

Señora

Alix Carmenza Céspedes de Vergel

Jefe de División de Nuevas Creaciones

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

E. S. D.

SUPERINDUSTRIA Y COMERCIO

Radicación : 00083957 00000005

Folios: 7

Fecha (AND): 2006-02-09 10:27:48

Trámite : 002 PATENTES D 1 REGISTRO/ 329 COMPLEMEN

Dependencia: 2020 DIVISION DE NUEVAS CREACIONES

Referencia: Expediente No. 00.083.957

Solicitud de Patente de Invención titulada: "Proceso para la producción de trocillos, producto y aparato para el mismo."

Solicitante: Frito-Lay North America Inc.

MEMORIAL DE ALCANCE

ÁLVARO CORREA ORDÓÑEZ, mayor de edad y vecino de Bogotá D.C., identificado según aparece al pie de mi firma, en mi condición de apoderado de la sociedad en referencia, manifiesto lo siguiente:

1. Presento documento de Poder de Abogado debidamente legalizado para dar cumplimiento con los requisitos establecidos por la Decisión 486 de ese Despacho.

Atentamente,


ÁLVARO CORREA ORDÓÑEZ

C.C.No.79.143.366 de Usaquén

T.P.20.281

Anexo: Poder de Abogado

**DILIGENCIA DE RECONOCIMIENTO
Y PRESENTACION PERSONAL**

Ante el Notario Once del Circulo de Santafé de Bogotá, compareció ALVARO

CORREA OLIVERA
Quién exhibió la C.C. No. 79143366

expedida en USAGUEN T.P. 2028

y declaró que la firma y huella que aparecen en el presente memorial son suyas y que el contenido del mismo es cierto.

Memorial dirigido a INTERESADO

Santafé de Bogotá, D.C.

Firma del Declarante

Autorizó la anterior Diligencia

NOTARIO ONCE DEL CIRCULO DE SANTAFÉ DE BOGOTÁ

REPUBLICA DE COLOMBIA
EL CIRCULO DE
BOGOTÁ, D.C.
ZULMA NAVARRO DE BAUTISTA
NOTARIA ONCE

207
000002 306

312

POD-03799

TRADUCCIÓN OFICIAL N° 2912052 de un documento escrito en inglés, efectuada el día 29 de diciembre de 2005 por Jaime Armando Garavito Burgos, c.c. N° 19.130.702 de Bogotá, Traductor e Intérprete Oficial según Resolución N° 034 de enero 11 de 1983 expedida por el Ministerio de Justicia

Texto en inglés y en español mediante el cual Frito-Lay North America, Inc. otorga poder a **ÁLVARO CORREA ORDÓÑEZ y/o OLGA GEORGETTE OTERO y/o RICARDO METKE MÉNDEZ y/o JUAN PABLO CONCHA.**

Dado y suscrito en Plano, TX, Estados Unidos el 01 de noviembre de 2005

(Firmado) Thomas P. Schur, Subsecretario

CERTIFICACION NOTARIAL

Texto en inglés y en español mediante el cual el suscrito Notario Público certifica la existencia legal de la sociedad Frito-Lay North America, Inc., así como las funciones y firma de su representante autorizado Thomas P. Schur, Subsecretario, para efectos de lo cual se basó en la Escritura de Constitución presentada ante la Secretaría de Estado de Delaware el 10 de septiembre de 1989.

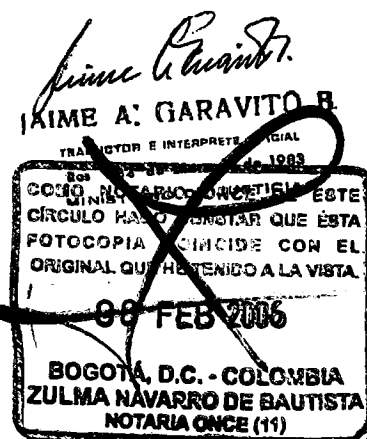
(Firmado) Lisa Mitchell, Notario Público

(Sello notarial que dice: "Lisa Mitchell, Notario Público, Estado de Texas. Mi comisión vence el 25 de julio de 2009")

(Aparece impreso sello del Estado de Texas)

Estado de Texas
Secretaría de Estado
APOSTILLA

1. País: Estados Unidos de América



100-03729

TRADUCCIÓN OFICIAL N.º 2012082 de un documento escrito en inglés, efectuado el día 20 de diciembre de 2006 por Jaime Armando Garvito Burgos, c.c. N.º 18.180.702 de Bogotá, Traductor e Interpreté Oficial según Resolución N.º 024 de enero 11 de 1988 expedida por el Ministerio de Justicia

Yo RICHARDO METKE MÉNDEZ y/o JUAN PABLO CONCHA
otorgo poder a ALVARO CORREA ORDÓÑEZ y/o OLGA GEORGETTE OSERO
Texto en inglés y en español mediante el cual Frito-Lay North America, Inc.

Esdo y suschito en Plano, TX, Estados Unidos el 01 de noviembre de 2006
(Firmado) Thomas P. Schur, Subsecretario

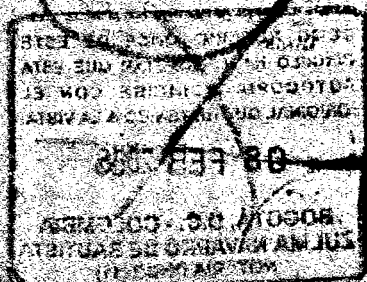
CERTIFICACION NOTARIAL

Texto en inglés y en español mediante el cual el suscrito Notario Público certifica la existencia legal de la sociedad Frito-Lay North America, Inc., así como las funciones y firma de su representante autorizado Thomas P. Schur, Subsecretario, para efectos de lo cual se pasó en la Escritura de Constitución presentada ante la Secretaría de Estado de Delaware el 10 de septiembre de 1999.
(Firmado) Lisa Mitchell, Notario Público
(Sello notarial que dice: "Lisa Mitchell, Notario Público, Estado de Texas, Mi comisión vence el 25 de julio de 2007")

(Aparece impreso sello del Estado de Texas)

Estado de Texas
Secretaría de Estado
APOSTILLA

Estados Unidos de América



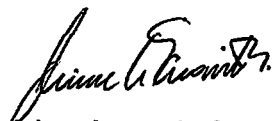
Este documento público

2. Ha sido firmado por LISA MITCHELL
3. Quien actúa en calidad de Notario Público, Estado de Texas
4. Lleva el sello de LISA MITCHELL, Notario Público, Estado de Texas. Mi comisión vence: Julio 25/09

Certificado

5. En Austin, Texas
6. El 04 de noviembre de 2005
7. Por el Secretario del Estado de Texas
8. Certificado N° N-497162
9. Sello (Aparece sello del Estado de Texas)
10. Firma (firmado) Roger Williams, Secretario de Estado

La anterior es traducción fiel y completa de la cual se deja copia en esta oficina para su confrontación.

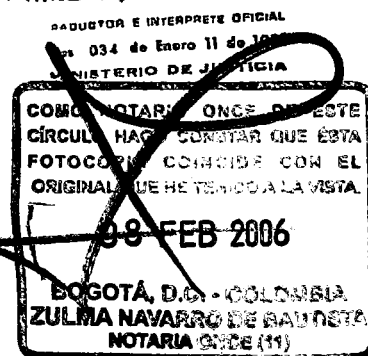


Jaime Armando Garavito Burgos
c.c. N° 19.130.702 de Bogotá
Traductor e Intérprete Oficial según Resolución N° 034 de enero 11 de 1983
expedida por el Ministerio de Justicia

BOGDM5 # 38735



JAIME A. GARAVITO B.



Este documento público

2. Ha sido firmado por LISA MITCHELL
3. Quien actúa en calidad de Notario Público, Estado de Texas
4. Lleva el sello de LISA MITCHELL, Notario Público, Estado de Texas. Mi comisión vence: Julio 25/03

Certificado

5. En Austin, Texas
6. El 04 de noviembre de 2002
7. Por el Secretario del Estado de Texas
8. Certificado N° N-487183
9. Sello (Aparece sello del Estado de Texas)
10. Firma (Firmado) Roger Williams, Secretario de Estado

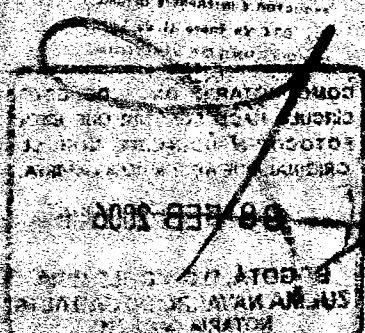
La anterior es traducción fiel y completa de la cual se dejó copia en esta oficina

para su confrontación.

Heime Armando Garavito Burgos
c.c. N° 19,130,702 de Burgos
Traductor e intérprete Oficial según Resolución N° 034 de enero 11 de 1983
expedida por el Ministerio de Justicia

BORGOS H 38735

JAIME A. GARAVITO B.



308

000004

314 308



The State of Texas

Secretary of State

APOSTILLE

(Convention de La Haye du 5 Octobre 1961)

1. Country: United States of America
2. This public document has been signed by LISA MITCHELL
3. acting in the capacity of Notary Public, State of Texas
4. and bears the seal/stamp of LISA MITCHELL, Notary Public, State of Texas, Commission Expires: 07-25-09

CERTIFIED

5. at Austin, Texas
6. on November 4, 2005
7. by the Secretary of State of Texas
8. Certificate No. N-497162
9. Seal
10. Signature:



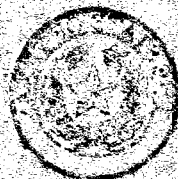
Roger Williams

Roger Williams
Secretary of State

COMO NOTARIO ENCE DE ESTE
CIRCULO DE NOTARIA CONSTATAR QUE ESTA
FOTOCOPIA COINCIDE CON EL
ORIGINAL QUE SE TIENE A LA VISTA.

08 FEB 2006

BOGOTÁ, D.C. - COLOMBIA
ZULMA NAVARRO DE BAUTISTA
NOTARIA ENCE (11)



State of Texas
Secretary of State
ALOSTILLE
(Convention de La Haya du 5 Octobre 1961)

United States of America

1. Country:

2. This public document has been signed by

LISA MITCHELL

3. acting in the capacity of

Notary Public State of Texas

4. and bears the seal of

LISA MITCHELL, Notary Public State of Texas
Commission Expires: 07-25-09

CERTIFIED

5. on November 4, 2002

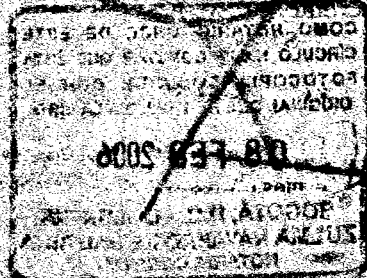
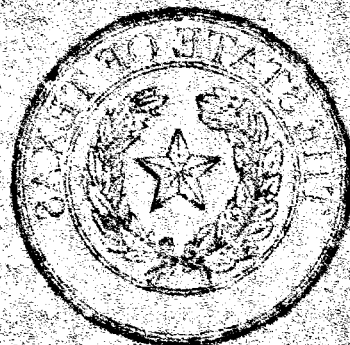
6. at Austin, Texas

7. by the Secretary of State of Texas

8. Certificate No. N-497192

9. Signature:

10. Seal



BAKER & MCKENZIE

Ralsbeck, Lara, Rodríguez & Rueda
Av. 82 No. 10 - 62 Piso 6
Bogotá, Colombia

NIT: 860 068 840-3
Tel: +57 1 634 1500
Fax: +57 1 376 2211
www.bakernet.com

POWER OF ATTORNEY

The undersigned.

Frito-Lay North America, Inc.

domiciled in

7701 Legacy Drive, Plano, Texas 75024-4099, US

declares that it hereby grants to

ALVARO CORREA-ORDOÑEZ and/or OLGA
GEORGETTE OTERO and/or RICARDO METKE and/or
JUAN PABLO CONCHA

with domicile at Av. 82 No. 10 - 62, 6th floor, of Bogotá D. C., Colombia, a full and sufficient power of attorney to obtain the protection of my (our) industrial property and against the unfair competition, for which purpose I (we) authorize the said attorneys to represent me (us) before any authorities or persons, with or without jurisdiction, specially those administrative, administrative contentious and judicial, as well as before Arbitration Court, in all matters concerning the following: a) Obtainment of patents, utility models, industrial designs, integrated circuits, layout-designs and vegetal varieties; the registration of trademarks, denominations of origin, commercial names, trade emblems, slogans and domain names; its renewal, assignments, change of name or domicile, voluntary cancellation; and the registration of licenses of use of the above rights; b) Processes of protection to the consumer, unfair competition, oppositions, cancellations, nullity, precautionary injunctions, infringement, granting of licenses, writ mandamus, the protection of trade secrets, and in general the civil, penal, an administrative processes relating to those rights. And that in all the above matters they may substitute this Power of Attorney, compromise, conciliate, admit the facts of the case, desist, cancel, receive, resign, and ratify acts done by representatives without a power of attorney.

I hereby ratify all actions previously taken on behalf of this company by the aforementioned attorneys with respect to the mentioned matters.

Thomas P. Scher

Done and subscribed in Plano, TX, US

On the 1st day of November of 2005

PODER

La abajo firmada,

Nombre de la Compañía
Frito-Lay North America, Inc.

domiciliada en

Dirección, ciudad, estado, país

7701 Legacy Drive, Plano, Texas
75024-4099 USA

declara por el presente que otorga a

ALVARO CORREA-ORDOÑEZ and/or OLGA GEORGETTE
OTERO and/or RICARDO METKE and/or JUAN PABLO
CONCHA

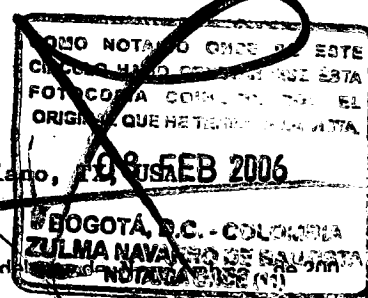
con domicilio en la Av. 82 No. 10 - 62 Piso 6 en Bogotá D. C., Colombia, poder especial amplio y suficiente, para obtener la protección de mi (nuestra) propiedad industrial y contra la competencia desleal, a cuyo efecto autorizo (amos) a los dichos apoderados para que me (nos) representen ante cualesquiera autoridades o personas, ejerzan o no jurisdicción, especialmente ante las del orden administrativo, contencioso-administrativo y judicial, así como los tribunales de arbitramento, en todo lo concerniente a los siguientes asuntos: a) Obtención de patentes de invención, modelos de utilidad, diseños industriales, esquemas de trazado de circuitos integrados y variedades vegetales; el registro de marcas, denominaciones de origen, nombres comerciales, enseñas, lemas comerciales y nombres de dominio; su renovación, traspaso, cambio de nombre o domicilio, cancelación voluntaria; y el registro de licencias de uso de esos derechos; b) Los procesos para la protección del consumidor, competencia desleal, oposiciones, cancelaciones, nulidades, medidas cautelares, infracciones, concesión de licencias, la tutela, la protección de secretos industriales, y en general procesos civiles, penales, administrativos relacionados con estos derechos. Y para que en todos los asuntos arriba determinados, puedan sustituir este mandato, transigir, conciliar, admitir los hechos del caso, desistir, cancelar, recibir, renunciar, y ratificar los actos de agentes oficiosos.

Igualmente, ratifico todo lo actuado hasta el momento en los mismos asuntos, por cualquiera de los mencionados apoderados en representación de ésta sociedad.

Dado y firmado en Plano, TX, US FEB 2006

A los 1

días de



[illegible]

NOTARIAL CERTIFICATION

On this 1st day of November
2005, the undersigned Notary

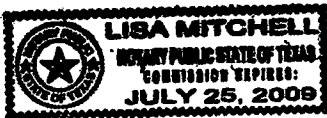
Lisa Mitchell

CERTIFIES

1. That **Thomas P. Schur**
of legal age and domiciled in **Plano, Texas, US**
set his hand on the foregoing document.
2. That the grantor is to me personally known and that he/she has legal capacity to execute the instrument.
3. That the grantor has executed the foregoing document as Assistant Secretary
of the judicial person **Frito-Lay North America, Inc.**
4. That the judicial person **Frito-Lay North America, Inc.**
having its home office in **Plano, Texas, US**
is duly organized, has present legal existence and that the purposes for which the power of attorney is granted are within the scope of its corporate purposes.
5. That the grantor has in fact the referred to authority and that his/her representation is legal.
6. That I have based certifications 3, 4 and 5 above on the following authentic documents for such purpose exhibited to me and which I mention specifically, giving their dates and their origin or source:

Articles of Incorporation were filed with
Delaware Secretary of State on September
10, 1989.

Lisa Mitchell



Notary Public

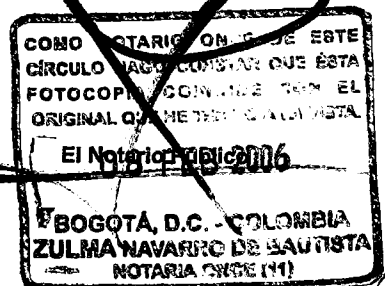
CERTIFICACION NOTARIAL

A los 1 días del mes de Noviembre
de 2005, el suscrito Notario

Lisa Mitchell

DA FE

1. Que **Thomas P. Schur**
mayor y domiciliado en **Plano, Texas, US**
suscribió de su puño y letra el documento que antecede.
2. Que conozco al otorgante y que éste tiene capacidad legal para el otorgamiento.
3. Que el otorgante ha suscrito el referido documento en su carácter de **Secretaria Asistente**
de la persona jurídica **Frito-Lay North America, Inc.**
4. Que la persona jurídica **Frito-Lay North America, Inc.**
con sede en **Plano, Texas, USA**
está legalmente constituida, que tiene existencia legal actual y que el acto para el cual se otorga el poder está comprendido entre los que constituyen su objeto social.
5. Que el otorgante tiene efectivamente la representación que ostenta y que ésta es legítima.
6. Que he basado las certificaciones 3, 4 y 5 anteriores en los siguientes documentos auténticos que al efecto se me exhibieron y que menciono específicamente con expresión de sus fechas y de su origen o procedencia:
Artículos de Incorporación fueron
presentados ante la Secretaría
del Estado de Delaware en Septiembre
10 de 1989



CERTIFICACION NOTARIAL

NOTARIAL CERTIFICATION

A los _____ días del mes de _____ de 2008

On this _____ day of _____, 2008

Ilustre Sr. _____

Ilustre Sr. _____

DA FE

CERTIFIES

Thomas P. Schur

Thomas P. Schur

Piano, Texas, US

of legal age and domiciled in Piano, Texas, US

mayor y domiciliado en

at his hand on the foregoing document

auscrito de su puño y letra el documento que antecede

Que el otorgante es quien se declara el otorgante y que este tiene capacidad legal para el otorgamiento

That the grantor is to me personally known and that he/she has legal capacity to execute the instrument

Que el otorgante ha suscrito el presente documento en su carácter de _____

That the grantor has executed the foregoing document as _____

de la persona jurídica _____

of the juridical person _____

Que la persona jurídica _____

That the juridical person _____

Piano, Texas, USA

Piano, Texas, US

esta legítimamente constituida, que tiene existencia legal actual y que el otorgante es quien se declara el otorgante y que este tiene capacidad legal para el otorgamiento

is duly organized, has present legal existence and that the grantor is to me personally known and that he/she has legal capacity to execute the instrument

Que el otorgante tiene plena capacidad legal para el otorgamiento

That the grantor has in fact the related to authority and that his/her legal representation is legal

Que he pasado las certificaciones 3, 4 y 5 anteriores en los siguientes documentos a _____

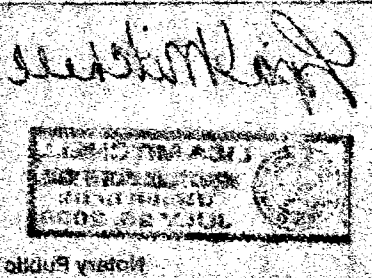
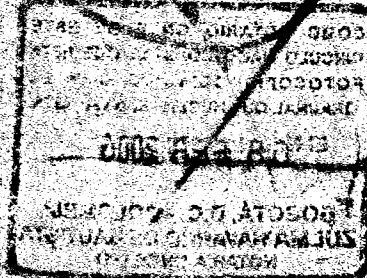
That I have based certifications 3, 4 and 5 above on the following documents on which for such purposes exhibited to me and which I mention specifically, giving their dates and their origin or source

Artículos de Incorporación fusion

Articles of Incorporation were filed with

the State Secretary of State on September

10, 1987



BAKER & MCKENZIE

3

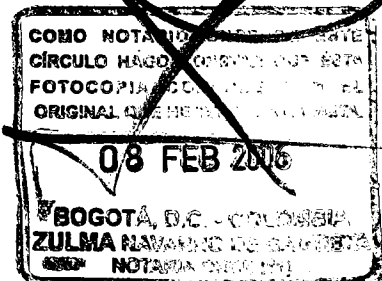
LEGALIZATION INSTRUCTIONS: The signature of the corporate official issuing the power in the name of the company should be authenticated by means of a Notarial Certification as the one enclosed herewith. The Notary's signature should then be authenticated using one of the two following procedures:

- (i) be apostilled, pursuant to the convention of the Apostille;

or if apostille is not available or convenient:

- (ii) follow the normal chain of the authentication leading to the legalization of the document by the Colombian Consul (the normal chain is that the Notary's signature is authenticated by the Country Clerk; sometimes the Consul legalizes the signature of the Clerk; other times the clerk's signature will have to first be legalized by the Secretary of the respective State).

Please note that it is important that the Notary certifies in the Notarial certificate or in other paper that the Company exists, that it is engaged in activities compatible with its corporate purposes and that the person who signs the power of attorney is authorized to do so. To that effect it is necessary to show to the Consul the documents proving the above facts. PLEASE DO NOT FORGET TO FILL THE BLANK SPACE IN POINT 6 OF THE NOTARIAL CERTIFICATION WITH THE ABOVE MENTIONED INFORMATION.



LEGALIZATION INSTRUCTIONS: The signature of the corporate official issuing the power in the name of the company should be authenticated by means of a Notarial Certification as the one enclosed herewith. The Notary's signature should then be authenticated using one of the two following procedures:

(i) be apostilled pursuant to the convention of the Apostille;

or if apostille is not available or convenient

(ii) follow the normal chain of the authentication leading to the legalization of the document by the Colombian Consul (the normal chain is that the Notary's signature is authenticated by the County Clerk; sometimes the Consul legalizes the signature of the Clerk; other times the clerk's signature will have to first be legalized by the Secretary of the respective State)

PLEASE DO NOT FORGET TO FILL THE BLANK SPACE IN POINT 8 OF THE NOTARIAL CERTIFICATION WITH THE ABOVE MENTIONED INFORMATION. Please note that it is important that the Notary confirm in the Notarial certificate or in other paper that the company exists, that it is engaged in activities compatible with its corporate purposes and that the person who signs the power of attorney is authorized to do so. To that effect it is necessary to show to the Consul the documents proving the above facts.



DIVISION DE NUEVAS CREACIONES

RADICACIÓN EXPEDIENTE No. 00-83957

**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 ☒ ☐

DIVISION DE NUEVAS CREACIONES

RADICACION EXPEDIENTE No. 00-83057

EL EXTRACTO DE LA PRESENTE SOLICITUD DE PATENTE DE INVENCION

FUE PUBLICADO EN LA GACETA DE PROPIEDAD INDUSTRIAL No. 523 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 publicacion 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 ☒ X _____

314 313
~~314~~
314

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

2020

Bogotá, D.C.

Doctor

Alvaro Correa Ordoñez
Apoderado

Oficio No.
00001780

**REFERENCIA: Radicación No. 00- 83957
Trámite 002
Evento 001
Actuación 430
Folios 029**

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.

- Capitulo descriptivo: folios 2 al 26
- Capitulo reivindicatorio: folios 27 al 30

NO se acepta reivindicación de prioridad US 09/434.622 del 4 de Noviembre de 1999 ni la prioridad US 09/602.333 del 23 Junio de 2000.

2. OBJETO DE LA INVENCION.

Título: "Proceso para la producción de trocillos, producto y aparato para el mismo"
La invención se refiere a :

- Método para elaborar trocillos expandidos que comprende los siguientes pasos: a) pasar el alimento por un preacondicionador; b) agregar vapor y agua caliente al alimento mientras se encuentra en el preacondicionador a fin de controlar la cocción de dicho alimento y mantener los niveles de temperatura dentro del preacondicionador que sean suficientes para inhibir el desarrollo de bacterias dentro del preacondicionado, en este paso se mantienen constantes las cantidades de agua y vapor con el fin de asegurar un nivel de humedad del alimento a medida que sale del preacondicionador entre 27 y 29% por peso; la temperatura del alimento al salir del preacondicionador es superior a 68 C; c) pasar dicho alimento por un extrusor; d) manipulación de la velocidad rotacional del extrusor para controlar la cocción del extrudado, de manera que se aumenta el nivel de cocción al disminuir la velocidad de rotación.; e) paso del extrudado a través de un troquel para formar una cinta delgada de espesor uniforme ; f) conversión de dicha cinta ancha en trocillos de forma triangular.
- Un trocillo expandido preparado mediante el proceso anterior caracterizado porque comprende: una mezcla de harina de masa e ingredientes menores la cual se somete a un preacondicionado en el cual se adiciona agua y vapor

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
DIVISION DE NUEVAS CREACIONES

2020

Bogotá D.C.

Doctor

Alvaro Gómez Ordoñez
Aprobado

00001720

REFERENCIA: Radicación No. 00-85237

Folios 029
Actuación 430
Exento 601
Trámite 002

Como resultado del examen de fondo, realizado con fundamento en el artículo 43 de la Decisión 486 de la Comisión de la Comunidad Andina, se le comunica:

1. DOCUMENTOS ESTUDIADOS

- Capítulo descriptivo: folios 2 al 26
- Capítulo reivindicación: folios 27 al 30

NO se acepta reivindicación de prioridad US 09/434.623 del 4 de Noviembre de 1999 ni la prioridad US 09/602.333 del 23 Junio de 2000.

2. OBJETO DE LA INVENCIÓN

Título: Proceso para la producción de trocitos, producto y aparato para el mismo.
La invención se refiere a:

Método para elaborar trocitos expandidos que comprende las siguientes etapas: a) pasar el alimento por un precondicionador; b) agregar agua y agua caliente al alimento mientras se encuentra en el precondicionador; c) controlar la cocción de dicho alimento y mantener los niveles de temperatura dentro del precondicionador que sean suficientes para iniciar el desarrollo de bacterias dentro del precondicionador; en este paso se mantienen constantes las cantidades de agua y vapor con el fin de evitar un nivel de humedad del alimento a medida que sale del precondicionador; entre 27 y 30% por peso; la temperatura del alimento al salir del precondicionador es superior a 68 C; d) pasar dicho alimento por un extrusor; e) manipulación de la velocidad del extrusor para controlar la cocción del extrudado de manera que se aumente el nivel de cocción al disminuir la velocidad de rotación; e) pasar el extrudado a través de un rodillo para formar una cinta delgada de espesor uniforme; f) conversión de dicha cinta ancha en trocitos de forma triangular.

Un trocito expandido preparado mediante el proceso anterior caracterizado porque comprende una mezcla de harina de maíz e ingredientes menores la cual se somete a un precondicionamiento en el cual se agrega agua y vapor.

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- para controlar la cocción del alimento y mantener los niveles de temperatura suficientes para impedir el desarrollo de bacterias dentro del preacondicionado luego se pasa el alimento desde el preacondicionador al extrusor. La cocción del extrudado es controlada por manipulación de la velocidad rotacional del extrusor. En el preacondicionador se utiliza una cantidad constante de agua y vapor con el fin de lograr un nivel constante de humedad del alimento y el nivel de humedad esta entre 27 y 35% en peso.
 - Un aparato para hacer trocillos expandidos caracterizado porque comprende:
 - a) un preacondicionador capaz de controlar la cocción, la gelatinización, e hidratación del alimento por variación de la relación vapor y agua agregados al acondicionador. B) un extrusor en serie con dicho preacondicionador, siendo dicho extrusor capaz de controlar el nivel de cocción del extrudado variando el tiempo de permanencia del extrudado, también controla el nivel de cocción del extrudado variando la velocidad rotacional del extrusor. El aparato además comprende un troquel capaz de convertir el extrudado en una cinta ancha, delgada y de espesor uniforme; el aparato posee un repujador y cortadora para formar trocillos con el extrudado, también comprende un secador y una freidora.

Clasificación Internacional de Patentes: A23P 1/12

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 1 se presenta un método para elaborar trocillos expandidos en el cual se presentan las cuatro primeras etapas del proceso mientras que en la reivindicación dependiente 5 se presentan las dos últimas etapas del proceso; por lo tanto si el método que se pretende proteger comprende las seis etapas para obtener los trocillos estas deben encontrarse en su totalidad en la reivindicación 1. Teniendo en cuenta el objeto de la invención que consiste en la producción de trocillos expandidos entonces es necesario presentar la etapa de freído dentro del método reivindicado.

De otra parte, en la etapa (a) del método se emplea el término "alimento" el cual no se encuentra definido y es un término que se utiliza a lo largo del capítulo reivindicatorio, este aspecto le resta claridad a la solicitud. Previamente a este paso se debe describir la preparación del alimento y se deben indicar las materias primas que se utilizan así como sus características ya que como se plantea en el capítulo descriptivo, el procedimiento para la preparación de trocillos expandibles depende en gran medida de la homogeneidad de la materia prima (folio 8).

El paso (d) del método presentado en la reivindicación 1, consiste en la "manipulación de la velocidad rotacional del extrusor.." esto no constituye una etapa del método ya que es una condición propia de la etapa que consiste en el paso del alimento por el extrusor.

En las reivindicaciones 3 y 4 se esta caracterizando el método presentado en la reivindicación 1 por medio de condiciones propias de un producto intermedio obtenido al final de la primera etapa del proceso y no por condiciones propias de las etapas que hacen parte del método para la elaboración de trocillos.

para controlar la cocción del alimento y mantener los niveles de temperatura adecuados para impedir el desarrollo de bacterias. Durante la preparación se pasa el alimento desde el acondicionador al extrusor. La cocción del extrusado es controlada por manipulación de la velocidad rotacional del extrusor. En el acondicionador se utiliza una cantidad constante de agua y vapor con el fin de lograr un nivel constante de humedad del alimento y el nivel de humedad está entre 27 y 35% en peso. El aparato para hacer trocitos expandidos está diseñado por los controladores: (a) un acondicionador capaz de controlar la cocción la velocidad de rotación del alimento por variación de la relación vapor y agua; (b) un extrusor en serie con dicho acondicionador, siendo dicho extrusor capaz de controlar el nivel de cocción del extrusado variando el tiempo de permanencia del extrusado, también controla el nivel de cocción del extrusado variando la velocidad rotacional del extrusor. El aparato además comprende un troquel capaz de convertir el extrusado en una cinta ancha, delgada y de espesor uniforme, el aparato posee un regulador y controlador para formar trocitos con el extrusado, también comprende un secador y una freidora.

Clasificación Internacional de Patentes: A23P 1/12

3. CLARIDAD DE LA SOLICITUD

De acuerdo a la Decisión 488 de la Comisión de la Comunidad Andina en su Artículo 30: "Las reivindicaciones definen la materia que se desea proteger mediante la patente. Deben ser claras y concisas y estar enteramente orientadas por la descripción", se hacen las siguientes observaciones al capítulo reivindicatorio:

En la reivindicación 1 se presenta un método para elaborar trocitos expandidos en el cual se presentan las cuatro primeras etapas del proceso mientras que en la reivindicación dependiente 2 se presentan las dos últimas etapas del proceso. Por lo tanto el método que se pretende proteger comprende las seis etapas para obtener los trocitos estos deben encontrarse en su totalidad en la reivindicación 1. Teniendo en cuenta el objeto de la invención que consiste en la producción de trocitos expandidos entonces es necesario presentar la etapa de trocado dentro del método reivindicado.

De otra parte, en la etapa (a) del método se amplía el término "alimento" el cual no se encuentra definido y es un término que se utiliza a lo largo del capítulo reivindicatorio, este aspecto le resta claridad a la solicitud. Previamente a este paso se debe describir la preparación del alimento y se deben indicar las materias primas que se utilizan así como sus características ya que como se plantea en el capítulo descriptivo, el procedimiento para la preparación de trocitos expandidos depende en gran medida de la homogeneidad de la materia prima (trigo).

El paso (b) del método presentado en la reivindicación 1, consiste en la manipulación de la velocidad rotacional del extrusor, esto no constituye una etapa del método ya que es una condición propia de la etapa que consiste en el paso del alimento por el extrusor.

En las reivindicaciones 3 y 4 se está caracterizando el método presentado en la reivindicación 1 por medio de condiciones propias de un producto intermedio obtenido al final de la primera etapa del proceso y no por condiciones propias de las etapas que hacen parte del método para la elaboración de trocitos.

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En la reivindicación independiente 6 se presenta el trocillo caracterizado por su composición y luego se describen las etapas del proceso para la obtención del trocillo, esta reivindicación carece de claridad ya que el producto se esta caracterizando en términos del proceso utilizado para su elaboración y la descripción realizada de la composición del mismo es muy general ya que solamente enuncia que el trocillo contiene harina de masa e ingredientes menores pero no esta especificando el tipo de harina ni cuales son los ingredientes menores así como tampoco presenta las proporciones en las cuales se encuentran dichos ingredientes.

Las reivindicaciones dependientes 8,9 y 12 se encuentran definiendo el producto por medio de condiciones del proceso para su elaboración por lo cual estas reivindicaciones le restan claridad a la solicitud ya que los productos se debe definir por su composición mientras que los procedimientos o métodos se definen por las condiciones de la etapas de los mismos.

En las reivindicaciones 10 y 11 el producto se esta definiendo por las condiciones de humedad y temperatura que se encuentran para un producto intermedio del proceso.

De otra parte, en la reivindicación 13 se define el producto en términos de la última etapa del proceso que consiste en freir los trocillos y no en términos de composición. Se reitera que esta última etapa del método debe mencionarse en la reivindicación 1; ya que tal como se muestra el procedimiento no se esta contemplando la etapa en la cual se expande el trocillo siendo este producto uno de los objetos de la solicitud.

Las reivindicaciones 14 a 19 describen el aparato utilizado para fabricar trocillos expandidos ; estas reivindicaciones se presentan de una manera muy general y no detallan el aparato objeto de la invención ya que en la reivindicación independiente 14 solamente se menciona que se encuentra constituido por un preacondicionador y un extrusor en serie, para estas unidades no se proporciona una descripción en detalle sobre los componentes y características principales de cada unidad sino que se mencionan las funciones de dichas unidades; por lo tanto esta reivindicación carece de claridad. De igual forma se presenta la reivindicación 15 en la cual se describe una de las funciones del extrusor.

En las reivindicaciones 16 a 19 se presentan otras partes que comprende el aparato de interés sin hacer una descripción detallada de dichas partes.

De otra parte se debe tener en cuenta la numeración seguida de las reivindicaciones en la solicitud ya que hace falta la reivindicación 7 a la cual se hace referencia.

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. Según los ajustes que se realicen a la solicitud, se debe tener en cuenta los cambios correspondientes en el título de la misma.

En la reivindicación independiente 8 se presenta el trocizo caracterizado por su composición y luego se describen las etapas del proceso para la obtención del trocizo. Esta reivindicación carece de claridad ya que el producto se está caracterizando en términos del proceso utilizado para su elaboración y la descripción realizada de la composición del mismo es muy general ya que solamente anuncia que el trocizo contiene fibras de masa e ingredientes menores pero no está especificando el tipo de fibras ni cuáles son los ingredientes menores así como tampoco presenta las proporciones en las cuales se encuentran dichos ingredientes.

Las reivindicaciones dependientes 9, 10 y 11 se encuentran definiendo el producto por medio de condiciones del proceso para su elaboración por lo cual estas reivindicaciones la están citando a la solicitud ya que los productos se definen según su composición mientras que los procedimientos o métodos se definen por las condiciones de las etapas de los mismos.

En las reivindicaciones 10 y 11 el producto se está definiendo por las condiciones de humedad y temperatura que se encuentran para un producto intermedio del proceso.

De otra parte, en la reivindicación 13 se define el producto en términos de la última etapa del proceso que consiste en tritar los trocizos y no en términos de la composición. Se refiere que esta última etapa del método debe mencionarse en la reivindicación 13 ya que tal como se muestra el procedimiento no se está completando la etapa en la cual se expande el trocizo siendo este producto uno de los objetos de la solicitud.

Las reivindicaciones 14 a 19 describen el aparato utilizado para fabricar trocizos expandidos; estas reivindicaciones se presentan de una manera muy general y no detallan el objeto de la invención ya que en la reivindicación independiente 14 solamente se menciona que se encuentra constituido por un precondicionador y un extrusor en serie, para estas unidades no se proporcionan una descripción en detalle sobre los componentes y características principales de cada una de ellas que se mencionan las funciones de dichas unidades por lo tanto esta reivindicación carece de claridad. De igual forma se presenta la reivindicación 5 en la cual se describe una de las funciones del extrusor.

En las reivindicaciones 18 a 19 se presentan otras partes que comprenden el aparato de interés sin hacer una descripción detallada de dichas partes.

De otra parte se debe tener en cuenta la numeración seguida de las reivindicaciones en la solicitud ya que hace falta la reivindicación 7 a la cual se hace referencia.

Según las observaciones anteriormente realizadas, la solicitud no cumple con el artículo 36 de la Decisión 466 y se deben realizar los ajustes necesarios para continuar con el trámite correspondiente de la solicitud. Según los ajustes que se realicen a la solicitud, se debe tener en cuenta los cambios correspondientes en el título de la misma.

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4. EVALUACION UNIDAD DE INVENCION.

Segùn el artículo 25 de la Decisi3n de la Comunidad Andina: *“La solicitud de patente s3lo podr3 comprender una invenci3n o un grupo de invenciones relacionadas entre s3, de manera que conformen un 3nico concepto inventivo.”*

La solicitud no guarda unidad de invenci3n ya que, tal como se encuentra reivindicado, comprende dos objetos el m3todo de preparaci3n del trocillo y el producto; de otra parte la solicitud tambi3n comprende el aparato para la elaboraci3n y de trocillos y este pertenece a otro campo tecnol3gico y es conocido en el arte previo ya que es un equipo utilizado com3nmente para fabricar pasabocas tipo snack.

5. DETERMINACI3N DEL ESTADO DE LA T3CNICA

Segùn la definici3n dada en el art. 16.- *“Una invenci3n se considerar3 nueva cuando no est3 comprendida en el estado de la t3cnica.*

El estado de la t3cnica comprender3 todo lo que haya sido accesible al p3blico por una descripci3n escrita u oral, utilizaci3n, comercializaci3n o cualquier otro medio antes de la fecha de presentaci3n de la solicitud de patente o, en su caso, de la prioridad reconocida.

S3lo para el efecto de la determinaci3n de la novedad, tambi3n se considerar3 dentro del estado de la t3cnica, el contenido de una solicitud de patente en tr3mite ante la oficina nacional competente, cuya fecha de presentaci3n o de prioridad fuese anterior a la fecha de presentaci3n o de prioridad de la solicitud de patente que se estuviese examinando, siempre que dicho contenido est3 incluido en la solicitud de fecha anterior cuando ella se publique o hubiese transcurrido el plazo previsto en el art3culo 40.” , se realiz3 la b3squeda de anterioridades en los archivos con que cuenta esta Oficina y se encontraron los siguientes documentos relacionados con la materia de la presente solicitud:

Nº	DOCUMENTO	TITULO	FECHA DE PUBLICACION
D1	US 5,165,950	Microwave expandable half product and process for its manufacture.	1992-11-24
D2	US 5,429,835	Fried snack product and method of preparing same	1995-07-04
D3	US 5,932,264	Method for preparing cooked cereal dough using twin screw preconditioning extruder	1999-08-03
D4	US 5,942,273	Method of preparing pellets for snack confectionery and an expanded snack confectionery.	1999-08-24

4. EVALUACION UNIDAD DE INVENCIÓN

Según el artículo 25 de la Decisión de la Comunidad Andina: "La solicitud de patente solo podrá comprender una invención o un grupo de invenciones relacionadas entre sí de manera que constituyan un único concepto inventivo."

La solicitud no guarda unidad de invención ya que, tal como se encuentran reivindicadas, comprende dos objetos de método de preparación del trocisco y el producto, de otra parte la solicitud también comprende el aparato para la elaboración y de trociscos y este pertenece a otro campo tecnológico y se conoce en el arte previo ya que es un equipo utilizado comúnmente para fabricar pasaportes tipo snack.

4. DETERMINACION DEL ESTADO DE LA TECNICA

Según la definición dada en el art. 15: "Una invención se considerará nueva cuando no está comprendida en el estado de la técnica."

El estado de la técnica comprende 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.

Solo 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 fuere anterior a la fecha de presentación o de prioridad de la solicitud de patente que se estuviera 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 antecedentes en los archivos con que cuenta esta Oficina y se encontraron las siguientes documentaciones relacionadas con la materia de la presente solicitud:

Nº	DOCUMENTO	TITULO	FECHA DE PUBLICACION
D1	US 2,102,850	Machinery and process for the manufacture of expanded ball product and	1933-11-24
D2	US 2,458,888	Food snack product and method of preparing same	1949-03-04
D3	US 2,832,284	Method for preparing cooked cereal dough using twin screw preconditioning extruder	1958-08-03
D4	US 2,842,273	Method of preparing pellets for snack confectionery and an expanded snack confectionery	1958-08-24

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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 NOVEDAD.

De acuerdo al art. 16.- *"Una invención se considerará nueva cuando no está comprendida en el estado de la técnica"* se conceptúa:

El documento D1 presenta un proceso para la preparación de un alimento estable el cual se expande al ser expuesto a la energía del horno microondas. El procedimiento considera los siguientes pasos: preparación de una mezcla de almidón seco incluyendo al menos 46% en peso de harina de trigo entre el 15-25% en peso de almidón de maíz, 6 a 15% de almidón modificado de maíz y sal entre un 5 a 10 % en peso. Esta mezcla se calienta a 100 C mientras que se va humectando hasta obtener porcentajes de humedad entre el 22 y 27 %; se amasa la mezcla manteniendo la temperatura entre 100 a 110 C se enfría la mezcla a una temperatura inferior a 100C. Se forman las piezas teniendo en cuenta formas predeterminadas y se secan las piezas. Esto se trabaja en una extrusora compuesta por un par de tornillos sin fin y nueve zonas en las cuales ocurre calentamiento de la masa con humectación simultánea, adición de vapor y enfriamiento. En este documento también se describe un preacondicionamiento de los ingredientes de la mezcla por medio de la adición de vapor y agua.

En este documento se describe un procedimiento que incluye los mismos pasos que se encuentran presentados en la solicitud ya que en el D1 se realiza un preacondicionamiento de la materia prima con vapor y agua en la extrusora, y se realiza la preparación en caliente.

La anterioridad D2 presenta el proceso de fabricación de pasabocas fritos el cual incluye dos etapas una extrusión inicial y la segunda consiste en el freído, preferiblemente en condiciones húmedas; el extrudado tiene un contenido de humedad entre el 16-40%. La extrusión se lleva a cabo utilizando un preacondicionado inicial, en esta etapa se inyecta vapor y el material sale con una humedad entre el 25 al 45% en peso. La extrusora utilizada esta compuesta por un par de tornillos sin fin engranados. La velocidad rotacional del extrusor se cambia dependiendo la etapa del proceso. La extrusora se encuentra equipada con tornillos co-rotacionales dispuestos de una forma específica para proporcionar un incremento en el tiempo de residencia y mezclado y generar puntos de presión en la extrusora. La materia prima del proceso incluye una cantidad de harina con bajo contenido de proteína para incrementar la expansión durante el freído. En este documento se llevan a cabo las etapas de preacondicionamiento en la cual se inyecta vapor a la mezcla y el rango de humedad que presenta la masa al salir se encuentra dentro de los valores contemplados para el alimento que se obtiene al finalizar esta misma etapa en el método reivindicado.

6. EVALUACION DE LOS REQUISITOS DE PATENTABILIDAD

El artículo 14 de la Decisión 488 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 488 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 NOVEDAD

De acuerdo al art. 15: "Una invención se considerará nueva cuando no esté comprendida en el estado de la técnica" se concluye:

El documento D1 presenta un proceso para la preparación de un alimento estable el cual se expone al ser expuesto a la energía del horno microondas. El procedimiento consiste en las siguientes etapas: preparación de una mezcla de almidón seco incluyendo al menos 48% en peso de harina de trigo entre el 15-25% en peso de almidón de maíz, 6 a 12% de almidón modificado de maíz y sal entre un 2 a 10% en peso. Esta mezcla se calienta a 100°C mientras que se va triturando hasta obtener porcentajes de humedad entre el 22 y 27%; se añade la mezcla manteniendo la temperatura entre 100 a 110°C se añade la mezcla a una temperatura inferior a 100°C. Se forman las piezas teniendo en cuenta formas predefinidas y se secan las piezas. Esto se repite en una extrusión continua por un par de tornillos sin fin y nuevo zona en las cuales ocurre calentamiento de la masa con humectación simultánea, adición de vapor y enfriamiento. En este documento también se describe un procedimiento para la extrusión de la mezcla por medio de la adición de vapor y agua.

En este documento se describe un procedimiento que incluye los mismos pasos que se encuentran presentados en la solicitud ya que en el D1 se realiza un acondicionamiento de la materia prima con vapor y agua en la extrusora y se realiza la extrusión en caliente.

La referencia D2 presenta el proceso de fabricación de pasapapas fritos el cual incluye dos etapas una extrusión inicial y la segunda consiste en el frito. Previamente en condiciones húmedas; el extrudado tiene un contenido de humedad entre el 10-40%. La extrusión se lleva a cabo utilizando un procedimiento inicial, en esta etapa se inyecta vapor y el material sale con una humedad entre el 25 al 45% en peso. La extrusora utiliza esta configuración un par de tornillos sin fin engranados. La velocidad rotacional del extrudador cambia dependiendo la etapa del proceso. La extrusora se encuentra equipada con tornillos co-rotacionales, después de una forma específica para proporcionar un momento en el tiempo de residencia y mezclado y generar puntos de presión en la extrusora. La materia prima del proceso incluye una cantidad de harina con alto contenido de proteína para incrementar la expansión durante el frito. En este documento se llevan a cabo las etapas de acondicionamiento en la cual se inyecta vapor a la mezcla y el rango de humedad que presenta la masa al salir se encuentra dentro de las valores contemplados para el alimento que se obtiene al finalizar esta misma etapa en el método reivindicado.

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Con estas anterioridades presentadas se aprecia que el método reivindicado que comprende principalmente las etapas de preacondicionamiento e, en la cual se adiciona en proporciones controladas agua y vapor así como la extrusión, son etapas que en el estado del arte se conocen y son etapas de proceso que se utilizan en la fabricación de varios productos dependiendo de la materia prima que se utilice y la consistencia final del producto que se desee obtener. También se puede observar en la anterioridad D2 que se cambia la velocidad rotacional del extrusor dependiendo la etapa del proceso que se lleve a cabo al igual que lo establecido en el numeral (d) de la reivindicación 1. Al hacer los cambios en esta velocidad se establecen condiciones de cocción que permiten obtener el producto con las condiciones deseadas.

La reivindicaciones 14 a 19 correspondientes al aparato carecen de novedad ya que se utiliza para la fabricación de trocillos expandibles un preacondicionador y una extrusora de modelos conocidos tal como se referencia en los folios 11 y 13 respectivamente. Además son unidades utilizadas comúnmente en la fabricación de pasabocas tipo snack. Por lo tanto la solicitud no cumple con el artículo 16 de la Decisión 486.

6.2. 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:

El documento D3 presenta un método para preparar masa cocinada de cereales por el uso de una extrusora; en este método se utiliza como materia prima cereales los cuales entran a la unidad de preacondicionamiento de la extrusora, el material seco se mezcla y pasa rápidamente por las dos primeras zonas, luego pasa a la tercera zona en la cual se introduce agua la cual es mezclada con el material seco para formar una mezcla húmeda y uniforme, en la zona siguiente se le adiciona vapor a la masa formada para proporcionarle calentamiento a dicho material. En la siguiente zona se forma una masa compacta precocinada la cual se mantiene por debajo de su punto de gelatinización; el material sale del preacondicionador para completar su cocción y se forman los pellets; según las medidas y formas establecidas.

En la anterioridad D4 se presenta un método para la preparación de pellets a partir de los cuales se preparan pasabocas expandidos. La dimensión de expansión que pueden alcanzar los pasabocas depende de las proporciones de la mezcla de harina de maíz y almidón de papa. La masa formada fue cocinada en una extrusora compuesta por una par de tornillos sin fin, la masa cocinada se pasa a través de un par de rodillos para obtener una hoja la cual se corta en pequeñas piezas las cuales son secadas por medio de aire caliente seco y por último son tratadas con una máquina de expansión.

Con estos documentos se observa que el tratamiento de harinas para elaboración de pasabocas se realiza en extrusoras en las cuales se pueden llevar a cabo las etapas de preacondicionamiento y la cocción del material para su posterior moldeado en las formas deseadas para el producto final.

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

Nº	DOCUMENTO	REIVINDICACIONES AFECTADAS	REQUISITO QUE AFECTA
D1	US 5,165,950	1 a 19	NOVEDAD
D2	US 5,429,835	1 a 19	NOVEDAD
D3	US 5,932,264	1 a 19	NIVEL INVENTIVO
D4	US 5,942,273	1 a 19	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 **08 FEB. 2007**

CONCEPTO TÉCNICO Nº 0148	EXAMINADOR TÉCNICO CÓDIGO 202064
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En conclusión los pedidos de patentabilidad de la presente solicitud se encuentran afectados así:

Nº	DOCUMENTO	REIVINDICACIONES AFECTADAS	REQUERIMIENTO
01	US 2.102.850	1 a 19	NOVEDAD
02	US 2.179.335	1 a 19	NOVEDAD
03	US 2.952.564	1 a 19	NIVEL INVENTIVO
04	US 2.942.273	1 a 19	NIVEL INVENTIVO

En cumplimiento del artículo 45 de la Decisión 488 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 al presente oficio conforme a lo dispuesto en el numeral 2.2 literal e) del capítulo quinto del título primero de la circular única No. 10 de 2001.

ALIX CARMEN A. CESPEDES DE VERGEL
Jefe de la División de Nuevas Creaciones

El anterior requerimiento fue notificado por fax en fecha de 04/08/2001

CONCEPTO TÉCNICO	EXAMINADOR TÉCNICO
Nº 01/8	CÓDIGO 300004

D1



US005165950A

United States Patent [19]

Boehmer et al.

[11] Patent Number: 5,165,950

[45] Date of Patent: Nov. 24, 1992

[54] MICROWAVE EXPANDABLE HALF PRODUCT AND PROCESS FOR ITS MANUFACTURE

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[73] Assignee: American Amaranth, Inc., Bricelyn, Minn.

[21] Appl. No.: 750,927

[22] Filed: Aug. 28, 1991

[51] Int. Cl.⁵ A23L 1/025; A23L 1/18

[52] U.S. Cl. 426/559; 426/242; 426/446; 426/448; 426/449; 426/560; 426/625

[58] Field of Search 426/559, 360, 446, 448, 426/449, 625, 242

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Primary Examiner—Jeanette Hunter

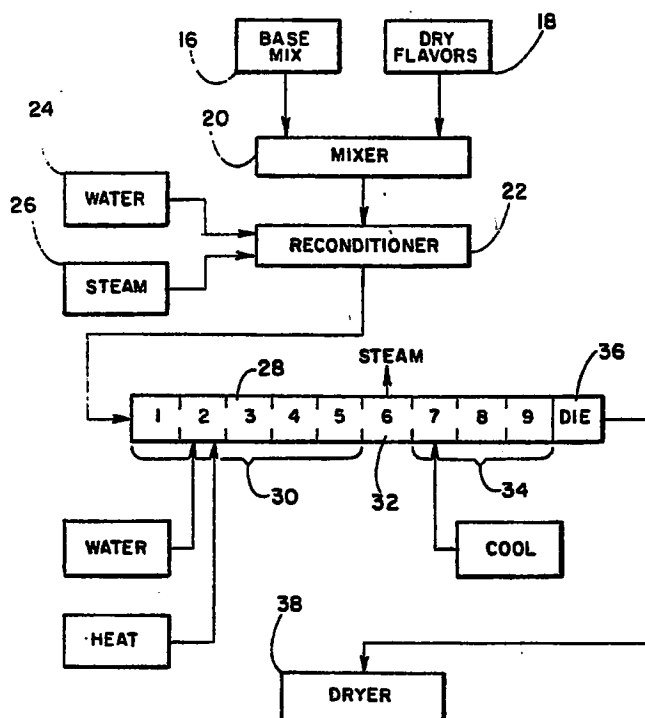
Assistant Examiner—Mary S. Mims

Attorney, Agent, or Firm—Haugen and Nikolai

[57] ABSTRACT

A process is disclosed for preparing a shelf stable half product expandable in microwave ovens. A chlorinated soft wheat flour, corn starch, modified corn starch and whole grain amaranth flour are combined to form a dry starch mixture. Salt and flavoring additives (if desired) are combined with the dry starch mixture. These ingredients are thoroughly mixed in a ribbon blender, then preconditioned in a paddle mixer with injection of steam and water, to form a mixture with moisture at 22-24 percent by weight. This mixture is provided to a twin screw extruder where it is worked and heated to substantially gelatinize the starches, vented for rapid cooling and moisture release, conveyed and lightly worked at reduced temperature, then forced through a shaping die and cut into pieces of the desired shape. The pieces are dried in a drying enclosure, at an air temperature of 43 degrees C., for about three and one-half to four hours.

23 Claims, 1 Drawing Sheet



1. General Information
 2. Physical Description
 3. Medical History
 4. Psychiatric History
 5. Substance Use
 6. Current Status
 7. Recommendations
 8. Signature
 9. Date
 10. Initials
 11. Printed Name
 12. Address
 13. City
 14. State
 15. Zip
 16. Phone
 17. Fax
 18. E-mail
 19. Referral Source
 20. Referral Date
 21. Referral Reason
 22. Referral Physician
 23. Referral Facility
 24. Referral Address
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1. The first step is to identify the problem. This involves understanding the nature of the problem, its scope, and its impact on the organization. It is important to gather all relevant information and to consult with key stakeholders to ensure a comprehensive understanding of the problem.

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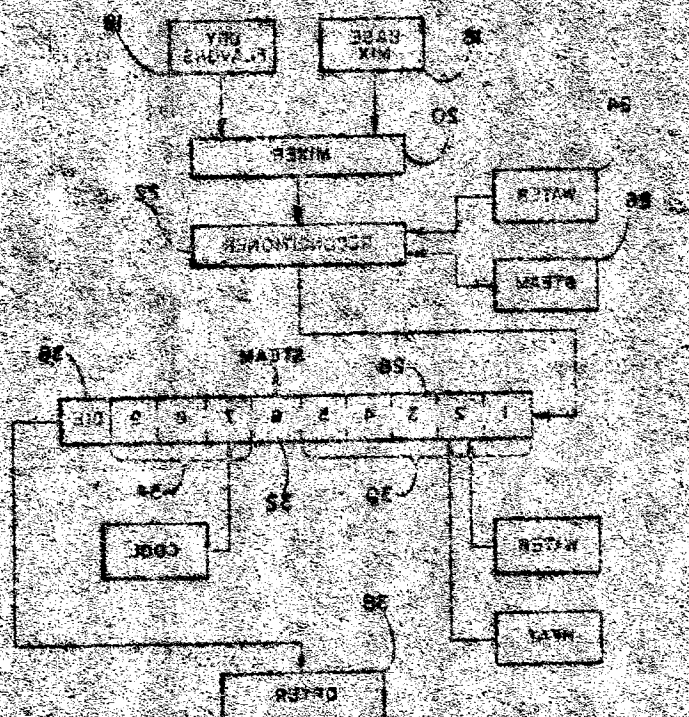
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1954-8-1	Deposit	20.00	100.00
1954-8-15	Check #107	10.00	90.00
1954-9-1	Balance	90.00	90.00
1954-9-15	Check #108	5.00	85.00
1954-10-1	Deposit	15.00	100.00
1954-10-15	Check #109	10.00	90.00
1954-11-1	Balance	90.00	90.00
1954-11-15	Check #110	5.00	85.00
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MICROWAVE EXPANDABLE HALF PRODUCT AND PROCESS FOR ITS MANUFACTURE

BACKGROUND OF THE INVENTION

The present invention relates to foods formed of extruded half products of cereal grains such as wheat and corn, and more particularly to half products suitable for expansion or puffing in microwave ovens.

Foods suitable for expanding (i.e. puffing or popping) have been made from extruded flours of cereal grains such as corn, wheat and oats. Other expandable foods include popping corn and amaranth grain. Traditionally, such products have been puffed by deep-fat frying. In recent years, concern about the greasy texture and calorie content of foods prepared by frying in fats or oils, has lead to increasing use of alternatives to deep-fat frying. Among these alternatives is the microwave oven. The widespread household use of microwave ovens has inspired efforts to provide half products and other foods suitable for microwave expansion.

For example, Van Hulle et al U.S. Pat. No. 4,409,250 discloses sugar coated, microwave puffable snacks. Pellets are formed from gelatinized farinaceous doughs, formed from waxy maize, millet, sorghum, milo and rice starches, as well as potato or tapioca starch. Optionally, sucrose and common salt can be added to the dough, to enhance expanding or puffing when the pellets are subject to microwave energy. The pellets are formed by extrusion under pressure and heat, then dried. Before they can be puffed, the pellets much be placed in a puffing medium of water and a carbohydrate sweetening agent.

Wilkinson et al U.S. Pat. No. 4,844,937 discloses a puffable half product made from corn materials, principally corn reduction flour or dry milled horny endosperm flour obtained by tempering whole corn, then running the tempered kernels through a degerminator. The material is combined with moisture, then run through an extruder to gelatinize the starch. A resulting dough is delivered to rotary blender, where the dough pieces are agitated to reduce surface moisture. The pieces then are delivered to a forming extruder where they are shaped, then cut and dried.

Spratt et al U.S. Pat. No. 4,990,348 is directed to half products expanded either by microwave or convection energy. The half products are based on a variety of raw materials including wheat starch, corn meal, potato flour, wheat flour and substantially brand-free oat flour. The material is tempered, heated, then extruded to form an unexpanded starch melt that hardens into a densified, glass-like half product. The product intentionally is cooled rather than dried, causing it to harden without substantially lowering its moisture content, which is said to provide a shelf stable ready to expand half product.

While the above and many other processes have proven satisfactory in connection with certain foods, these approaches do not adequately address the need for a cereal grain half product that undergoes substantial and reliable expansion in consumer microwave ovens.

Therefore, it is an object of the present invention to provide a process for preparing food half products employing moisture levels, temperatures and pressures lower than heretofore considered necessary.

Another object is to provide a half product based predominantly on starch sources other than corn, and at least in part utilizing amaranth flour.

Yet another object of the invention is to provide a food half product expandable in microwave ovens to an expanded volume substantially greater than the unexpanded volume.

SUMMARY OF THE INVENTION

To achieve these and other objects, there is provided a process for preparing a shelf stable food half product expandable when exposed to microwave energy. The process includes the following steps:

forming a dry starch mixture including at least 46 percent by weight a chlorinated soft wheat flour, from about 15 percent to about 25 percent by weight corn starch, from about 6 percent to about 15 percent by weight modified corn starch, and adding salt to the dry starch mixture in an amount ranging from about 5 percent to about 10 percent of the mixture, by weight;

heating the starch mixture and salt to a temperature of about 100 degrees C. while adding moisture until the mixture includes from about 22 percent to about 27 percent moisture, by weight;

kneading the mixture while maintaining the temperature of the starch mixture in the range of from about 100 degrees C. to about 110 degrees C.;

after said kneading, venting the starch mixture to rapidly cool the mixture to a temperature substantially below 100 degrees C.;

after said venting step, further lightly working the starch mixture while maintaining the temperature of the mixture below 100 degrees C.;

forming the mixture into a predetermined shape and cutting the mixture into pieces having the predetermined shape; and

drying the pieces to reduce their moisture content to within the range of about 9 percent to about 14 percent by weight, at a rate sufficiently gradual to substantially prevent case hardening.

Preferably the dry starch mixture is formed by thoroughly mixing the ingredients in a ribbon blender. Then, the starch mixture including salt and other additives is preconditioned in a paddle mixer, while steam and water are injected into the paddle mixture to increase the moisture of the starch mixture to within the desired range.

The preferred apparatus for the kneading, venting and working steps is a twin screw extruder having nine heads or zones. The initial five zones are heated to maintain the mixer temperature above 100 degrees C., the material of the starch mixture is mechanically worked, and water is added if necessary, all of which result in a substantially complete gelatinization of the starch in the mixture. The sixth zone of the extruder provides an open venting stage, along which steam escapes from the mixture to cause rapid cooling. In the final stage of the extruder (the seventh through the ninth zones), the starch mixture, by this time a gelatinized dough mass, is conveyed through the extruder with relatively minor mechanical work upon the dough. The dough is shaped by forcing it through a die at the downstream end of the extruder.

Beyond the die, the dough mass is cut into individual pieces and dried, preferably at a temperature in the range of 43 degrees C. to 65 degrees C., for about three and one-half to four hours. This reduces the moisture

content of the pieces to 9-14 percent, more preferably to 10-12 percent, by weight, while avoiding case hardening of the pieces. Further, it is preferable to wait at least a few days after drying, prior to microwave puffing. It is believed that immediately after drying, there remains a moisture gradient in each piece of the half product, i.e. due to a higher moisture content at the center of each piece. The moisture gradient is substantially reduced after a few days, without substantially changing the total moisture content of each piece.

The process of the invention is advantageously employed to produce a shelf stable food half product expandable in microwave ovens. The product is a substantially rigid, uniform matrix of substantially completely gelatinized starch from a dry starch mixture including at least 46 percent by weight a chlorinated soft wheat flour, from about 15 percent to 25 percent by weight corn starch, from about 6 percent to about 15 percent by weight modified corn starch, and additives including salt at from about 5 percent to about 10 percent by weight. The matrix is expandable in a microwave oven to an expanded volume of at least five times the unexpanded volume of the matrix.

The starch mixture further can include whole grain amaranth flour in the range of from 5 percent to 15 percent of the mixture, by weight. More particularly, the starch mixture includes the soft wheat flour at 61 percent, corn starch at 18-22 percent and more preferably 21 percent, modified corn starch at 1-10 percent and more preferably 9 percent, and amaranth flour at 8-10 percent and more preferably 9 percent. Additives to this basic mixture include the salt in the range of 3.2 percent to 5 percent, and flavoring additives in the range of 1 percent to 10 percent of the base mixture.

The food half product, prepared in accordance with the invention, has exhibited surprisingly favorable expansion when exposed to microwave energy in consumer microwave ovens. More particularly, the expansion yields a volume typically at least seven times the volume of the original, unexpanded half product. Frequently this amount of expansion is exceeded, to the point where occasional yields include expanded volumes exceeding thirteen times the original volume. The precise reason for this degree of expansion is not yet known. Corn starch and modified corn starch are known to enhance expansion, as is the addition of salt. The predominance of chlorinated soft wheat flour is thought to enhance gelatinization by promoting hydration and gelatinization of the starches. The amaranth flour is high in amylopectin, which is believed to promote puffing, yet also high in protein, which is believed to diminish puffability. However, the surprising expansion of the half product of the present invention, when subjected to microwave energy, is believed to be a synergistic result of the unique combination of ingredients, leading to a snack food having a fine texture, a crispness upon the initial bite, yet with a tenderness and rapid mouth melt.

IN THE DRAWINGS

FIG. 1 is a schematic view of a process for manufacturing a food half product according to the present invention; and

FIG. 2 is a schematic view showing part of a twin-screw extruder employed in the process.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Preparation of food half products according to the present invention involves selection of appropriate materials to provide a dry starch mix, identified as a base mix 16 in FIG. 1. A chlorinated soft wheat flour, known in the industry as cake flour, is preferred as the predominant source of starch, due to its low to moderate cost, and its relatively high nutritional content (e.g. as compared to corn, the wheat being substantially higher in calcium, iron and phosphorous, and somewhat higher lysine). Also, however, the cake flour is somewhat lower in protein than other wheat flours, which is believed to promote rapid hydration and cooking (gelatinization) of the starch.

Another desirable starch source is amaranth flour. Amaranth is considered nutritional, due to its relatively high content of protein, lysine, calcium and iron, for example as compared to corn and wheat. The minute (1-3 micrometer) starch particles of amaranth flour are believed to provide particularly favorable reception of flavoring additives. The contribution of amaranth to product puffability is probably close to neutral. The high amylopectin content is thought to enhance expansion, while the high protein level is thought to hinder expansion.

Corn starch and modified corn starch are favored starch sources, in that they are known to enhance puffing, are relatively low cost and abundant, and have nutritional value. These starches are particularly favorable in combination with amaranth flour, as amino acids lacking in corn are abundant in amaranth. Modified corn starch enhances the dry starch mixture in that it is more resistant to over cooking, enhances thickness and stability of the doughs formed from starch mixes, and provides resistance to heat and shear during cooking.

The starch mixture is further enhanced with dry additives as indicated at 18, for example salt and dry flavoring additives. Salt is considered particularly advantageous in the present invention, as the presence of salt leads to ion concentrations that absorb microwave energy, to enhance microwave expansion or puffing of the product. Common salt (NaCl) is preferred, although other edible salts can be employed, for example CaCl and KCl.

The base mix and additives are combined in a mixing device 20, e.g. a ribbon blender, a rotary blender, a rotating drum or a paddle mixer (for more rapid mixing, if desired). The product is agitated in the mixing device for a period of time (typically from one to five minutes) sufficient to thoroughly mix the constituents and provide a substantially uniform, dry mass.

The output of mixer 20 is provided to a preconditioning device 22, which can be a paddle mixer or an auger conveyor. Water and steam are injected into the preconditioning device as indicated at 24 and 26, respectively, at controlled rates to initiate cooking of the starch mixture and increase the moisture content of the starch mixture and additives to a moisture percent, by weight, in the range of about 22-27 percent, and more preferably 24-25 percent. For a throughput rate of about 110 kilograms per hour, water is added at about 6.4 kilograms per hour, and steam is injected at a rate of about 15 kilograms per hour. As the mixture including the base and additives leaves preconditioning device 22, it is in the form of a damp powder, having a consistency of, for example, moist sand.

From preconditioning device 22, the mixture is provided to an extruder 28, preferably a twin screw extruder. Extruder 28 includes nine zones cooperating to provide three stages of treatment for the dough. An initial heating and moisturizing stage 30, a rapid cooling or venting stage 32, and a subsequent conveyance stage 34, just upstream of a forming die 36.

Stage 30 includes five heads or zones of the extruder. Along this stage, the moist starch mixture is heated to a temperature in the range of about 100 degrees C. to about 110 degrees C., to substantially gelatinize the starches. To this end, the second zone, third zone, fourth zone and fifth zone are maintained at respective barrel temperatures of 89 degrees C., 95 degrees C., 102 degrees C. and 103 degrees C. At the sixth zone of extruder 28 (i.e. the second stage), steam is vented from the starch mix, at this stage a dough mass, to rapidly cool the dough to a temperature below 100 degrees C. To enhance cooling and moisture release, the third and fifth zones of the extruder are provided with shear locks as indicated schematically in FIG. 2. The shear locks at zone three prevent backflow of steam and create a region of heavy mechanical work on the starch mixture at and immediately upstream of the third zone. The shear locks at zone 5 also prevents backflow of steam, but more importantly provides a restriction so that dough is conveyed into second stage 32 at a slower rate than the extruder is able to convey material downstream out of the second stage. This tends to maintain zone 32 relatively free of material, for more effective venting.

After venting, the dough proceeds through stage 34 of the extruder, where the dough is cooled and conveyed, subject to relatively low mechanical work. More particularly, the seventh, eighth and ninth zones are maintained at respective barrel temperatures of 73 degrees C., 83 degrees C. and 91 degrees C., thus keeping the dough below 100 degrees C. as it is conveyed through the third stage of the extruder. The rapid cooling and moisture release at stage 32, and the cooling along the final stage of the extruder, combine to prevent premature expansion of the dough as it exits die 36.

At die 36, the dough is formed into the desired shape and cut, e.g. using a rotary knife. The dough at this point has a moisture content in the range of about 21-25 percent, and is forced through the die under pressure of at least 200 psi. By the time it exits extruder 28, the dough has undergone sufficient mechanical work, heat and addition of moisture to achieve nearly 100 percent gelatinization of the starches. More particularly, a gelatinization of at least 98 percent is achieved, based on enzyme susceptibility, or on reduction of crystallinity as observed by microscopic inspection under polarized light.

A belt, a pneumatic conveyor or other conveying means is provided to transport the cut dough pieces from extruder 28 to a drying device 38, where the air is maintained at a temperature in the range of from about 43 degrees C. to about 65 degrees C., and more preferably in the range of 43-49 degrees C. The duration within the drying device is sufficient to reduce the moisture content of the dough pieces to about 9-14 percent by weight, and more preferably 10-12 percent by weight, while avoiding any case hardening. More particularly, a drying time from about three and one-half to about four hours has been found satisfactory when the air temperature in the dryer is maintained at 43.5 degrees C., with humidity levels being sufficient to insure

the minimum duration of three and one-half hours for drying.

The process is further understood based on the following examples:

EXAMPLE I

A base or starch mixture was formed of a chlorinated soft wheat flour (cake flour) at 61 percent by weight, a pure food powder corn starch at 21 percent, modified corn starch (Mir-a-gel brand) at 9 percent by weight, and whole grain amaranth flour at 9 percent by weight. To this base, cheese flavoring was added at 4 percent, and a salt was added at 5 weight percent. Due to the presence of salt in the flavoring, the actual salt content was about 7 percent by weight. The starch mix and additives were thoroughly combined in a ribbon blender for a period of about five minutes. At this point, the mixture had a moisture content of about 11 percent by weight, and a density of about 32 pounds per cubic foot.

The starch mix including additives was then fed into a preconditioning device, in particular a paddle mixer operated at 190 rpm, although an operating range of 180 to 200 rpm was found satisfactory. Water was injected into the preconditioning device at rate of 6.4 kilograms per hour, and steam was injected at a rate of 0.254 kilograms per minute (about 15 kilograms per hour). The material throughput rate was about 110 kilograms per hour. Preconditioning formed a moist powder having a temperature of about 100 degrees C. and moisture at about 24 weight percent.

From a discharge chute of the preconditioner, the dough descended to the intake of extruder 28, particularly a twin screw extruder available from Wenger, Inc. of Sabetha, Kan. and identified as Model TX 52. The shafts of the extruder were operated at about 150 rpm, although it was found that a range of 140-165 rpm is satisfactory. Along the first stage of the extruder, water was added at the rate of 0.9 kilograms per hour. (In general, it has been found satisfactory to add water at the rate of 0-1.8 kilograms per hour). At the material throughput rate of about 110 kilograms per hour, the rotary knife was operated at a speed to cut individual pieces of the dough weighing about 1.6 grams each. The die was shaped to form six spoke wagon wheel pieces having a diameter of about one inch. A pressure head of about 450 pounds per square inch was developed at the ninth zone, just upstream of die 36. These conditions can vary, depending on the material throughput and the die shape. Of primary concern is providing sufficient heating, moisture addition and mechanical working of the dough, to achieve substantially total gelatinization of the starches.

The cut dough pieces were conveyed to dryer 38, where they were dried for three and one-half to four hours, with the air temperature in the dryer maintained at 43.5 degrees C. It should be noted that the conditions in dryer 36 can vary, keeping in mind the need to avoid case hardening, while completing the drying process in as short a time as reasonably practicable. Actual drying appears to proceed at approximately the same rate, throughout the 43-65 degrees C. temperature range.

The pieces of the starch were then expanded in a commercially available microwave oven at about 750 watts. Pieces of the dough were found to expand to volumes at least seven times the original, unexpanded volume, and in some cases as much as thirteen times the original volume. The expanded pieces had a uniform,

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rigid cellular structure, a fine texture and a crisp or crunchy mouth feel upon initial bite. The pieces also were tender and had a rapid mouth melt.

EXAMPLE II

The half product was prepared under conditions substantially identical to those in Example I, except that the moisture content of the mixture exiting the preconditioner was at 26 weight percent. With increased moisture content, it was found advantageous to operate the extruder at an increased speed of about 210-220 rpm. The resultant half product experienced expansion upon microwave heating, similar to that of the product of Example I.

EXAMPLE III

Process conditions were substantially identical to those in Example I, except that moisture of the starch mix and additives at the output of the preconditioner was 28 percent, and the extruder was operated at a speed of 240 rpm. The resulting volume expansion was somewhat less satisfactory than in Examples I and II, with expanded pieces having volumes of at least five times the original volumes.

EXAMPLE IV

Process conditions were substantially identical to those of Example I. However, 61 percent unchlorinated flour, in particular wheat flour known in the industry as pastry flour, was used in lieu of the chlorinated soft wheat flour of Example I. The resulting product expanded, but at a rate less than the expansion of products of Examples I and II.

EXAMPLE V

Process conditions were substantially identical to those in Example I, but 30 weight percent corn starch was used in lieu of the 21 percent corn starch plus 9 percent modified corn starch. The resultant product expanded at the satisfactory rates of Examples I and II, but did not exhibit the tenderness of the other products.

In general, it is believed essential to flavor the starch mix with dry flavoring additives, as opposed to essential oil flavors, to achieve the desired degree of expansion under microwave heating.

Thus in accordance with the present invention, a variety of starch sources including predominantly chlorinated soft wheat flour, with corn starch, modified corn starch and amaranth flour, enhanced with salt and flavorings if desired, are combined in a dry starch mixture. This mixture is preconditioned, substantially totally gelatinized and formed into pieces and dried, and exhibits a surprising degree of expansion in volume when subjected to microwave energy.

What is claimed is:

1. A process for preparing a shelf stable food half product expandable when exposed to microwave energy, including the steps of:
 - forming a dry starch mixture including at least 46 percent by weight a chlorinated soft wheat flour, from about 15 to about 25 percent by weight corn starch, from about 6 to about 15 percent modified corn starch, and from about 5 percent to about 10 percent salt;
 - heating the starch mixture to a temperature of about 100 degrees C. while adding moisture to the starch mixture until the starch mixture includes moisture

at from about 22 percent to about 27 percent by weight;

kneading the starch mixture while adding heat to maintain the temperature of the starch mixture in the range of from about 100 degrees C. to about 110 degrees C. to form a dough;

after said kneading step, rapidly cooling the dough to a temperature substantially below 100 degrees C.; after said cooling step, lightly working the dough while maintaining the dough to a temperature below about 100 degrees C.;

forming the dough into a predetermined shape and cutting the dough into pieces having the predetermined shape, as the dough exits the extrusion means; and

drying the dough pieces to reduce their moisture content to within the range of about 9 percent to about 14 percent by weight, at a rate sufficiently gradual to substantially avoid case hardening.

2. The process of claim 1 wherein:

the dry starch mixture further includes whole grain amaranth flour within the range of from about 5 percent to about 15 percent by weight.

3. The process of claim 2 wherein:

the step of forming a dry starch mixture further includes adding dry flavoring additives to the mixture in the range of from about 1 percent to about 10 percent by weight.

4. The process of claim 1 wherein:

the step of forming the dry starch mixture includes mixing constituents of the mixture in a ribbon blending device.

5. The process of claim 1 wherein:

the step of heating the starch mixture and adding moisture includes feeding the starch mixture through a preconditioning device for performing mechanical work upon the mixture while water and steam are added to the mixture, each at a controlled and steady rate.

6. The process of claim 5 wherein:

the step of heating the starch mixture includes adding moisture to increase the moisture content of the starch mixture to within the range of from 22 to 24 percent moisture by weight.

7. The process of claim 1 wherein:

the step of kneading the starch mixture includes feeding the dough through a first stage of a twin screw extruder having a plurality of zones along the first stage, and heating the zones along the first stage, at temperatures progressing from about 89 degrees C. at a first upstream zone, to a temperature of about 103 degrees C. at a final downstream zone of the first stage.

8. The process of claim 7 wherein:

the step of rapidly cooling the dough includes venting steam from the dough at an intermediate zone of the extruder immediately downstream of said final zone of the first stage.

9. The process of claim 7 wherein:

the step of working the dough includes the step of conveying the dough along a plurality of zones forming a third stage of the twin screw extruder, while cooling to maintain a first, upstream zone of the third stage at a temperature of about 73 degrees C., and a final, downstream zone of the third stage to a temperature of about 91 degrees C.

10. The process of claim 9 wherein:

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1. The purpose of this study is to determine the effect of the concentration of the solution on the rate of reaction. The reaction is the decomposition of hydrogen peroxide into water and oxygen. The rate of reaction is measured by the volume of oxygen gas evolved over a period of time. The concentration of the solution is varied by changing the volume of the solution used. The results are shown in the table below.

Concentration of Solution (M)	Volume of Oxygen Gas Evolved (ml)
0.1	10
0.2	20
0.3	30
0.4	40
0.5	50

2. The purpose of this study is to determine the effect of the temperature of the solution on the rate of reaction. The reaction is the decomposition of hydrogen peroxide into water and oxygen. The rate of reaction is measured by the volume of oxygen gas evolved over a period of time. The temperature of the solution is varied by changing the temperature of the water bath. The results are shown in the table below.

Temperature of Solution (°C)	Volume of Oxygen Gas Evolved (ml)
10	10
20	20
30	30
40	40
50	50

3. The purpose of this study is to determine the effect of the catalyst on the rate of reaction. The reaction is the decomposition of hydrogen peroxide into water and oxygen. The rate of reaction is measured by the volume of oxygen gas evolved over a period of time. The catalyst is varied by changing the amount of catalyst used. The results are shown in the table below.

Amount of Catalyst (g)	Volume of Oxygen Gas Evolved (ml)
0	10
1	20
2	30
3	40
4	50

4. The purpose of this study is to determine the effect of the surface area of the solid reactant on the rate of reaction. The reaction is the decomposition of hydrogen peroxide into water and oxygen. The rate of reaction is measured by the volume of oxygen gas evolved over a period of time. The surface area of the solid reactant is varied by changing the size of the solid reactant. The results are shown in the table below.

Surface Area of Solid Reactant (cm²)	Volume of Oxygen Gas Evolved (ml)
1	10
2	20
3	30
4	40
5	50

5. The purpose of this study is to determine the effect of the pressure of the gas on the rate of reaction. The reaction is the decomposition of hydrogen peroxide into water and oxygen. The rate of reaction is measured by the volume of oxygen gas evolved over a period of time. The pressure of the gas is varied by changing the volume of the gas. The results are shown in the table below.

Pressure of Gas (atm)	Volume of Oxygen Gas Evolved (ml)
1	10
2	20
3	30
4	40
5	50

6. The purpose of this study is to determine the effect of the concentration of the solution on the rate of reaction. The reaction is the decomposition of hydrogen peroxide into water and oxygen. The rate of reaction is measured by the volume of oxygen gas evolved over a period of time. The concentration of the solution is varied by changing the volume of the solution used. The results are shown in the table below.

Concentration of Solution (M)	Volume of Oxygen Gas Evolved (ml)
0.1	10
0.2	20
0.3	30
0.4	40
0.5	50

7. The purpose of this study is to determine the effect of the temperature of the solution on the rate of reaction. The reaction is the decomposition of hydrogen peroxide into water and oxygen. The rate of reaction is measured by the volume of oxygen gas evolved over a period of time. The temperature of the solution is varied by changing the temperature of the water bath. The results are shown in the table below.

Temperature of Solution (°C)	Volume of Oxygen Gas Evolved (ml)
10	10
20	20
30	30
40	40
50	50

8. The purpose of this study is to determine the effect of the catalyst on the rate of reaction. The reaction is the decomposition of hydrogen peroxide into water and oxygen. The rate of reaction is measured by the volume of oxygen gas evolved over a period of time. The catalyst is varied by changing the amount of catalyst used. The results are shown in the table below.

Amount of Catalyst (g)	Volume of Oxygen Gas Evolved (ml)
0	10
1	20
2	30
3	40
4	50

9. The purpose of this study is to determine the effect of the surface area of the solid reactant on the rate of reaction. The reaction is the decomposition of hydrogen peroxide into water and oxygen. The rate of reaction is measured by the volume of oxygen gas evolved over a period of time. The surface area of the solid reactant is varied by changing the size of the solid reactant. The results are shown in the table below.

Surface Area of Solid Reactant (cm²)	Volume of Oxygen Gas Evolved (ml)
1	10
2	20
3	30
4	40
5	50

10. The purpose of this study is to determine the effect of the pressure of the gas on the rate of reaction. The reaction is the decomposition of hydrogen peroxide into water and oxygen. The rate of reaction is measured by the volume of oxygen gas evolved over a period of time. The pressure of the gas is varied by changing the volume of the gas. The results are shown in the table below.

Pressure of Gas (atm)	Volume of Oxygen Gas Evolved (ml)
1	10
2	20
3	30
4	40
5	50

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The present was prepared under conditions of the highest scientific accuracy and reliability. The present was prepared under conditions of the highest scientific accuracy and reliability. The present was prepared under conditions of the highest scientific accuracy and reliability.

III. FUTURE

of the total classification now attributed to these
documents is unknown and the exact number of pages
involved cannot be known until the records are examined.
It is therefore very probable that the records are
now somewhere among the records of the FBI in the
New York City office. It is probable that the records
will be found in the New York City office.

VII. DISCUSSION

[illegible]**VALUE**[illegible][illegible]

D2



US005429835A

United States Patent [19]

Wenger et al.

[11] Patent Number: 5,429,835

[45] Date of Patent: Jul. 4, 1995

[54] FRIED SNACK PRODUCT AND METHOD OF PREPARING SAME

[75] Inventors: Marc L. Wenger, Sabetha; Jeffrey C. Herbster, Morrill, both of Kans.

[73] Assignee: Wenger Manufacturing, Inc., Sabetha, Kans.

[21] Appl. No.: 979,373

[22] Filed: Nov. 19, 1992

Related U.S. Application Data

[63] Continuation of Ser. No. 811,952, Dec. 23, 1991, abandoned, which is a continuation-in-part of Ser. No. 803,637, Dec. 5, 1991, abandoned.

[51] Int. Cl.⁶ A23L 1/6; A23L 1/18

[52] U.S. Cl. 426/557; 426/439; 426/440; 426/559; 426/808

[58] Field of Search 426/557, 439, 440, 559, 426/808

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Primary Examiner—Jeanette Hunter

Assistant Examiner—Mary S. Mims

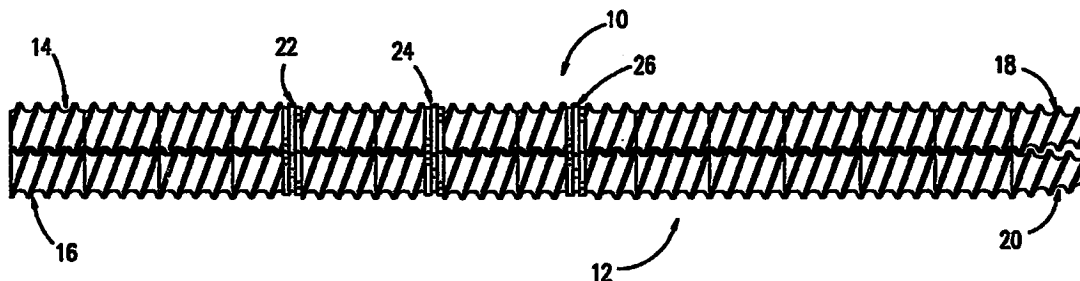
Attorney, Agent, or Firm—Hovey, Williams, Timmons & Collins

[57]

ABSTRACT

An improved fried snack product is provided which is fabricated by a two step process including initial extrusion followed by frying, preferably in a wet condition wherein the extrudate has a moisture content of from about 16-40% by weight. The starting mixture fed to the extruder preferably includes an amount of low protein flour (e.g., cake flour) in order to increase the expansion of the product upon frying. Fried snacks in accordance with the invention exhibit a smooth, even appearance, and have excellent organoleptic properties. Extrusion is advantageously carried out using an initial preconditioner and a co-rotating twin screw extruder equipped with a venting apparatus along the length thereof.

17 Claims, 1 Drawing Sheet



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 de tornillos sin fin engranados

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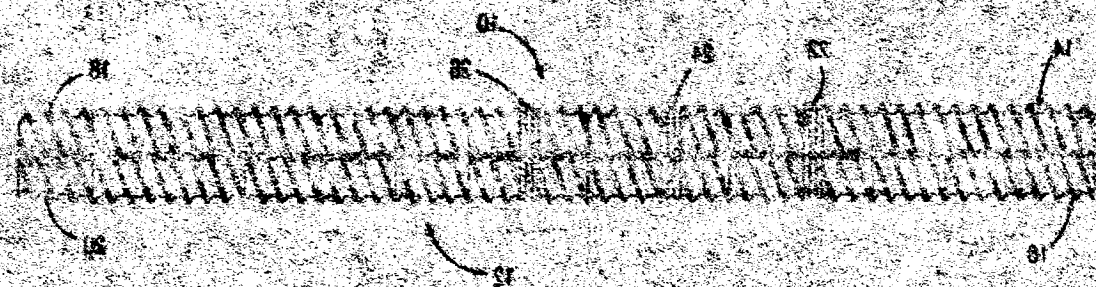
121	File #	Nov. 18, 1952
122	Appl. No.	573,170
123	Abstract	Process of making
124	Assignment	From Washington, D.C.
125	Inventors	James L. Brown, Edward J. Brown
126	Attorneys	John H. Brown, Jr.
127	Field of Invention	Method of making
128	Background of Invention	It is known in the art
129	Summary of Invention	The present invention
130	Objects of Invention	It is an object of the
131	Brief Description of Drawings	The drawings show
132	Detailed Description	Referring to the drawings
133	Claims	What is claimed is
134	References	U.S. Pat. No. 2,500,000
135	Examination	By James L. Brown
136	Witnesses	John H. Brown, Jr.
137	Signature	James L. Brown
138	Date	Nov. 18, 1952

[illegible]

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FRIED SNACK PRODUCT AND METHOD OF PREPARING SAME

This is a continuation of application Ser. No. 07/811,952 filed Dec. 23, 1991, now abandoned, which is in turn a continuation-in-part of application Ser. No. 07/803,637 filed Dec. 5, 1991, now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention is broadly concerned with improved fried snack products, as well as a method of fabricating such snacks. More particularly, it is concerned with snacks which have improved appearance and organoleptic characteristics by fabrication using initial low-temperature extrusion followed by frying while the extruded products are relatively wet, e.g., at a moisture level of from about 16-40% by weight. In another aspect of the invention, use of low protein flour, and especially cake flour, in the snack mixture gives improved, expanded products. Such low protein flours may be used exclusively, or in combination with pasta-type flours such as Durum or Semolina.

2. Description of the Prior Art

It is known that desirable snack products can be produced via a two-stage process wherein a starting flour/water mixture typically including pasta flour (e.g., Durum or Semolina) is first extruded, followed by drying of the extrudate and frying. As a class, these snacks are known as "third generation" products, and are characterized by an expanded, crunchy texture and mouth feel.

U.S. Pat. No. 5,059,439 describes a very successful process for the low temperature extrusion of pasta products to produce instant or quick-cooking pastas. In the preferred process, a starting pasta flour/water mixture is first preconditioned and then passed through a co-rotating twin screw extruder having a vent in the barrel thereof. Processing temperatures and retention times are controlled in the extruder, so that the final product is largely or completely cooked upon emerging from the extruder. Thereafter, the extrudate is dried to a moisture content of about 10-12% by weight. In use, the pasta products can be readily rehydrated and exhibit very desirable eating qualities.

The step of frying the dried, quick-cooking pasta product, although an obvious expedient in light of third generation snack technology, tends to yield a product which is characterized by irregular blistering on the surface thereof and minimal expansion. Therefore, while the extrusion fabrication of quick-cooking pasta and pasta-type products is known, as well as the advantages of such products, frying of these extrudates has not produced first-quality snack products.

SUMMARY OF THE INVENTION

The present invention overcomes the problems outlined above, and provides greatly improved fried snack products which have an even surface of desirable color, as well as the other organoleptic properties required for consumer acceptance. In addition, the products can be fabricated so as to achieve limited or substantial expansion upon frying, at the desire of the processor.

Broadly speaking, the method involves first forming a mixture or dough comprising flour and water, and passing the mixture into and through an extruder to form at least a partially cooked extrudate. Thereafter,

and very importantly, the extrudate is fried in a relatively wet condition, i.e., the extrudate at the point of frying should have a moisture content of from about 16-40% by weight (moisture content, wet basis), and more preferably from about 20-30% by weight.

In another aspect of the invention, it has been found that use of a low protein flour such as cake flour in the starting flour mixture provides a very desirable degree of expansion in the final fried product. Such low protein flours should have a protein content of up to about 11% by weight, and more preferably from about 1-9% by weight. The low protein flour can be used alone as the sole flour constituent or can be mixed in combination with other flours, and especially pasta-type flours. In such cases, the low protein flour is generally present at a level of from about 1-50% by weight of the total dry ingredients mixture, and more preferably from about 1-5% by weight.

BRIEF DESCRIPTION OF THE DRAWINGS

The single FIGURE is an essentially schematic, plan view illustrating the preferred twin screw extruder configuration used in the extrusion fabrication step of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

As indicated previously, an important feature of the invention resides in the discovery that an improved fried snack product may be fabricated by first forming a mixture or dough including flour and water, followed by extrusion of this mixture and frying of the extrudate in a relatively wet condition. Broadly, the preferred extrusion process of the invention closely follows that described in U.S. Pat. No. 5,059,439, which is incorporated by reference herein.

In particular, the apparatus employed preferably comprises a Wenger TX Model twin screw extruder as well as a Wenger DDC preconditioner. Both of these components are commercialized by Wenger Manufacturing, Inc. of Sabetha, Kans. The preconditioner is fully described in U.S. Pat. No. 4,752,139 also incorporated herein, and includes a elongated conditioning vessel having transversely arcuate walls presenting a pair of interconnected chambers, with one chamber having a greater cross-sectional area than the adjacent chamber. A mixing shaft is located within each chamber and includes outwardly extending mixing paddles thereon. The shafts are rotated at different rotational speeds respectively during operation. The extruder is illustrated and described in U.S. Pat. No. 4,875,847, also incorporated herein, and is characterized by a pair of co-rotating, intermeshing screws having a pair of conical screws adjacent the output end of the extruder.

The single FIGURE illustrates the preferred screw configuration found to be particularly useful in the context of the present invention. To this end, the extruder apparatus is equipped with co-rotating screws 10, 12 having respective inlet sections 14, 16 and conical nose screws 18, 20. In addition, shearlock sets 22, 24 and 26 are interposed along the length of the screws to increase mixing and residence time, and to generate transient pressure points in the extruder. Screw rotation will normally range from about 100-400 rpm. Those skilled in the art will of course appreciate that the screws 10, 12 are housed within an elongated, sectionalized barrel which is commonly provided with external jackets for introduction of indirect heating or cooling

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media. Moreover, a die is situated adjacent the ends of the nose screws 18, 20. A conventional pasta die may be used in this context to achieve the desired product shape and size.

The preferred extruder of the invention is also equipped with a venting assembly which serves to remove moisture from the material passing through the barrel. Such a venting assembly is specifically illustrated in the aforementioned U.S. Pat. No. 5,059,439. The venting assembly includes structure defining an aperture in one of the housing heads, along with a stuffer apparatus designed to prevent loss of material from the barrel and to draw a vacuum so as to assist in the venting operation.

In operation, the dry ingredients, namely flour and optional materials such as salt and surfactant are directed to the DDC preconditioner, whereupon moisture, in the form of water and/or steam, is added to the dry ingredients. In the preconditioner, a uniform mixture is created through the rotation of the mixing shafts. In particular, the mixture is subjected to a maximum temperature of from about 150°-230° F., and more preferably from about 190°-212° F., in the preconditioner; the residence time of the mixture in the preconditioner ranges from about 20 seconds to 6 minutes, more preferably from about 1-3 minutes. Preferably, steam is injected during travel of the mixture along the first one-third of the length of the preconditioner. The material exiting the preconditioner preferably has a moisture content of from about 20-50% by weight, and more preferably from about 25-45% by weight. Moreover, by virtue of the preconditioning treatment, the mixture is at least partially precooked therein.

Material leaving the preconditioner is fed directly to the inlet of the twin screw extruder. In the extruder, the mixture is subjected to a maximum temperature of up to about 240° F. and preferably up to about 220° F. In terms of ranges, the maximum temperature should be from about 150°-240° F. Desirably, the mixture is subjected to two stages of treatment in the extruder, namely a cooking stage and a downstream forming stage. The material is subjected to the highest temperature it will experience in the extruder in the cooking stage, whereas the temperatures experienced in the forming stage are generally below the maximum temperature of the cooking stage. Thus, while the cooking stage temperatures may range from 150°-240° F., preferably about 190°-220° F., those of the forming stage are generally lower, on the order of 130°-220° F., more preferably from about 150°-210° F.

The total residence time of the mixture in the extruder will typically be in the range of from about 30 seconds to 2 minutes, while more preferred residence times would be from about 10-25 seconds in the cooking region and from about 20-80 seconds in the forming region.

If venting is used, the vent apparatus should be situated between the cooking and forming regions. Most preferably, the venting apparatus is of the type described in U.S. Pat. No. 5,059,439, and a vacuum level of from about 5-20 in. Hg should be employed.

Maximum pressures within the extruder should be in the range of from about 200-1500 psig, more preferably from about 200-1000 psig. Normally, maximum pressures are achieved in the final extrusion head, just upstream of the die.

As the extrudate emerges from the extrusion die, it is cut by means of a rotary knife or similar expedient.

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Although not critical, the extrudate should have a total length of from about $\frac{3}{8}$ " to 2", more preferably from about $\frac{1}{2}$ to 1 $\frac{1}{4}$ ".

As explained, in one aspect of the invention, it is important that the extrudate not be substantially dried as is typical in the production of pastas. Rather, the extrudate should be maintained in a relatively wet condition for frying purposes. To this end, the extrudate may be immediately fried, or can be subjected to a cooling operation using ambient temperature air. This will have the effect of somewhat reducing the total moisture content of the extrudate, but it would still have a moisture level in excess of typical pasta production, of course, drying/cooling conditions are variable depending upon desired final product characteristics. Finally, if desired, the extrudate may be partially dried and/or allowed to equilibrate by sitting undisturbed for a number of hours before frying.

Frying conditions are completely conventional, and involve placing the extrudate in cooking oil having a temperature of from about 350°-400° F. for a period of from about 5-45 seconds. These conditions are variable, depending upon the qualities desired in the final product.

The final products after frying are essentially free of uneven blisters and exhibit a smooth, appealing outer surface and a characteristic fried color (the final color depends upon fryer temperature and retention time).

It has also been discovered that the final product quality of pasta-type snacks containing Durum or Semolina flour can be materially affected by the inclusion of certain ingredients other than pasta flour and water. For example, use may be made of minor amounts of surfactant and salt, with the surfactant being present at a level of from about 0.5-5% by weight. Salt may be used at normal percentages, typically from about 1-4% by weight. Desirably, the salt employed should be in flour form, as opposed to dendritic or flake form.

Most importantly, however, it has been discovered that use of low protein flour provides the most pronounced organoleptic improvement in the final fried product, especially in lighter density expanded products. Although a variety of low protein flours may be used, cake flour is the most preferred. Acceptable snacks can be fabricated using low protein or cake flour alone, but best results are obtained when such flours are mixed with pasta-type flours, most notably Durum or Semolina. In such cases, the low protein flour may be used at a level of from about 1-99% by weight, more preferably from about 1-50% by weight, and most preferably at a level of from about 1-5% by weight. The single most preferred products in accordance with the invention include about 1.5% by weight cake flour. The low protein flour ingredient enhances the expansion of the snack product upon frying, and is also believed to contribute to the even frying and characteristics of the snacks of the invention. Such is particularly true when use is made of optional ingredients such as baking soda or baking powder.

Cake flour is understood by those skilled in the art to be of a particular kind and quality, and is described in *Wheat Chemistry and Technology*, 1971 Edition, and edited by Y. Pomerantz, pp. 221 and 223; this information is incorporated by reference herein. Thus, cake flour is normally spring or winter wheat having a low flour absorption (farinograph) of from about 40-55, an ash content of from about 0.20-0.45, an alkaline water retention of from about 50-65, a white color, an average

Although the above is a summary of the facts, it is not intended to be a complete statement of the facts. The facts are set forth in the following pages.

A copy of the report of the investigation is being furnished to the Bureau of Investigation, Department of Justice, and to the Bureau of Customs, Department of Treasury, for their information and use.

The following is a list of the persons who were interviewed during the investigation:

The first person interviewed was the owner of the property, who stated that he had no knowledge of the facts of the case.

The second person interviewed was the person who was found in possession of the property, who stated that he had no knowledge of the facts of the case.

The third person interviewed was the person who was found in possession of the property, who stated that he had no knowledge of the facts of the case.

The fourth person interviewed was the person who was found in possession of the property, who stated that he had no knowledge of the facts of the case.

The fifth person interviewed was the person who was found in possession of the property, who stated that he had no knowledge of the facts of the case.

The sixth person interviewed was the person who was found in possession of the property, who stated that he had no knowledge of the facts of the case.

The seventh person interviewed was the person who was found in possession of the property, who stated that he had no knowledge of the facts of the case.

The eighth person interviewed was the person who was found in possession of the property, who stated that he had no knowledge of the facts of the case.

The ninth person interviewed was the person who was found in possession of the property, who stated that he had no knowledge of the facts of the case.

The tenth person interviewed was the person who was found in possession of the property, who stated that he had no knowledge of the facts of the case.

The eleventh person interviewed was the person who was found in possession of the property, who stated that he had no knowledge of the facts of the case.

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Fisher particle size of from about 8-12 microns, a protein content of from about 5-8.5%, and a MacMichael

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The extrusion conditions employed for these runs are set forth in the following table:

TABLE 1

		RUN #1	RUN #2	RUN #3	RUN #4
Raw Material Rate	PPH	3000	2870	2870	2870
Feed Screw Speed	RPM	180	285	285	285
Steam Flow to Preconditioner	PPH	270	250	250	250
Water Flow to Preconditioner	PPH	400	400	400	400
Preconditioner Temperature	*F.	200	195	195	195
EXTRUSION INFORMATION:					
Extruder Shaft Speed	RPM	160	160	160	160
Motor Load	%	60	56	56	56
Steam Flow to Extruder	PPH	200	200	200	200
Water Flow to Extruder	PPH	600	600	600	600
Control/Temperature-2nd Head	*F.	171	175	175	175
Control/Temperature-3rd Head	*F.	241	240	240	240
Control/Temperature-4th Head	*F.	210	212	212	212
Control/Temperature-5th Head	*F.	Vent	Vent	Vent	Vent
Control/Temperature-6th Head	*F.	152	155	155	155
Control/Temperature-7th Head	*F.	190	190	190	190
Control/Temperature-8th Head	*F.	190	190	190	190
Head/Pressure	PSIG	8/900	8/900	8/900	8/900
Head/Pressure	PSIG	7/500	7/500	7/500	7/500
FINAL PRODUCT INFORMATION:					
Extrudate Moisture		33.2			
Formula Number		(1)	(2)	(2)	(3)

viscosity of from about 35°-60°. Suitable cake flour may be obtained from ConAgra, Inc., namely its Pinnacle or American Beauty cake flours.

The following examples describe the preferred fabrication techniques and products in accordance with the invention. It is to be understood that the examples are presented by way of illustration only and nothing therein should be deemed a limitation upon the overall scope of the invention.

EXAMPLE I

In this series of runs, a Wenger TX-138 twin screw extruder was employed, having a Wenger DDC preconditioner and a barrel made up of eight interconnected, jacketed heads with the fifth head being equipped with a vent/vacuum port and a stuffer-type venting device of the type described in U.S. Pat. No. 5,059,439. The output end of the extruder barrel was equipped with a three-vane rotini die (Model R36296 sold by Maldari Bros. of New York, N.Y.). The screw configuration of the TX-138 machine is illustrated in the drawing FIGURE.

The following formulae were used in this series of runs:

(1)

Durum Flour—94.25% by weight
Cake Flour—1.5% by weight
Myvaplex 600—0.75% by weight
Salt Flour—3.5% by weight

(2)

Durum Flour—99.25% by weight
Myvaplex 600—0.75% by weight

(3)

Durum Flour—94.25% by weight
Cake Flour—1.5% by weight
Baking Soda—0.5% by weight
Myvaplex 600—0.75% by weight
Dendretic Salt—3.0% by weight

In the case of Run #1, a total of 1,600 pounds of extrudate was produced. This extrudate was pneumatically conveyed to the inlet of a two-pass dryer equipped with an airlock. At the airlock, the moisture content of the product was about 31.7% by weight, and a sample of this product was saved for frying. In the dryer, ambient temperature air was used, in order to cool the product and effect a measure of drying thereof. After the two-pass treatment (15 minutes each pass), the moisture content of the cooled product was about 19.5% by weight. This product was then divided into totes, four of which were loaded into a conventional truck, with four being loaded into a refrigerated truck. The product was shipped to a frying location, and was fried approximately 16 hours after extrusion.

The fried products were excellent, and exhibited small even blistering. The products derived from the cooling were considered the best.

In the case of Runs #2 and #3, the formula did not contain cake flour. However, the product was fried wet, specifically at a moisture level of about 27% by weight. These samples were obtained at the dryer airlock as described above.

The Run #4 extrudate was cooled in the two-pass dryer using ambient air and retention times of 30 minutes in each drying stage to achieve a final moisture content of about 19.5% by weight. The temperature recorded in the dryer during the cooling process was 180° F.

EXAMPLE II

In this example, a starting mixture made up of 99.25% by weight cake flour (General Mills) and 0.75% by weight Myvaplex surfactant was used. The equipment used was a Wenger DDC preconditioner with a nine head Wenger Model TX 52 extruder very similar to that described previously. The extruder was vented between the 6th and seventh heads, using the apparatus described above. The final die was a 0.025" elbow die (Maldari Bros. #46868).

The extrusion conditions recorded in this run are set forth below.

TABLE 2

		RUN #1
PRECONDITIONING INFORMATION:		
Feed Screw Speed	RPM	15
Mixing Cylinder Speed	RPM	110
Steam Flow to Preconditioner	PPM	0.38
Water Flow to Preconditioner	PPM	0.459
Mixing Cylinder Temperature	*F.	208
Moisture Entering Extruder	MCWB	29.79
EXTRUSION INFORMATION:		
Extruder Shaft Speed	RPM	160
Motor Load	%	32
Steam Flow to Extruder	PPM	0.513
Water Flow to Extruder	PPM	0.159
Control/Temperature-2nd Head	*F.	CW/118
Control/Temperature-3rd Head	*F.	CW/118
Control/Temperature-4th Head	*F.	HO/230
Control/Temperature-5th Head	*F.	HO/230
Control/Temperature-6th Head	*F.	HO/230
Control/Temperature-7th Head	*F.	CW/194
Control/Temperature-8th Head	*F.	CW/194
Control/Temperature-9th Head	*F.	CW/196
Head/Pressure	PSIG	9/1100
Head/Pressure	PSIG	DIE/600

The extrudate emerging from the extruder had a moisture content of 30.41% by weight, and was thereupon dried to a moisture content of 7.47% by weight. The drying sequence involved use of 160° F. air, with retention times in the first pass, second pass and cooler being 5.9, 21.0 and 10.5 minutes respectively.

The dried extrudate was then fried and exhibited a substantial degree of expansion. A control was also produced wherein the starting material was conventional pasta flour (Durum). This control when fried was compared with the cake flour extrudate. It was found that the straight cake flour extrudate of this example gave approximately twice the degree of expansion, as compared with the control. The cake flour extrudate furthermore exhibited a pleasing appearance and good organoleptic properties.

We claim:

1. In a method for fabricating a fried snack product including the steps of forming and preconditioning a mixture of flour and water for a period of about 20 seconds to 6 minutes and subjecting the mixture to elevated temperature to a maximum of from about 150°-230° F., and passing the preconditioned mixture into and through an extruder and forming at least a partially cooked extrudate, said extrusion step comprising the steps of introducing said preconditioning mixture into the barrel of an extruder equipped with a flighted, rotatable screw and an extrusion die, rotating the screw to sequentially advance the preconditioned mixture along the length of the barrel first through a cooking zone, then through a venting zone and a forming zone, and finally through said extrusion die, said

mixture having a maximum temperature of up to about 240° F. in said cooking zone, and thereafter frying the partially cooked extrudate, the improvement which comprises incorporating into said mixture a quantity of a low protein wheat flour having a protein content of from about 1-9% by weight.

2. The method of claim 1, said mixture comprising from about 20-50% by weight water.

3. The method of claim 2, said mixture comprising from about 25-45% by weight water.

4. The method of claim 1, including the step of injecting steam into said preconditioner during formation of said mixture.

5. The method of claim 1, wherein said mixture is subjected to two stages of treatment in said extruder, first in a cooking region wherein the highest temperature is below about 240° F., and second in a forming region wherein the temperature is less than the maximum temperature of the mixture in said cooking region.

6. The method of claim 5, including the steps of retaining said mixture in said cooking region for a period of from about 10-25 seconds, and retaining said mixture in said forming region for period of from about 20-80 seconds.

7. The method of claim 5, including the step of subjecting the mixture to venting between said cooking region and said forming region.

8. The method of claim 1, wherein said mixture is subjected to a pressure of from about 200-1500 psig in said extruder.

9. The method of claim 1, wherein said mixture has a residence time of from about 30 seconds to about 2 minutes in said extruder.

10. The method of claim 1, including the step of cooling said extrudate prior to frying thereof.

11. The method of claim 1, said frying step comprising placing said extrudate in cooking oil having a temperature of from about 350°-400° F. for a period of from about 5-45 seconds.

12. The method of claim 1, said low protein flour being the sole flour constituent of said mixture.

13. The method of claim 1, said mixture including respective quantities of a pasta-type flour and said low protein flour.

14. The method of claim 13, said low protein flour being present at a level of from about 1-50% by weight.

15. The method of claim 14, said low protein flour being present at a level of from about 1-5% by weight.

16. The method of claim 1, said low protein flour comprising cake flour.

17. A fried snack product made in accordance with the method of claim 1.

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TABLE 2

		RUN #1
PRECONDITIONING INFORMATION:		
Feed Screw Speed	RPM	15
Mixing Cylinder Speed	RPM	110
Steam Flow to Preconditioner	PPM	0.38
Water Flow to Preconditioner	PPM	0.459
Mixing Cylinder Temperature	°F.	208
Moisture Entering Extruder	MCWB	29.79
EXTRUSION INFORMATION:		
Extruder Shaft Speed	RPM	160
Motor Load	%	32
Steam Flow to Extruder	PPM	0.513
Water Flow to Extruder	PPM	0.159
Control/Temperature-2nd Head	°F.	CW/118
Control/Temperature-3rd Head	°F.	CW/118
Control/Temperature-4th Head	°F.	HO/230
Control/Temperature-5th Head	°F.	HO/230
Control/Temperature-6th Head	°F.	HO/230
Control/Temperature-7th Head	°F.	CW/194
Control/Temperature-8th Head	°F.	CW/194
Control/Temperature-9th Head	°F.	CW/196
Head/Pressure	PSIG	9/1100
Head/Pressure	PSIG	DIE/600

The extrudate emerging from the extruder had a moisture content of 30.41% by weight, and was thereupon dried to a moisture content of 7.47% by weight. The drying sequence involved use of 160° F. air, with retention times in the first pass, second pass and cooler being 5.9, 21.0 and 10.5 minutes respectively.

The dried extrudate was then fried and exhibited a substantial degree of expansion. A control was also produced wherein the starting material was conventional pasta flour (Durum). This control when fried was compared with the cake flour extrudate. It was found that the straight cake flour extrudate of this example gave approximately twice the degree of expansion, as compared with the control. The cake flour extrudate furthermore exhibited a pleasing appearance and good organoleptic properties.

We claim:

1. In a method for fabricating a fried snack product including the steps of forming and preconditioning a mixture of flour and water for a period of about 20 seconds to 6 minutes and subjecting the mixture to elevated temperature to a maximum of from about 150°-230° F., and passing the preconditioned mixture into and through an extruder and forming at least a partially cooked extrudate, said extrusion step comprising the steps of introducing said preconditioning mixture into the barrel of an extruder equipped with a flighted, rotatable screw and an extrusion die, rotating the screw to sequentially advance the preconditioned mixture along the length of the barrel first through a cooking zone, then through a venting zone and a forming zone, and finally through said extrusion die, said

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mixture having a maximum temperature of up to about 240° F. in said cooking zone, and thereafter frying the partially cooked extrudate, the improvement which comprises incorporating into said mixture a quantity of a low protein wheat flour having a protein content of from about 1-9% by weight.

2. The method of claim 1, said mixture comprising from about 20-50% by weight water.

3. The method of claim 2, said mixture comprising from about 25-45% by weight water.

4. The method of claim 1, including the step of injecting steam into said preconditioner during formation of said mixture.

5. The method of claim 1, wherein said mixture is subjected to two stages of treatment in said extruder, first in a cooking region wherein the highest temperature is below about 240° F., and second in a forming region wherein the temperature is less than the maximum temperature of the mixture in said cooking region.

6. The method of claim 5, including the steps of retaining said mixture in said cooking region for a period of from about 10-25 seconds, and retaining said mixture in said forming region for period of from about 20-80 seconds.

7. The method of claim 5, including the step of subjecting the mixture to venting between said cooking region and said forming region.

8. The method of claim 1, wherein said mixture is subjected to a pressure of from about 200-1500 psig in said extruder.

9. The method of claim 1, wherein said mixture has a residence time of from about 30 seconds to about 2 minutes in said extruder.

10. The method of claim 1, including the step of cooling said extrudate prior to frying thereof.

11. The method of claim 1, said frying step comprising placing said extrudate in cooking oil having a temperature of from about 350°-400° F. for a period of from about 5-45 seconds.

12. The method of claim 1, said low protein flour being the sole flour constituent of said mixture.

13. The method of claim 1, said mixture including respective quantities of a pasta-type flour and said low protein flour.

14. The method of claim 13, said low protein flour being present at a level of from about 1-50% by weight.

15. The method of claim 14, said low protein flour being present at a level of from about 1-5% by weight.

16. The method of claim 1, said low protein flour comprising cake flour.

17. A fried snack product made in accordance with the method of claim 1.

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1. The first step in the process of the investigation is the identification of the problem. This is done by the investigator who is assigned to the case. The investigator will then conduct a thorough search of the records of the organization to determine if there is any information that might be helpful in the investigation.

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United States Patent [19]
Hurd et al.

[11] **Patent Number:** **5,932,264**
[45] **Date of Patent:** **Aug. 3, 1999**

[54] **METHOD FOR PREPARING COOKED CEREAL DOUGH USING TWIN SCREW PRECONDITIONING EXTRUDER**

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[21] **Appl. No.:** 08/946,262

[22] **Filed:** Oct. 7, 1997

[51] **Int. Cl.⁶** A21D 8/00; A23P 1/00

[52] **U.S. Cl.** 426/511; 426/496; 426/516; 426/523

[58] **Field of Search** 426/496, 516, 426/507, 511, 523

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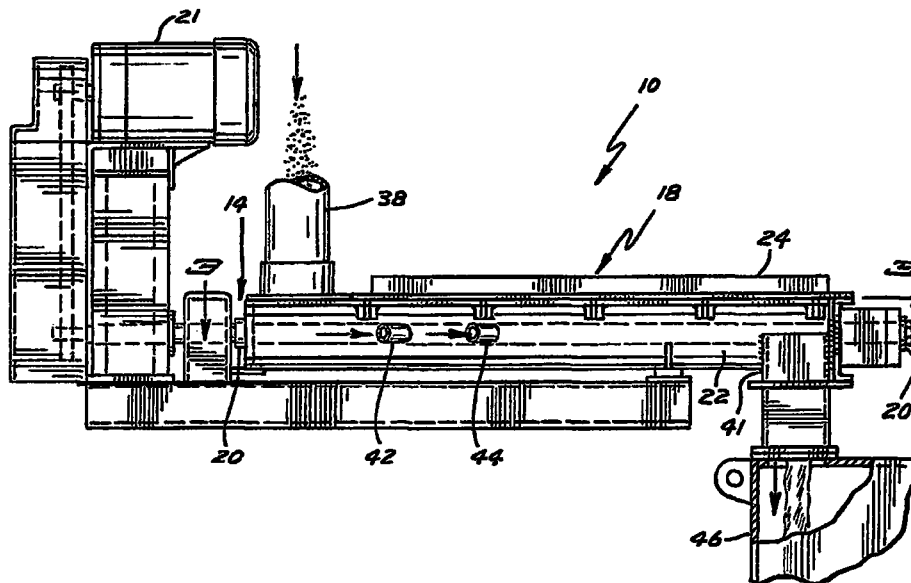
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[57] ABSTRACT

A dry raw cereal material having a starch fraction is fed into the inlet (38) of a twin screw preconditioning unit (10). The dry material is rapidly advanced and mixed in the first two zones (31, 32) and conveyed into a third zone (33). Water is introduced by ducts (42) and is admixed with the dry material to form a well mixed wetted cereal material. The screws (14, 16) include blank segments (14c, 16c) having radially extending pins (40) to create a material plug in the barrel (30) of the preconditioning unit (10). Steam is added to the wetted material in the next zone (34) to form a heated wetted cereal material which is worked in the fourth zone (34) to form a heated precooked non-continuous cereal compacted dough material which is generally maintained below its gelatinization point. The dough material exits the outlet (41) of the preconditioning unit (10) and enters a low shear extended time cereal cooker (46) which finish cooks the dough material to a fully cooked cereal dough which is formed into desirably shaped and sized pellets.

9 Claims, 2 Drawing Sheets



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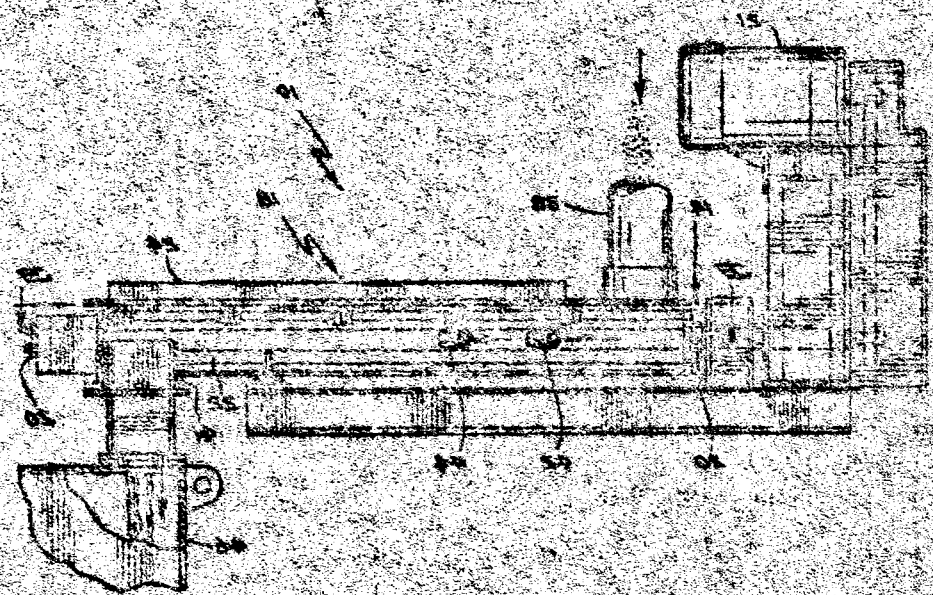
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 Filed: Oct. 3, 1967
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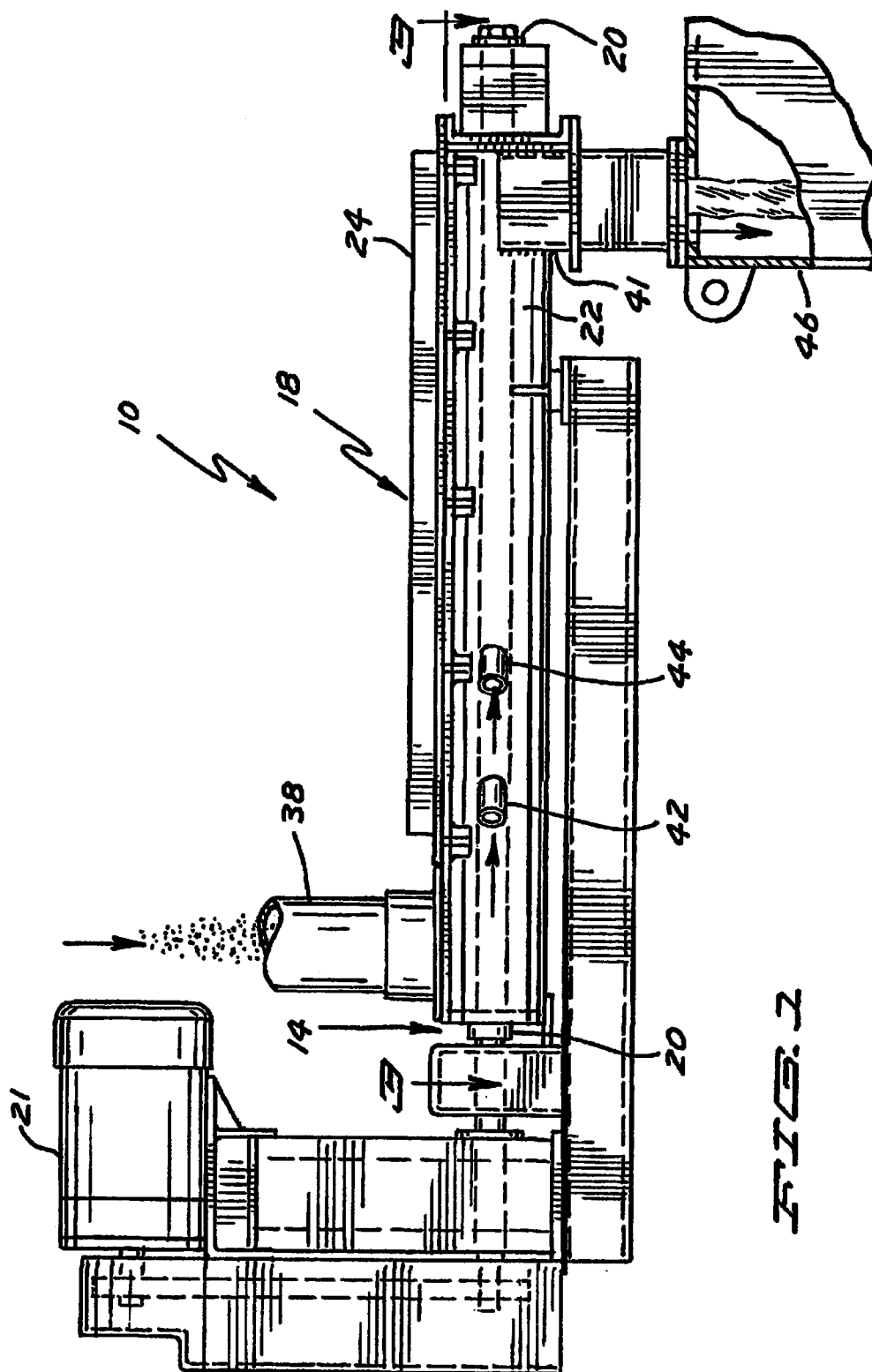
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FIG. 1 is a schematic diagram of the apparatus for measuring the thickness of a layer of material. The apparatus includes a source of radiation 10, a collimator 12, a sample 14, a detector 16, and a measuring unit 18. The radiation source 10 emits a beam of radiation 20 which passes through the collimator 12 and impinges on the sample 14. The radiation 20 is reflected back through the collimator 12 and is detected by the detector 16. The measuring unit 18 is connected to the detector 16 and is used to measure the intensity of the reflected radiation 20. The intensity of the reflected radiation 20 is a function of the thickness of the layer of material 14. The measuring unit 18 is used to determine the thickness of the layer of material 14 by measuring the intensity of the reflected radiation 20.

FIG. 1 is a schematic diagram of the apparatus for measuring the thickness of a layer of material.





U.S. Patent

Aug. 3, 1938

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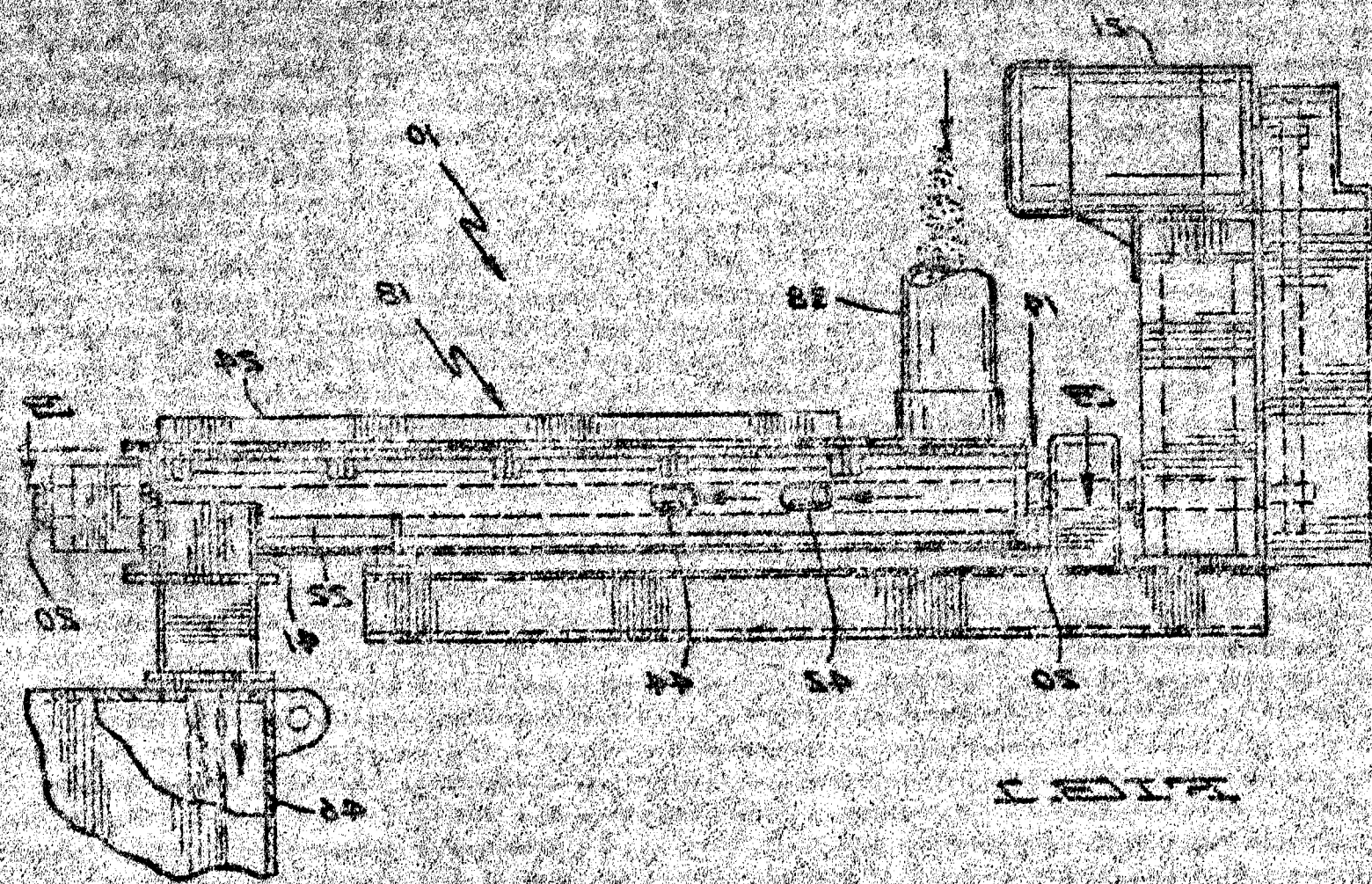
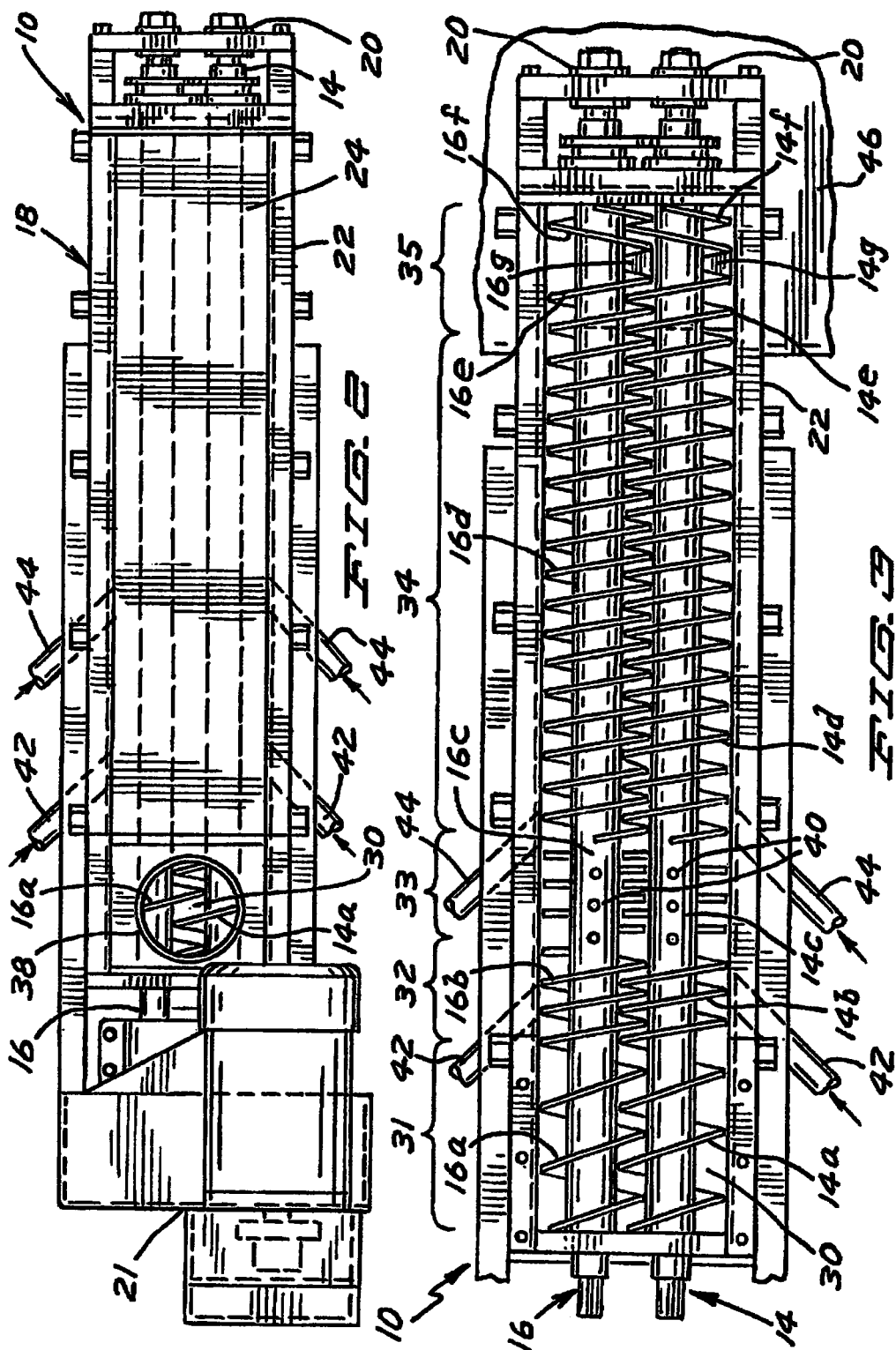


FIG. 1

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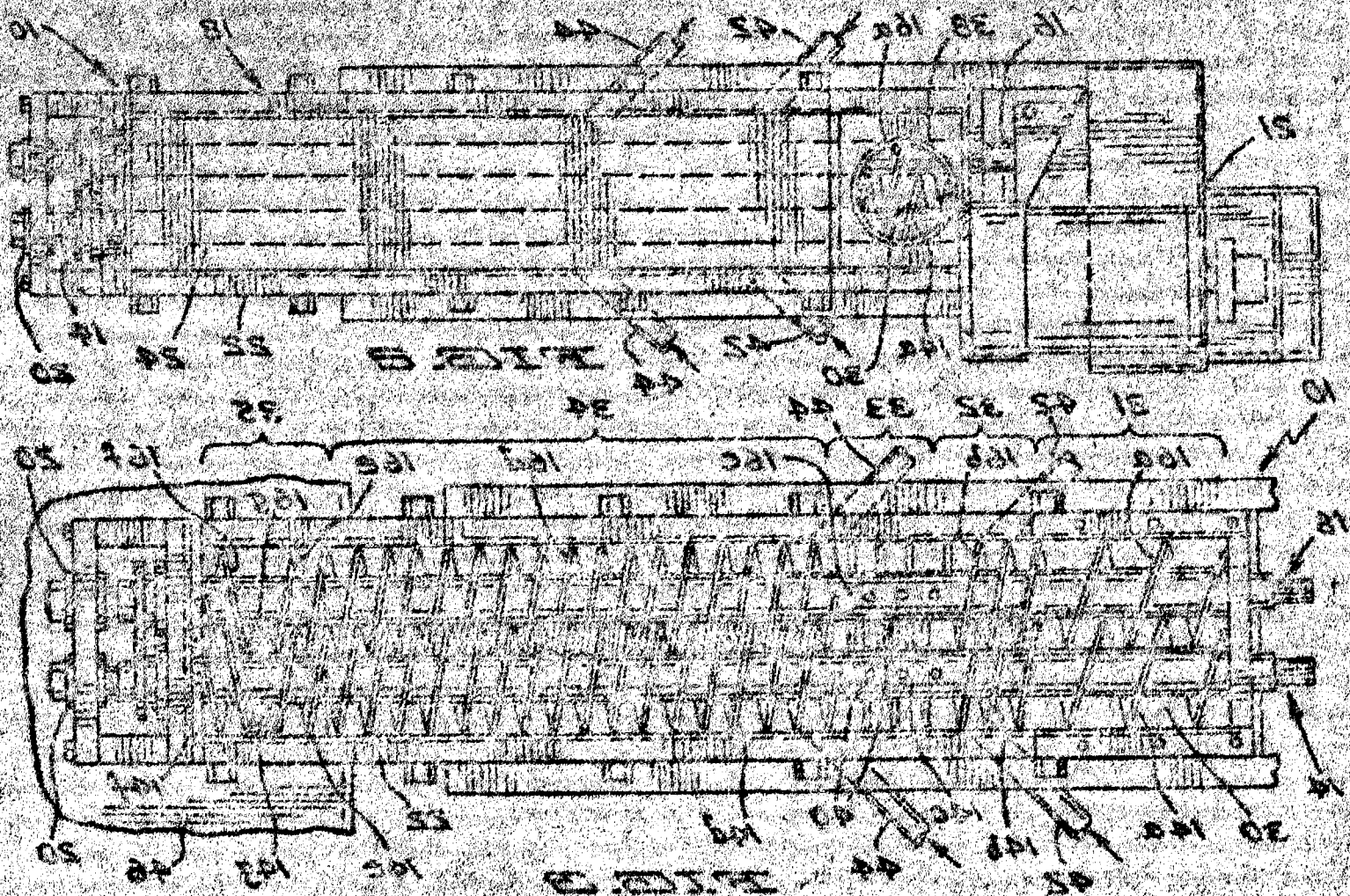


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METHOD FOR PREPARING COOKED CEREAL DOUGH USING TWIN SCREW PRECONDITIONING EXTRUDER

FIELD OF THE INVENTION

The present invention relates to improved food processing apparatus for preparing cooked cereal doughs such as for Ready-To-Eat cereals and to improved methods for preparing cooked cereal doughs.

BACKGROUND

A wide variety of apparatus and methods are known in the art for the provision of cooked cereal doughs, especially for ready-to-eat (RTE) cereal products. Such apparatus and methods convert a raw dry ungelatinized cereal material and water into a cooked cereal dough characterized by hydration and gelatinization of the starchy constituents of the cereal material. Important aspects of cereal cooking include not only the degree of gelatinization but also the texture of the cooked cereal dough.

A well known cereal cooking apparatus is known in the art as a James Cooker. The James Cooker provides a low shear, low pressure, extended time (e.g., 30 to 180 minutes) type of cooking yielding a cooked cereal dough that has a highly developed cooked flavor but has not experienced high amounts of shear. The dough is extruded under low shear through die plates with die holes to produce sized and shaped cooked cereal dough pellets. The basic design and operation of the James Cooker is described in U.S. Pat. Nos. 2,233,919 (issued Mar. 4, 1941 to T. R. James), 2,263,301 (issued Nov. 18, 1941 to T. R. James), and 2,272,007 (issued Feb. 3, 1942 to T. R. James), each of which is incorporated herein by reference. Over the years, various improvements have been made to the James Cooker (see, for example, U.S. Pat. No. 5,433,490, issued Jul. 18, 1995 to R. Hurd and S. Liedman which describes a quick change die mechanism especially useful for the James Cooker for the rapid change outs of plugged dies, also incorporated by reference herein).

The present invention provides further improvements in the James Cooker, namely; reductions in downtime, improvements in throughputs, and improvements in cook consistency and degree of control. The present invention involves mounting a twin screw preconditioning unit onto the inlet of the James Cooker for mixing, hydrating, heating and converting a cereal feed material into precooked crumbly dough material prior to feeding into the James Cooker.

James Cookers are typically run 24 hours a day in product runs from seven up to 21 or more days. During such extended production runs, however, the cookers frequently require being brought temporarily off-line due to plugging of the dies. Fouling or even plugging of the dies is most frequently caused by dry, hard dough balls in which the cereal material is incompletely cooked due to incomplete hydration of the cereal material. Changing out the die can require several hours before a clean die is in place and the cooker is brought up to steady state conditions. Such die change outs are required at unpredictable intervals and may happen several times a day. Also, a great quantity of food material that is inconsistently processed before the cookers reach steady state conditions must be discarded. In the '490 patent, this problem was addressed by an improvement in the outlet end of the James Cooker, namely, by providing a faster means for changing out the plugged dies.

However, the present invention provides an improvement in the inlet end of the James Cooker. Specifically, the present invention resides in part in adding a particular twin screw

preconditioning unit. By adding the present twin screw preconditioning unit, improvements are obtained in the consistency of hydration of the cereal feed material. Such hydration consistency improvements lead to reductions in the incidence of die plugging from dry dough balls. Reductions in downtime alone and attendant material waste represent significant cost savings, especially over extended production runs. The present invention can be used alone or in combination with the quick die changer improvements described in the '490 patent.

Such further reductions in downtime due to fewer plugged dies provided by the twin screw preconditioning unit alone can result in productivity improvements of 10 to 20%.

In addition to reducing downtime, employment of a twin screw preconditioning unit increases significantly the throughput of such James Cookers. Conceptually, the James Cooker has three zones in its cooking section that 1) mixes the ingredients, 2) hydrates the mixture, and 3) cooks the hydrated mixture. In addition to its cooking section, the James Cooker also includes a working section that works the cooked cereal material into a dough and extrudes the dough through the die plate to form cooked cereal dough pellets. The twin screw preconditioning unit performs the functions previously performed in the first two zones of cooking section of the James Cooker allowing for a more rapid and thus higher throughput of cereal material. The improvements in throughput can range from 10 to 25%.

By both reducing downtime and by increasing throughput, the total increase in output can be from about 20 to 45% or even more. In view of the expense of such James Cookers, such increases in output lead to dramatic cost savings and increased productivity.

Of course, rotating paddle types of cereal preconditioners are known for use immediately upstream of high shear extruders (see for example, U.S. Pat. No. 5,120,559, issued Jun. 9, 1992 to S. H. Rizvi, U.S. Pat. No. 4,285,271, issued Aug. 25, 1981 to Falck et al; and/or U.S. Pat. No. 4,665,810, issued May 19, 1987 to Falck). However, such preconditioners generally involve the mere passive exposure to wet moist steam to accomplish hydration. Also, the output material from such preconditioners must necessarily be free flowing, granular and fluffy in order to feed the material to single or twin screw extruders, in contrast to the more dense compacted precooked cereal dough material that exits the twin screw preconditioning unit of the present invention.

Still another advantage of the present invention resides in the ability to control the consistency of the cooked dough with respect to both texture and flavor. Moreover, conventional cereal preconditioners, and even prior usage of the James Cooker, typically require close control of the particle size of the cereal material. Since such preconditioners and the James Cooker passively expose the material to wet steam, close attention to the surface area-to-volume ratio must be made to ensure proper hydration. In contrast, using the present twin screw preconditioning unit allows for employment of a wide variety of particle size feed materials without materially adversely affecting the ability to control the desired cooked dough's properties.

Similarly, the consistency of hydration of the cereal mixture by using the twin screw preconditioning unit also results in a more consistent cook in the James Cooker in addition to the reduction in the incidence of die plugging. A more consistent cook results in a gain in product quality and may result in enhanced flavor development in the dough which was not previously possible with the James Cooker alone. The degree of hydration obtained independent of

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particle size, the more consistent cook, and the other attributes resulting in the utilization of the twin screw preconditioning unit with the James Cooker reduce the variability of the operating parameters and lend to automatic control to further simplify operator interface in the preparation of cooked cereal doughs.

Improved methods for preparing cooked cereal doughs having special application in the production of RTE cereals according to the preferred teachings of the present invention will become clearer in light of the following detailed description of an illustrative embodiment of this invention described in connection with the drawings.

DESCRIPTION OF THE DRAWINGS

The illustrative embodiment may best be described by reference to the accompanying drawings where:

FIG. 1 shows a side elevational view of a twin screw preconditioning unit utilized in the preparation of cooked cereal doughs according to the preferred teachings of the present invention.

FIG. 2 shows a top plan view of the twin screw preconditioning unit of FIG. 1.

FIG. 3 shows a cross sectional view of the twin screw preconditioning unit of FIG. 1 according to section line 3—3 of FIG. 1.

All figures are drawn for ease of explanation of the basic teachings of the present invention only; the extensions of the figures with respect to number, position, relationship, and dimensions of the parts to form the preferred embodiment will be explained or will be within the skill of the art after the following description has been read and understood. Further, the exact dimensions and dimensional proportions to conform to specific force, weight, strength, and similar requirements will likewise be within the skill of the art after the following description has been read and understood.

Where used in the various figures of the drawings, the same numerals designate the same or similar parts. Furthermore, when the terms "first", "second", "length", "end", "axial", "radial", "longitudinal", "upstream", "downstream", and similar terms are used herein, it should be understood that these terms have reference only to the structure shown in the drawings as it would appear to a person viewing the drawings and are utilized only to facilitate describing the illustrative embodiment.

DESCRIPTION

A twin screw preconditioning unit according to the preferred teachings of the present invention is shown in the drawings and generally designated 10. Generally, unit 10 is in the form of an extruder and includes substantially intermeshing screws 14 and 16 rotatably mounted inside of a housing assembly 18. In the most preferred form, housing assembly 18 is not jacketed. Screws 14 and 16 can include suitable seals and bearings 20 for rotatably mounting and sealing the shaft ends of screws 14 and 16 to housing assembly 18 to generally prevent feed materials and pre-cooked dough from leaking along the shafts of screws 14 and 16. A suitable drive 21 can be provided such as at the upstream ends of the shafts of screws 14 and 16 for co-rotating screws 14 and 16 inside of housing assembly 18 and in the most preferred form is of the variable speed type.

Assembly 18 includes a barrel or channel 30 of a FIG. 8-shape of a size and configuration corresponding to intermeshing screws 14 and 16 and specifically providing minimal screw-to-barrel clearance when screws 14 and 16 are

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located in channel 30. Assembly 18 can be formed in any desired manner including utilizing conventional barrel sections. In the most preferred form, assembly 18 is formed by a first housing 22 of a generally U-shape and by a cover 24 of a generally planar shape which is removably secured to the upper edges of first housing 22.

For purposes of explanation, unit 10 and specifically screws 14 and 16 inside of channel 30 can be considered as including five functional zones 31-35, with the material moving downstream from zone 31 to zone 32, zone 32 to zone 33, etc.

First zone 31 of unit 10 is for feeding the dry raw feed material into barrel 30 and generally includes an inlet 38 formed in housing assembly 18. In the most preferred form, inlet 38 is formed in cover 24 and is cylindrical in shape having circular cross sections. Inlet 38 has a diameter generally equal to the maximum lateral extent between the shafts of screws 14 and 16 and is positioned with its lateral extent generally corresponding to the maximum lateral extent between the shafts of screws 14 and 16. Screws 14 and 16 include flights 14a and 16a within zone 31 for rapidly advancing dry material entering channel 30 of housing assembly 18 from inlet 38 into zone 32 and for very course mixing of the dry material. In the preferred form, the longitudinal extent of inlet 38 is within the longitudinal extent of flights 14a and 16a and in the most preferred form is less than the longitudinal extent of flights 14a and 16a with inlet 38 positioned at the upstream end of flights 14a and 16a.

Second zone 32 of unit 10 is for initial mixing and conveying the dry raw feed material from zone 31 to zone 33. Screws 14 and 16 include flights 14b and 16b within zone 32, with flights 14b and 16b having a radial extent equal to flights 14a and 16a but being of a greater pitch than flights 14a and 16a. Zone 32 in the preferred form has a longitudinal length slightly less than zone 31 and in the preferred form is generally two thirds the longitudinal length of zone 31.

Third zone 33 of unit 10 is for creating a material plug in barrel 30 and for further mixing the material. Screws 14 and 16 within zone 33 each include a blank segment 14c and 16c which is free of conveying flights. In the most preferred form, blank segments 14c and 16c each include a plurality of pins 40 extending radially from the shafts of screws 14 and 16 to a radial extent generally equal to that of flights 14a, b and 16a, b. In the most preferred form, three pins 40 are longitudinally spaced along the shafts every 90° around the shafts of screws 14 and 16. Additionally, in the most preferred form, pins 40 of screw 14 are positioned longitudinally intermediate pins 40 of screw 16, with the first pins 40 of screw 14 being positioned longitudinally upstream of the first pins 40 of screw 16, the second and third pins 40 of screw 14 being positioned intermediate the first and second and the second and third pins 40 of screw 16, and with the third pins 40 of screw 16 being positioned longitudinally downstream of the third pins 40 of screw 14. Zone 33 in the preferred form has a longitudinal length generally equal to but slightly less than the longitudinal length of zone 32.

Fourth zone 34 of unit 10 is for providing residence time for conditioning and precooking the material into a pre-cooked dough material and for conveying the material from zone 33 to zone 35. Screws 14 and 16 include flights 14d and 16d within zone 34, with flights 14d and 16d in the most preferred form being of the same radial extent and pitch as flights 14b and 16b. In the most preferred form, zone 34 has a substantial longitudinal length which is slightly greater than one half of the total longitudinal length of barrel 30 of unit 10.

Fifth zone 35 of unit 10 is for allowing the exit of the conditioned precooked dough material from barrel 30 and generally includes an outlet 41 formed in housing assembly 18. In the most preferred form, outlet 41 is rectangular in shape having a lateral width generally equal to the lateral extent of barrel 30 and having a longitudinal width generally equal to the longitudinal extent of zone 35.

Screws 14 and 16 include flights 14e and 16e within zone 35, with flights 14e and 16e in the most preferred form being of the same radial extent and pitch and being continuous with flights 14d and 16d. Flights 14e and 16e have a longitudinal extent generally equal to but slightly less than one half that of zone 35 and outlet 41.

Screws 14 and 16 further include flights 14f and 16f within zone 35 and which are in a reverse direction of flights 14e and 16e and extend from the downstream end of barrel 30 towards the upstream end. In the most preferred form, flights 14f and 16f have the same radial extent and pitch as flights 14e and 16e (but reversed) and have a longitudinal extent generally equal to but slightly less one half that of zone 35 and outlet 41. The function of flights 14f and 16f is to generally prevent the precooked dough material from advancing to the downstream end of housing assembly 18. Material reaching the downstream end of housing assembly 18 may have a tendency to cause excessive wear in and/or to enter seals and bearings 20 for the downstream ends of screws 14 and 16.

Flights 14e and 14f and flights 16e and 16f are interconnected together by axially extending plates 14g and 16g which extend radially outward from the shafts of screws 14 and 16 to a radial extent equal to flights 14a, b, d, e, f and 16a, b, d, e, f. In the most preferred form, plates 14g and 16g are arranged at the same angular position on screws 14 and 16 in barrel 30. It can be appreciated that the pressure of the precooked dough material entering zone 35 drops as it leaves flights 14e and 16e and prior to its exiting through outlet 41. In the preferred form, the longitudinal length of zone 35 is generally equal to the longitudinal length of zone 32.

Unit 10 further includes provisions for introducing moisture and solutions into barrel 30 and the material being conveyed by screws 14 and 16. In the most preferred form, housing assembly 18 of unit 10 includes a pair of ducts 42 formed adjacent to the downstream end of zone 32 and another pair of ducts 44 formed adjacent to the upstream end of zone 34. In the most preferred form, ducts 42 and 44 extend at a decreasing acute angle in the order of 45° relative to the axes of screws 14 and 16 in the flow or movement direction of the material and in a plane generally parallel to a plane including the axes of both screws 14 and 16.

Outlet 41 of twin screw preconditioning unit 10 is directly connected to the inlet of a conventional James Cooker 46 according to the preferred teachings of the present invention. In particular, James Cooker 46 can be of the form shown and described in U.S. Pat. Nos. 2,233,919; 2,263,301; 2,272,007; and 5,433,490. However, it is believed that unit 10 can be utilized and can have special application for other low shear, low pressure, (0 to 100 psig) extended time type of cooking apparatus. In the most preferred form, unit 10 is mounted directly to the frame of James Cooker 46 and can extend over, in front of, or to either side of James Cooker 46.

Now that the basic construction of unit 10 according to the preferred teachings of the present invention has been set forth, improved methods for preparing cooked cereal doughs such as for RTE cereal products can be explained in the most preferred form utilizing unit 10 of the present invention. In

particular, drive 21 can be actuated to rotate screws 14 and 16 inside of housing assembly 18. Dry raw feed material is introduced into inlet 38 in any suitable manner, with the feed material in the preferred form being at ambient temperatures in the order of 50 to 120° F. (10 to 50° C.) depending upon season, plant location, storage conditions, etc.

Useful herein for the cereal feed materials are a wide variety of cereal materials derived from such common cereal as wheat, barley, oats, corn, triticale or other cereal grains and mixtures thereof. The cereal feed materials, of course, can also optionally include conventional cereal ingredients such as salt, minerals, malt syrup, sugar(s), fiber (e.g., bran, cellulose, pectin, psyllium), vitamins, flavor and colorants.

In a preferred embodiment, the cereal feed materials comprise a whole grain ingredient, e.g., soft wheat or whole oats. In other embodiments, various cereal feed materials such as cereal flours (whether whole grain or a cereal flour fraction) or cut cereal pieces can be used.

The particle size of the cereal feed materials is not critical, and it is an advantage of the present invention that the particle size can vary without materially adversely affecting the cooked cereal dough products obtained. Useful herein are flours, grits, flakes and other sizes and shapes of grain or cereal materials.

The dry feed material introduced into inlet 38 falls into and engages flights 14a and 16a which quickly convey the dry feed material from zone 31 to zone 32. The dry feed material is very coarsely mixed while being conveyed by flights 14a and 16a.

Due to the greater pitch of flights 14b and 16b, the dry feed material is mixed while being conveyed by flights 14b and 16b and obtains further fill in the FIG. 8-shape of barrel 30. While in zone 32, the dry feed material is admixed with sufficient amounts of water introduced into barrel 30 through ducts 42 in the preferred form at a temperature in the order of 90 to 120° F. (30 to 50° C.). While in zone 32, the dry feed material and water are mixed to form a well mixed wetted cereal feed material having a moisture content of about 25 to 40%.

Optionally, the present methods can additionally include the step of adding a sugar solution to the wet mixture to provide a sweetened mixture having a sucrose content of between about 1 to 5%. Such sugar solution could be added with the water through ducts 42 or could be added separately such as through further ducts. A portion of the total moisture content is thus provided by the sugar solution.

It should be noted that the provisions of flights 14a, b and 16a, b of differing pitches is advantageous in keeping zone 31 dry and in particular from keeping water and other solutions introduced into zone 32 such as through ducts 42 from entering zone 31 and particularly from reaching inlet 38. If moisture reaches inlet 38, bridging of inlet 38 by the feed material can occur which requires operator attention and reduces operation efficiency. Specifically, according to the preferred teachings of the present invention, ducts 42 introduce the water and solutions adjacent to the downstream end of zone 32 so that the feed material substantially fills barrel 30 to prevent an unobstructed passage to inlet 38. Additionally, as flights 14a and 16a rapidly advance the feed material into zone 32, the feed material is available to absorb and intermix with the water and solutions which are then not free to continue to travel upstream towards inlet 38.

Flights 14b and 16b deliver the well mixed wetted feed material to blank segments 14c and 16c. As blank segments 14c and 16c are free of flights, rotation of screws 14 and 16 does not result in movement of the wetted feed material in

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This same 25th of May 1941, the day after the attack on Pearl Harbor, the U.S. Navy announced that it had received information from a confidential source that the Japanese Navy was planning to attack the U.S. West Coast. The Navy was not sure of the accuracy of the information, but it was a possibility that the Japanese Navy was planning to attack the U.S. West Coast. The Navy was not sure of the accuracy of the information, but it was a possibility that the Japanese Navy was planning to attack the U.S. West Coast.

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zone 33. Rather movement of the wetted feed material is caused by the subsequent introduction of wetted feed material into blank segments 14c and 16c. Thus, the wetted feed material tends to fill barrel 30 in zone 33 and forms a plug which moves downstream.

Rotation of screws 14 and 16 causes pins 40 to rotate in the moving plug in zone 33. Pins 40 passing through the wetted feed material further mixes the wetted feed material in zone 33 and specifically within the longitudinal extent of blank segments 14c and 16c. As the wetted feed material is pushed through zone 33 by the subsequent introduction of additional feed material, it enters zone 34 and is engaged by flights 14d and 16d. Thus, the rotation of screws 14 and 16 causes flights 14d and 16d to convey the heated well mixed wetted feed material downstream.

Thereafter, steam is added to the well mixed wetted cereal material by its introduction into barrel 30 through ducts 44 in the preferred form. Steam is added in sufficient amounts to form a heated wetter feed material having a temperature of about 180 to 220° F. (82 to 104° C.), preferably about 190 to 215° F. (88 to 102° C.) and most preferably about 210 to 215° F. (99 to 102° C.). The steam can be any type of steam and conveniently is wet, intermediate pressure (30 to 60 psig, 310 to 515 kPa.) steam. The steam, upon condensation, provides about one part in 10 of the required moisture.

The steam provides substantially all of the heat for cooking of the well mixed wetted cereal material into the precooked dough material, with radiant and conductive heat also arising by virtue of the close proximity to James Cooker 46 and by virtue of mechanical energy.

It should then be appreciated that the material plug formed in blank segments 14c and 16c functions as a plug for preventing steam introduced through ducts 44 from passing upstream and specifically through zone 33 and into zones 31 and 32. It can be appreciated that loss of steam through inlet 38 is undesirable for several reasons including but not limited to increased operational costs, difficulties in introducing the raw feed material into inlet 38, and increased safety hazards and concerns for surrounding personnel and equipment.

Due to the increased temperature provided by the steam, it can be appreciated that the heated wetted feed material will be worked, cooked or otherwise conditioned while it moves through zone 34 due to the rotation of flights 14d and 16d. Specifically, the heated wetted feed material will turn into a precooked dough material generally prior to its entry into zone 35.

The precooked dough material, while heated, is importantly below its complete gelatinization point and thus does not constitute a fully cooked gelatinized cereal dough. Rather, the dough material is characterized by being hydrated, warmed and precooked.

The extent of cooking and various characteristics of a starchy material are frequently analyzed and described in the art using a Rapid Viscosity Analyzer ("RVA"). The RVA instrument subjects a sample material admixed with cold (25° C.) water, heats the sample during a prescribed time/temperature regimen and measures the viscosity of the material/water sample over time and temperature. The viscosity is expressed in Rapid Visco Units ("RVU", generally 1 RVU=11.9 centipoise.) over time to provide a pasting curve. The peak value on the curve "peak pasting value" is thus expressed in RVU units. Generally, a raw cereal flour will have a peak pasting value of about >700 RVU indicating no gelatinization. The finished cooked cereal doughs herein

are characterized by peak pasting values ranging from about 150 to 300 RVU indicating substantially complete gelatinization. The precooked dough material exiting twin screw preconditioning unit 10 is essentially characterized by peak pasting curve values ranging from about 300 to 500 RVU.

Another alternate way of expressing the desirable degree of cooking herein is the percentage of starch that is completely gelatinized. The present precooked dough material exiting twin screw preconditioning unit 10 is essentially characterized by a gelatinized starch fraction ranging from about 20 to 60% and preferably about 30 to 60%.

Upon complete gelatinization, a cooked cereal dough is transformed into a continuous material having a viscosity that is several orders of magnitude greater than the uncooked, ungelatinized dough material exiting twin screw preconditioning unit 10. When this transition occurs, the torque load on the motor driving the twin screw shafts increases dramatically. Depending upon the working capacity of the electric motor driving the shafts, the motor can undesirably cut-out completely leading to a freeze up of the system. Moreover, a fully gelatinized dough is difficult to feed into the inlet of James Cooker 46 by gravity feed from the discharge of twin screw preconditioning unit 10.

The precooked dough material leaving zone 34 enters into zone 35 where it exits unit 10 through outlet 41. It should be appreciated that due to the provision of plates 14g and 16g and reversed flights 14f and 16f, the pressure of the precooked dough material exiting outlet 41 is reduced from the pressure of the precooked dough material just before leaving zone 34.

The precooked dough material exiting twin screw preconditioning unit 10 has a temperature of about 180 to 220° F. (82 to 104° C.), preferably about 190 to 215° F. (88 to 102° C.) and most preferably about 210 to 215° F. (99 to 102° C.). The precooked dough material has a moisture content of about 27 to 40%, preferably about 30 to 38%.

The precooked dough material is compacted and crumbly and has a density that ranges from about 70 to 80 lb./ft.³ (1.12 to 1.28 g/cc), and preferably about 1.13 to 1.17 g/cc.

In contrast, precooked cereal material exiting a conventional paddle type preconditioner is lighter in density (60 to 65 lb./ft.³), different in texture (i.e., is pulverant and free flowing) and is lower in the percentage of gelatinization (i.e., <15%). These differences inherently result from the differences in design and operation of a paddle type preconditioner. In a paddle type preconditioner, the rotating paddles toss the cereal material upwards thereby exposing the suspended material to the wet steam environment. If the paddle shaft is turned too slowly, the material is not thrown upwards. If the material is gelatinized too much, then the cereal material becomes sticky and begins to stick to the paddles and is not thrown upwards to further hydrate and further gelatinize. As a result, the upper limit on the percentage of gelatinization is less than that obtained in twin screw preconditioning unit 10 of the present invention.

The residence time within twin screw preconditioning unit 10 according to the preferred teachings of the present invention is very brief, ranging on the order of about 10 to 30 seconds, and preferably about 10 to 20 seconds. Such a short processing time is in part due to the rapid absorption of steam by the cereal material by virtue of the steam being added after the material is thoroughly wetted. Specifically, the injection of steam into ducts 44 of unit 10 according to the teachings of the present invention provides key attributes which dramatically improve the cooking process. Particularly, exceptional and quick ingredient hydration

occurs within the residence time in unit 10 as compared to the thirty or more minutes which were required in James Cooker 46 alone. Also, exceptional and quick preheating of the dough material to saturation temperatures occurs within the residence time in unit 10 as compared to the thirty or more minutes which were required in James Cooker 46 alone.

The operating pressure within twin screw preconditioning unit 10 of the preferred form of the present invention is much lower than on a conventional cooking twin screw extruder and ranges from about 1 to 5 psig (108 to 136 kPa), and preferably about 1 to 2 psig (115 to 136 kPa).

The present precooked cereal dough material exiting twin screw preconditioning unit 10 has a pourable, or crumbly or discontinuous consistency. The precooked cereal dough material forms a compacted dough as compared to a continuous dough exiting the James Cooker. Also, the crumbly precooked dough material is distinguishable from the free flowing pulverant material that is prepared from a conventional preconditioner.

Thereafter, the precooked (or equivalently herein, "part-cooked" or "partially cooked") cereal dough material exiting twin screw preconditioning unit 10 is fed directly, such as by gravity falling, into the inlet of James Cooker 46. The precooked cereal dough material is then finished cooked for about 30 to 90 minutes, preferably on the order of about 50 to 70 minutes, at about 220 to 240° F. without shear to form a fully cooked cereal dough.

This represents a greatly improved performance capability of James Cooker 46 over James Cooker 46 utilized alone which had a total residence time preferably on the order of 70 to 90 minutes. This improved performance is due to the complete material premixing with steam and the precooking obtained by twin screw preconditioning unit 10 according to the teachings of the present invention. In particular, the zones of the cooking section of James Cooker 46 previously utilized to mix and hydrate the feed material are freed to be used for cooking as the precooked dough material leaving outlet 41 of unit 10 of the present invention is thoroughly mixed and hydrated. Thus, use of unit 10 of the present invention effectively increases the cooking length of James Cooker 46 by the length previously required to mix and hydrate the material, which could be one third of the length of James Cooker 46. Increased cooking length of James Cooker 46 provides increased flexibility for both product enhancement and equipment operation.

Operation of twin screw preconditioning unit 10 according to the preferred teachings of the present invention has resulted in the recognition of several advantages in the methods for preparing cooked cereal doughs and in the preferred form of unit 10 of the present invention. Specifically, it has been found that the arrangement of ducts 42 and 44 according to the preferred teachings of the present invention is particularly advantageous. First, the decreasing angle of ducts 42 and 44 reduces the tendency of material moving in barrel 30 by the rotation of screws 14 and 16 from backing into and plugging or otherwise blocking ducts 42 and 44. Additionally, the preferred positioning of ducts 42 is sufficiently downstream of inlet 38 and zone 31 so that the material upstream of duct 42 and within zone 32 generally prevents passage of moisture to zone 31 of unit 10. Likewise, the preferred positioning of ducts 44 in the upstream end of zone 34 insures that the wetted feed material in blank segments 14c and 16c creates a material plug for preventing steam introduced through ducts 44 from passing there beyond while presenting sufficient residence

time in zone 34 to arrive at precooked dough material of the desired characteristics.

Still another advantage of the present invention is that increases in output are obtained without increasing the footprint of the equipment in an existing facility.

Still another advantage resides in the safety of the combination of twin screw preconditioning unit 10 with James Cooker 46. Previously, when particulate feed material is fed to James Cooker 46, the steam and humidity can cause the particulate material to block or to form a bridge across the inlet of James Cooker 46. Such blocking or bridging required the operator to attempt to break the bridge using a stick. Once broken, the pressure within James Cooker 46 can cause a sputtering of the steam and hot materials. Frequently, such sputtering would cause burning or other operator injury. By directly feeding the output from twin screw preconditioning unit 10 to James Cooker 46, such bridging is substantially eliminated, thereby greatly reducing the incidence and severity of operator injury.

Still another advantage is that by directly connecting the output of twin screw preconditioning unit 10 to the inlet of James Cooker 46, atmospheric contamination of the cooked material is eliminated.

Still another advantage is that by directly connecting the output of twin screw preconditioning unit 10 to the inlet of James Cooker 46, spillage loss in charging James Cooker 46 is essentially eliminated.

Still another advantage is that since a significant amount of the processing occurs in twin screw preconditioning unit 10, James Cooker 46 can be brought up to desired steady state conditions faster than James Cooker 46 alone, leading to further improvements in productivity and output. Similarly, for the same reasons, changeovers and shutdowns can be performed quickly.

Thus since the invention disclosed herein may be embodied in other specific forms without departing from the spirit or general characteristics thereof, some of which forms have been indicated, the embodiments described herein are to be considered in all respects illustrative and not restrictive. The scope of the invention is to be indicated by the appended claims, rather than by the foregoing description, and all changes which come within the meaning of the claims are equivalency of the claims and are intended to be embraced therein.

What is claimed is:

1. A method for preparing a cooked cereal dough, comprising the steps of:

feeding a dry raw cereal material having a starch fraction to a twin screw preconditioning extruder;

introducing water into the preconditioning extruder to admix water to the dry raw cereal material to form a well mixed wetted cereal material having a moisture content of about 25 to 40%; thereafter

adding sufficient amounts of steam to the wetted cereal material within the preconditioning extruder to form a heated wetted cereal material having a temperature of about 180 to 220° F. (82 to 104° C.);

working the heated cereal material for 10 to about 30 seconds while maintaining the cereal material below its gelatinization point to form a heated precooked non-continuous cereal compacted dough, said dough having:

a temperature of about 180 to 220° F. (82 to 104° C.),

a moisture content of about 27 to 40%,

a density of about 70 to 80 lb./ft³. (1.12 to 1.28 g/cc)

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United States Patent [19]

Mochizuki et al.

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[54] **METHOD OF PREPARING PELLETS FOR
SNACK CONFECTIONERY AND AN
EXPANDED SNACK CONFECTIONERY**

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[58] **Field of Search** **426/549, 560,**
426/559, 618, 621, 808, 94

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[57] **ABSTRACT**

There are provided a method of preparing pellets for a snack confectionery and an expanded snack confectionery by using the pellets. A dough for the pellets contains corn flour and potato starch. The pellets are thermally treated by using a home-type hair dryer to make those into the expanded snack confectionery.

5 Claims, No Drawings

TITLE _____
INSTRUMENT NO. _____

[illegible]

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METHOD OF PREPARING PELLETS FOR SNACK CONFECTIONERY AND AN EXPANDED SNACK CONFECTIONERY

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a method of preparing pellets for snack confectionery and an expanded snack confectionery by using the pellets. The pellets can be expanded to make those into a final product of the snack confectionery, in a home by small amount and without through any frying operation.

2. Related Art

As a method of preparing an expanded snack confectionery with easy operation in a home, there is the method of obtaining popcorn snack, which comprises a step of heating popcorns by using a frying pan or microwave oven to cause explosive expansion of the popcorns.

There is also such a method that small rice-cake cubes are deep fried in an edible oil to cause expansion thereof.

However, there is no method of preparing an expanded snack confectionery in a home by using pellets of a dough for snack confectionery and without through any frying operation.

SUMMARY OF THE INVENTION

Therefore, one of the objects of the invention is to provide a method of preparing pellets for snack confectionery, which can be expanded in a home with easy operation and without through any frying operation.

Another object of the invention is to provide a method of preparing an expanded snack confectionery by using such pellets to allow the preparation of such expanded snack confectionery by small amount in a home.

For attaining the objects, the inventors have energetically studied and investigated to find that pellets for snack confectionery can be expanded by using a home-type hair dryer, if a composition of dough for the pellets is so adjusted that a time required for the expansion shall be made somewhat longer.

According to the invention, the first object can be attained by a method of preparing pellets for snack confectionery, which comprises steps of cooking raw materials of corn flour of 70-80 parts by weight, potato starch of 30-20 parts by weight, table salt, oil or fat and sucrose; forming a resulting cooked dough into a sheet; cutting the sheet into small pieces; and drying the pieces.

The second object can be attained by heating the pellets obtained by the method described in the preceding paragraph to cause expansion thereof.

It is preferable to use the table salt, oil or fat and sucrose in amounts of 0.5, 2-3 and 6-10 parts by weight, respectively, when total amount of the corn flour and potato starch is made as 100 parts by weight.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The invention will now be further explained in more detail with reference to Test Examples and Manufacturing Examples.

TEST EXAMPLE 1

An expansion ratio of pellets for snack confectionery depends on a mixing ratio of corn flour and potato starch.

Therefore, various dough different in composing ratio of corn flour and potato starch were prepared. Each of the doughs was cooked by a double-screwed extruder type cooker. The cooked dough was passed between a pair of rolls to obtain a sheet which was cut into small pieces, dried by hot air, and treated by an expanding machine (marketed by Arakawa Tekkou Co., Ltd. of Japan) for 40 seconds at 220° C. Each of resulting expanded snack confectioneries was subjected to a sensory test.

Results are shown in following Table 1.

TABLE 1

Corn flour (parts by weight)	Potato starch (parts by weight)	Ratio of expansion	Possibility of production	Taste
65	35	9.3	Difficulty (too sticky)	Good
70	30	8.5	Possible	Good
80	20	7.0	Possible	Good
85	15	4.3	Possible	No good

In Table 1, the ratio of expansion has been shown by a product value of length, thickness and width of the expanded good to a product value of those of the pellet.

From the results shown in Table 1, it can be said that in case of the dough containing corn flour of 65 parts by weight and potato starch of 35 parts by weight, it is too sticky to cause adhesion to rolls and cutter and thus workability is bad to make the production of pellets difficult, that in case of the dough containing corn flour of 85 parts by weight and potato starch of 15 parts by weight, the pellets can be obtained without any trouble in operation, but the ratio of expansion decreases to 4.3, which means the expanded product is too hard and decreases in taste, that if the ratio of expansion is less than 7.0, tooth-feeling of "saku-saku" (one of imitation sounds) inherent to expanded snack confectioneries cannot be obtained, and that therefore, it is preferable to set the amount ratio of corn flour and potato starch to 70-80:30-20 in parts by weight.

TEST EXAMPLE 2

Although the expansion characteristic of the pellets depends on an amount of the potato starch to be composed, heat supplying capacity of a home-type hair dryer is not large, so that there is such a fear that if heat is supplied from the hair dryer to surface of pellets, the surface of pellets may solidify prior to thermal expansion thereof, whereby completely expanded products can not be obtained.

To clear this problem, it is preferable to compose sucrose in the dough. Therefore, the relation between an amount of sucrose and ratio of expansion was checked. In this case, all of doughs were prepared by 70 parts by weight of corn flour, 30 parts by weight of potato starch and sucrose, and a home-type hair dryer (100V, 1000 watts) manufactured by Toshiba Electric Co., Ltd. of Japan was selected.

Results are shown in following Table 2.

TABLE 2

Amount of sucrose (parts by weight)	Ratio of expansion
5	4.5
6	6.9
7	7.0

1. The first of the following conditions shall be that the person shall be a citizen of the United States and shall have attained the age of twenty-one years at the time of the election.

ARTICLE I

2. The second of the following conditions shall be that the person shall have resided in the State of New York for a period of one year immediately preceding the election.

ARTICLE II

SECTION 1. OF THE QUALIFICATIONS

3. The third of the following conditions shall be that the person shall have been a resident of the County of New York for a period of one year immediately preceding the election.

4. The fourth of the following conditions shall be that the person shall have been a resident of the City of New York for a period of one year immediately preceding the election.

SECTION 2. OF THE QUALIFICATIONS

5. The fifth of the following conditions shall be that the person shall have been a resident of the City of New York for a period of one year immediately preceding the election.

6. The sixth of the following conditions shall be that the person shall have been a resident of the City of New York for a period of one year immediately preceding the election.

SECTION 3. OF THE QUALIFICATIONS

7. The seventh of the following conditions shall be that the person shall have been a resident of the City of New York for a period of one year immediately preceding the election.

1	20
2	25
3	30

8. The eighth of the following conditions shall be that the person shall have been a resident of the City of New York for a period of one year immediately preceding the election.

ARTICLE III

9. The ninth of the following conditions shall be that the person shall have been a resident of the City of New York for a period of one year immediately preceding the election.

ARTICLE IV

10. The tenth of the following conditions shall be that the person shall have been a resident of the City of New York for a period of one year immediately preceding the election.

11. The eleventh of the following conditions shall be that the person shall have been a resident of the City of New York for a period of one year immediately preceding the election.

12	15	20	25	30
13	16	21	26	31
14	17	22	27	32
15	18	23	28	33
16	19	24	29	34
17	20	25	30	35
18	21	26	31	36
19	22	27	32	37
20	23	28	33	38
21	24	29	34	39
22	25	30	35	40
23	26	31	36	41
24	27	32	37	42
25	28	33	38	43
26	29	34	39	44
27	30	35	40	45
28	31	36	41	46
29	32	37	42	47
30	33	38	43	48
31	34	39	44	49
32	35	40	45	50
33	36	41	46	51
34	37	42	47	52
35	38	43	48	53
36	39	44	49	54
37	40	45	50	55
38	41	46	51	56
39	42	47	52	57
40	43	48	53	58
41	44	49	54	59
42	45	50	55	60
43	46	51	56	61
44	47	52	57	62
45	48	53	58	63
46	49	54	59	64
47	50	55	60	65
48	51	56	61	66
49	52	57	62	67
50	53	58	63	68
51	54	59	64	69
52	55	60	65	70
53	56	61	66	71
54	57	62	67	72
55	58	63	68	73
56	59	64	69	74
57	60	65	70	75
58	61	66	71	76
59	62	67	72	77
60	63	68	73	78
61	64	69	74	79
62	65	70	75	80
63	66	71	76	81
64	67	72	77	82
65	68	73	78	83
66	69	74	79	84
67	70	75	80	85
68	71	76	81	86
69	72	77	82	87
70	73	78	83	88
71	74	79	84	89
72	75	80	85	90
73	76	81	86	91
74	77	82	87	92
75	78	83	88	93
76	79	84	89	94
77	80	85	90	95
78	81	86	91	96
79	82	87	92	97
80	83	88	93	98
81	84	89	94	99
82	85	90	95	100

12. The twelfth of the following conditions shall be that the person shall have been a resident of the City of New York for a period of one year immediately preceding the election.

ARTICLE V

13. The thirteenth of the following conditions shall be that the person shall have been a resident of the City of New York for a period of one year immediately preceding the election.

TABLE 2-continued

Amount of sucrose (parts by weight)	Ratio of expansion
8	7.0
9	7.1
10	7.2
11	7.2

As apparently seen from Table 2, the ratio of expansion cannot be improved, when the sucrose is composed in an amount less than 6 parts by weight to 100 parts by weight in total amount of the corn flour and potato starch. Even if the sucrose is composed in an amount more than 10 parts by weight, there is no problem in expansion of the pellets, but sweetness of the products increases, so that such products are not suitable as so-called a "savory-type snack confectionery".

Therefore, it is preferable to compose the sucrose in an amount of 6-10 parts by weight to 100 parts by weight in total amount of the corn flour and potato starch.

Manufacturing Example 1

Raw materials of corn flour (70 parts by weight), potato starch (30 parts by weight), table salt (0.5 parts by weight), vegetable oil (2 parts by weight) and sucrose (8 parts by weight) were homogeneously mixed and then preparing water (50 parts by weight) was added thereto to sufficiently mix the same for preparing a dough. The dough was charged into a double-screwed type cooking extruder (manufactured by Kurimoto Tekkou Co., Ltd. Japan).

Resulting cooked dough was formed into a sheet by charging the same between a pair of rolls with a mesh pattern on each outer surface thereof. The sheet-shaped dough was placed on another sheet-shaped dough. The double-layered sheet was cut into pieces by a rotary cutter and circular cutter. The pieces were dried by hot air at 80° C. to obtain dried snack pellets with moisture content of 11% by weight.

10 Dried pellets were put in a stainless-steel pan to supply hot air thereto for 30 seconds by a home-type hair dryer [manufactured by Ishizaki Electric Co., Ltd. of Japan, "Prajet PJ214A" (Trademark), 100V, 1020 watts] to obtain an expanded snack confectionery (ratio of expansion: 7).

The resulting products showed nice tooth-feeling or taste of "saku-saku" (imitation sound).

Manufacturing Example 2

Raw materials of corn flour (80 parts by weight), potato starch (20 parts by weight), table salt (0.5 parts by weight), vegetable oil (3 parts by weight) and sucrose (10 parts by weight) were homogeneously mixed and then preparing water (50 parts by weight) was added thereto to sufficiently mix the same for preparing a dough. The dough was charged into a double-screwed type cooking extruder (manufactured by Kurimoto Tekkou Co., Ltd. of Japan).

Resulting cooked dough was treated as in Manufacturing Example 1 to obtain dried snack pellets.

The pellets were expanded by the hair dryer employed in Manufacturing Example 1 to obtain an expanded snack confectionery (ratio of expansion: 7.2).

The resulting products showed nice tooth-feeling or taste of "saku-saku" (imitation sound).

What is claimed is:

1. A method of preparing pellets for snack confectionery, which comprises steps of cooking raw materials of corn flour of 70-80 parts by weight, potato starch of 30-20 parts, table salt, oil or fat and sucrose to prepare a cooked dough, forming and cutting the cooked dough into pieces, and drying the pieces.

2. A method as claimed in claim 1, wherein an amount of said sucrose is 6-10 parts by weight based on 100 parts by weight in total amount of said corn flour and potato starch.

3. A method of preparing an expanded snack confectionery, which comprises steps of cooking raw materials of corn flour of 70-80 parts by weight, potato starch of 30-20 parts, table salt, oil or fat and sucrose to prepare a cooked dough, forming and cutting the cooked dough into pieces, drying the pieces, and then heating the pieces to cause expansion thereof.

4. A method as claimed in claim 3, wherein an amount of said sucrose is 6-10 parts by weight based on 100 parts by weight in total amount of said corn flour and potato starch.

5. A method as claimed in claim 3, wherein said heating step is carried out by using a hair dryer.

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