



(51) International Patent Classification:

A23L 7/117 (2016.01) A23L 29/212 (2016.01)

A23J 3/14 (2006.01) A23L 33/185 (2016.01)

A23P 30/20 (2016.01)

(21) International Application Number:

PCT/EP2018/084042

(22) International Filing Date:

07 December 2018 (07.12.2018)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

17306745.5 11 December 2017 (11.12.2017) EP

(71) Applicant: **ROQUETTE FRERES** [FR/FR]; 1 rue de la Haute Loge, 62136 LESTREM (FR).

(72) Inventor: **KANTT, Carlos**; P/O ROQUETTE AMERICA 2211 Innovation Drive, GENEVA, IL 60134 (US).

(74) Agent: **CABINET PLASSERAUD**; 66 rue de la Chaussée d'Antin, 75440 PARIS CEDEX 09 (FR).

(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: HIGH PROTEIN CRIPS

(57) Abstract: The invention relates to the field of commercial extruded food products. In particular, the invention relates to a formulation for an extruded crisp foodstuff having a pea protein content of at least 60% by weight on total dry matter and made using pregelatinized starch, pea protein isolate and calcium carbonate.



WO 2019/115407 A1

HIGH PROTEIN CRIPS

FIELD OF THE INVENTION

The invention relates to the field of commercial extruded food products. In particular,
5 the invention relates to a formulation for an extruded crisp foodstuff having a pea protein content of at least 60% by weight on total dry matter and made using of pregelatinized starch, pea protein isolate and calcium carbonate.

BACKGROUND OF THE INVENTION

Extruded low-moisture foodstuffs are a staple component of many commercial food
10 products, ranging from pet foods to breakfast cereals and savoury snacks. Typically, these foodstuffs are composed primarily of starchy and/or proteinous materials.

Starch based materials have proved to be excellent materials for producing extruded foods of desirable organoleptic properties, including flavour, crispness and ability to display an expanded, 'light' texture even when immersed in fluid such as milk.

15 However, nutritional requirements have emphasized the desirability of relatively high protein levels in human foods, in preference to carbohydrates, such as starch. This has led food manufacturers to investigate the manufacture of relatively high protein extruded foodstuffs, i.e. having protein levels above about 20% by weight, as alternatives to the more traditional formulations.

20 Sander, Bennett and Austin proposed the use of twin screw extrusion to prepare breakfast cereals and snacks containing up to 50% by weight of protein by combining a farinaceous source such as rice flour with a concentrated protein source such as soy protein isolate. (see Fabrication of Low Moisture, High Protein Foods Using Soy Isolates and HTST Twin Screw Extrusion, Chemistry of Foods and Beverages,
25 Academic Press, Inc. (1982) p. 251).

More recently, Dupont Danisco launched Trupro® 1614, a pea protein based crisps including 55% by weight of protein on dry matter (<http://www.danisco.com/product-range/soy-protein/supror-nuggets-soy-protein/truprotm-pea-protein-nuggets>).

Above 55% of protein textured crisps are more difficult to obtain. Puris launched
30 recently PURIS PROTEIN CRISPS, a pea protein based crisps which contains pea

protein isolate (Purispea 870), pea protein isolate hydrolyzed (Purispea 870H) and pea flour including fiber. This recipe can lead to crisps having a higher protein content but needs a very complex mixture, involving different compounds (fiber, protein hydrolysate, ...).

- 5 JP2016144424 discloses a crispy puffed product having a high protein content of 80 wt.% or more, and a low starch content of less than 2 wt.% which contains a vegetable protein material adjusted to an average hydrolysis degree of 18%-54% by mixing an undecomposed vegetable protein material having a hydrolysis degree of less than 5%, and a highly decomposed vegetable protein material having a
10 hydrolysis degree of 20% or more, a divalent metal salt, and water. Once again, a complex mixture of various protein isolates is needed in order to get acceptable crisps.

Use of tuber sourced starch seems a solution in order to get a simple composition with high protein content.

- 15 US 6,242,033 reports a cereal textured product that may be made with 60% by weight of denatured soy protein and a tuber starch. Tuber starch, i.e. tapioca starch or potato starch, is described as essential in order to obtain a cereal-type product having a loose pack bulk density similar to breakfast cereal products.

- More recently, Glanbia commercially launched the pea and ancient grain based
20 HarvestPro CA crisps 60 which include 60% by weight vegetable protein isolate and also tapioca-tuber starch (<https://www.biscuitpeople.com/magazine/post/100-vegan-proteins-from-glanbia-nutritionals>).

If tuber starch like tapioca starch may offer a real solution, its restricted choice can lead to problems of availability or even price.

- 25 There is still a need to obtain pea protein crisps having a pea protein content above 60% by weight on dry matter made with a simple composition and a wider choice of starch sources.

SUMMARY OF THE INVENTION

- The present invention relates to expanded pea protein crisps having a high pea
30 protein content of at least 60% by weight on total dry matter consisting of a

combination of pea protein isolate, pregelatinized starch, calcium carbonate and optionally sodium metabisulfite.

The present invention also relates to the preparation process of a high protein content crisps, having a pea protein content of at least 60% by weight on total dry matter, consisting of a combination of pea protein isolate, pregelatinized starch, calcium carbonate and optionally sodium metabisulfite comprising:

- Mixing of pea protein isolate, pregelatinized starch, calcium carbonate and optionally sodium metabisulfite,
- Extrusion of the obtained mix, and
- Optionally drying of the expanded pea protein crisps,

wherein the mix of pea protein isolate, pregelatinized starch, calcium carbonate and optionally sodium metabisulfite has a pea protein isolate content of at least 60% by weight on total dry matter.

The present invention also relates to the industrial uses of high protein content crisps, having a pea protein content of at least 60% by weight on total dry matter, consisting of a combination of pea protein isolate, pregelatinized starch, calcium carbonate and optionally sodium metabisulfite, especially in the food, feed and/or pharmaceutical industry.

DETAILED DESCRIPTION OF THE INVENTION

A first object of this invention is an expanded pea protein crisp having a high pea protein content of at least 60% by weight on total dry matter and consisting of a combination of pea protein isolate, pregelatinized starch, calcium carbonate and optionally sodium metabisulfite.

In a first embodiment of this invention, the pregelatinized starch is a pregelatinized waxy maize starch. In contrast to common native starch, the use of this kind of starch allows production crisps having a high pea protein protein content of at least 60 % by weight on total dry matter. The pea protein content is advantageously 60% to 65% by weight on total dry matter, preferably 60%.

In a second embodiment of this invention, pregelatinized starch is still needed but the pea protein isolate is slightly hydrolyzed with a protease in order to reach a hydrolysis degree below 10, preferably comprised between 7 and 9. The protein content is advantageously comprised between 65% and 75%, preferably about 70% by weight on total dry matter.

In all embodiments, the calcium carbonate content is preferably below 1% by weight on total dry matter, preferably between 0.6 and 0.7%.

The expanded pea protein crisps of the present invention have generally a shape of a cylinder or of a sphere with a length or diameter comprised between 3 and 4 mm.

Their density is advantageously comprised between 0.25 and 0.4 g/ml, preferably between 0.3 and 0.35 g/ml. Their moisture content is advantageously comprised between 3 and 5% by weight or in other terms their dry matter content is comprised between 95 and 97% by weight..

The term "crisp" or "crisps", in the context of the present invention, is taken to mean a heat-expanded and dried product. Such crisps can be in the form of crunchy curls, puffs, protein inclusions, etc. Crisps can be used as or in a snack food, cereal, or can be used as an ingredient in other foods such as a nutritional bar, breakfast bar, breakfast cereal, or candy.

The term "pregelatinized starch", in the context of the present invention, is taken to mean a physically modified starch which, in contrast to native starch, forms dispersions, pastes or gels with cold water or cold milk depending on the concentration of the pregelatinized starch used.

The term "protein isolate", in the context of the present invention, means a protein composition which has a protein content of 80 % or more based on dry matter (weight of total Kjeldahl nitrogen multiplied by 6.25), preferably 85 % or more.

The term "pea", in the context of the present invention, is considered in its broadest accepted sense and includes in particular all varieties of "smooth pea", of "wrinkled pea", and all mutant varieties of "smooth pea" and of "wrinkled pea", this being whatever the uses for which said varieties are generally intended (food for human consumption, animal feed and/or other uses). In the present application, the term

"pea" includes the varieties of pea belonging to the *Pisum* genus and more particularly to the *sativum* and *aestivum* species.

The term "density", also known as bulk density, means in the present invention the mass per unit volume of a substance. The protocol used in this invention is described below :

1. Weigh a 1 liter graduated cylinder (W1 in grams)
2. Fill it up to 1 liter graduation with crisps and weigh again (W2 in grams).
3. Density = (W2 – W1)/1000 expressed in g/ml

The term "dry matter", in the context of the present invention, is herein considered as the percentage of matter excluding water in the total weight of a material. The protocol used in this invention is described below :

1. Weigh W1 grams of crisps
2. Put them in a 100°C oven until reaching a constant weight (W2 in grams)
3. Dry matter = W2/W1 * 100 expressed in %

The term "slightly hydrolyzed isolate" ", in the context of the present invention, is taken to mean a protein isolate which has been hydrolyzed with or without help of an enzyme (protease). Hydrolysis degree (or DH) is comprised between 5 and 10%, preferably between 6 and 8%, more preferably between 6,5% and 7%. The person skilled in the art can find all information to obtain such slightly hydrolyzed isolate in WO2017129921 which is hereby included by reference.

Measure of the DH (Degree of Hydrolysis): This measure is based on the method of determination of the amino acid nitrogen assay by the kit M UNLEAVENED EG (reference K-PANOPA) and the calculation of the degree of hydrolysis.

Principle: The free nitrogen groups of the amino acids of the sample react with N-acétyl-L-cystéine and OPhthaldialdéhyde (OPA) to form by-products of isoindole. The quantity of by-product of isoindole formed during this reaction is stoichiometric to the quantity of free nitrogen groups. It is the by-product of isoindole that is measured by the increase of the absorbance at 340 nm.

A second object of the present invention relates to the preparation process of a high protein content crisps, having a pea protein content of at least 60% by weight on total dry matter, consisting of combination of pea protein isolate, pregelatinized starch and calcium carbonate comprising:

- 5
- Mixing of pea protein isolate, pregelatinized starch and calcium carbonate,
 - Extrusion of the obtained mix, and
 - Optionally drying of the expanded pea protein crisps,

wherein the mix of pea protein isolate, pregelatinized starch, calcium carbonate and optionally sodium metabisulfite has a pea protein isolate content of at least 60% by weight on total dry matter.

10

Preferably, the ratio between pea protein isolate and pregelatinized starch respects the embodiments of the first object of this present invention, and also the content of calcium carbonate.

In a particular embodiment, pea protein isolate, pregelatinized starch and calcium carbonate are weighed and placed together in a tank in order to get a raw powder mix. Metasodiumbisulfite may also be added in order in order to avoid dark brown color formation in the subsequent extrusion step. Typically, the raw powder mix has a moisture content between 7 and 10% by weight or in other terms a dry matter content of 90 to 93% by weight.

15

The mix is then fed into the first zone of a twin screw extruder. The mix is generally introduced to the extrusion apparatus at a rate of 300-600 grams (g)/min in a 25mm diameter extruder.

20

Water is injected in a subsequent second zone of the extruder, at a level comprised between 15 to 30 % by weight of dry mix feed. Every type of water suitable for food applications can be used like tap water, decarbonated water, ...

25

Twin-screw extruder devices have long been used in the manufacture of a wide variety of edible products. One suitable extrusion device is a double-barrel, twin screw extruder as described, for example, in U.S. Patent No. 4,600,311. Examples of commercially available double-barrel, twin screw extrusion apparatus include a

CLEXTRAL ** (Registered trademark Model BC-72 extruder manufactured by Clextral, Inc. (Tampa, FL); a WENGER Model TX-57 extruder manufactured by Wenger (Sabetha, KS); a WENGER Model TX-52 extruder manufactured by Wenger (Sabetha, KS) . Preferably, COPERION ZSK25 extruder will be chosen.

- 5 The screws of a twin-screw extruder can rotate within the barrel in the same or opposite directions. Rotation of the screws in the same direction is referred to as single flow whereas rotation of the screws in opposite directions is referred to as double flow. The speed of the screw or screws of the extruder may vary depending on the particular apparatus. However, the screw speed is typically 400 to 900
10 revolutions per minute (rpm), preferably 600 to 900 rpm.

The extrusion apparatus generally comprises a plurality of temperature-controlled zones called barrels through which the protein mixture is conveyed under mechanical pressure prior to exiting the extrusion apparatus through an extrusion die. The dry input mix is progressively heated from 20°C to near 110°C. In a preferred
15 embodiment, the extruder comprises nine barrels and the temperature profile is as summarized in the table below :

barrel	Temp °C
2	50
3	50
4	50
5	80
6	110
7	110
8	90
9	80

The pressure within the extruder barrel is not narrowly critical. Typically the extrusion mass is subjected to a pressure of at least about 600 to 2000 psi, preferably 600 to 1200 psi. The barrel pressure is dependent on numerous factors including, for
20 example, extruder screw speed, feed rate of the mixture to the barrel, feed rate of water to the barrel, and the viscosity of the molten mass within the barrel.

The molten extrusion mass in the extrusion apparatus is extruded through a die to produce an extrudate, which may then be dried in a dryer. Extrusion conditions are generally such that the product emerging from the extruder barrel typically has a

moisture content of from about 10 to 20% by weight on total dry matter depending on water injection. The moisture content is derived from water present in the mixture introduced to the extruder, moisture added during preconditioning and/or any water injected into the extruder barrel during processing.

- 5 The exit temperature should be kept above 100°C in order to expand the product and thus obtain crisps, but below 120°C in order to prevent or minimize development of off-flavors.

Optionally, the expanded pea protein crisps obtained in the previous extrusion step can be dried. The dryer generally comprises a plurality of drying zones in which the
10 air temperature may vary. Generally, the temperature of the air within one or more of the zones will be from 75 to 85 °C. Typically, the extrudate is present in the dryer for a time sufficient to provide an extrudate having a desired moisture content. This desired moisture content may vary widely depending on the intended application of the extrudate and, typically, is from about 3 to 5% by weight on total dry matter.
15 Suitable dryers include those manufactured by Wolverine Proctor & Schwartz (Merrimac, MA), National Drying Machinery Co. (Philadelphia, PA), Wenger (Sabetha, KS), Cletral ** (Registered trademark (Tampa, FL), and Buehler (Minnneapolis, MN).

A third and last object of the present invention also relates to the industrial uses of high protein content crisps, having a pea protein content of at least 60% by weight on
20 total dry matter, consisting of combination of pea protein isolate, pregelatinized starch, calcium carbonate and optionally sodium metabisulfite, especially in the food, feed and/or pharmaceutical industry. The crisps can be used as is or in a snack food, cereal, or can be used as an ingredient in other foods such as a nutritional bar, breakfast bar, breakfast cereal, or candy.

- 25 The present invention may be further understood by reference to the following figures and examples. The following examples are merely illustrative of the invention and are not intended to be limiting.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 is a photo of pea protein crisps according to the invention (Example 2).

Figure 2 is a photo of pea protein crisps according to the invention (Example 4).

EXAMPLES

Example 1 : Unsuccessful production of 60% high protein crisps including native non-waxy starch

- Mix of 72% Nutralys F85M (protein richness : 83%), 27% of native non waxy pea starch and 0.8% of calcium carbonate (all percentages expressed by weight on total dry matter).
- Twin screw extrusion of dry mix with tap water injection
 - Extrusion process parameters :
 - Use of a COPERION ZSK25 extruder
 - Injection of dry mix at 500 g/min
 - Injection of tap water 100 g/min
 - Specific die rate 100 – 150 g/min/mm²
 - SME 400 - 800 Kj/Kg
- No extrusion process parameters allowed obtaining acceptable pea protein crisps.

Example 2 : Production of 60% protein rich crisps according to the invention

- Mix of 72% Nutralys F85M (protein richness : 83%), 27% of PREGEFLO® C100 (pregelatinized waxy corn starch from ROQUETTE®) and 0.8% of calcium carbonate (all percentages expressed by weight on total dry matter).
- Twin screw extrusion of dry mix with tap water injection
 - Extrusion process parameters :
 - Use of a COPERION ZSK25 extruder
 - Injection of dry mix at 500 g/min
 - Injection of tap water 100 g/min
 - Specific die rate 100 – 150 g/min/mm²
 - SME 400 - 800 Kj/Kg
- Drying in order to get dry crisps to 3 – 5 % moisture
- High protein crisps are obtained (see fig.1) :

- Round shape
- Diameter 3–4 mm
- Density 0.3 to 0.35 g/ml

- 5 0.4% of sodium metabisulfite may be added in the starting mix with the effect to lower coloration of pea crisps.

Example 3 : Production of 70% rich protein crisps

- 10 - Mix of 84% Nutralys F85M (protein content : 83%), 15% of PREGEFLO® C100 (pregelatinized starch from ROQUETTE®) and 0.8% of calcium carbonate (all percentages expressed by weight on total dry matter).
- 15 - Twin screw extrusion of dry mix with tap water injection
- Extrusion process parameters :
 - Use of a COPERION ZSK25 extruder
 - Injection of dry mix at 500 g/min
 - Injection of tap water 100 g/min
 - Specific die rate 100 – 150 g/min/mm²
 - SME 400 - 800 Kj/Kg
- Drying in order to get dry crisps to 4 – 5 % moisture
- Crisps obtained are not successful as they have a density above 0.5 g/ml.

20

Example 4 : Successful production of 70% rich protein crisps including waxy pregelatinized starch and slightly hydrolyzed pea protein hydrolysate following present invention

- 25 - Mix of 84% Nutralys F85M (protein content : 83%) hydrolyzed with a protease in order to have an hydrolysis degree of 7, 15% of PREGEFLO® C100 (pregelatinized starch from ROQUETTE®) and 0.8% of calcium carbonate (all percentages expressed by weight on total dry matter).
- Twin screw extrusion of dry mix with tap water injection
- Extrusion process parameters :

- Use of a COPERION ZSK25 extruder
- Injection of dry mix at 500 g/min
- Injection of tap water 100 g/min
- Specific die rate 100 – 150 g/min/mm²
- 5 ○ SME 400 - 800 Kj/Kg
- Drying in order to get dry crisps to 4 – 5 % moisture
- High protein crisps are obtained (see fig.2) :
 - Round shape
 - Diameter 3–4 mm
 - 10 ○ Density 0.3 to 0.35 g/ml

Example 5 : Unsuccessful production of 70% protein crisps including a highly hydrolyzed pea protein isolate

- Mix of 84% Nutralys F85M (protein content : 83%) hydrolyzed with a protease in order to have an hydrolysis degree of 24, 15% of PREGEFLO®
- 15 C100 (pregelatinized starch from ROQUETTE®) and 0.8% of calcium carbonate (all percentages expressed by weight on total dry matter).
- Twin screw extrusion of dry mix with tap water injection
 - Extrusion process parameters :
 - Use of a COPERION ZSK25 extruder
 - 20 ○ Injection of dry mix at 500 g/min
 - Injection of tap water 100 g/min
 - Specific die rate 100 – 150 g/min/mm²
 - SME 400 - 800 Kj/Kg
- No extrusion process parameters allowed to obtain acceptable pea crisps.

CLAIMS

1. Expanded pea protein crisps having a high protein content consisting of combination of pea protein isolate, pregelatinized starch, calcium carbonate, and optionally sodium metabisulfite.
- 5 2. Expanded pea protein crisps as claimed in claim 1 characterized in that the protein content is comprised between 60% and 65%, preferably about 60% by weight on total dry matter.
3. Expanded pea protein crisps as claimed in claim 1 or 2 characterized in that the pregelatinized starch is a waxy pregelatinized starch.
- 10 4. Expanded pea protein crisps as claimed in claim 1 characterized in that the protein content is comprised between 65% and 75%, preferably about 70% by weight on total dry matter.
5. Expanded pea protein crisps as claimed in any of claims 1 to 4 characterized in that pea protein isolate is a slightly hydrolyzed pea protein isolate.
- 15 6. Expanded pea protein crisps as claimed in claim 5 characterized in that the slightly hydrolyzed pea protein isolate has a DH comprised between 5 and 10%, preferably between 6 and 8%, more preferably between 6.5% and 7%.
7. Expanded pea protein crisps as claimed in any of claims 1 to 4 having a density is comprised between 0.25 and 0.4 g/ml, preferably between 0.3 and 0.35 g/ml.
- 20 8. Preparation process of expanded pea protein crisps as claimed in any of claims 1 to 7 comprising :
 - a. Mixing of pea protein isolate, pregelatinized starch, calcium carbonate, and optionally sodium metabisulfite,
 - 25 b. Extrusion of the above mix,
 - c. Optionally drying of the expanded pea protein crisps.
9. Industrial use of high protein content crisps as claimed in any of claims 1 to 7, especially in the food, feed and/or pharmaceutical industry.



FIGURE 1 :

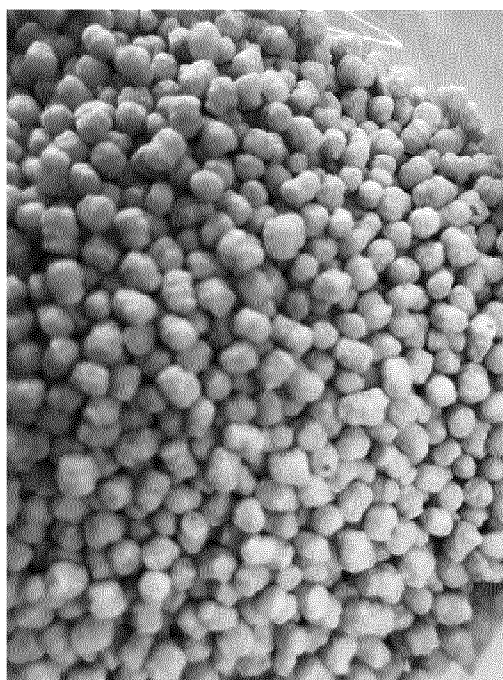


FIGURE 2 :

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2018/084042

A. CLASSIFICATION OF SUBJECT MATTER
INV. A23L7/117 A23J3/14 A23P30/20 A23L29/212 A23L33/185
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)
A23L A23J A23P

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, BIOSIS, FSTA

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DATABASE GNPD [Online] MINTEL; March 2013 (2013-03), Anonymous: "Pea Protein Chips", XP002777569, Database accession no. 2019856 the whole document	1,5-9
X	DATABASE GNPD [Online] MINTEL; October 2013 (2013-10), Anonymous: "Spicy Chilli Kick Flavour Pea Protein Chips", XP002777570, Database accession no. 2186666 the whole document	1,5-9



Further documents are listed in the continuation of Box C.



See patent family 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 application or patent 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

8 January 2019

Date of mailing of the international search report

18/01/2019

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Barac, Dominika

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2018/084042

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DATABASE GNPD [Online] MINTEL; May 2014 (2014-05), Anonymous: "Protein Crisps with Sea Salt and Vinegar", XP002777571, Database accession no. 2421261 the whole document -----	1,5-9
X	DATABASE GNPD [Online] MINTEL; December 2010 (2010-12), Anonymous: "Breakfast Cereal", XP002777572, Database accession no. 1466795 the whole document -----	1,5-9
X	Anonymous: "Tofalafels - Platypus Gone Health Nut", 7 April 2017 (2017-04-07), pages 1-6, XP055443552, Retrieved from the Internet: URL: http://platypusgonehealthnut.com/tofalafels/ [retrieved on 2018-01-23] the whole document -----	1,5-9
T	Anonymous: "Body360 BODYCRUNCH Vegan Protein Crunchies- PEA - Official Low Carb Grocery", 23 January 2018 (2018-01-23), pages 1-4, XP055443560, Retrieved from the Internet: URL: http://www.thelowcarbgrocery.com/catalog/body360-bodycrunch-vegan-protein-crunchies-pea-p-7786.html [retrieved on 2018-01-23] the whole document -----	
X	WO 2017/129921 A1 (ROQUETTE FRERES) 3 August 2017 (2017-08-03) cited in the application examples 1,22 -----	1-9
A	WO 2014/138451 A1 (KERRY GROUP SERVICES INTERNATIONAL LTD [US]) 12 September 2014 (2014-09-12) page 4, lines 10-23 claims 1-29 examples 1-5 ----- -/--	1-9

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2018/084042

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Anonymous: "High Protein Crisps 2016-03-02 Prepared Foods", ³ 2 March 2016 (2016-03-02), pages 1-3, XP055443588, Retrieved from the Internet: URL:https://www.preparedfoods.com/articles/117782-high-protein-crisps [retrieved on 2018-01-23] the whole document -----	1-9
A	Anonymous: "Experimenting with new protein sources World Grain", ³ 24 March 2017 (2017-03-24), pages 1-5, XP055443573, Retrieved from the Internet: URL:http://www.world-grain.com/articles/news_home/World_Grain_News/2017/03/Experimenting_with_new_protein.aspx?ID={15EB4239-966D-442B-BE89-47AC82CB8924}&page=2&cck=1 [retrieved on 2018-01-23] the whole document -----	1-9
A	Anonymous: "Packing in protein Food Business News", ¹ 1 March 2016 (2016-03-01), pages 1-7, XP055443599, Retrieved from the Internet: URL:http://www.foodbusinessnews.net/articles/news_home/Supplier-Innovations/2016/03/Packing_in_protein.aspx?ID={CF35EA30-2361-4213-8762-12E24875BED2} [retrieved on 2018-01-23] the whole document -----	1-9

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2018/084042

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2017129921 A1	03-08-2017	CA 3011053 A1	03-08-2017
		CN 108601371 A	28-09-2018
		EP 3407730 A1	05-12-2018
		KR 20180103921 A	19-09-2018
		WO 2017129921 A1	03-08-2017

WO 2014138451 A1	12-09-2014	US 2016007629 A1	14-01-2016
		WO 2014138451 A1	12-09-2014
