(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
21 May 2004 (21.05.2004)

PCT

(10) International Publication Number
WO 2004/041001 A1

(51) International Patent Classification[7]: A23L 1/18, 1/164, 1/168

(21) International Application Number: PCT/EP2003/012307

(22) International Filing Date: 5 November 2003 (05.11.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
02024760.7 6 November 2002 (06.11.2002) EP

(71) Applicant *(for all designated States except US)*: **NESTEC S.A.** [CH/CH]; Avenue Nestlé 55, CH-1800 Vevey (CH).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **HOITINK, Robertus** [NL/CH]; Chemin des Bluets 4, CH-1009 Pully (CH). **GUEX, Claude** [CH/CH]; Rue d'Orbe 63, CH-1400 Yverdon-les-Bains (CH). **VOISIN, Isabelle** [FR/CH]; Chemin du Sécheron 4, CH-1132 Lully (CH).

(74) Agent: **SCHNEITER, Sorin**; Nestec S.A., Avenue Nestlé 55, CH-1800 Vevey (CH).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)*

— *of inventorship (Rule 4.17(iv)) for US only*

Published:

— *with international search report*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

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

(54) Title: BREAKFAST CEREALS

(57) Abstract: The present invention relates to a cereal-based product, which changes or loses colour upon addition of an aqueous liquid. The invention further relates to a process for obtaining the product and to a breakfast cereal comprising two types of cereals. The colour change makes the consumption of breakfast cereals more interesting for children and adults. The cereal may be prepared by applying different coatings on a classic extruded cereals base, whereby an outer coating provides a certain colour and is essentially washed off upon addition of milk.

WO 2004/041001 A1

Breakfast Cereals

The present invention relates to a cereal-based product, which changes or loses colour upon addition of an aqueous liquid. The invention further relates to a process for obtaining the product and to a breakfast cereal comprising two types of cereals. The invention further relates to the use of colour changes in breakfast cereals.

The Background Art

Especially for kids meals such as breakfast or in-between meals do not always serve the sole purpose of providing nutrition. Much to the contrary, consumption of food is increasingly linked to other positive sensations. For example, the up-take of food may be accompanied by surprise, adventure and pleasure. In other words, eating should be fun. In still other words, good food – good life.

Especially with breakfast cereals intended for children several efforts have been made to arouse the curiosity of the consumer by animating or modifying the known and for children often boring way of having breakfast.

For example, in US 6,270,818 (QUAKER OATS) an animated food is disclosed. The food comprises an inner and an outer mass, whereby the outer mass disperses upon addition of liquid and reveals the inner mass, which has a different appearance than the inner mass. The inner mass may have the form of a dinosaur.

Furthermore, US 6,207,216 (GENERAL MILLS) teaches a quickly dissolving aerated food product, in particular marshmallow pieces. These confectionery products may have a quickly and a slowly dissolving portion, whereby a quickly dissolving shell surrounds the slowly dissolving portion that can have the shape of a small baby animal.

Although the above mentioned products are probably very interesting for children, they are very complex to manufacture and therefore expensive.

It is an object of the present invention to provide surprise and pleasure during consumption of a cereal-based product in a simple way. In particular, it is an

object to provide a breakfast cereal that surprises the consumer and is particularly interesting for children.

It is a further object of the present invention, to provide a cereal-based product that changes colour upon addition of aqueous liquids, such as water, milk or reconstituted milk, for example.

It is still further an object of the present invention to provide a cocoa-coated cereal-based product wherein the cocoa is essentially washed away upon addition of an aqueous liquid to the product and a white or different colour of the product becomes visible.

Summary of the Invention

Remarkably, it is possible to provide a cereal-based product that changes colour upon addition of an aqueous liquid such as milk, for example.

Consequently, in a first aspect the present invention provides cereal-based product, characterised in that it changes or loses colour upon addition of an aqueous liquid.

In a second aspect the invention provides a process for obtaining the cereal-based product according to the present invention, comprising the steps of

coating a cereal base with an inner, protective coating,

drying the coated breakfast cereal to a water content below 10 wt%, and

coating the coated breakfast cereal with an outer coating, which is quickly dissolvable in an aqueous liquid

In a third aspect the invention provides a cereal product comprising at least two types of cereals, wherein one type of cereal is the cereal-based product according to the present invention.

In a fourth aspect, the present invention provides the use of colour changes in breakfast cereals.

In a fifth aspect, the present invention provides the use of at least one coating on a cereal-based product to manufacture breakfast cereals that change or lose colour upon addition of an aqueous liquid.

An advantage of the present invention is that it provides a cereal-based product that gives a different experience and effect to the consumer than hitherto known products. The cereal-based product according to the invention may arouse the curiosity of the consumer and thus make a breakfast an unexpected happening or an interesting adventure.

Another advantage of the present invention is that the effect of colour change in cereal-based products may be achieved by standard technical equipment and on the base of natural food sources, if wished.

Yet another advantage of the present invention is that it provides a product that changes colour when an aqueous liquid such as milk is added.

Detailed Description of the Invention

Within the context of this specification the word “comprises” is taken to mean “includes, among other things”. It is not intended to be construed as “consists only of”.

In the context of the present invention, the term "cereal-based product" is intended to include those products that are also known as breakfast cereals and that are consumed after addition of water, milk, juice or generally aqueous liquids. However, the products according to the invention are not restricted to breakfast, but may be consumed at any time during a day, for example as a convenient easy-to-prepare, in-between-meal or snack.

In the context of the present invention, the term "colour" is intended to cover also black and white. Hence, a colour change is also achieved when a cocoa-brown cereal-based product becomes white because the cocoa-coating is completely washed off.

In the context of the present invention, it is distinguished between a "dissolvable" or "first" as opposed to an "second" or "inner" colour. The dissolvable or first

colour refers to the colour of the cereal-based product as it is visible during shelf-life or in the package before an aqueous liquid is added. The second colour is the colour that becomes visible only after dissolution of the dissolvable colour upon addition of the liquid. Hence, the second colour only becomes apparent at the moment of preparation of the cereal-based product, that is, when an aqueous liquid such as milk is added.

The terms "colour change", "changing or losing colour" refer to a visual effect, which is to be differentiated from circumstances where simply some of the coating dissolves upon addition of milk, for example. Many known breakfast cereals comprise a cocoa coating, which partially dissolves into milk for example. However, with these cereals, a clearly visible change of colour is not achieved, because substantial part of the coating sticks to or remains with the breakfast cereal. A colour change in the context of the present invention is a change that a consumer would clearly identify as a change in colour. For example: First brown, then white; first brown, then yellow or fawn, and so forth.

In the context of the present invention, a cereal based product is intended to be a product comprising at least 50%, preferably at least 70%, more preferably at least 80-90% by weight of dry matter of cereals, cereal derived matter or processed cereals, such as cereal flour, for example.

An aqueous liquid, in the context of the present invention, is a liquid comprising water that is usually added to breakfast cereals to prepare the meal. Examples are milk, reconstituted milk, juice, water, or other liquids, normally at the consumer's option.

Percentages in the context of the present invention are weight percentages of ingredients. Differing amounts of water may be present in a specific ingredient, which is clarified if necessary to describe the product or the method of obtaining it.

Preferably, in an embodiment of the cereal-based product according to the present invention it comprises a cereal base and at least one outer coating providing a dissolvable colour, which is quickly or easily dissolvable in an aqueous liquid.

In another embodiment, the cereal-based product further comprises an inner, protective coating between the cereal base and the at least one outer coating

In still another embodiment of the cereal-based product, the cereal base comprises at least 40% of rice flour.

In a further embodiment, the cereal base is an extruded cereal, for example, a cooked-extruded cereal. Preferably, it is a cooked-extruded-expanded cereal.

In still a further embodiment of cereal-based product according to the present invention, the outer coating provides the dissolvable colour and the inner coating prevents the dissolvable colour from attaching directly or permanently to the cereal base.

In yet a further embodiment, the outer coating is a cocoa-sugar solution and/or the inner coating is a sugar solution. For example, a cocoa-sugar solution may comprise, in percent by weight, 50-75% sugar, 5-20% cocoa powder and 10-30% water. A sugar solution may comprise 50-90% sugar and 50-10% water, for example.

In an embodiment, the cereal-based product is brown / cocoa, and which, upon addition of the aqueous liquid, changes its colour to white or fawn.

In an embodiment of the process according to the present invention, the inner coating is a sugar coating and/or the outer coating is a cocoa/sugar coating.

In an embodiment of the breakfast cereal according to the present invention, comprising at least two types of cereals, the at least two types of cereals are of similar shape and colour, whereby the colour is dissolvable with only one type.

In another embodiment of the breakfast cereal, the at least two types of cereals are of different shapes and of different dissolvable colours.

In still another embodiment, the different types of breakfast cereals have different shapes and dissolvable colours. Alternatively, in another embodiment, the breakfast cereals have different shapes and different second colours but a similar dissolvable colour.

The colour change or loss according to the present invention may be achieved by the following principle:

A cereal-base of a specific "inner" colour, such as a breakfast cereal, is coated with an outer coating providing an easily dissolvable colour, resulting in a cereal-based product displaying to a consumer the dissolvable colour, for example.

Upon addition of an aqueous liquid and if necessary, slight stirring, the outer coating is washed off or dissolved revealing to the consumer the cereal base with the inner colour. This corresponds to an embodiment of the present invention.

However, attention may be paid to the possibility that the outer coating adheres to the cereal base with the inner colour in a way that the addition of the aqueous liquid may not sufficiently wash off or dissolve the coated dissolvable colour. In other words, no clear or complete colour change is obtained, even upon slight stirring, because the cereal base retains spots of the outer coating providing the dissolvable colour.

For example, adhering or sticking of the outer coating may be found when cocoa-powder is used as part of the outer coating to provide brown as the dissolvable colour. If the coating comprising cocoa powder, or a coating with similar properties, is directly coated onto the cereal-base, a complete washing off or dissolution may not be achieved. In practice, this may often be the case, for example if it is wished that some of the cocoa of the coating will dissolve into the milk, to give a specific flavour and colour also to the milk. However, in these cases, a substantial part of the coating remains adhered to the cereal, having the consequence that not a real colour change in the sense of the present invention is obtained. An example of a breakfast cereal having a chocolate or cocoa coating is given in EP 1 051 922 A1.

If adhering of the outer coating to the cereal base is observed, it may be advantageous to apply an optional inner coating, between the cereal base and the outer coating, which prevents the outer coating from sticking or adhering directly to the cereal base. A cereal-base comprising an inner and an outer coating, the inner coating preventing the outer coating from sticking to the cereal base corresponds to a further embodiment of the present invention.

The inner coating thus may be defined as a protective coating, preventing the outer coating from sticking to the cereal base. The inner coating may, however, also be defined in terms of its function for easy washing off of the outer coating. Therefore, the inner coating may have properties that prevent an irreversible or intense sticking of the outer coating to it. If the cereal-based product according to the invention is exposed to an aqueous liquid, the outer coating, which provides a specific colour, is immediately washed off, because it does not stick or adhere to the inner coating due to the properties of the inner coating in relation to the outer coating.

As a variation, the cereal base may comprise a first coating providing an inner colour and a further coating providing a dissolvable colour, only the dissolvable coating/colour being washed off or dissolved upon addition of an aqueous liquid.

As a still further variation, the cereal base may comprise more than two coatings. For example,

- a first coating providing an inner, "second" colour,
- a second coating preventing the washing off / dissolution of the first coating, and,
- a third coating providing a "first", dissolvable colour which is washed off upon addition of an aqueous liquid.

The desired effect may also be achieved selecting or modifying a basic coating material providing a specific colour in a way that it is easy dissolvable in an aqueous liquid, such as milk, when coated onto a cereal-based product. This helps avoiding an inner, protective coating. For example, a coating may be provided that does only weakly attach to the breakfast cereal and that is therefore easily washed off when milk, etc, is added.

For the working of the present invention a suitable cereal-based product may first be prepared or commercially obtained. Principally, any cereal-base that is suitable as a breakfast cereal may be started with, for example. Likewise, any snack to be prepared by addition of milk or juice may be used.

Cereals are wheat, maize, barley, oat, rice, oat, millet and the like. Examples of suitable cereal-bases are crisps, flakes, puffs (oven or gun puffed), extruded, cooked-extruded and/or extruded-cooked-expanded cereals, for example. Hence,

cereal-bases comprise, for example, rice or maize crisps, puffed rice or oat, any kind of flakes, baked or compressed and flaked cereals, toasted cereals and so forth.

The skilled person is generally aware of how to obtain different cereal-bases such as flakes, puffs, crisps, and other extruded cereals, for example. In "Breakfast Cereals and how they are made", edited by Fast and Caldwell, 2nd edition 2000, published by the American Association of Cereal Chemists, Inc, St. Paul, USA, the preparation of all basic breakfast cereals may be found. Below a number of patent documents disclosing different kinds of cereal bases is given.

Suitable cereal-bases may have any form. A high variety in form may be obtained with cooked-extruded-expanded cereals, for example, whereby the form of the extrusion die more or less determines the final shape of the cereal base. Accordingly, cereal bases having the form of balls, cubes, rings, stars, animals, objects, letters, for example, may be obtained.

Preferably, the cereal base comprises, in percent by weight, at least 40%, preferably at least 50%, more preferably at least 60%, 70% or 80% of rice flour. For example, the cereal base comprises 60-75% rice flour. In selecting rice flour as a substantial component of the cereal-base, a substantially white or bright cereal base is obtained. This offers the possibility that the first colour of the cereal base be white, which will be displayed to the consumer if the outer coating is washed off upon addition of an aqueous liquid.

A further advantage of a rice-flour as a main ingredient of the cereal base is that it may be easily coloured by further food-grade colorants to provide a particular inner colour, if desired. For example, a blue, red, orange, yellow or green cereal base may be obtained by addition of the specific colorant at a suitable moment during the process of preparing the cereal base. By adding cocoa powder (3-10 wt.-%) to the dry mix, an extruded cereal base of a brown "inner" colour may be obtained.

Colorants may be added to the mix before extrusion. It is possible to add any food-grade colorants that will survive the conditions of extrusion-cooking or other way of preparing the cereal base, for example. Examples of possible food colorants suitable for extrusion are annatto, caramel, paprika extract, and

turmeric. Legislation of different countries permits more or fewer colour agents for products obtained by cooking-extrusion.

Preferably, the cereal base may be a cooked-extruded cereal comprising rice flour. Such a cereal base may be obtained, for example, by mixing dry ingredients, in percent by weight, 90 to 99% of cereal flour, about 1% salt and about 0.5% processing aids to add up to 100% of the dry mix. Sucrose may, optionally, also be added, in amounts of 1.5-20%, preferably 2-15%, more preferably 3-9%. The cereal flour may comprise at least 40% and up to 100% rice flour. Preferably, it comprises at least 60%, more preferably at least 80% rice flour, more rice flour will support a brighter white colour of the extruded base.

An amount of about 2 to 7% oil and about 10 to 15% water, calculated as percentage of the total dry mix weight may be mixed together with the dry mix before feeding the complete mix into the extruder. The complete mix may have a water content of about 10 to 15%, preferably about 11 to 13%.

Any suitable extruder, such as a BC-72 type Clextral twin screw extruder having a screw diameter of 88 mm and a screw length of 1200 mm may be used, for example.

Cooking extrusion may be carried out at 100 – 200°C, under a pressure of 20-200 bars, the two intermeshing screws rotating at 200-400 rpm, preferably 240-370 rpm, for example. The cooked thermoplastic mass may thereafter be extruded through a die having, for example 1- 50, for example six round outlet openings or orifices with a diameter of about 0.5 – 4.0, preferably 1-3.5 mm. The thermoplastic mass may be extruded directly into ambient air, for example and immediately cut with a blade cutter rotating adjacent to the opening at 2500-6000 rpm, for example 5000-5300 rpm.

The extrusion parameters, the die and the cutting process may be modified as to vary the characteristics, such as the texture, shape, and so forth, of the extruded cereal base. In other words, any extruder, die or cutting device may be used to obtain an extruded cereal base comprising rice flour.

If the extruded base is intended to be of a different colour than white, it is possible to add "extrusion-grade" colorants into the dry mixture before feeding

the complete mix into the extruder. In so doing, red, green, blue, orange, brown extruded bases may be obtained. The suitable amount of colorant to be added to the dry mixture depends strongly on the colouring power of the colorant. Usually, minute amounts are sufficient (below 5 wt.-%, preferably below 2%), but may have to be established in routine experiments for each colorant.

The extruded cereal base may have any form obtainable by extrusion, in the simplest case balls, for example. More complex and also three-dimensional forms may also be obtained, for example using the extrusion die and the method disclosed in EP-A-0898890. Examples of a cereal having the overall shape of an array of touching balls is disclosed in EP 1051 922 A1, cereals of the form (and colour) of a flower or a raspberry are disclosed in WO 9849902, and EP 0898890 A1 teaches cereals of various shapes surrounded by a ring, which was co-expanded. All these kinds of cereals, and more, may be selected to implement the present invention.

Before the cereal base is coated by an optional inner and an outer coating, it is preferably dried to a moisture content (percent by weight) of not more than 7%, preferably 1 to 5%, more preferably 1 to 4%, if necessary.

The outer coating providing the second colour may comprise any material or mixture of ingredients suitable to provide a specific colour and being washed off or dissolved upon addition of an aqueous liquid.

If it is wished to use natural ingredients, the outer coating may comprise, for example, cocoa powder to provide a second colour that is brown. In this case, a more distinctive colour change is obtained if the cereal-base is first coated with an inner, protective coating, because otherwise the cocoa will adhere to or even enter the cereal base to the end that the outer coating (cocoa) may not be washed off or dissolved completely.

A simple but functional example for an inner coating preventing the outer coating from adhering to the cereal-base may be a coating based on a sugar syrup. Accordingly, 60-80%, preferably 5-75% of sugar and 20-40%, preferably 25-35% of water are mixed to form a syrup. Optionally, further ingredients that improve the coating properties or flavours may be added to the syrup. For example, up to 12%, preferably up to 8% calcium carbonate and up to 6%,

preferably up to 4% vanillin may be added to the syrup. These two latter components improve the nutritional and organoleptical properties of the final product. They may be exchanged or supplemented by any other ingredient that modifies the taste, the texture or the nutritional property , for example, of the product. Thereafter, the syrup may be sprayed with spray nozzles in a continuously rotating coating drum or a batch enrober, for example, onto the cereal base to form the inner coating.

Any sugar may be suitable, such as sucrose, dextrose, fructose, invert sugar, glucose, in the form of syrup or in another form. While sugar based coatings are working very well, it may be envisaged to have a protective coating based on other ingredients. Any food grade ingredient may be used as a functional equivalent, as long as it provides a sufficient protective coating that prevents the outer, coloured coating from sticking to the cereal base.

The weight ratio of cereal base to syrup of the inner coating depends on surface of the cereal base and may be selected in a way that the entire surface of the cereal-base is sufficiently coated. If the cereal-base has the form of spherical balls the weight ratio of the cereal base to the syrup of the inner coating may be in the range of 1/1 to 3/1, (50:50 to about 70:30, for example).

After addition of the optional first coating, a drying step will generally be necessary to obtain a coated extruded base with a water content of not more that 12%, preferably not more than 8%, for example approximately 2-4%. This may be done with any commercially available belt dryer, for example.

The advantage of an inner, protective coating based on sugar is that it is transparent or white. It is thus conceivable to add food-grade colorants to the syrup to the end that the first coating provides a first colour to the cereal base, for example.

As mentioned above, the outer coating may comprise cocoa powder providing a second colour that is brown. The outer coating may comprise, for example, 50-70%, preferably 55-65% sugar, 5-20%, preferably 10-15% cocoa powder, 5-20%, preferably 7-15% dextrose, up to 3% caramelised sugar syrup, up to 1% vanillin and 10-20% water. The components may be mixed and applied with spray nozzles in a continuously rotating coating drum or in a batch enrober, for

example. However, any suitable coating apparatus may be used known to the skilled person.

The weight ratio of cereal base (comprising an optional inner coating) to the syrup of the outer coating again depends on surface of the cereal base and may be selected in a way that the entire surface of the cereal-base is sufficiently coated by the outer coating. If the cereal-base has the form of spherical balls and the above-described syrup comprising cocoa powder is used the weight ratio of the cereal base to the syrup of the outer coating may be in the range of 1/1 to 3/1, for example.

After an outer coating is applied, a further drying step may be necessary if a shelf-stable product is wished. This is usually the case with breakfast cereals, for example. Therefore, the cereal base comprising an optional inner and an outer coating may be dried to a water content of not more that 5%, preferably not more than 3%.

The cereal based product according to the present invention may be packaged as it is or mixed with other cereals. For example, it is possible to provide the cereal based product as a breakfast cereals together with other breakfast cereal, that is a mixture of different breakfast cereals comprising the cereal based product according to the present invention.

In a particular embodiment, it is possible to provide to a consumer a breakfast cereal comprising the cereal based product according to the present invention, mixed with a cereal based product of identical shape, size and colour as the cereal of the invention, but not changing/ losing colour upon addition of water. In so doing, a special visual effect is created.

For example, a cocoa/chocolate-coloured, extruded cereal not changing/losing colour may be obtained by extruding-cooking cereal-based materials as described above (comprising, for example rice flour and/or maize flour and/or flours of other cereals, for example), whereby cocoa powder (3-10%, preferably 2-7%, more preferably 3-5%) is added to the mix prior extrusion-cooking to the end that the extruded product has a cocoa or chocolate brown colour which cannot be washed off upon addition of an aqueous liquid such as milk.

This extruded product may be mixed and packaged with the cereal-based product according to the present invention in any amounts to form the breakfast cereal product according to the invention. For example, a breakfast cereal product may comprise the two types of cereals in ratios of 1:9 to 9:1. In an embodiment, the cereal-based product is present, in a packaged breakfast cereal in percentages by weight of 5-50%, preferably 10-40%, more preferably 15-30%.

The following examples are given by way of illustration only and in no way should be construed as limiting the subject matter of the present application. Percentages and parts are by weight unless otherwise indicated.

Example 1: Preparation of a white cereal base obtained by Extrusion-cooking

For the manufacturing of a base cereal, a mixture was prepared which had the following composition, (in parts, except added water):

	In parts	In wt.-% of all ingredients (also liquid)
Rice flour	92.7	79.2
Sugar	5	4.3
Calcium carbonate	1	0.8
Salt	0.8	0.7
Processing aid	0.5	0.4
Oil	5	4.3
Water	12	10.3
Total	117	100

For preparing the mixture, the powders were mixed together to obtain a dry mix in a mixer manufactured by Prodima S.A.. The dry mix, oil and water were then mixed together in the extruder. The mixture obtained in this way was a cooked-extruded-expanded product with the aid of a BC-72 type Clextral twin screw extruder having a screw diameter of 88 mm and a screw length of 1200 mm.

Cooking extrusion was carried out at 155°C under 120 bar. The two intermeshing screws rotating at 320 rpm. The cooked thermoplastic mass obtained in this way

was extruded through a die having six round outlet openings or orifices with a diameter of approximately 2.8 mm.

The thermoplastic mass was extruded into ambient air and immediately cut with a four blades cutter rotating adjacent to the opening at 5200 rpm.

The round balls obtained in this way expanded after cutting so that it was about 10mm in diameter. It had a water content of about 5% and a specific weight of approximately 105 g/l.

The base product was then dried with hot air in a fluidized dryer to a water content of 2.5%. The cereal base had a white colour.

Example 2 : Coating of the cereal base with an inner coating for protection and an outer coating for providing colour

The product of Example 1 was coated with an inner and an outer coating.

A coating slurry was prepared with the following composition (wt.-%):

Sucrose	70
Calcium carbonate	2.0
Vanillin	0.1

Water was added to achieve 100 wt.-% (a total solids of around 70 wt.-%).

For preparing the slurry, the components were mixed together in a double walled tank while being heated to about 80°C.

In a coating drum of 70 cm in diameter and 150 cm in length, the slurry was applied with 5 spray nozzles while still hot, at a rate of 235 kg/hr base and 87.5 kg/hr slurry.

The freshly coated product was then dried with hot air on a belt dryer (a two-belt dryer, manufactured by Comessa) to a residual water content of approximately 3%.

Subsequently a second coating slurry was prepared with the following composition (wt.-%):

Sucrose	61
Cocoa powder	12.5
Dextrose	9
Caramelised sugar syrup	1
Vanillin	0.2

Water was added to achieve total solids of about 80 wt.-%.

For preparing the slurry, the components were mixed together in a double walled tank while being heated to about 80°C.

In a tumbler 70 cm in diameter and 150 cm in length, the slurry was applied with 5 spray nozzles while still hot, at a rate of 200 kg/hr base and 80 kg/hr slurry.

The freshly coated product was then dried with hot air on a belt dryer to a residual water content of 2.2%.

The coated product has a specific weight of approximately 180 g/l. The product has a round shape, has a dark brown appearance and a crunchy texture.

As a whole it has the following composition:

	g/100g
Protein	4.3
Available carbohydrates	84.7
Fat	5.1
Dietary fibers	1.5
Ash	2.2
Water	2.2

If an aqueous liquid is added to the product, the outer, cocoa-coloured coating will easily dissolve completely into the aqueous liquid and the white colour of the original cereal base (Example 1) becomes visible.

Claims

1. A cereal-based product, characterised in that it changes or loses colour upon addition of an aqueous liquid.

2. The cereal-based product according to claim 1, characterised in that it comprises a cereal base and at least one outer coating providing a dissolvable colour, which is quickly or easily dissolvable in an aqueous liquid.

3. The cereal-based product according to claim 1, characterised in that it further comprises an inner, protective coating between the cereal base and the at least one outer coating.

4. The cereal based product according to claim 1, wherein the cereal base comprises at least 40% by weight of rice and/or maize flour.

5. The cereal-based product according to claim 1, wherein the cereal base is an extruded cereal.

6. The cereal-based product according to claim 1, wherein the outer coating provides the dissolvable colour and the inner coating prevents the dissolvable colour from attaching directly or permanently to the cereal base.

7. The cereal-based product according to claim 1, wherein the outer coating is a cocoa sugar solution and/or the inner coating is a sugar solution.

8. The cereal-based product according to claim 1, which is brown / cocoa, and which, upon addition of the aqueous liquid, changes its colour to white or fawn.

9. A process for obtaining the cereal-based product according to the present invention, comprising the steps of

coating a cereal base with an inner, protective coating,

drying the coated breakfast cereal to a water content below 10 wt%, and

coating the coated breakfast cereal with an outer coating, which is quickly dissolvable in an aqueous liquid

10. The process according to claim 7, wherein the inner coating is a sugar coating and/or the outer coating is a cocoa/sugar coating.

11. A breakfast cereal product comprising at least two types of cereals, wherein one type of cereal is the cereal-based product according to the present invention.

12. The use of colour changes in breakfast-cereals.

13. The use of at least one coating on a cereal based product to manufacture breakfast cereals that change or lose colour upon addition of an aqueous liquid.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 03/12307

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A23L1/18 A23L1/164 A23L1/168

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A23L

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ, FSTA

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 894 027 A (KAZEMZADEH MASSOUD) 13 April 1999 (1999-04-13) the whole document	1-13
X	US 2001/008646 A1 (SALISBURY DONALD KENT ET AL) 19 July 2001 (2001-07-19) paragraphs '0025!, '0029!, '0030!; claims; examples	1-13
X,P	US 6 495 179 B1 (LANGENFELD MATHEW F ET AL) 17 December 2002 (2002-12-17) example 1	1,12,13
A	US 4 755 390 A (CALANDRO THOMAS P ET AL) 5 July 1988 (1988-07-05) the whole document	1-13

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
4 March 2004	12/03/2004

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Vernier, F

1

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 03/12307

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	US 6 270 818 B1 (HINKEMEYER THOMAS J ET AL) 7 August 2001 (2001-08-07) cited in the application the whole document	1-13

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

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/EP 03/12307

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5894027 A	13-04-1999	WO 9815194 A1	16-04-1998
US 2001008646 A1	19-07-2001	US 2002044993 A1	18-04-2002
		US 2003099742 A1	29-05-2003
		AU 767682 B2	20-11-2003
		AU 1502401 A	26-07-2001
		BR 0100089 A	05-03-2002
		EP 1118274 A2	25-07-2001
		EP 1284103 A1	19-02-2003
		NO 20010341 A	20-07-2001
		US 2003031760 A1	13-02-2003
		US 2001008645 A1	19-07-2001
US 6495179 B1	17-12-2002	AU 4652500 A	10-11-2000
		WO 0064271 A1	02-11-2000
		US 2003091700 A1	15-05-2003
US 4755390 A	05-07-1988	EP 0203842 A2	03-12-1986
US 6270818 B1	07-08-2001	US 6159511 A	12-12-2000
		AU 761658 B2	05-06-2003
		AU 3688699 A	20-01-2000
		BR 9903494 A	20-11-2001
		CA 2265203 A1	01-01-2000
		EP 0968657 A1	05-01-2000
		IT T0990560 A1	03-01-2000

Box No. VIII (ii) DECLARATION: ENTITLEMENT TO APPLY FOR AND BE GRANTED A PATENT

The declaration must conform to the standardized wording provided for in Section 212; see Notes to Boxes Nos. VIII, VIII (i) to (v) (in general) and the specific Notes to Box No. VIII (ii). If this Box is not used, this sheet should not be included in the request.

Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent (Rules 4.17(ii) and 51*bis*.1(a)(ii)), in a case where the declaration under Rule 4.17(iv) is not appropriate:

in relation to this international application, NESTEC S.A. is entitled to apply for and be granted a patent by virtue of the following :

an assignment from :

HOITINK Robertus, Chemin des Bluets 4, 1009 PULLY, Switzerland, dated 01.10.2001

GUEX Claude, Rue d'Orbe 63, 1400 YVERDON-LES-BAINS, Switzerland, dated 01.10.1984

VOISIN Isabelle, Chemin du Sécheron 4, CH-1132 LULLY, Switzerland, dated 01.09.1991

to NESTEC S.A.

This declaration is made for the purpose of all designations, except the designation of the United States of America.

☐ This declaration is continued on the following sheet, "Continuation of Box No. VIII (ii)".

Box No. VIII (iii) DECLARATION: ENTITLEMENT TO CLAIM PRIORITY

The declaration must conform to the standardized wording provided for in Section 213; see Notes to Boxes Nos. VIII, VIII (i) to (v) (in general) and the specific Notes to Box No. VIII (iii). If this Box is not used, this sheet should not be included in the request.

Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application specified below, where the applicant is not the applicant who filed the earlier application or where the applicant's name has changed since the filing of the earlier application (Rules 4.17(iii) and 51*bis*.1(a)(iii)):

in relation to this international application, NESTEC S.A. is entitled to claim priority of earlier application No. 02024760.7 by virtue of the following :

an assignment from :

HOITINK Robertus, Chemin des Bluets 4, 1009 PULLY, Switzerland, dated 01.10.2001

GUEX Claude, Rue d'Orbe 63, 1400 YVERDON-LES-BAINS, Switzerland, dated 01.10.1984

VOISIN Isabelle, Chemin du Sécheron 4, CH-1132 LULLY, Switzerland, dated 01.09.1991

to NESTEC S.A.

This declaration is made for the purpose of all designations, except the designation of the United States of America.

☐ This declaration is continued on the following sheet, "Continuation of Box No. VIII (iii)".

Box No. VIII (iv) DECLARATION: INVENTORSHIP (only for the purposes of the designation of the United States of America)

The declaration must conform to the following standardized wording provided for in Section 214; see Notes to Boxes Nos. VIII, VIII (i) to (v) (in general) and the specific Notes to Box No. VIII (iv). If this Box is not used, this sheet should not be included in the request.

Declaration of inventorship (Rules 4.17(iv) and 51*bis*.1(a)(iv)) for the purposes of the designation of the United States of America:

I hereby declare that I believe I am the original, first and sole (if only one inventor is listed below) or joint (if more than one inventor is listed below) inventor of the subject matter which is claimed and for which a patent is sought.

This declaration is directed to the international application of which it forms a part (if filing declaration with application).

This declaration is directed to international application No. PCT/..... (if furnishing declaration pursuant to Rule 26*ter*).

I hereby declare that my residence, mailing address, and citizenship are as stated next to my name.

I hereby state that I have reviewed and understand the contents of the above-identified international application, including the claims of said application. I have identified in the request of said application, in compliance with PCT Rule 4.10, any claim to foreign priority, and I have identified below, under the heading "Prior Applications," by application number, country or Member of the World Trade Organization, day, month and year of filing, any application for a patent or inventor's certificate filed in a country other than the United States of America, including any PCT international application designating at least one country other than the United States of America, having a filing date before that of the application on which foreign priority is claimed.

Prior Applications: EP 02024760.7 06.11.2002

I hereby acknowledge the duty to disclose information that is known by me to be material to patentability as defined by 37 C.F.R. § 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the PCT international filing date of the continuation-in-part application.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name: HOITINK Robertus

Residence: Pully, Switzerland
(city and either US state, if applicable, or country)

Mailing Address: Chemin des Bluets 4
CH-1009 Pully, Switzerland

Citizenship: NL

Inventor's Signature: R Hoitink
(if not contained in the request, or if declaration is corrected or added under Rule 26*ter* after the filing of the international application. The signature must be that of the inventor, not that of the agent)

Date: 10 November 2003
(of signature which is not contained in the request, or of the declaration that is corrected or added under Rule 26*ter* after the filing of the international application)

Name: GUEX Claude

Residence: Yverdon-les-Bains
(city and either US state, if applicable, or country)

Mailing Address: Rue d'Orbe 63
CH-1400 Yverdon-les-Bains, Switzerland

Citizenship: CH

Inventor's Signature:
(if not contained in the request, or if declaration is corrected or added under Rule 26*ter* after the filing of the international application. The signature must be that of the inventor, not that of the agent)

Date: 11 November 2003
(of signature which is not contained in the request, or of the declaration that is corrected or added under Rule 26*ter* after the filing of the international application)

☒ This declaration is continued on the following sheet, "Continuation of Box No. VIII (iv)".

Continuation of Box No. VIII (i) to (v) DECLARATION

*If the space is insufficient in any of Boxes Nos. VIII (i) to (v) to furnish all the information, including in the case where **more than two inventors are to be named** in Box No. VIII (iv), in such case, write "Continuation of Box No. VIII ..." (indicate the item number of the Box) and furnish the information in the same manner as required for the purposes of the Box in which the space was insufficient. If additional space is needed in respect of two or more declarations, a separate continuation box must be used for each such declaration. If this Box is not used, this sheet should not be included in the request.*

Continuation of Box No. VIII(iv):

Name: VOISIN Isabelle
Residence: Lully, Switzerland
Mailing address: Chemin du Sécheron 4
CH-1132 Lully, Switzerland
Citizenship: FR

Inventor's signature: .....Voisin..... Date: 14....November.....2003