Mg stearate	1.5
Mannitol	2.0
	100.0

The lubricating system comprising the silica, hydrogenated oil, magnesium stearate and mannitol were blended together with the flavoring and blended with the gum granules prior to tableting. The gum granules flowed freely in the hopper and feeder of the tableting machine and released well from the punch die.

The use of active agents in the gum tablets of this invention can be illustrated by the following example.

EXAMPLE VII

A chewing gum composition was prepared using the following formulation:

Component	Weight percent
Gum base	22.0
Corn Syrup	18.0
Sugar	57.4
Flavoring	1.0
Softeners	0.95
Color (yellow #6)	0.15
Malic Acid	0.5
	100.00

The chewing gum composition was prepared and granulated in accordance with the procedure of Example III. The chewing gum had a moisture content of

about 3.3% by weight. Gum granules were made from the chewing gum and then tablets were made therefrom using the following tableting composition:

Component	Weight percent
Gum Granules	92.14
Coated Ascorbic Acid	1.35
Sodium ascorbate	1.31
Flavoring	2.0
Modified Maltodextrin	1.5
Mg stearate	1.0
Fumed silica	0.5
Color (yellow #6)	0.2

The composition was tableted using the stokes tableting machine. There was good flow in the hopper and feeder and good release from the punch die.

EXAMPLE VIII

Three batches of the chewing gum composition of Example I were prepared using 6%, 8% and 10% of the grinding aid, respectively. Dicalcium phosphate was the chosen grinding aid. The gum granules were tableted using formulation 7 of Table II, Example III. The resultant tablet, as tested by a panel of nine (9) experts was unacceptably gritty and chalky destroying the organoleptic appeal of the chewing gum. Thus, amounts of grinding aid outside the range claimed are not considered useful due to this result.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention and all such modifications are intended to be included within the scope of the claims.

We claim:

1. A process of producing a tableted chewing gum composition having a water content of about 2 to about 8% by weight which comprises:

preparing a chewing gum composition having a water content of about 2 to about 8% by weight comprising gum base and a sweetener selected from the group consisting of monosaccharides, disaccharides, polysaccharides and mixtures thereof;

grinding the chewing gum composition by utilizing a finely divided grinding aid present in the amounts of about 0.2% to about 5% by weight of the tableted chewing gum composition and selected from the group consisting of alkali metal phosphates, alkaline earth metal phosphates, maltodextrins and mixtures thereof, to form a granulation;

blending the granulation with a compression aid comprising modified maltodextrin and one or more materials selected from the group consisting of lubricants, glidants and anti-adherents; and compressing the resultant granulation to form a tablet.

2. The process of claim 1 wherein said sweetening agent is selected from the group consisting of sugar, corn syrup solids, and mixtures thereof.

3. The process of claim 1 wherein said materials are selected from the group consisting of metallic stearates, hydrogenated vegetable oils, partially hydrogenated

vegetable oils, polyethylene glycols, polyoxyethylene monostearates, animal fats, silicates, silicon dioxide, talc and mixtures thereof.

4. The process of claim 1 wherein said materials are selected from the group consisting of magnesium stearate, calcium stearate, fumed silica, powdered hydrogenated cottonseed oil, powdered hydrogenated vegetable oil, hydrogenated soya oil and mixtures thereof.

5. The tableted chewing gum composition produced by the process of claim 1.

6. The tableted chewing gum composition produced by the process of claim 2.

7. The tableted chewing gum composition produced by the process of claim 3.

8. The tableted chewing gum composition produced by the process of claim 4.

9. A process for producing a tableted chewing gum composition having a water content of about 2 to about 8% by weight which comprises:

preparing a chewing gum composition having a water content of about 2 to about 8% by weight comprising gum base and a sweetener selected from the group consisting of sugar alcohols, water-soluble artificial sweeteners, dipeptide based sweeteners and mixtures thereof;

grinding the chewing gum composition by utilizing a finely divided grinding aid present in the amounts of about 0.2% to about 5% by weight of the tableted chewing gum composition and selected from the group consisting of alkali metal phosphates, alkaline earth metal phosphates, maltodextrins and mixtures thereof, to form a granulation;

blending the granulation with a compression aid comprising one or more materials selected from the group consisting of lubricants, glidants and anti-adherents; and

compressing the resultant granulation to form a tablet.

10. The process of claim 4 wherein said sweetener is a sugar alcohol selected from the group consisting of sorbitol, xylitol, mannitol, and mixtures thereof.

11. The process of claim 9 wherein said materials are selected from the group consisting of metallic stearates, hydrogenated vegetable oils, partially hydrogenated vegetable oils, polyethylene glycols, polyoxyethylene monostearates, animal fats, silicates, silicon dioxide, talc, modified maltodextrin, and mixtures thereof.

12. The process of claim 9 wherein said materials are selected from the group consisting of magnesium stearate, calcium stearate, fumed silica, powdered hydrogenated cottonseed oil, powdered hydrogenated vegetable oil, hydrogenated soya oil, calcium carbonate, mannitol, sorbitol and mixtures thereof.

13. The tableted chewing gum composition produced by the process of claim 9.

14. The tableted chewing gum composition produced by the process of claim 10.

15. The tableted chewing gum composition produced by the process of claim 11.

16. The tableted chewing gum composition produced by the process of claim 12.

* * * * *

UNITED STATES PATENT OFFICE

2,290,120

CHEWING GUM PRODUCT AND METHOD OF PREPARING SAME

Christopher F. Thomas, Toronto, Ontario,
CanadaNo Drawing. Application September 14, 1940,
Serial No. 336,835

14 Claims. (Cl. 99-135)

My invention relates to chewing gum products and is particularly concerned with the preparing of chewing gum confections although, as will be seen hereinafter, the novel principles may be applied to the preparation of chewing gum products broadly.

Conventional chewing gum is made by combining together, in a suitable mixer, melted chicle or other chewing gum base, commercial liquid corn syrup, powdered sugar and flavor, with or without supplemental agents which produce desired modifications of texture, chewing characteristics and the like. The plastic chewing gum mass is then passed through rolls and sheeting and scoring machines in accordance with practices well known in the art to produce the usual chewing gum of commerce.

The chewing characteristics of chewing gum are graded by those varied in the art in accordance with the following: (1) the initial chew or, in other words, the chewing characteristics when the chewing gum is first placed in the mouth; (2) the intermediate chew or, in other words, the chewing characteristics at the time when the bulk of the soluble materials of the chewing gum is being leached out in the mouth; and (3) the final chew or, in other words, the chewing characteristics after substantially all of the solubles of the chewing gum have been chewed or leached out. In order for a chewing gum to be graded 100%, each of these three stages in the chew would be required to have a rating of 100%.

In a good chewing gum, the final chew is normally close to perfection since the formulation of the base is predicated on the obtaining of this characteristic or property. While the final chew is of excellent character, the usual result is that such characteristic is obtained at the expense of the grade or quality of the initial and intermediate chews, the initial chew being too stiff and the intermediate chew being too soft. An enormous amount of research work has been carried out in an effort to obtain a softening of the initial chew and a stiffening of the intermediate chew while, at the same time, maintaining the high quality of the final chew.

In accordance with my present invention, novel chewing gum products are produced with superior chewing characteristics. While the final chew is of essentially the same character as that of the conventional chewing gum, the initial and intermediate chews are markedly superior, particularly the initial chew which is considerably softer. This results largely from the novel pro-

cedure of making the chewing gum as a result of which its center is relatively porous whereas its surface is somewhat compact, there being what might almost be characterized as a shell on the surface of the pieces of the chewing gum. The solubles appear to dissolve somewhat more slowly and the soft mushiness of the intermediate chew, characteristic of conventional chewing gums, is absent and in place thereof is a desirable gummy firmness.

The novel chewing gums of my present invention comprise a coherent, pressed or compressed mass of discrete, finely divided particles of chewing gum base material, such as chicle or jelutong or mixtures thereof, as more fully pointed out hereinafter, and finely divided sweetening materials such as pulverulent sucrose, glucose, or other sugars or the like, and flavoring constituents, with or without supplemental agents, hereinafter mentioned.

In preparing the novel chewing gum products of my invention, the chewing gum base, preliminarily cleaned and purified, is reduced to pulverulent form in any suitable manner. I have found it to be highly satisfactory to refrigerate or freeze the chewing gum base so that it is rendered relatively rigid and then to comminute the frozen base in any suitable way to particles of the desired size. Such particles may, of course, vary in size within relatively wide limits but, in general, excellent results are obtained when the majority of the particles are in the range which will pass through a 80 mesh screen and preferably through a 100 mesh screen. The particles of chewing gum base material are then mixed with pulverulent commercial corn syrup and powdered sugar, of at least about the same degree of fineness as that of the particles of chewing gum base, and with a suitable flavor, all in the desired proportions, and the resulting mixture is pressed or compressed into the particular shape sought. The pulverulent corn syrup may conveniently be produced by freezing the commercial liquid corn syrup, pulverizing or powdering it, and then sieving to obtain particles of the desired size. The flavoring, which constitutes only a very small proportion of the product, may be utilized in the liquid form or in any desired state.

In order that those skilled in the art may even more fully appreciate the character and scope of the invention, I set forth hereinbelow one specific embodiment for carrying out the novel teachings of my invention. It will be understood that this embodiment is illustrative and in no

wise limitative of the full scope of my invention. Thus, for example, different base mixtures of gums, guttas, resins and the like may be utilized, with or without supplemental agents, the proportions of the ingredients may be varied, and other changes may be made within limits without departing from the spirit and teachings of my invention herein.

Commercial corn syrup is frozen by subjecting the same to a temperature of about -20 degrees F. The frozen product is ground, preferably in a cold room and while maintaining the grinder or grinding elements at about 0 degrees F. The ground, pulverulent product is then screened so as to collect those particles which pass through a 90 mesh screen and preferably through 100 mesh screen. The coarser particles, namely, those which remain on the screen, are reground either alone or together with freshly frozen corn syrup so as to obtain discrete particles of the fineness indicated. The ground, finely divided or powdered particles of corn syrup are then stored under conditions of low temperature and low relative humidity so as to prevent melting or coalescing of the particles.

Dry Mexican chicle, previously cleaned and purified, containing from about 2% to about 5% moisture, is frozen by subjecting the same to a temperature of about -10 degrees F. The frozen chicle is then ground under the same conditions described hereinabove in connection with the corn syrup so as to provide particles which pass a 100 mesh screen.

About 19 parts by weight of the corn syrup powder and about 20 parts by weight of the finely divided chicle are mixed together with about 80 parts by weight of powdered sugar (XXXXX) and about 1 part by weight of a desired flavoring material to provide a homogeneous mixture. The mixing preferably is carried out in a rotary drum, at either room temperature or somewhat below and preferably under conditions of low relative humidity. The homogeneous mixture is then passed through a "Colton" or "Stokes-Smith" tableting machine to produce coherent tablets, a relatively low pressure being used, preferably of the order of 40 lbs./sq. in. The resulting chewing gum product may then be packaged or, alternatively, it may be coated with the usual candy coating or any other desired coating and then packaged for distribution.

The temperatures at which the corn syrup and chicle are frozen prior to the comminution or grinding thereof are, of course, subject to relatively wide variation. In general, temperatures of the order of -10 degrees F. to -30 degrees F. for the corn syrup and of the order of 0 degrees F. to -20 degrees F. for the chicle or other chewing gum base are quite satisfactory although temperatures somewhat above or below these ranges give good results. It will be understood that the commercial corn syrup and the chicle or other chewing gum base may be frozen together and ground together instead of separately, although, for best results, I prefer to freeze and grind them separately. While I find it quite desirable to utilize the step of freezing followed by comminution to reduce the liquid corn syrup and chicle to discrete, finely divided or powdered particles, it will be understood that my invention encompasses, in its broader aspects, any manner of producing or providing discrete, finely divided or powdered corn syrup and chicle or other chewing gum base so that particles thereof may be admixed with powdered sucrose or the like and

compressed to form a coherent body in tablet or any other desired shape or form.

The chewing gum base materials which may be employed in the practice of my invention may be selected from a large group, representative examples of which are Mexican chicle, jelutong, gutta soh, gutta siak, gutta percha, balata, Perillo, Leche Caspi, ester gum, resins and resenes of various types including coumarone-indene resins, vinyl resins, petroleum resins, gutta katiau, mastic, kauri, dammar, rubber latex, crepe rubber, and the like, or blends of any two or more thereof. The invention is of especial utility in connection with confection products prepared from chicle, jelutong or mixtures thereof, or gutta soh, gutta siak, gutta katiau, and Leche Caspi alone or in admixture with chicle or jelutong.

For obtaining particular effects on texture, smoothness, cohesiveness and the like, various modifying agents may, if desired, be incorporated in the confection composition, for example, gum arabic, stearine, hydrogenated oils, waxes such as paraffins, beeswax, ceresin wax, carnauba wax, candellilla wax, spermaceti, petrolatum, cocoa butter, lanolin, phosphatides such as lecithins or cephalins, and the like. Those of solid materials which are pulverulent or may be rendered so may, of course, be incorporated with the other ingredients in the mixer or blender. The normally liquid materials or those which readily can be rendered liquid may be sprayed onto the other ingredients in the mixer or blender. The greasy or oleaginous addition materials may be blended into the chewing gum base and the resulting base treated as described hereinabove to convert the same to pulverulent or powder form.

For special purposes, different sugars or sweetening agents may be utilized such as lactose, dextrose, maltose and the like. However, since the usual chewing gum contains commercial corn syrup and sucrose, I particularly prefer to utilize said sweetening materials. I also prefer to utilize the ingredients in substantially the same proportions as they are employed in the ordinary chewing gum. However, the proportions of the various ingredients may vary somewhat without in any way departing from the spirit of my invention.

In addition to the advantages which my present invention brings about with respect to improvements in the chewing characteristics, still other advantages result. Thus, for example, each individual piece of the chewing gum of my present invention is substantially uniform in size and shape. This results not only in better looking unit pieces but also in higher wrapping machine production and lower wrapping machine material waste. In the manufacture of the conventional chewing gum, the sheeting of the warm chewing gum mass to make sticks or the like, while economical and convenient, results in the delivery of unit pieces which are not all of the same size or dimensions since a varying amount of stretching tension is given to unit pieces in various parts of the sheet. A still further advantage of my present invention resides in connection with the preparation of sugar-coated chewing gum. Since the chewing gum products of my invention have a smooth and glossy surface, they can be coated uniformly without difficulty by the usual panning procedure whereas chewing gum centers made by conventional methods usually show inequalities in the surface which show up as greyish spots in the finished sugar-coated pieces unless much care and expert attention is exercised during the coating operation.

It will be understood that the term "compressing", as used hereinabove and in the claims, is intended to cover any operation involving the application of pressure to the mixture of the chewing gum base and other ingredients. While I prefer to employ a tableting machine, other types of equipment may be utilized such as hydraulic presses, stamping machines, extruding devices, and the like.

It is preferred that the final chewing gum product contain on the order of about 3% to about 5% moisture and, therefore, the proportions of ingredients utilized together with their moisture contents should be taken into consideration in working out any particular compositions or formulas.

While I have described my invention in detail, it will be understood that variations and modifications may be made without departing from the spirit thereof, as exemplified by the appended claims.

What I claim as new and desire to protect by Letters Patent of the United States is:

1. A method which comprises providing finely divided, discrete, solid particles each of a chewing gum base and at least one sugar, mixing said particles to provide a substantially homogeneous mixture, and compressing said mixture to form a coherent body.

2. A method which comprises providing finely divided, discrete, solid particles each of a chewing gum base, a sugar, and corn syrup, mixing said particles to provide a substantially homogeneous mixture, and compressing said mixture to form a coherent body.

3. A method which comprises providing finely divided, discrete, solid particles of a chewing gum base, sucrose, and corn syrup, said particles having a size such that substantially all of them will pass through a 80 mesh screen, mixing said particles to provide a substantially homogeneous mixture, and compressing said mixture to form a coherent body.

4. A method in accordance with claim 3, wherein the sucrose is present in predominating proportions and the chewing gum base and corn syrup are present in minor but generally similar proportions.

5. A method which comprises freezing a chewing gum base material, comminuting said frozen material, mixing the comminuted particles with solid particles of sugar and corn syrup, and compressing the mixture to form a coherent confection body.

6. A method of making confections which comprises freezing a chewing gum base at a temperature of about 0 degrees F. to about -20 degrees F., freezing commercial corn syrup at a temperature of about -10 degrees F. to about -30 degrees F., comminuting said materials to provide particles which will pass through approximately a 100-mesh screen, mixing the particles with finely powdered sucrose, and compressing the mixture to form a coherent body.

7. A method in accordance with claim 6, wherein the chewing gum base comprises approximately 20%, the corn syrup about 19%, and the sucrose about 60% of the confection.

8. A method which comprises providing a frozen chewing gum base and frozen corn syrup, comminuting said frozen materials, mixing the comminuted particles with pulverulent particles of sucrose, and compressing the mixture to form a coherent confection body.

9. A method of making confections which comprises freezing a chewing gum base, freezing corn syrup, comminuting said frozen materials so as to provide particles which will pass through a screen of at least 80-mesh, mixing the comminuted particles with particles of sucrose having a fineness of at least the order of that of the particles of chewing gum base, and compressing the mixture to form a coherent confection body.

10. A chewing gum product comprising a coherent, compressed mixture of discrete particles of comminuted chewing gum base material and at least one sugar.

11. A chewing gum product comprising a coherent, compressed mixture of finely divided solid particles each of chewing gum base material, sucrose, and corn syrup.

12. A chewing gum product comprising a coherent, compressed mixture of initially finely divided solid particles each of a chewing gum base material comprising chicle, sucrose, and corn syrup.

13. Chewing gum comprising a coherent, compressed mixture of finely divided solid particles of a chewing gum base and sweetening material.

14. A chewing gum comprising a coherent, compressed mixture of initially finely divided solid particles each of chewing gum base material, sucrose, and corn syrup, said ingredients being present in proportions of about 20% chewing gum base material, about 60% sucrose, and about 19% corn syrup.

CHRISTOPHER F. THOMAS.

Patent Abstracts of Japan

205

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APPLICATION DATE : 18-06-82
APPLICATION NUMBER : 57103719

APPLICANT : LOTTE CO LTD;

INVENTOR : HAGIWARA NOBUHIDE;

INT.CL. : A23G 3/30

TITLE : PREPARATION OF CHEWING GUM BY FREEZE CRUSHING

ABSTRACT : PURPOSE: To prepare a chewing gum of high quality in easy steps, by dipping mixed whole raw materials for the chewing gum in liquid nitrogen, pulverizing and uniformly mixing the cold raw materials at the same time, returning the raw materials to ordinary temperature, and if necessary molding the resultant materials into a given shape.

CONSTITUTION: The whole raw materials for a chewing gum are introduced into a freezing hopper of a freeze crushing apparatus in irregular order. In the process, lumps, e.g. a resin or rubber, are previously cut to 5-10mm size to facilitate the passage through the outlet of the raw material hopper, and other materials are directly used in the usual distribution forms. The whole materials are then dipped in liquid nitrogen, exposed to -196°C cryogenic temperature and cooled to increase the brittleness. Thus, the resin or gum is easily pulverized. The whole raw materials are then fed to a pulverizer and pulverized in a very short time to give a fine powdery uniform mixture, which is then collected in a cyclone, taken out one after another and returned to ordinary temperature not to absorb moisture. The resultant powdery chewing gum is then compression molded in a given mold under a given pressure if necessary to give a sheet chewing gum.

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**REQUISITOS NECESARIOS PARA PRESENTACION Y AGILIZACION DEL
TRAMITE**

	USUARIO	RADICADOR
PATENTE DE INVENCION ✓	()	(✓)
Indicación de que se solicita la concesión de una patente.	()	(✓)
Datos de identificación del solicitante o de la persona que se presenta la solicitud.	()	(✓)
Descripción de la invención.	()	(✓)
Dibujos de ser estos pertinentes. X	()	(✓)
Comprobante de Pago de las tasas establecidas.		

COMPLETA ()	INCOMPLETA ()
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DISEÑO INDUSTRIAL ()	
- Indicación de que se solicita el registro de Diseño Industrial	() ()
- Datos de identificación del solicitante o de la persona que presenta la solicitud.	() ()
- Representación gráfica o fotográfica del Diseño Industrial o muestra del Material que incorpora el diseño.	() ()
- Comprobante de pago de las tasas establecidas	() ()

COMPLETA ()	INCOMPLETA ()
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ESQUEMA DE TRAZADO ()	
- Indicación de que solicita el registro de un Esquema de trazado.	() ()
- Datos de identificación del solicitante o de la persona que presenta La solicitud.	() ()
- Representación gráfica del esquema de trazado	() ()
- Comprobante de pago de las tasas establecidas.	() ()

COMPLETA ()	INCOMPLETA ()
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Firma Responsable:

Fecha:

2020
Bogotá, D.C.,

Doctora:
DILIA MARIA RODRIGUEZ D'ALEMAN

Oficio N° 10579

ASUNTO:	Radicación N°	04-106910
	Solicitud internacional	PCT/EP03/03598
	Fecha inicio fase nacional	05/11/2004
	Trámite	011
	Evento	379
	Actuación	416
	Folios	001

Como resultado del examen de forma, realizado con fundamento en el artículo 38 de la Decisión 486 de la Comisión de la Comunidad Andina, artículo 27 del Tratado de Cooperación en Materia de Patentes (PCT), regla 51 bis del Reglamento y Circular Única de la Superintendencia de Industria y Comercio, se le comunica que:

- La solicitud no contiene la copia del documento en que consta la cesión del derecho a la patente del inventor al solicitante o a su causante. (Art. 26-k) Decisión 486).
- La solicitud no contiene el poder debidamente otorgado, con el lleno de los requisitos exigidos por los artículos 63 y subsiguientes del Código de Procedimiento Civil. Adicionalmente, deberá presentar el documento que acredita la existencia y representación legal de la sociedad solicitante, cuando ésta fuere persona jurídica.

En cumplimiento de lo dispuesto por el artículo 39 de la Decisión 486, se le requiere para que dentro del término de dos meses siguientes a la fecha de notificación del presente oficio, complete los requisitos anteriormente enunciados. En caso de no dar cumplimiento al presente requerimiento, la solicitud se considerará abandonada y perderá su prelación.

Notifíquese el presente oficio conforme a lo dispuesto en el numeral 5.2, literal e), del capítulo quinto del título primero de la Circular Única N° 10 de 2001.


ALIX CARMENZA CESPEDES DE VERGEL
Jefe de la División de Nuevas Creaciones.

El anterior requerimiento fue notificado por fijación en lista de fecha, 19 Nov. 2004.

202047

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