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Señores
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Superintendencia de Industria y Comercio
En su Despacho

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
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TÍT. 2 PATENTES
Ene: 1 REGISTRO
Act. 29 COTONFORMACION Faltos: 1

Ref. NUEVA DIRECCION

Expediente No. 02 - 035 205

Patente: Extracción y procesamiento de jugos de café estabilizados

Favor tomar nota del siguiente cambio de dirección:

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Mil gracias,



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DIVISION DE NUEVAS CREACIONES

RADICACIÓN EXPEDIENTE No. 02-35205

**EL EXTRACTO DE LA PRESENTE SOLICITUD DE PATENTE DE INVENCION ,
FUE PUBLICADO EN LA GACETA DE PROPIEDAD INDUSTRIAL No 522, DE
FECHA 28 DE NOVIEMBRE DE 2002, EL TERMINO HABIL SEÑALADO POR
LA LEY EXPIRA EL 25 DE FEBRERO DE 2003.**

NOTA: Dentro del plazo de los seis (6) meses siguientes a partir de la fecha de publicación en la gaceta de Propiedad Industrial, deberá solicitar y cancelar el examen de patentabilidad so pena de que la solicitud caiga en abandono, de acuerdo con lo establecido en el Artículo 44 de la Decisión 486/2000.

SE PRESENTARON OPOSICIONES POR PARTE DE TERCEROS.

SI ☐ ☐

NO ☒ ☐

**SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
DIVISION DE NUEVAS CREACIONES**

2020

Bogotá, D.C.

Doctor

Edgar Villamizar
Apoderado

Oficio No... 6550

REFERENCIA: Radicación No. 02- 35205

Trámite 002

Evento 001

Actuación 430

Folios 012

Como resultado del examen de fondo, realizado con fundamento en el artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se le comunica:

1. DOCUMENTOS ESTUDIADOS.

- Capítulo descriptivo: folios 7 al 11
- Capítulo reivindicatorio: folios 12 al 13

La solicitud no reivindica prioridad.

2. OBJETO DE LA INVENCION.

Título: "Extracción y procesamiento de jugos de caña de azúcar estabilizados".

La invención se refiere a :

- Procedimiento para producir un jugo de caña de azúcar concentrado y estable para el consumo humano, el cual comprende los pasos de: seleccionar la caña, cortar y recolectar manualmente la caña, cortar en trozos y moler los trozos de caña hasta producir jugo, ajustar el pH del jugo de caña a un valor de 7.5; clarificar el jugo; remover los floculos de impurezas para conformar una pureza de jugo de 99.9%, pasteurizar el jugo; recuperar y enfriar el jugo estable.
- en el procedimiento la selección de especies de caña se realiza bajo el criterio de un contenido mínimo de 13.7 % de sacarosa. El pH se ajusta por adición de hidróxido de calcio. La adición de floculante y la remoción del mismo es un proceso repetitivo. El floculante utilizado es de origen vegetal del grupo de Guasito Balso o cadillo o mezclas de ellos.
- La clarificación del jugo se realiza por medio de un desnatado superficial de impurezas remanentes en el floculo con base en un equipo a manera de un tanque receptor de jugo en una primera clarificación para agitarlo y calentarlo através de vapor insuflado en su interior.
- El jugo de caña producido con una concentración de 80 grados Brix y una pureza de 99.9% con color y sabor natural.

Clasificación Internacional de Patentes: C13C 1/02 y C13D 1/02.

3. CLARIDAD DE LA SOLICITUD.

De acuerdo a la Decisión 486 de la Comisión de la Comunidad Andina en su Artículo 30.- *"Las reivindicaciones definirán la materia que se desea proteger mediante la patente. Deben ser claras y concisas y estar enteramente sustentadas por la descripción"*; se hacen las siguientes observaciones al capítulo reivindicatorio:

En la reivindicación 6 se esta caracterizando el procedimiento por una de las propiedades que tiene el producto obtenido a través de dicho procedimiento; esta reivindicación debería modificarse por cuanto todas las reivindicaciones que se refieran a un procedimiento deben plantearse definiendo las etapas del mismo así como mostrando las condiciones particulares de cada etapa del proceso; como es el caso de la reivindicaciones dependientes.

El procedimiento que se encuentra presentado en la solicitud es un procedimiento para obtención de jugo de caña muy general y convencional, si el componente novedoso de tal procedimiento es la clarificación del jugo por medio del equipo presentado en la figura 2, la solicitud debería enfocarse hacia ese paso en particular del procedimiento siempre y cuando el equipo descrito en dicha figura contenga componentes novedosos dados por el inventor.

Según las observaciones anteriormente realizadas, la solicitud no cumple con el artículo 30 de la Decisión 486 y se deben realizar los ajustes necesarios para continuar con el trámite correspondiente de la solicitud. De acuerdo a los cambios que se realicen a la solicitud se debe ajustar el título de la misma.

4. DETERMINACIÓN DEL ESTADO DE LA TÉCNICA

Según la definición dada en el art. 16.- *"Una invención se considerará nueva cuando no está comprendida en el estado de la técnica."*

El estado de la técnica comprenderá todo lo que haya sido accesible al público por una descripción escrita u oral, utilización, comercialización o cualquier otro medio antes de la fecha de presentación de la solicitud de patente o, en su caso, de la prioridad reconocida.

Sólo para el efecto de la determinación de la novedad, también se considerará dentro del estado de la técnica, el contenido de una solicitud de patente en trámite ante la oficina nacional competente, cuya fecha de presentación o de prioridad fuese anterior a la fecha de presentación o de prioridad de la solicitud de patente que se estuviese examinando, siempre que dicho contenido esté incluido en la solicitud de fecha anterior cuando ella se publique o hubiese transcurrido el plazo previsto en el artículo 40." . *se realizó la búsqueda de anterioridades en los archivos con que cuenta esta Oficina y se encontraron los siguientes documentos relacionados con la materia de la presente solicitud:*

N°	DOCUMENTO	TITULO	FECHA DE PUBLICACION
D1	US 6,068,869	Method of producing a stabilized sugar cane juice product.	2000-05-30
D2	US 4,627,880	Unprocessed complete cane sugar and method of producing it.	1986-12-09

Los documentos mencionados se anexan al expediente.

6. EVALUACIÓN DE LOS REQUISITOS DE PATENTABILIDAD

El artículo 14 de la Decisión 486 de la Comisión de la Comunidad Andina establece que: "Los Países Miembros otorgarán patentes para las invenciones, sean de producto o de procedimiento, en todos los campos de la tecnología, siempre que sean nuevas, tengan nivel inventivo y sean susceptibles de aplicación industrial."

En cumplimiento del artículo 14 de la Decisión 486, se procedió a evaluar los requisitos de novedad, nivel inventivo y aplicación industrial con el fin de establecer la patentabilidad de la invención reivindicada en la solicitud en estudio.

6.1. Evaluación de NIVEL INVENTIVO

De acuerdo al art. 18.- *"Se considerará que una invención tiene nivel inventivo si para una persona del oficio normalmente versada en la materia técnica correspondiente, esa invención no hubiese resultado obvia ni se hubiese derivado de manera evidente del estado de la técnica"*; se conceptúa:

En la anterioridad D1 se está presentando un método para fabricar un jugo de caña estabilizado para usarse en bebidas ligeras; el cual incluye conseguir caña de azúcar, la cual es esterilizada en un baño de agua que contiene una solución de una sal de amonio cuaternario; la caña es pasada por una serie de molinos de rodillos; a través de los cuales es posible extraer al menos un 90% del jugo de la caña. El jugo de caña extraído es acidificado inmediatamente sobre la extracción ya que se pone en contacto con una solución de ácido ascórbico para prevenir la decoloración del jugo de caña y también se pone en contacto simultáneamente con una solución ácida bien sea de ácido cítrico, ácido málico, ácido tartárico, ácido fosfórico y una mezcla de ellos; esto para reducir el pH del jugo a un pH cercano a 5. Dentro del procedimiento se emplean como coagulantes poliacrilamidas catiónicas así como polielectrolitos de alto peso molecular que son utilizados como floculantes. Para eliminar color o sabor residual se realiza un tratamiento con carbón activado. Las impurezas que pueda presentar el jugo son removidas por medio de un proceso de clarificación donde el jugo primero es filtrado a través de un sistema en bolsa de 5 micras y luego pasa por un sistema de una micra para remover partículas pequeñas. El jugo de caña en este estado es sometido a un proceso de ultrafiltración y luego es pasteurizado.

La anterioridad D2 presenta un método para producir azúcar de caña completa, en este método se muestra que el jugo obtenido de la caña por presión es pasteurizado teniendo como referencia la temperatura de pasteurización como la intermedia entre el segundo y el tercer punto de floculación de las grasas, proteínas, ceras y pentosanos que el jugo de caña contiene. Correspondiendo a una temperatura de 65 a 80 C. Según las diferencias químicas que los componentes del jugo presentan se definieron tres puntos de floculación, el primero de 48 a 55 C, el segundo de 58 a 65 C y el tercero a 85 C, por encima del punto de ebullición del jugo.

Según las anterioridades presentadas el procedimiento p de la solicitud presenta los mismos componentes que lo reportado en el estado de la técnica ya que tiene los pasos convencionales de obtener la materia, cortar y moler la caña, ajustar el pH, uso de floculantes para clarificar y pasteurización del jugo. Así como varias etapas de clarificación y floculación durante la ejecución del procedimiento. De esta manera el método propuesto tal como se encuentra presentado en el capítulo reivindicatorio es derivable del estado del arte publicado con fecha anterior a la de la solicitud.

La solicitud no cumple con el artículo 18 de la Decisión 486.

En conclusión los requisitos de patentabilidad de la presente solicitud se encuentran afectados así:

N°	DOCUMENTO	REVINDICACIONES AFECTADAS	REQUISITO QUE AFECTA
D1	US 6,068,889	1 a 10	NIVEL INVENTIVO
D2	US 4,627,880	1 a 10	NIVEL INVENTIVO

En cumplimiento del artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se le indica que debe dar respuesta dentro del término de sesenta días contados a partir de la fecha de la notificación de la presente comunicación. En caso de no dar respuesta al presente requerimiento, o si a pesar de la respuesta subsistieran los impedimentos para la concesión, se denegará la patente.

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 No. 10 de 2001.

ALIX CARMENZA CÉSPEDES DE VERGEL
Jefe de la División de Nuevas Creaciones.

El anterior requerimiento fue notificado por fijación en lista, de fecha **31 MAYO 2007**

CONCEPTO TÉCNICO N° 0620	EXAMINADOR TÉCNICO CÓDIGO 202064
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US 6068869A

United States Patent (19) **Patent Number:** 6,068,869
Bent Glaslov (45) **Date of Patent:** May 30, 2000

[54] METHOD OF PRODUCING A STABILIZED SUGAR CANE JUICE PRODUCT

[75] Inventor: Otto Peter Bent Glaslov, Waterfall, South Africa

[73] Assignee: Jucasa Investment CC, South Africa

[21] Appl. No.: 09/030,786

[22] Filed: Feb. 25, 1998

[51] Int. Cl.: C13K 3/00

[52] U.S. Cl.: 426/262; 426/49; 426/268; 426/481; 127/46.1; 127/50; 127/51; 127/55; 127/61

[58] Field of Search: 426/49, 48, 52, 426/262, 268, 541, 544, 590, 478, 481, 489; 127/43, 46.1, 50, 55, 61, 51, 36

[56] References Cited

U.S. PATENT DOCUMENTS

4,141,732	4/1978	Wiley	127/48
4,288,951	9/1980	Quarles et al.	127/48
4,332,622	6/1982	Thornhill, Jr. et al.	127/41
4,627,680	12/1986	Laugen et al.	127/43
5,058,300	11/1995	Monclou	127/43

OTHER PUBLICATIONS

The Condensed Chemical Dictionary 10th Ed. Geissorg, Harley (pp. 847, 780), 1981.

Primary Examiner—Milton Cado

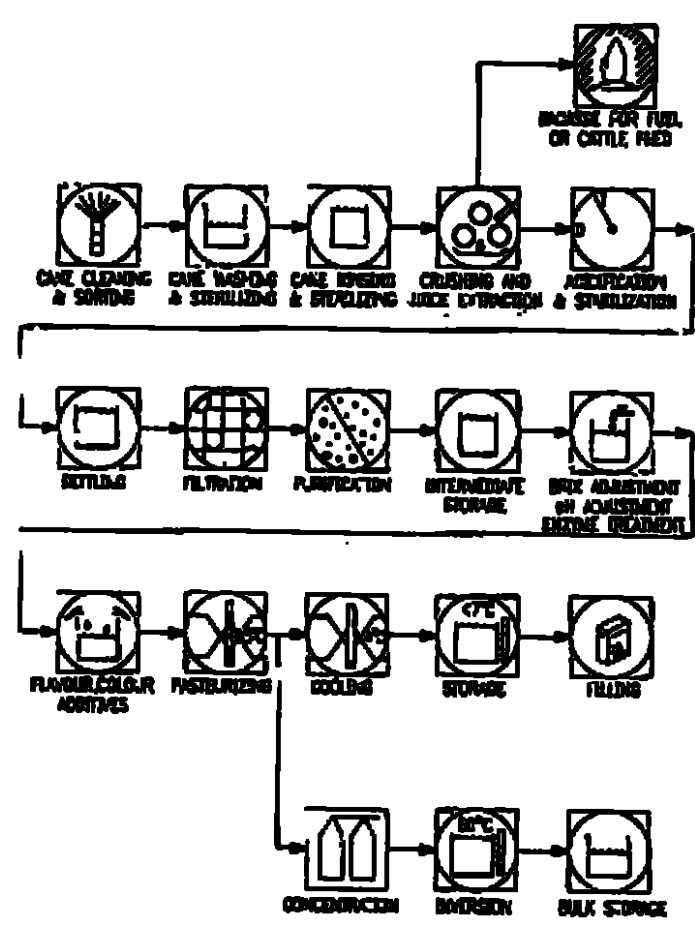
Assistant Examiner—Hao Mai

Attorney, Agent, or Firm—Nields, Lemack & Dingman

[57] ABSTRACT

A method of providing a stabilized sugar cane juice product for use in soft drinks, that includes providing cleaned sugar cane sticks and extracting cane juice from the sticks. Thereafter, the extracted cane juice is acidified immediately upon extraction by feeding it into a solution comprising ascorbic acid for preventing discoloration of the cane juice and also by feeding it simultaneously into an acidic solution of one of citric acid, malic acid, tartaric acid, phosphoric acid and a mixture thereof, for lowering the pH of the cane juice below a pH of 5. Furthermore, one of a sodium citrate solution, a potassium citrate solution, a sodium phosphate di-basic solution or a mixture thereof, is added to the cane juice for stabilizing it. The cane juice is then concentrated and decanted to remove unwanted foulants and aromatics.

15 Claims, 2 Drawing Sheets



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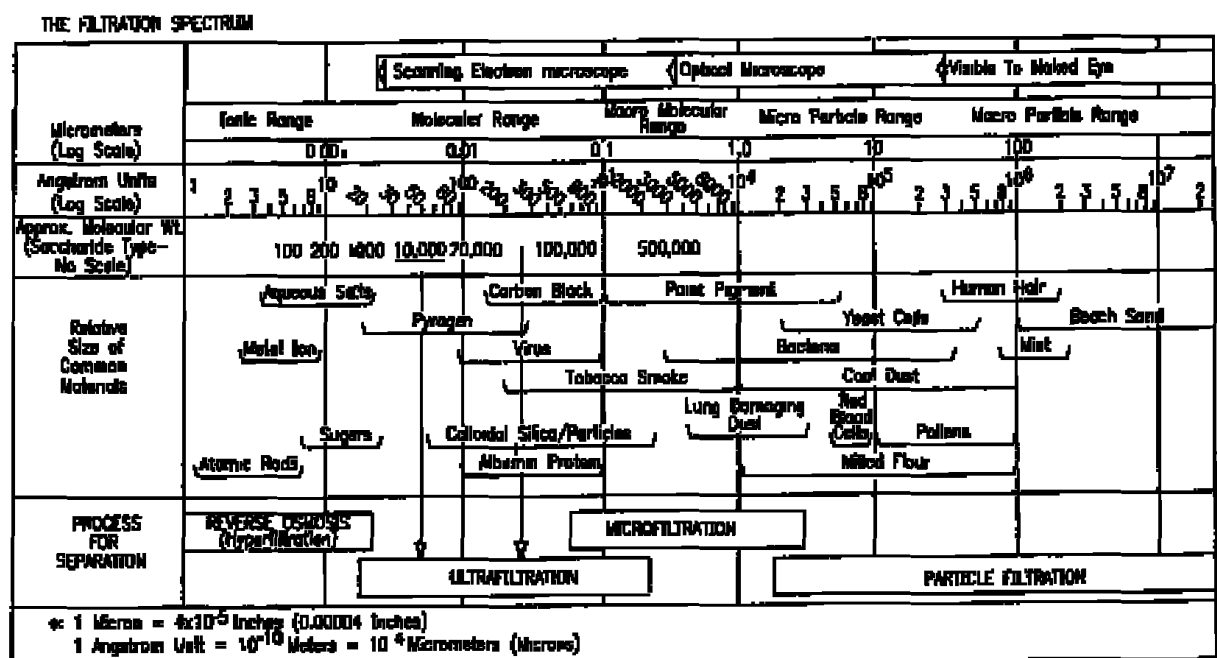


FIG. 2

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METHOD OF PRODUCING A STABILIZED SUGAR CANE JUICE PRODUCT

BACKGROUND OF THE INVENTION

The present invention relates to a method of producing a stabilized sugar cane juice product.

It is well known in many countries to drink the juice of freshly crushed sugar cane. However, it has not been possible to commercialize the provision of sugar cane juice because of very rapid discoloration of the juice from a pale yellow colour to brown. This is caused by the reaction of amino acids and sugar within the juice, commonly known as the "Maillard" reaction. This non-enzymatic reaction produces the brown pigment, melanoidin, which discolors the cane juice from its original pale yellow colour.

It is an object of this invention to overcome the above problems associated with sugar cane juice and thereby enable the provision of a cloudy or clear stabilized sugar cane juice product in commercially viable volumes and forms.

SUMMARY OF THE INVENTION

According to the invention there is provided a method of producing a stabilized cane juice product, which includes the steps of:

- providing cleaned sugar cane sticks;
- extracting sugar cane juice from said sugar cane sticks;
- adding to the extracted sugar cane juice, a solution comprising ascorbic acid for preventing the discoloration of the cane juice, and one of citric acid, malic acid, tartaric acid, phosphoric acid, and a mixture thereof, for lowering the pH of the cane juice below that of natural untreated cane juice, and one of a sodium citrate solution, a potassium citrate solution, a sodium phosphate di-basic solution, and a mixture thereof, for stabilizing the sugar cane juice; and
- weighing and bottling the sugar cane juice to remove unwanted liquids and gases.

The acidifying solution may contain 100 to 400 mg ascorbic acid per liter of solution.

The citric acid, malic acid, tartaric acid, phosphoric acid or a mixture thereof, of the acidifying solution may be sufficient for reducing the pH of the cane juice to below 5.

The sodium citrate solution, potassium citrate solution, sodium phosphate di-basic solution or a mixture thereof, of the acidifying solution, may be a 0.01 to 0.1% (m/m) solution.

The cane juice may be allowed to stand undisturbed for a predetermined period of time immediately after acidification thereof, during which time anaerobes and flocculants are added thereto.

The method may include filtering the cane juice after acidification thereof.

The filtration of the cane juice may be effected initially in two stages, with a first stage providing for the separation of particles having a size larger than five microns, from the cane juice, and a second filtration stage providing for the separation of particles having a size larger than one micron, from the cane juice, the cane juice having a cloudy appearance after filtration thereof.

In order to produce a substantially clear sugar cane juice, the method may include filtering the cane juice through a diatomaceous earth filter.

In order to further clarify the sugar cane juice, the method may include further filtering the cane juice in a tubular ultra-filtration system comprising two tubular ultra-filtration

modules forming part of a continuous ultra-filtration process in which a first ultra-filtration module filters out particles in the cane juice having a particle size larger than 45000×10^{-9} m, and in which a second ultra-filtration module filters out particles having a particle size larger than 5000×10^{-9} m.

The filtered cane juice may be stored and the Brix and pH of the cane juice adjusted, if required, the Brix being adjusted to between 10 and 14° Brix and the pH being adjusted to between 1.4 and 4.9, with the pH adjustment being effected by adding one of citric acid solution, malic acid solution, tartaric acid solution, phosphoric acid solution, and a mixture thereof. The method may include a sugar inversion process during the storage thereof, whereby substantially the entire sucrose content of the juice is converted into fructose and glucose by the addition of suitable enzymes into the cane juice.

The enzyme quantity added may be between 30 and 100 mg per liter of juice.

The enzyme added to the cane juice may be an enzyme known as "Invertase".

The sugar inversion process may include heating the cane juice to approximately 60° C. immediately after adding the enzyme thereto.

The method may include the addition of one or more of a group comprising fruit juices, flavourings, emulsifying agents, 0.1 and 1% (m/m) citric acid to the cane juice.

The method may include pasteurization of the cane juice after the storage thereof.

The method may include the addition of suitable preservatives for extending the shelf life of the sugar cane juice product.

The method may include removing water from the sugar cane juice product to form a sugar cane juice concentrate.

The method may include removing water from the sugar cane juice product by an evaporation process.

The method may include concentrating the sugar cane juice product.

The invention extends to a stabilized cane juice product manufactured in accordance with the method defined hereinabove.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Further features of the method of producing a stabilized sugar cane juice product, as defined hereinabove, is described in more detail hereinafter by way of a non-limiting example of the method of the invention, with reference to and as illustrated by way of the accompanying diagrams. In the drawings:

FIG. 1 shows a block diagram of a method of producing a stabilized sugar cane juice product in accordance with the invention; and

FIG. 2 shows a block diagram depicting the sizes of particles which can be separated in an ultrafiltration process.

Referring to the diagrams, the method of producing a stabilized cane juice product in accordance with the invention, includes the first step of providing freshly cut and crushed sugar cane sticks having all brown leaves removed. These sugar cane sticks can then be transported to the factory where the cane juice product of the invention is to be produced and where the cane sticks are immediately cleaned and all new buds, diseased parts, roots and tops cut off. All waste so collected typically can be used for fuel.

The clean sugar cane sticks are then sterilized by firstly being scrubbed in a water bath containing 0.1 to 1% (m/m) quaternary ammonium compound solution, which is known

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to be effective for sterilizing purposes. This solution is particularly suitable for destroying harmful bacteria associated with the sugar cane sticks and any wall attached thereto. The cane sticks are thereafter cleaned in a sterilizing solution comprising between 50 and 200 ppm chlorine, the chlorine solution being of common commercial grade.

After allowing the inside part of the sterilizing solution to "drip off" from the cane sticks, the cane sticks can be crushed in a roller crusher having a suitable number of smaller rollers that will ensure that at least 50% of the sugar cane juice is extracted from the cane sticks. The sugar cane juice also can be separated by any other method or technique. The bagasse waste can again be used for fuel.

Immediately upon the extraction of the sugar cane juice, it can be fed into an ascorbic acid solution containing between 100 and 500 mg ascorbic acid per liter, for preventing the discoloration of the cane juice. Simultaneously, in another solution of one of citric acid, malic acid, a tartaric acid, phosphoric acid and a mixture thereof, is added in order to reduce the pH of the cane juice to below 5, whereas a basic solution of one of sodium citrate, potassium citrate, sodium phosphate di-basic and a mixture thereof, is also simultaneously added for stabilizing the acidic solution. The ascorbic acid has proved to be particularly suitable for preventing discoloration of the extracted sugar cane juice, even after pasteurization treatment as envisaged hereafter. The basic solution is a 0.01 to 0.1% (m/m) solution.

During the stabilization of the cane juice as described above, the cane juice may be left undisturbed for approximately one hour, i.e. after the above-mentioned substances have been added thereto. During this period the cane juice is coagulated and flocculated to remove unwanted materials and impurities. The Applicant believes that a range of polycrylamide-based cationic coagulants as well as high molecular weight anionic polyelectrolytic flocculants may be used. The dosage of coagulants and flocculants must not exceed 35 mg/L. To further eliminate any residual odours and colours a further treatment of activated carbon may be used. The coagulants, flocculants and activated carbon must be of approved FDA, regulations (USA) and D.O.E. regulations (UK) as well as the regulations of the Department of National Health and Population Development (USA).

The said impurities can then be easily separated in a clarifying process, whereafter the juice is finally filtered through a fine micron filtration bag system which will remove remaining coarse particles from the juice and then a one micron filtration bag system for separating smaller particles. This filtration will result in the providing of a cloudy sugar cane juice that is pale yellow with no visible impurities and no sedimentation. To produce a substantially clear sugar cane juice, the juice is filtered through a diatomaceous earth filter.

In order to further clarify the cane juice, the cane juice is passed through a Molecular Ultrafiltration system. Referring to FIG. 2 of the drawings, in the Tubular Ultrafiltration system, the cane juice is further filtered in a first ultrafiltration module which filters out particles in the cane juice having a particle size larger than 4000×10^{-6} m and thereafter the cane juice is filtered in a second ultrafiltration module which filters out particles in the cane juice having a particle size larger than 5000×10^{-6} m. It is then performed an ultrafiltration of cane juice, the ultrafiltration equipment comprised a self-contained, food grade pilot plant equipped with two regular ultrafiltration modules. The ultrafiltration system was operated in a batch wise manner with recirculation of cane juice to be filtered. The feed pressures ranged from 200

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kPa to 600 kPa and the feed temperature varied from 15° C. to 60° C. In a test performed on the cane juice under filtration, it was found that very little loss of colour occurred when the filtered cane juice was concentrated from approximately 17° Brix to about 70° Brix. If considered necessary, filtration may be accompanied by de-flavouring.

During immediate storage of the juice after filtration, the Brix can be adjusted to between 10 and 14° Brix, such adjustment being done by using potable water. A further pH adjustment also can then be effected in order to provide for the pH of the juice to be between 4.4 and 4.9. The addition of one of citric acid, malic acid, tartaric acid, phosphoric acid and a mixture thereof, can be utilized for this purpose.

This intermediate storage stage may be accompanied by the conversion of the sucrose content of the juice into fructose and glucose. This can be done by adding between 50 mg and 100 mg "Invertase" enzyme into each liter of juice and heating the mixture to 60° C., at which temperature the mixture will remain for approximately 6 hours. This will allow the conversion to take place and effectively eliminate all sucrose from the juice. The conversion method also can be carried out in any other way that is effective and viable. If a concentrated form of the stabilized or flavored sugar cane juice is required for transportation and further processing elsewhere, then the Brix of the juice can be adjusted to between 65 and 83° Brix, such adjustment being done by the use of an evaporator for evaporating and concentrating the juice at a temperature below 60° C. at a high vacuum. When the required Brix has been reached, the concentrated syrup is pasteurized between 75° C. and 95° C. and held for not less than 3 minutes before being cooled down to ambient temperature.

After the above adjustment and inversion, a 0.1 to 1% (m/m) citric pecan (purified food grade) solution is added to the sugar cane juice and, if required, other fruit juice concentrates, flavouring and/or colourings can be added in order to provide a desired type and product. Thereafter, the resulting sugar cane juice, or sugar cane juice concentrate, with or without flavouring agents and other additives, can be pasteurized, typically at between 50 and 55° C. for 15 to 25 seconds, whereafter the juice can be cooled to below 4° C. This can be carried out in a standard plate heat exchanger as is commonly used. In tests performed on filtered cane juice, it was found that during pasteurization of the cane juice, the cane juice can be heated up to 95° C. for 5 minutes without colour or flavour deterioration of the cane juice.

The pasteurized juice can then be contained in a bulk container at a temperature preferably below 4° C. and final quality control checks can then be carried out. This is followed by filling the sugar cane juice into commercial trade containers in which the sugar cane juice can be finally provided to the public. It is anticipated that without any further preservation and by keeping the juice refrigerated below 4° C., the juice will have a shelf life of approximately one month, whereas together with suitable preservation, this can be extended to between 2 and 3 months. The cane juice can also be Ultra-High Temperature (UHT) treated at temperatures above 100° C. for a few seconds in an aseptic UHT system. The shelf life can now be extended to approximately 6 months without refrigeration.

It is believed that one or more of the individual steps associated with the method of producing a stabilized sugar cane juice product, as described above can be varied in various different respects while still encompassing the principles associated with the method of manufacturing a stabilized cane juice product, as hereinbefore described and

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desired. For industrial applications, the juice can be concentrated after pasteurization, or otherwise treated.

The final properties of the sugar cane juice drink are greatly variable and will be particularly determined by the additives that can be added to the juice in order to provide a juice with desired qualities.

What is claimed is:

1. A method of producing a stabilized cane juice product, which comprises the steps of:

providing cleaned sugar cane sticks;

extracting sugar cane juice from said sugar cane sticks;

adding to the extracted sugar cane juice, a solution comprising ascorbic acid for preventing the discoloration of the cane juice, and a member selected from the group consisting of citric acid, malic acid, tartaric acid, phosphoric acid, and a mixture thereof, for lowering the pH of the cane juice, and a member selected from the group consisting of a sodium citrate solution, a potassium citrate solution, a sodium phosphate di-basic solution, and a mixture thereof, for stabilizing the sugar cane juice;

vacuumating and degassing the sugar cane juice to remove remaining foulants and aromas;

filtering the sugar cane juice; and

storing the filtered sugar cane juice.

2. A method as claimed in claim 1, wherein the acidifying solution contains 100 to 400 mg. ascorbic acid per liter of solution.

3. A method as claimed in claim 1, wherein the citric acid, malic acid, tartaric acid, phosphoric acid or a mixture thereof, of the acidifying solution is sufficient for reducing the pH of the cane juice to below 5.

4. A method as claimed in claim 1, wherein the sodium citrate solution, potassium citrate solution, and/or phosphate di-basic solution or a mixture thereof, of the acidifying solution, is a 0.01 to 0.1% (wt/wt) solution.

5. A method as claimed in claim 1, wherein the cane juice is allowed to stand undisturbed for a predetermined period of time immediately after acidification thereof, during which time coagulable and flocculants are added thereto.

6. A method as claimed in claim 1, wherein the filtration of the cane juice is effected initially in two stages, with a first stage providing for the separation of particles having a size

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larger than five microns, from the cane juice, and a second filtration stage providing for the separation of particles having a size larger than one micron, from the cane juice, the cane juice having a cloudy appearance after filtration thereof.

7. A method as claimed in claim 6, further comprising the step of filtering the cane juice through a diatomaceous earth filter.

8. A method as claimed in claim 7, further comprising the step of filtering the cane juice in a tubular ultra-filtration system to produce a substantially clear cane juice product, the ultra-filtration system comprising two tubular ultra-filtration modules forming part of a continuous ultra-filtration process in which a first ultra-filtration module filters out particles in the cane juice having a particle size larger than 45000×10^{-6} m, and in which a second ultra-filtration module filters out particles having a particle size larger than 30000×10^{-6} m.

9. A method as claimed in claim 8, wherein the pH and pH of the filtered and stored cane juice is adjusted, if required, the pH being adjusted to between 10 and 14° Beiz and the pH being adjusted to between 1.4 and 4.9, with the pH adjustment being effected by adding one of citric acid solution, malic acid solution, tartaric acid solution, phosphoric acid solution, and a mixture thereof.

10. A method as claimed in claim 9, further comprising the step of pasteurizing of the cane juice after the storage thereof.

11. A method as claimed in claim 1, further comprising the step of adding at least one or more of a group comprising fruit juices, flavorings, coloring agents, and between 0.1 and 1% (wt/wt) citric acid to the cane juice.

12. A method as claimed in claim 1, further comprising the step of adding preservatives for extending the shelf life of the sugar cane juice product.

13. A method as claimed in claim 1, further comprising the step of removing water from the sugar cane juice to form a sugar cane juice concentrate.

14. A method as claimed in claim 13, further comprising the step of removing water from the sugar cane juice product by an evaporation process.

15. A method as claimed in claim 1, further comprising the step of carbonating the sugar cane juice.

* * * * *

United States Patent [2]

Langen et al.

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**[5] UNPROCESSED COMPLETE CANE SUGAR
AND METHOD OF PRODUCING IT**

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127/36

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[57] ABSTRACT

To produce an unprocessed complete cane sugar with
approximately the color and flavor of fresh sugarcane
juice and still containing valuable amino acids and vita-
mins, only up to 30% of the sugarcane juice in terms of
the weight of the cane is pressed from ripe, de-leaved,
and clean sugarcane with a high sucrose content, the
juice is pasteurized at a temperature above the second
flocculation point of the waxes, fats, proteins, and pen-
tanones, the flocculate is gently separated out, the puri-
fied juice gently thickened below the pasteurization
temperature, and the resulting syrup condensed into a
dry and pourable product by sufficiently extracting the
residual water.

11 Claims, No Drawings

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UNPROCESSED COMPLETE CANE SUGAR AND METHOD OF PRODUCING IT

DESCRIPTION

The invention concerns, first, a method of producing an unprocessed complete cane sugar from sugarcane juice and, second, the resulting new product.

Conventional commercially available white sugar is known to be pure sucrose isolated and freed from associated vegetable materials in the course of a number of purifying operations from the juices of sugar beets or sugarcane. The organic and inorganic associated materials of the plant juices are located in the molasses, which is employed as cattle feed or to produce fermentation products like alcohol and citric acid.

White sugar has for years been attacked as an empty vehicle for calories and energy and because of its alleged unwholesome activity. The view of many nutritionists is tending more and more today toward emphasizing the natural demands of human nutrition and recommending the use of foodstuffs left in their natural state, in which, in addition to nutrients that can be utilized to provide energy, they also contain essential substances in the form of associated materials.

Commercially available raw cane sugar is an intermediate or semifinished product from cane sugar production. The sugar crystals are only partly freed from the adhering syrup, which consists of vegetable associated materials and many technically dictated impurities, and accordingly colored brown. The only stage that raw sugars do not pass through is the last, affination or refining. They are accordingly considered, because of their associated materials, less denatured and hence, erroneously, more "natural" than white sugar, in spite of numerous impurities and of an often poor microbial situation.

There also exist, in regions where sugarcane is cultivated, what are called primitive sugars, obtained from sugarcane juice by hours and often days of boiling down in open pans until the resulting mass hardens upon cooling. Primitive sugars usually contain residues of sand and cellulose and turn out to be very high in bacteria. The long boiling at temperatures as high as 130° C. results in a structure-altering process accompanied by massive destruction of the sucrose and by formation of up to about 17% invert sugar. Primitive sugars produced without bleaching are dark brown and have to some extent a pronounced and astringent caramel flavor that considerably reduces their range of application. Attempts have already been made to separate out some of the proteins by adding flocculation promoters, especially plant juices like coconut milk, and to bleach the syrup by added sulfur-dioxide bleaches in order to produce lighter primitive sugars with a less pronounced inherent flavor.

Fresh sugarcane juice is light in color and very pleasant in flavor, but turns dark in just a few minutes after it has been obtained, and it is assumed that this can be ascribed not to oxidation from air but mainly to contact with ferrous oxides. Recommendations have accordingly been made to place the stalks of cane in a container of soap solution, scrub them off, rinse them with cold water, and sterilize them with a high-percentage chlorine solution or boiling water in order to remove the adherent impurities before proceeding to process them into juice. Only tools and machines of rust-free materials should be employed to cut the stalks and ob-

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tain the juice (German OS No. 2 215 196). Inhibiting the oxidation of the sugarcane juice, which is usually obtained with iron or steel mills, by adding sufficient quantities of ascorbic acid immediately after the juice has been obtained, has also been recommended. The resulting juice can in either case be crystallized by evaporation or freeze-dried (German OS No. 2 232 949).

Producing conventional cane sugar by centrifuging the sugarcane juice, from which the suspended constituents have been removed, heating it to a boil, and then centrifuging it again to remove nitrogenous non-sugar compounds is also known (Pieter Honig, *Principles of Sugar Technology*, pp. 494 ff.).

It is an object of the invention to develop an actually unprocessed sugar that corresponds to contemporary market demands, meaning that it will be dry, pourable, and hence generally applicable. It was obvious to begin with fresh sugarcane juice, which has been employed in addition to honey from ancient times as a flavorful sweetener. The juice itself is admittedly difficult to offer as an up-to-date sweetener. Shipping costs make it much too expensive, the unavoidable preservation would make it no longer natural, and it would also necessitate such a profound readjustment of consumption habits. It was accordingly decided that what was necessary was to convert the plant juice as gently as possible while retaining as much of its original composition, the associated materials normally occurring in the plant that is, as possible into a powdered or granulated form.

The method in accordance with the invention of producing an unprocessed complete cane sugar from sugarcane juice consists of pressing only up to 50% of the sugarcane juice in terms of the weight of the cane from ripe, de-leaved, and clean sugarcane with a high sucrose content, pasteurizing the juice at a temperature above the second flocculation point of the waxes, fats, proteins, and pentosans, separating out the flocculation, gently thickening the purified juice below the pasteurization temperature, and converting the resulting syrup into a dry and pourable product by suddenly extracting the residual water.

The cane is preferably pressed only once, being treated so gently that only 40 to 50% juice is obtained in terms of raw weight. The result is that the pressed-out sugarcane juice will contain more than 20 and especially more than 22% by weight of sucrose and that the sucrose content of the juice will be over 90% in terms of the overall solids content.

Sugarcane is conventionally pressed up to 80 to 85%, with the sucrose content frequently amounting to only about 12%. The gentle, meaning partial, pressing of the sugarcane in accordance with the invention makes it recommendable to further process the cane, which will still contain considerable amounts of sugar, as part of conventional sugar production.

The juice obtained by gentle pressing is then preferably pasteurized above the second but below the third flocculation point of the waxes, fats, proteins, and pentosans it contains. This corresponds to a temperature of 65 to 80° C. and preferably of 75 to 78° C. The sugarcane juice is raised to pasteurization temperature as rapidly as possible and maintained at that temperature 5 to 15 minutes to stabilize the flocculate. The flocculate is subsequently removed along with fibers and other insoluble components by means of separators. Additional purification of the pasteurized and partly floccu-

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into juice with filter or microorganism-decreasing filter layers can follow.

The differing chemical properties of the natural components of the sugarcane juices make it possible to define three flocculation points, the first at 48 to 55° C., the second at 55 to 65° C., and the third at 85° C. up to the boiling point of the juice. Inasmuch as pasteurization in accordance with the invention occurs above the second but below the third flocculation point, only the nutritionally insignificant waxes along with some proteins are separated out by the flocculation. Without prior removal of these particularly heat-sensitive waxes and proteins, drying the raw juice would lead only to an unattractive product without a satisfactory flavor.

Since pasteurization in accordance with the invention does not incorporate the third and highest flocculation point, an essential proportion of proteins will remain in the product. It has surprisingly turned out that heating the juice to a temperature between the second and third flocculation point is optimal, not only with respect to the demand that the complete cane sugar being produced be as "unprocessed" as possible and be satisfactory from the microbiological aspect, but also with respect to its having a maximum of flavor at a processability that is technically acceptable for modern plants. The purified juice, which is converted into a dry and pourable product subsequent to gentle thickening, the unprocessed sugarcane juice in accordance with the invention that is, will still contain waxes, proteins, and pectins that flocculate at higher temperatures, which will be apparent to the consumer when he employs the sugar in clear, hot solutions like tea.

Subsequent to the pasteurization and flocculation separation described herein, the clear and purified sugarcane juice is gently thickened, preferably under vacuum at a maximum temperature of 60° C., usually only 56° C. in practice. This thickens the clear sugarcane juice to a dry-matter (DM) content of 70 to 75%.

To finally convert the resulting syrup into a dry and pourable product, the residual water must be suddenly removed from it. This is preferably done by rapidly heating the thickened syrup to 143 to 155° C. in less than 60 seconds and then expanding it appropriately to allow the residual water to evaporate. The rapid heating in conjunction with letting the vapors escape, in a separation space at atmospheric pressure for example, will reduce the syrup to 92 to 97% dry matter. It is then cooled to at least 10° C. to crystallize it. The syrup that has been reduced to 92 to 97% dry matter can be allowed to flow freely out of the vapor-separation space onto or into appropriate equipment in which exothermic crystallization will occur spontaneously. An appropriate crystallizer of this type would be a steel belt heated in the vicinity of transfer and then cooled, or an open worm conveyor. It is also possible to spray a crystallizable syrup that has been thickened in this way onto the heated steel belt or into an open crystallizer subsequent to appropriate conveyance to distribute it more finely.

Other ways of converting the thickened syrup into a dry and pourable product are vacuum-cylinder drying and vacuum-belt drying.

The dried product can if necessary be subject to still further drying to a moisture content of less than 1%, especially in conjunction with agglomeration in a fluid bed.

The method in accordance with the invention makes it possible to convert the juice from ripe sugarcane,

without structure-altering heating processes and the resulting common discoloring and caramelization reactions and without significant leavening of the sucrose, into a dry form in which the vitamins, especially the B vitamins, and desirable proteins present in the sugarcane juice will remain and be demonstrable. The unprocessed complete cane sugar produced in accordance with the invention has approximately the color and flavor of freshly pressed sugarcane juice, and 100 g of dry matter will contain the following constituents:

99 to 95 g	sucrose
1 to 3	invert sugar
1 to 4	minerals and trace elements
1 to 3	proteins
200 to 600 mg	free amino acids
1 to 5 mg	B vitamins

EXAMPLE

40% of the weight of de-leaved and clean sugarcane was pressed out in the form of juice in a mill. The resulting juice, with a sugar content of 20% and a pH of 5.3, was pasteurized by heating with a heat exchanger to 75° C.

After being left to stand for 10 minutes without further heat being supplied and after the formation of a stable flocculate, the juice was conveyed through a clarifying separator and a downstream layer filter and then thickened in the vacuum to 70% dry matter at a maximum product temperature of 56° C.

The thickened syrup was heated to 143° C. within 45 seconds in a spiral-tube evaporator, concentrated to a 95% dry-matter content by vapor precipitation, and then metered out at a pressure of 2 to 3 bar onto a steel belt heated in the vicinity of transfer and cooled over its remaining run.

The dried, foamy and porous mass was cooled, reduced to a water content of less than 1% in a fluidized bed, and sifted. The resulting product was a freely flowing powder comparable in color and flavor to that from freshly and fully pressed sugarcane juice.

Analysis	
91.2%	sucrose
2.3	invert sugar
2.5	minerals and trace elements
1.3	proteins
240 mg	free amino acids
2.6	B vitamins
pH 5.3	

It will be understood that the specification and examples are illustrative but not restrictive of the present invention and that other embodiments within the spirit and scope of the invention will suggest themselves to those skilled in the art.

We claim:

1. A method of producing substantially complete cane sugar from sugarcane juice, consisting essentially of pressing sugarcane to squeeze out only up to about 50% of the sugarcane juice contained therein, the juice having a sucrose content of more than 20% by weight and more than 90% sucrose in terms of the total solids content, rapidly heating the juice to a pasteurizing temperature of 65° to 80° C. for 5 to 15 minutes, which temperature is above the second flocculation point and