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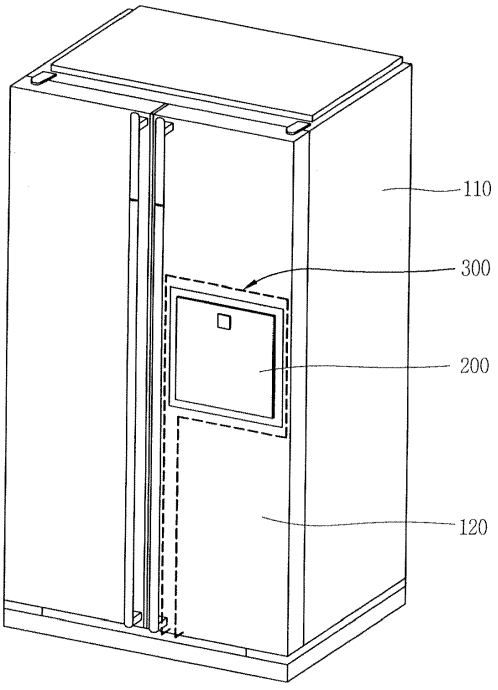
(54) Refrigerator

(57) A refrigerator includes a heat transfer unit (300), which transfers heat generated from a machine room within a refrigerator main body (110) to a periphery of a home bar (200) so as to remove dew formed at the periphery of the home bar, and an insulating unit (600) for surrounding an outer circumference of the heat transfer unit. The refrigerator further includes a heating unit (700) installed to be thermally conductive with the heat transfer unit, and a non-conductive cover (800) for covering the heat transfer unit and the heating unit. Consequently, waste heat generated from the machine room, other than a separate power supply unit, can be used to prevent dew formation at the periphery of the home bar, so as to remarkably reduce power consumption.

FIG. 1



EP 2 420 773 A2

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] This specification relates to a refrigerator, and particularly, to a refrigerator capable of preventing dew from being formed at a periphery of a home bar using heat generated from a machine room.

2. Background of the Invention

[0002] In general, a refrigerator is an electronic product for keeping stored foods in a fresh state for a long term of time by supplying cold air, which is generated from an evaporator of a refrigeration cycle, into a storage chamber. The refrigerator may be fabricated in variation types, such as an upright type having a freezing chamber and a refrigerating chamber partitioned up and down, a side-by-side type having the freezing chamber and the refrigerating chamber partitioned side by side and having a relatively large capacity, or the like. Also, refrigerators having a home bar or the like have come onto the market in order to meet various consumers' requirements.

[0003] A storage space is formed within a refrigerator main body. The storage space is partitioned into a freezing chamber and a refrigerating chamber in the center within the refrigerator main body. Doors for opening or closing the freezing chamber and the refrigerating chamber are installed at a front surface of the refrigerator main body. The doors are rotatably supported by hinge assemblies at both upper and lower side of the front surface of the refrigerator main body. Also, the door for opening or closing the refrigerating chamber is provided with a home bar for allowing stored foods or items to be taken without opening the door.

[0004] The home bar includes a home bar frame formed in a rectangular shape in an opening formed by cutting off the door, and a home bar door coupled to at least one side surface of the home bar frame for opening or closing the opening. The home bar door is fabricated in form of being accommodated in the opening, and an insulating layer is formed within the home bar door.

[0005] However, in the structure of the refrigerator according to the related art, a single gasket is interposed between the home bar door and the home bar frame, which causes a problem that a large quantity of dewdrops are formed at the perimeter (periphery) of the home bar frame.

[0006] To address the problem in the related art, a heater was mounted at the perimeter of the home bar frame. However, when the heater is mounted to prevent the dew formation, power for driving the heater is constantly supplied, thereby increasing power consumption.

[0007] Furthermore, heat generated from the heater is transferred into the refrigerator, resulting in an increase in power consumption of the overall refrigerator.

SUMMARY OF THE INVENTION

[0008] Therefore, an aspect of the detailed description is to provide a refrigerator having a heat transfer unit capable of preventing dew from being formed at a perimeter of a home bar, which is installed at the refrigerator to open or close a part of a refrigerating area.

[0009] Another aspect of the detailed description is to provide a refrigerator having a heat transfer unit capable of remarkably reducing power consumption by preventing dew formation at a perimeter of a home bar by using waste heat generated by refrigerating elements located within a machine room provided in the refrigerator.

[0010] To achieve these and other advantages and in accordance with the purpose of this specification, as embodied and broadly described herein, a refrigerator may include a refrigerator main body having a storage space for keeping foods, a door configured to open or close the storage space of the refrigerator main body, a home bar provided in the door, and a heat transfer unit installed to surround a periphery of the home bar, and configured to transfer heat generated from a machine room of the refrigerator main body to the periphery of the home bar.

[0011] The refrigerator may further include an insulating unit configured to cover an outer circumference of the heat transfer unit.

[0012] The refrigerator may further include a heating unit installed to be thermally conductive with the heat transfer unit, and a cover configured to cover the heat transfer unit and the heating unit.

[0013] Further scope of applicability of the present application will become more apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from the detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate exemplary embodiments and together with the description serve to explain the principles of the invention.

[0015] In the drawings:

FIG. 1 is a perspective view of a refrigerator in accordance with one exemplary embodiment;

FIG. 2 is a perspective view showing an example that a heat transfer unit is installed at the home bar of FIG. 1;

FIG. 3 is a front view of the refrigerator;

FIG. 4 is a side view showing an example that a condensation heat guiding passage is installed at a

lower portion of a refrigerator main body of the refrigerator;

FIG. 5 is a side view showing an example that an auxiliary fan is installed at front of the condensation heat guiding passage shown in FIG. 4;

FIG. 6 is a side view showing an example that a condenser is installed at a lower end of the refrigerator main body of the refrigerator;

FIG. 7 is a sectional view showing a state that a heat transfer unit is insulated at a periphery of the home bar;

FIG. 8 is a sectional view showing a state that the heat transfer unit is insulated at an inner side of the door;

FIG. 9 is a sectional view showing one example of a coupled state between the heat transfer unit and a heating unit;

FIG. 10 is a sectional view showing another example of a coupled state between the heat transfer unit and the heating unit; and

FIG. 11 is a block diagram showing a configuration of a heating temperature control module in accordance with this specification.

DETAILED DESCRIPTION OF THE INVENTION

[0016] Description will now be given in detail of a refrigerator according to the exemplary embodiments, with reference to the accompanying drawings. For the sake of brief description with reference to the drawings, the same or equivalent components will be provided with the same reference numbers, and description thereof will not be repeated.

[0017] FIG. 1 is a perspective view of a refrigerator in accordance with one exemplary embodiment, FIG. 2 is a perspective view showing an example that a heat transfer unit is installed at the home bar of FIG. 1, FIG. 3 is a front view of the refrigerator, FIG. 4 is a side view showing an example that a condensation heat guiding passage is installed at a lower portion of a refrigerator main body of the refrigerator, FIG. 5 is a side view showing an example that an auxiliary fan is installed at front of the condensation heat guiding passage shown in FIG. 4, and FIG. 6 is a side view showing an example that a condenser is installed at a lower end of the refrigerator main body of the refrigerator.

[0018] As shown in FIG. 1, a refrigerator in accordance with this specification may include a refrigerator main body (hereinafter, also referred to as 'main body') 110 having a storage space for keeping foods, and a door 120 rotatably coupled to the main body 110 for opening or closing an open surface of the storage space.

[0019] The refrigerator main body 110 may be partitioned into a refrigerating area and a freezing area. The door 120 may be provided with a home bar 200 for selectively exposing a part of the refrigerating area or the freezing area to the exterior.

[0020] A heat transfer unit 300 may be installed at a periphery (perimeter) of the home bar 200. The heat transfer unit 300 may transfer heat generated from an external heat source, such as condensation heat or heat generated from a compressor, to the periphery of the home bar 200 so as to remove dewdrops formed at the periphery of the home bar 200.

[0021] Referring to FIG. 2, the home bar 200 may include a home bar door 210 for opening or closing a part of the door 120, and a home bar frame 220 defining an opening open or closed by the home bar door 210. Here, the periphery of the home bar 200 may be defined as a region formed along the home bar frame 220.

[0022] Referring to FIG. 3, the heat transfer unit 300 may be implemented as a heat pipe. Both ends of the heat transfer unit 300 may be contactable with the heat source or present near the heat source, and a middle portion thereof may cover (surround) the periphery of the home bar 200. The heat transfer unit 300 may include a pipe body 310 having a core 320 disposed on an inner circumferential surface thereof, and a working fluid 330 filled within the pipe body 310 in a vacuum state and evaporated by heat transferred from the exterior.

[0023] Herein, both ends of the heat transfer unit 300 as the heat pipe may preferably be installed at a lower end of the refrigerator main body 10, namely, at a lower end of the door 120 installed at the refrigerator main body 110. Accordingly, the heat transfer unit 300 may be present near the machine room so as to easily utilize condensation heat or heat generated from a compressor.

[0024] The periphery of the home bar 200 contacting the heat transfer unit 300 may be made of plastic, and an inner portion of the refrigerator main body 110 or the door 120 contacting the heat transfer unit 300 may be formed of a metal. Herein, the inner portion of the refrigerator main body 110 contacting the heat transfer unit 300 may be preferably the inner portion of the door 120.

[0025] With the configuration of the heat transfer unit 300 according to the one exemplary embodiment, when external heat is applied to one end of the heat transfer unit 300, the volatile working fluid 330 filled in the heat transfer unit 300 in the vacuum state may be evaporated, and the evaporated working fluid 330 may then be moved up along the pipe body 310.

[0026] The working fluid 330 present within the periphery of the home bar 200 may be condensed by cold air supplied from the inside of the refrigerator main body 110 and moved down by its own gravity, thereby transferring heat.

[0027] Typically, as a machine room for installation of a condenser 400 or a compressor, which generates heat while forming a refrigeration cycle, is located within the lower end at the rear of the refrigerator main body 110, so-called machine room heat is generated. Such heat is discharged outside the refrigerator main body 110 by an element such as a fan (not shown).

[0028] Accordingly, a heat source may be formed within the lower portion of the refrigerator main body 110 by the heat generated from the elements such as the con-

denser 400 or the compressor. Hence, when both ends of the heat transfer unit 300 are installed at the lower end of the door 120, namely, the lower portion of the refrigerator main body 110, the machine room heat may be utilized as a heat source.

[0029] Referring to FIG. 4, the refrigerator main body 110 may further include a condensation heat guiding passage 410, which guides heat generated from the condenser 400 toward the end portion of the heat transfer unit 300.

[0030] Here, even if the condenser 400 is not installed within the lower portion of the refrigerator main body 110, the condensation heat guiding passage 410 may be used to utilize the condensation heat of the condenser 400 as a heat source.

[0031] Referring to FIG. 5, an auxiliary fan 500 may further be installed at the lower end of the refrigerator main body 110. The auxiliary fan 500 may guide heat generated from the condenser 400 installed in the refrigerator main body 110 to an end portion of the pipe body 310.

[0032] Here, the auxiliary fan 500 may be used to forcibly convect the heat generated from the condenser 400 to the end portion of the pipe body 310, whereby the condensation heat generated from the condenser 400 can be efficiently used.

[0033] Referring to FIG. 6, the condenser 400 may alternatively be installed at the lower end of the refrigerator main body 110.

[0034] In this example, both ends of the heat transfer unit 300 are approximately on a level with the heat source, accordingly, the condensation heat can be effectively utilized without a separate auxiliary fan. Of course, when the auxiliary fan 500 is applied even in this example, the condensation heat can be utilized more effectively.

[0035] In the meantime, the refrigerator may further include an insulating unit 600 (see FIGS. 7 and 8) for insulating the heat transfer unit 300.

[0036] The insulating unit 600 may be made of polyurethane, and employed to cover (surround) a portion excluding a portion where the periphery of the home bar 200 contacts an outer surface of the refrigerator main body 110.

[0037] FIG. 7 shows a state that the heat transfer unit 300 is covered (surrounded) by the insulating unit 600 at the side of the home bar 200.

[0038] As shown in FIG. 7, the periphery of the home bar 200 may be made of plastic as ABS resin, and the heat transfer unit 300 may be attached onto the peripheral surface of the home bar 200.

[0039] The insulating unit 600 may be foamed using polyurethane. The insulating unit 600 may be foamed to cover the peripheral surface of the home bar 200 and an outer circumference of the heat transfer unit 300. Accordingly, heat of the heat transfer unit 300 can be insulated by the insulating unit 600, thereby enhancing heat transfer efficiency.

[0040] FIG. 8 shows a state that the heat transfer unit 300 is covered (surrounded) by the insulating unit 600 at the side of the inner portion of the door 120 as the inner portion of the refrigerator main body 110.

[0041] As shown in FIG. 8, the inner portion of the door 120 may be formed of a metal. The heat transfer unit 300 for transferring heat generated from the lower portion of the refrigerator main body 110 up to the periphery of the home bar 200 may be adhered closely onto the inner portion of the door 120. The insulating unit 600 may be foamed to cover (surround) the heat transfer unit 300 within the inner portion of the door 120.

[0042] As the heat transfer unit 300 is insulated by the insulating unit 600, it may be possible to enhance heat transfer efficiency during a process of transferring heat from the heat source to the periphery of the home bar 200. On the other hand, a heat transfer loss within the inner portion of the door 120 can be efficiently reduced.

[0043] Meanwhile, the refrigerator may further include an auxiliary heater in regard of a case that heat from the heat source is not enough.

[0044] Referring to FIGS. 9 and 10, the refrigerator may further include a heating unit 700 installed to be thermally conductive with the heat transfer unit 300 located near the heat source, and a non-conductive cover 800 for covering the heat transfer unit 300 and the heating unit 700 near the heat source.

[0045] Here, the heating unit 700 may be a heater, which is heated up to a preset temperature by external power. The heating unit 700 may be fabricated in a shape having a preset length. That is, since the heat transfer unit 300 is formed in the shape of pipe with the preset length, the heating unit 700 may preferably be formed to be easily attached onto an outer surface of the heat transfer unit 300.

[0046] The non-conductive cover 800 may be formed in a shape like a tape having a preset width. The non-conductive cover 800 may be attached onto the inner surface of the refrigerator main body 110, namely, the inner surface of the door 120 to cover the heat transfer unit 300 and the heating unit 700.

[0047] The heating unit 700 may be connected to the outer surface of the heat transfer unit 300 located near the heat source, and the non-conductive cover 800 may be attached onto the inner surface of the door 120 to cover the heat transfer unit 300 and the heating unit 700.

[0048] The heating unit 700, which is a heater, may be attached onto the outer surface of the heat transfer unit 300, which is installed near the heat source, namely, at the inner surface of the door 120, in a physically contacted state. Here, the heating unit 700 may be attached onto the inner surface of the door 120, by using the non-conductive cover 800 without a separate adhesive agent, so as to prevent mis-alignment between the heat transfer unit 300 installed at the inner surface of the door 120 and the heating unit 700 located on the outer surface of the heat transfer unit 300. In addition, the non-conductive cover 800 may reduce externally discharged heat of the heating unit 700 or the heat transfer unit 300.

[0049] Although not shown, the heating unit 700 may be fixed onto a side surface of the heat transfer unit 300 or be provided in plurality to be contactable with the upper surface and both side surfaces of the heat transfer unit 300.

[0050] Although not shown, the heating unit 700 may be fabricated to have a recess, and accordingly, the heat transfer unit 300 may be inserted into the recess to be surrounded by the heating unit 700.

[0051] FIG. 10 shows that the heating unit 700 is attached onto the upper surface of the heat transfer unit 300 by a conductive adhesive 900.

[0052] As shown in FIG. 10, a preset amount of conductive adhesive 900 may be coated on the upper surface of the heat transfer unit 300, and the heating unit 700 may be located on the conductive adhesive 900 so as to be fixed onto the upper surface of the heat transfer unit 300.

[0053] The attachment of the non-conductive cover 800 may help the heat transfer unit 300 and the heating unit 700 to be firmer fixed to each other.

[0054] Here, heat generated from the heating unit 700 may be easily transferred to the heat transfer unit 300 via the conductive adhesive 900.

[0055] Thus, the heating unit 700 used as the auxiliary heater may directly contact the heat transfer unit 300 or be electrically conductive with the heat transfer unit 300 by virtue of the conductive adhesive 900 so as to facilitate heat transfer from the heating unit 700 to the heat transfer unit 300. In addition, the heat transfer unit 300 and the heating unit 700 may be covered with the non-conductive cover 800 so as to avoid or prevent heat generated from the heat transfer unit 300 and the heating unit 700 from being transferred to the exterior.

[0056] Accordingly, auxiliary heat supplied from the heating unit 700 to the heat transfer unit 300 and heat of the heat transfer unit 300 can be effectively transferred without a loss to the exterior by virtue of the non-conductive cover 800.

[0057] Meanwhile, the refrigerator may further include a heating temperature control module for control of heating temperature.

[0058] Referring to FIG. 11, the heating temperature control module may include a temperature sensor 720 for measuring the temperature of the heat transfer unit 300 located near the heat source, and a controller 730 electrically connected to the temperature sensor 720 for controlling the operation of the heating unit 700 such that the measured temperature reaches a preset reference heating temperature.

[0059] Accordingly, heat of a certain temperature at the lower end of the door 120 may be transferred to one end of the heat transfer unit 300, and the heat transfer unit 300 may transfer heat from the heat source to the periphery of the home bar 200 using the working fluid 330.

[0060] Here, the temperature sensor 720 may measure the temperature at the heat source, preferably, measure the temperature at the one end of the heat transfer unit 300 so as to transmit the measured temperature to the controller 730 in form of an electric signal.

[0061] The controller 730 may then determine whether the transmitted measured temperature reaches the preset reference heating temperature, and control the operation of the heating unit 700 such that the measured temperature reaches the preset reference heating temperature. The heating unit 700 may be connected to a power source 710, which may be driven by a signal from the controller 730.

[0062] Consequently, the temperature within the home bar 200 can be lower than dew point temperature without a separate power supply when using a heat pipe, namely, the heat transfer unit 300 and the heating unit 700, thereby remarkably reducing power consumed to prevent dew formation at the periphery of the home bar 200.

[0063] The foregoing embodiments and advantages are merely exemplary and are not to be construed as limiting the present disclosure. The present teachings can be readily applied to other types of apparatuses. This description is intended to be illustrative, and not to limit the scope of the claims. Many alternatives, modifications, and variations will be apparent to those skilled in the art. The features, structures, methods, and other characteristics of the exemplary embodiments described herein may be combined in various ways to obtain additional and/or alternative exemplary embodiments.

[0064] As the present features may be embodied in several forms without departing from the characteristics thereof, it should also be understood that the above-described embodiments are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be construed broadly within its scope as defined in the appended claims, and therefore all changes and modifications that fall within the metes and bounds of the claims, or equivalents of such metes and bounds are therefore intended to be embraced by the appended claims.

Claims

1. A refrigerator comprising:

   a refrigerator main body (110) having a storage space for keeping foods;
   a door (120) configured to open or close the storage space of the refrigerator main body;
   a home bar (200) provided in the door; and
   a heat transfer unit (300) installed to surround a periphery of the home bar, and configured to transfer heat generated from a machine room of the refrigerator main body to the periphery of the home bar.

2. The refrigerator of claim 1, wherein the heat transfer unit (300) is configured as a heat pipe.

3. The refrigerator of claim 1 or 2, wherein the heat transfer unit (300) is formed in a shape of pipe, having a middle portion surrounding the periphery of the home bar (200) and both ends located at a lower side of the refrigerator main body (110).

4. The refrigerator of one of claims 1 to 3, further comprising a condensation heat guiding passage (410) provided within a lower portion of the refrigerator main body (110), and configured to guide heat generated from a condenser (400) installed in the refrigerator main body (110) toward the end portion of the heat transfer unit (300).

5. The refrigerator of one of claims 1 to 3, further comprising an auxiliary fan (500) disposed at a lower end of the refrigerator main body (110) and configured to guide heat generated from the condenser (400) installed in the refrigerator main body toward the end portion of the heat transfer unit (300).

6. The refrigerator of claim 3, wherein the condenser (400) is installed at the lower end of the refrigerator main body.

7. The refrigerator of one of claims 1 to 6, further comprising an insulating unit (600) configured to cover an outer circumference of the heat transfer unit (300).

8. The refrigerator of claim 7, wherein the insulating unit (600) is formed of polyurethane and configured to cover a portion excluding a portion where the periphery of the home bar (200) contacts an outer surface of the refrigerator main body (110).

9. The refrigerator of one of claims 1 to 8, further comprising:

a heating unit (700) installed to be thermally conductive with the heat transfer unit (300); and
a cover (800) configured to cover the heat transfer unit (300) and the heating unit (700).

10. The refrigerator of claim 9, wherein the cover (800) is made of a non-conductive material.

11. The refrigerator of claim 9, wherein the heating unit (700) is contactable with an outer surface of the heat transfer unit (300),
wherein the cover (800) is attached onto an inner surface of the door (120) to cover the heat transfer unit (300) and the heating unit (700).

12. The refrigerator of claim 11, wherein the heating unit (700) is provided at least one in number and installed at least one side surface of the heat transfer unit (300) to be thermally conductive.

13. The refrigerator of one of claims 1 to 12, further comprising a conductive adhesive (900) interposed between the heat transfer unit (300) and the heating unit (700).

14. The refrigerator of one of claims 1 to 13, further comprising a heating temperature control module configured to control the heating temperature of the heating unit (700).

15. The refrigerator of claim 14, wherein the heating temperature control module comprises:

a temperature sensor (720) configured to measure the temperature of the heat transfer unit (300) located at the heat source; and
a controller (730) electrically connected to the temperature sensor (720) and configured to control the operation of the heating unit (700) such that the measured temperature reaches a preset reference heating temperature.

FIG. 1

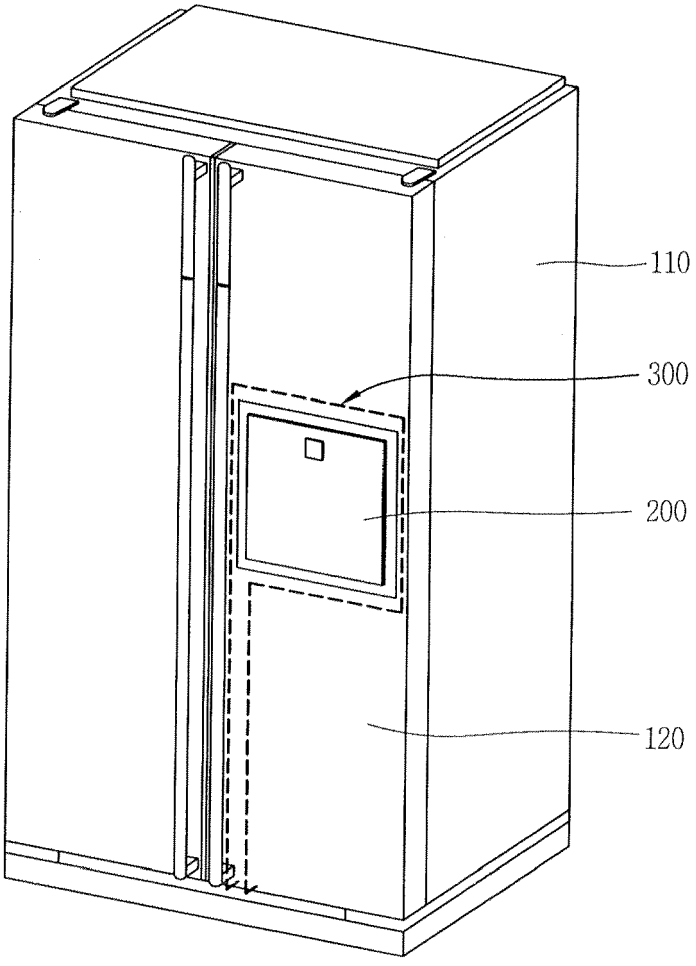


FIG. 2

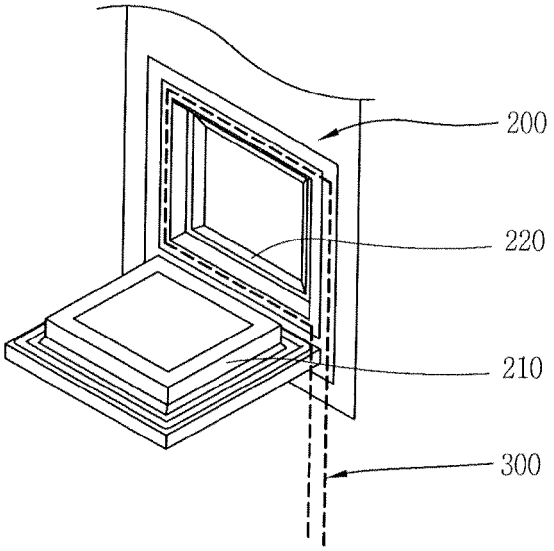


FIG. 3

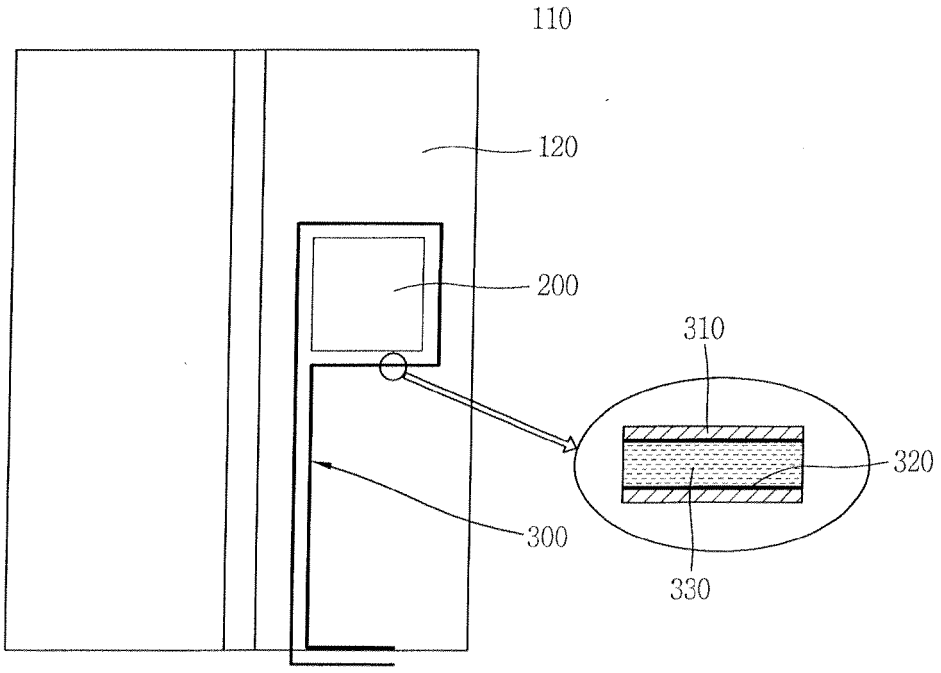


FIG. 4

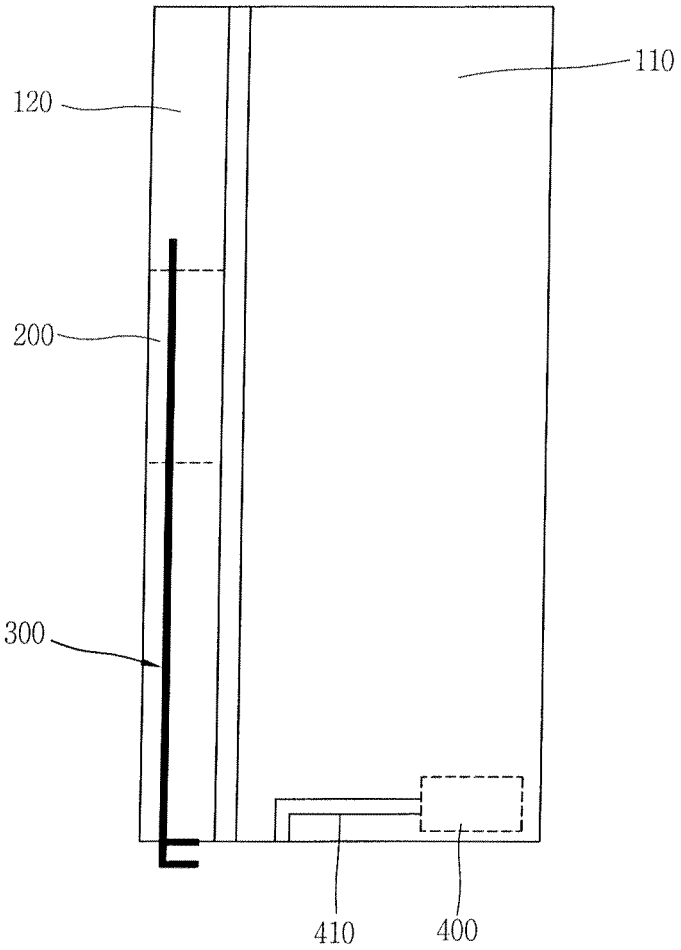


FIG. 5

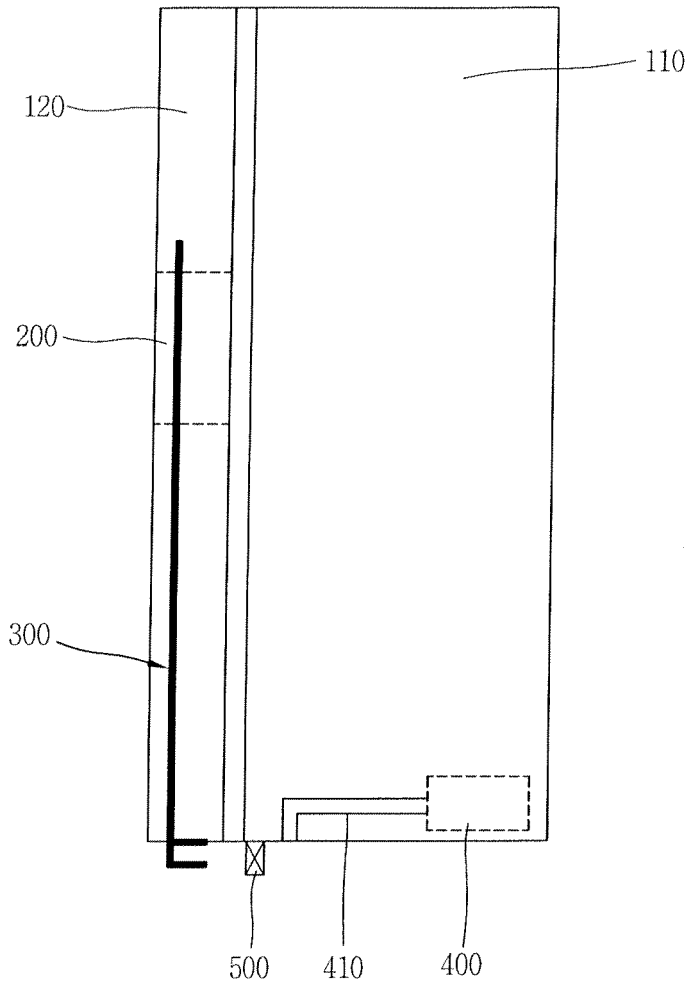


FIG. 6

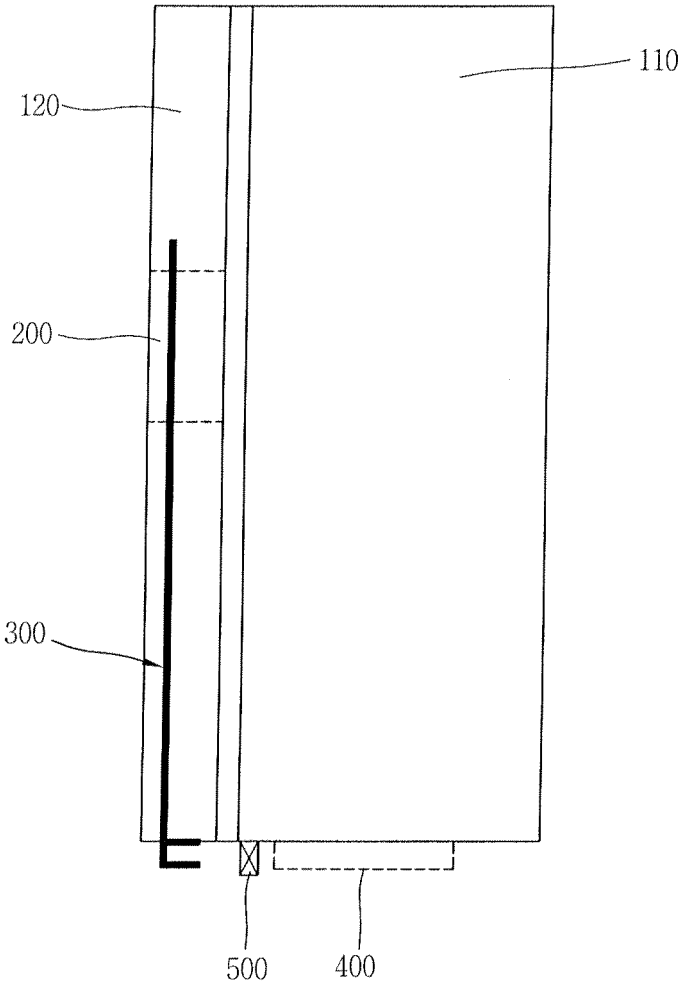


FIG. 7

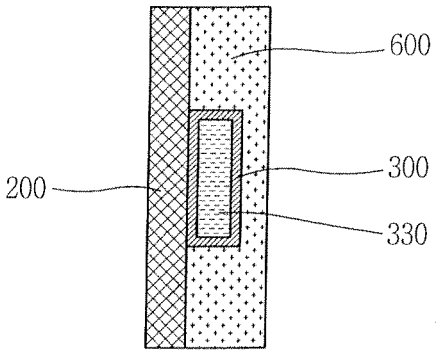


FIG. 8

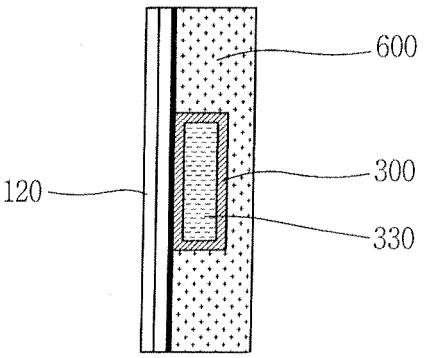


FIG. 9

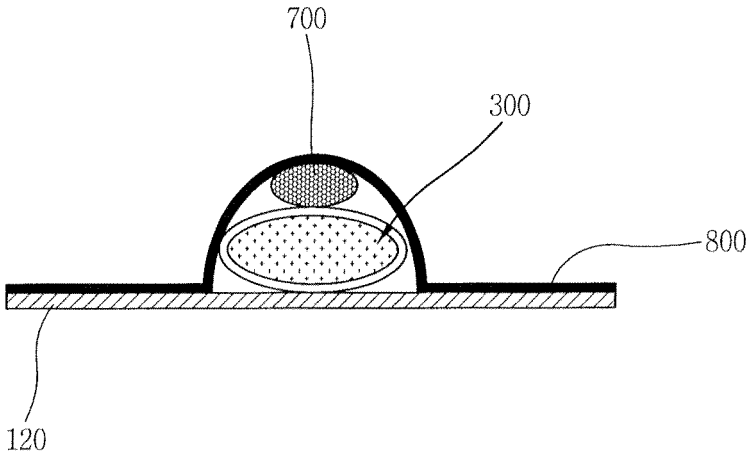


FIG. 10

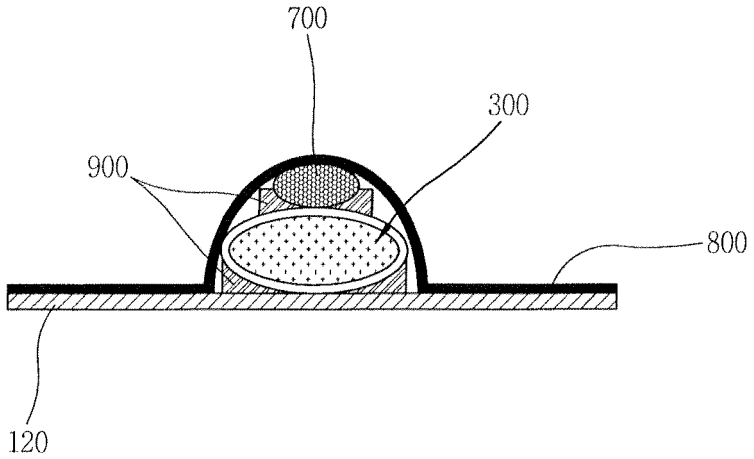
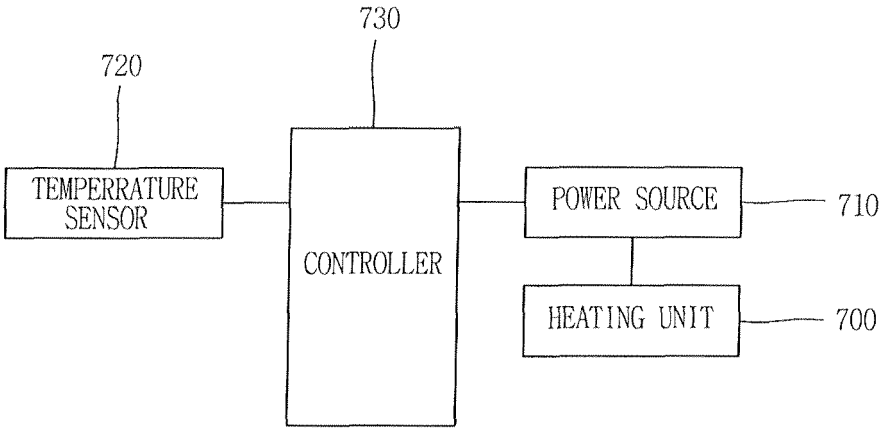


FIG. 11


730
720
TEMPERRATURE SENSOR
CONTROLLER
POWER SOURCE
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HEATING UNIT
700