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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
23 November 2017 (23.11.2017)

WIPO | PCT

(10) International Publication Number
WO 2017/197482 A1

(51) International Patent Classification:
A23L 5/10 (2016.01) *A47J 27/026* (2006.01)
A23L 27/00 (2016.01) *A47J 43/00* (2006.01)
A23L 5/30 (2016.01)

(21) International Application Number:
PCT/CA2017/000060

(22) International Filing Date:
20 March 2017 (20.03.2017)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
62/391,965 17 May 2016 (17.05.2016) US
62/496,756 28 October 2016 (28.10.2016) US

(72) Inventor; and
(71) Applicant: **MEIER, Hans, J.** [CA/CA]; c/o Transformpack Inc., 520 Edinburgh Dr., Unit F, Moncton, New Brunswick E1E 4C6 (CA).

(74) Agent: **MARIO D. THERIAULT & CO.**; 812 Hwy. 101, Nasonworth, Fredericton, New Brunswick E3C 2B5 (CA).

(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, 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))*

WO 2017/197482 A1

(54) Title: PRESSURE-CONTROLLED SOUS-VIDE COOKING METHOD AND APPLIANCE

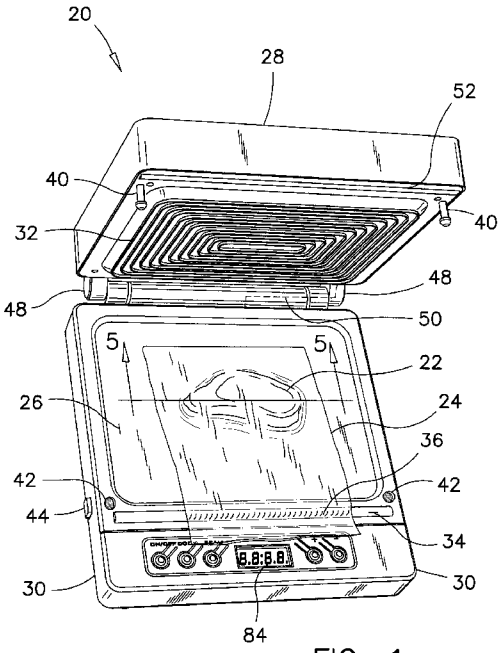

FIG. 1

(57) Abstract: A method for cooking and curing a food item comprises; sealing the food item in a plastic bag with a flavoring sheet, and applying pressure and heat on that food item. The step of applying pressure and heat includes controlling a pressure according to a pressure setting corresponding to a nature of the flavoring sheet, or to the ingredients in the flavoring sheet or to both. These pressure settings are also related to a nature of the food item, and/or to the cooking temperature. The sous-vide cooking appliance used for carrying that method comprises an inflatable membrane mounted against the heating surface for covering the heating surface and the food item. An air pump and pressure regulator are used to precisely adjust the pressure-temperature relation and the function of that relation during cooking, for promoting a flavor transfer between a flavoring sheet and the albumins of the meat being cooked.

TITLE: PRESSURE-CONTROLLED SOUS-VIDE COOKING METHOD AND APPLIANCE

This application claims the benefit of U.S. Provisional Application No. 62/391,965 filed May 17, 2016, and U.S. Provisional Application No. 62/496,756 filed October 28, 2016.

FIELD OF THE INVENTION

This invention pertains to cooking appliances and methods for controlling pressure, temperature and flavoring of food items during a cooking process.

BACKGROUND OF THE INVENTION

Flavor sheets are used for curing or marinating meat portions or other food items. A meat portion, for example, is packaged together with a flavor sheet, in such a way that the flavor sheet is in direct contact with the meat. The meat portion is cured or marinated during storage in a refrigerator, or in a refrigerated transport during delivery to the client.

These flavor sheets are made of a substrate suitable for contact with food. A treatment layer is deposited onto the substrate. This treatment layer comprises a pre-determinated amount of edible adhesive and a curing or marinating agent mixed in or otherwise retained to the substrate by the adhesive. When the meat is wrapped and packaged with a flavor sheet, the meat is in intimate contact with the food treatment layer of the flavor sheet. The adhesive dissolves in contact with the meat to release the curing or marinating substance onto the surface of

the meat portion, for absorption into the meat portion. A flavor of smoked meat for example can be obtained without smoking the meat. A flavor of maple-wood grilled steak for example can be obtained without grilling the steak. The flavor of frying or roasting can be obtained without frying or roasting the meat.

The flavor sheet technology can now infuse food with not only flavor but also a whole new set of food standards including visual and aromatic appeal; shelf life extension; nutritional improvements which can be expanded to, spices, salt, vitamins, minerals, fatty acids, and other nutritive supplements. The words curing, marinating and flavoring are used interchangeably herein to designate all the above food improvements.

Other benefits of flavoring sheets are disclosed in the publication: **US Patent # 6,623,773**, issued to Hans J. Meier on Sep. 23, 2003.

In another aspect in the preparation of food delicacies, "sous-vide" cooking is a method for cooking food that maintains the integrity of ingredients by heating them for an extended period of time at relatively low temperatures.

It is known that food cooked in a "sous-vide" environment may result in food that has been cooked more uniformly throughout when compared with food prepared by other cooking methods. It has been taught that food cooked by sous-vide cooking methods have better flavors, texture, or nutritional value than food cooked by frying or grilling for example.

Some aspects of sous-vide cooking appliances are described in the following publications:

US Patent 8,833,245 issued to E. Alipour on Sept. 16, 2014.
US Patent 9,282,846 issued to E. Alipour et al., on Mar. 15, 2016.

A sous-vide cooking appliance as described therein creates a vacuum around the food item and brings a heat transfer membrane in direct contact with the food item. The heat transfer medium in contact with the membrane is often a liquid. Generally, food is placed in a plastic bag, sealed under vacuum inside the bag. Heated water is circulated against the exterior of the plastic bag to cook the food inside the bag. Cooking is done for a long period of time, sometimes up to 24 hours at temperatures that are well below the boiling point of water, typically around 60-70^0 C. It is claimed that because the air is removed from the bag, a better control of the heat transfer can be maintained.

Because the food is cooked in an airless environment, it is easier to maintain an ideal core temperature for that food. The airless environment eliminates the effect of gas pressure inside the cooking chamber and any associated fluctuation in temperature.

Theoretically, if no air or other gases is present in the sealed package, there is no gas to inflate the bag upon heating and to reduce heat transfer through the bag. More importantly, the law of Thermodynamics teaches that pressure-temperature-volume (pvT) and interdependent from each other in a heat exchange process. An increase in temperature causes the pressure to rise, and an increase in pressure causes the temperature to increase. Therefore, the presence of air in a cooking container causes an increase in pressure in that container during the cooking process, and causes the temperature to fluctuate to an unknown value. One purpose of a "sous-vide" cooking process, is to eliminate internal pressure due to

air (airless) and to control volume so that temperature of cooking is better known and controlled.

Because of the low-temperature cooking in a sous-vide appliance, this method of cooking food has its inconvenience. For example, it is difficult to impart an open-fire-grilled taste to a piece of steak that has been cooked in a sous-vide appliance. This drawback has been solved by partly cooking the meat in a sous-vide appliance and finishing the cooking on an open-fire grill to sear the meat and to impart the meat with the desired taste and texture. This solution lengthens the cooking process and adds an extra step to a recipe.

Another drawback with sous-vide cooking methods is the absence of pressure on the meat. The absence of pressure on the meat has the adverse effects on some meats are prone to hardening. The heat from cooking causes connective tissues from these meats to contract. The heat from cooking causes the hardening of the meats, making them less tender and less succulent.

Also, a perfect vacuum is difficult to obtain. A pressure from residual gases inside the plastic bag is affected by altitude above sea level, by atmospheric pressure and by the cooking temperature. Because of this, basically, it becomes difficult to control precisely the pressure inside the plastic bag and the amount of water and juice released from the food during a sous-vide cooking process. This could render the food dry and less succulent. It also becomes somewhat difficult to control the degree of doneness of cooked food in a sous-vide cooking process by controlling only the temperature of a heat transfer medium, and not the residual pressure inside the cooking envelope.

Although the inventions found in the prior art deserve undeniable merits, it is believed that there is a need in the culinary industry for an appliance and method that are compatible to the use of flavor sheets in a sous-vide cooking environment.

SUMMARY OF THE PRESENT INVENTION

In the present invention there is provided an appliance and a method of cooking food using flavor sheet technology in a waterless, pressure-controlled sous-vide appliance.

In a first aspect of the present invention, there is provided a method for cooking and flavoring a food item. This method included the steps of: sealing the food item in a plastic bag with a flavoring sheet; and applying a pressure and heat on that food item for a cooking time period. The step of applying a pressure and heat includes controlling a pressure according to a pressure setting corresponding to a nature or to the ingredients in said flavoring sheet, or to both.

In another aspect of the present invention, the step of applying also comprises the step of applying a pressure and heat temperature that have a relation with each other and with a cooking time period. The step of applying a pressure and heat also comprises varying that pressure and temperature according to that relation, as a function of the cooking time period. That relation and this function are selected from settings corresponding to a nature of the food item being cooked.

When the food item is meat for example, the pressure-temperature relation and function are selected for causing an optimum amount of albumins to exude from the meat; to contact the flavoring sheet, to

entrap the flavoring substance from the sheet and to be absorbed back into the meat.

In another aspect of the present invention, there is provided a cooking appliance for cooking food items. The cooking appliance comprises a heating surface for receiving a food item thereon, and an inflatable membrane mounted against the heating surface for covering the heating surface and the food item. A locking device is included for retaining the inflatable membrane against the heating surface. The cooking appliance also comprises an air pump device incorporated therein for inflating the inflatable membrane and for applying a controlled pressure on the food item being cooked.

When cooking is done with a flavoring sheet in contact with the food item, the pressure created on the food item causes food juices to be brought to the surface of the food item and to dissolve with and to encapsulate flavoring substance from the flavoring sheet.

Depending on the calibration of the flavoring sheets, an endless variation of culinary objectives can be achieved, ranging from a simple topical seasoning to complex marinating, aromatic improvement, smoking, stewing, roasting, glazing and crusting.

In another aspect of the cooking appliance according to the present invention, the cooking appliance further comprises a pressure regulator for precisely controlling the air pressure inside the inflatable membrane. Such pressure regulator provides, to a certain extent, the ability to control a depth from which food juices are brought out of the food item.

The cooking appliance according to the present invention can be used with flavoring sheets to prepare delicious dishes such as, for examples only: BBQ™ proteins, smoked salmon, Gravid Lux ™, stews, roasted chicken, pot roasts, seafood with white sauce, or plain seasoned pork chops.

In yet another aspect of the present invention, the cooking appliance further comprises a bag sealing device mounted near the heating surface thereof for selectively sealing the food item in a plastic bag.

While pressure-controlled sous-vide cooking is an important aspect of the present invention, the cooking appliance can be used to vacuum-seal a food item in a bag for freezing and storage for examples.

In yet a further aspect of the present invention, the cooking appliance also comprises a mini-refrigeration system mounted in the lid thereof. This mini-refrigeration system is used for selectively cooling the inflatable membrane and the food item inside the cooking appliance. A food item can be sealed, cooled and stored inside the cooking appliance until meal time.

This brief summary has been provided so that the nature of the invention may be understood quickly. A more complete understanding of the invention can be obtained by reference to the following detailed description of the preferred embodiment thereof in connection with the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of the pressure-controlled sous-vide cooking appliance according to a preferred embodiment of the present invention is described with the aid of the accompanying drawings, in which like numerals denote like parts throughout the several views:

FIG. 1 is a perspective top view of the sous-vide cooking appliance according to the preferred embodiment of the present invention, shown with a piece of meat being readied for cooking;

FIG. 2 is a broken-away perspective top view of the sous-vide cooking appliance according to the preferred embodiment of the present invention, with the lid thereof fully open;

FIG. 3 is another perspective view of the sous-vide cooking appliance according to the preferred embodiment of the present invention shown in a closed mode;

FIG. 4 is a detached side view of the sous-vide cooking appliance according to the preferred embodiment of the present invention;

FIG. 5 is a cross-section view of the food package in **FIG. 1**, as seen along **line 5-5** in **FIG. 1**;

FIG. 6 is an enlarged view of a portion of the food package in **FIG. 1**, as seen in **detail circle 6** in **FIG. 5**.

The drawings presented herein are presented for convenience to explain the functions of all the elements includes in the cooking appliance

according to the preferred embodiment of the present invention. Elements and details that are obvious to the person skilled in the art may not have been illustrated. Conceptual sketches have been used to illustrate elements that would be readily understood in the light of the present disclosure. These drawings are not fabrication drawings, and should not be scaled.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring firstly to **FIG. 1** the preferred pressure-controlled sous-vide appliance, referred to herein as the sous-vide appliance **20** is illustrated at an interim point during a cooking process. A piece of food item **22** is placed in a plastic bag **24** and set on the resilient heating pad **26**. In use, the lid **28** is closed over the base member **30**. The deformable membrane **32** of the lid is inflated, flattening the plastic bag **24** and the food item **22**, and evacuating the air from inside the bag **24**. The heat-sealing bar **34** is activated to seal the bag **24** at its opening **36** in an airless, vacuum-like condition.

After the bag **24** has been sealed over the food item **22**, the lid **28** of the appliance is locked in a closed position over the base member **30** and the cooking cycle can be started.

Referring to **FIG. 2**, the overall arrangement of the preferred sous-vide appliance **20** is illustrated therein. The sous-vide appliance **20** has a clamshell design with a lid **28** and a base **30**. The lid **28** has a pair of lock pins **40** on its inside surface. These pins **40** engage into a corresponding pair of holes **42** in the upper surface of the base member **30**. Release buttons **44** in the sides of the base member **30** are used to release the lock pins **40** from a locking mechanism (not shown) mounted

inside the base member **30**. Although a pair of lock pins **40** and associated mechanisms are mentioned herein, it will be appreciated that other case locking devices can be used to retain the lid **28** tightly against the base member **30**.

Referring again to **FIG. 2**, the base member **30** has a heating pad **26** therein which preferably has a reflective upper surface that is relatively rigid. Alongside the heating pad **26**, there is illustrated the heat-sealing bar **34**. This bar is operated on 12 volts DC power and has capacity to seal common plastic bags. Next to the heat-sealing bar **34** is mounted the control display pad **46** and circuitry of the appliance. A battery (not shown) is preferably mounted in the base member **30** under the display pad **46** and circuitry of the appliance. A computer including a memory is also preferably included in the base **30** under the control pad **46**. The preferred sous-vide appliance **20** also has a battery charger (not shown) therein, which has an electrical supply cord **38**. This cord **38** is partly illustrated along the right hand side of the base **30** in **FIG. 2**.

The lid **28** has a flexible inflatable membrane **32** thereon. This membrane **32** comes in contact with the heating pad **26** of the base member **30**, when the lid **28** is closed over the base member **30**. The lid **28** is movably retained to the base member **30** by a hinge **48**.

Wiring and tubing between the base member **30** and the lid **28** are routed through that hinge **48** as indicated by dashed line **50**.

The display pad **46**, controls and instrumentation of the preferred sous-vide appliance **20** comprises an on/off button; a cook mode button; a bag seal mode button; a clock and a plus and minus buttons to set the clock and the cooking time, to change cooking modes; and temperature and

pressure modes. The instrumentation mentioned above also include at least one temperature sensor, a pressure sensor and a timer. The electronic circuits for all these functions are enclosed in the front portion of the base member **30**, underneath the display pad **46**.

The preferred sous-vide appliance **20** is operable as a sous-vide appliance providing cooking temperature of up to 80^0C. The preferred sous-vide appliance **20** is also operable as a vacuum packaging device. In the vacuum packing mode, the sous-vide cooking features of the preferred sous-vide appliance **20** are advantageously used to evacuate air from a package. A pair of heat-sealing bars **34** and **52** are used to seal the package while it is maintained under an airless state.

The lid **28** preferably contains a mini air compressor **60** and an electronically-controlled precision mini air pressure regulator **62** for controlling the degree of inflation of the membrane **32** and the pressure to be applied to the food item being cooked. The inflatable membrane **32** is made of concentric ridges **64** extending from the outside surface of a flexible skin-like material. It will be appreciated that the flexible membrane **32** is made of a washable, heat-resistant, food-grade silicon or latex material for example.

The lid **28** also preferably contains a mini-refrigeration unit **66** and an associated refrigerant tubing array **68**. The tubing array **68**; the refrigeration unit **66**; the air compressor **60** and the pressure regulating valve **62** are preferably enclosed in a layer of porous, sponge-like heat conductive material **70**. The membrane **32** is sealed to the lid **28** along its perimeter to form with the lid **28** an inflatable bladder.

The membrane **32** is inflatable to apply a pressure against a piece of food in a plastic bag, by way of the mini-air compressor **60** and the electronic pressure regulator **62**.

The base member **30** may have a similar inflatable bladder mounted therein facing the membrane **32**. In the preferred embodiment, the base member **30** has a heating plate **26** which is substantially rigid and has a reflective surface thereon. The heating plate **26** is preferably set somewhat lower than the rim **72** of the base member **30**, so as to form a shallow receptacle on the surface of the base member **30**.

An array of heating elements **80** and bus bars **82** are preferably mounted in the base member **30** under the heating plate **26**. The heating elements **80** and the bus bars **82** (only one is shown), are enclosed in a porous, sponge-like heat conductive material **70** as the material used in the lid **28**. It will be appreciated that other heat sources can be used. For example, the heat source may be a circulating hot gas, hot water or steam.

The heating plate **26** in the base member **30** may include a pressurized non-expandable bladder (not shown) that is inflated at a basic pressure of 3 psi., for example.

All the elements included in the base member **30** and the lid **28** are heat resistant, capable of withstanding temperatures of more than 80^0C without damage. A temperature sensor (not shown) for controlling the operation of the heating elements **80** is preferably mounted under the heating pad **26**.

Referring back to **FIG. 1**, it will be appreciated that a plastic bag **24** with a food item in it, a steak for example **22**, is flattened upon closing of the cover **28** over the base member **30**. The air inside the bag **24** is forced out, and the food item **22** inside the bag is maintained in a "sous-vide" condition as long as the cover **28** is closed and locked against the base member **30**. This food item **22** can be cooked at very low temperature of around 80^0C. A timer **84** is used to control the cooking time. Preferably, this food item **22** is maintained under a pressure of about 1-4 psi., during the entire cooking period. This pressure setting is provided herein as an example only, as this setting will be explained further herein below. The air pump **60** and regulator **62** can be used to inflate the pressurized bladders **32** to pressure higher or lower than 4 psi., if needed.

In a preferred embodiment, the pressure in the bladder **32** can be varied between 0-60 psi. The temperature of cooking can be adjusted from 50^0 C to 80^0C in a residential model, and between 50^0C and 100^0C in a commercial or industrial model.

Referring now to **FIGS. 3** and **4**, the preferred sous-vide cooking appliance **20** is illustrated in different views to show the elements of the appliance in alternate viewing angles. The array of slots **86** in **FIG. 3**, represents an air opening for the mini compressor **60**. The bosses **88** under the base member **30** of the appliance in **FIG. 4** represent legs to support the base member **30** over a horizontal surface.

Because the preferred sous-vide cooking appliance **20** has the ability to control the pressure surrounding the bag and the food item inside a bag, new culinary objectives can be contemplated. The preferred sous-vide appliance **20** can be used with flavor sheets as mentioned herein before.

Referring now to **FIGS. 1, 5** and **6**, a method of imparting flavor to a food item during cooking will be explained.

A preferred preparation for food item **22** is illustrated in **FIG. 5**. The food item **22** is covered by a flavor sheet **90** and sealed airless in a plastic bag **24**. The illustration in **FIG. 6**, explains the exchange of flavoring particles to the food item. As the temperature **"T"** increases in the food item **22**, the pressure inside the food item also increases because of a natural relationship between pressure and temperature in a fixed volume. Because of this increased pressure, the juices, as represented by label **92**, that are present in the food item exude or weep out of the food item **22** when the plastic bag **24** is held on all sides and prevented from expanding.

These juices **92** exude from the surface of the food item and mix with the flavoring substance at the surface of the flavoring sheet **90**. When the food item **22** is meat or other protein-based food, the juices **92** contain albumins. Preferably the adhesive of the flavor sheet contains an acid, sorbic acid for example. The acid present in the adhesive of the flavoring sheet causes these albumins to coagulate and to entrap therein the flavor particulate of the sheet. Because of the movement of the juices occurring at the surface of the meat during cooking, the coagulating albumins and flavor particulate are entrapped into the meat surface. The pressure inside the inflatable membrane **32**, and the corresponding pressure **"P"** applied to the food item **22**, determines the depth **"D"** of penetration at which the food juices **92** are driven out from the meat, and back into the surface of the meat.

It will be appreciated that hot regions at the surface of a food item being cooked comprises microscopic regions of higher and lower temperature;

and microscopic regions of higher and lower pressure. This effervescence-like regions help to absorb the coagulated albumin and encapsulated flavoring substance, back into the meat.

In order to further promote the absorption of flavoring substance deep in the food surface, the pressure **"P"** inside the pressurized bladder **32** can be relaxed and increased alternately or at the end of the cooking cycle. The cooking temperature **"T"** can also be relaxed and increased alternately or at the end of the cooking cycle to produce a similar effect.

The food items cooked in the preferred pressure-controlled sous-vide cooker remain moist and succulent, and a better degree of flavor transfer is obtained.

As mentioned before, pressure-temperature-volume (pvT) are interdependent from each other in a heat exchange process. Another variable is cooking time. In the pressure-controlled sous-vide cooking process according to the preferred embodiment of the present invention, the volume of the food item is kept constant, under pressure. Pressure is therefor interdependent with temperature and cooking time only.

In such a process, cooking time and temperature are important factors to obtain doneness and tenderness of a food item. Cooking time and temperature are depending on the size and type of food item being cooked. Pressure is an important factor to obtain the flavor and appearance of a food item. Pressure determines whether a flavor is absorbed superficially or deeply into the food item. Pressure is dependent on the type of food being cooked as well as on temperature, cooking time and the type of flavoring sheet used. Pressure also prevent contraction of connective tissues in meats that are prone to hardening.

In the pressure-controlled sous-vide cooking process according to the preferred embodiment of the present invention, temperature and cooking time are considered as a priority, or as dominant factors in a relation pressure-temperature, while pressure is considered as a secondary factor. When pressure is applied to the food item for flavor transfer, adjustment or correction is made if needed, to the temperature so that the temperature-cooking time product of a recipe remains unchanged.

Pressure is never increased to the point of, or at a moment wherein the food item can be over-cooked. Pressure can be increased, for example, at a moment when the food item is thoroughly hot and has sufficient entropy to tolerate a reduction of heat to accommodate an increase in pressure. Similarly, a relaxation of pressure can be accompanied by an increase of energy to the heater. In the pressure-controlled sous-vide cooking process according to the preferred embodiment of the present invention, a relation pressure-temperature, is a relation where temperature is a dominant factor. In other words, pressure and temperature are varied for obtaining a flavor transfer into the food item, for obtaining tenderness, and for maintaining constant a heat absorption by said food item during the cooking period

For examples, the following pressure settings in **Table 1**, are recommended for different proteins and different ingredients in the flavoring sheet used:

Table 1.

Protein type	Pressure Settings
For tenderizing meat prone to contraction during cooking	2-4 psi.
For marinating formulations	2-4 psi.
For herb and spice formulations	1-1.5 psi.
For chicken, fish and similar density protein	1-1.5 psi.
For steaks, chops, and similar density protein	2-3 psi.
For stews and sauces	less than 1 psi.
To increase exuded moisture	less than 1 psi.

It will be understood that a higher pressure causes shorter cooking and marinating time periods. Pressure may also be varied during the cooking period of a same food item. For example, a higher pressure may be used for a portion of the cooking period and a lower pressure may be used during another portion to increase exuded moisture and obtain a sauce or gravy base.

The selectable relations between pressure and temperature, and the variation of these relations as a function of cooking time, are preferably established by chefs according to experiments carried out with the preferred pressure-controlled sous-vide cooking appliance **20**. Corresponding cooking mode settings and cooking programs are developed and included in the memory of the controller of the preferred sous-vide appliance **20**. These recipes can be selected by the user from the display pad **46**.

For example, a recipe may include pressure-temperature settings and variations over a cooking time period for a specific size and nature of food item and a specific flavoring sheet. Such recipe may be developed for meat of different protein contents, different cut portions, different thicknesses, different size and weight, and different flavor and tenderness desired. These recipes are preferably pre-programmed in the control system of the preferred sous-vide appliance **20** through the display pad **46**. These recipes are preferably selected by the user from a menu display, as a selectable window under the clock **84**.

Furthermore, the preferred sous-vide cooking appliance **20** contains a mini-refrigeration system **66**, **68**, whereby a food item can be sealed in an airless condition, refrigerated inside the appliance **20** and taking out as in a lunch box. The food item can be stored in a refrigerated state and cooked at a preset time and temperature mode to be readied at meal time.

CLAIMS

What is claimed is:

1. A method for cooking and curing a food item, comprising the steps of:
sealing a food item in an airless mode with a flavoring sheet;
applying pressure and heat on said food item for a time period;
wherein said step of applying includes:
controlling said pressure according to a pressure setting corresponding to a nature of said flavoring sheet.

2. The method for cooking and curing a food item as claimed in **claim 1**, wherein said step of applying also comprises controlling said pressure according to a pressure setting corresponding to ingredients in said flavoring sheet.

3. The method for cooking and curing a food item as claimed in **claim 1**, wherein said step of applying also comprises the step of controlling said pressure according to a temperature of said heat.

4. The method for cooking and curing a food item, as claimed in **claim 1,** wherein said step of applying includes:
controlling said pressure and heat temperature according to a relation between said pressure and said temperature and varying said pressure and said temperature according to a function of said time period.

5. The method for cooking and curing a food item, as claimed in **claim 4** wherein said relation and said function are being selected from a recipe corresponding to a nature of said food item.

6. The method for cooking and curing a food item as claimed in **claim 5**, wherein said relation between said pressure and temperature is a relation where said temperature is a dominant factor and a heat absorption in said food item remains constant during a major portion of said time period.

7. The method for cooking and curing a food item as claimed in **claim 1**, wherein said step of sealing comprises placing said food item and said flavoring sheet in a plastic bag.

8. The method for cooking and curing a food item as claimed in **claim 5**, wherein said step of applying pressure on said food item comprises the steps of:

placing said plastic bag against a heating surface;

applying a deformable membrane against said plastic bag and said heating surface;

retaining said deformable membrane at a fix distance from said heating surface;

inflating said deformable membrane to said pressure.

9. The method for cooking and curing as claimed as **claim 1**, further including the step of selecting a flavoring sheet comprising an edible adhesive containing an acid.

10. The method for cooking and curing a food item as claimed in **claim 9**, wherein said food item is protein and further including the step of selecting a pressure-temperature relation for causing albumins to exude out from said protein; to contact said flavoring sheet, and to be absorbed back into said protein.

11. The method for cooking and curing a food item as claimed in **claim 5**, further including the steps of cooling said plastic bag and said food item between said inflatable membrane and said heating plate, while delaying said step of applying pressure and heat to said plastic bag.

12. The method for cooking and curing a food item as claimed in **claim 5**, wherein said pressure is alternately relaxed and increased during said step of applying pressure and heat.

13. A cooking appliance for cooking food items, comprising:
a heating surface for receiving one of said food items, and an inflatable membrane mounted against said heating surface, for covering said heating surface and said food item;
locking device for retaining said inflatable membrane against said heating surface;
an air pumping device incorporated therein for inflating said inflatable membrane and for applying a pressure on said food item against said heating surface.

14. The cooking appliance as claimed in **claim 13**, further comprising a pressure regulator for controlling an air pressure inside said inflatable membrane.

15. The cooking appliance as claimed in **claim 13**, further comprising a bag sealing device mounted near said heating surface for selectively sealing said food item in a plastic bag.

16. The cooking appliance as claimed in **claim 15**, further having a clam shell design having a lid and a base member, and wherein said heating surface is mounted in said base member and said inflatable membrane is mounted in said lid.

17. The cooking appliance as claimed in **claim 14**, wherein said inflatable membrane is filled with a sponge-like heat conductive material.

18. The cooking appliance as claimed in **claim 15**, further comprising a mini-refrigeration system mounted in said lid, for selectively cooling said inflatable membrane and said food item.

19. The cooking appliance as claimed in **claim 18**, further including a battery therein for operating said mini-refrigeration system, said bag sealing device and said air pumping device.

20. The cooking appliance as claimed in **claim 17**, wherein said heating surface is supported by said sponge-like heat conductive material.

21. The cooking appliance as claimed in **claim 13**, wherein said inflatable membrane has concentric ridges on a surface thereof.

22. A cooking appliance, comprising:

a heating surface for receiving a food item, and an inflatable membrane mounted against said heating surface, for covering said heating surface and said food item;

locking device for retaining said inflatable membrane against said heating surface;

an air pumping device incorporated therein for inflating said inflatable membrane and for applying a pressure on said food item against said heating surface;

a pressure regulator mounted therein for controlling air pressure inside said inflatable membrane;

a bag sealing device mounted near said heating surface for selectively sealing said food item in a plastic bag; and

a mini-refrigeration system mounted in said lid, for selectively cooling said inflatable membrane and said food item.

23. The cooking appliance as claimed in **claim 22**, further having a clam shell design including a lid and a base member, and wherein said heating surface is mounted in said base member and said inflatable membrane is mounted in said lid.

24. The cooking appliance as claimed in **claim 22**, wherein said inflatable membrane is filled with a sponge-like heat conductive material, and has concentric ridges on a surface thereof.

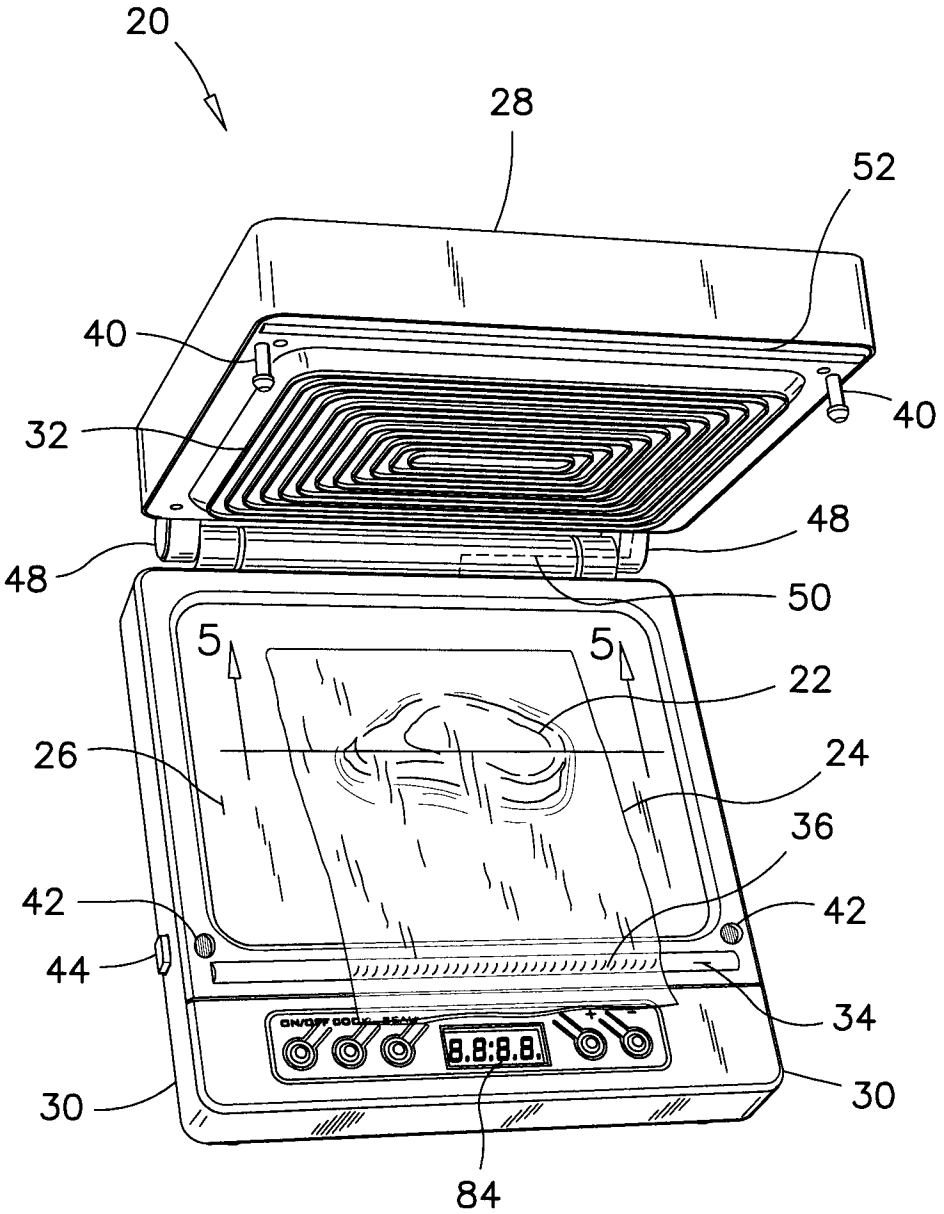

FIG. 1

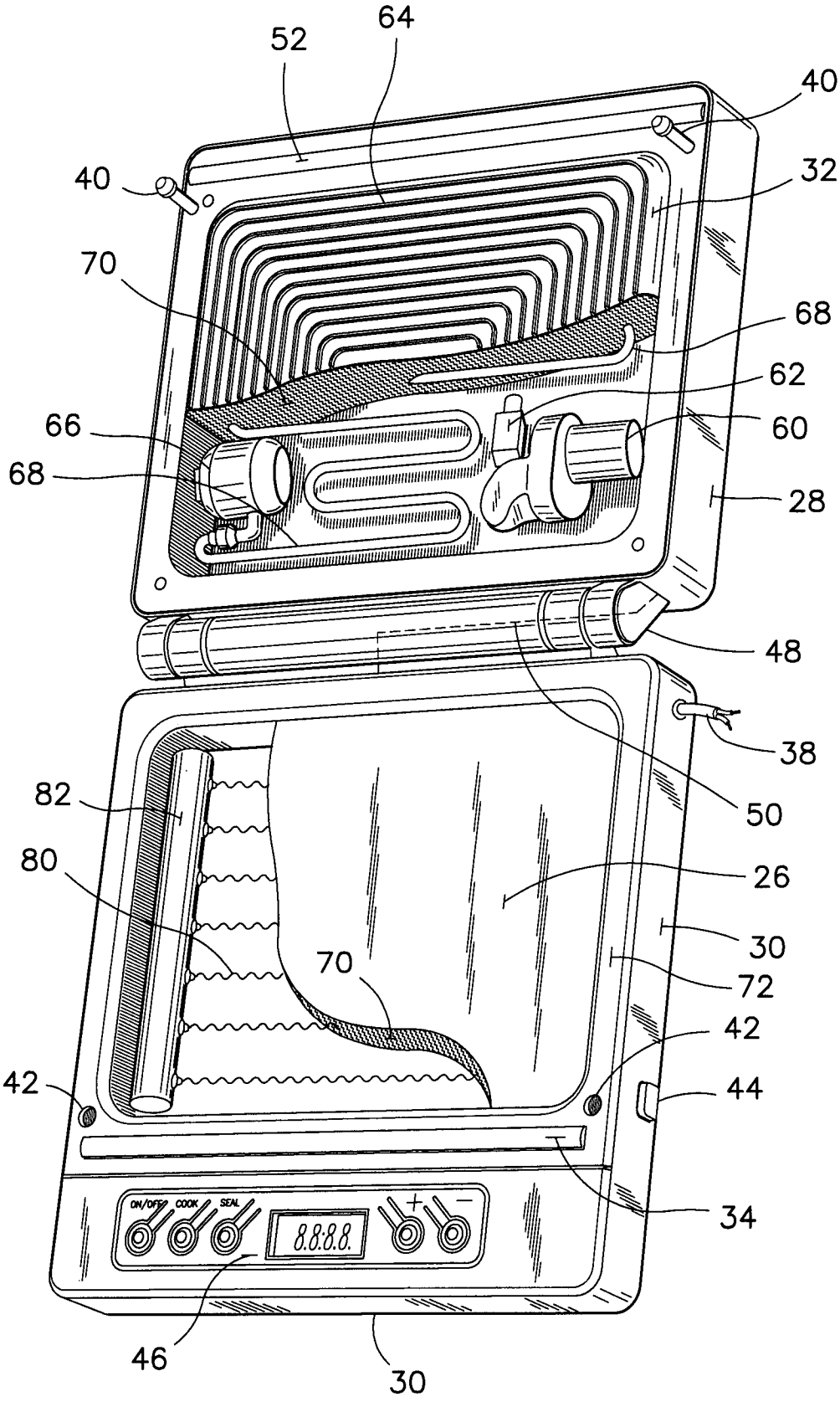
52
64
40
40
32
70
68
62
66
60
68
28
48
38
82
50
80
26
30
70
72
42
42
44
34
ON/OFF
COOK
SEAL
8.8.8.8.
46
30

FIG. 2

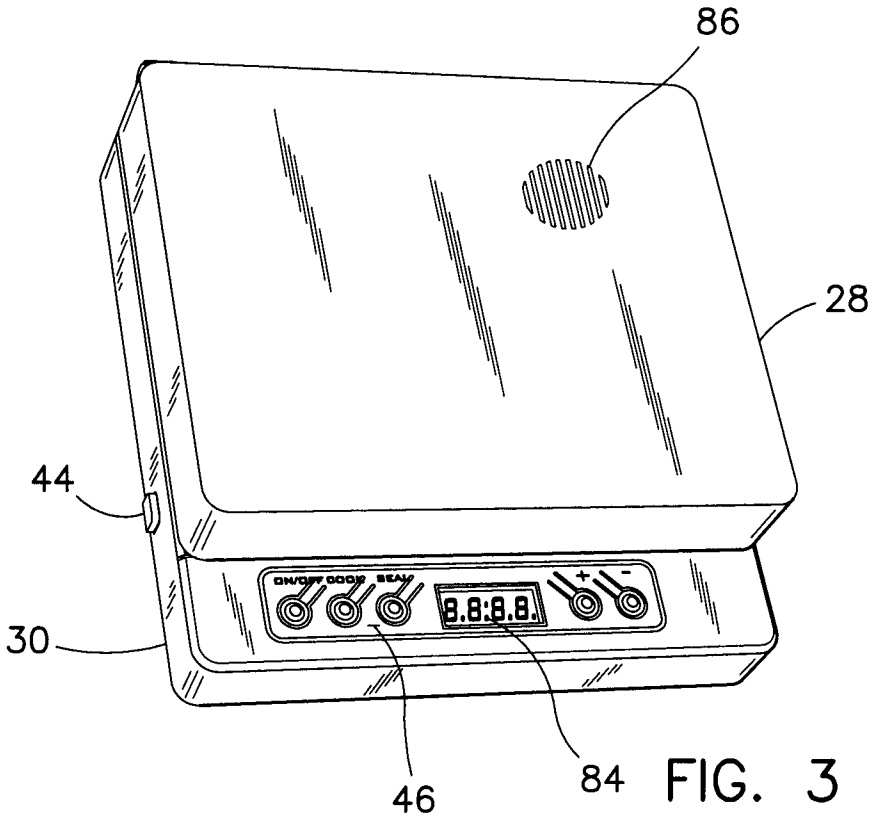

FIG. 3

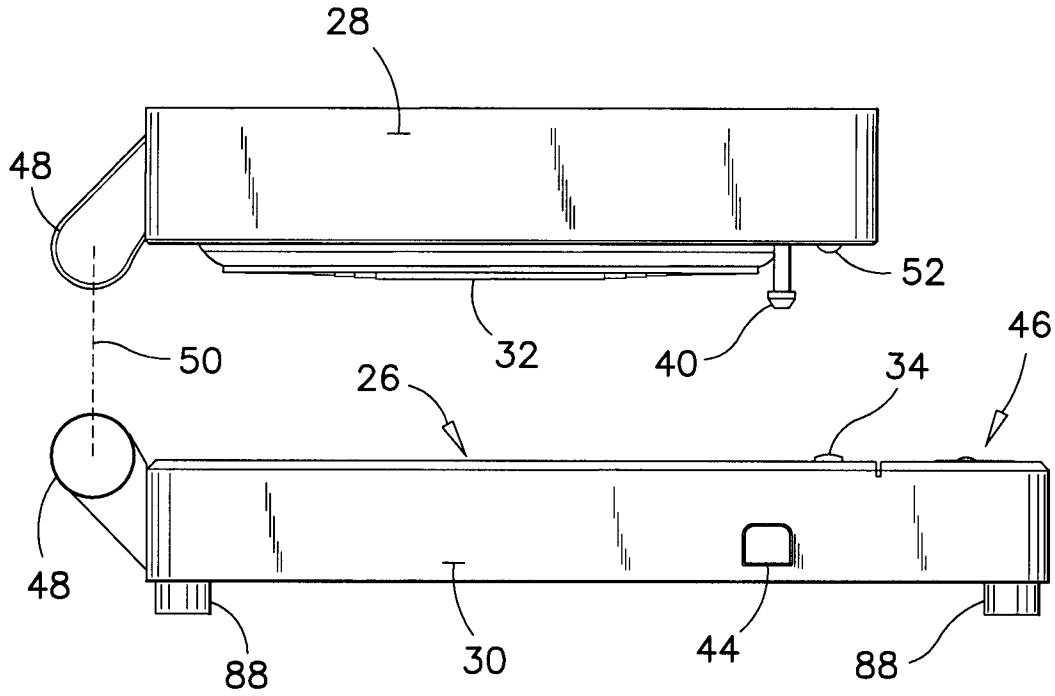

FIG. 4

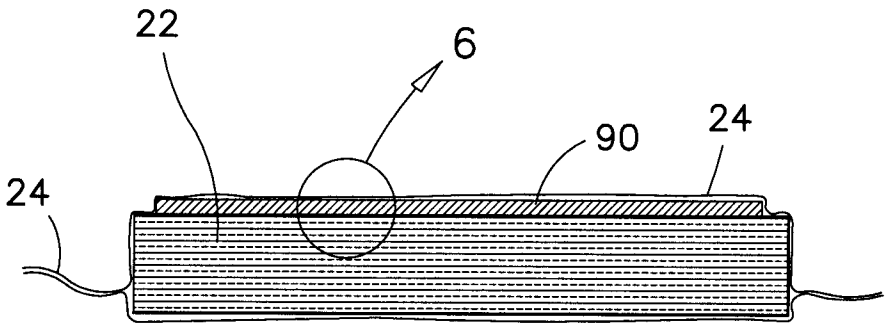

FIG. 5

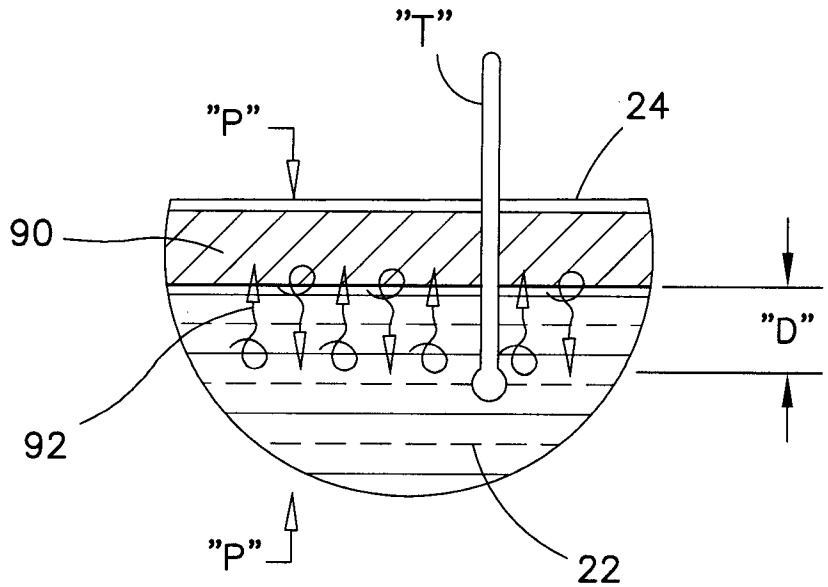

FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2017/000060

A. CLASSIFICATION OF SUBJECT MATTER
IPC: ***A23L 5/10*** (2016.01) , ***A23L 27/00*** (2016.01) , ***A23L 5/30*** (2016.01) , ***A47J 27/026*** (2006.01) , ***A47J 43/00*** (2006.01)

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-5/00, A23L-5/10, A23L-27/00, A47J-27/02, A47J-43/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
None

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)
Intellect, Scopus, GOOGLE patent search, Orbit
Keywords: sous-vide, cooking, appliance, flavor, flavour, sheet

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2008/0066624 (Taylor et al.) 20 March 2008 (20-03-2008)	1-24
A	US 2015/0257574 (Hoare et al.) 17 September 2015 (17-09-2015)	1-24
A	US 2015/0351579 (Johncock et al.) 10 December 2015 (10-12-2015)	1-24
A	US 9220362 (Eades et al.) 29 December 2015 (29-12-2015)	1-24

☐ 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 02 June 2017 (01-06-2017)	Date of mailing of the international search report 23 June 2017 (23-06-2017)
Name and mailing address of the ISA/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 Emman Ben Jamil (819) 639-8427

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CA2017/000060

Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
US2008066624A1	20 March 2008 (20-03-2008)		None
US2015257574A1			17 September 2015 (17-09-2015)
		US9603477B2	28 March 2017 (28-03-2017)
		AU2013299326A1	12 March 2015 (12-03-2015)
		AU2013299326B2	20 October 2016 (20-10-2016)
		CN104640484A	20 May 2015 (20-05-2015)
		CN104640484B	07 December 2016 (07-12-2016)
		EP2879555A1	10 June 2015 (10-06-2015)
		EP2879555A4	16 March 2016 (16-03-2016)
		RU2015107000A	20 September 2016 (20-09-2016)
		WO2014019018A1	06 February 2014 (06-02-2014)
US2015351579A1			10 December 2015 (10-12-2015)
		EP2954809A1	16 December 2015 (16-12-2015)
		EP2954809B1	10 May 2017 (10-05-2017)
US9220362B2	29 December 2015 (29-12-2015)		
		US2011185915A1	04 August 2011 (04-08-2011)
		AU2010293067A1	19 April 2012 (19-04-2012)
		AU2010293067B2	06 April 2017 (06-04-2017)
		CA2773525A1	17 March 2011 (17-03-2011)
		CN102665495A	12 September 2012 (12-09-2012)
		CN102665495B	13 May 2015 (13-05-2015)
		EP2475290A2	18 July 2012 (18-07-2012)
		EP2475290B1	26 March 2014 (26-03-2014)
		EP2749190A1	02 July 2014 (02-07-2014)
		IN2978DEN2012A	31 July 2015 (31-07-2015)
		KR20120115212A	17 October 2012 (17-10-2012)
		MX2012002841A	23 August 2012 (23-08-2012)
		USD651034S	27 December 2011 (27-12-2011)
		USD651459S	03 January 2012 (03-01-2012)
		US2016174749A1	23 June 2016 (23-06-2016)
		WO2011031306A2	17 March 2011 (17-03-2011)
		WO2011031306A3	09 February 2012 (09-02-2012)