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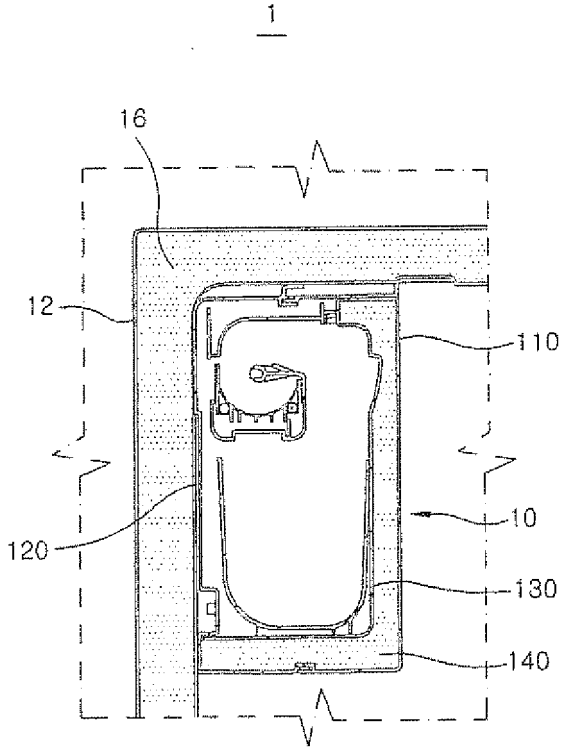
(54) **REFRIGERATOR AND METHOD FOR MANUFACTURING THE SAME**

(57) Embodiments of the present invention provide a refrigerator, comprising a main body (12) having a food storage space therein, a casing (10) disposed in the storage space, the casing having a space for producing ice, and an ice tray provided in the casing and configured to contain water for producing ice, wherein the casing comprises a first outer frame (110) and a second outer frame (120) that are configured to form an appearance of the casing, an inner frame (130) provided between the first outer frame and the second outer frame, and an L-shaped thermal insulation frame (140) configured to fill a space between the inner frame and the first outer frame.

FIG.5



EP 3 106 803 A1

Description

Related Applications

[0001] This application is based on and claims priority to Korean Patent Application No. 10-2015-0086083, filed on June 17, 2015 for inventor Sung Jin Yang. The disclosure of this application is incorporated herein in its entirety by reference.

Field of the Invention

[0002] The present invention relates to a refrigerator and a method for manufacturing said refrigerator.

Background of the Invention

[0003] A refrigerator is a device for low temperature storage of food and may be configured to provide freezing storage or cold storage of food according to the kind of food a user wants to store.

[0004] The inside of a refrigerator is cooled by a supply of cold air; this cold air is continuously generated by a heat exchange process with a refrigerant, based on a freezing cycle which goes through a process of compression-condensation-expansion-evaporation. The cold air supplied to the inside of the refrigerator is evenly transferred to the inside of the refrigerator by convection.

[0005] Generally, the main body of a refrigerator has a rectangular parallelepiped shape, the front surface of which opens, and the main body of the refrigerator may harbor a refrigerating compartment and a freezing compartment. Further, the front surface of the main body may be provided with a refrigerating compartment door and a freezing compartment door for selectively shielding an opening portion. A storage space in the refrigerator may be provided with multiple drawers, shelves or receiving boxes in which various foods may be stored in an optimal condition.

[0006] Top mount type refrigerators, in which a freezing compartment is positioned in the upper section and a refrigerating compartment is positioned in the lower section, are well-known. Recently, however, for user convenience, bottom freezer type refrigerators (in which the freezing compartment is positioned in the lower section) have been produced. In the case of the bottom freeze type refrigerator, the more frequently used refrigerating compartment is positioned in the upper section and a relatively less used freezing compartment is positioned at a lower position; thus, a user may conveniently use the refrigerating compartment. However, since the freezing compartment is located in the lower section, the bottom freezer type refrigerator has a disadvantage in that a user needs to bend down to open the freezing compartment door to take out ice.

[0007] To solve the above issue, a refrigerator has been produced in which a dispenser for taking out ice is installed in the refrigerating compartment door positioned in the upper part of the bottom freeze type refrigerator. In this case, the refrigerating compartment door, or the inside of the refrigerating compartment, may be provided with an ice machine which generates ice.

[0008] The ice machine may include an ice making system which includes an ice tray for generating ice, an ice bucket in which the generated ice is stored, and a transfer system transferring the ice stored in the ice bucket to the dispenser.

[0009] Moreover, the conventional ice machine has a thermal insulation structure to prevent cold air in the ice machine from increasing in temperature by heat exchange with the outside air. A representative example of the conventional ice machine having such a thermal insulation structure is shown in Fig. 7.

[0010] Fig. 7 is a sectional view showing an enlargement of a portion of a conventional refrigerator in which an ice machine is installed.

[0011] Referring to Fig. 7, the ice machine 20 of the conventional refrigerator 2 includes an insulator 22 provided along the perimeter of the ice machine 20. For example, the insulator 22, made of foaming urethane, functions to prevent the cold temperature in the ice machine 20 from increasing by heat exchange with the outside air.

[0012] Typically, a thermal insulator 24 is for a casing of the refrigerator 2 and is provided between an inner layer and an outer layer of the housing of the refrigerator 2. Therefore, portions of an insulator 22a for the ice machine 20 that are disposed in the parts of the ice machine 20 that make contact with the inner layer of the housing of the refrigerator 2 overlap with the insulator 24 for the housing of the refrigerator 2.

[0013] Consequently, a dead space is present in the refrigerator 2; this reduces the internal capacity.

[0014] Furthermore, the overlapping insulation structure increases the number of parts, thereby increasing the material cost.

[0015] In addition, the casing of the ice machine is assembled by coupling parts to each other, but there is a problem in that the junction of the coupled parts of the casing is not always reliably sealed.

Summary of the Invention

[0016] In view of the above, the present invention provides a refrigerator configured so that the internal capacity thereof can be increased by reducing a dead space in the refrigerator. In one embodiment, a refrigerator is provided, the refrigerator comprising a main body, wherein said body comprises a food storage space, a casing disposed in the storage space, the casing comprising a space for producing ice, and an ice tray disposed in the casing and configured to contain water for producing ice. This casing comprises a first outer frame and a second outer frame, an inner frame provided between the first outer frame and the second outer frame, and an L-shaped thermal insulation frame configured to reside within a space between the inner frame and the first outer frame.

[0017] Furthermore, the present invention provides a method for manufacturing the refrigerator, the method comprising preparing a first outer frame configured to form a portion of an outer surface of a casing, wherein the casing comprises a cooling space for an ice machine, installing a heater on an end of the first outer frame, installing a thermal insulation frame having an L-shaped cross-section inside the first outer frame, installing an inner frame on the thermal insulation frame, coupling a second outer frame to the first outer frame, the second outer frame being configured to form a remaining portion of the outer surface of the casing, and installing a sealing membrane on at least one edge of the first and second outer frames, wherein said membrane is brought into contact with the main body of the refrigerator when the casing is installed in the refrigerator.

Brief Description of the Drawings

[0018] The objects and features of the present invention will become apparent from the following description of embodiments given in conjunction with the accompanying drawings, in which:

Fig. 1 is a view showing a refrigerator provided with an ice machine in accordance with an embodiment of the present invention;
Fig. 2 is a side sectional view of the ice machine of Fig. 1;
Fig. 3 is an exploded perspective view illustrating a casing of the ice machine of Fig. 1;
Fig. 4 is a view showing a layout of a sealing membrane provided in the ice machine of Fig. 1;
Fig. 5 is a sectional view showing an enlargement of a portion of the refrigerator in which the ice machine of Fig. 1 is installed;
Fig. 6 is a flowchart showing an exemplary method for manufacturing the ice machine of Fig. 1; and
Fig. 7 is a sectional view showing an enlargement of a portion of a conventional refrigerator in which an ice machine is installed.

Detailed Description of the Embodiments

[0019] Hereinafter, embodiments of the present invention will be described in detail with reference to the accompanying drawings which form a part hereof.

[0020] In describing the embodiments of the present invention, a detailed description of known functions or constructions related to the present invention will be omitted if it is deemed that such description would make the gist of the present invention unnecessarily vague.

[0021] Fig. 1 is a view showing a refrigerator provided with an ice machine in accordance with an embodiment of the present invention. Fig. 2 is a side sectional view of the ice machine of Fig. 1. Fig. 3 is an exploded perspective view illustrating a casing of the ice machine of Fig. 1. Fig. 4 is a view showing a layout of a sealing membrane provided in the ice machine of Fig. 1.

[0022] Referring to Figs. 1 to 4, a refrigerator 1 is provided with an ice machine 10 in accordance with the embodiment of the present invention that includes a main body 12, a barrier 14, refrigerating compartment doors 13, and a freezing compartment door 15. The main body 12 forms the appearance of the refrigerator 1. The barrier 14 partitions a food storage space defined in the main body 12 into an upper refrigerating compartment R and a lower freezing compartment F. The refrigerating compartment doors 13 are provided on respective opposite edges of a front surface of the main body 12 and configured so as to be rotatable so that the refrigerating compartment R can be selectively opened or closed by movement of the refrigerating compartment doors 13.

[0023] Although the ice machine 10 has been illustrated as being disposed at a predetermined position in an upper portion of the refrigerating compartment R, other embodiments are possible. For example, the ice machine 10 may be installed at another position in the refrigerating compartment R or at a predetermined position in the refrigerating compartment door 13 or other element.

[0024] Further, the ice machine 10 may be installed to make close contact with an inner surface of the refrigerator 1.

[0025] The ice machine 10 may include a casing 100, a cooling unit (not shown), an ice-making system 200, an ice bucket 320, a transfer system 400, and an outlet port 500.

[0026] A cooling space 105, in which ice can be generated, is defined in the casing 100. The ice-making system 200 is disposed at an upper position in the cooling space 105. The ice bucket 320 is disposed below the ice-making system 200.

[0027] The outlet port 500 is provided in a first end of the casing 100. A cold air supply port, through which cold air is supplied into the casing 100, is provided in a second end of the casing 100 that is opposed to the first end thereof.

[0028] The casing 100 includes a first outer frame 110 and a second outer frame 120 which form the appearance of the casing 100, an inner frame 130 which is provided between the first outer frame 110 and the second outer frame 120, and a thermal insulation frame 140 which is installed between the first outer frame 110 and the inner frame 130 so that space between the first outer frame 110 and the inner frame 130 is filled with the thermal insulation frame 140.

[0029] The first outer frame 110 includes at least one of the surfaces which form the casing 100. The first outer frame 110 includes a coupling part 112 provided for assembly with the outlet port 500. The coupling part 112 may be a frame which has a communication hole through which ice passes when it is transferred to the outlet port 500.

[0030] The coupling part 112 may be provided with a heater 150 so that when dew forms on the coupling part 112, the heater 150 can evaporate the dew and thus re-

move it.

[0031] In detail, when the ice bucket 320 is opened so a user can draw out a large amount of ice at one time, or to check the ice machine 10 for defects, warm air may enter the ice machine 10 and meet cold air in the ice machine 10, thereby causing dew to form. Generally, dew may mainly form on the junction between the ice-making system 200 and the outlet port 500. In the present embodiment, the heater 150 can remove the dew by evaporation.

[0032] The thermal insulation frame 140 is provided inside the first outer frame 110. The thermal insulation frame 140 is made of material such as urethane foam having excellent thermal insulation performance and may be manufactured by foaming the raw material in a mold and then hardening it.

[0033] Furthermore, the thermal insulation frame 140 has an L-shaped cross-section. When the ice machine 10 is installed in the main body 12 of the refrigerator 1, the thermal insulation frame 140 thermally insulates a part of the ice machine 10 that is opposed to the inner surface of the refrigerator 1 that makes contact with the ice machine 10.

[0034] The inner frame 130 is provided inside the thermal insulation frame 140 and may be coupled to the first outer frame 110, e.g. by screws or similar devices. In other words, a variety of well-known methods can be used to couple the inner frame 130 to the first outer frames 110.

[0035] The inner frame 130 that is reliably coupled and fastened to the first outer frame 110 serves to bring the thermal insulation frame 140 into close contact with the first outer frame 110 and fix the thermal insulation frame 140 to the first outer frame 110. As such, the thermal insulation frame 140 is disposed and fixed between the inner frame 130 and the first outer frame 110

[0036] The second outer frame 120 is coupled to the inner frame 130 and the first outer frame 110. The cooling space 105 is defined between the second outer frame 120 and the inner frame 130. The ice-making system 200, the ice bucket 320, and the transfer system 400 are disposed in the cooling space 105 between the second outer frame 120 and the inner frame 130.

[0037] Furthermore, when the casing 100 is installed in the main body 12 of the refrigerator 1 such that the casing 100 makes close contact with the inner surface of the main body 12, a sealing membrane 160 is provided on edges of the first and second outer frames 110 and 120 that come into contact with the inner surface of the main body 12 of the refrigerator 1. The sealing membrane 160 is made of elastic material such as rubber and is compressed by pressure generated when the casing 100 comes into close contact with the inner surface of the main body 12, thus completely sealing the gap between the casing 100 and the inner surface of the main body 12.

[0038] The cooling unit generates cold air and supplies the generated cold air to an ice tray 210. The cooling unit may include a compressor, a condenser, an expansion valve, and an evaporator to form a cooling cycle. The cooling unit generates cold air by means of heat exchange between refrigerant and air. Generated cold air is supplied to the ice tray 210 by an air blower or the like via a discharge duct 310 connected to the cool air supply port of the casing 100 and via a cold air guide unit 220.

[0039] The ice-making system 200 includes the ice tray 210 which can contain water therein, the cold air guide unit 220, which guides the flow of cold air so that the cold air that is supplied from the cooling unit can flow along the bottom of the ice tray 210, and a rotating unit 230 which rotates the ice tray 210 to drop the generated ice in the ice tray 210 downward.

[0040] The ice tray 210 provides a space which receives water from a water supply pipe (not shown) or the like and in which the water is cooled to form ice. In detail, the ice tray 210 includes in an upper surface thereof with a plurality of forming spaces which contains water therein. The forming spaces can have a variety of shapes depending on shapes of ice to be produced. The number of forming spaces can also be changed.

[0041] The ice tray 210 is preferably made of metal, such as, for example, aluminum, having high thermal conductivity. As the thermal conductivity of the ice tray 210 is increased, a heat exchange rate between water and cold air in the ice tray 210 can be enhanced. In this way, the ice tray 210 functions as a type of heat exchanger. Although it is not shown in the drawings, cooling ribs or the like may be provided under the lower surface of the ice tray 210 so as to increase the area with which the ice tray 210 makes contact with cold air.

[0042] The cold air guide unit 220 guides cold air supplied from the cooling unit to space under the ice tray 210. The cold air guide unit 220 is connected to the discharge duct 310 by a passage through which cold air is supplied from the cooling unit. The cold air guide unit 220 includes first and second cold air guide membranes 221 and 222 which are connected to at least one surface of the discharge duct 310. In detail, as shown in the drawing, the first cold air guide membrane 221 extends from an upper surface of the discharge duct 310, and the second cold air guide membrane 222 extends from a lower surface of the discharge duct 310.

[0043] The first cold air guide membrane 221 is connected between the upper surface of the discharge duct 310 and a bracket 211 to which the ice tray 210 is mounted. The second cold air guide membrane 222 extends from the lower surface of the discharge duct 310 and is disposed to be spaced apart from the lower surface of the ice tray 210 by a predetermined distance. Thereby, a cold air flow passage 225 through which cold air can flow is defined between the lower surface of the ice tray 210 and the upper surface of the second cold air guide membrane 222.

[0044] Cold air guided by the cold air guide membranes 221 and 222 flows toward the lower surface of the ice tray 210 and then receives heat from the ice tray 210, whereby the water contained in the ice tray 210 is phase-

changed into ice.

[0045] When the rotating unit 230 rotates the ice tray 210, the ice that has been produced in the ice tray 210 is dropped into the ice bucket 320 that is disposed below the ice tray 210. In detail, when the rotating shaft 231 is rotated, the ice tray 210 is turned upside down such that the upper surface of the ice tray 210 faces the ice bucket 320. Here, when the ice tray 210 is rotated to a predetermined angle or more, the ice tray 210 is twisted by an interference membrane (not shown). Then, pieces of ice that have been in the ice tray 210 are dropped into the ice bucket 320 by twisting of the ice tray 210.

[0046] Furthermore, a plurality of ejectors (not shown) may be provided on the rotating shaft 231 and arranged along the length of the rotating shaft 231 so that ice can be removed from the ice tray 210 by rotating only the ejectors without rotating the entirety of the ice tray 210.

[0047] The transfer system 400 functions to transfer ice toward the outlet port 500 and includes an auger 410 and an auger motor 420. The auger 410 is a rotating membrane which has a screw or a spiral blade. The auger motor 420 rotates the auger 410. The auger 410 is disposed in the ice bucket 320. Pieces of ice that are in the ice bucket 320 are disposed between portions of the blade of the auger 410 and thus can be transferred to the outlet port 500 by the rotation of the auger 410. The auger motor 420 is housed in an auger motor housing 430.

[0048] The outlet port 500 may be connected to a dispenser (not shown) that is provided in either of the refrigerating compartment doors 13. Depending on the selection of the user, pieces of ice can be transferred by the transfer system 400 and supplied to the user via the dispenser. Although it is not shown in the drawings, a cutting unit that can cut ice into a predetermined size may be provided in the outlet port 500.

[0049] Hereinbelow, the operation and effect of the ice machine 10 of the refrigerator 1 having the above-mentioned construction will be described.

[0050] In the ice machine 10 in accordance with the present embodiment, cold air generated via the compressor, the condenser, the expansion valve, and the evaporator can be supplied to the cooling space 105 through the discharge duct 310. The cold air freezes water contained in the ice tray 210 that is disposed in the cooling space 105. Here, because the cold air guide unit 220 extends from the discharge duct 310, cold air discharged from the discharge duct 310 can flow along the cold air guide unit 220.

[0051] In detail, the cold air flows into space between the first and second cold air guide membranes 221 and 222 and then moves along the cold air flow passage 225 formed between the lower surface of the ice tray 210 and the second cold air guide membrane 222. The cold air flows along the lower surface of the ice tray 210 and receives heat from the lower surface of the ice tray 210, thereby cooling and freezing the water contained in the ice tray 210. When the rotating shaft 231 is rotated, ice that has been produced in the ice tray 210 is dropped downward and stored in the ice bucket 320 that is disposed below the ice tray 210.

[0052] Moreover, to prevent cold air supplied into the cooling space 105 from receiving heat from the outside air of the ice machine 10 during the process of supplying cold air to the ice machine 10 and producing ice, the cooling space 105 needs to be thermally insulated. Given this, the thermal insulation frame 140 is provided in the casing 100 to insulate the cooling space 105 from the outside.

[0053] A space in panels that form the main body 12 of the refrigerator 1 is filled with an insulator. The ice machine 10 is installed in the main body 12 at close contact with a corner of the main body 12. Therefore, a separate insulator is not required in at least two surfaces of the ice machine 10. This will be described in more detail with reference to Fig. 5.

[0054] Fig. 5 is a sectional view showing an enlargement of a portion of the refrigerator in which the ice machine of Fig. 1 is installed.

[0055] Referring to Fig. 5, an insulator 16 is provided in the panels that form the main body 12 of the refrigerator 1. The ice machine 10 is installed in the main body 12 in such a way that it is brought into close contact with a corner of the main body 12. Referring to Fig. 5, the left and upper surfaces of the ice machine 10 are insulated by the insulator 16. Therefore, a separate insulator is not required for the left or upper surface of the ice machine 10. The thermal insulation frame 140 is provided for the right and lower surfaces of the ice machine 10 that are opposed to the left and upper surfaces thereof, which make close contact with the inner surface of the main body 12. Consequently, the internal space of the ice machine 10 can be reliably insulated from the outside.

[0056] The thermal insulation frame 140 has a substantially L-shaped cross-section. The description "having the L-shaped cross-section" can be construed as including two surfaces that respectively correspond to the two surfaces (the right and lower surfaces of the case of Fig. 5) of the ice machine 10 and are connected to each other at a predetermined angle. For example, the predetermined angle may be 90°, but the spirit of the present invention is not limited to this.

[0057] In further embodiments, the outlet port 500 that is installed on the first end of the ice machine 10 may be provided with a separate insulation membrane. The cold air supply port provided on the second end of the ice machine 10 may be closely connected to a cold air duct (not shown) that functions as a passage for the supply of cold air from the cooling unit.

[0058] In accordance with the ice machine 10 of the refrigerator 1 of the present embodiment, the internal capacity of the refrigerator 1 can be increased compared to that of refrigerators of other designs. The material expense for producing the refrigerator 1 can be reduced, and the productivity can be enhanced. Further, the ice machine 10 can be effectively thermally sealed.

[0059] Hereinafter, a method for manufacturing the ice machine 10 of the refrigerator 1 in accordance with the present embodiment will be described in detail with reference to Fig. 6.

[0060] Fig. 6 is a flowchart showing an exemplary method for manufacturing the ice machine of Fig. 1.

[0061] Referring to Fig. 6, the ice machine 10 includes multiple systems such as the ice-making system 200, the ice bucket 320, and the transfer system 400. Further, the ice machine 10 is configured such that these systems are installed in the casing 100.

[0062] The ice-making system 200, the ice bucket 320 and the transfer system 400 can be manufactured in accordance with various well-known techniques.

[0063] To manufacture the casing 100 that receives the produced systems, the first outer frame 110 that forms some of the outer surface of the casing 110 is prepared, at step S1. Thereafter, at step S2, the heater 150 is installed in the coupling part 112 provided on the first end of the prepared first outer frame 110. Here, the heater 150 may be installed along the perimeter of the communication hole that is formed, for transfer of ice, in the coupling part 112.

[0064] At step S3, the thermal insulation frame 140 is installed inside the first outer frame 110. At step S4, the inner frame 130 is installed on the thermal insulation frame 140, whereby the thermal insulation frame 140 is consequently installed between the inner frame 130 and the first outer frame 110.

[0065] Here, the inner frame 130 may be coupled to the first outer frame 110 by a coupling means such as bolt coupling or the like. Furthermore, the inner frame 130 is coupled to the first outer frame 110 such that the thermal insulation frame 140 is brought into close contact with the first outer frame 110.

[0066] Subsequently, at step S5, the ice-making system 200, the ice bucket 320, and the transfer system 400 that have been pre-manufactured are assembled with the inner frame 130 or the first outer frame 110. At step S6, the second outer frame 120 is coupled to the first outer frame 110. Here, the coupled systems are disposed in the space between the inner frame 130 and the second outer frame 120.

[0067] At step S7, the sealing membrane is provided on edges of the first and second outer frames 110 and 120 that come into contact with the inner surface of the main body 12 of the refrigerator 1 when the casing 100 is installed in the refrigerator 1. The ice machine 10 that is manufactured by the above-mentioned method is installed in the main body 12 of the refrigerator 1 in such a way that the ice machine 10 is brought into close contact with a corner of the main body 12.

[0068] As described above, in accordance with an embodiment of the present invention, the internal capacity of a refrigerator can be increased compared to that of a refrigerator with other design. The material cost for producing the refrigerator can be reduced, and the productivity can be enhanced. Further, the ice machine can be effectively thermally sealed.

[0069] While an ice machine of a refrigerator in accordance with the invention have been shown and described with respect to the exemplary embodiments, the present invention is not limited thereto. It will be understood by those skilled in the art that various changes and modifications may be made without departing from the scope of the invention as defined in the following claims.

Claims

1. A refrigerator, comprising:

a main body comprising a food storage space;
a casing disposed in the storage space, the casing comprising a space for producing ice; and
an ice tray disposed in the casing and configured to contain water for producing ice,
wherein the casing comprises:

a first outer frame and a second outer frame;
an inner frame provided between the first outer frame and the second outer frame; and
an L-shaped thermal insulation frame configured to reside within a space between the inner frame and the first outer frame.

2. The refrigerator of claim 1, further comprising:

an ice bucket disposed below the ice tray and configured to receive ice dropped from the ice tray; and
an outlet port through which the ice is removed from the ice bucket, wherein the outlet port is connected to a first end of the casing, and wherein a cold air supply port is installed on a second end of the casing and configured to supply cold air from a cooling unit.

3. The refrigerator of claim 2, further comprising:

a transfer system configured to transfer the ice to the outlet port.

4. The refrigerator of claim 2, wherein a heater is installed on the first end of the casing.

5. The refrigerator of claim 4, wherein:

the casing is installed in close contact with the main body of the refrigerator; and
a sealing membrane is provided on at least one edge of the first and second outer frames, wherein said membrane is disposed in contact with the main body of the refrigerator.

6. A method for manufacturing a refrigerator, the method comprising:

preparing a first outer frame configured to form a portion of an outer surface of a casing, the casing comprising a cooling space for an ice machine;
installing a heater on an end of the first outer frame;
installing a thermal insulation frame having an L-shaped cross-section inside the first outer frame;
installing an inner frame on the thermal insulation frame;
coupling a second outer frame to the first outer frame, the second outer frame being configured to form a remaining portion of the outer surface of the casing; and
installing a sealing membrane on at least one edge of the first and second outer frames, wherein said membrane is brought into contact with the main body of the refrigerator when the casing is installed in the refrigerator.

7. The method of claim 6, further comprising, after installing the inner frame,
installing an ice-making system comprising:

an ice tray configured to contain water therein;
an ice bucket configured to receive ice dropped from the ice tray;
an outlet port through which the ice is removed from the ice bucket;
and a transfer system configured to transfer the ice toward the outlet port.

8. A refrigerator, comprising:

a main body comprising a food storage space;
a casing disposed in the storage space, the casing comprising a space for producing ice; and
an ice tray disposed in the casing and configured to contain water for producing ice,
wherein the casing comprises:

a first outer frame and a second outer frame;
an inner frame provided between the first outer frame and the second outer frame; and
a thermal insulation frame configured to fill a space between the inner frame and the first outer frame.

9. The refrigerator of claim 8, further comprising:

an ice bucket disposed below the ice tray and configured to receive ice dropped from the ice tray; and
an outlet port through which the ice is removed from the ice bucket, wherein the outlet port is connected to a first end of the casing, and wherein a cold air supply port is installed on a second end of the casing and configured to supply cold air from a cooling unit.

10. The refrigerator of claim 9, further comprising:

a transfer system configured to transfer the ice to the outlet port.

11. The refrigerator of claim 9, wherein a heater is installed on the first end of the casing.

12. The refrigerator of claim 11, wherein:

the casing is installed in close contact with the main body of the refrigerator; and
a sealing membrane is provided on at least one edge of the first and second outer frames, wherein said membrane is disposed in contact with the main body of the refrigerator.

FIG. 1

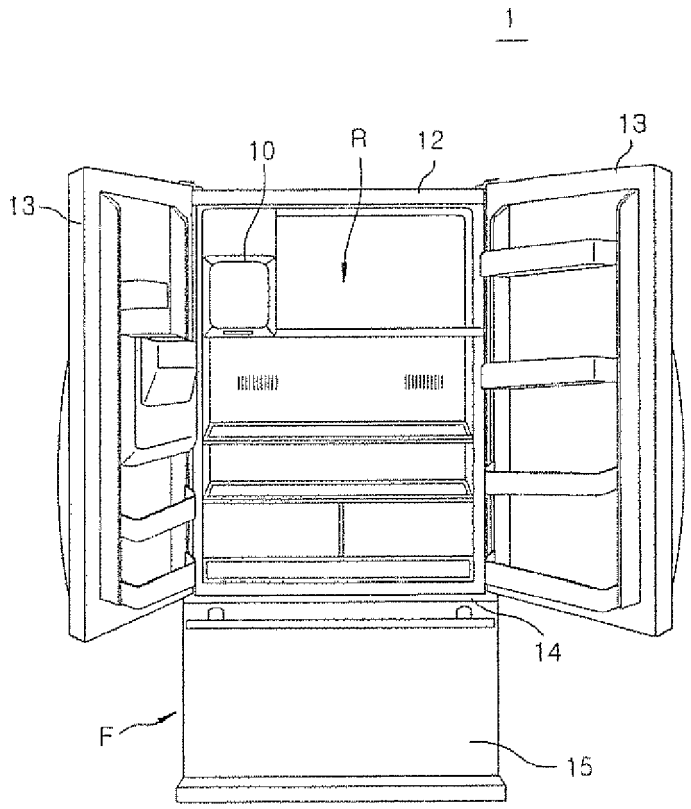


FIG.2

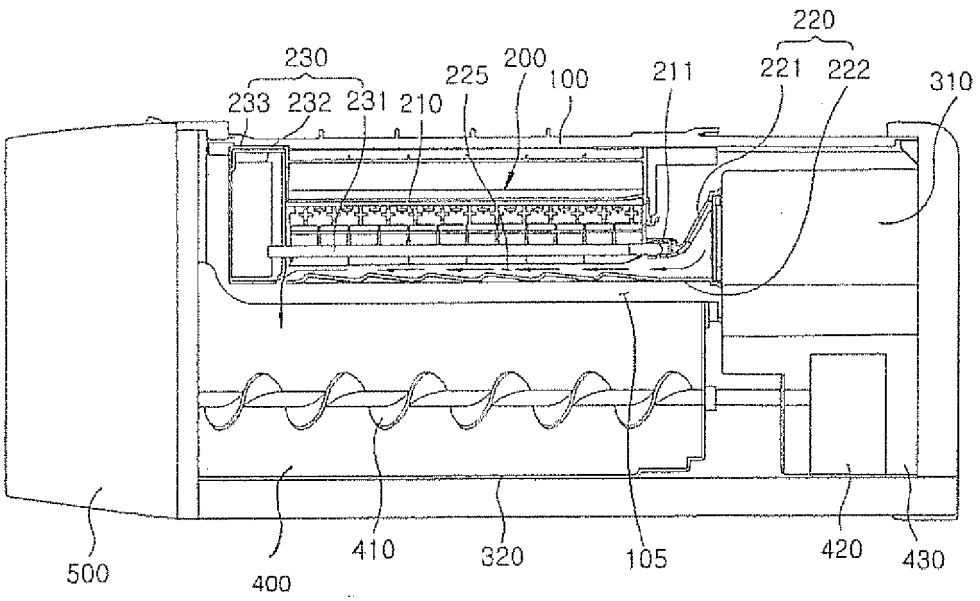

10
220
230
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FIG.3

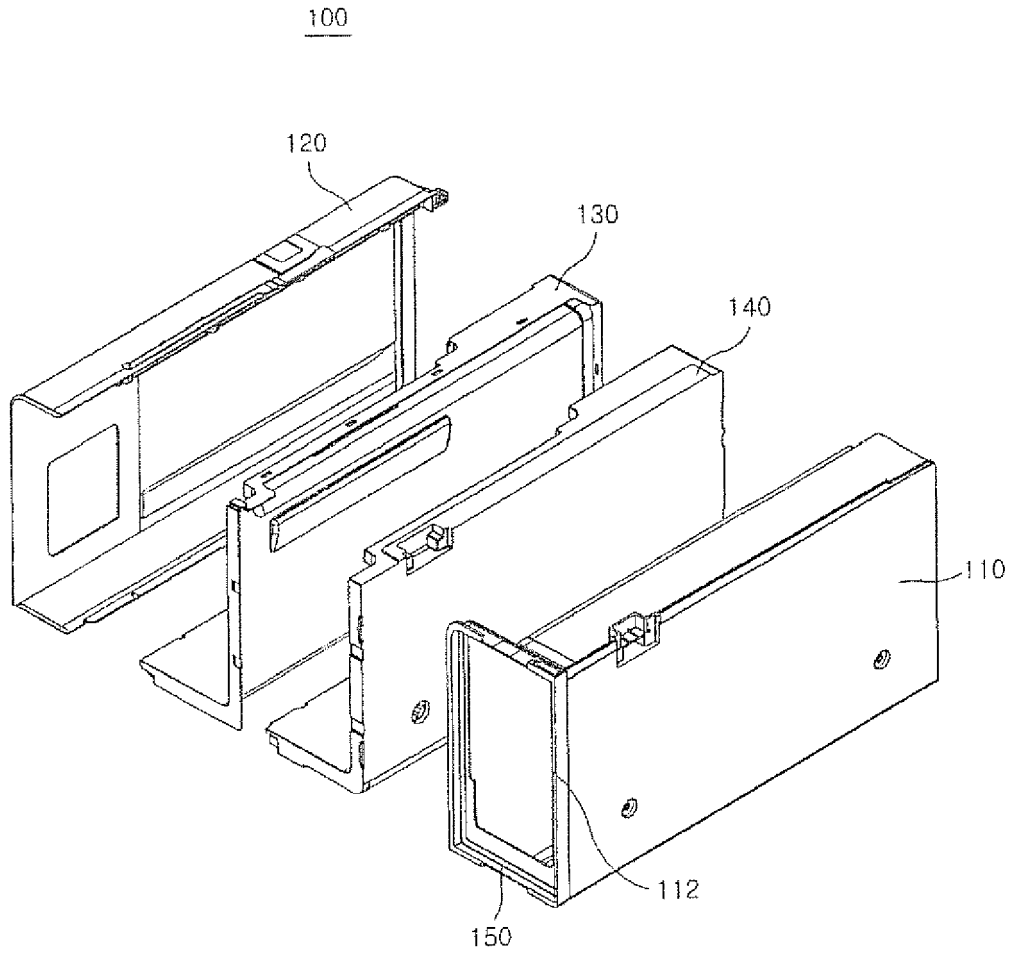


FIG. 4

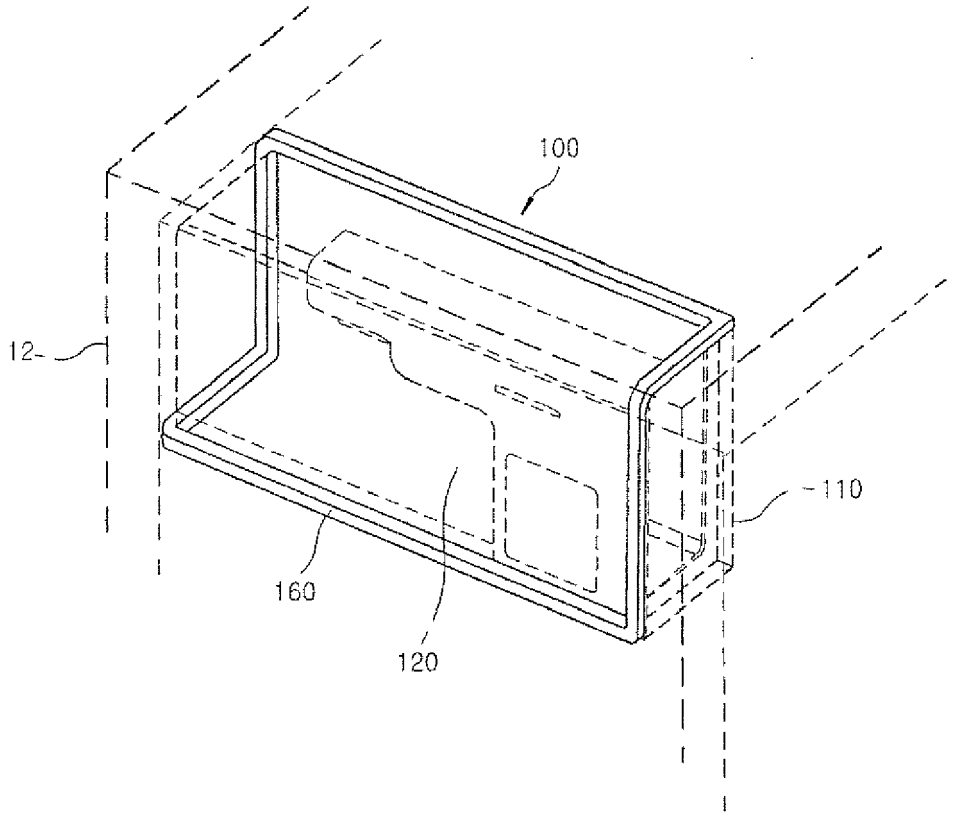


FIG.5

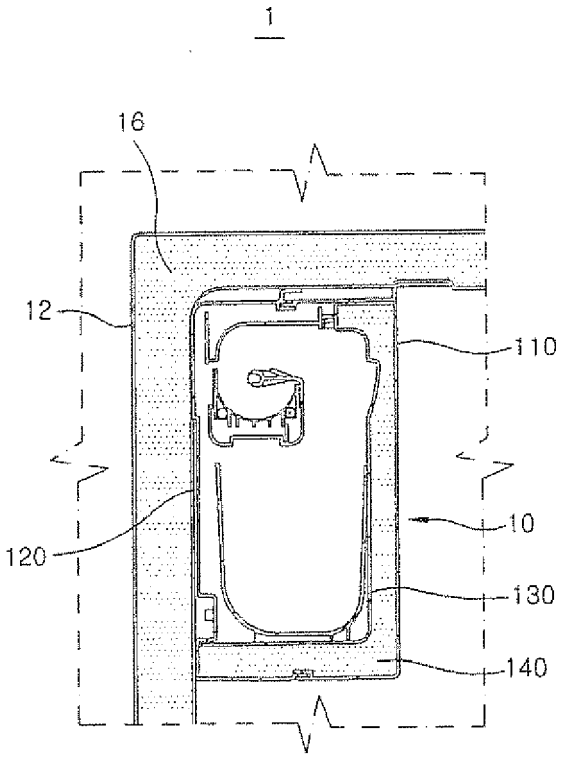


FIG.6

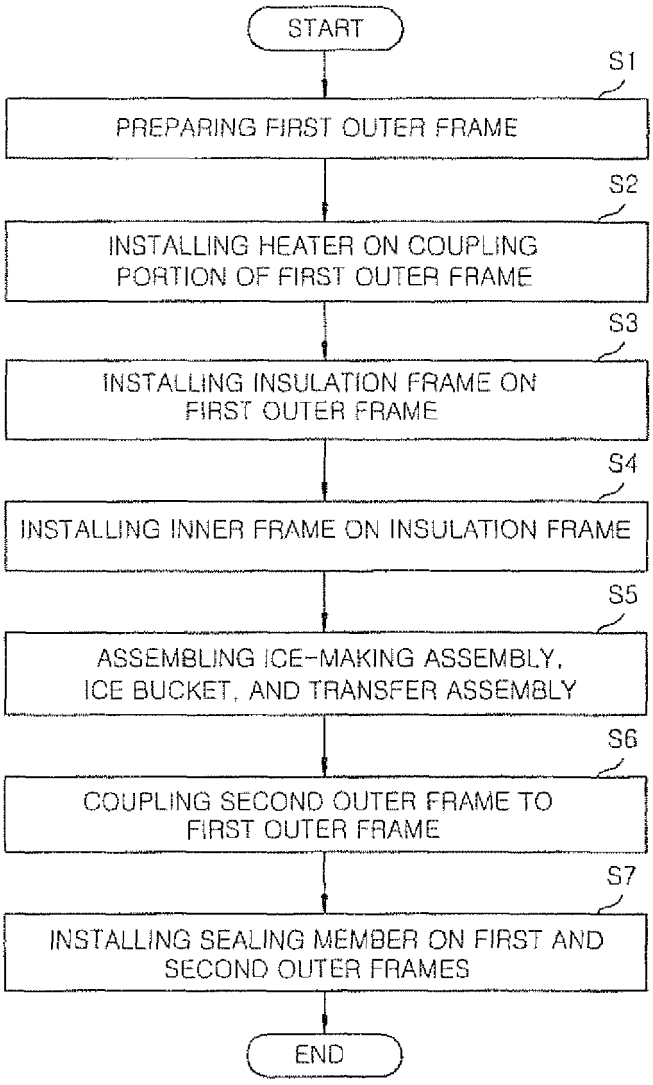
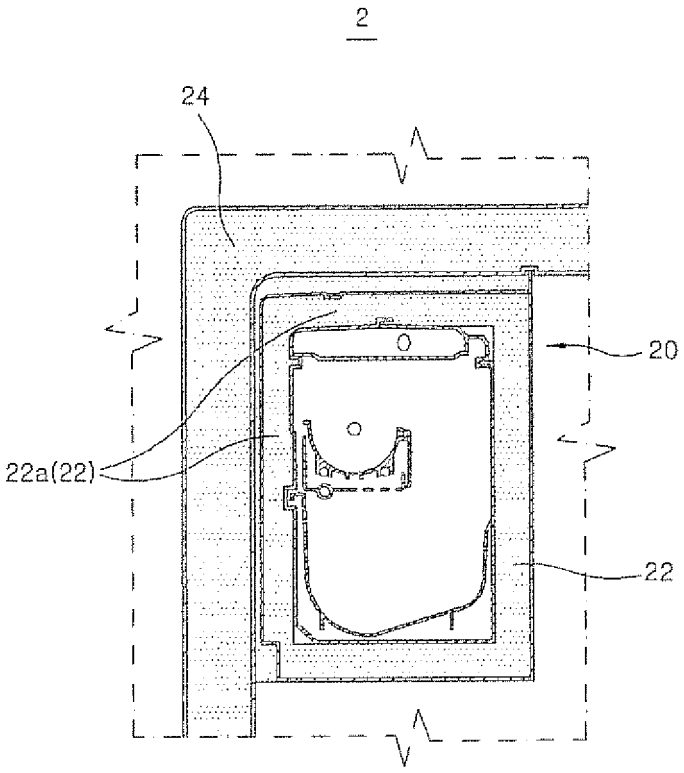

START
S1
PREPARING FIRST OUTER FRAME
S2
INSTALLING HEATER ON COUPLING PORTION OF FIRST OUTER FRAME
S3
INSTALLING INSULATION FRAME ON FIRST OUTER FRAME
S4
INSTALLING INNER FRAME ON INSULATION FRAME
S5
ASSEMBLING ICE-MAKING ASSEMBLY, ICE BUCKET, AND TRANSFER ASSEMBLY
S6
COUPLING SECOND OUTER FRAME TO FIRST OUTER FRAME
S7
INSTALLING SEALING MEMBER ON FIRST AND SECOND OUTER FRAMES
END

FIG. 7



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EUROPEAN SEARCH REPORT

Application Number
EP 15 18 7267

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	EP 2 650 628 A2 (SAMSUNG ELECTRONICS CO LTD [KR]) 16 October 2013 (2013-10-16) * paragraph [0043]; figures 2,4,5,8 *	1-3,8-10 4-7,11, 12	INV. F25C5/00 F25D21/04
Y	WO 2010/066725 A2 (BSH BOSCH SIEMENS HAUSGERAETE [DE]; BAI YUFA [CN]; GAO LIANG [CN]; LU) 17 June 2010 (2010-06-17) * page 10, line 8 - line 18; figure 2 *	4-7,11, 12	
X	EP 2 610 563 A2 (SAMSUNG ELECTRONICS CO LTD [KR]) 3 July 2013 (2013-07-03) * figure 3 *	1-3,8-10	
X	US 2010/319373 A1 (JEONG JIN [KR] ET AL) 23 December 2010 (2010-12-23) * figure 8 *	1-3,8-10	
X	US 2006/090496 A1 (ADAMSKI JOSEPH R [US] ET AL) 4 May 2006 (2006-05-04) * figure 5 *	1-3,8-10	
			TECHNICAL FIELDS SEARCHED (IPC) F25C F25D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	12 October 2016	Kuljis, Bruno

CATEGORY OF CITED DOCUMENTS

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12-10-2016

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2650628 A2	16-10-2013	CN 103363756 A	23-10-2013
		EP 2650628 A2	16-10-2013
		KR 20130114851 A	21-10-2013
		US 2013263620 A1	10-10-2013
		US 2013298404 A1	14-11-2013
		WO 2013154306 A1	17-10-2013
WO 2010066725 A2	17-06-2010	CN 101749910 A	23-06-2010
		EP 2373941 A2	12-10-2011
		US 2011283731 A1	24-11-2011
		WO 2010066725 A2	17-06-2010
EP 2610563 A2	03-07-2013	EP 2610563 A2	03-07-2013
		KR 20130078531 A	10-07-2013
		US 2013167575 A1	04-07-2013
US 2010319373 A1	23-12-2010	CN 101929774 A	29-12-2010
		EP 2282145 A2	09-02-2011
		KR 20100137637 A	31-12-2010
		US 2010319373 A1	23-12-2010
US 2006090496 A1	04-05-2006	CA 2521359 A1	27-03-2006
		US 2006090496 A1	04-05-2006
		US 2006201189 A1	14-09-2006
		US 2010293984 A1	25-11-2010
		US 2012000234 A1	05-01-2012
		US 2012324937 A1	27-12-2012

EPO FORM P0459

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Patent documents cited in the description

- KR 1020150086083 **[0001]**