



- (51) International Patent Classification:
A47J 27/04 (2006.01)
- (21) International Application Number:
PCT/EP2017/055125
- (22) International Filing Date:
6 March 2017 (06.03.2017)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
PCT/CN2016/076845 21 March 2016 (21.03.2016) CN
16167744.8 29 April 2016 (29.04.2016) EP
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(NL).
- (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,

[Continued on next page]

(54) Title: STEAM BOILING APPARATUS AND FOOD PREPARATION METHOD

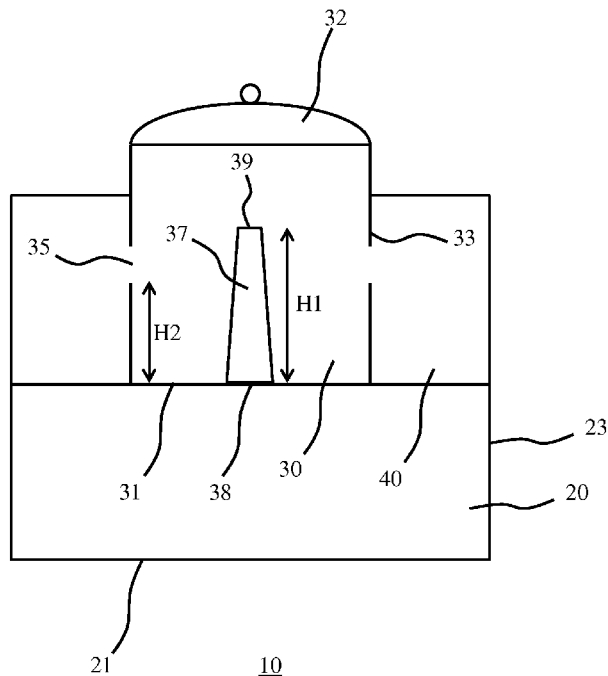


FIG. 3

(57) Abstract: A steam boiling apparatus (10) is disclosed that comprises a steam generation compartment (20) and a liquid retention compartment (30) on the steam generation compartment. The liquid retention compartment comprises a floor (31) over the steam generation compartment including a hollow protrusion (37) extending from the floor into the liquid retention compartment, the hollow protrusion delimiting a steam outlet (39) at a first height (H1) from the floor. The steam boiling apparatus (10) further comprises an overflow compartment (40) in fluid communication with the liquid retention compartment through at least one liquid outlet (35) below the first height. A method of preparing a watery food product in such a steam boiling apparatus (10) is also disclosed.



DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, **Published:**

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).

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

Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted
a patent (Rule 4.17(ii))*

Steam boiling apparatus and food preparation method

FIELD OF THE INVENTION

The present invention relates to a steam boiling apparatus comprising a steam generation compartment; a liquid retention compartment on the steam generation compartment, the liquid retention compartment comprising a floor over the steam generation compartment including a hollow protrusion extending from the floor into the liquid retention compartment, the hollow protrusion delimiting an steam outlet into the liquid retention compartment.

The present invention further relates to a method of preparing a watery food product in such a steam boiling apparatus.

BACKGROUND OF THE INVENTION

Steaming food is a popular food preparation technique, as it does not require fats to cook the food and as such is considered by some as a particularly healthy food preparing technique. A common steam boiling apparatus such as a steam pot comprises a steam generation compartment such as a water reservoir that can be exposed to heat in order to generate steam. A liquid retention compartment such as a collection reservoir is typically placed on top of and in fluid communication with the steam generation compartment, for example through a hollow protrusion, e.g. a steam hole, extending from the floor of the liquid retention compartment, which floor may act as a lid sealing the steam generation compartment, such that steam generated in the steam generation compartment is forced into the liquid retention compartment containing one or more food products to be cooked. In this manner, the food product(s) in the liquid retention compartment may be steamed. An example of such a steam boiling apparatus is disclosed in CN202426280 A.

Such a food preparation technique may for example be used to prepare watery food products such as soups or sauces. By condensation, the steam entering the liquid retention compartment will convert to water, which is collected in the liquid retention compartment to form the watery food product together with the food product(s) in this compartment. Compared to conventional boiling, this has the advantage that smaller amounts of water are typically needed to cook the food product(s), thus leading to more concentrated

flavours in the watery food product. However, a drawback of this technique is that it typically takes longer to prepare the watery food product, as the cooking process should be continued long enough to accumulate sufficient water in the liquid retention compartment to obtain a watery food product with the desired consistency.

Such prolonged exposure to high temperatures may cause a significant loss of temperature-labile nutrients from the one or more food products through thermal degradation. FIG. 1 is a graph depicting a retention rate of Vitamin C (ascorbic acid) in a food product as a function of time when exposed to temperatures of 80°C (top curve), 90°C (middle curve) and 100°C (bottom curve), whereas FIG. 2 is a graph depicting a retention rate of Vitamin B-1 (thiamine) in a food product cooked at 99°C as function of time. As will be immediately apparent from these graphs, prolonged exposure to higher temperatures leads to a decreased retention (i.e. an increased loss) of such temperature-labeled nutrients from the food products. Therefore, prolonged exposure of such food products in the liquid retention compartment to the high temperatures associated with the steam entering this compartment and the condensed (near-boiling) water contacting the food product is undesirable in terms of nutrients retention in the watery food product.

SUMMARY OF THE INVENTION

The present invention seeks to provide a steam boiling apparatus in which a watery food product may be prepared with a higher temperature-labile nutrient retention.

The present invention further seeks to provide a method of preparing a watery food product in such a steam boiling apparatus.

According to an aspect, there is provided a steam boiling apparatus comprising a steam generation compartment; a liquid retention compartment on the steam generation compartment, the liquid retention compartment comprising a floor over the steam generation compartment including a hollow protrusion extending from the floor into the liquid retention compartment, the hollow protrusion delimiting an steam outlet at a first height from the floor; and an overflow compartment in fluid communication with the liquid retention compartment through at least one liquid outlet below the first height.

This facilitates the transfer of a fraction of the watery food product from the liquid retention compartment to the overflow compartment. As the overflow compartment is not directly exposed to the steam generated in the steam generation compartment or to hot water formed by condensing steam, the temperatures in the overflow compartment are typically lower than in the liquid retention compartment, such that a higher retention of

temperature-labile nutrients in the fraction of the watery food product transferred to the overflow compartment is achieved, thereby achieving an overall increase of temperature-labeled nutrients in the watery food product.

In an embodiment, the at least one liquid outlet is located in the floor or in a side wall of the liquid retention compartment at a second height from the floor, the second height being smaller than the first height to facilitate a gravity-fed transfer of the watery food product from the liquid retention compartment to the overflow compartment.

Alternatively, the steam boiling apparatus may further comprise a fluid transfer member containing the at least one liquid outlet, wherein the fluid transfer member comprises a smart valve or a pump. In this manner, the transfer of the watery food product from the liquid retention compartment to the overflow compartment may be controlled, e.g. by periodically engaging the fluid transfer member, to avoid loss of nutrients in the watery food product by an overly long dwell time of the watery food product in the liquid retention compartment. To this end, the steam boiling apparatus may further comprise a controller adapted to control the fluid transfer member, wherein the controller is adapted to periodically engage the fluid transfer member.

The overflow compartment may surround the liquid retention compartment in order to provide a particularly straightforward embodiment of the steam boiling apparatus of the present invention. For example, the overflow compartment may be an annular compartment delimited by said side wall.

In an embodiment, the liquid retention compartment is mounted in the overflow compartment. Such a modular design facilitates easy cleaning of the steam boiling apparatus after use. The liquid retention compartment in this embodiment may be a temporary compartment formed by placing the at least one side wall in the overflow compartment to delimit the liquid retention compartment from the overflow compartment. In this embodiment, the hollow protrusion may form an integral part of the floor of the overflow compartment.

Preferably, a volume of the overflow compartment below the at least one liquid outlet is larger than a volume of the liquid retention compartment below the at least one liquid outlet. This is ensured that a major fraction of the watery food product can be retained in the overflow compartment, thus further increasing temperature-labile nutrient retention in the watery food product.

The steam outlet may be located in any suitable location of the hollow protrusion. In an example embodiment, the steam outlet is delimited by an end portion of the

hollow protrusion such as an end portion distal to the floor from which the hollow protrusion extends.

The hollow protrusion may have any suitable shape. In an example embodiment, the hollow protrusion has a truncated conical shape tapering inwardly into the liquid retention compartment.

The at least one liquid outlet may comprise plurality of liquid outlets at regular intervals in the side wall, each liquid outlet being at the second height from the floor. This may increase the flow rate of the watery food product from the liquid retention compartment into the overflow compartment, thus reducing dwell time of the fraction of the watery food product to be transferred in the liquid retention compartment.

The steam boiling apparatus may be heated in any suitable manner. For instance, the steam generation compartment may comprise a floor suitable for heating by an external heat source such as a flame or a burner of a hob or the like. Alternatively, the steam boiling apparatus may further comprise a heating element arranged to boil water in the steam generation compartment, which has the advantage that the steam boiling apparatus may be used in an environment where electricity is available to power the heating element but in which other forms of heating are unavailable, e.g. an office environment.

The steam boiling apparatus may further comprise a user interface, wherein the heating element is responsive to the user interface. For example, the user interface may be used to control the heating level of the heating element and/or the operating time of the heating element.

In an embodiment, the steam boiling apparatus further comprises a fluid sensor on a sidewall of the overflow compartment and spatially separated from a floor of the overflow compartment, wherein the heating element is responsive to the fluid sensor. Such a fluid sensor may be used to automatically disable the heating element once a predefined fluid level is detected in the overflow compartment, which is indicative of the watery food product having been produced in a predefined amount or volume.

According to another aspect, there is provided a method of preparing a watery food product in the steam boiling apparatus of any of the above embodiments, the method comprising placing water in the steam generation compartment; placing a food product in the liquid retention compartment; heating the water to generate steam; producing a first fraction of the watery food product by collecting the steam in the liquid retention compartment; and producing a second fraction of the watery food product by transferring the second fraction from the liquid retention compartment to the overflow compartment. In this manner, a watery

food product with increased retention levels of temperature-labeled nutrients may be produced.

The method may further comprise removing the liquid retention compartment from the steam generation compartment and combining the first fraction in the liquid retention compartment with the second fraction in the overflow compartment in order to obtain the cooked watery food product. This for example may be achieved by removing the overflow compartment from the liquid retention compartment.

The method may further comprise terminating heating the water to generate steam in response to a sensor signal indicating a predefined fill level of the overflow compartment to accurately control the desired amount of watery food product to be prepared.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention are described in more detail and by way of non-limiting examples with reference to the accompanying drawings, wherein

FIG. 1 is a graph depicting the retention of ascorbic acid (Vitamin C) in a watery food product during cooking as a function of time;

FIG. 2 is a graph depicting the retention of thiamine (Vitamin B1) in a watery food product during cooking as a function of time;

FIG. 3 schematically depicts a cross-section of a steam boiling apparatus according to an embodiment;

FIG. 4 schematically depicts an exploded view of a steam boiling apparatus according to an embodiment;

FIG. 5 schematically depicts an exploded view of a steam boiling apparatus according to an alternative embodiment;

FIG. 6 schematically depicts a cross-section of a steam boiling apparatus according to another embodiment;

FIG. 7 schematically depicts a cross-section of a steam boiling apparatus according to yet another embodiment;

FIG. 8 schematically depicts a cross-section of a steam boiling apparatus according to a further embodiment; and

FIG. 9 schematically depicts a cross-section of a steam boiling apparatus according to another further embodiment.

DETAILED DESCRIPTION OF THE EMBODIMENTS

It should be understood that the Figures are merely schematic and are not drawn to scale. It should also be understood that the same reference numerals are used throughout the Figures to indicate the same or similar parts.

5 FIG. 3 schematically depicts a cross-section of a steam boiling apparatus 10 according to an embodiment, and FIG. 4 schematically depicts an exploded perspective view of such a steam boiling apparatus 10. The steam boiling apparatus 10 comprises a steam generation compartment 20, which may be filled with water in order to generate steam upon the heating the water with an external heat source such as a flame, a burner of a hob or the
10 like. To this end, the floor or bottom 21 of the steam generation compartment 20 may be made of a heat-resistant thermally conductive material such as a metal or metal alloy to conduct the heat produced by such an external heat source to the water contained within the steam generation compartment 20. The at least one sidewall 23 of the steam generation compartment 20 may be made of the same material as the floor 21 although this is not
15 essential.

The steam boiling apparatus 10 further comprises a liquid retention compartment 30 in fluid communication with the steam generation compartment 20. The liquid retention compartment 30 typically comprises a floor 31 dimensioned to fit on top of the steam generation compartment 20, thereby hermetically sealing the steam generation
20 compartment 20 such that any steam generated during the operation of the steam boiling apparatus 10 is forced from the steam generation compartment 20 into the liquid retention compartment 30 through a hollow protrusion 37 upwardly extending from the floor 31, which hollow protrusion 37 comprises an steam outlet 38 through which steam can enter the hollow protrusion 37 from the steam generation compartment 20 and an outlet 39 through which
25 steam can exit the hollow protrusion 37 into the liquid retention compartment 30.

The outlet 39 is located at a height H1 from the floor 31 and may be located in any suitable portion of the hollow protrusion 37. In FIG. 3 and 4, the outlet 39 is located in an end portion of the hollow protrusion 37 distal to the floor 31 away of non-limiting example; it is for instance equally feasible that the outlet 39 is located in a side wall of the hollow
30 protrusion 37, in which case the hollow protrusion 37 typically has a total height exceeding the height H1.

The hollow protrusion 37 may have any suitable shape. For example, the hollow protrusion 37 may have a truncated conical shape in which the widest portion of the

truncated cone coincides with the floor 31, with the truncated cone narrowing or tapering inwardly in a direction away from the floor 31, i.e. into the liquid retention compartment 30.

The liquid retention compartment 30 further comprises one or more sidewalls 33, e.g. a single side wall in case of a circular liquid retention compartment 30 or multiple sidewalls in case of a polygonal liquid retention compartment 30. A lid 32, which may be a removable lid, may be provided on the liquid retention compartment 30, e.g. supported by the one or more sidewalls 33, which lid 32 is typically dimensioned to seal the liquid retention compartment 30 such that steam cannot escape the liquid retention compartment 30. The liquid retention compartment 30 typically comprises a floor space laterally extending between the hollow protrusion 37 and its one or more sidewalls 33 onto which one or more food products for preparing a watery food product may be placed.

The one or more sidewalls 33 further comprise a liquid outlet at a second height H2 from the floor 31. The second height H2 is smaller than the first height H1, i.e. $H2 < H1$. The one or more sidewalls 33 may comprise a single liquid outlet 35 at the second height H2 or may comprise a plurality of such liquid outlets 35, which liquid outlets may be spaced at regular intervals from each other and may all be positioned at a height H2 from the floor 31.

The one or more liquid outlets 35 fluidly connect the liquid retention compartment 30 to an overflow compartment 40 in which a fraction of the watery food product may be collected. For this reason, $H2 < H1$ such that the watery food product spills over, i.e. is gravity-fed, into the overflow compartment 40 rather than into the steam generation compartment 20. The overflow compartment 40 may surround the liquid retention compartment 30 and may have any suitable shape, e.g. an annular shape. The overflow compartment 40 is provided to gradually collect liquid formed in the liquid retention compartment 30, such that the overflow compartment 40 contains a gradually increasing fraction of the watery food product prepared in steam boiling apparatus 10. Specifically, as steam condenses in the liquid retention compartment 30, the fluid level in the liquid retention compartment 30 slowly increases until the fluid level reaches the height H2 and which point liquid retained in the liquid retention compartment 30 spills over into the overflow compartment 40. Because the overflow compartment 40 is not in direct contact with the steam produced in the steam generation compartment 20, the liquid retained in the overflow compartment 40 can cool down, thereby reducing or even halting the rate of decomposition of the temperature-labile nutrients in the fraction of the watery food product spilled over into the overflow compartment 40.

The liquid retention compartment 30 may be removably mounted in the overflow compartment 40, as shown in FIG. 4. Although not specifically shown, the bottom portion of the one or more sidewalls 33 of the liquid retention compartment 30 and/or an intermediate floor section may comprise alignment members including a watertight seal for aligning the liquid retention compartment 30 with the overflow compartment 40. The overflow compartment 40 may comprise an opening (not shown), e.g. in a central location of the floor of the overflow compartment, which opening aligns with inlet 38 such that steam generated in the steam generation compartment 20 can enter the liquid retention compartment 30 through the opening and the inlet 38 respectively. However, it should be understood that alternative embodiments of such a modular arrangement are equally feasible, such as for example an arrangement in which the floor of the overflow compartment 40 adjoins the floor 31 of the liquid retention compartment 30 in a watertight manner, e.g. by a seal arrangement between the floor 31 and the floor of the overflow compartment 40.

Yet another alternative embodiment of such a modular arrangement is schematically depicted in FIG. 5 in which a perspective exploded view of the steam boiling apparatus 10 according to this embodiment is shown. In this embodiment, the floor 31 and hollow protrusion 37 form an integral part of the overflow compartment 40. In this embodiment, the liquid retention compartment 30 is formed by placement of a removable side wall arrangement comprising the one or more sidewalls 33 in the overflow compartment 40 as indicated by the block arrow. In this embodiment, the liquid fractions of the watery food product contained in the liquid retention compartment 30 and overflow compartment 40 may be combined by simply removing the side wall arrangement following completion of the preparation of the watery food product.

At least one of the liquid retention compartment 30 and the overflow compartment 40 may further comprise a pouring member (not shown) such as a spout or the like to facilitate pouring from the steam boiling apparatus 10 into a receptacle such as a bowl or the like. Any suitable pouring member may be considered for this purpose. The overflow compartment 40 optionally may comprise a lid or the like (not shown), which may be removable in order to facilitate removal of the fraction of the watery food product contained in the overflow compartment 40 from this compartment. Other arrangements for facilitating the removal of the watery food product from the steam boiling apparatus will be immediately apparent to the skilled person and it should be understood that any suitable arrangement may be contemplated.

The liquid retention compartment 30 and the overflow compartment 40 may be made of any suitable material, such as a metal, a metal alloy, a heat-resistant plastics material or any suitable combination thereof. The steam generation compartment 20, the liquid retention compartment 30 and the overflow compartment 40 may be formed in any suitable manner, e.g. by moulding or casting.

In a particularly advantageous embodiment, a volume V_{OC} of a portion of the overflow compartment 40 from the floor of the overflow compartment up to the lower edge of the one or more liquid outlets 35 fluidly connecting the overflow compartment 40 to the liquid retention compartment 30, i.e. the volume of the portion of the overflow compartment 40 that can retain a liquid without this liquid spilling over into the liquid retention compartment 30, is larger than a volume V_{LRC} of a portion of the liquid retention compartment from the floor 31 up to the one or more liquid outlets 35, i.e. $V_{OC} > V_{LRC}$.

In the embodiments schematically depicted in FIG. 3-5, the steam boiling apparatus 10 was adapted to be heated by an external heat source such as a flame or a burner of a hob or the like. FIG. 6 schematically depicts an alternative embodiment in which the steam boiling apparatus 10, e.g. the embodiments thereof as shown in FIG. 3-5 and described in more detail above, further comprises a heating element 50 such as an electrical heating element. The heating element 50 is typically arranged to heat water contained in the steam generation compartment 20 in order to convert the water into steam to be forced into the liquid retention compartment 30 by building up steam pressure in the steam generation compartment 20, as is well-known per se. The heating element 50 may be attached to or integrated in any suitable part of the steam generation compartment 20, e.g. the floor 21 and/or the one or more sidewalls 23 of the steam generation compartment 20.

The heating element 50 optionally may be responsive to a user interface 60, e.g. one or more switches, buttons, levers, a touch screen or the like, which user interface 60 may be provided in any suitable location of the steam boiling apparatus 10, e.g. on a side wall 23 or on the lid 32. Alternatively, the user interface 60 may form an integral part of such a side wall or lid. The user interface 60 may be adapted to control the heating element 50, for example to switch on or off the heating element 50, to control an operation time of the heating element 50, in which case the user interface 60 may include a timer (not shown), such that the heating element 50 may be operated for a defined period of time, to set a heating level of the heating element 50, e.g. to define a rate at which the water contained in the steam generation compartment 20 is converted into steam, and so on.

FIG. 7 schematically depicts another embodiment of steam boiling apparatus 10 according to the present invention, in which the steam boiling apparatus 10 as previously described with the aid of FIG. 6 further comprises a fluid sensor 70 in the overflow compartment 40 below the level H2, i.e. at a height below the bottom edge of the one or more liquid outlets 35, such that the fluid sensor 70 can detect a fluid level in the overflow compartment 40. The fluid sensor 70 may be adapted to detect a single fluid level or may be adapted to detect a plurality of fluid levels. For example, the fluid sensor 70 may be a capacitive sensor in which the capacity measured by the capacitive sensor is a function of the fluid level, such that a measured capacity can be translated to a particular fluid level.

Alternatively, a vertical array of fluid sensors may be provided, i.e. extending substantially vertically from the floor of the overflow compartment 40, such that a fluid level may be detected by identifying the highest fluid sensor in the vertical array detecting contact with the liquid in the overflow compartment 40.

The heating element 50 may be responsive to the fluid sensor 70 such that upon the fluid sensor 70 detecting a particular fluid level in the overflow compartment 40 indicative of a desired amount of the watery food product, the heating element 50 is switched off. In this manner, it is ensured that a desired amount of the watery food product is prepared, e.g. an amount corresponding to the amount of food product(s) placed in the liquid retention compartment 30 prior to the food preparation process. This for instance increases the likelihood that the watery food product prepared in the steam boiling apparatus 10 has the desired consistency, i.e. is not too thick or too watery.

The fluid sensor 70 may comprise a processing element such as a microprocessor or the like for translating a raw sensor signal into a fluid level indication. Alternatively, such a processing element may form part of the heating element 50 or the user interface 60, with the fluid sensor 70 arranged to provide the raw sensor signal to this processing element. In an embodiment, the fluid sensor 70 is responsive to the user interface 60. For example, a user may use the user interface 60 to enable or disable the fluid sensor 70 and/or to define a desired fluid level to be detected in case of a fluid sensor 70 adapted to detect multiple fluid levels within the overflow compartment 40.

In the above embodiments, the overflow compartment 40 is gravity-fed from the liquid retention compartment 30. FIG. 8 schematically depicts an alternative embodiment of the steam boiling apparatus 10 in which the one or more liquid outlets 35 comprise a fluid transfer member 70 such as a pump or a smart valve for a controlled transfer of a watery food product from the liquid retention compartment 30, e.g. at set times, in order to ensure that the

watery food product is retained for a limited amount of time only in the liquid retention compartment 30 in order to preserve nutrients in the watery food product. In this embodiment, the fluid transfer member 70 may be located in a side wall 33 or the floor 31 of the liquid retention compartment 30. The fluid transfer member 70 may be controlled by a controller (not shown), which controller may be responsive to the user interface 60, e.g. may be programmed to transfer the watery food product from the liquid retention compartment 30 to the overflow compartment 40 at user-specified intervals. In case of the fluid transfer member 70 comprising a fluid pump, the pump may be arranged to siphon the watery food product from the liquid retention compartment 30 to the overflow compartment 40.

In the above embodiments, the overflow compartment 40 is located adjacent to the liquid retention compartment 30. FIG. 9 schematically depicts an alternative embodiment of the steam boiling apparatus 10 in which the overflow compartment 40 is located below the liquid retention compartment 30, with the overflow compartment 40 in fluid communication with the liquid retention compartment 30 through the fluid transfer member 70. The fluid transfer member 70 may be located in the floor 31 of the liquid retention compartment 30, e.g. in the case of a smart valve or pump, although such a pump may be located in any suitable location, e.g. in a side wall 33 of the liquid retention compartment 30, with an outlet of the pump fluidly connected to the overflow compartment via a channel, a conduit, tubing or the like. As before, the fluid transfer member 70 may be arranged to periodically transfer the watery food product from the liquid retention compartment 30 to the overflow compartment 40, which periods may be user-defined as explained above. In this embodiment, the overflow compartment 40 is warmed by the steam generated in the steam generation compartment 20, thus avoiding excessive cooling of the watery food product fraction in the overflow compartment 40.

In embodiments where the steam boiling apparatus 10 comprises the fluid transfer member 70, and in particular a fluid pump, the opening 35 may not be located in the side wall 33 or bottom 31 of the liquid retention compartment 30. Instead, the opening 35 may form part of or define a fluid inlet of the fluid transfer member 70, with the fluid transfer member 70 further comprising a fluid outlet in the overflow compartment 40.

The steam boiling apparatus 10 according to embodiments of the present invention as described above may be used in a method of preparing a watery food product. In accordance with this method, the watery food product may be prepared by placing water in the steam generation compartment 20 and by placing a food product in the liquid retention compartment 30. Next, the water in the steam generation compartment 20 to generate steam.

The build-up of steam in the steam generation compartment 20 forces steam into the liquid retention compartment 30 containing the food product through the hollow protrusion 37. The steam forced into the liquid retention compartment 30 produces a first fraction of the watery food product, where the steam is collected and condensed into hot water. This continual collection process at some point causes the liquid level in the liquid retention compartment 30 to reach the height H2, which causes liquid to spill into the overflow compartment 40 through the one or more liquid outlets 35, thereby producing a second fraction of the watery food product. This second fraction is typically retained at a lower temperature than the first fraction of the watery food product retained in the liquid retention compartment 30, thereby preserving temperature-labile nutrients in the second fraction. Preferably, the second fraction is larger than the first fraction upon completion of the food preparation process such that temperature-labile nutrients are preserved in a majority fraction of the prepared watery food product. Alternatively, the second fraction may be formed by engaging a fluid transfer member 70 to allow or force the second fraction of the watery food product from the liquid retention compartment 30 to the overflow compartment 40.

Upon completion of the food preparation process, the liquid retention compartment 30 may be removed from the steam generation compartment 20 and the first fraction of the watery food product retained in the liquid retention compartment 30 may be combined with the second fraction of the watery food product retained in the overflow compartment 40 to form the watery food product. This combination of the first fraction and second fraction for example may be achieved by removing the overflow compartment 40 from the liquid retention compartment 30 or vice versa, e.g. by removing a partition, i.e. the one or more sidewalls 33. Alternatively, the first and second fraction may be combined by pouring the respective fractions into a receptacle such as a bowl or the like.

In an embodiment, the heating process to heat the water in order to generate steam may be terminated in response to a sensor signal indicating a predefined fill level of the overflow compartment 40. As explained above, this ensures the production of a well-controlled amount of the watery food product, which may aid to achieve the desired consistency of the watery food product.

It should be noted that the above-mentioned embodiments illustrate rather than limit the invention, and that those skilled in the art will be able to design many alternative embodiments without departing from the scope of the appended claims. In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. The word "comprising" does not exclude the presence of elements or steps other than those listed

in a claim. The word "a" or "an" preceding an element does not exclude the presence of a plurality of such elements. The invention can be implemented by means of hardware comprising several distinct elements. In the device claim enumerating several means, several of these means can be embodied by one and the same item of hardware. The mere fact that
5 certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

CLAIMS:

1. A steam boiling apparatus (10) comprising:
a steam generation compartment (20);
a liquid retention compartment (30) on the steam generation compartment, the liquid retention compartment comprising:
 - 5 a floor (31) over the steam generation compartment including a hollow protrusion (37) extending from the floor into the liquid retention compartment, the hollow protrusion delimiting a steam outlet (39) at a first height (H1) from the floor; and
an overflow compartment (40) in fluid communication with the liquid retention compartment through at least one liquid outlet (35), said at least one liquid outlet
10 being located below the first height (H1) in the liquid retention compartment.
2. The steam boiling apparatus (10) of claim 1, wherein the at least one liquid outlet (35) is located in the floor (31) or in a side wall (33) of the liquid retention compartment (30) at a second height (H2) from the floor, the second height being smaller
15 than the first height.
3. The steam boiling apparatus (10) of claim 1 or 2, wherein the overflow compartment (40) surrounds the liquid retention compartment (30).
- 20 4. The steam boiling apparatus (10) of claim 3, wherein the overflow compartment (40) is an annular compartment delimited by said side wall (33).
5. The steam boiling apparatus (10) of any of claims 1-4, wherein a volume of the overflow compartment (40) below the at least one liquid outlet (35) is larger than a
25 volume of the liquid retention compartment (30) below the at least one liquid outlet.
6. The steam boiling apparatus (10) of any of claims 1-5, further comprising a fluid transfer member (70) containing the at least one liquid outlet (35), wherein the fluid transfer member comprises a smart valve or a pump.

7. The steam boiling apparatus (10) of claim 6, further comprising a controller adapted to control the fluid transfer member (70), wherein the controller is adapted to periodically engage the fluid transfer member.

8. The steam boiling apparatus (10) of any of claims 1-7, wherein the at least one liquid outlet (35) comprises plurality of liquid outlets at regular intervals.

9. The steam boiling apparatus (10) of any of claims 1-8, further comprising a heating element (50) arranged to boil water in the steam generation compartment (20).

10. The steam boiling apparatus (10) of claim 9, further comprising a user interface (60), wherein the heating element (50) is responsive to the user interface.

11. The steam boiling apparatus of claim 9 or 10, further comprising a fluid sensor (70) on a sidewall (43) of the overflow compartment (40) and spatially separated from a floor (41) of the overflow compartment, wherein the heating element (50) is responsive to the fluid sensor.

12. A method of preparing a watery food product in the steam boiling apparatus of any of claims 1-11, the method comprising:

placing water in the steam generation compartment;

placing a food product in the liquid retention compartment;

heating the water to generate steam;

producing a first fraction of the watery food product by collecting the steam in the liquid retention compartment; and

producing a second fraction of the watery food product by transferring the second fraction from the liquid retention compartment to the overflow compartment.

13. The method of claim 12, further comprising:

removing the liquid retention compartment from the steam generation compartment; and

combining the first fraction in the liquid retention compartment with the second fraction in the overflow compartment.

14. The method of claim 13, wherein combining the first fraction in the liquid retention compartment with the second fraction in the overflow compartment comprises removing the overflow compartment from the liquid retention compartment.

5 15. The method of any of claims 12-14, further comprising terminating heating the water to generate steam in response to a sensor signal indicating a predefined fill level of the overflow compartment.

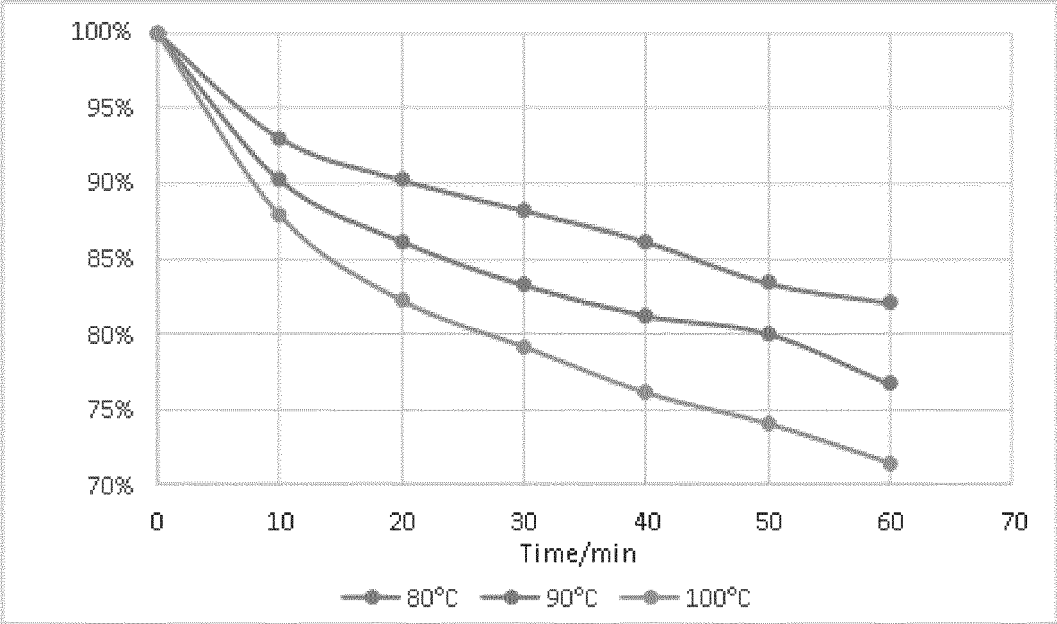


FIG. 1

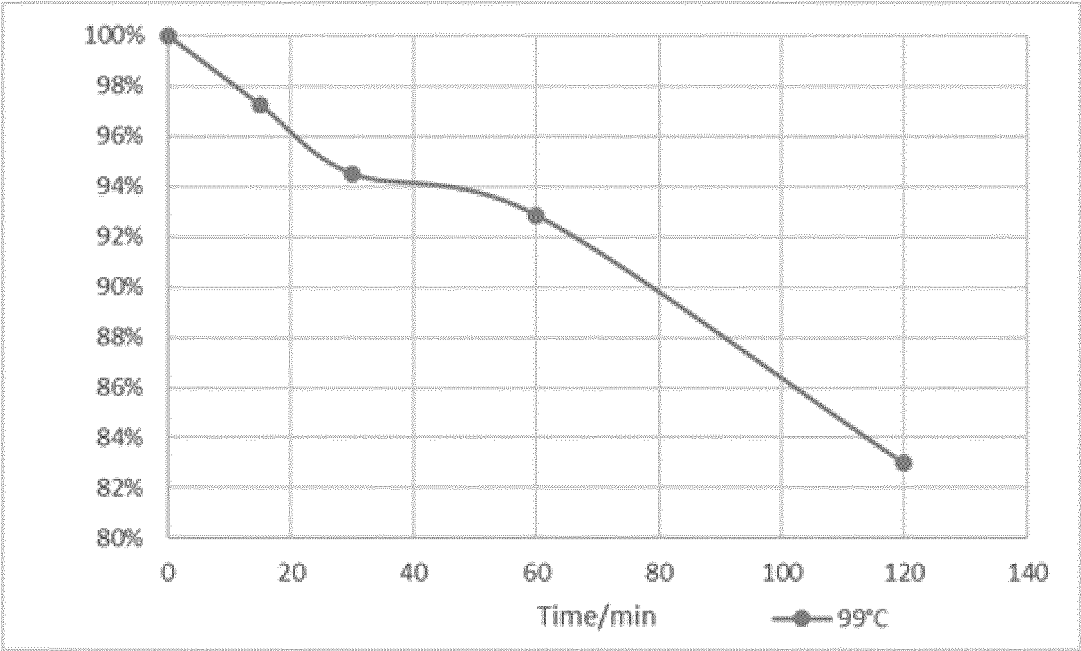


FIG. 2

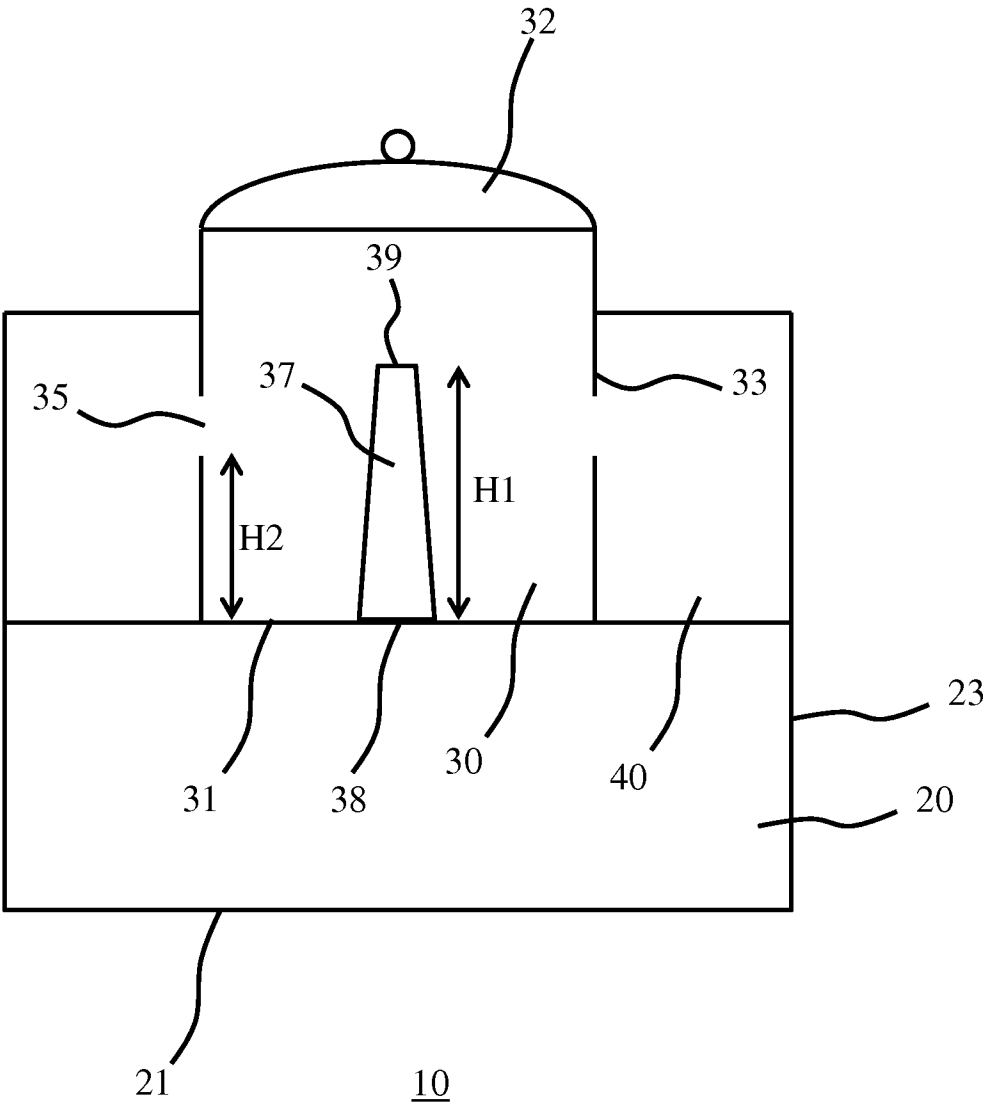


FIG. 3

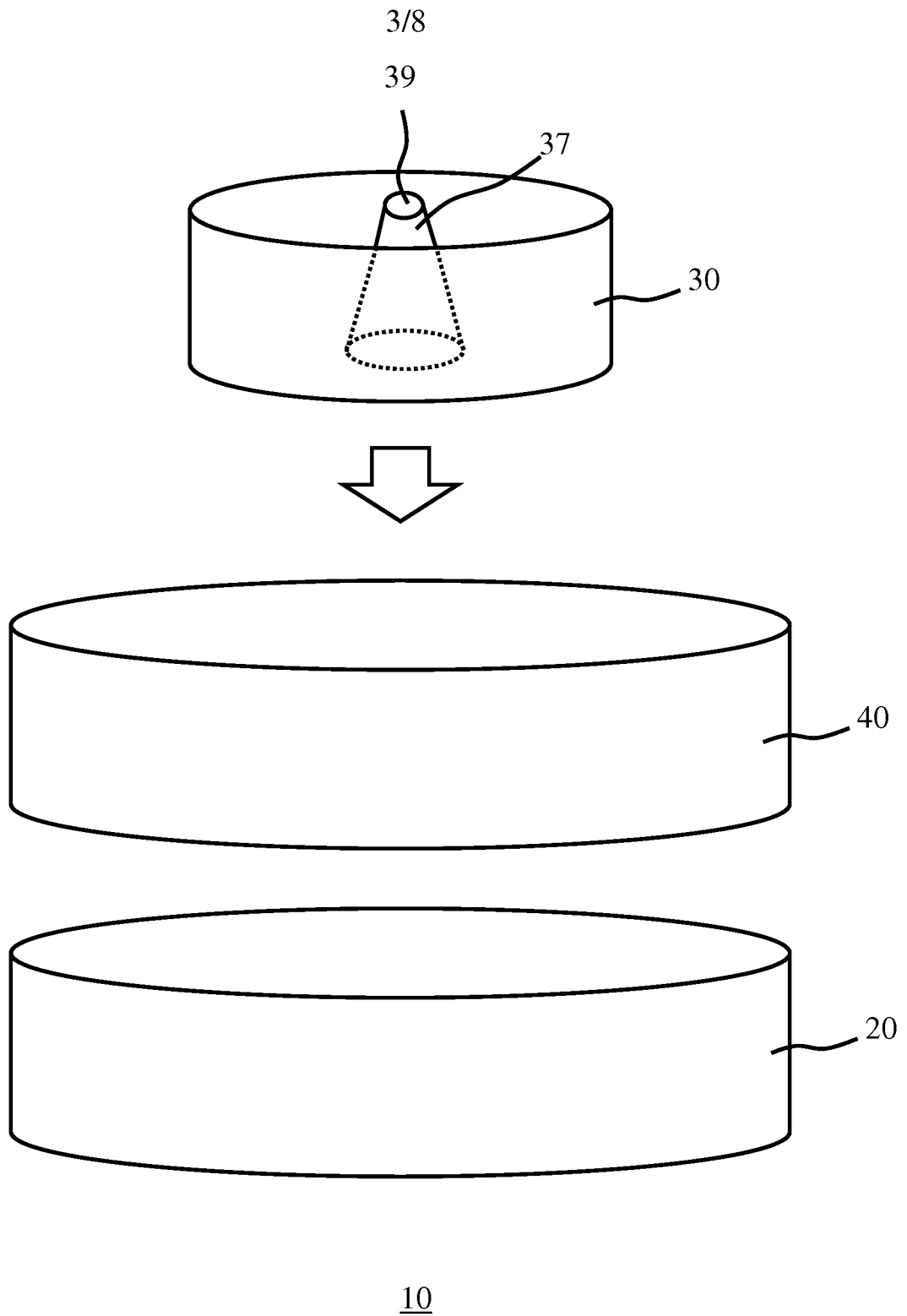
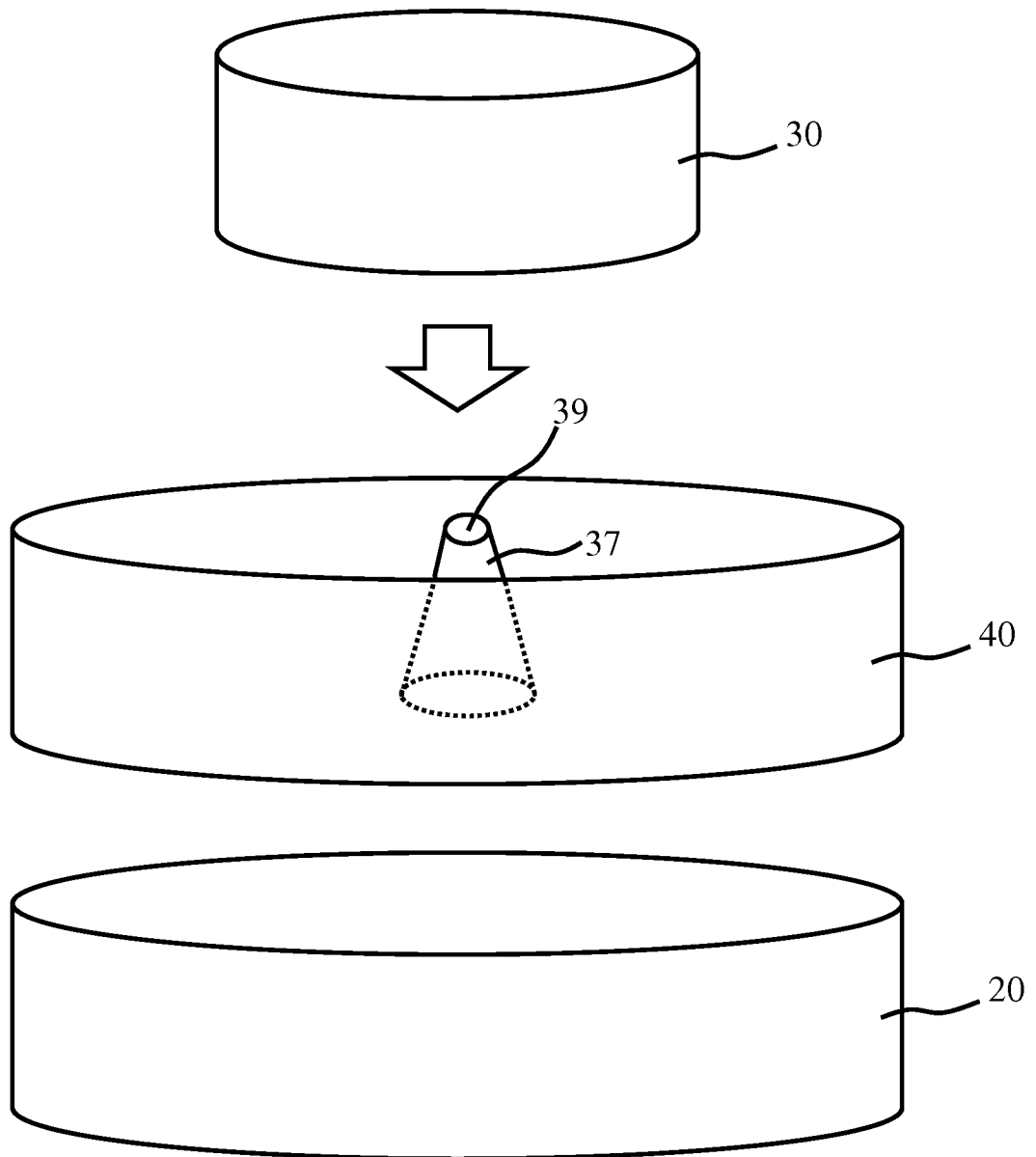


FIG. 4

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FIG. 5

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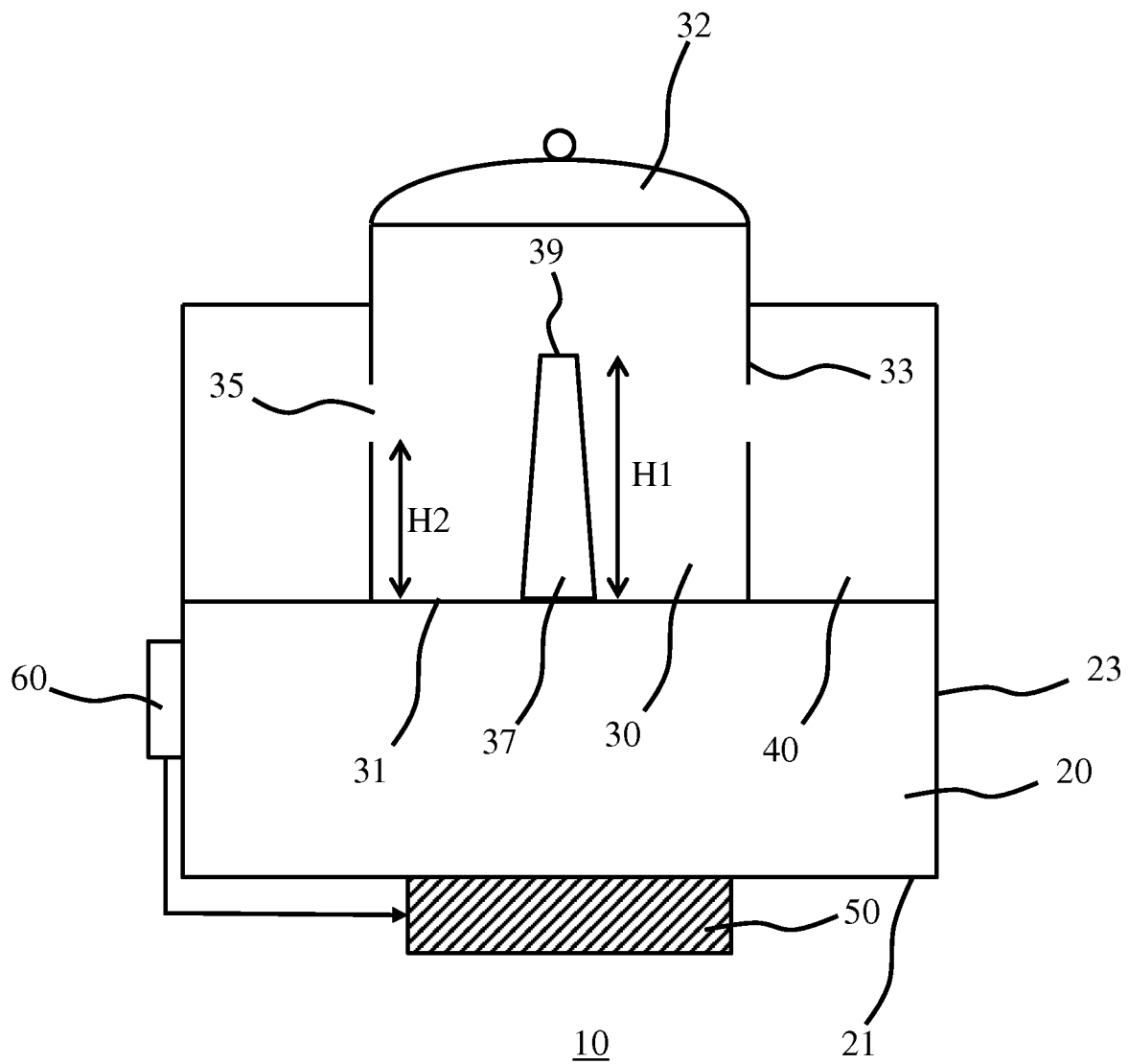
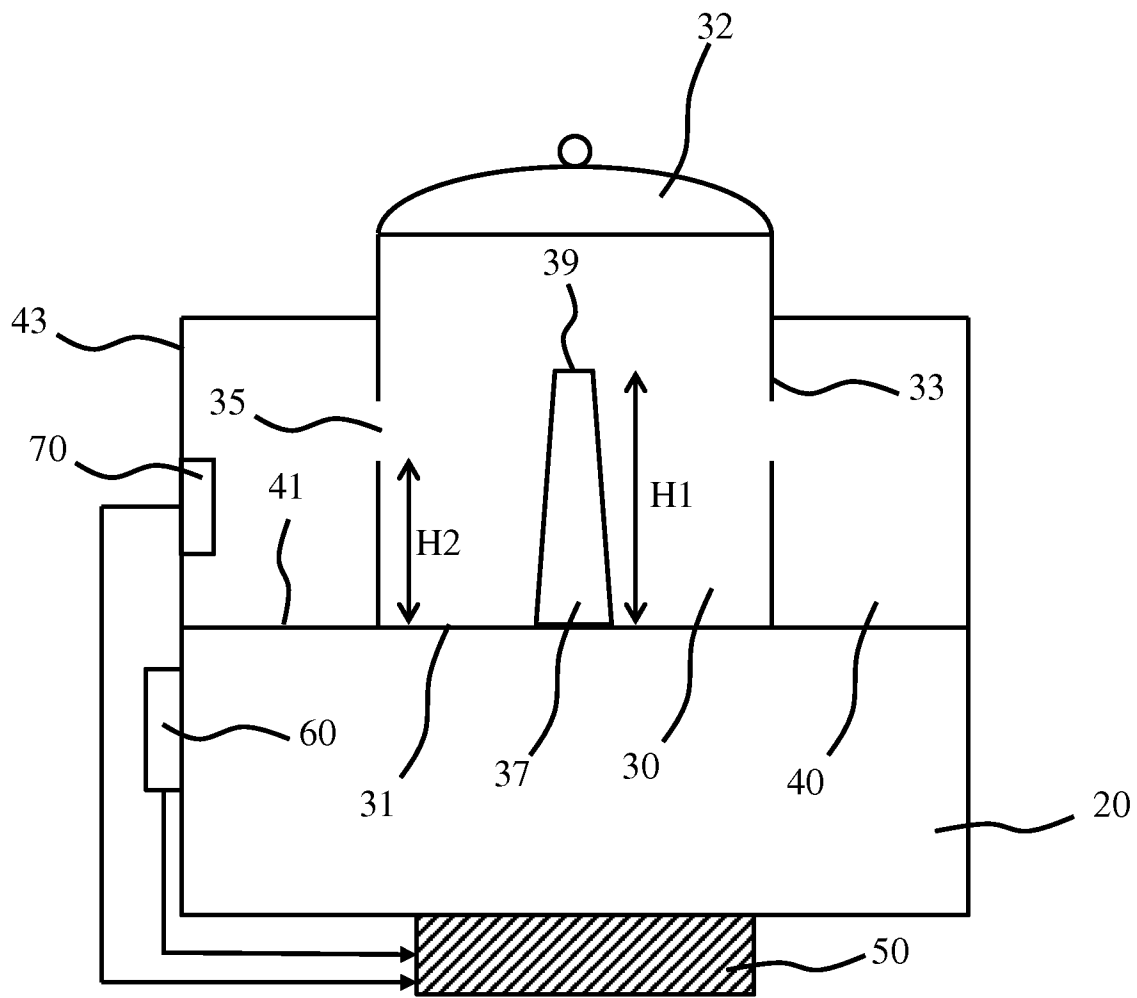


FIG. 6

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FIG. 7

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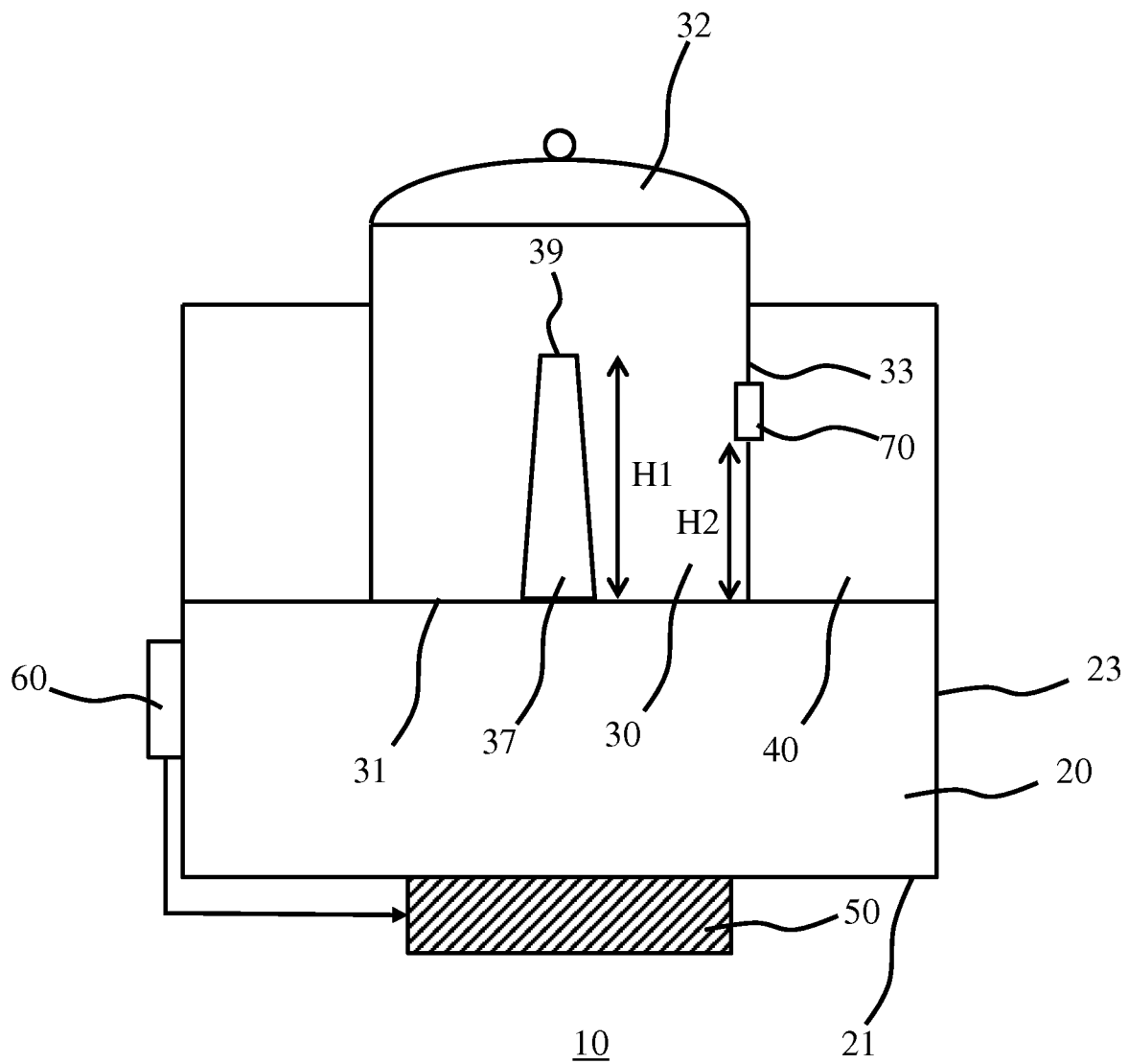


FIG. 8

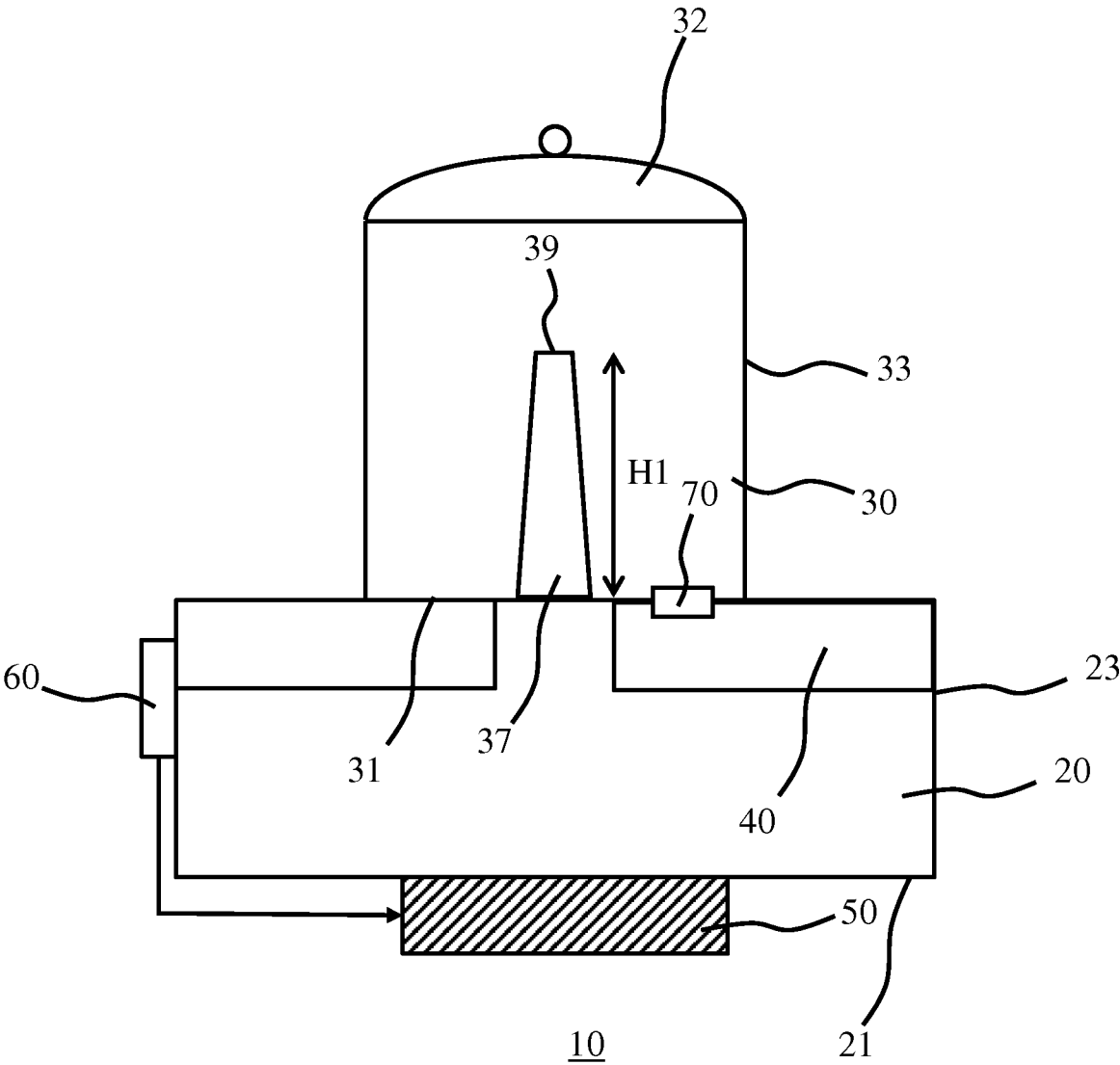


FIG. 9

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/055125

A. CLASSIFICATION OF SUBJECT MATTER
INV. A47J27/04
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)
A47J F24C

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2014/013417 A2 (KONINKL PHILIPS NV [NL]) 23 January 2014 (2014-01-23)	1-4, 12
Y	figure 1	5-11, 13-15
X	----- US 6 125 738 A (POISTER CLARENCE E [US]) 3 October 2000 (2000-10-03)	1
Y	figure 1	2-15
Y	----- US 5 586 487 A (MARINO FRANCIS E [US]) 24 December 1996 (1996-12-24)	1-15
Y	----- US 2016/066738 A1 (SHIBUYA MASAKI [JP] ET AL) 10 March 2016 (2016-03-10)	1-15
	figure 4B -----	



Further documents are listed in the continuation of Box C.



See patent family annex.

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"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

26 April 2017

Date of mailing of the international search report

09/05/2017

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Authorized officer

Behammer, Frank

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2017/055125

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