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- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))
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(54) **Title**: FROZEN CONFECTIONS COMPRISING GELATIN

(57) **Abstract**: A frozen confection comprising gelatine, characterised in that the frozen confection comprises: from 0.05 to 1.5 wt% gelatine; at most 1 wt% monosaccharides; from 10 to 30 wt% disaccharides; and from 2 to 8 wt% polysaccharides is provided.



WO 2019/101504 A1

FROZEN CONFECTIONS COMPRISING GELATIN

Technical field

- 5 The present invention relates to frozen confections containing gelatin, in particular this present invention relates to frozen confections containing gelatin that have a specific sugar blend to enhance the functionality of the gelatin.

Background

- 10 Stabilisers are used in frozen confections to maintain the viscosity of compositions. Stabilisers are also useful for maintaining the physio-chemical state of compositions and they can contribute to desirable, uniform product characteristics and a smooth feel on consumption. They also improve the handling properties of products during manufacture and dispensing.
- 15 Ingredients that provide such stabilisation effects are therefore indispensable to the manufacture of commercially acceptable frozen confection products and although efficient stabiliser systems do exist, they are often chemically modified ingredients and/or they appear on the ingredients labelling of products as additives or as "E numbers". Consumers are
- 20 becoming increasingly concerned about ingredients used in their products and in some cases the perception is that any additives should be avoided and natural ingredients are preferred. Certain natural stabilisation systems do exist and one such stabiliser is gelatin which may be used in frozen confection products.
- 25 CA2942266 discloses a process for the preparation of a protein-fortified frozen dessert formulation comprising (amongst others) a step of mixing in the first mix a stabilizing agent. Suitable stabilizing agents may comprise gelatin. WO12110376 relates to a packaged shelf- or chilled- stable mix of ingredients for the preparation of a frozen confection. According to a particular embodiment, the mix further comprises one or more stabilizers. Suitable stabilizers
- 30 include gelatin. US2004175462 relates to a frozen dessert. The composition may contain at least one thickening agent chosen from a group including gelatin. US2010092644 relates to frozen food products, such as ice creams, comprising special emulsifying systems. In some preferred embodiments, the frozen food product additionally comprises one or more stabilizers that may comprise at least one stabilizer selected from a group including gelatine. US4500553

relates to a method of producing a frozen, dual-textured confection comprising a cream and gelatin-containing aerated phase and a natural or simulated fruit phase. US3576648 discloses a frozen comestible comprising an aqueous admixture of a first fraction and a second fraction in which gelatin is listed amongst a long list of stabilisers.

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Although gelatin is a stabilising ingredient from a natural origin, it would be advantageous to improve the performance of this ingredient in order to increase its stabilizing functionality and to allow less of this additive to be used in products. Ideally the increase in its stabilizing functionality would be achieved without the use of any additional ingredients of processing steps.

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Summary of invention

We have now found that the stabilising functionality of gelatin in frozen confections can be enhanced by employing a specific blend of sugars in the product.

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Accordingly, the invention provides a frozen confection comprising gelatine, characterised in that the frozen confection comprises

- from 0.05 to 1.5 wt% gelatine;
- at most 1 wt% monosaccharides;
- from 10 to 30 wt% disaccharides; and
- from 2 to 8 wt% polysaccharides.

20

Preferably the frozen confection comprises at most 1.25 wt% gelatine, more preferably at most 1 wt%, more preferably still at most 0.9 wt%, yet more preferably at most 0.8 wt%, even more preferably at most 0.7 wt%, most preferably at most 0.6 wt% gelatine.

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Preferably the frozen confection comprises at least 0.075 wt% gelatine, more preferably at least 0.1 wt%, more preferably still at least 0.2 wt%, yet more preferably at least 0.3 wt%, most preferably at least 0.4 wt% gelatine.

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Preferably the frozen confection comprises at most 0.75 wt% monosaccharides, more preferably at most 0.5 wt%, more preferably still at most 0.25 wt%, yet more preferably at most

0.1 wt%, yet more preferably still at most 0.05 wt%, even more preferably at most 0.01 wt%, most preferably no monosaccharides.

5 Preferably the frozen confection comprises at least 12.5 wt% disaccharides, more preferably at least 15 wt%, more preferably at least 17.5 wt%.

Preferably the frozen confection comprises at most 27.5 wt% disaccharides, more preferably at most 25 wt%, most preferably at most 22.5 wt%.

10 Preferably the frozen confection comprises at least 3 wt% polysaccharides, more preferably at least 3.5 wt%, more preferably at least 4 wt%.

Preferably the frozen confection comprises at most 7 wt% polysaccharides, more preferably at most 6 wt%, most preferably at most 5 wt%.

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Preferably the total sugars number average molecular weight is from 250 to 450 g/mol, more preferably from 300 to 425 g/mol, most preferably from 350 to 400 g/mol.

20 Preferably the total sugars content of the frozen confection is from 15 to 45wt%, more preferably from 20 to 40 wt%, most preferably from 25 to 35 wt%.

25 Preferably the frozen confection comprises at most 1 wt% additional stabilisers, more preferably at most 0.5 wt%, more preferably still at most 0.25 wt%, yet more preferably at most 0.1 wt, yet more preferably still at most 0.05 wt%, even more preferably at most 0.01 wt%, most preferably no additional stabilisers.

The frozen confection may additionally contain protein, such as milk protein or soy protein, preferably in an amount of from 1 to 10 wt%, more preferably from 2 to 8 wt%. Preferably, the protein is milk protein.

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The frozen confections may also contain fat, such as butterfat, coconut oil, palm, oil, sunflower oil and the like, preferably in an amount of from 1 to 15 wt%, more preferably from 2 to 10 wt%. The frozen confections may include other ingredients typically used in such products, such as emulsifiers, colours, flavours, fruit etc.

Preferably the ice content of the frozen confection as measured at -18°C is from 30 to 70 %, more preferably from 35 to 65 %, more preferably still from 40 to 60 %, most preferably from 45 to 55 %.

5

Preferably the overrun of the frozen confection is from 50 to 250 %, more preferably from 75 to 200 %, more preferably still from 100 to 175 %, most preferably from 125 to 150.

Preferably the frozen confection is an ice cream, milk ice, frozen yoghurt, or sherbet.

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Detailed description of invention

All percentages, unless otherwise stated, refer to the percentage by weight, with the exception of percentages cited in relation to the overrun.

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Frozen confection

As used herein, the term “frozen confection” means an edible confection made by freezing a mix of ingredients which includes water. Frozen confections typically contain fat, non-fat milk solids and sugars, together with other minor ingredients such as stabilisers, emulsifiers, colours and flavourings. Preferred frozen confections include ice cream, water ice, frozen yoghurt, sorbet and the like.

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Gelatin

Gelatin (also spelled Gelatine) is an odourless, tasteless thickening agent that forms a gel when combined with liquid and heated. It is thermo-reversible, meaning the gel liquefies when heated above its melting point but regains a jelly-like consistency when cooled again. The melting point of gelatin is close to the body temperature of the animal from which it is made, which for mammals is around 37°C. The raw material for gelatin is collagen, a naturally occurring pure protein, which is commercially produced from bones, cartilage, tendons, skin and connective tissue of various animals. Much of commercial gelatin is a by-product of pigskin. The term “bloom” refers to the firmness of gelatin. A Bloom Gelometer may be used to measure the rigidity of a gelatin film. The measurement is called the Bloom Strength. A higher number indicates a stiffer product. Gelatin used in food typically has a Bloom between 125 and 250. Common examples of foods containing gelatin are moulded desserts, cold

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soups, trifles, aspic, marshmallows, and confectioneries such as jelly beans. Gelatin may also be used as a stabilizer, thickener, or texturizer in foods such as jams, yogurt, cream cheese, and margarine. It is often added to reduced-fat foods to simulate the mouthfeel of fat and to create volume without adding calories. Additionally, gelatin is used for the clarification of juices and vinegar.

When used in frozen confections, gelatin is typically present in an amount of at least 2 wt% of the product and often even higher in order to deliver stabilisation. However, as a result of the specific sugar blend according to the present invention and its ability to enhance the stabilising performance of gelatin, the amount of gelatin in the present invention need only be at most 1.5 wt%, preferably at most 1.25 wt%, more preferably at most 1 wt%, more preferably still at most 0.9 wt%, yet more preferably at most 0.8 wt%, even more preferably at most 0.7 wt%, most preferably at most 0.6 wt%. Some gelatin is required for stabilisation and therefore the frozen confection comprises at least 0.05 wt% gelatin, preferably at least 0.075 wt%, more preferably at least 0.1 wt%, more preferably still at least 0.2 wt%, yet more preferably at least 0.3 wt%, most preferably at least 0.4 wt%.

Sugar blend

As used herein the term “sugars” refers to monosaccharides, disaccharides and polysaccharides. The term “sugar blend” refers to the relative amounts of monosaccharides, disaccharides and polysaccharides that are added to the formulation. The term “polysaccharide” means a saccharide with a degree of polymerisation of at least 3. The total sugars content of an ice confection is thus the sum of all digestible monosaccharides, disaccharides and polysaccharides present within the ice confection, including any sugars from lactose from milk solids.

As mentioned above and demonstrated in the Examples below, we have surprisingly found that the stabilising performance of gelatin in a frozen confection is enhanced by employing a specific sugar blend. Compared to the sugar blends in the prior art frozen confections that comprise gelatin, the sugar blend of the present invention is low in monosaccharides, has elevated levels of polysaccharides and has high levels of disaccharides.

The frozen confection therefore comprises at most 1 wt% monosaccharides, preferably at most 0.75 wt%, more preferably at most 0.5 wt%, more preferably still at most 0.25 wt%, yet

more preferably at most 0.1 wt%, yet more preferably still at most 0.05 wt%, even more preferably at most 0.01 wt%, most preferably none.

5 The frozen confection comprises at least 10 wt% disaccharides, preferably at least 12.5 wt%, more preferably at least 15 wt%, more preferably at least 17.5 wt% and at most 30 wt%, preferably at most 27.5 wt%, more preferably at most 25 wt%, most preferably at most 22.5 wt%.

10 The frozen confection comprises at least 2 wt% polysaccharides, preferably at least 3 wt%, more preferably at least 3.5 wt% polysaccharides, more preferably at least 4 wt% and at most 7 wt%, more preferably at most 6 wt%, most preferably at most 5 wt%.

Total sugars number average molecular weight

15 The number average molecular weight of the mixture of mono-, di- and poly-saccharides, M_n , is given by the formula:

$$M_n = \frac{\sum w_i}{\sum \left(\frac{w_i}{M_i}\right)} = \frac{\sum N_i M_i}{\sum N_i}$$

20 wherein w_i is the mass of species i , M_i is the molar mass of species i , and N_i is the number of moles of species i of molar mass M_i . The number average molecular weight of glucose syrups is calculated from their dextrose equivalent (DE) number, which is a measure of the amount of reducing sugars present in a sugar product, relative to dextrose, expressed as a percentage on a dry basis. For example, a maltodextrin with a DE of 10 would have 10% of the reducing power of dextrose (which has a DE of 100). Thus, the number average molecular weight of
25 glucose syrups can be calculated from the formula (Chirife et al, Journal of Food Engineering, 33, 221-226 (1997)):

$$M_n = 18016/DE$$

30 Preferably the total sugars number average molecular weight of the frozen confection is from 250 to 450 g/mol, more preferably from 300 to 425 g/mol, most preferably from 350 to 400 g/mol.

Stabilisers

As stated above, the stabilising effect of the gelatin is enhanced by the specific sugar blend and the frozen confection of the present invention is able to employ lower levels of gelatin than the prior art frozen confections that comprise gelatin. In addition, the frozen confection of the present invention need not require high levels of additional stabilisers such as alginates, gum arabic, gum ghatti, gum karaya, gum tragacanth, locust bean gum, carrageenans, xanthan gum, guar gum, gelatine, agar, sodium carboxymethylcellulose, microcrystalline cellulose, methyl and methylethyl celluloses, hydroxypropyl and hydroxypropylmethyl celluloses, low and high methoxyl pectins and mixtures thereof. Consequently, the frozen confection preferably comprises at most 1 wt% additional stabilisers, more preferably at most 0.5 wt%, more preferably still at most 0.25 wt%, yet more preferably at most 0.1 wt%, yet more preferably still at most 0.05 wt%, even more preferably at most 0.01 wt%, most preferably no additional stabilisers.

Emulsifiers

The term emulsifier as used herein includes mono- and di-glycerides of saturated or unsaturated fatty acids (e.g. monoglyceryl palmitate - MGP), polyoxyethylene derivatives of hexahydric alcohols (usually sorbitol), glycols, glycol esters, polyglycerol esters, sorbitan esters, stearyl lactylate, acetic acid esters, lactic acid esters, citric acid esters, acetylated monoglyceride, diacetyl tartaric acid esters, polyoxyethylene sorbitan esters (such as polysorbate 80), sucrose esters, lecithin, egg, and egg yolk. The term also includes mixtures of any the above. The frozen confection may comprise from 0.05 to 1 wt% of emulsifiers, more preferably from 0.075 to 0.8 wt%, more preferably still from 0.1 to 0.7 wt%, yet more preferably 0.2 to 0.6 wt%, most preferably from 0.3 to 0.5 wt%.

Fat

Fats are largely made up of triglycerides (approximately 98%), together with minor amounts of other components such as phospholipids and diglycerides. Triglycerides are esters of glycerol with three fatty acids. Fatty acids which have no carbon-carbon double bonds are said to be saturated (herein abbreviated as SAFA), whereas fatty acids that contain one or more carbon-carbon double bonds are said to be monounsaturated (abbreviated as MUFA) and polyunsaturated (PUFA) respectively. Fats that are liquid at ambient temperatures are often referred to as oils. In this specification the term "fat" includes such oils. The SAFA, MUFA and

PUFA contents of fats and oils are given in "The Lipid Handbook", Second Edition, Authors Frank D Gunstone, John L Harwood, Fred B Padley, Published by Chapman & Hall 1994.

Total solids content

- 5 The total solids content of a frozen confection is the dry weight of the confection, i.e. the sum of the weights of all the ingredients other than water, expressed as a percentage of the total weight. It is measured as described in Ice Cream, 6th Edition, Marshall et al. (2003) p296. The frozen confection may comprise total solids content in the range from 10 to 70 wt% of emulsifiers, more preferably from 15 to 60 wt%, more preferably still from 20 to 55 wt%, yet
10 more preferably 30 to 50 wt%, most preferably from 35 to 45 wt%.

Overrun

The overrun of ice cream (and other frozen aerated confections) is defined by the formula:

- 15 **overrun (%) = (Density of mix - Density of ice cream) / (Density of mix) x 100.**

Overrun is measured (at atmospheric pressure) as follows. The density of the unaerated mix is determined by weighing a standard overrun cup containing mix at approximately 4°C, subtracting the mass of the cup and dividing by the known volume of the cup (density =
20 mass/volume). A minimum of three repeat measurements is taken. The density of the (aerated) ice cream is determined by repeating the procedure using the same overrun cup with freshly drawn ice cream (at typically -5°C to -6°C). Again a minimum of three repeat measurements is taken. With knowledge of the density of both unaerated mix and aerated ice cream, the overrun can be calculated using the equation given above.

25

The overrun of the frozen confection may be from 50 to 250 %, more preferably from 75 to 200 %, more preferably still from 100 to 175 %, most preferably from 125 to 150.

Processing

- 30 The frozen confection may be manufactured using standard techniques in which the dry ingredients are combined and then hydrated by mixing with the water. The resultant mix is then homogenised and pasteurised before aging at about 4°C for about 24 hours to create a premix. The premix is then frozen and aerated to form the frozen confection product which is hardened and then stored at about -20°C.

Viscosity

The viscosity of the premix at can be assessed as follows:

1. Fill samples into 17mm (or 27mm) profiled rheology cups.
- 5 2. Load samples onto a Paar Physica MCR501 rheometer maintained at +5°C.
3. Immerse a 17mm (or 27mm) profiled bob geometry or a 12.5mm Vane in the sample. Equilibrate sample for 5 minutes.
4. Carry out Shear Rate sweep out on the sample using the following measurement profile:
Shear Rate range = 0.01-1000s⁻¹ (log); Measurement point duration = 120-10s (log); Slope =
10 10 points per decade; Measurement position = 0mm.
5. The viscosity data for each sample is averaged over two runs and plotted against the Shear rate using a log vs log plot.

The viscosity of the premix after aging is preferably at most 3 Pa.s at a shear rate of 100s⁻¹,
15 more preferably at most 2.5 Pa.s, more preferably still at most 2 Pa.s, yet more preferably at most 1.75 Pa.s, even more preferably at most 1.5 Pa.s. Preferably the viscosity of the premix after aging is at least 0.2 Pa.s at a shear rate of 100s⁻¹, more preferably at least 0.5 Pa.s, more preferably still at least 0.75 Pa.s, yet more preferably at least 1 Pa.s, most preferably at least 1.2 Pa.s.

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As set out above, gelatin used in combination with the claimed sugar blend delivers enhanced functionality, especially in terms of prevention of loss of overrun and serum separation typically caused by temperature abuse and/or cycling. Gelatin utilised in this way is particularly suitable for use in frozen confections because such gelatin has enhanced stabilising functionality and
25 hence the stability of frozen confections is also enhanced. One of the benefits of this invention is that all aspects of the standard manufacturing process may still be employed and so standard processes, ingredients and apparatus may be employed when making such products yet the end product still benefits from an improvement in stability.

30 The present invention will now be further described with reference to the following non-limiting examples.

Examples

Processing

Sample A (comparative) and Sample 1 (according to the invention) were prepared from the formulations as set out in Table 1. The samples were made as follows:

- 5 1. Water at approx. 83°C was added to a mixing vessel and stirring started.
2. Sucrose, stabilisers, emulsifiers and gelatin were added.
3. DE28 added.
4. Maltodextrin added
5. Skimmed milk powder added (at a temperature below 75°C).
- 10 6. Melted coconut fat added.
7. Mixing continued for 15 minutes.
8. Flavour added.
9. Two-stage homogenisation (1st stage 275 bar, 2nd stage 30 bar).
10. Pasteurisation (for 25 seconds at 85°C, then cooled to 5°C).

15

The products were placed in to tubs and stored at -20°C until needed for Melt-Refreeze abuse tests.

	Ingredient (wt%)	
	Sample A	Sample 1
Coconut Oil	5	5
Skimmed milk powder (1.5% fat)	5.95	5.95
Sucrose (dry)	11	21
Fructose (45% of Invert sugar)	1.8	0
Dextrose monohydrate (45% of invert sugar)	1.8	0
Glucose DE-28	7	1.49
17-19 DE Maltodextrin	4	3
Locust bean gum	0.1	0.1
Gelatin 200 Bloom	0.5	0.5
Sodium Alginate	0.1	0.1
Monodiglyceride HP60	0.25	0.25
Monodiglyceride PS-222	0.15	0.15

Flavour Vanilla	0.148	0.148
Flavour Bourbon Vanilla	0.05	0.05
Water	to 100	to 100
Total Sugars Molecular Weight (g/mol)	378	378
Ice Content at -18C (%)	51	49
Overrun (%)	120	120
Total Solids wt%	36.87	37.25
Total Lactose wt%	3.09	3.09
Total Sugars wt%	18.72	24.45
Total Carbohydrate (inc fibre) wt%	28.13	28.36

Table 1 – Formulation and processing of Samples A and 1

Melt-Refreeze abuse tests.

- 5 Tubs containing Samples A and 1 were removed from -20°C storage and placed on a shelf in a 35°C storage room for 4 hours, then returned to the -20°C store and placed on a shelf. The tubs were then stored at -20°C for a minimum of 24 hours before the second melt-refreeze cycle was carried out. In total 3 melt-refreeze cycles were carried out.
- 10 After 3 melt-refreeze cycles the amount of serum drained to the bottom of the tub was assessed (serum separation) and the tub lid was removed and the amount of shrinkage from the top of the tub was also assessed (overrun loss). The results are shown in Table 2.

	Sample A	Sample 1
Overrun loss (%)	24	4.1
Serum separation (%)	23.2	0

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Table 2 – Results of melt-refreeze abuse tests

As can be seen from the results in Table 2, Sample 1 suffered significantly less overrun loss than Sample A and zero serum separation. This was despite the fact that both Samples contained exactly the same levels of stabilisers and emulsifiers. It can therefore be seen that

the stabilising effect of gelatin is greatly enhanced when a sugar blend according to the present invention is used, even when the amount of gelatin is as low as 0.5 wt%.

Claims

- 1) A frozen confection comprising gelatine, characterised in that the frozen confection comprises
 - 5 - from 0.05 to 1.5 wt% gelatine;
 - at most 1 wt% monosaccharides;
 - from 10 to 30 wt% disaccharides; and
 - from 2 to 8 wt% polysaccharides.
- 10 2) A frozen confection according to claim 1 comprising at most 1 wt% gelatine.
- 3) A frozen confection according to claim 1 or claim 2 comprising at least 0.1 wt% gelatine.
- 4) A frozen confection according to any of the preceding claims comprising at most 0.5 wt%
15 monosaccharides.
- 5) A frozen confection according to any of the preceding claims comprising at least 15 wt%
 disaccharides.
- 20 6) A frozen confection according to any of the preceding claims comprising at most 25 wt%
 disaccharides.
- 7) A frozen confection according to any of the preceding claims comprising at least 3.5 wt%
 polysaccharides.
- 25 8) A frozen confection according to any of the preceding claims comprising at most 6 wt%
 polysaccharides.
- 9) A frozen confection according to any of the preceding claims wherein the total sugars
30 number average molecular weight is from 250 to 450 g/mol.
- 10) A frozen confection according to any of the preceding claims wherein the total sugars
 content is from 15 to 45wt%.

- 11) A frozen confection according to any of the preceding claims comprising wherein the frozen confection is an ice cream, milk ice, frozen yoghurt, or sherbet.

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
INV. A23G9/34 A23G9/38
ADD.

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)
A23G

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.
A	EP 1 597 976 A1 (NESTEC SA [CH]) 23 November 2005 (2005-11-23) paragraphs [0017], [0019]; claims 9,10 -----	1-11
A	WO 2017/001266 A1 (UNILEVER PLC [GB]; UNILEVER NV [NL]; CONOPCO INC D/B/A UNILEVER [US]) 5 January 2017 (2017-01-05) page 8, paragraphs 3,4 -----	1-11
A	US 2008/118620 A1 (ANNALUISE GERTRUD JOHANNSEN LE [GB] ET AL) 22 May 2008 (2008-05-22) paragraphs [0041] - [0061]; claims -----	1-11
A	CA 2 942 266 A1 (BERNETT NOAH [CA]) 8 November 2016 (2016-11-08) cited in the application the whole document -----	1-11



Further documents are listed in the continuation of Box C.



See patent family annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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