

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

División de Nuevas Creaciones

E. S. D.

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO



Nº. 05-033843-00008-0000

Fecha: 2010-08-02 16:57:09 Dep. 2020 DIR.NUEVASCR
Tra. 2 PATENTES Eve: 1 REGDEPOSITO
Act. 444 RESPUESTAREQUE Folios: 24

Ref: EXPEDIENTE Nº 05-033843

Solicitud de Patente a nombre de KRAFT FOODS

GLOBAL BRANDS, LLC

Me refiero al concepto técnico Nº 792 contenido en el Oficio 3928 notificado en la solicitud indicada en la referencia y al respecto presento la descripción y reivindicaciones corregidas, orientadas al objeto que se desea proteger y atendiendo las recomendaciones del Examinador.

Acorde con lo adjunto, modifíco el título de la invención originalmente presentado por el siguiente.

PRODUCTO COMESTIBLE MULTICAPA QUE ACTUA COMO BARRERA PARA LA TRANSFERENCIA DE AGUA ENTRE COMPONENTE ALIMENTICIOS.

En cuanto a la objeción a la Reivindicación 1, manifiesto lo siguiente:

Los solicitantes no captan en que consiste la inconsistencia en la Reivindicación principal. En efecto, en la Reivindicación 3 el lípido microparticulado tiene un punto de fusión de 70° o más y a su turno la Reivindicación 9 indica los componentes de los que se selecciona el lípido de alta fusión. En todo caso, pedirían una mayor aclaración al respecto.

Pedro Castillo Pineda & Asociados

ABOGADOS

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Desisto de las Reivindicaciones 20 a 37 inclusive.

Por lo expuesto, pido se efectúe el análisis sobre la determinación del estado de la técnica y evaluación de los requisitos de patentabilidad.

Atentamente,



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**PRODUCTO COMESTIBLE, MULTICAPA QUE ACTÚA COMO BARRERA
PARA LA TRANSFERENCIA DE AGUA ENTRE COMPONENTES
ALIMENTICIOS**

CAMPO DE LA INVENCION

La presente invención se refiere a un producto comestible, multicapa que actúa como barrera para la transferencia de agua entre componentes alimenticios, apropiado para uso en productos alimenticios. Más particularmente, el producto comestible, multicapa que actúa como barrera para la transferencia de agua entre componentes alimenticios es útil en prevenir y/o inhibir la migración de la humedad dentro de un producto alimenticio multicomponente y es flexible. El producto comestible, multicapa que actúa como barrera para la transferencia de agua entre componentes alimenticios de esta invención incluye una capa de lípido y una capa hidrófoba flexible.

ANTECEDENTES

Para muchos productos alimenticios, es necesario mantener los niveles de humedad cuando el producto tiene que exhibir propiedades organolépticas, calidad y sabor óptimos. La migración de la humedad en productos alimenticios terminados puede poner en serio peligro la calidad, estabilidad y las propiedades organolépticas. Además, muchas reacciones químicas y enzimáticas indeseables se desarrollan a unas tasas que se rigen en parte por el contenido de humedad de los alimentos. Las tasas excesivas de estas reacciones pueden promover cambios nocivos en el sabor, color, textura y valor nutritivo de los productos alimenticios.

En productos alimenticios multicomponente, en particular aquellos que tienen componentes con diferentes contenidos de humedad y actividades de agua (verbigracia, queso pre-empacado y galletas saladas, rosquillas pre-empacadas y productos de queso crema y similares), la humedad puede migrar entre los componentes adyacentes, alterando las características de los componentes y las propiedades organolépticas. Además de comprometer la calidad de los productos alimenticios terminados, la migración de la humedad puede dificultar la producción y la distribución de los productos alimenticios. Así, por ejemplo, el queso en un producto de queso/galleta salada podría deshidratarse completamente mientras, al mismo tiempo, la galleta salada pierde su cualidad crocante.

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Un método de impedir la migración de la humedad en alimentos incluye recubrir una o más superficies del producto alimenticio con una barrera de humedad, comestible. Tales barreras deben tener una baja permeabilidad a la humedad con el fin de impedir la migración de agua entre áreas de diferentes actividades de agua. Además, la barrera debe cubrir completamente la superficie del alimento, incluidas las grietas, y adherirse bien a la superficie del producto alimenticio. La barrera de humedad debe ser suficientemente fuerte, suave y flexible para formar una superficie continua, que no se rompa con la manipulación, pero que pueda penetrarse fácilmente durante el consumo. Además, las propiedades organolépticas de la película de barrera como sabor, regusto y tacto en la boca deben ser imperceptibles, de manera que el consumidor no perciba la barrera cuando se consume el producto alimenticio. Finalmente, la barrera de humedad debe ser fácil de elaborar y fácil de usar.

Debido a que los lípidos, tales como aceites, grasas y ceras se componen de moléculas insolubles en agua, lipófilas, capaces de formar una estructura impermeable al agua, éstos se han investigado para uso en películas de barrera de humedad. Con respecto a los materiales oleaginosos derivados de lípidos (es decir, poliésteres de sacarosa, monoglicéridos acetilados y similares) y/u otros lípidos formadores de película, se ha demostrado que, a menos que se utilice un recubrimiento de grosor indeseable, la barrera no es suficientemente efectiva para productos alimenticios que requieren una vida útil prolongada. Tales lípidos formadores de película tienden a volverse inestables bajo condiciones prácticas y normales de uso y pierden la integridad de la película y la efectividad de la barrera. Aparte de la inestabilidad estructural, esa difusión de aceite o rotura que surge con la manipulación o la variación de las temperaturas, tales barreras de humedad a base de lípidos presentan las desventajas de ser inaceptables desde el punto de vista organoléptico ya que, usualmente, tienen un tacto en la boca grasoso o ceroso.

En consecuencia, muchas de las barreras en el arte usan un lípido impermeable al agua, en asociación con hidrocoloides o polisacáridos (verbigracia, alginato, pectina, carragenina, derivados de celulosa, almidón, hidrolizados de almidón y/o gelatina) para formar estructuras gelatinosas o matrices semi-rígidas, entrecruzadas para atrapar y/o inmovilizar el material lípido o no acuoso. En muchos casos estos componentes se forman como películas de dos capas. Estas películas de dos capas pueden fundirse de antemano y aplicarse a la superficie de un alimento como una película auto-soportante, con la capa de lípido orientada

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hacia el componente con la mayor actividad de agua. Véase, por ejemplo, las patentes de los Estados Unidos 4,671,963 (9 de junio de 1987), 4,880,646 (14 de noviembre de 1987), 4,915,971 (10 de abril de 1990) y 5,130,151 (14 de julio de 1992).

No obstante existe un número de desventajas asociadas con estas barreras de humedad del arte previo. En sí mismos los hidrocoloides son hidrófilos y/o solubles en agua y, por lo tanto, con el tiempo tienden a absorber agua. La absorción de agua por el material hidrófilo en tales barreras de humedad se acelera en gran proporción mientras la película está directamente en contacto con alimentos que tienen una actividad de agua (A_w) superior a 0.75. Además, algunos hidrocoloides tienden a hacer las barreras bastante rígidas, requiriendo la adición de un plastificante hidrófilo (verbigracia, poliol) para aumentar la flexibilidad. A menudo, estos plastificantes son en sí mismos potentes aglutinantes de humedad, que favorecen de ese modo la migración de la humedad a las barreras y disminuyen la estabilidad estructural y la efectividad de las barreras. Más aún, con frecuencia, la textura y el espesor requeridos de algunas de estas barreras hacen perceptible e inaceptable su presencia cuando se consume el producto. Se requieren pasos de procesamiento adicionales (por ejemplo, fundición y secamiento) para formar estas películas, haciéndolas así difíciles de emplear en la producción comercial de alta velocidad.

Las barreras de humedad provistas por la presente invención representan una mejora significativa de las barreras de humedad del arte previo y superan los problemas asociados con las barreras de humedad del arte previo.

SUMARIO

La presente invención provee un producto comestible, multicapa que actúa como barrera para la transferencia de agua entre componentes alimenticios. Este producto comestible, multicapa que actúa como barrera para la transferencia de agua entre componentes alimenticios es altamente efectivo en prevenir la migración de la humedad en un producto alimenticio, multicomponente, entre componentes alimenticios que poseen diferentes actividades de agua y/o contenidos de humedad con una temperatura de almacenamiento dada. El producto comestible, multicapa que actúa como barrera para la transferencia de agua entre componentes alimenticios es efectivo para proporcionar una barrera con flexibilidad mecánica suficiente, que es aceptable desde el punto de vista

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organoléptico, con varios tipos de alimentos con un rango de temperaturas de uso y almacenamiento. El producto comestible, multicapa que actúa como barrera para la transferencia de agua entre componentes alimenticios puede aplicarse fácilmente con equipo comercial. El producto comestible, multicapa que actúa como barrera para la transferencia de agua entre componentes alimenticios es flexible y, por consiguiente, no se rompe fácilmente con la manipulación o el uso.

El producto comestible, multicapa que actúa como barrera para la transferencia de agua entre componentes alimenticios de la presente invención incluye una capa de lípido y una capa hidrófoba flexible. Preferiblemente, la capa de lípido es también flexible. La capa de lípido se forma de una composición que comprende de 0 a 35 por ciento de un lípido de alta fusión, microparticulado comestible, que posee un punto de fusión de 70°C ó más, y una mezcla de triglicérido de baja fusión, comestible, que posee un punto de fusión de 35°C ó menos. Para los efectos de esta invención, una "mezcla de triglicéridos de baja fusión, comestible" incluye un triglicérido simple de bajo punto de fusión, comestible y, preferiblemente, mezclas de tales triglicéridos. Por lo general, tales mezclas de triglicéridos incluyen aceites y grasas comestibles total o parcialmente hidrogenados, naturales; aceites y grasas comestibles fraccionados; y/o aceites y grasas comestibles no hidrogenados que tienen el perfil (descrito más adelante) apropiado de contenido de grasa sólida (SFC). Triglicéridos apropiados de baja fusión, comestibles, incluyen aceites vegetales hidrogenados y/o fraccionados, naturales, oxidativamente estables o grasas animales, incluidos, por ejemplo, aceite de coco, aceite de colza, aceite de soya, aceite de palma, aceite de nuez de palma, aceite de girasol, aceite de maíz, aceite de canola, aceite de semilla de algodón, aceite de maní, manteca de cacao, grasa de leche anhidra, tocino, grasa de carne de vaca y similares, así como sus mezclas. Los triglicéridos preferidos de baja fusión, comestibles, deben ser estables contra la oxidación y/o hidrólisis e incluyen aceite de canola, aceite de palma, aceite de nuez de palma, aceite de coco, aceite de soya parcialmente hidrogenado y sus mezclas. Además, la capa de lípido puede contener igualmente hasta 35 por ciento de un lípido de alto punto de fusión, microparticulado, comestible, que tiene un punto de fusión de 70°C o más. Si se incluye en la capa de lípido, el lípido de alta fusión, microparticulado comestible, no debe contener cantidades suficientes de grandes partículas (generalmente 50 micrones o más) para impartir una textura granulosa al producto alimenticio, en el cual se utiliza la barrera de humedad. Preferiblemente, el lípido de alta fusión,

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microparticulado, comestible, tiene un tamaño de partícula promedio basado en volumen (medido, por ejemplo, usando un Detector Láser de Tamaño de Partícula Horiba LA-900 de Horiba Instrument, Inc., Irvine, CA) de 10 micrones o menos (preferiblemente 1 a alrededor 5 micrones), en donde por lo menos 5 por ciento de las partículas de lípido microparticulado tienen un tamaño de partícula de 1 micrón o menos. Esta composición posee propiedades termomecánicas únicas, que la hacen ideal como una barrera de humedad, comestible, para uso en productos alimenticios.

En un aspecto importante, la capa de lípido proporciona una barrera en donde el contenido de grasa sólida (SFC) no varía más de 5 por ciento, si la temperatura de almacenamiento varía $\pm 5^{\circ}\text{C}$. Variaciones superiores a 5 por ciento podrían comprometer la efectividad de la barrera. En el aspecto más importante de la invención, el SFC de la capa de lípido a la temperatura de almacenamiento del producto es 50 a 70 por ciento, preferiblemente 55 a 70 por ciento y, muy preferiblemente, 60 a 65 por ciento a la temperatura de almacenamiento del producto (es decir, 0 a 5°C para condiciones de almacenamiento refrigerado y 15 a 25°C para condiciones de almacenamiento ambiente). Con el fin de obtener las propiedades organolépticas deseadas, el SFC de la capa de lípido debe variar menos de 20 por ciento a temperaturas en el rango de 20 a 37°C y menos de 35 por ciento a temperatura en el rango de 37 a 60°C . Estas características proporcionan una barrera de humedad con una fusión limpia y rápida y un tacto en la boca no seroso.

Típicamente, la capa de lípido incluye 65 a 100 por ciento de la mezcla de triglicérido de baja fusión, comestible, y 0 a 35 por ciento del lípido de alto punto de fusión, microparticulado, comestible. Preferiblemente, la capa de lípido contiene 75 a 95 por ciento de la mezcla de triglicérido de baja fusión, comestible, y 5 a 25 por ciento del lípido comestible de alta fusión; muy preferiblemente, la composición contiene 85 a 92 por ciento de la mezcla de triglicérido de baja fusión, comestible, y 8 a 15 por ciento del lípido comestible de alto punto de fusión. La capa de lípido tiene un espesor de 50 micrones a 1 mm y, más preferiblemente, 125 a 300 micrones.

Como se anotó más arriba, la capa de lípido puede contener de manera opcional una dispersión de partículas sólidas (es decir, lípido microparticulado de alto punto de fusión). En tales casos, la película de lípido contiene preferiblemente 0.1 a 30 por ciento de partículas sólidas, basado en el peso de la película de

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lípidos. Ejemplos de partículas sólidas que pueden dispersarse en la capa de lípidos incluyen chocolate, mantequilla de maní, crema de confitería y similares, así como sus mezclas. Como se anotó también más arriba, la distribución del tamaño de partícula debe proporcionar una percepción no granulosa, cuando se consume el producto alimenticio. Las partículas pueden ser de cualquier forma y se dispersan dentro de la composición de la capa de lípidos usando técnicas y equipo convencionales de mezclado.

El producto comestible, multicapa que actúa como barrera para la transferencia de agua entre componentes alimenticios incluye además una capa hidrófoba flexible. La capa hidrófoba flexible puede incluir ceras, ésteres de ácido acético de monoglicéridos, ácidos succínico de monoglicéridos, ésteres de ácido cítrico de monoglicéridos, monoésteres de propilen glicol, triglicéridos que contienen por lo menos un ácido graso C2 a C4 y por lo menos un ácido graso C12 a C24, lípidos formadores de cristales alfa y sus mezclas. La capa hidrófoba flexible tiene generalmente 50 micrones a 1 mm de espesor y, preferiblemente, 125 a 300 micrones de espesor.

La presente invención provee asimismo un método para impedir la migración de la humedad entre componentes alimenticios, que tienen diferentes niveles de humedad. En este aspecto, este producto comestible, multicapa que actúa como barrera para la transferencia de agua entre componentes alimenticios es particularmente efectivo para uso en alimentos multicomponente, con por lo menos un componente que tiene una Aw de más de 0.75. El producto comestible, multicapa que actúa como barrera para la transferencia de agua entre componentes alimenticios de la invención tiene una baja permeabilidad a la humedad, excelente flexibilidad y es fácil de manufacturar y se usa con una variedad de productos alimenticios. El producto comestible, multicapa que actúa como barrera para la transferencia de agua entre componentes alimenticios se formula especialmente para la temperatura prevista de almacenamiento del producto alimenticio y es efectivo para cubrir en su totalidad una superficie de un alimento y proporcionar una barrera, que es suficientemente fuerte, estable y no quebradiza, para formar una superficie resistente a la rotura durante la manipulación y el almacenamiento (a temperaturas de refrigeración o ambientes), pero que se penetra fácilmente durante el consumo. El producto comestible, multicapa que actúa como barrera para la transferencia de agua entre componentes alimenticios posee propiedades organolépticas de sabor, regusto y

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tacto en la boca que son esencialmente imperceptibles, de modo que el consumidor no es consciente de la presencia de la barrera cuando se consume el producto. El producto comestible, multicapa que actúa como barrera para la transferencia de agua entre componentes alimenticios de la invención es efectivo para reducir la migración de la humedad entre componentes alimenticios durante 21 días de almacenamiento en por lo menos 90 por ciento, más preferiblemente en por lo menos 99 por ciento y, muy preferiblemente, en por lo menos 99.9 por ciento, comparada con componentes alimenticios donde no está presente una barrera de humedad. Además, el producto comestible, multicapa que actúa como barrera para la transferencia de agua entre componentes alimenticios de la invención es efectivo para aumentar la vida útil refrigerada de un producto alimenticio, que contiene la barrera de humedad, en por lo menos 8 veces y, más preferiblemente, en por lo menos 16 veces, comparada con un producto alimenticio donde no está presente una barrera de humedad. Esto se traduce generalmente en una vida útil refrigerada para un producto alimenticio multicomponente de cuatro meses o más.

La presente invención provee igualmente un método para reducir la migración de la humedad entre componentes alimenticios. En este aspecto, el producto comestible, multicapa que actúa como barrera para la transferencia de agua entre componentes alimenticios se pone en contacto con un componente alimenticio para reducir la migración de la humedad de un componente alimenticio a otro. Por lo general, el producto comestible, multicapa que actúa como barrera para la transferencia de agua entre componentes alimenticios se aplica al componente alimenticio para formar una capa de barrera esencialmente continua de por lo menos 100 micrones de espesor preferiblemente 200 micrones a 1 mm de espesor y, más preferiblemente, 250 a 500 micrones de espesor.

DESCRIPCIÓN DETALLADA

El producto comestible, multicapa que actúa como barrera para la transferencia de agua entre componentes alimenticios de la presente invención posee propiedades organolépticas de sabor, regusto y tacto en la boca, que son imperceptibles, de modo que el consumidor no es consciente de la presencia de la barrera cuando se consume el producto. La barrera de humedad multicapa es flexible y auto-soportada, lo cual elimina la necesidad de una red/película polimérica base, suprimiendo así la necesidad de fundido, recubrimiento o secamiento con una capa de base polimérica y los defectos indeseables de textura

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resultantes, tales como dureza o masticabilidad. Ciertamente, el producto comestible, multicapa que actúa como barrera para la transferencia de agua entre componentes alimenticios de la presente invención es de fusión limpia y rápida, está exenta de residuos y posee un tacto en la boca cremoso (es decir, suave), no ceroso.

Adicionalmente, la composición de producto comestible, multicapa que actúa como barrera para la transferencia de agua entre componentes alimenticios de la presente invención incluye una capa de lípido que posee una estructura reticular estable soportada por numerosas partículas grasas cristalinas finas, que resisten la tendencia a recrystalizarse, presentar eflorescencia ("bloom") o romperse, y provee excelente estabilidad a temperatura prevista de almacenamiento del producto alimenticio. La relación específica grasa/aceite definida por el SFC se diseña y mantiene para temperaturas corrientes de almacenamiento. Esta red fina, estable, de cristales de grasa contribuye asimismo a inmovilizar la fracción de aceite líquida en la barrera.

En general, esto provee una capa de lípido no porosa, resistente al agua, estable, que resulta en una barrera más efectiva y una matriz grasa más estable, de modo que puede minimizarse la rotura que ocurre durante el enfriamiento y el almacenamiento. El SFC específico se diseña igualmente para fusión rápida a temperaturas corporales para impartir un tacto en la boca agradable o indetectable y para facilidad de aplicación mediante, por ejemplo, aspersion, brocha o recubrimiento.

Definiciones

A menos que se indique lo contrario, todos los términos científicos y técnicos usados aquí tienen el mismo significado como los entiende comúnmente una persona de habilidad ordinaria en el arte, al cual pertenece esta invención. Todas las patentes y publicaciones mencionadas aquí se incorporan aquí por referencia. Todos los porcentajes o relaciones son en peso, a menos que se especifique otra cosa. Para efectos de la presente invención, los siguientes términos se definen más adelante; asimismo pueden definirse otros términos en cualquier parte en esta especificación.

Tal como se emplea aquí, "barrera" o "barrera de humedad" se entiende para describir una estructura esencialmente continua, delgada, o una capa que es esencialmente impermeable a la migración de la humedad a través de ella y que

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recubre una superficie exterior o interior de un producto alimenticio. La barrera puede describirse como un recubrimiento, película, o membrana. La barrera puede situarse entre componentes que tienen diferentes actividades de agua en el producto alimenticio, para impedir o reducir significativamente la migración de la humedad entre los componentes, o en la superficie exterior del producto alimenticio para impedir o reducir significativamente la migración de la humedad entre el producto alimenticio y el entorno ambiente. La barrera de humedad de esta invención está diseñada para emplearse en contacto directo con alimentos húmedos y para ser efectiva contra la migración de la humedad mediante el equilibrio del vapor y/o difusión de líquido. Para efectos de esta invención, en el caso de impedir la migración de la humedad entre el producto alimenticio y el entorno ambiente, se consideraría que el primer componente alimenticio es una o más superficies exteriores del producto alimenticio y se consideraría que el segundo componente alimenticio es el entorno ambiente.

Tal como se emplea aquí, "actividad de agua" (A_w) es la relación de presión de vapor en el alimento de interés y la presión de vapor pura a la misma temperatura.

Tal como se emplea aquí "lípidos" se refiere a cualquiera de un grupo de sustancias que, en general, son solubles en, o miscibles con, éter, cloroformo, u otros disolventes orgánicos de grasas y aceites (técnicamente, triglicéridos de ácidos grasos, abreviatura de triglicéridos) pero son prácticamente insolubles en agua. Los lípidos pueden clasificarse como lípidos simples, lípidos compuestos o lípidos derivados. Los lípidos simples incluyen ésteres de ácidos grasos con alcoholes. Las grasas y aceites son ésteres de ácidos grasos con glicerina, y las ceras son ésteres de ácidos grasos con alcoholes distintos de glicerina. Los lípidos compuestos incluyen fosfolípidos, cerebrósidos o glicolípidos, y otros, tales como esfingolípidos, y carotenoides. Lípidos derivados incluyen sustancias derivadas de lípidos naturales (simples o compuestos) e incluyen ácidos grasos, alcoholes grasos y esteroides, hidrocarburos y emulsionantes (lípidos tensoactivos derivados artificialmente).

"Relación de grasa/aceite" o "contenido de grasa sólida" (SFC) se usa por lo común para describir la reología y la composición de fases de los lípidos. La grasa es sólida a una temperatura dada, mientras que el aceite es líquido. La relación grasa/aceite de un lípido dado no es una constante, sino función de la temperatura. Por ejemplo, la mantequilla puede considerarse como principalmente

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sólida (70 por ciento SFC) a 0°C, plástica (15 por ciento SFC) a temperatura de la sala, y completamente líquida (0 por ciento SFC) por encima de 40°C. Por lo tanto, es posible diseñar una mezcla de triglicéridos que tenga cualquier relación grasa/aceite a una temperatura(s) dada (por lo menos en las temperaturas de interés para productos alimenticios). Cuando en la composición se utiliza un agente de control de cristales de grasa a base de lípidos, a menudo tal agente en sí es también un lípido; por consiguiente, el SFC actual de una barrera tiene que incluir las fracciones de grasa y aceite del agente de control de cristales de grasa. La relación grasa/aceite en una barrera varía con la temperatura y es importante para la efectividad y la estabilidad de la barrera a la temperatura actual de almacenamiento (verbigracia, de 0 a 5°C para almacenamiento refrigerado) de un producto alimenticio. Es también un aspecto importante de esta invención que la composición de la barrera sola, sin considerar su perfil SFC exacto, no pueda proporcionar una efectividad de barrera superior. En otras palabras, una composición de barrera efectiva a temperatura ambiente fallará probablemente a temperatura de refrigeración y, *vice versa*, si su SFC varía significativamente entre 20 y 5°C. La relación grasa/aceite es también importante para el tacto en la boca/aceptabilidad sensorial de 25 a 37°C, y es importante para facilitar la aplicación a la temperatura (típicamente mayor de 40°C) de transporte o aplicación (por ejemplo, aspersión).

La "efectividad de la barrera" se evaluó analíticamente por un método de copa de queso ("a cheese-cup method"). Se preparó un control usando una copa plástica, impermeable al agua, con queso procesado marca Kraft Velveeta ($A_w = 0.94$) y se puso en una cámara de humedad constante sobre solución de cloruro de sodio saturado con una humedad relativa de equilibrio de 33 por ciento a temperatura de refrigeración ($5 \pm 1^\circ\text{C}$ para todos los ejemplos). La pérdida de humedad o peso se monitorea durante un período de 21 días como punto de referencia para la comparación de la efectividad de la barrera. A menudo, un tiempo de almacenamiento demasiado corto arroja resultados no confiables que no pueden extrapolarse a un desempeño de almacenamiento de período más prolongado (por ejemplo 4 meses). Copas de queso preparadas análogamente, recubiertas con una composición de barrera seleccionada, con un espesor de 300 micrones, se compararon con el control bajo condiciones idénticas en términos de "pérdida porcentual de humedad" versus tiempo de almacenamiento. Se requiere un promedio de por lo menos 4 réplicas y se usan para efectos de comparación. Este método de comparación simula más estrechamente la condición de

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aplicación actual del producto, en el cual la barrera está en contacto directo con un componente alimenticio húmedo. Generalmente, una pérdida de humedad menor de 1 por ciento durante un periodo de 3 semanas provee una barrera de humedad efectiva.

Composición de la Capa de Lípido

La capa de lípido del producto comestible, multicapa que actúa como barrera para la transferencia de agua entre componentes alimenticios de la invención incluye una mezcla de lípido comestible, que tiene un punto de fusión de 35°C o menos y que posee un SFC a temperatura prevista de almacenamiento del producto alimenticio de 50 a 70 por ciento, preferiblemente 55 a 70 por ciento y, muy preferiblemente, 60 a 65 por ciento. Para efectos prácticos, el lípido de baja fusión comprende preferiblemente una mezcla de triglicéridos de ácidos grasos, incluidos grasas y aceites comestibles hidrogenados (completa o parcialmente) y/o fraccionados, naturales, y se refiere aquí a "una mezcla de triglicérido de baja fusión, comestible" de éstos. Para los efectos de esta invención, las expresiones "triglicérido comestible de baja fusión" tienen como propósito incluir triglicéridos simples, así como mezclas o combinaciones de triglicéridos. De igual manera pueden utilizarse lípidos modificados o sintéticos tales como monoglicérido acetilado y aceite de parafina, pero son menos preferidos. Triglicéridos apropiados de bajo punto de fusión, comestibles, incluyen generalmente una mezcla de uno o más aceites hidrogenados o no hidrogenados, que poseen el perfil SFC deseado. Triglicéridos apropiados de baja fusión, comestibles, comprenden aceites vegetales estables a la oxidación, naturales o hidrogenados y/o fraccionados, o grasas animales incluidos, por ejemplo, aceite de coco, aceite de colza, aceite de soya, aceite de palma, aceite de nuez de palma, aceite de girasol, aceite de maíz, aceite de canola, aceite de semilla de algodón, aceite de maní, manteca de cacao, grasa de leche anhidra, tocino, grasa de carne de vaca y similares, así como sus mezclas. Los triglicéridos preferidos de baja fusión, comestibles, deben ser estables frente la oxidación o hidrólisis y pueden incluir aceite de canola, aceite de palma, aceite de nuez de palma, aceite de coco, aceite de soya parcialmente hidrogenado y sus mezclas. La selección de una mezcla de triglicéridos de baja de fusión, que satisfaga las especificaciones SFC de esta invención, contribuye a garantizar una efectividad superior de barrera, características deseables de tacto

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en la boca y propiedades aceptables de manipulación de la composición de la barrera final. Por ejemplo, el SFC de la composición de la barrera de esta invención se diseña también para que no sea más de 35 por ciento a una temperatura por encima de 37 a 50°C, preferiblemente menos de 20 por ciento. Además, la diferencia en SFC entre 20°C y 37°C de la composición de la barrera se fija por lo menos 20 por ciento y, preferiblemente, más de 30 por ciento.

Composición de Capa Hidrófoba Flexible

El producto comestible, multicapa que actúa como barrera para la transferencia de agua entre componentes alimenticios incluye además una capa hidrófoba flexible. La capa hidrófoba flexible puede comprender ceras, ésteres de ácido acético de monoglicéridos, ácidos succínicos de monoglicéridos, ésteres de ácido cítrico de monoglicéridos, monoésteres de propilen glicol, triglicéridos que contienen por lo menos un ácido graso C2 a C4 y por lo menos un ácido graso C12 a C24, líquidos formadores de cristales alfa y sus mezclas. La capa hidrófoba flexible tiene generalmente 50 micrones a 1 mm de espesor y, preferiblemente, 125 a 300 micrones de espesor.

Aplicación de la Barrera de Humedad Multicapa

La composición de lípido se calienta primero de 40 a 50°C, a los cuales se funden casi todas las grasas de triglicérido de baja fusión o mezclas. El lípido de alta fusión, microparticulado, si se incluye en la composición de lípido, no se altera físicamente o se funde. Donde se desea inhibir la migración de la humedad entre porciones adyacentes de un producto alimenticio que posee diferentes actividades de agua, la composición de la barrera de humedad puede aplicarse a la superficie de contacto de una (o ambas) porciones y se deja enfriar a por debajo de 20°C, antes de juntar las porciones. La composición de la barrera de humedad tendrá una viscosidad de 20 a 2000 cps, a una temperatura de desde 40 a 50°C. Donde se desea inhibir la migración de la humedad entre un producto alimenticio y el entorno ambiente, la composición de la barrera de humedad puede aplicarse a una o más de las superficies exteriores del producto alimenticio y dejarse enfriar. En un aspecto importante de la invención, pueden obtenerse tamaños de partícula deseados sin tasas de enfriamiento controladas debido al uso de lípido de alta fusión, microparticulado. Ésta es una ventaja inesperada sobre el empleo de

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otros tipos de agentes de control de cristales de grasa, tales como ceras de alta fusión y emulsificantes, fundiendo primero tales agentes de control de cristales de grasa en una mezcla de triglicéridos. Agentes convencionales de control de cristales de grasa o ensemillamiento (verbigracia, triestearato de sorbitán, ésteres de poliglicerol, tales como mono/dioleato de di/triglicerol y similares) pueden usarse asimismo en combinación con tasas de enfriamiento más rápidas.

Las técnicas apropiadas para aplicar la barrera incluyen, por ejemplo, aspersión, inmersión, recubrimiento en cazoleta, recubrimiento con líquido, deposición, extrusión, uso de lecho fluidizado y similares. En una incorporación de la invención, la barrera se aplica sumergiendo el producto alimenticio, o simplemente su superficie a recubrir, en una composición de la barrera de humedad derretida o fundida, retirando el producto alimenticio y dejando enfriar el producto recubierto. En otra incorporación de la invención, la película fundida se aplica por brocha o, en otra forma, la composición a la superficie(s) deseada del producto. En todavía otra incorporación, la película puede aplicarse usando un aerosol, incluido un aerosol atomizado, brocha de aire y similares. Generalmente, la barrera de humedad comestible se aplica al componente alimenticio para formar una capa de barrera esencialmente continua de por lo menos 20 micrones de espesor, preferiblemente 100 micrones a 1 mm de espesor y, más preferiblemente, 200 a 500 micrones de espesor.

La capa hidrófoba flexible se aplica preferiblemente sobre la capa de lípido usando técnicas similares. Aún más preferiblemente, la capa hidrófoba flexible se aplica a una temperatura de 45 a 60°C y rociándola sobre la capa de lípido. Preferiblemente, la capa de lípido de baja fusión se aplica adyacente al alimento que tiene la actividad de agua más alta.

Modificadores Opcionales de Crecimiento de Cristales

La capa de lípido puede incluir además, como ingrediente opcional, un material que es efectivo para promover la formación de pequeños cristales de grasa (de la mezcla de triglicéridos durante el enfriamiento). Ejemplos de tales modificadores opcionales de crecimiento de cristales incluyen lípidos de alto punto de fusión, microparticulados, agentes inhibidores de crecimiento de cristales (verbigracia, ésteres de poliglicerina, triestearato de sorbitán) y similares, así como sus mezclas. Los lípidos de alto punto de fusión, microparticulados, que tienen un

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punto de fusión de 70°C o mayor, se prefieren por lo general para uso como modificadores de crecimiento de cristales en la presente invención. Tales modificadores de crecimiento de cristales inhiben el crecimiento de cristales y, por consiguiente, son efectivos para promover la formación de pequeños cristales de grasa (de la mezcla de triglicéridos durante el enfriamiento). Tales pequeños cristales de grasa inmovilizan efectivamente la fracción de aceite líquido restante de la mezcla de triglicéridos, impidiendo en esta forma el drenaje del aceite líquido de la red de cristales de grasa. Durante el almacenamiento subsiguiente, tales agentes de control de cristales de grasa son también efectivos en estabilizar la red tridimensional de cristales de grasa sólida, compuesta de numerosos pequeños cristales de grasa. La presencia de cristales de grasa más pequeños proporciona por lo general una mejor barrera de humedad.

Si se usan, los lípidos de alta fusión, microparticulados, están presentes en la composición de la capa de lípido en un nivel de 1 a 35 por ciento y, preferiblemente, 5 a 15 por ciento. Si se emplean, los agentes inhibidores de crecimiento de cristales están presentes en la composición de la capa de lípido en un nivel de 0.01 a 1 por ciento y, preferiblemente, 0.1 a 0.3 por ciento.

Lípidos preferidos de alta fusión, comestibles, tienen una de fusión de 70°C o más y, más preferiblemente, 100°C o más. Para efectos de esta invención, el término "lípidos de alta fusión, comestibles" incluye ácidos grasos de cadena larga, comestibles, sus monoglicéridos, diglicéridos y triglicéridos, sus sales de metal alcalino y otros derivados de los mismos. De igual manera pueden usarse otros lípidos de alta fusión, aprobados para alimentos, naturales o sintéticos, o sustancias similares a lípidos, tales como alcohol graso (cera), parafina y poliésteres de sacarosa. Generalmente, los lípidos de alta fusión, comestibles, se forman de ácidos grasos de cadena larga que tienen por lo menos 12 átomos de carbono y, preferiblemente, 18 a 24 átomos de carbono; preferiblemente, los ácidos grasos de cadena larga son saturados. Ácidos grasos de cadena larga saturados, apropiados, que se emplean para formar los lípidos de alta fusión, comestibles, incluyen, por ejemplo, ácido palmítico, ácido esteárico, ácido araquídico, ácido behénico, ácido lignocérico y similares; sus derivados, incluidos, por ejemplo, monoestearato de glicerina, diestearato de glicerina, triestearato de glicerina, estearato de calcio, estearato de magnesio, poliésteres de sacarosa de alta fusión, alcoholes grasos de alta fusión, ceras de alta fusión, fosfolípidos de alta fusión y similares, así como mezclas de los mismos.

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Tales lípidos de alta fusión se microparticulan usando equipo convencional de micromolienda. El equipo apropiado de micromolienda incluye, por ejemplo, molinos de bolas, molinos de coloides, molinos con energía de fluidos, molinos de pasador/disco, molinos de martillo y similares. El lípido de alta fusión, comestible, se micromuele a una temperatura de 40 a 70°C, preferiblemente 45 a 60°C. La micromolienda es efectiva para proporcionar numerosos fragmentos con un tamaño de partícula de 0.1 micrones o menos, que se cree que son el componente funcional responsable del control de cristales de grasa y la estabilización. En tal lípido de alta fusión microparticulado, el tamaño de partícula promedio, medido por un detector láser de partícula Horiba LA-900 (Horiba Instrument, Inc. Irvine, CA) es 10 micrones o menos y, preferiblemente, 1 a 5 micrones, con por lo menos 5 por ciento de las partículas (con base en el volumen) siendo menos de 0.1 micrones y, preferiblemente, con 1 a 20 por ciento siendo menos de 1 micrones. Por lo general, el tamaño de partícula se mide preferiblemente a 20°C dispersando lípido de alta fusión microparticulado en aceite de soya, usando un sonicador antes de la medición.

Una grasa preferida de alta fusión, microparticulada, para uso en la presente invención es estearato de calcio micromolido. El estearato de calcio micromolido es estable, puesto que tiene un punto de fusión de 145°C, es insoluble en agua, es un ingrediente de alimentos GRAS (reconocido generalmente como exento de riesgo) aprobado y tiene un costo razonable.

Los siguientes ejemplos ilustran métodos para llevar a cabo la invención y debe entenderse que son ilustrativos pero no limitantes del ámbito de la invención, la cual se define por las reivindicaciones adjuntas.

EJEMPLOS

EJEMPLO 1. Se formó una composición de capa de lípido de baja fusión mezclando aceite de nuez de palma (PKO) y aceite de canola (CO) en una relación PKO:CO de 72:28 a una temperatura de 50°C. El contenido de grasa sólida de la composición de capa de lípido de baja fusión era la indicada en la siguiente tabla:

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Temperatura (°)	SFC (%)
0	65.0
5	64.3
10	59.6
20	38.9
25	16.5

Se preparó una composición de capa hidrófoba flexible mezclando un monoglicérido acetilado (Myvacet 7-07K de Quest International; punto de fusión de 40°C) y grasa de leche anhidra en una relación de 54:46 a 80°C.

Tajadas de queso (Kraft Cheddar Singles preparado usando 2% de leche) se recubrieron a ambos lados con la composición de capa de lípido de baja fusión (Control 1) o la capa hidrófoba flexible (Control 2). La aplicación se llevó a cabo rociando cada lado de la tajada de queso dos veces a una tasa de 2 g/lado (proporcionando un total de 4 g/lado; la primera aplicación se dejó solidificar antes de aplicarse la capa final) utilizando un Atomizador de Pistola ("Dot Gun Sprayer") (CE00/C-1100; hhs Leimauftrags-Systeme GmbH, Krefeld, Alemania) operada a 50°C. El espesor del material de la barrera era de 250 micrones para cada lado.

Se prepararon muestras inventivas recubriendo primero por aspersion cada lado de las tajadas de queso con 2 g/lado de la composición de capa de lípido de baja fusión, usando la misma técnica y condiciones descritas anteriormente, dejando solidificar la capa de lípido de baja fusión y, luego, recubriendo por aspersion cada capa de lípido de baja fusión con 2 g/lado de la composición de la capa hidrófoba flexible, utilizando la misma técnica y condiciones descritas anteriormente. El espesor de la capa de lípido de baja fusión era de 125 micrones y el espesor de la capa hidrófoba flexible era de 125 micrones, para un espesor total de 250 micrones a cada lado.

La mitad de las muestras para cada composición de recubrimiento (es decir, Controles 1 y 2 y Muestra Inventiva) se rompieron seriamente mediante deformación controlada (es decir, flexión hasta que las capas se resquebrajaron visualmente). A continuación, se pesó cada muestra individual y luego se puso en una bandeja de metal perforada, que se almacenó en un deshidratador 0.33 Aw refrigerado. Se pesaron las muestras individuales después de 1, 2 y 4 semanas de tiempo de almacenamiento.

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Los resultados se presentan en la siguiente Tabla. Como puede verse de estos datos, las muestras inventivas se comportaron significativamente mejor que cualquiera de los controles. Por supuesto, incluso la muestra inventiva "resquebrajada" se comportó significativamente mejor que las muestras continuas de control o "no resquebrajadas". La comparación de las muestras inventivas "resquebrajadas" con las muestras de control "resquebrajadas" muestra una mejora dramática para las muestras inventivas. Por consiguiente, incluso si se rompe la integridad de la muestra inventiva, lo cual es menos probable que ocurra debido a su naturaleza flexible, se esperaría todavía que se comportara a niveles altos de desempeño para mantener los índices de humedad en productos alimenticios, que tienen componentes con diferentes actividades de agua.

Tiempo (días)	Pérdida de Humedad Promedio (%)					
	Control 1		Control 2		Muestra Inventiva	
	Continuo	ResquebrajadoCracke	Continuo	Resquebrajado	Continua	ResquebrajadaCracked
0	0	0	0	0	0	0
6	0.30 ± 0.28	1,18±0.16	0.11 ±0.04	0.17 ±0.07	-0.06 ± 0.004	0.05 ± 0.07
14	0.75 ± 0.54	2.36 ±0.13	0.34 ±0.10	0.43 ± 0.16	-0.01 ± 0.07	0.19 ±0.15
21	0.92 ± 0.72	3.05 ±0.11	0.41 ± 0.09	0.58 ± 0.20	0.03 ±0.07	0.25 ± 0.22
38	1.32 ±1.05	4.25 ±0.21	0.70 ±0.16	0.87 ± 0.28	0.04 ± 0.03	0.34 ± 0.26

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EJEMPLO 2. Una barrera de humedad multicapa inventiva (usando las composiciones de Ejemplo 1) se aplicó a un alimento de queso procesado, tajado, listo para comer, como se describe en Ejemplo 1. Las tajadas de queso con la barrera de humedad inventiva se pusieron entre dos tajadas de tostada. El emparedado de queso frío resultante se evaluó entonces usando un panel catador informal. La barrera de humedad inventiva no era cerosa o granulosa y no presentó sabores desagradables u otras propiedades organolépticas.

Se espera que numerosas modificaciones y variaciones en la práctica de la invención se les ocurran a aquellas personas expertas en el arte al considerar la anterior descripción detallada de la invención. En consecuencia, se pretende que tales modificaciones y variaciones se incluyan en el ámbito de las siguientes reivindicaciones.

LO QUE SE REIVINDICA ES:

1. Un producto comestible, multicapa que actúa como barrera para la transferencia de agua entre componentes alimenticios, apropiado para separar componentes alimenticios que poseen diferentes actividades de agua en un producto alimenticio, comprendiendo dicha barrera de humedad por lo menos una capa de lípido, en donde la por lo menos una capa de lípido comprende una mezcla triglicérido de baja fusión, comestible, que tiene un punto de fusión de 35°C ó menos; y por lo menos una capa de barrera hidrófoba flexible.

2. La barrera de humedad de la reivindicación 1, en donde la por lo menos una capa de lípido comprende además un agente de control de cristales de grasa.

3. La barrera de humedad de la reivindicación 2, en donde la por lo menos una capa de lípido contiene 1 a 35 por ciento del agente de control de cristales de grasa y en donde el agente de control de cristales de grasa es un lípido, microparticulado comestible, que tiene un punto de fusión de 70°C ó más, y un tamaño de partícula promedio de 10 micrones.

4. La barrera de humedad de la reivindicación 1, en donde la capa de lípido tiene un contenido de grasa sólida de desde 50 a 70 por ciento a una temperatura de almacenamiento para el producto alimenticio sobre el cual se aplica la composición.

5. La barrera de humedad de la reivindicación 4, en donde la capa de lípido tiene un contenido de grasa sólida de desde 55 a 70 por ciento a la temperatura de almacenamiento para el producto alimenticio sobre el cual se aplica la composición.

6. La barrera de humedad de la reivindicación 5, en donde la capa de lípido tiene un contenido de grasa sólida de desde 60 a 65 por ciento a la temperatura de almacenamiento para el producto alimenticio sobre el cual se aplica la composición.

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7. La barrera de humedad de la reivindicación 1, en donde la capa de lípido tiene un contenido de grasa sólida de menos de 3 por ciento por encima de 37°C.

8. La barrera de humedad de la reivindicación 1, en donde la capa de lípido tiene un contenido de grasa sólida que varía menos de 20 por ciento entre 20°C y 37°C.

9. La barrera de humedad de la reivindicación 3, en donde el lípido de alto punto de fusión, microparticulado comestible, se selecciona del grupo conformado por ácido esteárico, ácido araquídico, ácido behénico, ácido lignocérico, monoestearato de glicerina, diestearato de glicerina, triestearato de glicerina, estearato de calcio, estearato de magnesio, poliésteres de sacarosa de alta fusión, alcoholes grasos de alta fusión, ceras de alta fusión, fosfolípidos de alta fusión y sus mezclas.

10. La barrera de humedad de la reivindicación 3, en donde el lípido de alta fusión, microparticulado comestible, es estearato de calcio.

11. La barrera de humedad de la reivindicación 1, en donde la mezcla de triglicérido de baja fusión, comestible, se selecciona del grupo conformado por aceite de coco modificado y fraccionado, hidrogenado, natural, aceite de nuez de palma, aceite de colza, aceite de soya, aceite de palma, aceite de girasol, aceite de maíz, aceite de canola, aceite de semilla de algodón, aceite de maní, manteca de cacao, grasa de leche anhidra, tocino, grasa de carne de vaca, monoglicérido acetilado y sus mezclas.

→ ver folio 70
aceite de palmiste

12. La barrera de humedad de la reivindicación 3, en donde la por lo menos una capa de lípido contiene de 5 a 25 por ciento del lípido de alta fusión, microparticulado comestible, y en donde el lípido de alta fusión, microparticulado comestible, tiene un punto de fusión de 100°C o más, y un tamaño de partícula promedio de menos de 5 micrones.

13. La barrera de humedad de la reivindicación 12, en donde la por lo menos una capa de lípido comprende de 5 a 15 por ciento del lípido de alta fusión, microparticulado, comestible.

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14. La barrera de humedad de la reivindicación 1, en donde la capa de lípido tiene 50 micrones a 1 mm de espesor.

15. La barrera de humedad de la reivindicación 1, en donde la capa de lípido comprende además una dispersión de partículas sólidas, seleccionadas las partículas sólidas del grupo conformado por partículas sólidas de chocolate, mantequilla de maní, crema de confitería y sus mezclas.

16. La barrera de humedad de la reivindicación 1, en donde la capa hidrófoba flexible se selecciona del grupo conformado por ceras, ésteres de ácido acético de monoglicéridos, ácidos succínicos de monoglicéridos, ésteres de ácido cítrico de monoglicéridos, monoésteres de propilen glicol, triglicéridos que contienen por lo menos un ácido graso C2 a C4 y por lo menos un ácido graso C12 a C24, lípidos formadores de cristales alfa y sus mezclas.

17. La barrera de humedad de la reivindicación 3, en donde la capa hidrófoba flexible se selecciona del grupo conformado por ceras, ésteres de ácido acético de monoglicéridos, ácidos succínicos de monoglicéridos, ésteres de ácido cítrico de monoglicéridos, monoésteres de propilen glicol, triglicéridos que contienen por lo menos un ácido graso C2 a C4 y por lo menos un ácido graso C12 a C24, lípidos formadores de cristales alfa y sus mezclas.

18. El producto comestible, multicapa que actúa como barrera para la transferencia de agua entre componentes alimenticios de la reivindicación 16, en donde la capa hidrófoba flexible tiene 50 micrones a 1 mm de espesor.

19. El producto comestible, multicapa que actúa como barrera para la transferencia de agua entre componentes alimenticios de la reivindicación 17, en donde la capa hidrófoba flexible tiene 50 micrones a 1 mm de espesor.

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

2020
Bogotá, D. C., 22 de septiembre de 2010

Doctor
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ASUNTO

Radicación **05-33843**
Trámite **002**
Evento **001**
Actuación **430**
Oficio **12800**
Folios **025**

Patente de Invención ☒ Patente de Modelo de Utilidad ☐
Vía Nacional ☒
Vía PCT (fase nacional) ☐ Cap. I ☐ Cap. II ☐

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:

- 1.1. Descripción: Folios: 3 a 21 tal como se radicó inicialmente
Folios 105 a 123 tal como se modificó el 2 de agosto de 2010
- 1.2. Reivindicaciones: Folios 22 a 27 tal como se radicó inicialmente
Folios 124 a 126 tal como se modificó el 2 de agosto de 2010
- 1.3. Prioridad:
Folios: 47 a 79
Fecha 19 de abril de 2004
País Estados Unidos
Número 10/826709
- 1.4. Argumentos del solicitante Folios: 103 a 104

2. Modificaciones (Artículo 34 D. 486 y Art. 22 Tratado PCT)

Se aceptan las modificaciones realizadas por el solicitante toda vez que no amplían el objeto inicial de la solicitud.

3. Objeto de la invención

- Título de la solicitud (folio 1)
Barrera de humedad, comestible, multicapa, apropiada para separar componentes alimenticios y métodos para reducir la migración de la humedad entre dichos componentes
- Las reivindicaciones 1 a 37 de la solicitud en estudio se refieren a
Una barrera de humedad, comestible, multicapa, apropiada para separar componentes alimenticios que poseen diferentes actividades hídricas (sic) en un producto alimenticio, comprendiendo dicha barrera de humedad por lo menos una capa de lípido, en donde la por lo menos una capa de lípido comprende una mezcla de triglicérido de baja fusión (sic), comestible, que tiene un punto de fusión de 35°C o menos; y por lo menos una capa de barrera hidrófoba flexible.
- El anterior producto busca *prevenir la migración de la humedad dentro de un producto alimenticio multicapa.*
- La Clasificación Internacional de Patentes (IPC) para esta solicitud es
A 23 L 1/09.

4. De la solicitud de Patente

4.1. Descripción (Artículo 28 D. 486)

La descripción de la solicitud en estudio presenta los siguientes defectos:

La traducción de la solicitud sigue adoleciendo de problemas; como ya se dijo en el concepto técnico anterior, dicha traducción es literal lo que causa imprecisiones, frases sin sentido técnico en español y posibles tergiversaciones del sentido original del texto. Como se le advirtió al solicitante, el documento que se presentara a esta oficina debería ser revisada por un conocedor de la materia, algo que al parecer no ocurrió.

La siguiente es una muestra de los errores en los que incurre el texto:

- Lípido de alta fusión. En español no tiene sentido técnico. Debería estarse refiriendo a lípidos con un punto de fusión alto o a lípidos con una alta temperatura de fusión. Lo mismo sucede con varios compuestos que denomina de alta fusión.
- Triglicérido de baja fusión. En español no tiene sentido técnico. Debería estarse refiriendo a triglicéridos con un punto de fusión bajo o a lípidos con una baja temperatura de fusión. Lo mismo sucede con varios compuestos que denomina de baja fusión.
- No es correcta la expresión "aceite de nuez de palma" para la frase inglesa "palm kernel oil". La traducción correcta es aceite de palmiste.
- No tienen sentido técnico en español las frases "ácidos succinico de monoglicéridos", "ésteres de ácido acético de monoglicéridos" y los nombres de varios compuestos más relacionados en la solicitud.

Nuevamente se le indica al solicitante que su texto en español deberá ser revisado por un conocedor del arte.

Además de lo anterior, se le recuerda al solicitante que todas las unidades de medida deben venir según el Sistema Internacional de Unidades; los centipoises no pertenecen a este sistema por lo que donde aparezcan dichas unidades deberá modificarse.

Por lo anterior, la descripción no cumple con el requisito de claridad y/o divulgación completa que permita su comprensión y ejecución de acuerdo al art. 28 de la Decisión 486 y/o art. 22 del Tratado PCT

4.2. Reivindicaciones (Artículo 30 D. 486)

El capítulo reivindicatorio de la solicitud en estudio presenta los siguientes defectos:

- Como ya se advirtió en el punto 4.1 del presente examen y en el concepto técnico anterior, la traducción del texto en inglés es deficiente por lo que causa que el capítulo reivindicatorio no sea claro como lo exige la legislación. Nuevamente se advierte de la urgencia de la revisión de la solicitud por parte de un conocedor del arte.
- Dado que la traducción presenta errores como ya se dijo, en diversas partes existen inconsistencias con el texto original o se encuentran frases sin sentido. Por ejemplo, la reivindicación 11 habla de mezcla de triglicerido (sic) de baja fusión (sic), comestible, se selecciona del grupo conformado por aceite de coco modificado y fraccionado, hidrogenado, natural, aceite de nuez de palma, etc. En primer lugar la enumeración se encuentra mal hecha. Si se mira el texto original en inglés (folio 70) lo que la traducción debería decir es "donde la mezcla de triglicéridos comestible de bajo punto de fusión consiste de aceite de coco, ya sea natural, hidrogenado, fraccionado o modificado; aceite de palmiste, etc." debe revisarse el texto.
- La reivindicación 4 es ambigua, pues establece unos parámetros basados en la variable "temperatura de almacenamiento". Dado que pueden existir diversas temperaturas de almacenamiento (por ejemplo, se puede almacenar bajo congelación, bajo refrigeración, a diversas temperaturas ambiente dependiendo del lugar, etc.) y dado que una pequeña variación de temperatura influye notablemente en el comportamiento de una grasa, por consiguiente no es preciso decir que la grasa tiene ciertas propiedades a una "temperatura de almacenamiento". El solicitante deberá establecer dichos parámetros a temperaturas específicas en las escalas establecidas y no de forma ambigua.
- La reivindicación 7 también es ambigua. El rango "por encima de 37°C" es sumamente amplio y las propiedades de una grasa varían notablemente con pequeños cambios de temperatura. Por consiguiente decir que el contenido de una grasa sólida es de menos de 3% por encima de 37°C es sumamente ambiguo y no permitiría identificar claramente los productos a los que se refiere la solicitud.
- La reivindicación 8 también es ambigua. El solicitante relaciona "una grasa sólida que varía menos de 20 por ciento entre 20°C y 37°C"; dicha frase podría interpretarse de muchas maneras ¿si la grasa se calienta desde 20°C hasta 37°C la fracción sólida varía en menos del 20% del producto? ¿las propiedades de la grasa varían menos del 20%? ¿es la cantidad de grasa la que cambia? El solicitante deberá redactar mejor la reivindicación para que se entienda que es lo que se desea proteger.
- No es admisible identificar elementos de forma ambigua empleando adjetivos, cuando dichos elementos pueden ser medidos. Por ejemplo, no se admite colocar que un producto tiene alto o bajo punto de fusión, ya que puede decirse que dicho producto tiene un punto de fusión de X °C a una presión Y. Tampoco se admite que se hable de barreras flexibles pues no se está caracterizando adecuadamente el producto.

5. Determinación del Estado de la Técnica

- La fecha que se ha tenido en cuenta para determinar el estado de la técnica es *16 de abril de 2004*
- Teniendo en cuenta la fecha indicada se realizó la búsqueda en el estado de la técnica de documentos relacionados con la solicitud encontrándose los siguientes documentos más relevantes:

Nº	Documento	Título	Fecha de publicación*
D1	US 5147670	Edible fat based films	15,09,1992
D2	US 5520942	Snack food coating using supercritical fluid spray	28,05,1996
D3	US 5130151	Natural and synthetic edible moisture barrier	14,07,1992
D4	US 4671963	Stearate treated food products	07,06,1987
D5	US 6039988	Laminated baked product and method of making the same	21,03,2000
D6	WO 9201394	Moisture barrier film	06,02,1992

6. Análisis de patentabilidad (Artículo 14 D. 486)

El solicitante pretende que se le proteja

Un producto comestible, multicapa (usado como una barrera de humedad) comprendiendo por lo menos una capa de lípido que contiene una mezcla de triglicéridos que tiene un punto de fusión de 35°C o menos y por lo menos una capa de barrera hidrófoba flexible.

Lo que caracteriza el solicitante es un producto que al menos tenga una capa con mezcla de triglicéridos con punto de fusión menor a 35°C y una capa hidrófoba.

D1 relaciona un producto comestible que también sirve como barrera, donde al menos existe una capa con triglicéridos y punto de fusión menor a 35°C. (ver especialmente resumen de la invención y columna 4). Luego D1 le quita la novedad a la presente solicitud. D2 relaciona compuestos que incorporan barreras para la humedad, los cuales a su vez señalan compuestos grasos con puntos de fusión inferiores a 35°C (ver columna 8). D3 también enuncia barreras contra la humedad que incorporan sustancias grasas con puntos de fusión inferiores a 35°C; aún más los da por conocidos en el arte (ver todo el documento). D4 enuncia un recubrimiento que previene la migración de humedad y está realizado con sustancias grasas con puntos de fusión inferiores a 35°C. D5 relaciona un laminado que incluye una capa grasa que previene el paso de humedad, donde también los componentes grasos tienen puntos de fusión inferiores a 35°C. Lo mismo sucede con el documento D6.

Un técnico medio conoce que en la industria de los alimentos para evitar la migración de agua entre sectores se deben colocar barreras, las cuales deben ser hidrófobas. Además, el técnico medio conoce que en alimentos comúnmente se usan compuestos lipídicos con puntos de fusión inferiores a 35°C ya que dicha temperatura corresponde a un parámetro definido para que productos grasos sólidos se disuelvan en la boca de una persona sin mayor esfuerzo y puedan estar sólidos a temperaturas de almacenamiento ambiente de 20°C e inferiores. Por consiguiente, el planteamiento del solicitante no es nuevo y es evidente para un conocedor del arte.

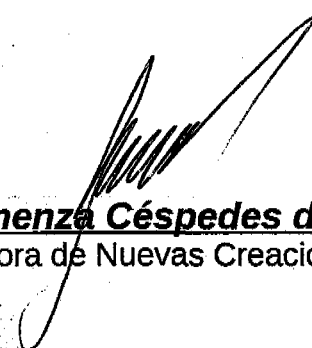
7. Conclusión:

Los requisitos de patentabilidad de la presente solicitud se encuentran afectados así:

N°	Documento N°	Reivindicaciones afectadas	Requisito que afecta
D1	US 5147670	1 - 19	Novedad
			Nivel Inventivo
D2	US 5520942	1 - 19	Novedad
			Nivel Inventivo
D3	US 5130151	1 - 19	Novedad
			Nivel Inventivo
D4	US 4671963	1 - 19	Novedad
			Nivel Inventivo
D5	US 6039988	1 - 19	Novedad
			Nivel Inventivo
D6	WO 9201394	1 - 19	Novedad
			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 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 N° 10 de 2001.


Alix Carmenza Céspedes de Vergel
Directora de Nuevas Creaciones (C)

Concepto Técnico No. **2967**
Examinador Técnico **202003**

El anterior requerimiento fue notificado por fijación en lista, de fecha

30 SET. 2010

United States Patent
Cebula et al.

(11) Patent Number: 5,147,670
(5) Date of Patent: Sep. 15, 1992

EDIBLE FAT-BASED FILMS

[54] Inventors: Deryck J. Cebula, Eaton Sogoo, John P. Pierce, Rosalind Norflantz, both of Great Britain

[73] Assignees: Lever Brothers Company, Division of Conaheen, Inc., New York, N.Y.

[21] Appl. No.: 587,245

[22] Filed: Jul. 25, 1990

[30] Foreign Application Priority Data

Jul. 25, 1989 [EP] European Pat. Off. 89201943.6

Jun. 21, 1990 [EP] European Pat. Off. 90036944.4

[51] Int. Cl. A23D 9/06; A23P 1/08

[52] U.S. Cl. 426/310; 426/330.6

[53] Field of Search 426/310, 426/330.6

[56] References Cited

U.S. PATENT DOCUMENTS

2,886,438 5/1959 Basky et al.

3,479,191 11/1969 Cole

3,600,186 6/1971 Mattoon et al.

FOREIGN PATENT DOCUMENTS

4,157,334 1/1979 Helio 426/310

4,880,657 11/1989 Gaffey et al.

4,999,964 4/1990 Adams et al.

4,999,960 10/1990 Kester 426/38

0236288 9/1987 European Pat. Off.

0236289 9/1987 European Pat. Off.

0235181 10/1988 European Pat. Off.

0290428 11/1988 European Pat. Off.

1403253 5/1995 France

6220573 5/2000 Japan

OTHER PUBLICATIONS

Pette, Sellen, *Ausdrichmittel* 80(5), 180-186 (1978).

Emulsions: *Theory and Practice*, p.2 (New York).

Primary Examiner—Caswell Padon

Attorney, Agent, or Firm—Gerard J. McGowan, Jr.

ABSTRACT

The present invention pertains to edible diffusion-retarding fat-based films for food products based upon a blend of one or more polyol fatty acid polyesters. The films are particularly suitable for filled confectioneries.

6 Claims, No Drawings

5,147,670

BACKGROUND OF THE INVENTION

The present invention relates to edible diffusion-retarding fat-based films for food products. In many food products, and in particular composite food products, such as coated, layered or filled products, fat and moisture-migration or diffusion upon storage from one food material to an adjacent food material causes product degradation due to the deleterious effects by the migrating material or component upon the appearance, the consistency, the microbiological or chemical stability and/or the flavor balance of the introduced or intruding material.

Accordingly, migration and diffusion effects provide a principal difficulty in terms of structural and compositional freedom and consumer acceptability. Food products suffering from degradation due to such migration or diffusion phenomena may be found in every food industry area where products are encountered requiring long-term physical separation of food materials from each other or from the environment.

Examples of diffusive food products are encountered in the bakery industries, such as with baking mixes comprising fresh nut or fruit pieces, meat-filled pastries, pizzas, snack products and toasts, and in the confectionery, chocolate and dairy industries such as filled chocolates, in particular pralines, coated or wafered ice-creams, liquid-filled candy bars, cream-filled biscuits and the like.

In general the greater the difference in the fat or moisture content or in the type of fat between the adjacent food materials, the greater the risk of fat- or moisture-migration upon storage will be.

In the art the above problems of migration or diffusion into or between food materials have been approached by modification or adjustment of the food materials themselves, or by applying to or in-between adjacent food materials a film of an edible material more resistant to migration or diffusion, thereby slowing down deterioration of the food product upon storage.

In the area of bakery and confectionery products the use of triglyceride fats as, in particular, moisture barriers is known. Although dependent upon the storage temperatures involved generally barrier films have a relatively high solids content at the storage temperature of the product, and comprise saturated fatty acids. The provide a film structure of the layer. One in this application of such barrier films has been the use of fully saturated compounds such as found in beeswax, tallow, carnauba wax and the like, or other hard. An additional problem frequently encountered with particularly low-melting applications of fat-based barrier layers is that of cracking of the barrier layer upon storage resulting in decreased barrier efficiency. Prior art disclosures have not provided a fully adequate solution.

SUMMARY OF THE INVENTION

It has now been found that the use of fat-based films or barrier layers which include considerable amounts of polyol fatty acid polyesters provide a very good protection to fat and moisture migration, polyol fatty acid polyesters showing good cracking behaviour upon storage over a wide range of temperatures. The fat-like properties of polyol fatty acid polyesters allows application in a wide variety of food products, the improved

barrier behaviour providing an improved shelf-life by the increased resistance for prolonged periods of time against fat and moisture migration.

The polyol fatty acid polyester based films are particularly useful for confectionery applications where fat migration is prohibitive to satisfactory product formulation as also for applications involving cold or frozen storage conditions, such as composite or coated frozen products.

Accordingly, in its broadest aspect the present invention provides an edible diffusion-retarding fat-based film for food products the fat component of said film comprising 30 to 100% by weight of a blend of one or more polyol fatty acid polyesters.

In a further aspect the present invention provides food products comprising an edible diffusion-retarding fat-based film, the fat component of said film comprising 30 to 100% by weight of a blend of one or more polyol fatty acid polyesters.

In still a further aspect the present invention provides composite food products comprising two or more food materials physically separated by an edible diffusion-retarding fat-based film, the fat component of said film comprising 30 to 100% by weight of a blend of one or more polyol fatty acid polyesters.

In a specific aspect the present invention provides composite food products comprising a material comprising a continuous fat-phase and a material sensitive to fat-migration separated by an edible diffusion-retarding fat-based film, the fat component of said film comprising 30 to 100% by weight of a blend of one or more polyol fatty acid polyesters.

In a further specific aspect the present invention provides the use of a blend of one or more polyol fatty acid polyesters as fat-migration retarding component in edible fat-based films for composite food products.

In an alternative aspect the present invention provides edible food products comprising a material sensitive to fat-migration separated by an edible diffusion-retarding fat-based film, the fat component of said film comprising 30 to 100% by weight of a blend of one or more polyol fatty acid polyesters.

DETAILED DESCRIPTION OF THE INVENTION

The applications of polyol fatty acid polyesters as fat-replacers in low-calorie food products and as cryo-fat-modification agents have been described in e.g. U.S. Pat. No. 3,600,186, JP 62/28738, U.S. Pat. No. 2,886,438, EP 0 235 283, EP 0 271 951 and EP 0 290 420. Coatings of fresh fruits and vegetables with a composite film on the basis of carboxymethyl cellulose and sucrose fatty acid esters have been described in an article by Lowings and Cuts in *Proc. Inst. Food Sci. Tech. Ann. Symp.*, page 52 of July 1981.

These publications do not describe or suggest the application of polyol fatty acid polyesters in diffusion-retarding films.

The polyol fatty acid polyesters employed in the present invention are fatty acid polyesters derived from aliphatic compounds which comprise at least four free hydroxyl groups. Such polyols in particular include the group of sugar polyols, which comprises the sugars, i.e. the mono-, di- and polysaccharides, the corresponding sugar alcohols and the derivatives thereof having at least four free hydroxyl groups. Examples of the pre-

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fatted sugar polyols include glucose, mannose, galactose, xylose, fructose, sorbitol, tagatose, ribitose, xylitol, malitose, lactose, cellobiose, raffinose, sucrose, erythritol, mannitol, lactitol, sorbitol, xylitol and α-methylglucose. The monose polyol is preferred most. The degree of conversion to polyester, which is defined as the percentage of polyol hydroxyl groups that, on an average, have been esterified with fatty acids, should be 70% or more, and preferably is 85 or even 95% or more.

In general, and preferably in view of resistance to enzymatic degradation, polyol fatty acid polyesters having the high degrees of conversion in accordance with the invention, are selected from indigestible polyesters. For the purposes of the invention by indigestible is meant that about 75% by weight or more of the material concerned is not digested by the human body.

Stable blends of one or more polyol fatty acid polyesters for use in the fat-based films in accordance with the present invention are characterized by a N_{50} value which corresponds to a relatively high solid content of the temperature range of normal storage. Most of the films have been prepared from a mixture of polyol fatty acid polyesters and a sugar alcohol, such as sorbitol, mannitol, xylitol, or glycerol, in a weight ratio of 1 to 10.

It has been found that the N_{50} value refers to the N_{50} value of the normal storage temperature of the food product in which the film is intended for use. For the purposes of the present invention it has been found convenient to take the normal storage temperature for films intended for non-frozen applications to be 20°C . for edible applications to be 5°C . and for frozen applications to be -20°C .

The N_{50} value at mouth temperature of soluble blends of one or more polyol fatty acid polyesters for use in the fat-based films in accordance with the present invention is selected to be relatively low, in particular in applications where retrograde characteristics play an important role, and is suitably characterized by an N_{50} of 70 or less, in particular an N_{50} of 50 or less the range of 30 to 60 being most suitable, and an N_{50} of 20 or less, in particular an N_{50} of 10 or less, as N_{50} within the range of from 10 to 20 being preferred most. For cold storage applications an N_{50} within the range of from 0 to 10 and for particular within the range of from 0 to 5 are preferred most.

The selection of the appropriate blend of fatty acids in the polyester is determined by the above-specified melting characteristics of the polyol fatty acid polyester, as conveniently defined by its N_{50} value or N_{50} value. The N_{50} value is the graph of N_{50} values versus the temperature t . The N_{50} value is conveniently measured by the nuclear magnetic relaxation technique and is a direct measure of the level of solid fat content at temperature t . This method is suitably described in Fette, Seifen, Anstrichmittel 80(5), 180-186 (1978). To some extent the measurement of N_{50} values is dependent on the temperature profile used to prepare the samples for the NMR-measurement. For the purposes of the present invention the following preparatory temperature profile is adopted: 30 minutes at 60°C , 50 minutes at 0°C , 40 hours at 25°C , again 50 minutes at 0°C , and finally 60 minutes at the temperature of the measurement, after which the NMR measurement is carried out.

Fatty acids per se, lower aliphatics thereof or naturally occurring fats and oils may be used as source for the polyester fatty acids. Conventional techniques may be used to introduce the required fatty acid composition and degree of saturation. Suitable such techniques include hydrogenation, interesterification and fractionation, and may be used before or after conversion of the polyols to the corresponding polyol fatty acid polyesters.

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Sources of suitable polyester fatty acids blends are vegetable oils, in particular soybean, sunflower, safflower, cottonseed, palm and palm kernel oils. Such oils may be partially or fully hydrogenated, and in options may be specifically product specifications the use of mixtures of, optionally partially or fully hydrogenated oils may be of special advantage.

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Instead of a single polyol fatty acid polyester, a polyester which is synthesized from a polyol and a source for the fatty acid residues in a single reaction, is also a mixture of polyol fatty acid polyesters may be used to provide the overall solid profile of the final blend in accordance with the present invention.

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In this specification the term "blend" is intended to encompass both a single polyol fatty acid polyester and a mixture of more than one polyol fatty acid polyester. The present invention may consist solely of the one or more polyol fatty acid polyester, but also allows mixing with other materials, such as natural cocoa-butter and nut-oils, such as hazel and peanut oils, provided such mixing does not result in a fat component having a solid content outside the range of the range as indicated hereinafter for the blend of polyesters. If a mixture is contained in the range of 50 to 100% by weight of the fat component, and preferably is within the range of 75 to 100%, to take full advantage of the improved film characteristics, the fat component of the film composition most preferably consists of 90% by weight or more of the blend of polyesters.

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The fat component may be the sole component of the film, or it may be the continuous phase of a dispersion, suspension or emulsion. In general the film composition comprises from 20 to 100% of fat component, and preferably comprises from 50 to 100%, and most preferably from 60% to 100% by weight.

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In addition to the blend of polyol fatty acid polyesters and optionally further fatty materials the film composition in accordance with the present invention may comprise one or more further film ingredients, in particular coloring and flavoring components.

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In food products, such as candy, confectionery and ice-cream products, the film composition may further comprise ingredients such as sugar, water, suitable flavoring, in particular cocoa powder, chocolate liquor or cocoa mass, or nut or fruit flavorings, milk solids, and emulsifier, such as in particular lecithin, preservatives and antioxidants, and vitamins, such as vitamin E.

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In the manufacture of the food products in accordance with the present invention the film is applied by conventional methods, such as in molten form following by solidification, in solution in a suitable liquid-dissolving solvent, such as e.g. alcohol, and subsequent removal of the solvent, or as an emulsion followed by drying. Suitably the film is applied by spraying of the film material in molten form onto the food material to be coated or to be physically separated from the further food material.

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In the finished food products suitable thickness of the barrier material layer is primarily dictated by method of application and/or hygienic considerations. In general the film is applied in a thickness of up to 1 mm, and preferably of from 0.01 to 0.5 mm, a thickness of from 0.02 to 0.05 mm being preferred most.

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It is also possible to use the film in accordance with the present invention to a multiple form, i.e. in combination with one or more films on the basis of other materials, as selected from the group of hydrogenated vegetable oils, paraffin waxes, proteins such as gelatin, polysaccharides, such as starch, pectin, carrageenan, dextrans and cellulose derivatives. In particular, carboxymethylcellulose, methylcellulose, hydroxypropyl methylcellulose and hydroxypropyl cellulose.

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The films according to the present invention find particular application in composite packaging products, such as for example, in the form of a film laminate, in which the film is applied to one or more layers of other materials, such as paper, cardboard, plastic, metal, glass, etc. The films are further in particular applicable in the form of a film laminate, in which the film is applied to one or more layers of other materials, such as paper, cardboard, plastic, metal, glass, etc.

-continued-

chocolate	filling
top washer	bottom washer
score powder (10-25% fat)	5.0%
hydrogenated palm kernel oil	45.0%
chocolate coating (in %)	31.9%
lecithin	0.4%

(*) non-tempered hydrogenated and fractionated blend of soybeans oil and palm oil 50% 37°C and 50% 37°C and 50% 37°C and 50% 37°C

The chocolate was prepared by conventional processing involving melting, refining by roller mill and conching. The molten chocolate was cooled to about 40°C , before introduction into the top washer and subsequently cooled in a cooling tunnel at 10° to 15°C . The filling was prepared by simple mixing and the molten filling was introduced into the bottom washer at about 40°C .

Two sucrose fatty acid polyester films were evaluated on their barrier behaviour:

57B-1: sucrose fatty acid polyester derived from a blend of 55% of fully hydrogenated soybean oil (top washing point 60°C) and 45% of rough hardened soybean oil (top washing point 27°C). The polyester having a degree of conversion of 95% and a N_{50} value of 37°C.

57B-2: sucrose fatty acid polyester derived from a blend of 55% of fully hydrogenated palm kernel oil and 45% of fully hardened palm kernel oil. The polyester having a degree of conversion of 95% and a N_{50} value of 37°C.

TABLE I

penetration values of succinonitrile in trim silver chloride at 25°C			
storage time	SPP-1	SPP-2	no film
1 day	5	3	7
1 days	5	11	14
14 days	20	15	23
28 days	38	30	36

The results in Table I clearly illustrate the diffusion-retarding properties of the polyester films.

What is claimed is:

1. A composite food product comprising two or more fat based components physically separated by an edible fat diffusion-retarding film based on fat which comprises 50 to 100% by weight of a blend of one or more polyol fatty acid polyesters.

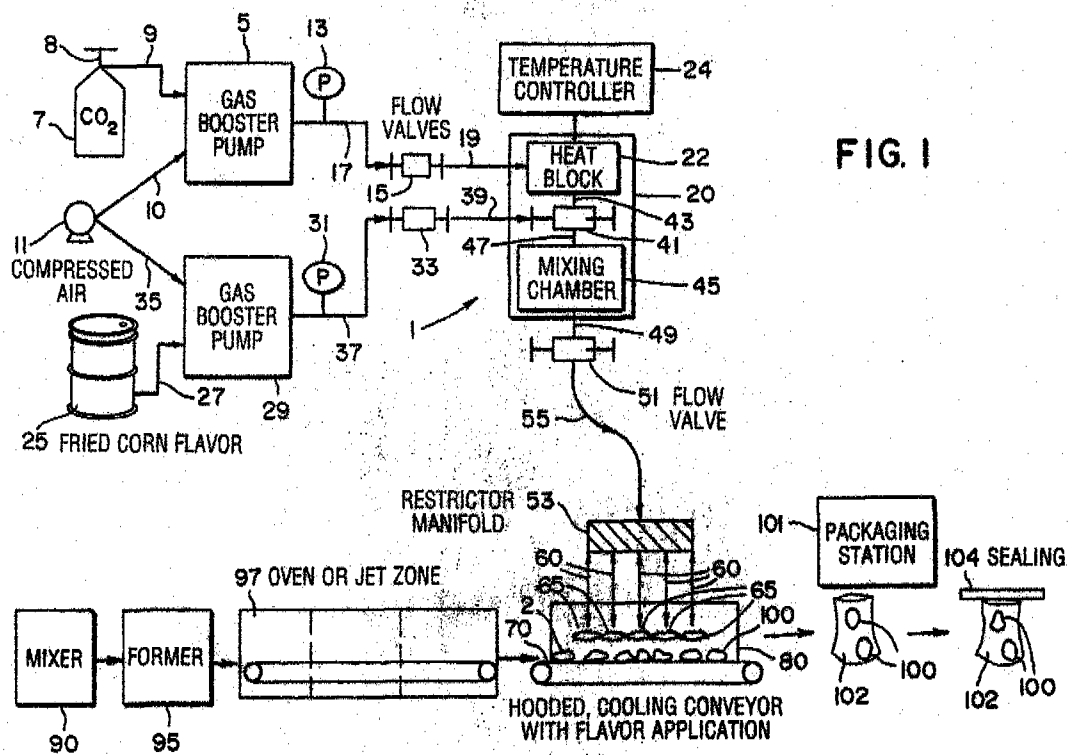
2. The food according to claim 1 in which the polyol fatty acid polyesters are the polyester products of polyols selected from the group of sugars, sugar alcohols and sugar derivatives having at least four free hydroxyl groups, and fatty acids derived from partially or fully hydrogenated vegetable oils, having a degree of conversion of 95% or more.

3. The food according to claim 1 in which the blend of one or more polyol fatty acid polyesters has an N_{50} value of 60 to 95, an N_{50} below 70 and an N_{50} below 20.

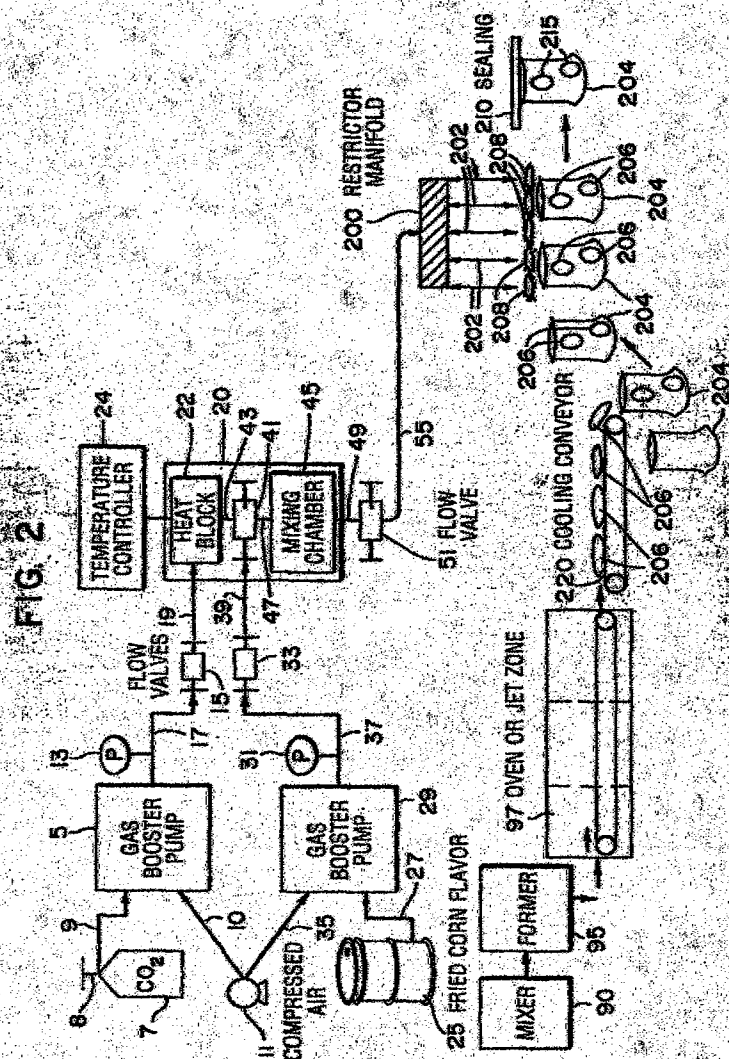
4. The food according to claim 1 in which the fat component of the film comprises of from 70 to 100% by weight of the blend of one more polyol fatty acid polyesters.

5. A composite food product comprising both a material comprising a continuous fat-phase and an edible fat diffusion-retarding film based on fat which comprises 50

[illegible]



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SNACK FOOD COATING USING SUPERCRITICAL FLUID SPRAY

FIELD OF THE INVENTION

The present invention relates to the production of no-fat, low fat and reduced fat coated foods such as chips, nuts, bread sticks, crackers and cookies, using a supercritical fluid as a solvent/carrier for edible, heat-sensitive or highly volatile ingredients such as oil- or fat-soluble flavors, colorants, odorants, or vitamins.

BACKGROUND OF THE INVENTION

The coating of baked products by spraying with an oleaginous or hydrophobic composition is disclosed in U.S. Pat. Nos. 5,130,150, 4,960,600, 4,038,422, and 3,484,250. The dispensing of pressurized oil-based compositions from a pressurized container onto a food product such as meat or a salad is disclosed in U.S. Pat. Nos. 4,801,465 and 2,844,469, respectively.

However, in the topical application of flavors, colorants, odorants, or other food additives or compositions to foods using an oleaginous composition, such as spray-oil, as a solvent or carrier substantially increases the fat content of the product. The oil-based carrier not only serves as a carrier for the additive but also may promote desirable adhesion of the additive to the substrate. A glossy appearance, lubricious mouth feel, and desirable color, flavor, and texture attributes may also be provided to the final product by the oil-based carrier.

Replacement of oil with water as a spraying medium can adversely affect the texture and microbial stability of products such as baked goods. While excess water may be removed by further heating or drying, these additional steps may decompose or volatilize heat sensitive or volatile additives. The additional heating may also increase "chipping" or breakage problems in baked goods or adversely affect their flavor, color, appearance, or texture.

U.S. Pat. No. 4,335,149 discloses the direct condensation of volatiles, such as coffee aroma, on a food substrate, such as coffee, at cryogenic temperatures. The substrate is cooled cryogenically and then fluidized. The gaseous volatiles are then condensed onto the cryogenically coated substrate.

Direct application of flavors, colorants, odorants, or other additives without a carrier, solvent, or diluent leads to problems of uneven distribution of the additive, localized concentrations or "hot spots" of the additive, and loss of the desirable appearance, taste and texture attributes imparted by oil- or fat-based carriers.

The use of supercritical carbon dioxide as a solvent for spraying insoluble coatings onto an insoluble substrate is disclosed in U.S. Pat. Nos. 5,108,799, 5,027,742, 4,970,093, 4,923,720, 4,882,167, and 4,582,731 and in Nielsen et al., "Supercritical Fluid Spray Application Technology: A Pollution Prevention Technology For The Future," Union Carbide Chemicals and Plastics Company, Inc., South Charleston, W. Va., 17th Water Works & Higher Solids Coatings Symposium, New Orleans, La. (Feb. 23-25, 1990).

Shaw et al., C & EN, pages 26-39 (Dec. 23, 1991) discloses that the extraordinary solvating power, high compressibility, and mass transport characteristics of supercritical water make it an unusual medium for chemical reactions.

Rizvi et al., Food Technology, pages 55-65 (June 1986) discloses the use of supercritical fluids as solvents for the extraction of food components from foods such as hops, coffee, tea, tobacco, and spices.

U.S. Pat. No. 5,035,908 discloses injecting gas or supercritical fluid into a coffee fluid in the production of soluble coffee forms such as freeze-dried and roasted whole bean look-alikes.

U.S. Pat. No. 5,120,359 discloses injection of a supercritical fluid carrying various flavors, colorants, or other solubilized materials into a dough.

However, spray coating of a baked product or other food using a supercritical fluid or high pressure gas as a carrier to reduce fat content is not disclosed in these references.

The present invention provides a process for the preparation of no-fat, low-fat, and reduced fat coated foods such as baked goods, snacks, nuts, and the like by replacing a substantial portion of an oil-based carrier with a high pressure gas or supercritical fluid as a carrier and/or solvent for food additives such as flavors, colorants, moisture barriers, vitamins, and odorants. The no-, low-, and reduced fat products of the present invention exhibit the appearance, taste, and textural attributes of higher fat or oil content sprayed products.

SUMMARY OF THE INVENTION

In the present invention, no-, low-, or reduced-fat foods such as nuts, chips, snacks, crackers, cookies, breadsticks, or other baked goods are produced using a high pressure gas or a supercritical fluid, such as supercritical carbon dioxide, as a solvent or carrier for an oil- or fat-soluble flavorant, odorant, vitamin, other edible heat sensitive or highly volatile food ingredients, or edible moisture barriers such as waxes and hydrocolloids. The high pressure gas or supercritical fluid, preferably supercritical carbon dioxide, replaces a substantial portion of a fat- or oil-based carrier or solvent for topical application of a heat-sensitive or volatile ingredient to a baked, fried, roasted, microwaved, or cooked product. The supercritical fluid or high pressure gas and the volatile or heat sensitive ingredient may be sprayed onto the food product at low temperatures, prior to or after insertion of the product into a package.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic diagram of a supercritical fluid flavor delivery system for the post-bake spraying of snack chips before they are packaged.

FIG. 2 is a schematic diagram of a supercritical fluid flavor and fragrance delivery system for the spraying of snack chips in a package.

DETAILED DESCRIPTION OF THE INVENTION

In embodiments of the present invention, the amount of oil or fat-based carriers or solvents used to typically apply food additives or food enhancers may be substantially reduced or eliminated to enable production of reduced fat, low fat, and even no-fat products. The oil-based or fat-based carriers or solvents are replaced in whole or in part by a supercritical fluid or high pressure gas. The supercritical fluid or high pressure gas serves as a spray medium or carrier for flavors, odorants, colorants, moisture barriers, vitamins, other food additives or food enhancers, and mixtures thereof. In embodiments of the invention, post baking or post cooking application of the food additives or enhancers substantially reduces loss of the additives or enhancers due to heat decomposition or volatilization in the production of

food products such as baked goods or leavened products, snacks, and nuts.

As used herein, a reduced fat food product is a product having its fat content reduced by at least 25% by weight from the standard or conventional product. A low fat product has a fat content of less than or equal to about two grams of fat per 30 gram serving. A no-fat or zero-fat product has a fat content of less than or equal to about 0.5 grams of fat per 30 gram serving or less than or equal to about 1.67% fat, based upon the total weight of the final product.

The food additive is spray coated onto the surface of a food product by vaporizing a supercritical fluid or high pressure gas from the additive. The additive coating is obtained from a solution, suspension, or dispersion of the additive and a supercritical fluid or high pressure gas.

Vaporization occurs by passage of the atmosphere of supercritical fluid and additive from a high pressure zone through an orifice or spray head to a low pressure zone outside of the orifice to form a spray of food additive particles or droplets which are deposited onto predetermined areas of the food surface. The food additive, high pressure gas or supercritical fluid spray may undergo a pressure drop off at least about 450 psi, generally at least about 900 psi upon spraying to achieve atomization. The deposition is preferably as an essentially uniform film covering substantially the entire food surface.

As used herein, reference to supercritical fluids as solvents for the food additive connotes the dissolving of the food additive by the supercritical fluid or vice versa. However, the invention also includes the dispersion and suspension of the food additive by the supercritical fluid. Thus, it is to be understood that solvent and carrier are intended to mean that the additive is rendered into a more fluid flowable condition by virtue of the supercritical fluid or high pressure gas. It includes dissolving, suspending, emulsifying, and/or dispersing of the food additive by the supercritical fluid or high pressure gas or vice versa so that the additive is characterizable by a lower viscosity and a more fluid composition for the transport of the food additive.

Near-supercritical liquids also demonstrate solubility characteristics and other pertinent properties similar to those of supercritical fluids. The solvent may be a liquid at the supercritical temperatures, even though it is a solid at lower temperatures. In addition, fluid modifiers can often alter supercritical fluid properties significantly, even in relatively low concentrations, greatly increasing solubility for some solutes. As used herein, the phrase "supercritical fluid" indicates a compound above, at, or slightly below the critical temperature and pressure of that compound.

At pressures above the critical point, the resulting supercritical fluid or "dense gas" will obtain densities approaching those of a liquid and will assume some of the properties of a liquid. These properties are dependent upon the fluid composition, temperature, and pressure. Just above the critical temperature, small changes and pressure result in large changes in the density of the supercritical fluid. The "liquid-like" behavior of a supercritical fluid at higher pressures results in greatly enhanced solubilizing capabilities compared to those of the "subcritical" compound with higher diffusion coefficients and an extended useful temperature range compared to liquids.

In the present invention, the greater the ratio of additive carried to the amount of supercritical fluid, the quicker are the coating, dissolving, and the less the amount of supercritical fluid required for coating the product. It has been found that increasing the pressure increases the amount

of food additive carried per unit weight of supercritical fluid. The carrier medium may be dissolution of the additive in the supercritical fluid or vice versa, or it may involve dispersion, suspension, emulsification, or combinations thereof. In the present invention, the ratio of the weight of food additive to the weight of supercritical fluid or high pressure gas is at least about 1:1, preferably at least about 1:2, most preferably at least about 1:1 on a consistent basis. It is believed that at weight ratios of additive to carbon dioxide in the range of about 1:1 to 2:1, for example, there is a single phase flow of material instead of two-phase flow and increasing system pressure (e.g., up to 3900 psi) results in a linear increase in grams of flavor delivered per gram of carbon dioxide.

Exemplary compounds which are known to have utility as supercritical fluids are given in Table I:

TABLE I

Compound	Examples of Supercritical Solvents			Critical Pressure (atm)	Critical Density (g/cm ³)
	Boiling Point (°C)	Critical Temperature (°C)	Critical Pressure (atm)		
CO ₂	-78.5	31.1	73.8	0.445	
N ₂	-195.8	-126.3	33.5	0.254	
CH ₄	-162.0	-82.1	45.5	0.3	
H ₂ O	100.00	374.15	218.3	0.315	
Methane	-82.56	35.5	71.7	0.45	
Ethane	-88.40	32.1	48.3	0.3	
Propane	-42.1	96.7	41.9	0.217	
Butane	-0.5	152.0	37.7	0.227	
Pentane	36.1	196.6	33.3	0.232	
Hexane	68.7	234.0	29.5	0.232	
Heptane	93.6	269.6	26.7	0.232	
Octane	125.6	297.6	23.5	0.232	
Nonane	150.8	319.0	21.5	0.232	
Decane	174.0	340.0	19.5	0.232	
Undecane	195.8	359.0	17.5	0.232	
Dodecane	218.2	376.0	15.5	0.232	
Tridecane	239.8	391.0	13.5	0.232	
Myristane	261.8	405.0	11.5	0.232	
Pentadecane	283.8	419.0	9.5	0.232	
Hexadecane	306.3	433.0	7.5	0.232	
Heptadecane	328.3	447.0	5.5	0.232	
Octadecane	350.8	461.0	3.5	0.232	
Nonadecane	372.8	475.0	1.5	0.232	
Eicosane	395.3	489.0	0.5	0.232	

Supercritical carbon dioxide fluid and/or supercritical nitrogen fluid is preferably used in the present invention because of the low toxicity, low critical temperature, and low cost of carbon dioxide and nitrogen. Other supercritical fluids and mixtures thereof may be used provided the compounds are of low toxicity and their critical temperatures are sufficiently low so as not to result in heat decomposition or excessive volatilization of the food additive. In addition, the supercritical fluid should preferably be that of a nonflammable compound. For example, aerosols, aerosols (A-20) may be used as a supercritical fluid alone or in combination with carbon dioxide. In the present invention, a substantially thinner, uniform layer of the additive is deposited upon the food substrate than is achieved by the conventional spray or deposition method. The layer of the food additive on the substrate surface may be continuous or discontinuous. The liquid and/or solid particles which are deposited as fine or coarse particles on the surface or may be deposited as a thin mask of discrete particles. It is believed that the uniformity of the additive coating is due to the entire surface of the food substrate provides for the initial appearance, taste, and textural attributes of fat or oil sprayed products which have substantially thicker coatings. In addition, the use of less amount of fat as a carrier decreases the fat masking effect that the fat has on flavorants. Thus, even if masking effect of additives are dependent on the surface, their surface area initially available to the tongue, taste and saliva are not substantially reduced by reducing the

existing thickness. Also, the deposition of small particles which do not coalesce into a flat continuous layer may increase the surface area available for initial sensory impact by providing peaks and valleys.

The additive particles supplied in the spray to the food surface may be from about 1 micron in diameter to about 100 microns in diameter. Exemplary thicknesses of the food additive coating may range from about 1 micron to about 100 microns.

The food additive may be applied to the food substrate without the use of a solvent or carrier other than the supercritical fluid or high pressure gas. Solvents or carriers other than the supercritical fluid or high pressure gas which may be used in the present invention include non-toxic, edible solvents which are capable of dissolving, dispersing, or suspending the food additive in combination with the supercritical fluid. Although minimal, if any, use of a carrier other than the supercritical fluid is generally desired, inclusion of other solvents or carriers for the food additive may be needed for delivery of the food additive to the apparatus for admixing with the supercritical fluid. In addition, commercially available forms of the food additive may include a solvent carrier. For example, the additive solvent may be an oil for fat-soluble flavors or vitamins, C₁₂-soluble, propylene glycol, ethanol, cranberries, and water are examples of solvents or carriers which may be used with the additives.

In addition, conventional oleaginous-based carriers, such as spray oil may be used in combination with the supercritical fluid where the desired solubility, dispersibility or suspension ability of the food additive may not be achieved using the supercritical fluid alone. However, the present invention still permits substantial reduction in the fat content of food products. In the present invention, the amount of oleaginous carrier or solvent, such as spray oil, is reduced by at least about 25% by weight, preferably at least about 50% by weight, most preferably at least about 75% by weight, based upon the weight of the oleaginous carrier conventionally used in the typical application of a food additive or enhance.

Conventional solvents or carriers for the additives may range from 0 to about 75% by weight, based upon the total weight of the additive, solvent, and supercritical fluid. For example, the amount of fat in a spray formulation may be as much as 75% by weight, based upon the total weight of the spray formulation.

Administering of the supercritical fluid, such as supercritical carbon dioxide fluid, with the food additive and optional solvent, reduces the viscosity of the food additive and its solvent to a range where it can be atomized by passing it through a spray orifice, such as that of an aerosol, air-assisted, or air spray gun. After atomization, a substantial portion of the supercritical fluid vaporizes, leaving a substantial amount of the original food additive formulation and its optional conventional solvent. Upon contacting the substrate food, the remaining fluid mixture of food additive and its optional solvent may flow to produce a thin, uniform, smooth film on the substrate. If the food additive is a particulate or if a conventional solvent is not used or is used in low amounts, then the additive may be solidified as fine particles or it may be deposited as fine droplets that are uniformly dispersed onto the substrate surface.

In embodiments of the present invention, the additive, such as a flavorant, is pressurized, by means of a pump for example, and admixed with a supercritical fluid. The pressurized mixture of the food additive dissolved, suspended or

dispersed in the supercritical fluid may then be transported to the nozzle of a spray device. The supercritical fluid containing the food additive is rapidly passed through a relatively narrow orifice into an expanded area which causes an immediate pressure drop. The supercritical fluid expands to a gas or vapor essentially immediately, at an expansion rate which far exceeds the expansion rate of the more dense or viscous food additive and any optional solvent that accompanies the food additive. The food additive may expand faster than the food additive. The food additive and any accompanying solvent is broken or atomized into discrete particles or droplets. The gaseous or vaporous component which was the supercritical fluid, disappears from the particles or droplets into the general atmosphere.

The spray pressure used in the present invention depends upon the food additive formulation, the supercritical fluid being used as a carrier, and the viscosity of the liquid mixture. The minimum spray pressure just before expansion is at least at or slightly below the critical pressure of the supercritical fluid. It has been found that increasing the pressure substantially above the critical pressure of the supercritical fluid increases the amount of the food additive carried by the supercritical fluid. In embodiments of the invention, the spray pressure may be at least about 2,000 psi, preferably at least about 3,000 psi, most preferably greater than 5,000 psi and below about 10,000 psi.

The spray temperature which is used in the present invention depends upon the food additive formulation, the supercritical fluid being used, and the concentration of the supercritical fluid in the liquid mixture. The temperature of the product being sprayed and the amount and temperature of air entrained during spraying may also affect the spray temperature. The minimum spray temperature is at or slightly below the critical temperature of the supercritical fluid. The maximum spray temperature is the highest temperature at which the components of the liquid mixture, such as the flavorant or odorant, are not significantly thermally degraded during the time that the liquid mixture is at that temperature.

Prior to atomization, the spray composition is preferably heated to avoid condensing of solids, such as solid carbon dioxide, and any ambient water vapor present due to high humidity in the ambient air. For example, the spray formulation may be heated to about 31°C. If the supercritical fluid is supercritical carbon dioxide fluid, rapid expansion of the supercritical fluid could cause the spray nozzle or water which could result in clogging of the spray orifice. For supercritical carbon dioxide, the minimum spray temperature is about 31°C. The thermal stability of the components in the substrate determines the maximum spray temperature. Exemplary spray temperatures range from about 35°C to about 70°C. As the temperature of the supercritical carbon dioxide in the substrate increases, higher spray temperatures may be used to counteract the greater cooling effect caused by the expansion of the supercritical carbon dioxide.

Rapid cooling of the spray to near or below ambient temperature while it is close to the spray orifice may cause ambient air into the spray. Entrainment of the ambient air warms the spray to ambient or near ambient temperature before the spray reaches the substrate. The rapid cooling may be beneficial in reducing the amount of food additive which evaporates in the spray in comparison to the amount lost in conventional heated airless sprays.

The spray temperature may be obtained by heating the supercritical fluid or the food additive or both before administration.

ing them. The mixture of supercritical fluid and food additive may be heated before it enters the spraying device, such as a spray gun or spray drying nozzle. The spray gun itself may be heated, or the heated mixture may be circulated, or through the spray gun to maintain the spray temperature.

The environment in which the food substances are sprayed may be air or other gas environments which are sprayed near atmospheric pressure. Other gas environments which may be used include air with reduced oxygen content or inert gases such as nitrogen, carbon dioxide, helium, argon, xenon, or a mixture thereof. For example, the food substance, such as carotenes may be placed in oxygen impermeable packaging, preferably flushed with nitrogen, and then sprayed with the supercritical fluid mixture for application of an additive to the food product and its package.

Known spray devices, such as conventional spray guns may be used in the present invention. Conventional spray guns use nozzles which are designed to spray droplets of liquid. The spray gun may be of the type known in U.S. Pat. Nos. 3,556,411, 3,647,147, 3,659,787, 3,754,718, 3,907,202, 4,053,500, 4,097,000, and 4,362,869. The admixture of supercritical fluid and food additive may be filtered using conventional filters to remove particulates that may clog the spray orifice.

The spray may be in the shape of a cone that is circular or elliptical in cross section. It may be in the shape of a flat fan, a feathered spray, or a rounded parabolic shaped spray. The distance from the spray orifice to the substrate surface may range, for example, from about 4 inches to about 36 inches.

Exemplary food additives or enhancers which may be typically applied to food substances in accordance with the present invention include flavors or seasonings; odors or fragrances; colorants; nutrient barriers; vitamins and mineral supplements; and mixtures thereof. The additives may be heat sensitive or highly volatile components. The food additives may be fat or oil soluble or water soluble ingredients. The food additive may also be a non-mutative sweetener.

In the present invention, "heat-sensitive" additives include those ingredients or components that undergo a chemical denaturation or reaction into compounds which do not have the desired activity or characteristic flavor of the starting composition. Some heat-sensitive or heat-labile compositions, upon degradation, may result in the formation of undesirable compounds which produce an unpleasant taste or mouth feel and can affect the shelf stability of the food product. Heat-sensitive additives also include materials such as flavoring compositions that can change their physical integrity when heated, such as melting, volatilizing, or separation of components.

The flavors, odors, and colorants which may be sprayed in accordance with the present invention may be the same composition or compound or they may be different. For example, a commercially available flavorant composition may also function as an odorant and/or a colorant. The flavors, odors, and colorants may be natural or artificial.

Exemplary flavorants and seasonings which may be sprayed in accordance with the present invention include vanilla, vanilla, orange, lemon, butterscotch, chocolate, coffee, cocoa, and butter flavors; fruit flavors; cheese flavors; barbecue flavors; onion, garlic, jalapeno, capsaicin, and four cream flavors; food flavors; vegetable flavors; spice flavors; food flavors; and mixtures thereof, and the like.

Examples of commercially available flavorants which may be sprayed in accordance with the present invention are TASTEMAKER natural fried type flavor 243736, TASTEMAKER artificial fried flavor 246398, TASTEMAKER artificial French fry flavor 244315, TASTEMAKER natural fried potato flavor 251130, TASTEMAKER natural potato flavor 247798, FLOREXENECHE French Fry flavor 250130-13-08A11 and MCCORMICK French Fry Flavor F45312.

Exemplary odors or fragrances which may be sprayed in accordance with the present invention include aromatic materials which convey desirable aromas, such as cinnamon, history-smoked odors, barbecue odors, nutty fragrances, and the like.

Exemplary colorants or coloring materials which may be sprayed onto the food substances in accordance with the present invention include natural and artificial food colorings, brownings, compositions, dyes, and lakes.

The flavors, odors, and colorants may be used in effective amounts to provide a desirable level of flavor, odor, and coloring, respectively in the final coated product which is at least comparable to levels provided by the use of conventional oils or fat carriers. Exemplary amounts of these additives range from about 0.01% by weight to about 3% by weight, based upon the total weight of the final coated food product.

Exemplary vitamin additives include multi-vitamin preparations, individual vitamins, such as Vitamin E, Vitamin A, Vitamin D, Vitamin K, Vitamin B₁, Vitamin B₂, Vitamin B₆, Vitamin C, and folic acid. Exemplary minerals which may be used include calcium, iron, zinc, copper, magnesium, and phosphorus. The vitamins and/or mineral additives are used in amounts to provide a therapeutically effective amount of the additive in the final product. Exemplary amounts of the additive by weight to about 0.01% by weight to about 0.25% by weight of a vitamin and mineral premix, based upon the total weight of the final coated food product.

Non-mutative sweeteners for typical application in accordance with the present invention include saccharin, sodium cyclamate, aspartame, K, sucralose, cyclamate, allicin, glycyrrhizic acid, steviol glycosides, or other L-aspartic acid derivatives. The non-mutative sweeteners may be sprayed onto the food substance to provide sweetening amounts of the sweetener on the final product. Exemplary amounts of the non-mutative sweetener are from about 0.01% to about 1.0% by weight, based upon the total weight of the final coated food product.

Exemplary moisture barriers which may be sprayed onto the substances in accordance with the present invention include edible waxes, edible shellacs, and hydrocolloids such as alginate, pectin, carrageenan, gum, and xanthan gum, and zinc. Edible waxes include complex mixtures of alcohols, esters, and esters formed from long-chain fatty acids and low-chain alcohols, as well as long-chain alcohols, and are generally plastic solids at room temperature. The edible waxes may be natural or synthetic waxes such as beeswax, and/or vegetable waxes such as rice bran wax, and/or carnauba wax. Exemplary amounts of the moisture barrier are from about 0.5% by weight to about 3% by weight, based upon the total weight of the final coated product.

The shortening or fat which may be used in the sprays in accordance with the present invention may be any edible fat or oil or mixture thereof and may include conventional food-grade emulsifiers. Vegetable oils, lard, marine oils, and mixtures thereof which are fractionated, partially hydrogenated, and the like.

ated, and/or interesterified are exemplary of the shortenings or fats which may be used in the present invention. Edible reduced or low calorie, or non-digestible fats, fat substitutes, or synthetic fats which are process compatible may also be used. The shortenings or fats may be solid or fluid at room temperatures of from about 75° F. to about 90° F.

Exemplary emulsifiers which can be used include lecithin, sorbitan monostearate, mono- and/or di-glycerides, polyoxyethylene sorbitan fatty acid esters, such as polysorbates (e.g., polysorbate 20), sorbitan monostearate, and sodium lauryl sulfate-2-lauryls. Exemplary amounts are up to about 3% by weight of one or more emulsifiers based upon the weight of the final coated product.

Exemplary of the food products which may be coated in accordance with the present invention are fat-containing based or starch based foods such as crackers, cookies, potato chips, corn chips, extruded or expanded snacks, such as cheese balls, breadsticks, chip-like snacks which may be baked, microwave, and/or fried; roasted peanuts, cashews and almonds, and the like. The chip-like snacks may be produced from vegetable slices or fabricated from a dough or dough-like mixture.

A supercritical fluid delivery system 1 for the topical application of flavor to food products, such as snack chips 2, is shown schematically in FIG. 1. As shown in FIG. 1, liquid carbon dioxide 3 is pumped from a liquid carbon dioxide cylinder 7 or other source of carbon dioxide. The liquid carbon dioxide 3 may be preheated by passing it through a preheating jacket 8, and then it is pumped into a preheating chamber 9. The preheating chamber 9 is connected to a heating chamber 10 from a heater 11. The preheated carbon dioxide 3 is then pumped into a mixing chamber 12. The mixing chamber 12 is connected to a spray gun 13. The spray gun 13 is connected to a nozzle 14. The nozzle 14 is connected to a spray gun 15. The spray gun 15 is connected to a nozzle 16. The nozzle 16 is connected to a spray gun 17. The spray gun 17 is connected to a nozzle 18. The nozzle 18 is connected to a spray gun 19. The spray gun 19 is connected to a nozzle 20. The nozzle 20 is connected to a spray gun 21. The spray gun 21 is connected to a nozzle 22. The nozzle 22 is connected to a spray gun 23. The spray gun 23 is connected to a nozzle 24. The nozzle 24 is connected to a spray gun 25. The spray gun 25 is connected to a nozzle 26. The nozzle 26 is connected to a spray gun 27. The spray gun 27 is connected to a nozzle 28. The nozzle 28 is connected to a spray gun 29. The spray gun 29 is connected to a nozzle 30. The nozzle 30 is connected to a spray gun 31. The spray gun 31 is connected to a nozzle 32. The nozzle 32 is connected to a spray gun 33. The spray gun 33 is connected to a nozzle 34. The nozzle 34 is connected to a spray gun 35. The spray gun 35 is connected to a nozzle 36. The nozzle 36 is connected to a spray gun 37. The spray gun 37 is connected to a nozzle 38. The nozzle 38 is connected to a spray gun 39. The spray gun 39 is connected to a nozzle 40. The nozzle 40 is connected to a spray gun 41. The spray gun 41 is connected to a nozzle 42. The nozzle 42 is connected to a spray gun 43. The spray gun 43 is connected to a nozzle 44. The nozzle 44 is connected to a spray gun 45. The spray gun 45 is connected to a nozzle 46. The nozzle 46 is connected to a spray gun 47. The spray gun 47 is connected to a nozzle 48. The nozzle 48 is connected to a spray gun 49. The spray gun 49 is connected to a nozzle 50. The nozzle 50 is connected to a spray gun 51. The spray gun 51 is connected to a nozzle 52. The nozzle 52 is connected to a spray gun 53. The spray gun 53 is connected to a nozzle 54. The nozzle 54 is connected to a spray gun 55. The spray gun 55 is connected to a nozzle 56. The nozzle 56 is connected to a spray gun 57. The spray gun 57 is connected to a nozzle 58. The nozzle 58 is connected to a spray gun 59. The spray gun 59 is connected to a nozzle 60. The nozzle 60 is connected to a spray gun 61. The spray gun 61 is connected to a nozzle 62. The nozzle 62 is connected to a spray gun 63. 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United States Patent [19]

Averbach

[11] Patent Number: 5,130,151

[45] Date of Patent: Jul. 14, 1992

[54] NATURAL AND SYNTHETIC EDIBLE MOISTURE BARRIER

[75] Inventor: Benjamin L. Averbach, Belmont, Mass.

[73] Assignee: Megafoods, Inc., Dover, Mass.

[21] Appl. No.: 633,664

[22] Filed: Dec. 26, 1990

[51] Int. Cl.⁵ A21D 15/06; A23B 4/10; A23D 9/00

[52] U.S. Cl. 426/302; 426/304; 426/310; 426/611

[58] Field of Search 426/39, 99, 302, 304, 426/310, 611

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Assistant Examiner—Helen Pratt

Attorney, Agent, or Firm—Lahive & Cockfield

[57] ABSTRACT

A thin, edible moisture barrier consists essentially of oleaginous material and wax, and has a permeability value of less than 0.07×10^{-9} gm cm⁻² (cm Hg)⁻¹ cm. At least a portion of the oleaginous material is synthetic. The barrier can be applied as a molten solution to a food product surface, cooling rapidly to form a continuous barrier that prevents the migration of moisture into, out of, or between components of the food product.

30 Claims, 2 Drawing Sheets

U.S. Patent

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Sheet 1 of 2

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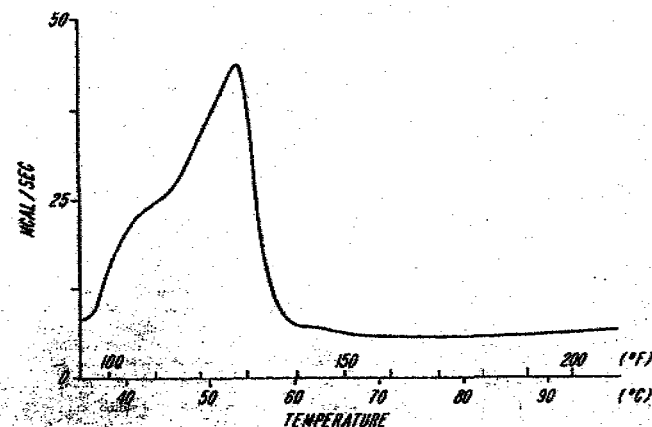


FIG. 1A

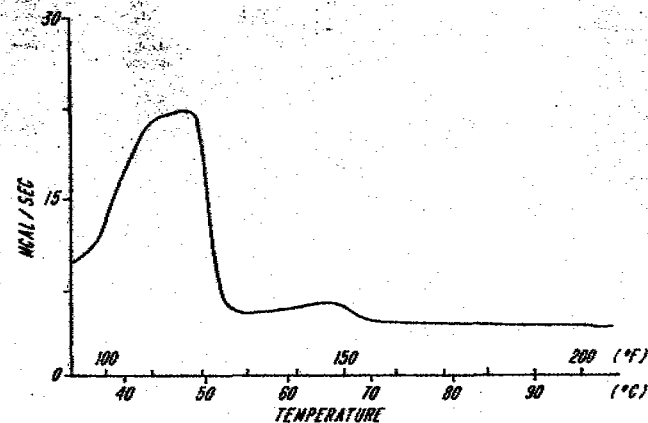


FIG. 1B

159

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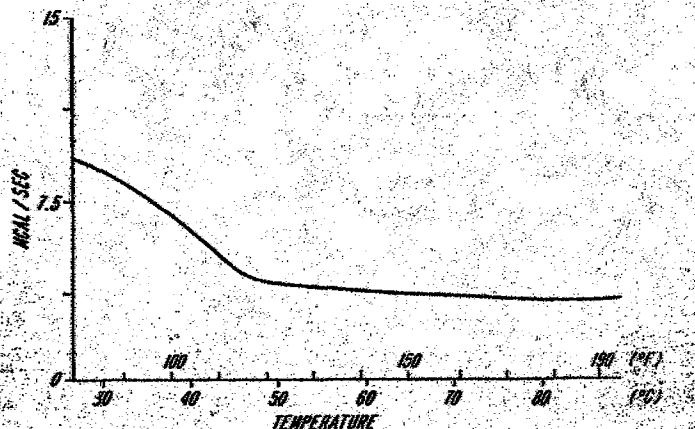


FIG. 2A

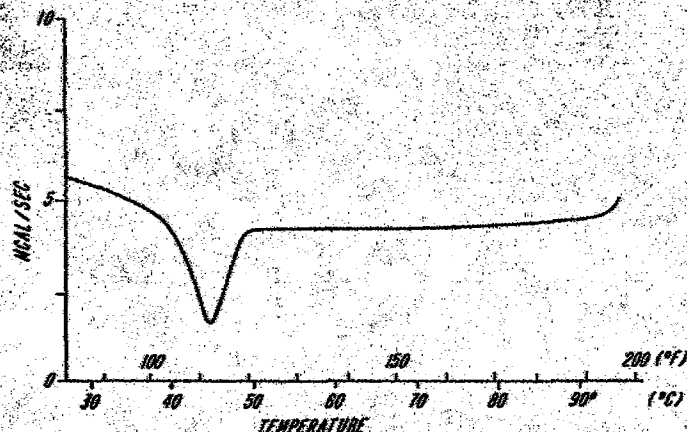


FIG. 2B

NATURAL AND SYNTHETIC EDIBLE MOISTURE BARRIER

BACKGROUND OF THE INVENTION

The present invention relates to an edible coating for food products. More particularly, this invention relates to an edible moisture barrier capable of inhibiting the migration of moisture through the surface of a food product. The moisture barrier is particularly useful in preventing moisture migration within a multi-component food product between components having different water activities.

For many food products, particularly cooked food products, critical levels of moisture must be maintained if the product is to exhibit optimum quality and acceptable safety. Moisture migration in finished food products can seriously compromise quality, stability and safety. For example, the loss of moisture out of food products having a relatively high moisture content, such as brownies or cookies, dries out these foods and they are perceived as having lost their freshness. Similarly, absorption of moisture from the surrounding atmosphere into a food product, especially having a low moisture content, such as a cracker, can cause the food product to become soft, losing the desired crispness associated with the fresh product. In addition, many chemical and enzymatic deterioration reactions proceed at rates partially governed by the moisture content of foods. Excessive rates of these reactions can promote deleterious changes in the flavor, color, texture, and nutritive value of food products.

In a multi-component food product, particularly those various components have different moisture contents and water activities such as, for example, a glazed doughnut, a sandwich, or a pie composed of a pie crust and a filling, the moisture can migrate between adjacent components, altering the character of several of the food product's components. For example, in a glazed doughnut, the glazing can absorb water from the fried dough body, becoming sticky and moist. At the same time, the dough body loses moisture, becoming dry.

In addition to compromising the quality of finished food products, moisture migration can hinder production and distribution of food products. For example, as the glazing on a doughnut absorbs moisture from the fried doughnut, the glazing deteriorates and becomes sticky.

Of the various methods of affecting moisture migration known in the art, coating the food product with an edible moisture barrier holds much promise. To have utility, the barrier should have a low permeability to moisture, in order to prevent the migration of water or water vapor. In addition, the barrier should cover the food surface completely, including crevices and adhere well to the food product surface. The moisture barrier should be sufficiently strong, soft and flexible to form a continuous surface that will not crack upon handling, yet can be easily penetrated during consumption. In addition, the barrier film's organoleptic properties of taste, after taste and mouth feel should be imperceptible, and there should be no awareness of the barrier when it is being bitten through. Finally, the moisture barrier should be easy to manufacture and easy to use.

Because lipids, such as, for example, oils, fats and waxes, are composed of water insoluble molecules capable of forming a water impervious structure, they

have been investigated for use in moisture barrier films. With respect to oleaginous materials (fats and oils), it has been shown that, unless an undesirably thick coating is used, the barrier is ineffective. Wax barriers have disadvantages as moisture barriers because they tend to crack upon handling or with changes in temperatures. Accordingly, many of the barriers in the art use a water-impermeable lipid in association with hydrocolloids (polysaccharides) such as alginate, pectin, carrageenan, cellulose derivatives, starch, starch hydrolysates and/or gelatin to form a gel structure that provides a cross-linked semi-rigid matrix to entrap and/or immobilize the nonaqueous material. In many cases these components are formed as bilayer films to provide water impermeability. These bilayer films may be precast and applied to a food surface as a self-supporting film with the lipid layer oriented toward the component with highest water activity (w_a). See, for example, U.S. Pat. No. 4,915,971 and PCT Publication No. 86/00501 (both to Farnema); U.S. Pat. No. 4,889,646 (Lew); and Greener et al. (1989) *Journal of Food Science*, vol. 54, pp. 1393-1399 and 1400-1406.

There are, however, a number of drawbacks associated with these barriers. The hydrocolloids themselves are water soluble and tend to absorb water with time. In addition, some hydrocolloids tend to make the barriers fairly stiff, requiring the addition of a plasticizer to increase flexibility. Furthermore, the thickness of some of these barriers may make their presence perceptible when they are being bitten through.

Another method is in use crosslinked, inflated shells for the matrix, see, for example, U.S. Pat. No. 4,710,228 for the matrix, or to form microemulsions of fat and water, see, for example, U.S. Pat. No. 4,600,951 to Rubenstein. However, the water permeability of both these types of barriers is fairly high, and the coatings are undesirably thick to overcome this significant permeability.

None of the edible moisture barriers of the art have succeeded in providing all of the requirements for a thin effective moisture barrier that is imperceptible to taste. Accordingly, it is an object of this invention to provide a thin edible moisture barrier consisting essentially of oleaginous materials and wax which is essentially imperceptible to taste and which is used as a barrier to moisture migration in or out of a food product. Another object includes providing a moisture barrier which is capable of inhibiting the migration of moisture between components of a multi-component food product, particularly between adjacent components having different water activities. Another object of the invention is to provide methods of coating surfaces of a food product with a moisture barrier which are rapid and which are particularly suited to automated production methodologies used in industrial scale food production.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

GENERAL DESCRIPTION

In accordance with the invention, a thin, continuous edible moisture barrier is obtained in a composition consisting essentially of a major portion by weight of edible oleaginous materials (oils, fats, and synthetic oil-like substances) and a minor portion by weight of edible wax. The oleaginous materials have a melting point above the ambient temperature, and the wax is present in an amount sufficient to nucleate solidification

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of the molten oleaginous materials under quiescent ambient conditions. For example, in one preferred practice of the invention, oleaginous materials are heated to a temperature near 70° F. (generally referred to as "room temperature") and then poured into a mold. The mold is of a shape and size which will produce a desired thickness of the invention, the edible oleaginous materials comprising at least about 95% (most preferably at least about 99%) of the composition, and the edible waxes comprise no more than about 5% (most preferably no more than about 2%) of the composition. The molten barriers of this invention have a permeability value of less than about 0.07×10^{-9} cm²-sec⁻¹ cm Hg⁻¹ cm, and, in the preferred practice of this invention, a permeability value of less than 0.02×10^{-9} cm²-sec⁻¹ cm Hg⁻¹ cm.

In one practice of the invention, the molten barrier is used to inhibit moisture migration through a surface of a food product. The food product may be cooked, such as by baking, frying or boiling. Alternatively, the food product may be fresh. Illustrative examples of cooked food products include baked goods such as breads, cookies and crackers, fried goods such as doughnuts, honeybuns, and other raised dough products, and boiled goods such as bagels. Illustrative examples of fresh food products include fruits and vegetables such as apples and cucumbers, and raw food products to be cooked at a later time, such as pizza dough. The moisture barrier of this invention is useful in preventing moisture from entering or exiting the food product, as well as from migrating between adjacent portions of a food product, particularly portions having differing water activities, such as the glazing and dough body of a glazed doughnut, or the filling and crust of a pie.

As used herein, the term "oleaginous materials" is understood to include natural and synthetic oleaginous ("oil-like") materials. Natural oleaginous materials are understood to mean fatty acids and their esters (glycerides), and include molecules commonly referred to as oils and/or fats. Accordingly, oleaginous materials useful in the moisture barrier compositions of this invention can be created by partial hydrogenation of suitable oils or mixtures of oils. Synthetic oleaginous materials are understood to mean non-naturally occurring molecules having the functional properties of natural-sourced oleaginous materials. Those skilled in the art will be able to determine suitable food grade oily substances useful in the practice of this invention.

Currently preferred natural oleaginous materials composed of partially hydrogenated oils and useful under ambient conditions of room temperature (about 70° F.) have a melting point range of about 90° F.-150° F. One preferred natural oleaginous material is 75% soy oil and 25% palm oil, and has a melting point of about 117° F. Another preferred partially hydrogenated oil composition useful at room temperature consists of 90% soy oil and 10% cottonseed oil and has a melting point of about 117°-117° F. Still another preferred oleaginous material useful at room temperature consists solely of partially hydrogenated soy oil, and has a melting point of about 95°-99° F.

Currently preferred synthetic oleaginous materials include sugar and sugar alcohol (polyol) fatty acid polyesters that are solid at ambient temperatures. Most preferably, the sugar and sugar alcohol components of these polyesters have at least four hydroxyl groups with which at least four fatty acid groups can be esterified, so that the polyol fatty acid polyester is substantially non-

digestible in the body's intestinal tract. Preferred fatty acid components contain at least 2-24 carbon atoms. As used herein, "edible waxes" are understood to mean complex mixtures of alcohols, acids and esters formed from long-chain fatty acids and long-chain alcohols, as well as some long-chain alkanes, and are generally plastic solids at room temperatures. Accordingly, waxes useful in the moisture barrier compositions of this invention include any suitable edible natural or synthetic wax. In preferred practices of the invention, moisture barrier films contain beeswax, and/or vegetable waxes such as rice bran wax and/or carnauba wax. As used herein, "barrier" is understood to describe a thin continuous structure that is essentially impermeable to moisture migration through it, and which coats an inner or outer surface of a food product. The barrier may be described as a coating, a film or a membrane.

The moisture barrier composition of this invention is applied to a surface of the food product in a molten state, and is allowed to cool to form a thin, continuous, adherent pliable film that is essentially impermeable to the passage of water or water vapor under natural ambient conditions. The high concentration of oleaginous materials provides a flowable liquid that coats the surface well. The presence of the wax improves the strength of the film and its wettability, and serves to activate the solidification process. The cooled, solid film is thin, continuous and pliable. Using the preferred oleaginous material to wax proportions within the range of at least about 25% (most preferably at least about 90%) of the composition, the barrier is not more than about 5% (most preferably not more than about 2%) wax, and the film's organoleptic properties of taste, after-taste and mouth feel will be essentially imperceptible.

Where inhibition of moisture migration between adjacent portions of a food product having different water activities is desired, the moisture barrier composition can be applied to the contacting surface of one or both portions and allowed to cool, before the portions are brought together.

In one practice of the invention, the barrier is applied by immersing the food product or simply the surface thereof to be coated into a molten solution of the moisture barrier composition and allowing the coated product to cool. In another practice of the invention, the molten film is applied by brushing or otherwise applying the composition to the desired surface of the product, such as by pan coating, rolling, film extrusion, water fall, or bed dipping. In still another practice of the invention, the film can be applied as an atomized spray, such as by air-brushing.

BRIEF DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the nature and objects of the invention, reference should be made to the following detailed description and the accompanying drawings, in which:

FIGS. 1A and 1B are graphs showing representative heating curves for (A) an oleaginous material useful in the moisture barrier composition of this invention (75% soy oil, 25% palm oil, partially hydrogenated), and (B) the same oleaginous material composition in the presence of 1% rice bran wax; and

FIGS. 2A and 2B are representative cooling curves for (A) an oleaginous material useful in the moisture barrier composition of this invention (75% soy, 25% palm, partially hydrogenated), and (B) the same oleaginous material in the presence of 1% rice bran wax.

DESCRIPTION OF ILLUSTRATED EMBODIMENTS

The moisture barriers of this invention are characterized as soft, flexible and strong enough to remain continuous and not crack on handling, yet that are easily penetrable during consumption. The barriers also spread easily over the food surfaces to which they are applied, being able to coat crevices and to bridge small ones to form a continuous film. Accordingly, the barriers have a low surface tension relative to the food surface, yet are able to adhere well to the food product upon cooling. The films also are thin, essentially impermeable to taste, and are essentially impermeable to the migration of water or water vapor through them. Accordingly, they have a very low water permeability value, (P),

The coating compositions of this invention consist essentially of oleaginous materials and wax in an amount of at least about 25% (most preferably at least about 90%) of the composition. The oleaginous materials are understood to mean fatty acids and their esters (glycerides), and include molecules commonly referred to as oils and/or fats. Accordingly, oleaginous materials useful in the moisture barrier compositions of this invention can be created by partial hydrogenation of suitable oils or mixtures of oils. Synthetic oleaginous materials are understood to mean non-naturally occurring molecules having the functional properties of natural-sourced oleaginous materials. Those skilled in the art will be able to determine suitable food grade oily substances useful in the practice of this invention.

Currently preferred natural oleaginous materials composed of partially hydrogenated oils and useful under ambient conditions of room temperature (about 70° F.) have a melting point range of about 90° F.-150° F. One preferred natural oleaginous material is 75% soy oil and 25% palm oil, and has a melting point of about 117° F. Another preferred partially hydrogenated oil composition useful at room temperature consists of 90% soy oil and 10% cottonseed oil and has a melting point of about 117°-117° F. Still another preferred oleaginous material useful at room temperature consists solely of partially hydrogenated soy oil, and has a melting point of about 95°-99° F.

Currently preferred synthetic oleaginous materials include sugar and sugar alcohol (polyol) fatty acid polyesters that are solid at ambient temperatures. Most preferably, the sugar and sugar alcohol components of these polyesters have at least four hydroxyl groups with which at least four fatty acid groups can be esterified, so that the polyol fatty acid polyester is substantially non-

Services Division, Cincinnati, Ohio; Hunt-Wesson, Inc., Fullerton, Calif.; and Dunfee, Inc., Louisville, Ky. Each of these oils has been partially hydrogenated using conventional means to achieve the appropriate melting temperature properties. Additional information on edible oils and fats can be found in a number of texts well known in the art, including Kirk-Othmer, *Engineering Encyclopedia of Chemical Technology*, John Wiley & Sons, New York, 1978.

TABLE 1

Identification	1	2	3
Composition (%)	75 soy, 25 palm	90 soy, 10 cottonseed	100 soy
Melting Point, °F.	117	132-137	95-99
Solid fat index, 30° F.	43	26	38
30	24	21	48
20	12	—	—
10	—	—	—

The currently preferred synthetic oleaginous materials useful in this invention include sugar and sugar alcohol (polyol) fatty acid polyesters. Most preferably, these polyol fatty acid esters contain at least four hydroxyl groups by the body's intestinal tract, and therefore non-digestible. Accordingly, preferred sugar and sugar alcohol components contain at least four hydroxyl groups, with which the fatty acid groups can be esterified. Preferred fatty acid components contain at least 2 to 24 carbon atoms. The sugar and sugar alcohol fatty acid polyesters useful as synthetic oleaginous materials in this invention may be prepared by a variety of methods well known to those of ordinary skill in the art. A more detailed description of sugar and sugar alcohol fatty acid polyesters can be found in U.S. Pat. Nos. 4,789,664; 4,810,526; and 4,919,964, all herein incorporated by reference. In addition, as an example, the preparation of sucrose fatty acid esters is described in U.S. Pat. Nos. 4,318,772 and 4,317,360, also herein incorporated by reference.

The wax that is added to the oleaginous composition is present in a quantity sufficient to potentiate solidification of the molten oleaginous materials upon cooling. Useful waxes are edible, and can be animal, mineral or vegetable in composition, and natural or synthetic in origin. These waxes are completely soluble in the molten fat/oil and, in the small quantities used, raise the melting temperature of the fat/oil by only a few degrees. Waxes can be obtained from numerous commercial sources, among them the Frang R. Ross Co., Inc. (Jersey City, N.J.). Several typical examples, well suited for use in the practice of this invention, are listed in Table 2.

TABLE 2

Wax	Melting Point, °F.
Soy Bean Wax	167
Carnauba	182
Beeswax	147

Additional information on waxes can be found in numerous texts well known in the art, including Kirk-Othmer *Engineering Encyclopedia of Chemical Technology*, John Wiley & Sons, New York, 1978.

The heating and cooling characteristics of molten moisture barriers can be followed using standard differential scanning calorimetry. In this procedure, a small

quantity of material is heated (or cooled) at a predetermined rate and the heat which is evolved or absorbed is measured and plotted as function of time. The material is heated and cooled through a number of cycles. The heating and cooling rates are determined by means of the technique described in ASTM E96-66 (Reapproved 1972). The permeability, P , of a film or membrane is defined as follows:

$$P = \frac{W}{A \cdot P \cdot d \cdot t}$$

(Eq. 1)

where: W is the weight of water lost in grams, A is the area of the membrane in cm², t is the time in seconds, d is the difference in water vapor pressure between one side of the membrane and the other in (cm Hg) and P is the thickness in cm. The permeability, P , thus has the dimensions gm cm⁻² sec⁻¹ (cm Hg)⁻¹ cm. The water loss also may be expressed in cm³ (STP), but this does not change the resultant values of permeability. The permeability thus can be established as a property of the barrier material and compared with other materials.

The ability to wet a given surface also can be measured where the surface is smooth and the area can be defined precisely. In the case of the surface of a food product such as doughnuts, in which the surface is irregular, the wetting of the liquid barrier material is not on the surface. Generally, adhesion can be judged by looking at the doughnut and observing the separation of the barrier.

Trace impermeability is judged primarily by a leak test. This is difficult to quantify and reliance must be placed on the integrity of calibrated testers for the determination of this property.

Several illustrated embodiments are described below, using the methods described herein.

The effects of the addition of a small amount of wax to a partially hydrogenated oil can be seen from data obtained by means of differential scanning calorimetry. Typical data obtained for the combination spanning of 99% of oleaginous material (75% soy, 25% palm oil), partially hydrogenated, melting point 112° F., and 1% of wax are shown in FIGS. 1 and 2.

Different samples containing a small amount of the partially hydrogenated oil composition are heated and cooled at a constant rate of 20° C./minute in the presence and absence of wax. In addition, the samples are cooled under quiescent conditions (without agitation). These cooling conditions are typical of those used in a practical industrial coating operation, and the resulting barrier membranes thus are representative of what is expected in such commercial practice.

FIG. 1A shows the heating curve for the oil alone. Several distinct peaks are observed, corresponding to the various fatty acids in the oil. The cooling curve for the same oil is shown in FIG. 2A. The characteristic peaks do not appear on cooling, and the resultant material is a supercooled liquid at room temperature. The corresponding heating and cooling curves for the composition containing 1% wax are shown in FIGS. 1B and 2B. The heating curve, FIG. 1B, is somewhat different from that of the oil alone but has the same general shape as FIG. 1A. The cooling curve for the oil with wax shows a distinct heat evolution at 45° C., corresponding to a solidification process. The addition of 1% wax thus has helped to nucleate the solidification process on cooling. This solidification strengthens the resultant membrane at room temperature and enhances the bridging of crevices in the substrate material. This

enhanced bridging provides the improvement in the resistance to the permeation of water vapor observed in the permeability experiments (see Samples 1-11, infra). The permeability of the barriers and the ability to seal crevices is measured by coating a non-woven fabric having uniform elliptical pores approximately 0.3 mm wide by 2.5 mm long. A known weight of oleaginous material is melted by heating to 200° F., and a predetermined weight of wax is added. At this temperature, the oleaginous material and wax form a single molten phase. A piece of fabric with a measured area and weight then is drawn through the molten oleaginous wax solution. The temperature of the molten solution is, typically, 150° F. The coating solidifies within a few minutes and is handled easily after five minutes. The permeability of the membrane to water vapor then is measured, using the method described in ASTM E96-66. An equivalent thickness of the barrier is obtained by dividing the weight of the coating by the area and by the density.

In Samples 1-5, the permeability values of molten barriers containing varying percentages of wax, are determined. In these examples, the oleaginous material is composed of partially hydrogenated oils (75% soy oil, 25% palm oil, m.p. 112° F.) and the wax is 100% rice bran wax. The permeability values determined (units, gm cm⁻² sec⁻¹ (cm Hg)⁻¹ cm) are listed below in Table 3. Note that Sample No. 1 is not the invention.

TABLE 3

Sample	% Oleaginous Material	% Wax	Permeability (P)
1	100	0	1.30 × 10 ⁻³
2	95	0.5	0.07 × 10 ⁻³
3	90	1.0	0.02 × 10 ⁻³
4	85	1.5	0.02 × 10 ⁻³
5	80	2.0	<0.02 × 10 ⁻³

The sensitivity of the weight loss measurement is such as to limit the accuracy of each permeability measurement to ±0.03 × 10⁻³. For comparison, the average value of permeability listed by Seaborn and by Egge, supra, for their crosslinked stearic barriers, is of the order of 3 × 10⁻³ gm cm⁻² sec⁻¹ (cm Hg)⁻¹ cm. An examination of the coated fabric shows that the coating with oil alone does not seal all of the pores in the fabric, and water loss probably occurs by the passage of water vapor through these pores. With the 99.5% oil-0.5% wax, there are fewer unsealed pores, and the permeability is reduced. With 99% oil-1.0% wax, all of the pores are sealed and the barrier is impervious. Further additions of wax progressively stiffen the barrier, and by 5% wax the barrier is considered to be too stiff to be impermeable to the test. Nonetheless, barriers comprising about 5% wax or even about 10% wax may be useful for certain applications, such as for coating disposable fruit and/or vegetable skins.

In Samples 6-8, the permeability values of molten barriers containing different waxes are investigated. In these examples, the oleaginous material consists of partially hydrogenated oils (75% soy oil, 25% palm oil, m.p. 112° F.). All barriers are essentially impermeable to moisture migration through the film (P < 0.02 × 10⁻³ gm cm⁻² sec⁻¹ (cm Hg)⁻¹ cm). Table 4 lists the permeabilities of barriers containing 1% wax and 99% oleaginous material.

TABLE 4

Sample	% Oleaginous Material	% Wax	Permeability (P)
6	90	1.0 rice bran	<0.02 × 10 ⁻³
7	90	1.0 soybean	<0.02 × 10 ⁻³
8	90	1.0 tallow	<0.02 × 10 ⁻³

In Samples 9-11, molten barrier compositions containing different partially hydrogenated oils are investigated. (99% oil, 1% rice bran wax for all examples). In all cases, the barriers are essentially impermeable, as determined by the limits of the assay (P < 0.02 × 10⁻³ gm cm⁻² sec⁻¹ (cm Hg)⁻¹ cm).

TABLE 5

Sample	% Oleaginous Material	Melting Point, °F.	Permeability (P)
9	75.25 soybeans	112	<0.02 × 10 ⁻³
10	75.25 soybeans	112.7	<0.02 × 10 ⁻³
11	75.25 soybeans	115.49	<0.02 × 10 ⁻³

The preferred combination of Sample No. 4, i.e., 99% oleaginous material (75% soy, 25% palm oil), partially hydrogenated, melting point 112° F., and 1% wax, and 1% wax is readily used as a food product (glazed doughnuts). Doughnuts made from a yeast-raised dough are used. These are usually the type for "heavy dipping" chocolate. The molten fat/wax solution is substituted at 140° F. and the doughnut is immersed in the melt and withdrawn immediately. The coated doughnuts are allowed to cool for the minutes on a rack and then immersed in the glazing mixture and allowed to dry. A similar batch of uncoated doughnuts are glazed immediately afterwards to provide a control lot. Each set of glazed doughnuts, coated and uncoated is placed in a box usually used for packaging doughnuts and aged for twelve hours at room temperature. After this aging period, the glazed on the uncoated doughnuts has become syrupy and very sticky to the touch. The glazed on the coated doughnuts remains firm and has not turned to a sticky syrup. The glazed on the coated doughnuts remains firm for three days, at which point the experiment is discontinued.

Similar sets of coated and uncoated doughnuts also are prepared for a taste test. Two panels of six people taste sections of doughnuts cut from coated and uncoated samples and all six panelists agree that both sets of doughnuts taste the same.

A more extensive trial is run by making doughnuts in a commercial doughnut machine, using the same coating compositions as in the experiment above. A batch of doughnuts is prepared, coated, and glazed and then stored at room temperature in conventional packaging. Here also, the glazed remains firm and intact after three days of storage and the experiment is terminated.

The procedure for evaluating the barrier on glazed doughnuts, but using a brownie in one instance, and a cracker in another. A brownie has a comparatively high water activity and loses freshness when moisture is lost from the brownie. By contrast, a cracker has a relatively low water activity, and loses freshness as it absorbs water. Using the preferred composition of Sample No. 4, the cracker and brownies are immersed in the molten fat/wax solution and withdrawn immediately. The coated products then cool on a rack (approx-

imately 1-5 minutes). A set of the coated crackers (and a control uncoated set) is then placed in a moisture chamber for 24 hours. During this time the uncoated crackers take in a substantial quantity of water, becoming soggy in texture and weighing more. The coated crackers, by contrast, do not change their texture during this time, and condensation can be seen forming on the film surface.

Similarly, the brownies (coated and uncoated) are each placed in a box for 24 hours. The uncoated brownies lose moisture during this time while the coated brownies are unaffected.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained with the edible moisture barrier film as shown and described. It is to be understood that all matter contained in the above description and shown in the drawings is within the scope of the claims appended hereto.

Having described the invention, what is claimed as new and secured by Letters Patent is:

1. A composition useful as a moisture barrier for a food product, said composition consisting essentially of a major portion by weight of edible oleaginous material having a melting point above the ambient temperature and at least a portion of which is a synthetic oleaginous material selected from the group consisting of sugar fatty acid polyesters and sugar alcohol polyesters, and a minor portion by weight of edible wax.

2. A composition according to claim 1 wherein said said edible wax being present in an amount sufficient to nucleate solidification of said oleaginous material from a molten state under quiescent ambient conditions, and

3. A composition being adapted for forming a thin, continuous, adherent, pliable barrier on a surface of the food product, and for being essentially impermeable to the passage of water vapor through the barrier under ambient conditions.

4. A composition according to claim 1 wherein said oleaginous materials have a melting point of at least about 90° F.

5. A composition according to claim 1 wherein said oleaginous materials have a melting point within the range of about 90°-130° F.

6. A composition according to claim 1 wherein said oleaginous materials include synthetic oleaginous materials selected from the group consisting of sugar fatty acid polyesters.

7. A composition according to claim 1 consisting essentially of at least about 95% of said edible oleaginous materials and not more than about 5% of said edible wax.

8. A composition according to claim 1 further characterized by having a permeability value, P , of less than about 0.07×10^{-3} gm cm⁻² sec⁻¹ (cm Hg)⁻¹ cm.

9. A composition according to claim 1 further characterized by having a permeability value, P , of less than about 0.02×10^{-3} gm cm⁻² sec⁻¹ (cm Hg)⁻¹ cm.

10. A composition according to claim 1 wherein said edible oleaginous materials include partially hydrogenated oils.

STEARATE TREATED FOOD PRODUCTS

This is a continuation-in-part of application Ser. No. 546,323 filed Oct. 28, 1963, now abandoned.

This application relates to food products in general and more specifically, to a coated food product such as a granola bar, and a method for preparing such a coated food product which will retain its natural character in the presence of moisture.

Food products which are normally crunchy in nature and have a firm texture and chewy nature when fresh and recently prepared, have a tendency to become soggy and suffer a loss of texture through the passage of time and exposure to moisture-laden air. Good packaging techniques can generally extend the shelf life of such products. However, once the package is opened, a food product with a chewy texture and a crunchy character tends to begin deteriorating immediately. Measures such as the addition of salt of sucrose and other sugar alcohols to a granola mixture could, if mixed in the right proportions, retain the chewy characteristics of a granola bar for some time. However, such measures are ineffective in the retention of the crunchy characteristics of individual food particles in a mixture of other foodstuffs having contrasting characteristics. Thus, a food product with dual texture characteristics is not possible by the teachings of the prior art.

In attempting to prolong the shelf life and original character of various food products, many different coatings have been attempted. Foods have been coated with oil, dough, sugar, and fats, among other coatings. All of the above have been found unsatisfactory for one reason or another but primarily because of discoloration in the film formed on the object being coated. In general, these coatings are permeable to moisture, are hygroscopic and merely delay the change in textural characteristics by only a short time at best.

SUMMARY OF THE INVENTION

Therefore, an object of the subject invention is a method for coating foodstuffs or food products in a manner which will maintain the crunchiness and chewy textural characteristics of a food product in the presence of moisture.

Another object of the subject invention is a method of developing within grains the crunchy character of a food product.

Yet another object of the subject invention is a coated food product such as grains and nuts which are insensitive to water.

A still further object of the subject invention is a coating composition which, when applied to food product provides a crunchy, chewy character to the food product.

Further objects are attained in accordance with the present invention wherein there is provided a coating composition and a method for applying that coating composition to food products such as grains and nuts, which coating composition provides a measure of insensitivity to moisture in a food product. A coating composition of an alkaline metal salt of stearic acid, such as zinc stearate, calcium stearate, or magnesium stearate is applied to the food product, such as in the form of a granola bar, which retains the original texture of the food product in the presence of moisture. Surprisingly enough, the taste of the original food product is not affected by the coating when the coating comprises less

than 8% by weight of the food product coated. A food product such as a cereal may be coated by dissolving the stearate in a carrier such as hard fat and then applying the stearate and fat blend while hot to the crisp rice. In the alternative, the rice may be first coated with fat and then the zinc stearate may be dusted onto the fat coated rice and heated. The stearate may also be incorporated directly into the food product without a carrier.

The novel features of the invention both as to the product and the method of making to product together with further objectives and advantages thereof will be better understood from the following descriptions in which the presently preferred method and composition of the invention is set forth.

DETAILED DESCRIPTION OF THE INVENTION

The coating composition of the subject invention comprises a metal salt of stearic acid such as zinc stearate, calcium stearate, or magnesium stearate in a carrier of fat or oil. The stearate used should be a uniform fine particle powder of high purity and food grade quality. The carrier may be a hydrogenated or partially hydrogenated fat or oil such as those as will be disclosed in the following examples. Where the product itself can provide, or be the source of, the oil, as in some nuts, then the addition of the fat or oil becomes unnecessary, and the stearate need only be dusted on the product prior to heating. In certain cases, the stearate may simply be dusted on per se, or dispersed in a suitable carrier and sprayed on. The heating step found in each of the examples is important for achieving a continuous or substantially continuous film over or within the food product, whether the stearate is used as a coating on the food product or is incorporated directly into the food product. As a result, the temperature and time of heating should be closely controlled within the parameters set forth in order to achieve the necessary water insensitivity and repellent properties. The method and coating composition of the subject invention will become more evident from the following examples.

EXAMPLE 1

In each of the experiments in the following table rice is heated in a pan coating apparatus. To the rice is added the oil and the mixture is agitated. After the rice becomes fully coated with the oil the zinc stearate is dusted onto the coated rice and then dried in an oven at 300° F. for seven minutes. A simple taste test showed no evidence of off flavors as added flavor.

Rice	Hydrogenated Fat	Zinc Stearate	Water Absorbed
------	------------------	---------------	----------------

1. 500 g	0	0	32 ml
----------	---	---	-------

2. 500 g	50 g	30 g	14 ml
----------	------	------	-------

3. 500 g	50 g	30 g	7 ml
----------	------	------	------

4. 500 g	50 g	0	28 ml
----------	------	---	-------

5. 500 g	0	30 g	14 ml
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The above samples were evaluated for water absorption properties. The greater the amount of water absorbed the less effective the coating properties seem to be. In this evaluation 10.8 grams of the coated rice is dispersed in 300 ml of water and stirred for five minutes. The solids are removed and the water volume noted. The difference noted in the water volume comprises an indication of the relative amounts of water absorption

EXAMPLE II

by the rice. Thus, samples 1 and 5 show the least degree of coating, therefore, a maximum water gain by the rice.

EXAMPLE III

250 g wheat flakes
25 g hydrogenated palm oil;
10 g zinc stearate.
The wheat flakes were coated with the above ingredients using the method of Example I. The coated product was evaluated according to the method outlined in Example I. The control product, i.e., the uncoated wheat flakes, absorbed 35 ml of water in the evaluation method of Example I, while the rice product, i.e., the coated product, absorbed 22 ml of water showing a relatively high degree of protection from moisture. No evidence of off taste or added tastes were noted.

EXAMPLE IV

750 g granola mix;
75 g fat;
30 g zinc stearate.
The granola mix in this example was coated with zinc stearate in the same method as set forth in Example I. The resulting product was evaluated according to the method of Example I. The taste of the resulting product appears unaffected.

EXAMPLE V

Ice cream mixes are blended with crisp rice, both coated according to the subject invention and uncoated. The ice cream blend is immediately frozen. Twenty-four hours later the ice cream blend containing the coated rice is firm and crunchy whereas the control product having the uncoated crisp rice has lost its textural properties being gummy and gel-like. The taste of the ice cream having the coated rice is not different from that of a fresh batch of uncoated crisp rice and ice cream.

EXAMPLE VI

A granola bar mix is prepared according to the following:

%	Ingredients
---	-------------

5.5	crisp rice
-----	------------

5.0	chocolate chips
-----	-----------------

31.5	syrup mix
------	-----------

52.5	granola mix
------	-------------

18.44	Syrup mix
-------	-----------

5.0	sugar
-----	-------

0.4	salt
-----	------

2.7	shortening
-----	------------

1.5	vanilla
-----	---------

1.5	water
-----	-------

The dry mix was heated to 100° F. and mixed with syrup matrix which had been preheated to 170° F. The bars were formed as known in the art and evaluated for taste

EXAMPLE VII

The following coated cereal samples are prepared by heating the rice, pouring melted fat into a pan until the rice is fully coated, adding the calcium stearate and drying in a 300° F. oven for seven minutes:

CEREAL	FAT	CALCIUM STEARATE
--------	-----	------------------

7. 500 g 102 Rice	25 g 170 Fat (Palm)	20 g
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8. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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9. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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10. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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11. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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12. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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13. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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14. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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15. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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16. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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17. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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18. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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19. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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20. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
--------------------	---------------------	------

21. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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22. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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23. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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24. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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25. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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26. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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27. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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28. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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29. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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30. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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31. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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32. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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33. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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34. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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35. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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36. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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37. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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38. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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39. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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40. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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41. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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42. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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43. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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44. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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45. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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46. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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47. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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48. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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49. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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50. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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51. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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52. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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53. 500 g 102 Rice	20 g 170 Fat (Palm)	20 g
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EXAMPLE VIII

Further studies are performed to show the relationship of the amount of water absorbed and the percentage by weight of calcium stearate coating.

Chap Rice	Hydro- genated Fat	Calcium Stearate (%)	Temp (°F)	Time (hr)	Water Absorbed 50/100
28. 500 g	50 g	0.25	300	2.5	1.5
29. 500 g	50 g	1.0	300	2.5	1.5
30. 500 g	50 g	2.0	300	2.5	1.5
31. 500 g	50 g	3.0	300	2.5	1.5
32. 500 g	50 g	4.0	300	2.5	1.5
33. 500 g	50 g	5.0	300	2.5	1.5
34. 500 g	50 g	6.0	300	2.5	1.5
35. 500 g	50 g	7.0	300	2.5	1.5
36. 500 g	50 g	8.0	300	2.5	1.5
37. 500 g	50 g	9.0	300	2.5	1.5
38. 500 g	50 g	10.0	300	2.5	1.5
39. 500 g	50 g	0	300	2.5	1.5

*Vanilla syrup added

By examples 28-37 it can be seen that coatings of calcium stearate which are below 1.0% by weight would appear to be ineffective in providing moisture resistance to the crisp rice, while coatings of calcium stearate comprising percentages of the total weight over 8%, while effectively providing moisture resistance to the crisp rice, result in an undesirable metallic aftertaste and are unacceptable for that reason. Thus, the range of acceptable amounts of calcium stearate would be 2%-8%, and preferably between 3%-6%. As to the Zinc stearate and magnesium stearate are also found to be acceptable within such limits. It is expected that these limitations would hold true for most food products.

EXAMPLE IX

As a further example, calcium stearate was dusted onto raw macadamia nuts which were then heated at 350° F. for 8 minutes. The dusted nuts were then placed in an airtight container and stored at 35° F. for 5 minutes. The dusted nuts were placed with 7 minutes alongside control nuts, which were heated at 350° F. for 8 minutes. After 48 hours, the control product was soft and not crunchy, but the uncoated product was soft and not crunchy. No off flavors or additional flavors were noted.

EXAMPLE X

Calcium stearate was dusted onto toasted coconuts which had first been heated and mixed with melted Driscoll's KCS fat. The dusted nuts were placed in an airtight container and stored at 35° F. for 5 minutes. The dusted nuts were placed with 7 minutes alongside control nuts, which were heated at 350° F. for 8 minutes. After 48 hours, the control product was soft and not crunchy, but the uncoated product was soft and not crunchy. No off flavors or additional flavors were noted.

From the above examples, it should be noted that the amount of calcium stearate may be applied in any number of ways such as being dusted onto fat coated rice, as in Examples 1 through 6 and then heated at temperatures above 265° F. or coated with a fat containing zinc stearate and then heated at temperatures above 265° F., as shown in Examples 7-20. In the alternative, if the product to be coated is capable of existing oil upon heating or by other means it may only be necessary to dust the heated product with the stearate of choice. Thus, it is important to note that the invention comprises the application of a coating of a stearate such as calcium stearate, magnesium stearate or zinc stearate to the food product or

the inclusion of such a stearate within the food product in a manner which obtains a substantially continuous film over or within the food product. By such a process, not only can gains be given the crispness of a rice nut, but this crispness can be maintained over a long period of time and the rice nut can be coated with a substantially continuous film of stearate. The stearate is subject invention food products containing a dual texture, such as liquid or semi-liquid products with crunchy nuggets contained therein, or ice cream with crunchy particles within it is possible.

EXAMPLE XI

In the following example, crisp rice is coated with magnesium stearate in the manner set forth in Example IX. The coated rice is mixed with caramel prepared according to any of several recipes known in the art. The addition of the coated rice to the caramel provides a high bulk and a crunchy character with no off taste. When the caramel is stirred with uncoated rice, the mixture soon becomes soggy and loses its crunchy character entirely.

EXAMPLE XII

Ingredients were prepared according to the following recipe:

Grains	Ingredients
50	grounded sugar
25	crisp rice
100	corn syrup
20	vanilla syrup
10	butter
15	salt

Mix the above ingredients thoroughly and heat to 245° F.; add the following:

20	invert sugar
1.5 ml	crisp rice (found with calcium stearate as in Example IX)
50	small pieces

Mix thoroughly while still hot and let cool. The sticky candy formed from the cooled mixture above was crunchy, firm and did not impart a gummy or off taste to the product. More coated crisp rice could be added only to the extent of the peanut butter and caramel. Thus with increasing coated rice and less costly peanut butter, better cost control can be achieved without sacrificing quality.

Each of the above Examples I through XII shows no evidence of extraneous tastes being added to the product on cooking by the composition and method of the subject invention with these exceptions noted. The taste can be affected greatly by the quality, nature and amount of the fat or oil used to initially coat the product. Thus, it is possible to achieve a different taste sensation by the selection of the fat or oil, as desired and as known in the art. Should no additional taste be desired

One tablespoon of each of samples 2 through 20 coated as set forth above, is blended with four fluid ounces of vanilla ice cream and placed in a freezer set at 20° F. Each ice cream cup is hermetically sealed before being placed in the freezer. Control samples of four fluid ounces of vanilla ice cream with a tablespoon of crisp uncoated rice is likewise placed in a freezer in sealed containers. A "taste test" is conducted every forty-eight hours by taking a spoonful of each sample and comparing the texture of the coated cereal in each sample as compared to the uncoated control samples. In these tests, the uncoated control samples produces a soft, moist cereal whereas each of the coated rice products samples produces a variety of firm and chewy textures comprising the cereal and the ice cream. In each taste test, no evidence of a taste attributable to the coating is found.

Moisture absorption tests are performed on sample no. 7 of the above coated samples and compared to a control uncoated rice product according to the procedure outlined in Example I. Sample 7 is found to absorb 25 ml of water, while samples 8 and 10 absorb 12.5 ml of water. The control uncoated rice product absorbs 50 ml of water, which shows in comparison to the uncoated samples, a high resistance to the absorption of moisture as the result of coating with calcium stearate according to the subject invention. Each of samples 2-20 was also prepared with the use of zinc stearate. Tests identical to those set forth above yield identical results.

The following examples, with duplicate ingredients and coating, and prepared according to the procedure utilized in preparing sample 4 of Example I, are subjected to a variety of times and temperatures in the baking step, as indicated.

Rice	Hydro- genated Fat	Calcium Stearate	Temp (°F)	Time	Water Absorbed
21. 500 g	50 g	30 g	250	7 min	31 ml
22. 500 g	50 g	30 g	260	7 min	30 ml
23. 500 g	50 g	30 g	265	7 min	13 ml
24. 500 g	50 g	30 g	300	7 min	7 ml
25. 500 g	50 g	30 g	300	7 min	15 ml
26. 500 g	50 g	30 g	330	7 min	29 ml
27. 500 g	50 g	30 g	350	7 min	29 ml

It becomes apparent that heating at about 265° F. and above for the required period of time is necessary to achieve a substantially continuous film over the food product. The preferred baking temperature is 275° F. to 350° F. Most preferred are temperatures in the range of 300° F.-325° F. The time required is that which is necessary to bring all components up to the required temperature. Thus, this time might vary with different ovens or different volumes being baked. Further, baking temperatures higher than 350° F. tend to change the character of the food product at the baking times used and thus should be avoided. Temperatures higher than 350° F. applied to the stearate containing food product hasten rancidity of the resulting food product.

then the oil or fat selected for use should be bland and substantially tasteless, as those used in the accompanying examples.

EXAMPLE XIII

Two pounds of calcium stearate are blended with 100 pounds of flour. The flour is formed of 95 parts whole wheat flour and 5 parts white flour. The calcium stearate is blended with water to yield a dough with a moisture content of 17%. The dough is heated in an extruder and forced through the extruder die orifices or opening where it is flash dried and toasted. An identical product was made without the addition of calcium stearate. The product to which calcium stearate was added had a less uniform coating at the die face, extruded easier with no water vapor and provided a finished product which was water resistant. The control product, i.e., no stearate, absorbed water quickly to become soggy and difficult to eat in an efficient manner.

EXAMPLE XIV

Two lbs of fresh potato chips are placed in a pan of oil heated to 300° F. To the oil is added calcium stearate at a 4% level. The chips are removed, dried, and allowed to stand at 85° F. and 40% RH. After 24 hours, the product was still firm and crunchy, whereas the control (no stearate added) was soft and soggy.

EXAMPLE XV

Two lbs of extruded rice and corn blend are prepared with two percent calcium stearate as set forth in Example XIII. The extrudate is placed in a heated extruder and blended with 80 grams of heated fat, 80 grams of calcium stearate are dusted onto the fat coated extrudate and then the entire coated extrudate is heated to approximately 360° F. for one minute. With this process, a total of 8% calcium stearate is placed within and on the rice and corn product, the maximum permissible without the introduction of off-tastes, such as metallic, soapy tastes. When less than 2% total stearate is placed in and on the rice and corn product in this manner, unacceptably low moisture resistance is experienced, similar to when the product is only coated with the stearate at levels below 2% by weight. The finished product, however, having both internal and external stearates, is very hydrophobic, being so much so that it floats on water.

While the invention has been described with reference to a preferred embodiment, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof. Therefore, it is intended that the invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out this invention, but that the invention will include all embodiments falling within the scope of the appended claims.

We claim:

1. A solid food product having a substantially continuous moisture resistant coating consisting essentially of an alkaline metal salt of stearic acid, said alkaline metal salt of stearic acid being selected from the group con-

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10. The food product of claim 7 wherein said second component is selected from the group consisting of chips, rice, wheat flakes, granola mix, potato chips, corn chips, and nuts.

11. The food product of claim 7 wherein said first component is selected from the group consisting of baked goods, low cream and confections.

12. A method for preparing a food product having certain characteristics and which is resistant to mold, comprising the steps of:

a. applying about 2% to about 5% by weight of a preservative to a food product, said preservative being selected from the group consisting of

15 illustrate resistance means consisting essentially of
modifying the chemical composition of the food product
to a degree selected from the group consisting of
calcium stearate, zinc stearate and magnesium stear-
ate to form a discontinuous film about said food
product.

20 b. heating said food product to a temperature from

265° F. to 350° F. and for a time sufficient to form a substantially continuous film about said feed product for retarding said crumbly characteristics in the presence of moisture, without affecting taste.

14. The method of claim 12 wherein said stearate is distilled onto the food product previously coated with a material selected from the group consisting of partially hydrogenated fats and partially hydrogenated oils.

16. The method of claim 13 further including the step of adding said coated food product to a second food product of dissimilar textural properties to form a dual-texture food which will retain said final texture over a

17. The method of claim 12 wherein said food product contains said stearate as an internal ingredient prior to application of said casting, and the total amount of said stearate is 2% to 8% by weight of said food product.

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[11] Patent Number: 6,039,988
[45] Date of Patent: Mar. 21, 2000

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577 **ABSTRACT**
Althorpe, Agent, or Firm—Jed R. Nisile, PC.

A baked good incites a laminate. The laminate includes a layer of fat and a protein layer which absorbs a portion of the fat layer. The laminate prevents moisture from penetrating

18 Claims, 1 Drawing Sheet

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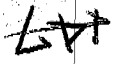


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Age Group	U.S. should take action (%)	U.S. should not take action (%)
18-29	92	8
30-49	91	9
50-69	90	10
70+	88	12



LAMINATED BAKED PRODUCT AND METHOD OF MAKING THE SAME

CROSS-REFERENCES TO RELATED APPLICATIONS

This is a continuation-in-part of application Ser. No. 08/593,036, filed Jan. 31, 1996, now U.S. Pat. No. 5,789,008.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not applicable

REFERENCE TO "MICROFILME APPENDIX" (SEE 37 CFR 1.96)

Not applicable

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an ice cream sandwich and method for making the same.

More particularly, the invention relates to an ice cream sandwich cookie which maintains its crispness after being contacted by ice cream, which can withstand temperatures of 120 degrees F. to 130 degrees F. during shipment, and which complements the edible texture and flavor of an ice cream sandwich.

2. Description of the Related Art including Information Disclosed Under 37 CFR 1.97 and 1.98

Conventional oblong or rectangular ice cream sandwiches comprise a slab of vanilla ice cream between a pair of rectangular chocolate cookies. The chocolate cookies absorb moisture from the ice cream and, as a result, the cookies become soft and moist and tend to stick to the fingers of a person holding and eating the ice cream sandwich. The migration of moisture from ice cream to the cookies is one reason that the crispy brown wafer "cookie" material used to make ice cream cones can not be utilized in an ice cream sandwich. The crispy wafer material would absorb moisture from the ice cream and become soft and mushy. The wafer material (or the ice cream) can be sealed by completely coating the wafer material with chocolate in order to block the migration of moisture from the ice cream to the wafer material. A chocolate coating is messy and tends to stick to the fingers of a person consuming the ice cream sandwich. Further, many individuals are either allergic to or simply do not like chocolate. And, many ice cream flavors do not combine favorably with chocolate. Another disadvantage of chocolate is that it tends to melt at temperatures in excess of 100 degrees F. During shipment to plants which manufacture ice cream sandwiches, wafers can encounter temperatures of 120 to 130 degrees F. Such temperatures cause many chocolate compositions to melt and, as a consequence, cause wafers coated with chocolate to stick to one another. In order to counter this problem, "high-temperature" chocolate compositions have been prepared which resist melting at high temperatures. However, many of these high temperature chocolate compositions can have an unfavorable waxy texture when frozen.

Another solution to the problems of moisture absorption is to saturate with oil the cookies in an ice cream sandwich. Saturating cookies with oil makes them sticky and gooey and can cause portions of the cookies to stick to the fingers of an individual consuming the ice cream sandwich.

Making an ice cream sandwich with chocolate cookies, wafer material, or other baked or cooked food compositions which are firm and crispy is advantageous because consumers like the combination of ice cream and crispy cookie materials. This is why ice cream cones are popular.

Another disadvantage of many wafer and cookie materials is that they are too weak to be utilized on machinery which produces an ice cream sandwich by injecting soft ice cream between a pair of spaced apart cookies and by then indexing the cookies to "wipe" excess ice cream off the nozzle which injected the ice cream.

Accordingly, it would be highly desirable to provide an improved ice cream sandwich which would include ice cream sandwiched between a pair of crispy crunchy cookies.

It would also be highly desirable to provide a cookie which could be utilized for an ice cream sandwich and which would resist or prevent the migration of moisture from the ice cream into the cookie through the cookie-ice cream interface.

Further, it would be highly desirable to provide improved ice cream sandwich cookies of the type described which could be shipped at high temperatures without experiencing degradation in quality and without softening one another, and which could be utilized on equipment which produces ice cream sandwiches at a high rate of speed by using a pair of cookies to receive soft ice cream and to then "wipe" the ice cream from the nozzle dispensing the ice cream.

Therefore, it is a principal object of the invention to provide an improved ice cream sandwich and method for producing the same.

A further object of the invention is to provide an ice cream sandwich including a slab of ice cream sandwiched intermediate a pair of crispy, crunchy cookies.

Another object of the invention is to provide a laminate cookie which can contact ice cream for an extended period of time without permitting moisture to migrate from the ice cream across the ice cream-cookie interface and into the cookie.

Still a further object of the invention is to provide a laminate cookie which includes a moisture barrier which resists degradation when the cookie is subjected to temperatures in the range of -40 degrees F. to 130 degrees F.

Yet another object of the invention is to provide an food laminate which can enhance the edibility and taste of an ice cream sandwich.

And, a further object of the invention is to provide an ice cream sandwich cookie which need not be saturated with oil to prevent the absorption of moisture by the cookie.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S)

These and other, further and more specific objects and advantages of the invention will be apparent to those skilled in the art from the following detailed description thereof, taken in conjunction with the drawings, in which:

FIG. 1 is a perspective view of an ice cream sandwich constructed in accordance with the principles of the invention; and

FIG. 2 is a section view of a portion of the ice cream sandwich of FIG. 1 illustrating further structural details of the top cookie thereof and taken along section line 2-2 thereof.

BRIEF SUMMARY OF THE INVENTION

Briefly, in accordance with my invention I provide an improved ice cream sandwich. The ice cream sandwich

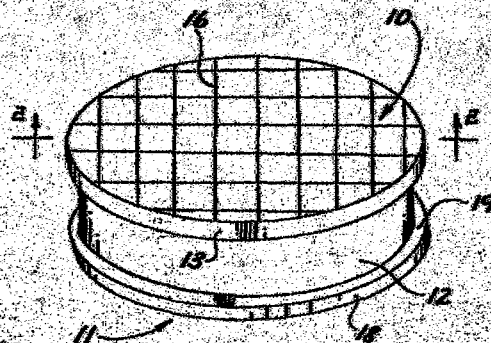


FIG. 1

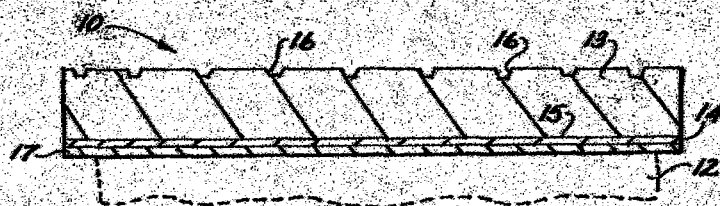


FIG. 2

includes at least one layer of ice cream; at least one cookie having an inner support surface facing said layer of ice cream; an oil said inner support surface; and a membrane comprising said oil and said inner support surface and contacting said edible food, said membrane contacting said layer of ice cream. The oil is liquid at a temperature in the range of 65 to 140 degrees F. The cookie can be crispy.

In another embodiment of the invention, I provide as an article of manufacture comprising a laminate for an ice cream sandwich. The ice cream sandwich includes ice cream contacting the laminate. The laminate includes a cookie having an inner support surface which faces the ice cream in said ice cream sandwich; a hydrophobic food substance on said inner support surface; and a membrane covering the food substance and the inner support surface and comprising an edible food.

In a further embodiment of the invention, I provide a method of producing a laminate for an ice cream sandwich. The ice cream sandwich includes ice cream contacting the laminate. The method includes the steps of providing a laminate having an inner support surface which faces and is adjacent said ice cream in said ice cream sandwich; and, contacting the support surface with a hydrophobic food substance and with a membrane comprised of an edible food.

DETAILED DESCRIPTION OF THE INVENTION

The cookies utilized in the practice of the invention are presently preferably the rectangular chocolate cookies used in conventional ice cream sandwiches or are cookies made from the creamy brown wafer material which includes a grid pattern. The creamy brown wafer material (hereafter, "wafer material") typically comprises the cone into which the ice cream is dispensed, either from a soft serve machine or manually with a scoop. Some wafer material is light and quite porous. Other wafer material is heavier or denser; for example, the heavier-denser dark brown wafer material which comprises the type of a DRUM STICK (Trademark) ice cream cone. Either type of wafer material can be utilized in the practice of the invention. The cookies utilized in the invention can be baked or made from any desired edible food material other than the cookie materials described above. As utilized herein, the term cookies includes any small cake. Such cakes are usually, but not necessarily, sweet. A cake is any of a variety of breads which are baked or otherwise cooked.

In the automated "wipe" machines which produce an ice cream sandwich by injecting through a nozzle ice cream into a sandwich mold, the nozzle is positioned between a pair of spaced opposed cookies and by indexing the sandwich away from the nozzle so that one of the cookies "wipes" the ice cream off the nozzle, when retracted, the nozzle is positioned between the cookies. This method comprises the ice cream, if a heavier denser wafer material (like the wafer material in a DRUM) is utilized (if not, the wafer material must be heated). While the cookies are utilized in the ice cream sandwich, the wafer material is heated so that the wafer material is softened and the wafer material is retracted so that they are rectangular (like the chocolate cookies currently utilized in conventional ice cream sandwiches) or are circular.

If ice cream is dispensed between a pair of opposing rectangular cookies and the resulting ice cream sandwich is immediately eaten, then each cookie need not be particularly resistant to absorbing moisture from the ice cream which is contacting the cookie. If, however, ice cream is dispensed on one or more cookies and the resulting ice cream sandwich is stored frozen for a period of time prior to being eaten, then

it is desirable that the cookies not absorb moisture from the ice cream in the sandwich.

I have discovered a food laminate which slows or prevents the migration of moisture from ice cream through the laminate-ice cream contact interface and into the huminate. The laminate includes a cookie, preferably (but not necessarily) a crispy crunchy cookie of the type described above. A liquid layer of an edible oil is sprayed or otherwise applied over the surface of the cookies which normally would contact the ice cream as an ice cream sandwich. The edible oil is preferably applied relatively uniformly over the entire surface of the cookie, or at least over the periphery of the cookie, so that the cookies which would, if the oil were not applied, be contacted by the ice cream or the ice cream sandwich. After the oil is sprayed or otherwise spread onto the cookie a sheet of an edible membrane is pressed against the oil. The oil is preferably in liquid form, but may be solid. The oil is semi-solid-semi-solid or solid. As used herein, the term oil includes any of numerous edible hydrophobic mineral, vegetable, and synthetic substances, including animal and vegetable fats, that are generally slippery, viscous, liquid or liquefiable at, or above room temperature (preferably at temperatures in excess of 90 degrees F), soluble in various organic solvents (such as sugar), but not soluble in water. Edible means suitable by nature for use as food for humans and animals. Examples of oils include, without limitation, milk butter, fractions of butter, high melting point fractions of butter, low melting point fractions of butter, olive oil, coconut oil, corn butter, white chocolate, vanilla oil, hydrogenated and partially hydrogenated oils such as partially hydrogenated canola or soybean oil.

The membrane is preferably impregnative with the cookie surface, but should at least cover the area of the cookie surface which would be contacted by the ice cream in the ice cream sandwich if the oil and membrane were not applied to the cookie. When the membrane is pressed against the cookie, the oil helps the membrane adhere to the cookie. Most cookie surfaces are not extremely smooth. The coating of the paper to high and low points on the cookie during the forming of the paper to high and low points on the cookie can also facilitate adherence of the membrane to the cookie. Feed compositions other than oil can be utilized to adhere the membrane to the cookie.

The membrane can, if desired, be porous and absorb excess oil on the anode. More than one layer of membrane can be utilized. The thickness of the membrane and of the membrane layer can vary as desired. Soft thin membranes with the consistency of soft, pliable tracing paper can be utilized as can thicker membranes having the thickness of twenty pound paper, of construction paper, or of various cardboards. The softness, porosity, absorbency, and pliability of the membrane can also vary. However, a thin,

porous, pliable, soft membrane of rice starch paper is presently produced. The rice starch paper absorbs a excess oil from the cookies. Potato starch paper, made from potato starch, paper made from the protein casing, or any other sheet of edible membrane can be utilized in the practice of the invention. The rice starch paper and other starch membranes used above are extremely compressed substantially of starch, but include small amounts of protein, including binders, etc. Such membranes comprised of starch are readily available in commerce. The membrane utilized need not be porous as long as the oil or other fluid composition incline adhere the paper to the cookie surface.

The combination of hydrophobic oil and membrane is important. If only the oil is utilized, then high temperatures encountered during shipment of the laryngate feed of the

The invention can make the oil less viscous and cause it to be absorbed into the cookie. The membrane helps to retain the oil in the desired position adjacent and contacting the membrane, or when the membrane is porous and/or absorbent, retains the oil in the membrane. One stabilizes the oil. The oil also stabilizes the membrane. One reason that it is preferable that the membrane be porous is that the membrane can absorb and at least partially absorb oil is that the oil makes the membrane water resistant and helps prevent the starch in the membrane from being dissolved by water in the cream surrounding the ice cream. Ordinarily, at least two portions of the membrane resist the migration of moisture from the ice cream into the cookie portion of the laminate food. Together, the hydrophobic oil and membrane form an effective barrier for significantly slowing or preventing the migration of moisture from ice cream contacting the paper. Flavoring, vitamins, minerals, trace elements, preservatives, and other components can, if desired, be added to the membrane, the oil, and the cookies used in the ice cream sandwich of the invention.

In an alternate embodiment of the invention, oil is applied to or absorbed into the membrane before the membrane is applied to the cookie. This procedure may be desirable because it reduces the number of applications which must be made on the surface of the cookie which will be adjacent to ice cream in an ice cream sandwich. The oil and membrane can be applied to any surface(s) on all surfaces of the cookie:

In still another embodiment of the invention, the oil and/or wax membrane are applied to the surface of a first cookie, after which a second cookie is applied over the membrane, to sandwich the edible membrane and oil between a pair of cookies. Additional quantities of oil or other food components can be utilized to secure the second cookie layer to the first cookie. The second cookie optionally, but not necessarily, is complementary with the first cookie and is the same size as the first cookie. The resulting food laminate includes the first cookie, an oil layer, at least one layer of edible membrane, a second oil layer, and the second cookie. In this embodiment of the invention, the second cookie layer directly migrates from the ice cream in an ice cream sandwich. Moisture migrates from the ice cream sandwich into the second cookie, but the edible membrane/oil layers prevent the moisture from migrating into the first cookie.

In yet another embodiment of the invention, cookie batter is placed on a layer of edible membrane impregnated with oil. When the batter and paper are baked, the membrane adheres to the resulting cookie. Or, the membrane is adhered to the cookie after it is baked or cooked. Applying the membrane to a baked cookie while it is still warm facilitates the adhering of the membrane to the cookie.

The amount of oil applied to the surface of a cookie can vary as desired, but it is presently preferred that the amount of oil be minimized to insure that at least the outer portion of the cookie does not become saturated with oil and lose its crispy texture. The outer portion of the cookie is the portion which is not contacted by ice cream and which ordinarily is contacted by the fingers of an individual holding and eating an ice cream sandwich which includes the cookie. As noted in the Examples below, only a relatively small amount of oil ordinarily is required.

The following examples depict the presently preferred embodiments of the invention for the purpose of illustrating the practice thereof and not by way of limitation of the scope of the invention.

EXAMPLE 1

Waffle batter is prepared. The following ingredients are used:

EXAMPLE 1

1½ cups sifted all-purpose flour
 2 teaspoons baking powder
 ½ teaspoon salt
 2 beaten egg yolks
 1¼ cups milk
 ½ cup solid oil or melted shortening
 2 stiffly beaten egg whites
 The dry ingredients are sifted together. The yolks, milk and oil are combined and stirred into the dry ingredients. The whites are folded in, leaving a few lumps. The resulting soufflé batter makes three ten-inch waffles.

EXAMPLE 2

A waffle iron is provided. The iron includes a lower flat circular metal griddle or plate surface and an upper rimmed indented circular metal griddle or plate that impresses a grid pattern into waffle batter as it bakes. Parts of the griddles are put into waffle batter as it bakes. The upper griddle is turned about its vertical axis to move the upper griddle to a position adjacent to the lower griddle. The upper and lower griddles are heated to temperatures sufficient to produce waffles from batter poured on the griddles. The upper griddle is turned about its hinge to a position adjacent to the lower griddle and one-half of the batter from the lower heated griddle is scooped into the upper griddle. The upper griddle is turned about its hinge to a position in which it contacts the batter on the lower griddle. The batter is cooked on both the upper and lower griddles for several minutes or until the waffle is cooked and a crispy texture is produced. The upper griddle is then turned about its hinge to remove the waffle from the lower griddle and the cooked crispy waffle is produced. The upper griddle has a lower flat surface which is removed. The cooked waffle has a lower flat surface and an upper surface which has grid pattern. The cooked waffle is about one-half inch thick.

EXAMPLE 3

A pair of circular waffle cookies 13, 18 (FIG. 1) about three and a half inches in diameter are cut from the waffle produced in Example 2. Each of the circular waffle cookies has a lower flat surface 15 and an upper surface which has a oval pattern 16.

Thin porous rice starch paper is obtained. The starch paper has a thickness comparable to that of tracing paper. Two circular pieces 17, 19 each having a diameter of about three and a half inches are cut from the rice paper.

An aerosol can of PAM cooking oil is provided. The aerosol can of PAM is distributed by American Home Food Products, Inc. of Madison, N.J. 07794. PAM cooking oil includes canola oil, *grape alcohol from corn* (advised for clarity), lecithin from soybeans (prevents sticking), and propellant. A one second spray from the aerosol can of PAM covers a 4" surface at 1 to 1.2 inches away. PAM cooking oil is 100% natural.

The aerosol can of PAM, the circular waffle cookies 13 and 18, and the circular pieces of edible rice starch paper 17 and 19 are utilized in the following manner to produce a pair of food laminates.

First, the aerosol can of PAM is held about six inches away from the lower substantially flat surface 15 of one 13 of the circular waffle cookies. The valve-nozzle of the aerosol can of PAM is manually operated to open the valve-nozzle for one second to cause PAM cooking oil spray

to contact the lower flat surface 13 of the wafer cookie 13. A layer 14 of PAM oil is produced on the lower surface 15. Second, a membrane comprising one of the circular pieces 17 of rice starch paper is pressed against the lower flat surface 15 of the wafer cookie 13. The PAM oil 14 on the lower surface causes the porous membrane 17 to adhere to the lower surface. The membrane 17 absorbs some of the PAM oil 14 from the lower surface of the cookies.

The foregoing two steps are utilized on the remaining wafer cookie 18 to produce a food laminate, i.e., the bottom flat surface of the remaining circular wafer cookie 18 is sprayed with PAM oil for one second, after which a membrane comprising the remaining circular piece of rice starch paper 19 is pressed against the lower flat surface of the remaining wafer cookie 18. The food laminate with the cookie 18 is substantially identical to the food laminate with the cookie 13.

After each of the wafer cookies has been treated with PAM oil and a membrane, a pair of food laminates 10 and 11 are produced. Each food laminate includes a wafer cookie 13 or 18, a layer 14 of PAM oil, and a membrane 17 or 19 of rice starch paper.

EXAMPLE 4

The pair of food laminates of Example 3 are stacked such that the membrane 17 on the bottom food laminate 10 is in register with and contacts the top surface of the bottom food laminate 11. The top surface 19 of the bottom food laminate 11 is in register with and contacts the bottom surface 15 of the bottom food laminate 10. The pair of stacked food laminates 10, 11 are placed in an oven and heated to 120 degrees F. for one hour. The food laminates are removed and cooled.

The top food laminate 10 is filled from the bottom food laminate 11. Laminate 10 does not stick to laminate 11.

EXAMPLE 5

Example 4 is repeated, except that the stacked food laminates are left in the oven for twelve hours. Similar results are obtained. The top food laminate 10 does not stick to the bottom food laminate 11.

EXAMPLE 6

Example 4 is repeated, except that the stacked food laminates 10, 11 are left in the oven for forty-eight hours. Similar results are obtained. The top food laminate 10 does not stick to the bottom food laminate 11.

EXAMPLE 7

A three-quarter inch layer 12 of soft serve vanilla ice cream is dispensed between the food laminates 10 and 11 of Example 3 to form the ice cream sandwich illustrated in FIG. 1. The ice cream contacts only the membrane-lined surfaces of laminates 10 and 11. The circular spaced apart food laminates 10 and 11 are parallel to one another. The ice cream sandwich is stored in the freezer of a General Electric refrigerator for one month. After one month the sandwich is removed and the cookies 13 and 18 are evaluated for crispness. Cookies 13 and 18 are as crisp as they were prior to making and freezing the ice cream sandwich. Moisture from the ice cream has not penetrated the cookies 13 and 18, or, if moisture from the ice cream has penetrated the cookies 13 and 18, it is not noticeable and is negligible.

EXAMPLE 8

Example 3 is repeated, except that the cookies 13 and 18 from Example 3 are utilized without applying a layer of PAM oil and of membrane to each cookie. Consequently, the ice cream sandwich of Example 7 consists only of cookies 13 and 18 directly contacting the ice cream 12 without a barrier of PAM oil and rice starch paper intermediate ice cream 12 and cookies 13 and 18. After one month, the ice cream sandwich is removed from the freezer and the cookies 13, 18 are evaluated for crispness. Cookies 13 and 18 have absorbed moisture from ice cream 12 and are no longer crisp.

EXAMPLE 9

Examples 3 to 8 are repeated, except that olive oil and membranes comprised of thin sheets of goats starch paper are utilized in place of the PAM oil and of the membranes comprised of rice starch paper. Similar results are obtained.

EXAMPLE 10

Examples 3 to 8 are repeated, except that a one-quarter inch thick, crispy crunchy chocolate cookies are utilized in place of each of the wafer cookies 13 and 18. Each of the pair of chocolate cookies is about three and a half inches in diameter. The chocolate cookies have a consistency similar in make-up to the round chocolate cookies used to make OREO brand chocolate cookies with the white filling. Similar results are obtained. In particular, in Example 7, the chocolate cookies are crisp after the ice cream sandwich is removed from the freezer after one month. In Example 8, the chocolate cookies are not crisp and have absorbed moisture from the ice cream 12, the ice cream sandwich.

EXAMPLE 11

Example 30 is repeated, except that membranes comprised of thin pasta starch paper are utilized in place of the rice starch paper membranes and corn oil is utilized in place of the PAM oil. Similar results are obtained.

EXAMPLE 12

Examples 1 to 8 are repeated, except that the waffles produced in Example 2 are each about 0.085 inch thick. Although the thickness of each wafer can vary as desired, it is presently preferred that the thickness of the waffles be in the range of about 0.07 inch to 0.10 inch.

EXAMPLE 13

Examples 1 to 8 are repeated, except that:
1. The waffles produced in Example 2 are each about 0.085 inch thick instead of one-half inch thick.
2. When the waffles produced in Example 2 are removed from the wafer form they are moist and pliable and become crisp and rigid in about five to fifteen seconds.
3. Before the waffles produced in Example 2 become crisp and rigid, they are each turned around a separate conical metal mandrel to form a wafer cone for recovering ice cream. After each wafer cone becomes crisp and rigid it is removed from its mandrel.
4. In Example 3, conical food laminates are produced by spraying PAM oil against the inner conical surface of each of the wafer cones, and each piece of rice starch paper membrane is wrapped in a conical shape and inserted in one of the cones and pressed against the inner conical surface of the cone. Each piece of mem-

brane adheres to the inner conical surface of one of the wafer cones. Consequently, in Example 3, a pair of PAM oil-treated food laminates with the wafer cones are produced instead of food laminates 10 and 11.
5. In Examples 4, 5, and 6, one wafer cone laminate is stacked inside the other wafer cone laminate such that the membrane in one wafer cone laminate contacts the outer wafer surface of the other cone laminate. The stacked pair of wafer cone laminates is placed in the oven instead of the stacked food laminates 10 and 11. The one wafer cone laminate is heated to 120 degrees F. for one, twelve, or forty-eight hours, respectively.

6. In Example 7, each of the wafer cone laminates is filled with soft serve vanilla ice cream instead of dispensing the ice cream between laminates 10 and 11. The ice cream only contacts the membrane lined inner surface of each cone laminate. Each cone laminate comprises an ice cream sandwich because the ice cream in the cone is contacting the inner surface of the wafer cone laminate. Because the ice cream is also contacting a pair of opposing conical surfaces of the wafer cone laminate, the ice cream is also in contact with the wafer cone laminate. The wafer cone laminate is similar to the wafer cone laminate in that the wafer cone laminate is stored in the freezer of a refrigerator for one month, the waffle cone pieces of the cone laminates are still crisp.
7. In Example 8, the wafer cones are utilized without applying a layer of PAM oil and of membrane to the inside or outside. The waffle cones are similar to the wafer cones in that the wafer cones are stored in the freezer of a refrigerator for one month, the waffle cones have absorbed moisture and are no longer crisp.

The ingredients utilized to produce the cookies of the ice cream sandwich are well known in the art. For example, the ingredients of a powder mixture utilized to make sugar waffle cones include, in order of descending proportion, wheat flour, sugar, vegetable shortening (containing partially hydrogenated soybean oil), dextrose, whole egg, lecithin, and artificial flavoring.

EXAMPLE 14

One thousand grams of zein is obtained. Zein is a water-insoluble prolamine protein of corn gluten. The zein is food grade I-4000 zein powder produced by Freeman Industries, L.L.C. of 100 Marlble Road, Tuckahoe, N.Y. 10787-0415. The zein is a straw-to-yellow colored granular powder which has a blend taste and a molecular weight of about 35,000. The bulk density range of the zein is 1.25 to 2.1 gm/10 ml. The zein is insoluble in water, and is soluble in 80% alcohol. The zein comprises on a dry basis about 88 to 96% protein. One hundred percent of the zein powder passes through a U.S. 20 mesh screen. The total bacterial count of the zein does not exceed 1000 per gram. Tests carried out on the zein for *Escherichia coli* and *Salmonella* indicate that these bacteria are not present.

Zein includes aspartic, asparagine, glutamic acid and glutamine, isoleucine, leucine, phenylalanine, proline, serine, tyrosine and other amino acids. Alcohol partially solubilizes the zein; promoting intermingling.

EXAMPLE 15

The 1000 grams of zein powder of Example 14 is mixed with 9000 grams of a 90% isopropyl alcohol solution in

produce a zein-alcohol solution. The 90% isopropyl alcohol solution includes 90% by weight isopropyl alcohol and 10% by weight water. The zein-alcohol solution is stirred for about five to ten minutes, or until the zein is completely dissolved. The resulting zein-alcohol solution is somewhat viscous, has a pH of 7.0 (the pH is typically in the range of 6.5 to 7.0) and has a light amber color. Fifteen grams of ascorbic acid is added to the zein-alcohol solution to prevent intermingling, interlocking, adsorption, and hindering of the zein-alcohol solution.

If desired ethanol can be utilized in place of isopropyl alcohol in the alcohol solution which is about 75% to 95% by weight. The alcohol solution can include from about 75% to 95% by weight alcohol (either isopropyl alcohol or ethanol), but preferably includes from about 80 to 90% by weight alcohol. When the amount of water in the alcohol solution is reduced, the drying time is reduced. When the amount of water in the alcohol solution is increased, the cost of supplying alcohol is reduced and the alcohol solution is less flammable.

Plasticizers can be utilized to replace about 0.01% to 2.0% by weight of the water in the alcohol solution and to act as a wetting agent. Examples of plasticizers which can be utilized with zein include stearic acid, oleic acid, castor oil (polyol), polyethylene glycol, glycerol, propylene glycol, and glycerine. Such plasticizers will increase the solubility of a film made with the zein-alcohol solution and also produce a film which is more flexible. The addition of plasticizers to the zein-alcohol solution will slightly increase the drying time. Plasticizers assist in the drying of a zein-alcohol solution over a fat layer because plasticizers are conductive (and, in the practice of the invention, preferably are to at least some extent fat soluble as well as alcohol soluble). If casein is utilized, the alcohol content ordinarily must be reduced to less than 95% by weight of the zein-alcohol solution to prevent the protein from denaturing.

Surfactants can be utilized to replace about 0.001% to 3.0% by weight, preferably 0.1% to 1.5% by weight, of the water in the alcohol solution. Examples of surfactants are sodium lauryl sulfates or food grade alkyl-sulfate-sulfonates. Such surfactants assist the spreading of a zein-alcohol solution over a fat layer. When zein is subjected with alcohol, a surfactant solubility is not required. If, however, zein or some other protein is utilized which is dissolved primarily in water, then a surfactant is desirable to prevent the solution protein solution from bonding on the fat layer.

A solution of zein can also, if desired, be made without utilizing any alcohol. In such a case, zein is admixed with propylene glycol and ammonia to produce a zein-glycol-ammonia solution. The strong odor of ammonia is one disadvantage of a zein-glycol-ammonia solution. When, however, the zein film is dry, there is no residual ammonia in the film. The zein-glycol-ammonia solution can include plasticizers, surfactants, and emulsifiers.

A water soluble protein like whey can be utilized in place of zein, in which case a stabilizer like beta-lactin can be utilized.

The weight percent of zein in the zein-alcohol solution is in the range of 1% to 20%.

EXAMPLE 16

EXAMPLE 13 is repeated except that the circular pieces 17 of rice starch paper are not utilized. Instead, after PAM is used to form a layer 14 of PAM oil on the lower surface 15 of the zein-alcohol solution of EXAMPLE 15, a quantity of the zein-alcohol solution of EXAMPLE 15 is sprayed onto layer 14 to form a thin layer of zein-alcohol

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solution extending over and co-extant with layer 14. The zein-alcohol layer dries to form a circular film having a diameter equivalent to each of the circular pieces 17 of rice starch paper which was utilized in EXAMPLE 3, which pieces 17 are not utilized in this EXAMPLE 16. Similarly, after PAM oil is sprayed on the bottom flat surface of cookie 15, a layer of zein-alcohol solution is sprayed onto the oil covering the bottom flat surface of cookie 15. Starch is added from the zein-alcohol solution is adsorbed by fat in layer 14. Fat from layer 14 is adsorbed by alcohol in the zein-alcohol solution. The zein-alcohol solution dries to form a circular film having a diameter equivalent to each of the circular pieces 17 of rice starch paper utilized in EXAMPLE 3, which pieces 17 are not utilized in this EXAMPLE 16.

After each of the waffle cookies has been treated with PAM oil and the zein-alcohol solution, a pair of food laminates are produced. Each food laminate includes a waffle cookie 13 or 16, a layer 14 of PAM oil, and a dried zein film covering and contacting the layer 14 of PAM oil. The dried zein film is from 60% to 99.999%, preferably 90% to 99%, by weight zein protein.

EXAMPLE 17

Examples 3 to 8 are repeated, except that the food laminates prepared in EXAMPLE 16 are utilized instead of the food laminates prepared in EXAMPLE 3. Similar results are obtained.

EXAMPLE 18

Example 10 is repeated except that the one-quarter inch thick crispy crunchy chocolate cookies are laminated utilizing the process described in EXAMPLE 16, i.e., the chocolate cookies are laminated by applying a layer of PAM and by then applying a layer of zein-alcohol solution. Similar results are obtained.

EXAMPLE 19

Example 13 is repeated except that in Step 4 of Example 13, rice starch paper is not utilized. Instead, after PAM oil is sprayed against the inner conical surface of each of the waffle cones to form a layer of PAM oil, the zein-alcohol solution of Example 15 is sprayed on the PAM oil covering the inner conical surface. The zein-alcohol solution is permitted to dry to form a zein film covering the PAM oil and the inner conical surface of the waffle cones. Similar results are obtained.

EXAMPLE 20

Example 16 is repeated except that a pair of crispy, crunchy, corn flakes of the type utilized in KELLOG'S CORN FLAKES and other similar corn flakes breakfast cereals is utilized in place of the circular waffle cookies 13, 16, i.e., each corn flake is sealed with a laminate layer by first spraying and completely coating it with PAM oil and then spraying and completely coating it with the zein-alcohol solution of Example 15. The zein-alcohol solution dries to form a zein film completely covering and sealing each corn flake.

EXAMPLE 21

The pair of laminate corn flakes of EXAMPLE 20 are placed in a bowl of milk along with ordinary corn flakes not laminated with the PAM oil and zein film. The laminate corn flakes retain their crispness longer than corn flakes not laminated with PAM oil and the zein film.

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EXAMPLE 22

Twenty-five grams of lathion and eleven grams of 99WR food grade potassium stearate (Sold by WITCO Company) is admixed with 7854 grams of 95% ethanol (95% ethanol is comprised of 95% by weight ethanol and 5% by weight water) to form an ethanol-stearate solution. Ten grams of sodium lauryl sulfate (NF grade) is mixed with eleven hundred grams of water to form an aqueous sulfate solution. The aqueous sulfate solution is mixed with the ethanol-stearate solution to form an ethanol-stearate-sulfate solution. The 1000 grams of zein powder of Example 1 is mixed with the ethanol-stearate-sulfate solution to produce ten thousand grams of a zein-alcohol solution. 9000 grams of a 90% isopropyl alcohol solution to produce a zein-alcohol solution. The zein-alcohol solution is stirred for about five to ten minutes, or until the zein is completely dissolved. The resulting zein-alcohol solution is somewhat viscous, has a pH of 6.8 (the pH is typically in the range of 6.3 to 7.0) and has a light amber color.

EXAMPLE 23

Example 16 is repeated, except that the zein-alcohol solution of Example 22 is utilized in place of the zein-alcohol solution of Example 15. Similar results are obtained.

EXAMPLE 24

Examples 3 to 8 are repeated, except that the food laminates prepared in EXAMPLE 23 are utilized instead of the food laminates prepared in EXAMPLE 16. Similar results are obtained.

EXAMPLE 25

Examples 23 and 24 are repeated, except that chocolate with a melting point of 92 degrees is utilized in place of the PAM oil. Similar results are obtained.

EXAMPLE 26

Examples 23 and 24 are repeated, except that chocolate with a melting point of 72 degrees is utilized in place of the PAM oil. Similar results are obtained.

EXAMPLE 27

Examples 23 and 24 are repeated, except that chocolate with a melting point of 100 degrees is utilized in place of the PAM oil. Similar results are obtained.

EXAMPLE 28

Ten grams of sodium lauryl sulfate (NF grade) is mixed with eleven hundred grams of water to form an aqueous sulfate solution. The aqueous sulfate solution is mixed with 7859 grams of ethanol to form an ethanol-sulfate solution. One thousand grams of food grade casein powder is mixed with the ethanol-sulfate solution to produce ten thousand grams of an aqueous casein solution. The aqueous casein solution is stirred for about five to ten minutes, or until the zein is completely dissolved. The resulting aqueous casein solution is somewhat viscous, has a pH of 7.0 (the pH is typically in the range of 6.3 to 7.0) and has a light amber color. The weight percent of casein in the aqueous casein solution is in the range of 1% to 20%.

EXAMPLE 29

Example 16 is repeated, except that the aqueous casein solution of Example 28 is utilized in place of the zein-

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alcohol solution of Example 15. The aqueous casein solution is applied to a fine mist at an elevated temperature of 90 degrees F. to form only a thin film to facilitate drying of the solution. The dried casein film includes from 80% to 99.99% by weight casein, preferably 90 to 99% by weight casein. Otherwise similar results are obtained.

EXAMPLE 30

Example 29 is repeated, except that (1) chocolate with a melting point of 92 degrees is utilized in place of the PAM oil, (2) the chocolate solidifies and cools to a room temperature of 76 degrees F. before the aqueous casein solution is sprayed onto the chocolate disk. Similar results are obtained.

EXAMPLE 31

The waffle cookies prepared in Example 30 are shipped. During shipping, the temperature of the cookies rises from 76 degrees F. to 95 degrees F. for a short while and then cools to 80 degrees F. The chocolate melts when the temperature exceeds 92 degrees F. When the chocolate melts, a portion of the chocolate is absorbed by the casein film.

EXAMPLE 32

Example 29 is repeated, except that (1) chocolate with a melting point of 72 degrees is utilized in place of the PAM oil, (2) the chocolate is liquid when the aqueous casein solution is sprayed onto the chocolate, and (3) the chocolate solidifies while the casein solution simultaneously dries to form a casein film over the chocolate. The simultaneous drying of the chocolate and the casein solution facilitates absorption of portions of the chocolate into the casein film and facilitates absorption of portions of the aqueous casein solution into the chocolate. Otherwise similar results are obtained.

As would be appreciated by those of skill in the art, the laminating processes of the invention can, if desired, be utilized on any type of cookie, cereal, bread, bagel, cracker, muffin, or other bakery products, regardless of whether such baked goods are utilized in an ice cream sandwich.

Having described by invention in such terms as to enable those skilled in the art to understand and practice it, and having identified the presently preferred embodiments thereof, I claim:

1. A food product comprising
 - (a) at least one baked member having at least one outer surface;
 - (b) a layer of edible oil on said outer surface;
 - (c) a protein-containing layer covering said layer of edible oil, comprising an edible food, said layer of edible oil being partially adsorbed by said protein-containing layer.
2. A process for laminating a baked product comprising the steps of
 - (a) spraying a layer of edible oil on said baked product;
 - (b) spraying a protein-containing layer of protein on said layer of edible oil such that at least a portion of said

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edible oil is partially adsorbed by said protein-containing layer; and,

(d) permitting said protein-containing layer to dry to form a protein film covering said layer of edible oil.

3. A food product comprising

(a) at least one baked member having at least one outer surface;

(b) a layer of edible oil on said outer surface; and,

(c) a protein-containing layer covering said layer of edible oil, comprising an edible food and a fat-solubilizing component which at least partially solubilizes said oil layer to facilitate intermingling of said oil and said protein-containing layers.

4. A food product comprising

(a) at least one baked member having at least one outer surface;

(b) a liquid layer of edible oil on said outer surface; and,

(c) a protein liquid layer covering said liquid layer of edible oil, said protein liquid layer comprising a solution of protein which adsorbs at least a portion of said liquid layer of oil into said protein liquid layer.

5. The food product of claim 3 wherein said fat-solubilizing component is an alcohol.

6. The food product of claim 3 wherein said protein-containing layer when dry includes from 80% to 99.999% by weight protein.

7. The food product of claim 4 wherein said protein-containing layer when dry includes from 80% to 99.999% by weight protein.

8. The method of claim 2 wherein said protein-containing layer includes a fat-solubilizing component.

9. The method of claim 3 wherein said fat-solubilizing component is an alcohol.

10. The method of claim 2 wherein said layer of edible oil is liquid and said protein-containing layer sprayed on said layer of edible oil is liquid.

11. The method of claim 2 wherein said protein-containing layer includes a fat-solubilizing component.

12. The method of claim 11 wherein said fat-solubilizing component is an alcohol.

13. The food product of claim 1 wherein said protein-containing layer when dry includes from 80% to 99.999% by weight protein.

14. The method of claim 2 wherein said protein-containing layer when dry includes from 80% to 99.999% by weight protein.

15. The food product of claim 4 wherein the protein is provided by including zein in the protein-containing layer.

16. The food product of claim 7 wherein the protein is provided by including zein in the protein-containing layer.

17. The food product of claim 13 wherein the protein is provided by including zein in the protein-containing layer.

18. The food product of claim 14 wherein the protein is provided by including zein in the protein-containing layer.

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