

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference E2760177		FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/CA2017/050469	International filing date (<i>day/month/year</i>) 13 April 2017 (13-04-2017)	Priority date (<i>day/month/year</i>)	
International Patent Classification (IPC) or national classification and IPC IPC: A23L 5/00 (2016.01), A23B 4/03 (2006.01), A23B 7/02 (2006.01), A23L 13/00 (2016.01), A23L 17/00 (2016.01), A23L 19/00 (2016.01) (more IPCs on the last page)			
Applicant ENWAVE CORPORATION			
1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36. 2. This REPORT consists of a total of <u>5</u> sheets, including this cover sheet. 3. This report is also accompanied by ANNEXES, comprising: a. ☐ (<i>sent to the applicant and to the International Bureau</i>) a total of <u>7</u> sheets, as follows: ☒ sheets of the description, claims and/or drawings which have been amended and/or sheets containing rectifications authorized by this Authority, unless those sheets were superseded or cancelled, and any accompanying letters (see Rules 46.5, 66.8, 70.16, 91.2, and Section 607 of the Administrative Instructions). ☐ sheets containing rectifications, where the decision was made by this Authority not to take them into account because they were not authorized by or notified to this Authority at the time when this Authority began to draw up this report, and any accompanying letters (Rules 66.4bis, 70.2(e), 70.16 and 91.2). ☐ superseded sheets and any accompanying letters, where this Authority either considers that the superseding sheets contain an amendment that goes beyond the disclosure in the international application as filed, or the superseding sheets were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in item 4 of Box No. I and the Supplemental Box (see Rule 70.16(b)). b. ☐ (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)) containing a sequence listing, in the form of an Annex C/ST.25 text file, as indicated in the Supplemental Box Relating to Sequence Listing (see paragraph 3ter of Annex C of the Administrative Instructions). 4. This report contains indications relating to the following items: ☒ Box No. I Basis of the report ☐ Box No. II Priority ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability ☐ Box No. IV Lack of unity of invention ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement ☐ Box No. VI Certain documents cited ☐ Box No. VII Certain defects in the international application ☐ Box No. VIII Certain observations on the international application			
Date of submission of the demand 05 February 2019 (05-02-2019)		Date of completion of this report 30 April 2019 (30-04-2019)	
Name and mailing address of the IPEA/CA Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 819-953-2476		Authorized officer Elizabeth McKay Andrews (819) 997-2950	

1. With regard to the **language**, this report is based on:
 - ☒ the international application in the language in which it was filed.
 - ☐ translation of the international application into _____ which is the language of a translation furnished for the purposes of:
 - ☐ international search (Rules 12.3(a) and 23.1(b)).
 - ☐ publication of the international application (Rule 12.4(a)).
 - ☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a) and (b)).
2. With regard to the **elements** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):
 - ☐ the international application as originally filed/furnished, or
 - ☒ the description:

pages	2-7		as originally filed/furnished.
pages*	1	received by this Authority on	05 February 2019 (05-02-2019)
pages*		received by this Authority on	
 - ☒ the claims:

Nos.			as originally filed/furnished.
Nos.*		as amended (together with any statement) under Article 19	
Nos.*	1-25	received by this Authority on	05 February 2019 (05-02-2019)
 - ☐ the drawings:

pages			as originally filed/furnished
pages*		received by this Authority on	
pages*		received by this Authority on	
 - ☐ a sequence listing - see Supplemental Box Relating to Sequence Listing.
3. ☒ The amendments have resulted in the cancellation of:
 - ☐ the description, pages
 - ☒ the claims, Nos. 26-29
 - ☐ the drawings, sheets/figs.
 - ☐ the sequence listing (specify):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since either they are considered to go beyond the disclosure as filed, or they were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in the Supplemental Box (Rules 70.2(c) and (c-bis)):
 - ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (specify):
5. ☐ This report has been established:
 - ☐ taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rules 66.1(d-bis) and 70.2(e)).
 - ☐ without taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91(Rules 66.4bis and 70.2(e)).
6. With regard to top-up searches (Rules 66.1ter and 70.2(f)):
 - ☒ A top-up search was carried out by this Authority on 09 April 2019 (09-04-2019)
 - ☐ Additional relevant documents have been discovered during the top-up search
 - ☐ No top-up search was carried out by this Authority because it would serve no useful purpose.
7. ☐ Supplementary international search report(s) from Authority(ies) _____ has/have been received and taken into account in establishing this report (Rule 45bis.8(b) and (c)).

* If item 4 applies, some or all of those sheets may be marked "superseded."

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-25	YES
	Claims	none	NO
Inventive step (IS)	Claims	1-25	YES
	Claims	none	NO
Industrial applicability (IA)	Claims	1-25	YES
	Claims	none	NO

2. Citations and explanations (Rule 70.7)

1. Reference is made to the following documents, identified in the ISR:

D1: CA2781644A1

D2: CN101228896A

D3: S. Bai-Ngew et al., "Characterization of microwave vacuum-dried durian chips", Journal of Food Engineering 104 (2011) 114-122.

D4: US6312745B1

D5: Li et al., "Freeze Drying of Apple Slices with and without Application of Microwaves" Drying Technology, 32: 1769-1776, 2014.

D6: CA2678089A

2. Prior Art Teachings:

D1 teaches microwave vacuum-drying of organic material using a resonant cavity microwave dehydrator. D1 teaches suitable food products for this dehydration process are fruits, vegetables (carrots, potatoes, and beets), meats, fish, and seafood (pages 4 and 5). The food product can be either fresh or frozen (pages 4 and 5 and Example 2). The dehydrator is operated at a vacuum pressure of 0.01 to 100 Torr (page 12). The final moisture content of the exemplified food products range between 1.02% and 1.59% (Example 2).

D2 teaches freeze-drying and subsequent vacuum microwave dehydration of fruits (strawberry), vegetable and seafood (sea cucumber, fish). The method taught includes options of pre-cooking the food (blanching, enzyme inactivation in a flavored liquid immersion), initial quick freezing or freeze-drying to reduce the water content to 60-30%. The vacuum microwave drying is carried out under vacuum pressure of 60 to 80 kPa and the final moisture content of the food product is not more than 5%.

D3 teaches microwave vacuum drying (VMD) durian chips. It teaches that VMD technique can be used to create a desirable, crispy texture for snack foods. The VMD process can be preceded with physical pre-treatments such as freezing, chilling or blanching. The process studied included microwave vacuum drying of durian chips, some of which had been pretreated by freezing to -18° C. The microwave vacuum drier was operated at 13.33 kPa. The pre-frozen durian slices showed a large porous sponge-like structure after VMD producing a crispy texture.

-----continued in Supplemental Box-----

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: **Box No. V**

2. Citations and explanations (Rule 70.7)

D4 teaches dehydrating berries (such as blueberries) using vacuum microwave drying (VMD) at an absolute pressure of 1-200 mm Hg and drying frozen berries to a residual moisture content of less than 35% (18% and 15% in the examples). Example 1 teaches to pre-dry (air dried) frozen blueberries before subjecting them to the VMD process. Example 2 demonstrated to process frozen blueberries at two different microwave power levels (1.5 kW followed by 0.75 kW) during the VMD method. Example 3 teaches to agitate the berries during treatment.

D5 teaches a method of dehydrating apple slices using freeze drying combined with microwave assisted vacuum drying (VMD). Apple slices were pretreated with an anti-browning solution (citric acid, sodium bisulfate, calcium chloride and sodium chloride) before freezing at -30°C. Drying was carried out by, initially, freeze drying to decrease the water content to 20-30% of initial moisture content, followed by VMD to under 5% final water content. The VMD was carried out under vacuum pressure of either 5 or 35 kPa.

D6 teaches a method for microwave vacuum-drying of organic materials, such as food products using a travelling wave microwave dehydrator. It teaches to dehydrate food products, such as fruits, vegetables, chips (e.g. apple, potato, banana, tortilla), and meats (page 3). The microwave vacuum dehydrator is operated at a vacuum of between 20-100 mm HG (page 12). The food pieces are tumbled as the material is being dehydrated (page 13). Further, it teaches to pre-dry blueberries before applying the microwave vacuum-drying technique to avoid crushing of the berries during agitation in the method.

3. Novelty and Inventive Step:

None of D1 – D6 teaches to cook the food before freezing and microwave vacuum-drying. Claims 1-25 are novel and comply with the requirements of **PCT Article 33(2)**.

Cooking the food first would not be obvious to one skilled in the art, therefore claims 1-25 involve an inventive step and comply with the requirements of **PCT Article 33(3)**.

4. Industrial Applicability:

The subject matter of claims 1-29 is considered to be industrially applicable and thus complies with the requirements of **PCT Article 33(4)**.

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**

Continuation of: International Patent Classification (IPC) or national classification and IPC (supplemental)

A23L 19/10 (2016.01), *A23L 19/12* (2016.01), *A23L 3/54* (2006.01)

E276 0177/DJM

IN THE CANADIAN INTELLECTUAL PROPERTY OFFICE
PATENTS BRANCH

Applicant: EnWave Corporation
Title: METHOD OF MAKING DRIED POROUS FOOD PRODUCTS
Intl. Appln. No: PCT/CA2017/050469
Intl. Filing Date: 13 April 2017

Date: February 5, 2019

To: Canadian PCT Receiving Office
Canadian Intellectual Property Office
Place du Portage I, C114 – 1st Floor, Box PCT
50 Victoria Street
Gatineau, Québec K1A 0C9

ARTICLE 34 AMENDMENT

This is an Amendment under PCT Article 34 responsive to the Written Opinion mailed January 4, 2018. The Applicant amends this application as follows:

In the Disclosure

Replace page 1 of the disclosure by the enclosed replacement page 1.

In the Claims

Replace pages 8-10 of the claims by the enclosed replacement pages 8-10 containing claims 1-25.

REMARKS

The Claim Amendments

Claim 1 has been amended as follows:

1. A method of making a porous, crunchy, dehydrated food product, comprising:
(a) cooking a piece of food, the food being one of a vegetable, meat and seafood;
(b) ~~(a)~~ freezing the cooked ~~[[a]]~~ piece of food, the cooked piece of food having a moisture content of 45 wt.% or higher, and thereby forming ice crystals in the piece of food;

(c) ~~(b)~~ exposing the frozen piece of food to microwave radiation in a microwave-vacuum dehydrator at a pressure that is less than atmospheric and at which the boiling point of water is above 0°C, causing the frozen piece of food to thaw and water to evaporate from the thawed piece of food, leaving pores formed by the ice crystals within the piece of food, to produce the porous, crunchy, dehydrated food product.

These amendments to claim 1 are supported by the description at page 2, lines 8-10, lines 19-23 and lines 32-33, and page 3, lines 8-12, by original claims 2, 8 and 9, and by Examples 1 and 2.

Claims 2, 3, 8 and 9 have been cancelled. New claim 6 has been added. It is supported in the description by Examples 1 and 2.

Claims 2, 3, 8 and 9 have been cancelled.

The remaining claims and claim dependencies have been renumbered accordingly.

Novelty and Inventive Step

The Examiner cited documents D1 to D6, stating that claims 1-6, 8-15, 17-24, 26, 27 and 29 lack novelty, and claims 1-29 lack an inventive step. The Applicant submits that amended claims 1-25 are novel and inventive.

Amended claim 1 requires the step of cooking a piece of food. It is the cooked piece of food, having a moisture content of at least 45 weight percent, that is subjected to freezing in step (b) of the method. None of the cited references disclose such a step.

The step of cooking the piece of food prior to freezing it was the subject of previously-pending claim 9. The Examiner cited D2 (CN 101228896A) and D3 (S. Bai-Ngew et al.) as disclosing such feature. The Applicant disagrees.

D2 discloses a step of blanching food for inactivating enzymes or curing it (English abstract of D2). D3 refers to blanching as a preparation prior to drying (page 114, last paragraph). Blanching is clearly distinguishable from cooking. As noted in the present specification at page 2, lines 18-20, "Blanching is an optional step for vegetables, which improves the final taste, texture and/or colour for some products. The slices are then cooked and cooled down." It is well understood in the food preparation art that blanching is a process that may be carried out on certain food products such as

vegetables and fruits to deactivate enzymes and preserve the food. In contrast, cooking is a process that dramatically alters the chemical and physical properties of the food, breaking down starches, denaturing proteins and changing the composition and texture of the food.

Having regard to the chemical and physical transformation of food that occurs in cooking it would not be obvious to a skilled person to develop the claimed process to produce a porous, crunchy, dehydrated food product.

It is further noted that none of the cited references disclose freezing a cooked piece of food having a high moisture content (45 weight percent or higher) to form ice crystals in it and expose it to microwave radiation in a vacuum chamber to remove water by evaporation and leave pores formed by the ice crystals within the piece of food.

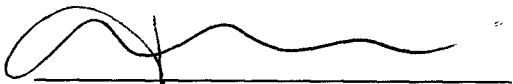
For at least the foregoing reasons, the amended claims define novel and inventive subject matter.

Response to observations in Box No. VIII of the Written Opinion

The typographical error in the document number at page 1, line 12 of the description has been corrected. In amended page 1 of the description submitted herewith, the U.S. patent number reads US 6,312,745.

Pursuant to Rule 66.4(b) the Applicant requests that it be given one or more additional opportunities to submit amendments and/or arguments, should the amendments and/or arguments presented herein be deemed insufficient to overcome all objections raised by the International Preliminary Examining Authority.

Respectfully submitted,
Oyen Wiggs Green & Mutala LLP

By: 

David J. McGruder*

*Law Corporation

Tel: 604.669.3432 ext. 9040

Fax: 604.681.4081

Email: dmcgruder@patentable.com

METHOD OF MAKING DRIED POROUS FOOD PRODUCTS

Field of the Invention

The invention pertains to methods of making dried food products having a porous
5 structure and crunchy texture, based on vegetables, meats or seafood, using
freezing and microwave vacuum-drying.

Background of the Invention

It is known in the food processing art to make dehydrated food products by means of
10 microwave vacuum-dehydration. Examples in the patent literature are WO
2014/085897 (Durance et al.), which discloses the production of dehydrated cheese
pieces, and US 6,312,745 (Durance et al.), which discloses the production of
dehydrated berries.

15 Where a dried vegetable, meat or seafood product is intended as a snack food, it is
desirable that it have a porous structure and crunchy texture. The present invention
is directed to methods for making such food products.

Summary of the Invention

20 The invention provides a method of making a shelf-stable food, using freezing and
dehydration under particular conditions in a microwave-vacuum dehydrator.

One aspect of the invention provides a method of making a porous, crunchy,
dehydrated vegetable-, meat- or seafood-based food product. A piece of food
25 comprising vegetable, meat or seafood is frozen and exposed to microwave
radiation in a microwave-vacuum dehydrator at a pressure that is less than
atmospheric and at which the boiling point of water is above 0°C. This causes the
frozen food piece to rapidly thaw and water to evaporate from the thawed food piece,
resulting in the crunchy, dehydrated food product. The freezing causes the
30 formation of ice crystals within the food piece, leaving pores (i.e. cavities) when the
ice crystals are removed. The microwave-vacuum drying, under the selected
conditions, leaves the pores intact, resulting in a highly porous structure.

Claims

1. A method of making a porous, crunchy, dehydrated food product, comprising:
 - (a) cooking a piece of food, the food being one of a vegetable, meat and seafood;
 - (b) freezing the cooked piece of food, the cooked piece of food having a moisture content of 45 wt.% or higher, and thereby forming ice crystals in the piece of food;
 - (c) exposing the frozen piece of food to microwave radiation in a microwave-vacuum dehydrator at a pressure that is less than atmospheric and at which the boiling point of water is above 0°C, causing the frozen piece of food to thaw and water to evaporate from the thawed piece of food, leaving pores formed by the ice crystals within the piece of food, to produce the porous, crunchy, dehydrated food product.
2. A method according to claim 1, wherein the food comprises a vegetable selected from the group consisting of potato, sweet potato, carrot, beet and parsnip.
3. A method according to claim 1, wherein the food comprises meat.
4. A method according to claim 1, wherein the food comprises seafood.
5. A method according to claim 4, wherein the seafood comprises shrimp or mussels.
6. A method according to any preceding claim, wherein step (a) is done for a time period of at least 10 minutes.
7. A method according to any preceding claim, further comprising the step of reducing moisture content of the piece of food before step (b).
8. A method according to any preceding claim, wherein step (b) is done at a temperature in the range of -80°C to -5°C.
9. A method according to any preceding claim, wherein step (b) is done at a temperature of -20°C or less.

10. A method according to any preceding claim, wherein step (c) is done at an absolute pressure in the range of 5 to 100 Torr.

11. A method according to any preceding claim, wherein step (c) is done at a pressure in the range of 20 to 40 Torr.

12. A method according to claim 1, wherein the piece of food is a composite food comprising the vegetable, meat or seafood and one or more of sugar, salt, starch and seasoning.

13. A method according to claim 2, wherein the porous, crunchy, dehydrated food product has a moisture content less than 5 wt.%.

14. A method according to claim 2, wherein the porous, crunchy, dehydrated food product has a moisture content less than 3 wt.%.

15. A method according to claim 3, 4, or 5, wherein the porous, crunchy, dehydrated food product has a moisture content less than 10 wt.%.

16. A method according to claim 3, 4, or 5, wherein the porous, crunchy, dehydrated food product has a moisture content less than 7 wt.%.

17. A method according to any preceding claim, further comprising, during step (c), tumbling the pieces of food in the microwave-vacuum dehydrator.

18. A method according to any preceding claim, wherein step (c) is done in at least two stages and a microwave power level of the microwave-vacuum dehydrator is higher in a first stage than in a second stage.

19. A method according to any preceding claim, wherein step (c) causes the formation of steam in the pores, preventing collapse of the pores.

20. A method according to any preceding claim, wherein the dehydrator is a resonant cavity microwave dehydrator.

21. A method according to any one of claims 1-20, wherein the dehydrator is a travelling wave microwave dehydrator.
22. A dried, crunchy, food product made by the method of any preceding claim.
23. A food product comprising crunchy potato having pores therein and a moisture content less than 5 wt.%.
24. A food product comprising crunchy sweet potato having pores therein and a moisture content less than 5 wt.%.
25. A food product comprising crunchy meat or seafood having pores therein and a moisture content less than 10 wt.%.

From the INTERNATIONAL BUREAU

PCTNOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

To:

MCGRUDER, David J.
Oyen Wiggs Green & Mutala LLP
480 - The Station
601 West Cordova Street
Vancouver, British Columbia V6B 1G1
CANADA

Date of mailing (day/month/year) 09 May 2019 (09.05.2019)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference E2760177	
International application No. PCT/CA2017/050469	International filing date (day/month/year) 13 April 2017 (13.04.2017)

1. The following indications appeared on record concerning:		
☒ the applicant	☐ the inventor	☐ the agent
☐ the common representative		
Name and Address ENWAVE CORPORATION 1668 Derwent Way - Unit #5 Delta, British Columbia V3M 6R9 Canada	State of Nationality CA	State of Residence CA
	Telephone No.	
	Facsimile No.	
	E-mail address mail@patentable.com	
2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:		
☐ the person	☐ the name	☒ the address
☐ the nationality		
☐ the residence		
Name and Address ENWAVE CORPORATION Unit 1 - 1668 Derwent Way Delta, British Columbia V3M 6R9 Canada	State of Nationality CA	State of Residence CA
	Telephone No.	
	Facsimile No.	
	E-mail address mail@patentable.com ☐ Notifications by e-mail authorized	
3. Further observations, if necessary:		
4. A copy of this notification has been sent to:		
☒ the receiving Office	☐ the International Preliminary Examining Authority	
☐ the International Searching Authority	☐ the designated Offices concerned	
☐ the Authority(ies) specified for supplementary search	☒ the elected Offices concerned	
	☐ other:	

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer KISELEVA Tatyana Sergeevna e-mail pct.team4@wipo.int Telephone No. +41 22 338 74 04
---	--