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(54) Title: A PROCESS FOR PREPARING A DEHYDRATED FOOD COMPOSITION

(57) Abstract: The present invention relates to a process for preparing a dehydrated food composition, said process comprising the preparation of a vegetable-based puree and dehydration of said by puree by drum drying. The dehydrated food composition so obtained can be stored for a long period prior to reconstitution with water and imparts a very balanced, authentic vegetable flavour upon such reconstitution. There is a need for drum dried ingredients providing improved flavour and fragrance retention. It is surprisingly found that flavour and fragrance retention of drum dried vegetable-based compositions is improved substantially when including a starch having a high amylopectin to amylose ratio and a relatively small particle size.

A PROCESS FOR PREPARING A DEHYDRATED FOOD COMPOSITION

TECHNICAL FIELD OF THE INVENTION

The present invention relates to a process for preparing a dehydrated food composition, said process comprising the preparation of a vegetable-based puree and dehydration of said by puree by drum drying. The dehydrated food composition so obtained can be stored for a long period prior to reconstitution with water and imparts a very balanced, authentic vegetable flavour upon such reconstitution.

BACKGROUND OF THE INVENTION

Vegetables, including herbs and spices, are widely used in food products. Since vegetables are seasonal and because they are very sensitive to spoilage due to their high water content, they are widely employed in dehydrated form in the manufacture of foodstuffs. However, the drying processes employed to produce dehydrated vegetables often have an adverse effect on the flavour quality of these dehydrated vegetables. Frequently, desirable flavour notes are lost during the drying process as a result of volatilisation and/or degradation of key flavour substances. Furthermore, undesirable flavour notes can be generated during the drying process as a result chemical reactions that are promoted by heat and/or the presence of oxygen. Thus, the flavour quality of foodstuffs that have been manufactured using dehydrated vegetables may be improved by mitigating the adverse effects of the drying process on the flavour quality of these dehydrated vegetables.

The prior art comprises several examples of drying processes that aim to retain the flavour characteristics of fresh vegetables. An example of such a process is freeze drying. Freeze drying, however, is a relatively expensive drying technique and as such not suitable for widespread use in the production of dehydrated vegetables.

Air drying is widely used to dehydrate vegetables. Air drying is more economical than freeze drying but an important drawback of this drying technique lies in the fact that the

flavour quality of the vegetables frequently deteriorates during the drying process, e.g. as a result of flavour losses and oxidative changes.

Another drying technique that has been employed to dehydrate vegetables is drum drying (or roller drying). Drum drying is a method used for drying out pureed vegetables that are applied as a thin film onto the surface of a heated drum. The dried vegetable solids are then scraped off the drum with a knife and recovered in the form of flakes.

Drum drying is a very efficient drying technique and yields a dried material that can easily be handled. An inherent limitation of drum drying of vegetables resides in the requirement that the vegetables must be pureed. The heat exposure on the hot drums can suitably be used to gelatinise starch that is contained in the vegetable puree. As a result, starch containing dehydrated vegetables that have been produced by drum drying have the ability to rapidly swell in aqueous liquids.

Dehydration of vegetables by means of drum drying as described in the prior art frequently yields dehydrated vegetable products that suffer from astringency and an unbalanced flavour that lacks fullness.

GB 845 937 relates to a process for manufacturing a dry pre-cooked soup mix, which comprises forming a mixture of dry soup particles, moistening individual particles of the dry soup mixture to an extent sufficient to render them sticky, causing these sticky particles to firmly adhere together in the form of random aggregates of a size substantially greater than the size of the individual particles, and then removing the excess moisture. Example IV of British patent describes the preparation of a dry tomato soup pre-mix by preparing a mixture of 30% tomato paste, carboxy methyl cellulose, vegetable shortening, rice flour and water (total solids content of the mixture was14%), cooking the mixture at 85°C for 45 minutes and then drying it on a drum dryer.

GB 1 335 787 concerns a method of forming green pea flakes in which a hydrogenated vegetable oil and a starch are mixed with cooked green split peas and water to form an aqueous slurry and the slurry is dried in a thin film to form flakes.

US 6,340,494 describes a process for producing dry products which can be reconstituted with cold and hot aqueous liquids by roller drying of fruit concentrates and vegetable concentrates containing external starch, wherein flakes obtained by comminution after the roller drying are agglomerated using the fruit concentrates and vegetable concentrates and the resulting agglomerate is subjected to a heat-moisture treatment and simultaneously dried to the desired final water content.

US 6,730,345 describes a method for sauteing onions, comprising:

- cutting at least one cleaned, whole onion to produce onion parts;
- coating said onion parts with a sauteing agent;
- sauteing said onion parts by contacting with an amount of heated air at a temperature of 121-204 °C for 6-60 minutes to produce sauteed onion parts; and,
- treating said sauteed onions, wherein said treatment is selected from the group consisting of freezing, drying, freeze drying, treating with preservatives, and combinations thereof.

US 2004/0013789 describes a process for producing tomato flakes that are stable to cooking by roller-drying an aqueous suspension containing tomato concentrate, foreign starch and pectin or sodium alginate, and by treating the flakes so obtained with an aqueous solution containing calcium ions.

Our co-pending application WO2012/1 59873 discloses a process for preparing a dehydrated food composition comprising the steps of: mixing a vegetable component and oil to produce a vegetable-oil mixture, said vegetable component and said oil together representing at least 70 wt.% of the vegetable-oil mixture; heating said vegetable-oil mixture at a temperature of at least 70°C; if the vegetable-oil mixture is not a puree, comminuting the vegetable-oil mixture before, during and/or after the heating to produce a puree; mixing said puree with a starch component to produce a thickened puree, said starch component being selected from native starch, modified starch and combinations thereof; drum drying said thickened puree to form a dehydrated food composition; said dehydrated food composition comprising 0.1-50% of oil by weight of the total dehydrated food composition and having an Aw of at most 0.45. A further advantage of adding starch is that it helps in film building over the drum.

However, despite these developments, there is still a need for drum dried ingredients providing improved flavour and fragrance retention as a substantial loss of flavour volatiles still occurs during drying.

In "Factors affecting retention and release of flavour compounds in food carbohydrates; International Food Research Journal 17: 23-34", it is suggested that amylopectin and amylose both capture flavours and fragrances, and that it is expected that due to the binding capacity, high amylose starch would be better than starches containing high quantities of amylopectin.

It is surprisingly found that flavour and fragrance retention of drum dried vegetable-based compositions is improved substantially when including a starch having a high amylopectin to amylose ratio and a relatively small particle size.

SUMMARY OF THE INVENTION

Accordingly, in a first aspect the invention provides a process for preparing a dehydrated food composition comprising the steps of:

- mixing a vegetable component and oil to produce a vegetable-oil mixture, said vegetable component and said oil together representing at least 70 wt.% of the vegetable-oil mixture, said vegetable component being selected from vegetable pieces, vegetable puree, vegetable juice and combinations thereof;
- heating said vegetable-oil mixture at a temperature of at least 70°C;
- if the vegetable-oil mixture is not a puree, comminuting the vegetable-oil mixture before, during and/or after the heating to produce a puree;
- mixing the puree with a starch component to produce a thickened puree, said starch component being selected from native starch, modified starch and combinations thereof;
- drum drying said thickened puree to form a dehydrated food composition;

said dehydrated food composition comprising 0.1-50% of oil by weight of the total dehydrated food composition and having an A_w of at most 0.45

characterized in that the starch has a volume average particle size of less than 30 micrometer and a amylopectin to amylose ratio of at least 2.

In a second aspect, the invention provides a process according to the first aspect of the invention, wherein the dehydrated food composition is combined with one or more other edible ingredients to produce an instant dry mix that can be reconstituted with hot water to produce a soup, a sauce, a gravy, a meal maker, a side dish, a seasoning or a bouillon.

In a third aspect, the invention provides a dehydrated food composition obtained by a process according the first aspect of the invention or an instant dry mix obtained by the second aspect of the invention.

These and other aspects, features and advantages will become apparent to those of ordinary skill in the art from a reading of the following detailed description and the appended claims. For the avoidance of doubt, any feature of one aspect of the present invention may be utilised in any other aspect of the invention. The word "comprising" is intended to mean "including" but not necessarily "consisting of" or "composed of." In other words, the listed steps or options need not be exhaustive. It is noted that the examples given in the description below are intended to clarify the invention and are not intended to limit the invention to those examples per se. Similarly, all percentages are weight/weight percentages unless otherwise indicated. Except in the operating and comparative examples, or where otherwise explicitly indicated, all numbers in this description indicating amounts of material or conditions of reaction, physical properties of materials and/or use are to be understood as modified by the word "about". Numerical ranges expressed in the format "from x to y" are understood to include x and y. When for a specific feature multiple preferred ranges are described in the format "from x to y", it is understood that all ranges combining the different endpoints are also contemplated.

DETAILED DESCRIPTION OF THE INVENTION

Accordingly, the invention provides a process for preparing a dehydrated food composition comprising the steps of:

- mixing a vegetable component and oil to produce a vegetable-oil mixture, said vegetable component and said oil together representing at least 70 wt.% of the vegetable-oil mixture, said vegetable component being selected from vegetable pieces, vegetable puree, vegetable juice and combinations thereof;
- heating said vegetable-oil mixture at a temperature of at least 70°C;
- if the vegetable-oil mixture is not a puree, comminuting the vegetable-oil mixture before, during and/or after the heating to produce a puree;
- mixing the puree with a starch component to produce a thickened puree, said starch component being selected from native starch, modified starch and combinations thereof;
- drum drying said thickened puree to form a dehydrated food composition;

said dehydrated food composition comprising 0.1-50% of oil by weight of the total dehydrated food composition and having an A_w of at most 0.45 characterized in that the starch has a volume average particle size of less than 30 micrometer and a amylopectin to amylose ratio of at least 2.

The term "vegetable" as used herein refers to an edible plant or part of a plant other than a sweet fruit or seed. Examples of edible plant parts include leafs, stems and roots of a plant. In the context of the present invention tomato, paprika, beans, peas and mushrooms are considered to be vegetables.

The term "oil" as used herein refers to a lipid selected from the group consisting of triglycerides, diglycerides, monoglycerides, phospholipids and combinations thereof. The oils employed in accordance with the present invention can be liquid or solid at ambient temperature.

The term "comminuting" refers to the breaking up of particles into smaller fragments, especially by subjecting such particles to mechanical force.

The term "puree" as used herein refers to vegetables that have been ground, pressed, blended, and/or sieved to the consistency of a soft creamy paste or thick liquid.

Typically, a puree contains less than 10 wt.%, preferably less than 5 wt.% of vegetable particles having diameter of 3 mm or more.

The term "juice" as used herein refers to a liquid that is naturally contained in vegetable tissue and that is obtained from such vegetable tissue by mechanically squeezing or macerating vegetables flesh without the application solvents. The term "juice" also encompasses concentrated juice.

The term "vegetable piece" as used herein refers to a vegetable particle having a weight of at least 0.05 g, preferably of at least 0.1 g.

Whenever reference is made herein to the diameter of individual particles, such as vegetable pieces or vegetable particles within a puree, unless indicated otherwise said diameter should be construed as referring to the mean diameter of such a particle.

The vegetable component that is used as a starting material in the present process preferably comprises vegetable pieces. Most preferably, the vegetable component comprises at least 10 wt.%, most preferably at least 30 wt.% of vegetable pieces.

The vegetable pieces employed in the present process preferably are pieces of fresh or blanched vegetables that after harvesting have not been subjected to preservation techniques such as drying, canning, pickling, salting, sugar crystallisation, food irradiation, preserving in syrup, and/or addition of preservatives. Fresh vegetables that have been frozen to retain their fresh characteristics are also considered fresh vegetables.

The vegetable pieces that may be employed in the present process preferably include vegetables that have cut by e.g. slicing, dicing or chopping. The term "cutting" as used herein refers to the subdividing of vegetables into smaller pieces.

The vegetable component employed in the present process can be derived from a great variety of vegetables. Examples of vegetables from which the vegetable component may suitably be derived include onion, shallot, celery, celeriac, carrot,

tomato, paprika, mushroom, parsley, garlic, leek, pumpkin, eggplant, courgette, asparagus, ginger, spinach, turnip, peas, beans, thyme, basil, oregano and combinations thereof. Typically, at least 50 wt.%, more preferably at least 70 wt.% and most preferably at least 90 wt.% of vegetable component are vegetables pieces derived from the latter vegetables.

The benefits of the present process are very evident if the vegetable component comprises vegetables belonging to the genus *Allium.* Examples of vegetables belonging to the genus *Allium* that can advantageously be processed in accordance with the present method include onion, garlic, shallots, leeks, scallions, chives and combinations thereof. Preferably, the vegetable component comprises at least 5 wt.% of vegetables belonging to the genus *Allium.* More preferably, the vegetable component comprises at least 8 wt.%, most preferably at least 15 wt.% of vegetables belonging to the genus *Allium.*

The inventors have observed that particularly good results can be obtained with the present process if the vegetable component employed is derived from two or more different vegetables. According to a particularly preferred embodiment these two or more vegetables are selected from the group consisting of onion, shallot, celery, celeriac, bell pepper, courgette, eggplant, basil, parsley, thyme, oregano, pumpkin ginger, beans, peas, spinach, asparagus, turnip carrot, tomato, leek, mushrooms, garlic, and combinations thereof.

The oil employed in the present process preferably contains at least 80 wt.%, more preferably at least 90 wt.% of triglycerides. Examples of oils that may be employed in the present process include vegetable oils and milk fat. The oil may be provided in the present process in the form of a water-in-oil emulsion such as margarine or butter. Preferably, the oil is provided in an essentially water-free form. Most preferably, the oil employed is selected from vegetable oil, butter oil and a combination thereof.

The heating of the vegetable-oil mixture preferably takes place at a temperature in the range of 70-150°C. At the lower end of this temperature range the heating times can suitably be in the range of e.g. 10 minutes up to hours, whereas at the upper end of the

range adequate heating times are measured in seconds. In a preferred embodiment of the present process the vegetable-oil mixture is heated to a temperature in the range of 70-150°C for a minimum period of time t_{min}, wherein t_{min} is calculated as a function of the heating temperature T in accordance with the following equation:

$$t_{min} = 1 + ((150-T)^3/20{,}000)^2.$$

In the following table shows heating times calculated for different heating temperatures using this equation:

Temperature (°C)	Heating time (sec)
70	656.4
80	295.1
90	117.6
100	40.1
110	11.2
120	2.8
130	1.2
140	1.0
150	1.0

According to a particularly preferred embodiment, the vegetable-oil mixture is heated to 75-120°C for a minimum period of time t_{min}, wherein t_{min} is calculated as a function of the heating temperature T in accordance with the following equation:

$$t_{min} = 10 + ((120-T)^2/60)^2$$

In the following table shows heating times calculated for different heating temperatures using this equation:

Temperature (°C)	Heating time (sec)
75	1149,1
80	721,1
90	235,0
100	54,4
110	12,8
120	10,0

The heating step of the present process has a pronounced impact on the flavour characteristics of the dehydrated product. Very good results can be obtained if the

vegetable-oil mixture is heated to 75-120°C, preferably to 85-100°C, for 0.5-30 minutes.

During the heating of the vegetable-oil mixture moisture loss may occur as a result of evaporation. Typically, not more than 50% of the water contained in the mixture is lost during the heating step. Even more preferably, not more than 20% of the water is lost during heating.

In the preparation of the vegetable-oil mixture advantageously only a minor amount of oil is used. Accordingly, in a particularly preferred embodiment the vegetable-oil mixture is prepared by combining 100 parts by weight of vegetable component with 0.5-10 parts by weight of oil, even more preferably by combining 100 parts by weight of vegetable component with 1-6 parts by weight of oil

Typically, the vegetable-oil mixture contains 0.5-10 wt.%, more preferably 1-6 wt.% of oil when the heating of the mixture commences.

The vegetable-oil mixture may suitably contain other components besides the vegetable component and oil, e.g. seasoning, spices, dried herbs, salt and/or sugar. Preferably, the vegetable component and the oil together represent at least 90 wt.% of the vegetable-oil mixture that is heated in the present process prior to drum drying.

The puree that is mixed with the starch component advantageously contains no more than a minor amount of vegetable particles having a diameter of more than 2 mm. Accordingly, in a preferred embodiment at least 90 wt.%, more preferably at least 95 wt.% of the puree consists or vegetable particles having a diameter of less than 2 mm, more preferably of less than 1 mm.

In case the vegetable-oil mixture contains vegetable pieces, said mixture can suitably be comminuted to produce a puree before, during or after the heating. The invention also encompasses a process in which comminution occurs during at least two of these three phases. According to a particularly preferred embodiment, comminution of a

vegetable-oil mixture containing vegetable pieces occurs simultaneously to heating in the present process.

In the present process the starch component is typically added to the puree in an amount of 1-80% by weight of the vegetable component, more preferably 2-60% by weight of the vegetable component. According to a particularly preferred embodiment, the starch component is a native starch. The starch component to produce a thickened puree, said starch component is selected from native starch, modified starch and combinations thereof. Without wishing to be bound by a theory, starch predominantly comprises of two molecules, linear and helical amylose, and branched amylopectin. It has been found that the best flavour and fragrance retention results are obtained with an amylopectin to amylose ratio of at least 2, preferably 3, more preferably 4. It has also been found that the flavour and fragrance retention is best when the starch particles have a volume average particle size of less than 30 micrometer, preferably less than 25 micrometer, or even less than 20 micrometer.

Before the drum drying, other components besides the starch component may be added to the puree. Examples of such components include vegetable puree, vegetable juice and water. Preferably, the heat treated puree obtained from steps A) to C) of the present process represents at least 20 wt.%, more preferably at least 30 wt.% of the thickened puree that is subjected to drum drying.

The water content of thickened puree that is applied onto the heated drum at the beginning of the drum drying typically lies in the range of 40-95 wt.%. Even more preferably, said water content lies in the range of 50-90 wt.%.

The temperature of the drums employed during drum drying greatly affects the flavour quality of the dehydrated food composition. Preferably, the thickened puree is drum dried on drums that are heated to 110-180°C. Particularly good results can be obtained if the thickened puree is dried on drums that are heated to 120-150°C.

The present process preferably yields a dehydrated food composition in the form of flakes. The dehydrated food composition typically has a bulk density of 40-500 g/l,

more preferably of 50-300 g/l. The water activity of the dehydrated food composition preferably lies in the range of 0.10-0.40.

The dehydrated food composition preferably contains 0.5-40 wt.%, most preferably 2-30 wt.% of oil.

The dehydrated food composition produced by the process described herein before is advantageously combined with one or more other edible ingredients to produce an instant dry mix that can be reconstituted with hot water to produce a soup, a sauce, a gravy, a meal maker, a side dish, a seasoning or a bouillon. Typically, the dehydrated food composition is combined with one or more other ingredients in such amounts that it represents 1-80 wt.%, more preferably 3-50 wt.% of the instant dry mix.

Another aspect of the present invention relates to a dehydrated food composition obtained by the process described herein or an instant dry mix obtained by a process as described herein.

The invention is further illustrated by the following non-limiting examples.

EXAMPLES

Example 1

Experimental methods

Sample preparation: ADD flakes used in this study (varying starch) were prepared as follows:

Normal ADD sample: pre-processed carrot, onion and celery with olive oil to make puree and then added 4% pea starch (to the puree) and then drum dried.

ADD flakes without pea starch: pre-processed carrot, onion and celery with olive oil to make puree and then puree were drum dried. This is to be noted that the film building during drum drying were not optimal without starch.

ADD flakes with post-added pea starch: pre-processed carrot, onion and celery with olive oil to make puree and then puree are drum dried. Starch solution was also drum

dried separately and then post-added (at the same dry wt% as of normal ADD with pea starch).

ADD with different starches: pre-processed carrot, onion and celery with olive oil to make puree and then added 4% starch (X) to puree and then puree are drum dried.

Analytical method for volatile analysis: SPME-GC-MS

GC-MS data acquisition was performed using a 7890A gas chromatograph (Agilent Technology) using DB Wax column (J&W Scientific). The chromatograph was equipped with an MS detector (5975C from Agilent Technology, electron source 70 eV, m/z 28-300). Temperatures at the inlet and detector were 200 °C and 230 °C, respectively with the gas flow (helium) through the column was at 1.0 ml per minute. All GC-MS data analysis performed with Chemstation software (supplied by Agilent). The GC-MS measures amount (normalized value - Y-axis) of flavour volatiles (type of compounds - X-axis). These volatile compounds (shown in X-axis) are known (from literature) to contribute to flavour of carrot/onion etc. It has been checked that the result of GC-MS analysis was independent of the water activity of all samples (aw = 0.28-0.33).

Role of starch in flavour retention in ADD flakes

Drum drying of vegetables in presence of starch helps to maximize the flavour retention as shown by comparative analysis of aroma profile of rehydrated ADD flakes with and without starch. This can potentially be related to the physical state (gelatinised /native) of starch.

Results

starch	dp (um)	% AP	AP/A ratio	GC (limonene)	GC (DPDS)	GC (DMTS)
pea	-	65	1.9	0.45	0.55	0.85
tapioca	17	83	4.9	0.9	0.7	0.8
potato	36	79	3.8	0.5	0.6	0.75
corn	9.8	72	2.6	0.72	0.76	0.98
waxy corn	14.3	97	32.3	0.98	0.95	0.91
high amyl corn	-	47	0.9	0.26	0.26	0.36

*) AP=amylopectin, A=Amylose

As shown in the table above the retention of the flavour ingredients (limonene, DPDS and DMTS) is best when the amylopectin to amylose ratio is at least 2. It also shows

that starch with a particle size of more than 30 micrometer is not performing as well as those with a particle size below 30 micrometer.

Claims

1. A process for preparing a dehydrated food composition comprising the steps of:
   A) mixing a vegetable component and oil to produce a vegetable-oil mixture, said vegetable component and said oil together representing at least 70 wt.% of the vegetable-oil mixture, said vegetable component being selected from vegetable pieces, vegetable puree, vegetable juice and combinations thereof;
   B) heating said vegetable-oil mixture at a temperature of at least 70°C;
   C) if the vegetable-oil mixture is not a puree, comminuting the vegetable-oil mixture before, during and/or after the heating to produce a puree;
   D) mixing the puree with a starch component to produce a thickened puree, said starch component being selected from native starch, modified starch and combinations thereof;
   E) drum drying said thickened puree to form a dehydrated food composition;

   said dehydrated food composition comprising 0.1-50% of oil by weight of the total dehydrated food composition and having an A_w of at most 0.45
   characterized in that the starch has a volume average particle size of less than 30 micrometer and a amylopectin to amylose ratio of at least 2.

2. Process according to claim 1 in which the vegetable component is derived from a vegetable selected from the group consisting of onion, shallot, celery, celeriac, carrot, tomato, paprika, mushroom, parsley, garlic, leek, pumpkin, eggplant, courgette, asparagus, ginger, spinach, turnip, peas, beans, thyme, basil, oregano and combinations thereof.

3. Process according to any one of the preceding claims, wherein the vegetable component comprises vegetable pieces and wherein the vegetable-oil mixture is comminuted before, during and/or after the heating to produce a puree.

4. Process according to any one of the preceding claims, wherein the vegetable-oil mixture is heated to 70-150°C, for a minimum period of time t_{min}, wherein t_{min} is calculated in accordance with the following equation:

$t_{min} = 1 + ((150-T)^3/20{,}000)^2$.

5. Process according to any one of the preceding claims, wherein the vegetable component and the oil together represent at least 90 wt.% of the mixture that is heated.

6. Process according to any one of the preceding claims, wherein the vegetable-oil mixture is prepared by combining 100 parts by weight of the vegetable component with 0.5-10 parts by weight of oil.

7. Process according to any one of the preceding claims, wherein at least 90 wt.% of the the puree consists of vegetable particles having a diameter of less than 2 mm.

8. Process according to any one of the preceding claims wherein starch component is added to the puree in an amount of 1-80% by weight of the vegetable component, preferably 2-60% by weight of the vegetable component.

9. Process according to any one of the preceding claims, wherein the thickened puree has a water content in the range of 40-95 wt.% at the beginning of the drum drying.

10. Process according to any one of the preceding claims, wherein the thickened puree is drum dried on drums that are heated to 110-180°C.

11. Process according to any one of the preceding claims, wherein the dehydrated food composition has a bulk density of 50-300 g/l.

12. Process according to any one of the preceding claims, wherein the dehydrated food composition has an A_w of 0.10-0.40.

13. Process according to any one of the preceding claims, wherein the dehydrated food composition comprises 0.5-40 wt.% of oil.

14. Process according to any one of the preceding claims, wherein the dehydrated food composition is combined with one or more other edible ingredients to produce an

instant dry mix that can be reconstituted with hot water to produce a soup, a sauce, a gravy, a meal maker, a side dish, a seasoning or a bouillon.

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. A23L3/48 A23B7/028 A23L23/10
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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)
A23L A23B

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 practicable, search terms used)
EPO-Internal , WPI Data, FSTA, BIOSIS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2012/159873 Al (UNILEVER NV [NL] ; UNILEVER PLC [GB] ; UNILEVER HINDUSTAN [IN] ; BECK STE) 29 November 2012 (2012-11-29) cited in the application * page 3, lines 24-32 ; examples; claims 1-15 *	1-14
A	WO 2012/175318 Al (UNILEVER NV [NL] ; UNILEVER PLC [GB] ; UNILEVER HINDUSTAN [IN] ; JESSBERG) 27 December 2012 (2012-12-27) * page 3, lines 20-30; examples 1-14; claims 1-11 *	1-14
A	WO 02/07536 A2 (PROCTER & GAMBLE [US]) 31 January 2002 (2002-01-31) * example 1; claims 1-6 *	1-14

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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

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"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
17 February 2017	27/02/2017

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, Fax: (+31-70) 340-3016	Georgopoulos, N

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2017/050443

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
Wo 2012159873 Al	29-11-2012	BR 112013028137 A2	10-01-2017
		CA 2834396 Al	29-11-2012
		EP 2713772 Al	09-04-2014
		MX 338934 B	06-05-2016
		WO 2012159873 Al	29-11-2012
Wo 2012175318 Al	27-12-2012	BR 112013030835 A2	04-10-2016
		CA 2837800 Al	27-12-2012
		EP 2723192 Al	30-04-2014
		WO 2012175318 Al	27-12-2012
wo 0207536 A2	31-01-2002	AR 030065 Al	13-08-2003
		AT 349915 T	15-01-2007
		AU 7797601 A	05-02-2002
		BR 0112694 A	24-06-2003
		CA 2416365 Al	31-01-2002
		CN 1444458 A	24-09-2003
		DE 60125772 T2	18-10-2007
		EP 1303196 A2	23-04-2003
		JP 5047230 B2	10-10-2012
		JP 2004504046 A	12-02-2004
		JP 2009213489 A	24-09-2009
		KR 20030019616 A	06-03-2003
		MX PA03000722 A	04-06-2003
		WO 0207536 A2	31-01-2002