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(54) REFRIGERATOR

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RÉFRIGÉRATEUR

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Description

Technical Field

[0001] The present disclosure relates to a refrigerator.

Background Art

[0002] Refrigerators are home appliances for storing foods at low temperatures. Air cooled by heat exchange with a refrigerant circulating in a refrigeration cycle is used to cool the storage space of a refrigerator so that foods stored in the storage space can be kept in optimal conditions.

[0003] Along with the change of people's eating patterns and preference, large and multifunctional refrigerators have been introduced, and refrigerators having various storage space structures have been introduced.

[0004] Generally, the inner storage space of a refrigerator is divided into a refrigerator compartment and a freezer compartment, and the refrigerator can be variously configured according to the arrangement of the refrigerator compartment and the freezer compartment.

[0005] For example, in a side-by-side type refrigerator, a refrigerator compartment and a freezer compartment are arranged in left and right sides and are configured to be individually opened and closed by using a refrigerator compartment door and a freezer compartment door.

[0006] In the side-by-side refrigerator, an evaporator is disposed at a rear side of the refrigerator compartment and/or the freezer compartment to supply cooling air to the refrigerator compartment and the freezer compartment, and thus the inner space of the side-by-side refrigerator is reduced by the space necessary to install the evaporator.

[0007] For this reason, Korean Patent No. 10-039849 discloses a refrigerator. In the disclosed refrigerator, an evaporator and a cooling air circulation fan are disposed in a barrier which divides the inner space of the refrigerator into a refrigerator compartment and a freezer compartment.

[0008] However, in the disclosed refrigerator, the barrier in which the evaporator and the cooling air circulation fan are disposed is not sufficiently insulated, and thus the refrigerator compartment can be over-cooled. In addition, cooling air cannot be smoothly circulated in the barrier because the inner space of the barrier is narrow.

[0009] WO 2008/146999 A1 relates to a refrigerator according to the preamble of claim 1 comprising a refrigerator body having an inner space opened/closed by a refrigerator door; a partition wall having one or more first cool air channels therein and having a predetermined thickness and area, for partitioning the inner space of the refrigerator body into two or more spaces; one or more evaporators installed at the first cool air channels, for generating cool air; and one or more fans installed at the first cool air channel, for supplying cool air generated from the evaporator to the corresponding space. Further disclosed is a refrigerator, comprising: a refrigerator body having a freezing chamber that stores food in a frozen state, and a chilling chamber that stores food in a fresh state, the chambers are partitioned from each other by a partition wall; a freezing chamber door and a chilling chamber door coupled to the refrigerator body, for opening and closing the freezing chamber and the chilling chamber; and a freezing chamber evaporator and a chilling chamber evaporator installed at the partition wall of the refrigerator body.

[0010] WO 2009/008613 relates to a refrigerator having a body defined with a plurality of cooling compartments, a plate arranged to partition the cooling compartments, and a cold air supplier arranged at one wall of the plate, to supply cold air to at least one of the cooling compartments.

Technical Problem

[0011] It is an object of the present invention to provide a refrigerator having a wider inner storage space while maintaining the insulating performance of a barrier.

[0012] A further object is to provide a refrigerator in which cooling air can flow smoothly in a barrier accommodating an evaporator.

[0013] A further object is to provide a refrigerator in which cooling air can flow smoothly to a freezer compartment and a freezer compartment.

These objects are solved with the features of the claims.

Solution to Problem

[0014] In one example, a refrigerator includes: a storage space including a freezer compartment and a refrigerator compartment; a barrier main body defining the freezer compartment and the refrigerator compartment; an insulator disposed at a side of the barrier main body to insulate the refrigerator compartment from the freezer compartment; an evaporator disposed at a side of the insulator to generate cooling air; a fan motor assembly disposed at an upper side of the evaporator to provide a driving force for circulating cooling air; a barrier cover configured to cover sides of the evaporator and the fan motor assembly; and a cooling-air passage defined between the insulator and the barrier cover to allow a flow of cooling air generated by the evaporator.

[0015] In another example, a refrigerator includes: a storage space including a freezer compartment and a refrigerator compartment; a barrier main body defining the freezer compartment and the refrigerator compartment; an evaporator disposed at a side of the barrier main body to generate cooling air; a fan motor assembly disposed at an upper side of the evaporator to provide a driving force for circulating cooling air; a barrier cover configured to cover sides of the evaporator and the fan motor assembly; and a cooling-air discharge part disposed at an upper part of the barrier main body or the barrier cover to discharge cooling air to the storage space, wherein the cooling-air discharge part includes a first guide rib sloped downward to discharge cooling air toward a lower part of the storage space.

[0016] The cooling-air discharge part may further include: a second guide rib sloped toward a front side of the storage space; and a third guide rib sloped toward a rear side of the storage space.

[0017] The refrigerator may further include a cooling-air inlet part disposed at a lower part of the barrier main body or the barrier cover to guide cooling air to the evaporator after the cooling air is circulated in the storage space, wherein the cooling-air inlet part may be located under the evaporator.

[0018] The cooling-air inlet part may include an inlet guide sloped upward in a direction from the storage space to the barrier main body or the barrier cover.

[0019] The cooling-air discharge part may further include: a central guide to discharge cooling air to a lateral side of the storage space; and a lateral guide to discharge cooling air toward the front or rear side of the storage space.

[0020] The lateral guide may be provided in plurality between the central guide and the cooling-air discharge part, wherein the slope of the lateral guide may increase from the central guide to the cooling-air discharge part.

[0021] The barrier main body may include: a first case facing the refrigerator compartment; a second case facing the freezer compartment; and a concave part formed at the second case by recessing a part of the second case toward the refrigerator compartment to accommodate the evaporator and the fan motor assembly.

[0022] The cooling-air discharge part may further include: cover outlets disposed at the barrier cover to discharge cooling air to the freezer compartment; and an outlet grill disposed at the barrier main body to discharge cooling air to the refrigerator compartment, wherein a first outlet of the cover outlets may be disposed at a position facing the outlet grill.

[0023] The refrigerator may further include a damper member disposed between the first outlet and the outlet grill to selectively discharge cooling air to the refrigerator compartment.

[0024] The barrier main body may further include an inlet grill to allow an inflow of cooling air from the refrigerator compartment, wherein the inlet grill may be disposed at a rear side of the barrier main body.

[0025] In another example, a refrigerator includes: a cabinet forming a storage space; a barrier dividing the storage space into a freezer compartment and a refrigerator compartment, the barrier including a concave part; an evaporator disposed in the concave part; and a catch hook disposed at the evaporator so as to be hooked on an inside of the barrier.

[0026] The catch hook may be inserted through a catch slot disposed at a side of the concave part and then be hooked.

[0027] The catch hook may be hooked in a catch space communicating with the concave part.

[0028] In another example, a refrigerator includes: a cabinet forming a storage space; a barrier dividing the storage space into a freezer compartment and a refrigerator compartment, the barrier including a concave part; a barrier cover configured to cover the concave part; an evaporator disposed in the concave part; a fixing member disposed through a surface of the concave part such that both ends of the fixing member are disposed in the concave part and the barrier; and a coupling piece coupled to the fixing member to fixing the evaporator to an inside of the concave part.

[0029] A catch protrusion may be disposed at an end of the fixing member disposed in the barrier to prevent the fixing member from being freely detached in a state where the fixing member is inserted through the surface of the concave part.

[0030] In a state where the end of the fixing member disposed in the barrier is inserted through a side of the evaporator, the coupling piece may be coupled to the fixing member.

[0031] The barrier may be constituted by a part of an inner case forming the freezer compartment, a part of an inner case forming the refrigerator compartment, and a front plate forming a part of a front surface of the cabinet.

[0032] A part of the barrier adjacent to the freezer compartment may be recessed toward the refrigerator compartment to form the concave part.

[0033] An insulation layer may be disposed in the barrier between the refrigerator compartment and the concave part.

[0034] The refrigerator may further include a sealing member to seal a gap between the barrier and the barrier cover.

[0035] The barrier cover may include at least two parts, and the sealing member may seal a gap between the parts of the barrier cover.

[0036] The evaporator may include: a refrigerant tube in which a refrigerant flows; and a plurality of fins through which the refrigerant tube is inserted. Based on an imaginary vertical line passing through centers of the fins, ends of the fins are close to the freezer compartment and the other ends of the fins are close to the refrigerator compartment, and the refrigerant tube may be more distant from the other ends of the fins than the ends of the fins.

[0037] In another example, a refrigerator includes: a cabinet forming a storage space; a barrier dividing the storage space into a freezer compartment and a refrigerator compartment, the barrier including an insulator at an inner side and a concave part at a side; an evaporator in the concave part; a blower unit disposed in the concave part at an upper side of the evaporator; and a barrier cover configured to cover the concave part, wherein the evaporator includes a first tube in which refrigerant flows, a second tube in which the refrigerant flows independently of the first tube; and a plurality of heat exchange fins through which both the first and second tubes are inserted, wherein the refrigerant flows in one or both of the first and second tubes according to temperatures of the freezer compartment and the refrigerator compartment.

[0038] The refrigerator may further include a value configured to control a refrigerant passage so that the refrigerant flows in one or both of the first and second tubes.

[0039] If the temperature of the freezer compartment reaches a set temperature, the refrigerant may flow both of the first and second tubes regardless of the temperature of the refrigerator compartment.

[0040] Alternatively, if the temperature of the freezer compartment reaches the set temperature but the temperature of the refrigerator compartment does not reach a set temperature, the refrigerant may flow only in the first tube.

[0041] A distance between the first tube and the barrier cover may be greater than a distance between the second tube and the barrier cover.

[0042] Based on a flow direction of cooling air, the second tube may be disposed at a downstream side of the first tube.

[0043] A distance from the barrier cover to a line bisecting the heat exchange fins in left and right parts may be greater than a distance from the barrier cover to a line bisecting a horizontal distance between the first and second tubes that are disposed at the same height.

[0044] The barrier may be constituted by a part of a first inner case forming the freezer compartment and a part of a second inner case forming the refrigerator compartment, wherein the evaporator may include a mounting structure so as to be mounted on the first inner case, and the first inner case may include a catch slot so as to be coupled with the mounting structure.

[0045] The refrigerator may further include: a compressor configured to compress the refrigerant; and a bypass tube through which the refrigerant is bypassed from the compressor to an inlet side of the evaporator, wherein if it is necessary to defrost the evaporator, the refrigerant discharged from the compressor may be guide to the inlet side of the evaporator through the bypass tube, and then the refrigerant may flow through one or both of the first and second tubes.

[0046] The details of one or more examples and embodiments of the invention are set forth in the accompanying drawings and the description below. Other features will be apparent from the description and drawings, and from the claims.

Advantageous Effects of Invention

[0047] According to the examples and embodiments of the invention, the cooling passage is disposed between the barrier and the barrier cover, and the insulator is provided in the barrier. Therefore, supply of cooling air to the refrigerator compartment can be controlled.

[0048] In addition, the cooling-air passage is formed in the insulator, and the insulator is coupled to a side of the case of the barrier. Thus, the barrier can have a simple structure while maintaining its insulating performance.

[0049] Since a vacuum insulator is included in the insulator disposed in the barrier, the insulating performance of the barrier can be good.

[0050] In addition, since the blower unit accommodating part is deeper than other accommodating parts, a space through which cooling air flows from the evaporator to the blower fan can be sufficiently ensured, and thus cooling air can flow more smoothly.

[0051] In addition, since the blower unit accommodating part and the cooling-air passage are formed in the barrier by recessing parts of the barrier, cooling air can flow more smoothly in the barrier, and the barrier can have a simple structure.

[0052] In addition, since the cooling-air passage is disposed between the barrier and the barrier cover, cooling air can be easily discharged from the cooling-air passage to the storage space.

[0053] In addition, the cooling-air outlet is formed in an upper part of the barrier in a manner such that cooling air can be discharged from the cooling-air outlet to an upper or lower side of the storage space. Therefore, the storage space can be uniformly cooled.

[0054] In addition, the cooling-air inlet is formed in a lower part of the barrier. Thus, cooling air introduced into the barrier through the cooling-air inlet can be effectively supplied to the evaporator.

[0055] In addition, since the blower unit accommodating part is deeper than other parts, a space through which cooling air flows from the evaporator to the blower fan can be ensured, and thus the flow efficiency of cooling air can be improved.

[0056] In addition, since the blower unit accommodating part and the cooling-air passage are formed in the barrier by recessing parts of the barrier, the flow efficient of cooling air in the barrier can be improved, and the structure of the barrier can be simple.

[0057] In addition, the evaporator includes a plurality of tubes through which refrigerant can flow independently, and it can be controlled that refrigerant flows in some of the tubes for cooling the refrigerator compartment. Therefore, an evaporator having a small capacity can be used, and thus the output power of the compressor can be reduced to save electricity.

[0058] In addition, some of the tubes of the evaporator where refrigerant flows to reduce the temperature of the refrigerator compartment are disposed closer to the freezer compartment than to the refrigerator compartment based on the positions of heat exchange fins. Therefore, heat exchange between the evaporator (or the evaporator accommodating part) and the refrigerator compartment can be minimized.

Brief Description of Drawings

[0059]

Fig. 1 is a perspective view illustrating a refrigerator.

Fig. 2 is a perspective view illustrating the refrigerator when doors of the refrigerator are opened according to the first example.

Fig. 3 is an exploded perspective view illustrating a barrier according to the first example.

Fig. 4 is a sectional view taken along line 4-4' of Fig. 1.

Fig. 5 is a front view illustrating a concave part of the barrier according to the first example.

Fig. 6 is a cut-away view illustrating a section taken along line 6-6' of Fig. 5.

Fig. 7 is a view illustrating a cooling air flow state of the barrier observed from a freezer compartment side.

Fig. 8 is a view illustrating a cooling air flow state of the barrier observed from a refrigerator compartment side.

Fig. 9 is a partial exploded perspective view illustrating a barrier according to a second example.

Fig. 10 is a sectional view illustrating the barrier according to the second example.

Fig. 11 is a perspective view illustrating a barrier according to an embodiment of the invention.

Fig. 12 is an exploded perspective view illustrating a barrier according to a third example.

Fig. 13 is a vertical sectional view illustrating the barrier.

Fig. 14 is a sectional view taken along line 14-14' of Fig. 12.

Fig. 15 is a sectional view taken along line 15-15' of Fig. 12.

Fig. 16 is a sectional view taken along line 16-16' of Fig. 12.

Fig. 17 is a view illustrating a cooling air flow state of the barrier observed from a refrigerator compartment side.

Fig. 18 is a sectional view taken line 18-18' of Fig. 17.

Fig. 19 is an exploded perspective view illustrating a barrier according to a fourth example.

Fig. 20 is a vertical sectional view illustrating the barrier.

Fig. 21 is an enlarged view illustrating portion A of Fig. 20.

Figs. 22 to 24 are views for explaining processes of fixing an evaporator of a refrigerator according to the fourth example.

Figs. 26 and 27 are sectional view illustrating another structure for disposing the evaporator.

Fig. 28 is a schematic view illustrating a refrigerant cycle of a refrigerator according to a fifth example.

Fig. 29 is an exploded perspective view illustrating a barrier.

Fig. 30 is a vertical sectional view illustrating the barrier.

Fig. 31 is a vertical sectional view illustrating another evaporator structure of the barrier.

Fig. 32 is a perspective view illustrating another evaporator structure.

Best Mode for Carrying out the Invention

[0060] Reference will now be made in detail to the embodiments of the present invention and the further examples which are illustrated in the accompanying drawings. The invention may, however, be embodied in many different forms and should not be construed as being limited to the embodiments set forth herein; rather, that alternate embodiments included in other retrogressive inventions or falling within the scope of the present disclosure can easily be derived through adding, altering, and changing, and will fully convey the concept of the invention to those skilled in the art.

[0061] Fig. 1 is a perspective view illustrating a refrigerator,
and Fig. 2 is a perspective view illustrating the refrigerator when doors of the refrigerator are opened according to the first example.

[0062] Referring to Figs. 1 and 2, a refrigerator 1 of the first example includes a cabinet 10 forming a storage space and doors 20 configured to close and open the storage space.

[0063] The cabinet 10 has a hexahedron shape with an opened front side. The cabinet 10 is divided by a barrier 100 into left and light parts to form a freezer compartment 30 and a refrigerator compartment 40. A plurality of drawers and shelves are provided in the freezer compartment 30 and the refrigerator compartment 40 so that various foods can be stored.

[0064] The doors 20 are used to close and open the freezer compartment 30 and the refrigerator compartment 40 individually. For this, the doors 20 include a freezer compartment door 22 corresponding to the opened front side of the freezer compartment 30, and a refrigerator compartment door 24 corresponding to the opened front side of the refrigerator compartment 40.

[0065] The freezer compartment door 22 and the refrigerator compartment door 24 are rotatably coupled to the cabinet 10, respectively, so that the freezer compartment 30 and the refrigerator compartment 40 can be opened and closed. A plurality of baskets may be provided at the rear sides of the freezer compartment door 22 and the refrigerator compartment door 24 to store foods. In addition, if necessary, an ice maker, a dispenser, and a home bar may be provided at the freezer compartment door 22 and the refrigerator compartment door 24.

[0066] The barrier 100 is disposed vertically in the storage space of the cabinet 10, and the freezer compartment 30 and the refrigerator compartment 40 are disposed at the left and right sides of the barrier 100. In addition, the barrier 100 is configured to insulate the freezer compartment 30 and the refrigerator compartment 40 from each other for preventing heat exchange therebetween.

[0067] Hereinafter, the barrier 100 will be described in detail with reference to the accompanying drawings.

[0068] Fig. 3 is an exploded perspective view illustrating the barrier 100 of the first example; Fig. 4 is a sectional view taken along line 4-4' of Fig. 1; Fig. 5 is a front view illustrating a concave part of the barrier 100 of the first example; and Fig. 6 is a cut-away view illustrating a section taken along line 6-6' of Fig. 5.

[0069] Referring to Figs. 3 to 6, the barrier 100 includes a barrier main body 101 and a barrier cover 400. The freezer compartment 30 and the refrigerator compartment 40 are separated by the barrier main body 101. The barrier main body 101 extends vertically in the cabinet 10, and an evaporator 110 and a blower unit 130 are disposed in the barrier main body 101.

[0070] The barrier main body 101 includes cases which form inner sides of the freezer compartment 30 and the refrigerator compartment 40. The cases include a first case 170 forming a side of the refrigerator compartment 40 and a second case 180 forming a side of the freezer compartment 30.

[0071] An insulator is disposed between the first case 170 and the second case 180 so that the barrier 100 can insulate the refrigerator compartment 40 from the freezer compartment 30. The insulator may be formed by filling a foaming agent between the cases.

[0072] A concave part 200 is disposed in a freezer compartment side of the barrier 100. The concave part 200 may be formed by recessing at least a part of the second case 180.

[0073] In detail, the concave part 200 includes an evaporator accommodating part 210 in which the evaporator 110 is accommodated, a blower unit accommodating part 220 in which the blower unit 130 is accommodated to circulate cooling air, and a cooling-air passage 230 configured to supply cooling air generated by the evaporator 110 to the freezer compartment 30 and the refrigerator compartment 40.

[0074] The evaporator accommodating part 210 is disposed at a lower part of the barrier 100 and is slightly larger than the evaporator 110 to accommodate the evaporator 110.

[0075] The evaporator accommodating part 210 has a sufficient depth such that the evaporator 110 may not protrude from the outside of the barrier 100. The evaporator 110 may be disposed in the evaporator accommodating part 210 by using additional fixing members or structures.

[0076] The evaporator 110 includes refrigerant tubes 112 arranged along the same vertical extension lines. For example, the evaporator 110 may be a multi flow channel type condenser which includes left and right headers and refrigerant tubes disposed between the headers.

[0077] A cooling-air inlet 212 is disposed at a lower end of the evaporator accommodating part 210. Cooling air may be introduced into the cooling-air inlet 212 from the inside of the refrigerator compartment 40, and the cooling-air inlet 212 may be disposed at a rear side of the evaporator accommodating part 210.

[0078] An inlet grill 214 is disposed at an outer side of the cooling-air inlet 212 to guide cooling air from the inside of the refrigerator compartment 40 to the inside of the barrier 100. The inlet grill 214 may prevent permeation of foreign substances from the refrigerator compartment 40.

[0079] The cooling-air inlet 212 may be disposed at a position corresponding to the position of a structure such as a drawer provided in the refrigerator compartment 40 so that the cooling-air inlet 212 may not be exposed when the refrigerator compartment door 24 is opened.

[0080] A drain pan 120 is disposed under the evaporator accommodating part 210 to drain defrosted water. The drain pan 120 may be coupled to a lower part of the evaporator 110 and may communicate with a machine room of the cabinet 10.

[0081] The blower unit accommodating part 220 is disposed at an upper side of the evaporator accommodating part 210. The blower unit accommodating part 220 provides a space in which the blower unit 130 can be accommodated. The blower unit 130 includes a motor 132, a blower fan 134, and a shroud 136.

[0082] In detail, the motor 132 may be used to rotate the blower fan 134. The motor 132 may be a general electric motor of the related art.

[0083] The blower fan 134 is disposed on a rotation shaft of the motor 132. The blower fan 134 includes a centrifugal fan configured to receive cooling air in a rotation shaft direction and discharge the cooling air in a circumferential direction. A turbo fan having good blowing performance may be used as the blower fan 134.

[0084] The motor 132 and the blower fan 134 are disposed in a center part of the blower unit accommodating part 220. The motor 132 may be coupled to the blower unit accommodating part 220 by using additional coupling members.

[0085] The shroud 136 guides cooling air into and out of the blower fan 134.

[0086] The blower fan 134 is disposed in the shroud 136. The shroud 136 includes an orifice 137 formed at a position corresponding to the position of the rotation center of the blower fan 134, and a discharge hole 139 formed in the direction of the cooling-air passage 230.

[0087] Cooling air is introduced into the shroud 136 through the orifice 137 and is discharged from the shroud 136 through the blower fan 134 and the discharge hole 139.

[0088] The shroud 136 may be coupled to the blower unit accommodating part 220 or the barrier cover 400 (described later). If necessary, the shroud 136 and the barrier cover 400 may be formed in one piece.

[0089] Cooling-air guide parts 222 are formed on both sides of the blower unit accommodating part 220. The cooling-air guide parts 222 guide cooling air from the evaporator accommodating part 210 to the shroud 136.

[0090] The cooling-air guide parts 222 may be narrowed as it goes upward. That is, the cooling-air guide parts 222 may be sloped or rounded as it goes upward.

[0091] In detail, the bottom side of the blower unit accommodating part 220 may have the same width as that of the topside of the evaporator accommodating part 210, and the topside of the blower unit accommodating part 220 may have the same width as that of the bottom side of the cooling-air passage 230 (described later). At this time, the topside of the blower unit accommodating part 220 has the same width as that of the discharge hole 139 of the shroud 136.

[0092] In addition, the blower unit accommodating part 220 is deeper than the evaporator accommodating part 210 and the cooling-air passage 230 so that the blower unit accommodating part 220 is spaced apart from the shroud 136.

[0093] In this case, cooling air supplied from the evaporator accommodating part 210 may smoothly flow to the orifice 137 through a gap between the blower unit accommodating part 220 and the shroud 136.

[0094] Since the evaporator accommodating part 210 and the blower unit accommodating part 220 have different depth, the evaporator accommodating part 210 and the blower unit accommodating part 220 form a stepped part. Thus, the thickness of the insulator disposed in the barrier 100 may be different at the evaporator accommodating part 210 and the blower unit accommodating part 220.

[0095] In detail, since the evaporator accommodating part 210 is shallower than the blower unit accommodating part 220, the insulator is thicker at the evaporator accommodating part 210 than at the blower unit accommodating part 220. Therefore, the evaporator 110 which is cooler than other parts may be reliably insulated.

[0096] In addition, owing to the structure, a wider cooling-air passage can be guaranteed at the blower unit 130. Although the thickness of the insulator is relatively thin at the blower unit accommodating part 220, since the temperature of the blower unit 130 is relatively higher than the evaporator 110, the blower unit 130 may be sufficiently insulated.

[0097] The evaporator accommodating part 210 and the blower unit accommodating part 220 which have different depths are connected through a connection part 240. The connection part 240 forms a boundary between the evaporator accommodating part 210 and the blower unit 130, and owing to the connection part 240, cooling air may flow smoothly into the blower unit accommodating part 220.

[0098] The cooling-air passage 230 is disposed at the topside of the blower unit accommodating part 220. The cooling-air passage 230 extends to an upper part of the barrier 100 so that cooling air discharged from the discharge hole 139 of the shroud 136 can be guided to the refrigerator compartment 40 and the freezer compartment 30.

[0099] The width of the cooling-air passage 230 may correspond to the width of the opened topside of the blower unit accommodating part 220 or the width of the discharge hole 139 of the shroud 136.

[0100] The cooling-air passage 230 is shallower than the blower unit accommodating part 220. Therefore, the insulator may be thicker at the cooling-air passage 230 than at the blower unit accommodating part 220.

[0101] That is, the insulator includes a first insulator part 310 at a position corresponding to the evaporator accommodating part 210, a second insulator part 320 at a position corresponding to the blower unit accommodating part 220, and a third insulator part 330 at a position corresponding to the cooling-air passage 230.

[0102] In detail, the first insulator part 310 is disposed between the first case 170 and the second case 180 at a position corresponding to the evaporator accommodating part 210, and the second and third insulator parts 320 and 330 are disposed between the first case 170 and the second case 180 at positions corresponding to the blower unit accommodating part 220 and the cooling-air passage 230.

[0103] That is, the cooling-air passage 230 may be defined as a space between the insulator (the third insulator part 330) and the barrier cover 400.

[0104] Owing to this structure, the insulator (310, 330) can be sufficiently provided at a side of the evaporator 110 where cooling air is generated and a side of the cooling-air passage 230 where the cooling air flows, and thus the refrigerator compartment 40 can be sufficiently insulated.

[0105] In addition, a sufficient cooling-air passage can be guaranteed at a side of the blower unit 130 through which cooling air flows from the evaporator accommodating part 210 to the cooling-air passage 230 while the flow direction of the cooling air is varied. Therefore, cooling air can flow smoothly through the blower unit 130.

[0106] The cooling-air passage 230 may be defined as a space between the barrier cover 400 and the second case 180. The cooling-air passage 230 may be formed by coupling the barrier cover 400 to a side of the second case 180.

[0107] The cooling-air outlet 232 is disposed on the topside of the cooling-air passage 230. The cooling-air outlet 232 may be disposed at a top center part of the barrier 100 and may be exposed to the refrigerator compartment 40. An outlet grill 234 is provided at the cooling-air outlet 232 to guide cooling air discharged to the refrigerator compartment 40.

[0108] A cooling-air distribution device 140 is disposed in the cooling-air passage 230 at a position corresponding to the cooling-air outlet 232. The cooling-air distribution device 140 is used to selectively supply cooling air from the cooling-air passage 230 to the cooling-air outlet 232.

[0109] The cooling-air distribution device 140 includes a damper, and a passage to the cooling-air outlet 232 is selectively opened and closed by the damper.

[0110] When the cooling-air distribution device 140 is opened, at least a part of cooling air guided through the cooling-air passage 230 may be discharged to the refrigerator compartment 40 through the cooling-air outlet 232.

[0111] On the other hand, if the cooling-air distribution device 140 is closed, cooling air guided through the cooling-air passage 230 may be discharged to the freezer compartment 30 but may not be discharged to the refrigerator compartment 40.

[0112] The barrier cover 400 is disposed at a side of the concave part 200. The barrier cover 400 is provided as an element of the barrier 100 to cover the concave part 200.

[0113] The barrier cover 400 forms a part of a side of the barrier 100, that is, a part of an inner wall of the freezer compartment 30. In a state where the barrier cover 400 is disposed on the barrier 100, the barrier cover 400 and the side surface of the barrier 100 form the same plane.

[0114] The barrier cover 400 may be formed of a one-piece plate or a plurality of parts. In the latter case, the barrier cover 400 may be divided into parts that cover the evaporator accommodating part 210, the blower unit accommodating part 220, and the cooling-air passage 230, respectively.

[0115] The other side surface of the barrier 100 opposite to the barrier cover 400 is formed into a flat shape without any protruded part to form a part of an inner wall of the refrigerator compartment 40. That is, both side surfaces of the barrier 100 may be flat.

[0116] A back surface of the barrier cover 400 corresponding to the evaporator 110 is brought into contact with the evaporator 110, and a mounting guide 420 is provided on the barrier cover 400 to guide the evaporator 110 when the barrier cover 400 and the evaporator 110 are coupled.

[0117] A side of the blower unit accommodating part 220 opened to the freezer compartment 30 is blocked by a back surface of the barrier cover 400 corresponding to the blower unit accommodating part 220 so that cooling air can be guide to the orifice 137 of the shroud 136.

[0118] A side of the cooling-air passage 230 opened to the freezer compartment 30 is blocked by a back surface of the barrier cover 400 corresponding to the cooling-air passage 230 so that cooling air can flow through the cooling-air passage 230.

[0119] A cover inlet 430 is formed in a lower end of the barrier cover 400 corresponding to the evaporator accommodating part 210. The cover inlet 430 guides cooling air from the freezer compartment 30 to the evaporator accommodating part 210.

[0120] A plurality of cover outlets 410 are formed in an upper part of the barrier cover 400 corresponding to the cooling-air passage 230. The cover outlets 410 may be arranged at predetermined intervals. Cooling air flowing through the cooling-air passage 230 may be introduced into the freezer compartment 30 through the cover outlets 410.

[0121] Mounting parts 440 are formed on both sides of the barrier cover 400. The barrier cover 400 may be fixed to the side surface of the barrier 100 by fastening the mounting parts 440 with coupling members (not shown).

[0122] Parts of the barrier 100 corresponding to the mounting parts 440 are recessed so that the mounting parts 440 may not protrude outwardly.

[0123] Hereinafter, an explanation will be given on an operation of the refrigerator 1 of the first example with reference to the accompanying drawings.

[0124] Fig. 7 is a view illustrating a cooling air flow state of the barrier 100 observed from a freezer compartment side, and Fig. 8 is a view illustrating a cooling air flow state of the barrier 100 observed from a refrigerator compartment side.

[0125] When the refrigerator 1 is powered, the refrigerator 1 operates on a refrigeration cycle. During the refrigeration cycle, cooling air is generated from the evaporator 110.

[0126] First, supply of cooling air to the freezer compartment 30 will be explained with reference to Fig. 7.

[0127] To supply cooling air to the freezer compartment 30, the blower fan 134 is rotated by the motor 132. As the blower fan 134 operates, cooling air is introduced into the cover inlet 430, and the cooling air exchanges heat with the evaporator 110.

[0128] Then, the cooling air flows upward in the evaporator accommodating part 210 and enters the inside of the blower unit accommodating part 220 along the connection part 240. In the blower unit accommodating part 220, the cooling air is introduced into the orifice 137 of the shroud 136 along the cooling-air guide parts 222.

[0129] The cooling air introduced into the shroud 136 is discharged through the discharge hole 139 of the shroud 136 and is guided to the cooling-air passage 230. The cooling air guided to the cooling-air passage 230 is supplied into the freezer compartment 30 through the cover outlets 410 of the barrier cover 400.

[0130] Since the cover outlets 410 are arranged vertically at a plurality of positions, the cooling air can be uniformly discharged into the freezer compartment 30 through the cover outlets 410. The inside of the freezer compartment 30 is cooled by the cooling air, and then the cooling air is introduced into the cover inlet 430 again by the blower fan 134. In this way, the cooling air is circulated.

[0131] At this time, if the cooling-air distribution device 140 is in a closed state, the cooling air is not supplied to the refrigerator compartment 40 but is supplied only to the freezer compartment 30.

[0132] The evaporator accommodating part 210, the blower unit accommodating part 220, and the cooling-air passage 230 are covered by the barrier cover 400 which has a relatively small thickness. Therefore, there may be conductive heat exchange between the inside of the freezer compartment 30 and the cooling air flowing in the concave part 200.

[0133] Supply of cooling air to the refrigerator compartment 40 will be explained with reference to Fig. 8.

[0134] When the blower fan 134 is operated, cooling air is introduced into the barrier 100 through the cover inlet 430 and the cooling-air inlet 212. Then, the cooling air exchanges heat with the evaporator 110 and flows upward by the operation of the blower fan 134.

[0135] The cooling air flows into the cooling-air passage 230 through the blower unit 130 in the same way as that described with reference to Fig. 7. Thus, a description thereof will not be repeated.

[0136] In the cooling-air passage 230, the cooling air is guided to the cooling-air distribution device 140. To supply the cooling air to the refrigerator compartment 40, the cooling-air distribution device 140 is in an opened state. At least a part of the cooling air flowing in the cooling-air passage 230 is discharged to the cooling-air outlet 232 through the cooling-air distribution device 140.

[0137] Then, the cooling air is supplied into the refrigerator compartment 40 from the cooling-air outlet 232 to cool the inside of the refrigerator compartment 40. After the cooling air flows throughout the refrigerator compartment 40, the cooling air is introduced again into the barrier 100 through the cooling-air inlet 212, and then the cooling air exchanges heat with the evaporator 110.

[0138] Hereinafter, a second example and an embodiment of the invention will be explained. The second example and the embodiment of the invention are the same as the first example except for the inner structure of the barrier. Thus, the difference will be mainly explained, and the same elements as the first example will be denoted by the same reference numerals. Descriptions of the same elements will not be repeated.

[0139] Fig. 9 is a partial exploded perspective view illustrating a barrier according to a second example, and Fig. 10 is a sectional view illustrating the barrier according to the second example.

[0140] Referring to Figs. 9 and 10, a barrier 100 of the second example includes a barrier main body 101 by which a freezer compartment 30 and a refrigerator compartment 40 is separated, a concave part 600 formed by recessing at least a part of the barrier 100, and an insulator 500 disposed in the concave part 600.

[0141] The barrier main body 101 includes a first case 170 facing the refrigerator compartment 40, a second case 180 facing the freezer compartment 30, and an insulator part 630 filled between the first case 170 and the second case 180.

[0142] The concave part 600 is formed by recessing at least a part of the second case 180, and the bottom surface of the concave part 600 forms a side surface of the first case 170.

[0143] The insulator part 630 is disposed in the barrier main body 101 around the concave part 600. That is, a part of the barrier main body 101 where the concave part 600 is not formed is constituted by the first case 170, the second case 180, and the insulator part 630.

[0144] The insulator 500 is coupled to a side of the first case 170. That is, the insulator 500 is coupled to the concave part 600.

[0145] In detail, the insulator 500 includes an evaporator accommodating part 510 in which an evaporator 110 is accommodated, a blower unit accommodating part 520 disposed above the evaporator accommodating part 510 to receive a blower unit 130, and a cooling-air passage 530 to which cooling air is blown from the blower unit 130.

[0146] The insulator 500 is thinner at the blower unit accommodating part 520 than at the evaporator accommodating part 510 and the cooling-air passage 530.

[0147] Owing to this structure, the insulator 500 can be sufficiently provided at the evaporator accommodating part 510 and the cooling-air passage 530, and a sufficient cooling-air passage can be formed at the blower unit accommodating part 520.

[0148] An inlet corresponding part 512 is disposed at a lower part of the insulator 500 to allow an inflow of cooling air from the refrigerator compartment 40, and an outlet corresponding part 532 is formed to allow an outflow of cooling air from the cooling-air passage 530 to the refrigerator compartment 40.

[0149] The inlet corresponding part 512 is disposed at a position corresponding to a cooling-air inlet 212, and the outlet corresponding part 532 is disposed at a position corresponding to a cooling-air outlet 232.

[0150] Referring to Fig. 10, a barrier cover 400 is brought into contact with a side of the insulator 500. Particularly, the barrier cover 400 may be brought into contact with the insulator 500 at a position corresponding to the cooling-air passage 530.

[0151] In this case, since a gap between the concave part 600 and the barrier cover 400 except for the cooling-air passage 530 can be insulated by the insulator 500, reliable insulation may be guaranteed.

[0152] In this way, since the evaporator accommodating part 510, the blower unit accommodating part 520, and the cooling-air passage 530 are directly formed in the insulator 500, reliable insulation can be guaranteed.

[0153] In addition, since the insulator 500 can be placed on an upper part of the first case 170 and coupled with the barrier cover 400, assembling of the insulator 500 may be easily performed.

[0154] Fig. 11 is a perspective view illustrating a barrier according to an embodiment of the invention.

[0155] Referring to Fig. 11, a barrier 100 of the embodiment includes a first case 170 facing a refrigerator compartment 40, a second case 180 facing a freezer compartment 30, and an insulator disposed between the first case 170 and the second case 180.

[0156] The insulator includes a vacuum insulator 610 and a polyurethane foam 620.

[0157] The vacuum insulator 610 includes a sealing part formed of a film having a thermal deposition layer, and a core material disposed in the sealing part. The core material may include an open cell rigid plastic foam or an inorganic substance such as inorganic fiber and inorganic powder.

[0158] The sealing part may be formed of a complex plastic laminate film and may be securely fixed to the surface of the core material by thermal deposition.

[0159] The vacuum insulator 610 may be attached to an inner side of the second case 180, and the polyurethane foam 620 may be filled between the vacuum insulator 610 and the first case 170. Owing to the polyurethane foam 620, the insulating performance of the insulator may be improved.

[0160] In this way, since the vacuum insulator 610 and the polyurethane foam 620 are disposed in the barrier 100, the insulating performance of the barrier 100 can be high although the inner space of the barrier 100 is not enough.

[0161] Hereinafter, a third example will now be described. Since the current example is the same as the first example except for an inner configuration of a barrier, different parts between the first and third examples will be described principally, and a description of the same parts thereof will be omitted.

[0162] Fig. 12 is an exploded perspective view illustrating a barrier according to the third example. Fig. 13 is a vertical sectional view illustrating the barrier.

[0163] Referring to Figs. 12 and 13, a barrier 100 according to the current example includes a barrier main body 101 and a barrier cover 400. A freezer compartment 30 and a refrigerator compartment 40 are separated by the barrier main body 101. The barrier main body 101 extends vertically in a cabinet 10, and an evaporator 110 and a blower unit 130 are disposed in the barrier main body 101.

[0164] The barrier main body 101 includes cases which form inner sides of the freezer compartment 30 and the refrigerator compartment 40. The cases include a first case 170 forming a side of the refrigerator compartment 40 and a second case 180 forming a side of the freezer compartment 30. An insulator is disposed between the first case 170 and the second case 180.

[0165] A concave part 200 is disposed in a freezer compartment side of the barrier 100. The concave part 200 includes an evaporator accommodating part 210, a blower unit accommodating part 220, and a cooling-air passage 230.

[0166] A cooling-air inlet 212 and an inlet grill 214 are disposed in the lower portion of the barrier 100, and a cooling-air outlet 232 and an outlet grill 234 are disposed in the upper portion of the barrier 100, so that cooling air in the refrigerator compartment 40 can circulate within the barrier 100. A drain pan 120 for discharging defrosted water is disposed under the evaporator 110.

[0167] The blower unit 130 including a motor 132, a blower fan 134, and a shroud 136 is disposed in the blower unit accommodating part 220. The blower unit 130 may suck cooling air along a rotation shaft and discharge the air in a radial direction, so as to discharge the air upward to the cooling-air passage 230.

[0168] The cooling-air passage 230 guides cooling air discharged from a discharge hole 139 of the shroud 136 to the refrigerator compartment 40 and the freezer compartment 30, and extends up to the upper portion of the barrier 100.

[0169] The cooling-air passage 230 may be defined as a space between a barrier cover 400 and a second case 180, and be formed by coupling the barrier cover 400 to a portion of the second case 180.

[0170] A cooling-air distribution device 140 is provided to the cooling-air passage 230 to correspond to the cooling-air outlet 232. In detail, the cooling-air distribution device 140 may be disposed between the cooling-air outlet 232 and upper outlets 411 to be described later.

[0171] The cooling-air distribution device 140 includes a damper member 142 that is openable, and an actuator 145 that is driven to open and close the damper member 142.

[0172] When the damper member 142 is opened, a portion of cooling air can be discharged from the cooling-air passage 230 to the cooling-air outlet 232, and be introduced to the refrigerator compartment 40. On the contrary, when the damper member 142 is closed, cooling air guided through the cooling-air passage 230 is not discharged to the cooling-air outlet 232, and is discharged only to the freezer compartment 30.

[0173] The barrier cover 400 is disposed at a side of the concave part 200. The barrier cover 400 constitutes the barrier 100 to cover the concave part 200. The barrier cover 400 may have a plate shape to correspond to the size of the concave part 200, and be divided into an upper plate and a lower plate.

[0174] A plurality of cover outlets 411, 415, and 419 are disposed in the upper portion of the barrier cover 400 to correspond to the cooling-air passage 230. The cover outlets 411, 415, and 419 may be spaced predetermined distances from one another. Cooling air flowing through the cooling-air passage 230 may be introduced to the freezer compartment 30 through the cover outlets 411, 415, and 419.

[0175] The cover outlets 411, 415, and 419 include: the upper outlets 411 disposed at the upper end of the barrier cover 400 and facing the cooling-air outlet 232; a plurality of middle outlets (also denoted by 415) disposed under the upper outlets 411 and spaced apart therefrom; and a plurality of lower outlets (also denoted by 419) disposed under the middle outlets 415 and spaced apart therefrom,

[0176] The middle outlets 415 and the lower outlets 419 include a plurality of outlets that are spaced apart from one another at the front and rear sides of the barrier cover 400.

[0177] For convenience in description, the upper, middle, and lower outlets 411, 415, and 419 are called first, second, and third outlets, respectively.

[0178] Hereinafter, a configuration of cover inlets 430 and the cover outlets 411, 415, and 419 will now be described with reference to the accompanying drawings.

[0179] Fig. 14 is a sectional view taken along line 14-14' of Fig. 12. Fig. 15 is a sectional view taken along line 15-15' of Fig. 12. Fig. 16 is a sectional view taken along line 16-16' of Fig. 12.

[0180] Referring to Fig. 14, the upper outlet 411 includes: a first outlet hole 413 for discharging cooling air from the inside of the barrier 100 to the freezer compartment 30; and first guide ribs 412 for guiding the cooling air discharged from the first outlet hole 413 to the lower portion of the freezer compartment 30.

[0181] In detail, the first guide ribs 412 include a plurality of ribs that are vertically spaced apart from one another within the first outlet hole 413. The first guide ribs 412 are inclined downward or rounded to be directed to the front side of the barrier cover 400.

[0182] Thus, while being discharged from the first outlet hole 413, cooling air can flow to the lateral and rear sides of the freezer compartment 30. As such, since cooling air is discharged downward from the upper outlets 411, the cooling air can efficiently circulate within the freezer compartment 30.

[0183] Alternatively, at least one part of the first guide ribs 412 may be inclined forward, and the other part may be inclined rearward. That is, the first guide ribs 412 may be configured as second guide ribs 416 and third guide ribs 417, which will be described later.

[0184] In this case, cooling air discharged from the first outlet hole 413 can flow to the front and rear sides of the freezer compartment 30.

[0185] Referring to Fig. 15, the middle outlets 415 include a second outlet hole 418a disposed in the rear portion of the barrier cover 400, and the second guide ribs 416 disposed within the second outlet hole 418a.

[0186] In detail, the second guide ribs 416 include a plurality of ribs that are horizontally spaced apart from one another within the second outlet hole 418a. The second guide ribs 416 are round to be directed to the rear side of the barrier cover 400. Thus, while being discharged from the second outlet hole 418a, cooling air can flow to the rear side of the freezer compartment 30.

[0187] The middle outlet 415 includes a third outlet hole 418b spaced forward from the second outlet hole 418a, and the third guide ribs 417 disposed within the third outlet hole 418b.

[0188] In detail, the third guide ribs 417 include a plurality of ribs that are laterally spaced apart from one another within the third outlet hole 418b. The third guide ribs 417 are round to be directed to the front side of the barrier cover 400. Thus, while being discharged from the third outlet hole 418b, cooling air can flow to the front side of the freezer compartment 30.

[0189] As such, since the second guide ribs 416 are inclined rearward and the third guide ribs 417 are inclined forward, cooling air discharged from the middle outlet 415 can be uniformly dispersed to the freezer compartment 30.

[0190] Since an inner structure of the lower outlets 419 is the same as that of the middle outlets 415, a description thereof will be omitted.

[0191] As a result, cooling air discharged from the upper outlets 411 can flow to the lateral lower side of the freezer compartment 30, and cooling air discharged from the middle outlets 415 and the lower outlets 419 can flow to the front and rear sides of the freezer compartment 30. Thus, cooling air can uniformly flow within the entire space of the freezer compartment 30.

[0192] Since the cooling air discharged from the cover outlets 411, 415, and 419 has a lower temperature that that of the cooling air existing within the freezer compartment 30, the cooling air discharged from the cover outlets 411, 415, and 419 can flow down to the lower portion of the freezer compartment 30.

[0193] Referring to Fig. 16, the cover inlet 430 includes an inlet hole 434 through which cooling air discharged from the freezer compartment 30 flows to the inside of the barrier 100, that is, to the evaporator 110, and inlet guides 432 disposed within the inlet hole 434 to guide a flow of cooling air.

[0194] In detail, the inlet guides 432 include a plurality of ribs that are vertically spaced apart from each other within the inlet hole 434. The inlet guides 432 are round to be directed to the upper side of the barrier cover 400. Thus, while cooling air is introduced to the barrier 100 through the inlet hole 434, the cooling air can flow to the upper side of the barrier 100.

[0195] Since the evaporator 110 is disposed at the upper side of the inlet hole 434, the cooling air introduced into the barrier 100 can efficiently flow to the evaporator 110. That is, when suction force is applied to the inlet hole 434 while a fan motor assembly (also denoted by 130) is driven, cooling air is smoothly guided from the freezer compartment 30 to the evaporator 110, thereby reducing a flow loss of the cooling air.

[0196] As described above, the cooling air discharged from the cover outlets 411, 415, and 419 may uniformly cool the freezer compartment 30 and move downward, and be guided to the evaporator 110 through the cover inlets 430. As a result, cooling air can effectively circulate within the barrier 100 and the freezer compartment 30.

[0197] Fig. 17 is a view illustrating a cooling air flow state of the barrier observed from a refrigerator compartment side. Fig. 18 is a sectional view taken along line 18-18' of Fig. 17.

[0198] A state where cooling air is supplied to the refrigerator compartment 40 will be described with reference to Figs. 17 and 18.

[0199] When the blower fan 134 is driven, cooling air is introduced from the freezer compartment 30 and the refrigerator compartment 40 into the barrier 100 through the cover inlets 430 and the cooling-air inlet 212. The cooling air exchanges heat in the evaporator 110, and is moved upward according to the driving of the blower fan 134.

[0200] Since a process that the cooling air flows to the cooling-air passage 230 through the blower unit 130 is the same as that illustrated in Fig. 10, a description thereof will be omitted.

[0201] The cooling air guided through the cooling-air passage 230 is supplied up to the damper member 142 at the upper end of the cooling-air passage 230. When the cooling air is supplied to the refrigerator compartment 40, the damper member 142 is opened. At least one portion of the cooling air flowing through the cooling-air passage 230 is discharged to the cooling-air outlet 232 through the cooling-air distribution device 140.

[0202] The cooling air supplied into the refrigerator compartment 40 through the cooling-air outlet 232 cools the inside of the refrigerator compartment 40. The cooling air circulating within the refrigerator compartment 40 is introduced into the barrier 100 through the cooling-air inlet 212, and can exchange heat.

[0203] The outlet grill 234 includes a refrigerator compartment outlet hole 238 for discharging cooling air, and a plurality of guide ribs for guiding a flow direction of discharged cooling air.

[0204] The guide ribs include a central guide 235 vertically disposed in an approximately central portion of the refrigerator compartment outlet hole 238, and a plurality of lateral guides spaced apart from the central guide 235 to lateral sides of the outlet grill 234. The lateral guides are inclined from a vertical line.

[0205] The lateral guides include first lateral guides 236 adjacent to the central guide 235, and second lateral guides 237 spaced apart from the first lateral guides 236 to lateral ends of the outlet grill 234.

[0206] An inclination angle β of the first lateral guides 236 from the vertical line is smaller than an inclination angle α of the second lateral guides 237 from the vertical line. That is, an inclination angle of the lateral guides gradually increases from the central guide 235 to the lateral ends.

[0207] In this case, cooling air guided by the lateral guides can be uniformly discharged to the front and rear portions of the refrigerator compartment 40.

[0208] Cooling air guided by the central guide 235 is discharged to a lateral surface of the refrigerator compartment 40, and cooling air guided by the first and second lateral guides 236 and 237 is discharged to the front and rear portions of the refrigerator compartment 40.

[0209] Although not shown, a configuration of the inlet grill 214 may correspond to that of the outlet grill 234. That is, the inlet grill 214 may include a central guide and lateral guides to introduce cooling air from the front, rear, and lateral portions of the refrigerator compartment 40.

[0210] Alternatively, the inlet grill 214 may have the same configuration as that of the cover inlets 430.

[0211] As described above, since cooling air discharged to the refrigerator compartment 40 can be uniformly dispersed in a storage space of the refrigerator compartment 40, the cooling effect thereof can be improved.

[0212] Although the outlet grill 234 and the cover outlets 411, 415, and 419 are different in configuration from one another in the current example, the outlet grill 234 may have the configuration of one of the cover outlets 411, 415, and 419, or the cover outlets 411, 415, and 419 may have the configuration of the outlet grill 234.

[0213] For convenience in description, the outlet grill 234 and the cover outlets 411, 415, and 419 may be referred to as a 'cooling-air discharge part', and the cover inlets 430 and the cooling-air inlet 212 may be referred to as a 'cooling-air introduction part'.

[0214] Hereinafter, a fourth example will now be described. Since the current example is the same as the first example except for an inner configuration of a barrier, different parts between the first and fourth examples will be described principally, and a description of the same parts thereof will be omitted.

[0215] Fig. 19 is an exploded perspective view illustrating a barrier according to the fourth example. Fig. 20 is a vertical sectional view illustrating the barrier. Fig. 21 is an enlarged view illustrating a region A of Fig. 20.

[0216] Referring to Figs. 19 to 21, inner cases 150 defining a freezer compartment 30 and a refrigerator compartment 40 are disposed in both side surfaces of a barrier 100, respectively. For convenience in description, an inner case defining the freezer compartment 30 is referred to as a first inner case 101, and an inner case defining the refrigerator compartment 40 is referred to as a second inner case 103. A front plate 105 forms the front surface of the barrier 100. The front plate 105 may be fixed to the front ends of the first and second cases 101 and 103. An inner space of the barrier 100, that is, a space between the front plate 105 and the first and second cases 101 and 103 may be filled with a foaming agent to form an insulation layer 300. The insulation layer 300 uniformly fills the entire inner space of the barrier 100.

[0217] A concave part 200 is disposed in a surface of the barrier 100, that is, in a surface adjacent to the freezer compartment 30 in the current example. The concave part 200 is formed by partially recessing the surface of the barrier 100. Substantially, the concave part 200 may be formed by partially recessing the first inner case 101 to the refrigerator compartment 40. The concave part 200 accommodates an evaporator 110 and a blower unit 130, which will be described later.

[0218] In more detail, the concave part 200 includes an evaporator accommodating part 210, a blower unit accommodating part 220, and a cooling-air passage 230. The evaporator accommodating part 210 accommodates the evaporator 110, and the blower unit accommodating part 220 accommodates the blower unit 130. Cooling air to be supplied to the freezer compartment 30 and the refrigerator compartment 40 flows through the cooling-air passage 230.

[0219] A cooling-air inlet 212 is disposed in the lower portion of the barrier 100, and an inlet grill 214 is installed on the cooling-air inlet 212. A cooling-air outlet 232 is disposed in the upper portion of the barrier 100, and an outlet grill 234 is installed on the cooling-air outlet 232. Thus, cooling air can circulate in the refrigerator compartment 40 and the barrier 100.

[0220] A plurality of first coupling rib seat parts 216 are disposed in portions of the barrier 100, that is, in portions of the first inner case 101 adjacent to the evaporator accommodating part 210. First coupling ribs 416 to be described later are seated on the first coupling rib seat parts 216. A portion of the barrier 100, that is, a portion of the first inner case 101 adjacent to the evaporator accommodating part 210 is recessed to the refrigerator compartment 40 to form the first coupling rib seat part 216. A plurality of first coupling holes 217 are disposed in the first coupling rib seat parts 216. The first coupling holes 217 are coupled with first coupling pieces (not shown) for fixing a lower cover 401 to be described later.

[0221] The blower unit accommodating part 220 is disposed in the central portion of the concave part 200 to correspond to the upper side of the evaporator accommodating part 210. Substantially, the blower unit accommodating part 220 provides a space for accommodating the blower unit 130 and connects the evaporator accommodating part 210 to the cooling-air passage 230 to discharge cooling air from the evaporator accommodating part 210 to the cooling-air passage 230.

[0222] Cooling-air guide parts 222 are disposed at both sides of the blower unit accommodating part 220. Cooling air guided from the evaporator accommodating part 210 to the blower unit accommodating part 220 is guided to a shroud 136 to be described later by the cooling-air guide parts 222. In the current example, the width of the blower unit accommodating part 220 gradually decreases upward to form the cooling-air guide parts 222. For example, the lower end of the blower unit accommodating part 220 may have the same width as that of the upper end of the evaporator accommodating part 210, and the upper end of the blower unit accommodating part 220 may have the same width as that of the lower end of the cooling-air passage 230, so as to form the cooling-air guide parts 222. In this case, the cooling-air guide parts 222 may be inclined at a preset angle, or be round with a preset curvature.

[0223] The cooling-air passage 230 is disposed in the upper portion of the concave part 200 to correspond to the upper side of the blower unit accommodating part 220. Cooling air sucked into the concave part 200 through the cooling-air inlet 212 and cover inlets 430 to be described later, substantially, cooling air sucked into the evaporator accommodating part 210 and exchanging heat with the evaporator 110 is guided to the freezer compartment 30 and the refrigerator compartment 40 by the cooling-air passage 230. To this end, the cooling-air passage 230 extends from the upper end of the blower unit accommodating part 220 to the upper end of the barrier 100.

[0224] A barrier cover 400 to be described later covers the cooling-air passage 230 to substantially form a cooling-air passage through which cooling air flows. The cooling-air outlet 232 is disposed at the upper end of the cooling-air passage 230. Substantially, the cooling-air outlet 232 is formed by partially cutting the second inner case 103. The cooling-air outlet 232 functions as an outlet for discharging cooling air to the refrigerator compartment 40. The outlet grill 234 may be installed on the cooling-air outlet 232 to guide the direction of cooling air discharged to the refrigerator compartment 40.

[0225] A plurality of second coupling rib seat parts 244 and a plurality of second coupling rib seat parts 236 are disposed in a side of the barrier 100, that is, in portions of the first inner case 101 adjacent to the blower unit accommodating part 220 and the cooling-air passage 230. The portions of the first inner case 101 adjacent to the blower unit accommodating part 220 and the cooling-air passage 230 are partially recessed to form the second coupling rib seat parts 244 and 236. Second coupling holes 245 are disposed in the second coupling rib seat parts 244, and second coupling holes 237 are disposed in the second coupling rib seat parts 236. The second coupling holes 245 and 237 are coupled with second coupling pieces (not shown) for fixing an upper cover 402 to be described later.

[0226] In the current example, the depth of the blower unit accommodating part 220 is greater than those of the evaporator accommodating part 210 and the cooling-air passage 230. In other words, a portion of the concave part 200 corresponding to the blower unit accommodating part 220 is further recessed than the rest of the concave part 200 corresponding to the evaporator accommodating part 210 and the cooling-air passage 230. Thus, the thickness of the insulation layer 300 is substantially greater in inner portions of the barrier 100 corresponding to the evaporator accommodating part 210 and the cooling-air passage 230 than in an inner portion of the barrier 100 corresponding to the blower unit accommodating part 220.

[0227] Thus, an insulating performance of the evaporator accommodating part 210 in which the evaporator 110 having a relatively low temperature is disposed can be ensured, and cooling air can flow through the evaporator accommodating part 210, the blower unit accommodating part 220, and the cooling-air passage 230. In other words, a thickness of the insulation layer 300 corresponding to the evaporator accommodating part 210 in which the evaporator 110 having a relatively low temperature is disposed is relatively increased to ensure that the barrier 100 insulates the space between the freezer compartment 30 and the refrigerator compartment 40 and efficiently prevent a heat exchange between the evaporator accommodating part 210 and both the freezer compartment 30 and the refrigerator compartment 40, especially, prevent a heat exchange between the evaporator accommodating part 210 and the refrigerator compartment 40. In addition, substantially, cooling air can flow through a gap between the upper end of the evaporator accommodating part 210 and the lower end of the blower unit accommodating part 220, and a gap between the lower end of the cooling-air passage 230 and the upper end of the blower unit accommodating part 220.

[0228] An inclination guide surface 240 is disposed between the evaporator accommodating part 210 and the blower unit accommodating part 220. The inclination guide surface 240 compensates for the thickness difference of the insulation layer 300 between the evaporator accommodating part 210 and the blower unit accommodating part 220 as described above, so as to prevent a stepped part from being formed between the evaporator accommodating part 210 and the blower unit accommodating part 220. Thus, the inclination guide surface 240 may be inclined from the upper end of the evaporator accommodating part 210 to the lower end of the blower unit accommodating part 220.

[0229] The concave part 200 is covered with the barrier cover 400. The barrier cover 400 may include a plate that has a predetermined shape and a predetermined size, that is, has a shape and a size to cover the concave part 200. Substantially, it may be considered that the barrier cover 400 is coupled to the first inner case 101 to form a side surface of the freezer compartment 30. For example, a surface of the barrier cover 400 exposed to the freezer compartment 30 may be substantially flush with the rest of the first inner case 101 except for the concave part 200.

[0230] In the current example, the barrier cover 400 includes the lower cover 401 and the upper cover 402. The lower cover 401 covers the evaporator accommodating part 210. The upper cover 402 covers the blower unit accommodating part 220 and the cooling-air passage 230. Alternatively, the barrier cover 400 may be provided in the form of a single member. Alternatively, the barrier cover 400 may be constituted by two or more parts, considering the size of the concave part 200 and a service such as a repair and a replacement of parts.

[0231] A mounting guide 420 is disposed on an inner surface of the lower cover 401. The mounting guide 420 supports the evaporator 110. The lower cover 401 includes the cover inlet 430. The cover inlets 430 function as inlets through which cooling air is sucked from the freezer compartment 30 to the evaporator accommodating part 210.

[0232] The lower cover 401 includes the first coupling ribs 416. When the lower cover 401 covers the evaporator accommodating part 210, the first coupling ribs 416 are seated on the first coupling rib seat parts 216. The first coupling ribs 416 have third through holes 417, respectively. The first coupling pieces, coupled to the first coupling holes 217 for fixing the lower cover 401 to the barrier 100, pass through the third through holes 417.

[0233] The upper cover 402 includes cover outlets 410. The cover outlets 410 functions as outlets for discharging cooling air to the freezer compartment 30. The cover outlets 410 are formed by partially cutting the upper cover 402 to correspond to the cooling-air passage 230.

[0234] The upper cover 402 includes second coupling ribs 424. When the upper cover 402 covers the blower unit accommodating part 220 and the cooling-air passage 230, the second coupling ribs 424 are seated on the second coupling rib seat parts 244 and 236. The second coupling ribs 424 have second through holes 425, respectively. The second coupling pieces, coupled to the second coupling holes 245 and 237, pass through the second through holes 425.

[0235] A first sealing member 418 and a second sealing member 426 are disposed on a border of the lower cover 401 and a border of the upper cover 402, respectively. The first and second sealing members 418 and 426 prevent cooling air from leaking out of the concave part 200, that is, to the freezer compartment 30. To this end, the first and second sealing members 418 and 426 substantially seal a gap between the lower cover 401 and the barrier 100, a gap between the upper cover 402 and the barrier 100, and a gap between the lower cover 401 and the upper cover 402, that is, a gap between the upper end of the lower cover 401 and the lower end of the upper cover 402.

[0236] The evaporator accommodating part 210 accommodates the evaporator 110. The evaporator 110 has a shape and a size to be accommodated by the evaporator accommodating part 210. For example, the evaporator 110 includes a refrigerant tube 112 having a serpentine shape, a plurality of fins 114 through which the refrigerant tube 112 passes, and two heads 116 supporting the refrigerant tube 112. The refrigerant tube 112 may have the same distance from both ends of the fins 114. For example, the evaporator 110 may be a multi flow type condenser including a refrigerant tube between headers disposed at both sides.

[0237] A drain pan 120 is installed on the evaporator accommodating part 210 to discharge defrosted water generated from the evaporator 110 in an defrosting operation to the outside of the barrier 100, particularly, to a machine room.

[0238] The blower unit 130 including a motor 132, a blower fan 134, and a shroud 136 is installed within the blower unit accommodating part 220. Thus, air can be introduced into the barrier 100 from the freezer compartment 30 and the refrigerator compartment 40, and exchange heat, and then, be discharged to the freezer compartment 30 and the refrigerator compartment 40.

[0239] A cooling-air distribution device 140 is provided to the cooling-air passage 230 to control the amount of cooling air discharged to the refrigerator compartment 40 through the cooling-air outlet 232.

[0240] Referring to Fig. 21, a catch slot 218 and a catch hook 117 are provided to the evaporator accommodating part 210 and the evaporator 110, respectively, to fix the evaporator 110 to the evaporator accommodating part 210. That is, the catch slot 218 is disposed in a surface of the evaporator accommodating part 210. The catch hook 117 is provided to the evaporator 110, as described above. In the current example, the catch slot 218 is provided in duplicate, and the catch hook 117 is also provided in duplicate, but the number thereof is not limited thereto.

[0241] In more detail, a portion of the first inner case 101 forming a surface of the evaporator accommodating part 210 is cut in a vertical elongated shape to form the catch slot 218. A sealing tape 219 is attached to an inner surface of the barrier 100 corresponding to the catch slot 218, that is, to an inner surface of the first inner case 101. The sealing tape 219 prevents the foaming agent forming the insulation layer 300 from leaking through the catch slot 218.

[0242] The catch hook 117 extends from a surface of the evaporator 110. Although the catch hook 117 extends substantially from the upper end of the head 116 in the current example, the catch hook 117 may be fixed as a separate part to the head 116.

[0243] The catch hook 117 has an approximately L shape, as a whole. In more detail, the catch hook 117 includes an extension part 118 and a catch part 119. The extension part 118 extends approximately in the horizontal direction from a surface of the evaporator 110. The catch part 119 extends downward from the front end of the extension part 118. In this case, the length of the catch part 119 is smaller than that of the catch slot 218. Thus, the catch part 119 can pass through the catch slot 218. In the state where the catch hook 117, that is, the extension part 118 and the catch part 119 pass through the catch slot 218, when the evaporator 110 moves downward because of its weight, the catch part 119 is caught to the catch slot 218 to fix the evaporator 110. At this point, the sealing tape 219 is torn by the catch part 119.

[0244] Figs. 22 to 24 are views for explaining processes of fixing an evaporator of a refrigerator according to the fourth example.

[0245] Referring to Fig. 22, a sealing tape 219 is attached to a back surface of a first inner case 101. Here, the sealing tape 219 has a configuration and size enough to shield a catch slot 218. Also, the sealing tape 219 is attached to the back surface of the first inner case 101 corresponding to the catch slot 218.

[0246] Referring to Fig. 23, the first inner case 101 and a second inner case 103 are coupled to each other to form a barrier 100. A foaming agent is injected into the barrier 100. Thus, the foaming liquid injected into the barrier 100 is solidified to form an insulation layer 300.

[0247] Referring to Fig. 24, an evaporator 110 is received into an evaporator accommodating part 210. Here, the evaporator 110 is moved to allow a catch hook 117 to pass through the catch slot 218. Thus, the catch hook 117, i.e., an extension part 118 and a catch part 119 tears the sealing tape 219

[0248] An external force applied to the evaporator 110 is removed. Thus, since the evaporator 110 is moved downward by its self-weight, the catch hook 117 is caught on the catch slot 218. (See Fig. 5)

[0249] As described above, the evaporator 110 is received into the evaporator accommodating part 210, the evaporator 110 is substantially further spaced from a refrigerator compartment 40 when compared to a freezer compartment 30. That is to say, since the insulation layer 300 between the refrigerator compartment 40 and the evaporator accommodating part 210 is relatively thicker than that of the insulator layer 300 between the freezer compartment 30 and the evaporator accommodating part 210, insulation performance between the refrigerator compartment 40 and the evaporator accommodating part 210 may be secured. Thus, heat exchange between the evaporator accommodating part 210 and the refrigerator compartment 40 having a relatively high temperature than that of the evaporator accommodating part 210 may be further efficiently prevented. That is, it may prevent a temperature within the refrigerator compartment 40 having the relatively high temperature than that of the evaporator accommodating part 210 from being decreased by low-temperature cooling air flowing into the evaporator 110. Summarily, an effect of the evaporator 110 with respect to the refrigerator compartment 40 may be minimized to substantially prevent products received in the refrigerator compartment 40 from being over-cooled.

[0250] The evaporator 110 may include other parts for mounting except the above-described parts. Hereinafter, this will be described in detail with reference to the accompanying drawings. Also, since other parts that are not shown in drawings are equal to those of the foregoing fourth example, their detail descriptions will be omitted.

[0251] Figs. 25 to 27 are sectional view illustrating another structure for disposing the evaporator.

[0252] Referring to Fig. 25, in the current example, a plurality of catch spaces 710 is defined in a first inner case 101 corresponding to an inner surface of an evaporator accommodating part 210. A portion of the inner surface of the evaporator accommodating part 210, i.e., a portion of the first inner case 101 may be recessed to define the catch spaces 710. Alternatively, the catch space 710 may be separately defined by a member fixed to a back surface of the first inner case 101.

[0253] In detail, the catch space 710 includes an entrance part 712 and a catch groove 716. An entrance hole 714 horizontally communicating with the evaporator accommodating part 210 is defined in the entrance part 712. The catch groove 716 is disposed under the entrance part 712. Substantially, a bottom surface of the entrance part 712 may be recessed downward to define the catch groove 716. The catch groove 716 vertically communicates with the entrance part 712, but does not communicate with the evaporator accommodating part 210.

[0254] A catch hook 117 is disposed in the evaporator 110. The catch hook 117 includes an extension part 118 and a catch part 119. The catch hook 117 may be substantially same as that of the first example. However, in the current example, the catch hook 117, i.e., the catch part 119 may be substantially have a length less than that of the entrance hole 714.

[0255] In the current example, when the evaporator is moved downward by its self-weight in a state where the catch hook 117 passes through the entrance hole 714 and is disposed inside the catch space 710, i.e., the entrance part 712, the catch part 119 is substantially caught in the catch groove 716. Thus, the evaporator 110 is fixed to the evaporator accommodating part 210 in a state where it is accommodated in the evaporator accommodating part 210.

[0256] Also, in the current example, since the catch slot 218 (see Fig. 21) according to the first example is substantially omitted, a portion of the first inner case 101 defining the evaporator accommodating part 210 is not cut. Thus, according to the current example, it may certainly prevent a foaming agent from leaking through the catch slot 218. Also, according to the current example, a member such as a sealing tape 219 (see Fig. 21) for shielding the catch slot 218 and a process for fixing the member may be omitted.

[0257] The evaporator 110 may include other parts for mounting except the above-described parts. Hereinafter, this will be described in detail with reference to the accompanying drawings. Also, since other parts that are not shown in drawings are equal to those of the foregoing fourth example, their detail descriptions will be omitted.

[0258] Referring to Fig. 26, in the current example, a through opening 730 is defined in a first inner case 101 defining an evaporator accommodating part 210. A fixing boss 732 is installed in the through opening 730. Substantially, one end of the fixing boss 732 is disposed inside the evaporator accommodating part 210 and the other end of the fixing boss 732 is disposed inside a barrier 100 in a state where the fixing boss 732 passes through the through opening 730.

[0259] A coupling groove 734 is defined in the fixing boss 732. The coupling groove 734 is longitudinally defined in a length direction of the fixing boss 732, i.e., a horizontal direction. Here, the coupling groove 734 extends from the one end of the fixing boss 732 disposed inside the evaporator accommodating part 210 to the inside of the fixing boss 732.

[0260] Also, a catch protrusion 736 is disposed on the one end of the fixing boss 732 disposed inside an insulation layer 300 with respect to the through opening 730. The catch protrusion 736 extends from an outer surface of the fixing boss 732 to the outside. In a state where the fixing boss 732 passes through the through opening 730, the catch protrusion 736 is caught on a back surface of the first inner case 101 adjacent to the through opening 730. Thus, it may prevent the fixing boss 732 from being separated from the through opening 730.

[0261] A fixing rib 747 is disposed on the evaporator 110. For example, an upper end of a head 116 may be cut and bent with respect to the rest portion of the head 116 to form the fixing rib 747. Here, the fixing rib 747 contacts the first inner case 101. An insertion hole 748 is defined in the fixing rib 747. The one end of the fixing boss 732 disposed inside the evaporator accommodating part 210 is inserted into the insertion hole 748.

[0262] A coupling piece 750 is coupled to the coupling groove 734. In detail, the coupling piece 750 is coupled to the coupling groove 734 in a state where the one end of the fixing boss 732 is inserted into the insertion hole 748. Here, a head part 752 of the coupling piece 750 has a size enough to allow at least portion thereof is closely attached to the fixing rib 747 in a state where the coupling piece 750 is coupled to the coupling groove 734. That is, the head part 752 may have a size greater than that of the coupling groove 734. Thus, when the coupling piece 750 is coupled to the coupling groove 734, the evaporator 110 may be fixed inside the evaporator accommodating part 210, i.e., to the fixing boss 732.

[0263] The evaporator 110 may include other parts for mounting except the above-described parts. Hereinafter, this will be described in detail with reference to the accompanying drawings. Also, since other parts that are not shown in drawings are equal to those of the foregoing fourth example, their detail descriptions will be omitted.

[0264] Referring to Fig. 27, in the current example, an evaporator 770 includes refrigerant tubes 772 having a serpentine shape and a plurality of fins 774 through which the refrigerant tubes 772 are inserted. The evaporator 770 may have the same configuration as those of the foregoing first to second examples and the embodiment of the invention. However, in the current example, the refrigerant tubes 772 are further spaced from the other end of the fin 774 adjacent to a refrigerator compartment 40 when compared to an end of the fin 774 adjacent to a freezer compartment 30 with respect to an imaginary line X vertically passing through the center of the fin 774 in a state where the evaporator 770 is accommodated in the evaporator accommodating part 210. Thus, the refrigerant tubes 772 in which a substantially low temperature refrigerant flows may be further spaced from the refrigerator compartment 40 than from the freezer compartment 30.

[0265] Since the refrigerant tube 772 is further spaced from the refrigerator compartment 40 than the freezer compartment 30, the refrigerator compartment 40 having a relatively high temperature than that of the freezer compartment 30 is further spaced from the evaporator 770, i.e., the low temperature refrigerant flowing into the evaporator 770. Thus, it may prevent the refrigerator compartment 40 from being over-cooled by a temperature decrease therein due to an influence of the low temperature refrigerant flowing into the evaporator 770.

[0266] Hereinafter, a fifth example will be described. Since the current example is the same as the first example except for a portion of an inner configuration of a barrier, different parts between the first and fifth examples will be described principally, and a description of the same parts thereof will be omitted.

[0267] Fig. 28 is a schematic view illustrating a refrigerant cycle of a refrigerator according to a fifth example. Fig. 29 is an exploded perspective view illustrating a barrier according to the example. Fig. 30 is a vertical sectional view illustrating the barrier.

[0268] Referring to Figs. 28 to 30, a refrigerant cycle according to the current example may be performed by a compressor 50, a condenser 60, an expansion unit 70, and evaporator 110.

[0269] The compressor 50 is connected to the condenser 60 by a connection tube 52. A bypass tube 90 for bypassing a high temperature refrigerant compressed by the compressor 50 toward a discharge tube 72 of the expansion unit 70 is connected to the connection tube 52. The bypass tube 90 and the connection tube 52 are connected to a valve 92. The valve 92 may be a three-way valve. Alternatively, valves may be disposed on the connection tube 52 and the bypass tube 90, respectively.

[0270] When a refrigerator is operated in a normal mode, the valve 92 may control a flow direction of a refrigerant so that the refrigerant discharged from the compressor 50 flows into the condenser 60. When the refrigerator is operated in a defrosting mode, the valve 92 may control a flow direction of the refrigerant so that the refrigerant discharged from the compressor 50 flows into the bypass tube 90. Alternatively, when the refrigerator is operated in the defrosting mode, the valve 92 may control a flow direction of the refrigerant so that the refrigerant discharged from the compressor 50 flows into the condenser 60 and the bypass tube 90.

[0271] A depression part 94 for depressing the refrigerant may be disposed on the bypass tube 90. The expansion unit 70 and the depression part 94 may be one of a capillary tube or an openable electronic expansion valve.

[0272] The discharge tube 72 of the expansion unit 70 is connected to a valve 80. The valve 80 may be a three-way valve. The valve 80 is connected to a first tube 111 and a second tube 112, which constitute the evaporator 110. The valve 80 controls a flow direction of the refrigerant so that the refrigerant flows into one of the first tube 111 and the second tube 112 or flows into the first and second tubes 111 and 112 at the same time. Alternatively, valves may be disposed on the first and second tubes 111 and 112, respectively.

[0273] The first tube 111 and the second tube 112 are combined with each other at an inlet side of the compressor 50. Also, the evaporator 110 includes a plurality of heat exchange fins 115 through which both the first and second tubes 111 and 112 are inserted. That is, both the first and second tubes 111 and 112 are inserted through each of the heat exchange fins 115. The evaporator 110 is mounted on a barrier 100. In the current example, each of the tubes 111 and 112 may be a circular-shaped tube or a micro channel tube in which a plurality of refrigerant passages is defined.

[0274] Hereinafter, a structure of the barrier will be described in detail.

[0275] The barrier 100 partitions an inner space a refrigerator compartment 40 and a freezer compartment 30. Also, the barrier 100 may be insulated by an insulator filled into a casing defining an outer appearance thereof. The casing of the barrier 100 may be formed by in-cases defining the insides of the refrigerator compartment 40 and the freezer compartment 30. Alternatively, the barrier 100 may be formed by a separate member.

[0276] A concave part 200 is disposed in a lateral surface (a left side surface when viewed in Fig. 4) of the barrier 100 defining a sidewall of the freezer compartment 30. The concave part 200 includes an evaporator accommodating part 210, a flower unit accommodating part 220, and a cooling-air passage 230.

[0277] The evaporator 110 is accommodated in the evaporator accommodating part 210. When viewed in Fig. 30, the first and second tubes 111 and 112 constituting the evaporator 110 are disposed in left and right directions (left and right directions of the refrigerator). Each of the tubes 111 and 112 is bent several times and is vertically disposed. The first tube 111 is disposed adjacent to the freezer compartment 30 than the second tube 112.

[0278] A plurality of mounting structures 113 for mounting the evaporator 110 on an inner case 151 defining the freezer compartment 30 is disposed in the evaporator 110. A catch hook 117 coupled to a catch slot 218 is disposed at an upper portion of each of the mounting structures 113. A cover part 216 for covering the catch slot 218 is disposed inside the barrier 100.

[0279] A cooling-air inlet 212 and an inlet grill 214 through which cooling air within the refrigerator compartment 40 is introduced are defined in a lower portion of the barrier 100. A cooling-air outlet 232 and an outlet grill 234 through which cooling air is supplied into the refrigerator compartment 40 are defined in an upper portion of the barrier 100.

[0280] A drain pan 120 for discharging defrosted water or condensed water generated during an defrosting operation from the inside of the barrier 100 toward a machine room may be disposed under the evaporator 110.

[0281] A blower unit 130 including a motor 132, a blower fan 134, and a shroud 136 is accommodated into an upper side of the evaporator accommodating part 210. The blower unit 130 is operated to allow cooling air within the freezer compartment 30 and the refrigerator compartment 40 to be introduced into the barrier 100, thereby heat-exchanging between the freezer compartment 30 and the refrigerator compartment 40.

[0282] A cooling-air passage 230 is defined above the blower unit accommodating part 220. The cooling-air passage 230 guides cooling air discharged from the shroud 136 to the refrigerator compartment 40 and the freezer compartment 30. A cooling-air distribution device 140 is disposed in the cooling-air passage 230.

[0283] The concave part 200 is covered by a barrier cover 400. The barrier cover 400 may be manufactured into a single board or a plurality of boards. A plurality of cover outlets 410 for discharging the cooling air into the freezer compartment 30 is defined in an upper portion of the barrier cover 400. A cover inlet 430 for introducing the cooling air within the freezer compartment 30 into the evaporator accommodating part 210 is disposed in a lower portion of the barrier cover 400.

[0284] Hereinafter, an effect of the refrigerator according to the current example will be described.

[0285] When a power is applied to the refrigerator 1, the compressor 50 is operated, and thus the refrigerant flows. Then, the blower fan 134 is rotated by an operation of the motor 132. The blower fan 134 is rotated to introduce the cooling air within the freezer compartment 30 and the cooling air within the refrigerator compartment 40 into the evaporator accommodating part 210. When the refrigerator 1 is initially operated, since a temperature within each of the freezer compartment 30 and the refrigerator compartment 40 is lower than a set temperature, the cooling air is supplied into each of the freezer compartment 30 and the refrigerator compartment 40. Here, a cooling-air control device communicates with the cooling-air passage 230 and the cooling-air outlet 232 to supply the cooling air into the refrigerator compartment 40.

[0286] The valve 80 controls the passage so that the refrigerant flows into the first and second tubes 111 and 112.

[0287] The cooling air introduced into the evaporator accommodating part 210 is moved upward after the cooling air exchanges heat with the evaporator 110 while passing through the evaporator 110. The cooling air moved upward from the evaporator accommodating part 210 flows into the blower unit accommodating part 220 along a connection part 240. Then, the cooling air is guided to the cooling-air passage 230. The cooling air guided to the cooling-air passage 230 is discharged into the freezer compartment 30 and the freezer compartment 40 through the outlets 232 and 410.

[0288] A temperature within each of the freezer compartment 30 and the refrigerator compartment 40 is decreased by the cooling air discharged into the freezer compartment 30 and the refrigerator compartment 40.

[0289] When the temperature of the refrigerator compartment 40 reaches the set temperature, but the temperature of the freezer compartment 30 does not reach the set temperature during the supply of the cooling air into the freezer compartment 30 and the refrigerator compartment 40, the supply of the cooling air into the refrigerator compartment 40 is interrupted.

[0290] In detail, the cooling-air distribution device 140 interrupts the communication between the cooling-air outlet 232 and the cooling-air passage 230. Thus, the cooling-air exchanging heat with the evaporator 110 is supplied into only the freezer compartment 30.

[0291] Here, when the temperature of the freezer compartment 30 does not reach the set temperature, the refrigerant flows into the first and second tubes 111 and 112 regardless of whether the temperature of the refrigerator compartment 40 reaches the set temperature.

[0292] When the temperature of the freezer compartment 30 reaches the set temperature, but the temperature of refrigerator compartment 40 does not reach the set temperature during the supply of the cooling air into the freezer compartment 30 and the refrigerator compartment 40, the refrigerant flows into only the first tube 111. That is, the valve 80 controls the refrigerant passage so that the refrigerant flows into the first tube 111 and does not flow into the second tube 112.

[0293] Here, the cooling air exchanging heat with the evaporator 110 may be supplied into the freezer compartment 30.

[0294] Since the set temperature of the refrigerator compartment 40 is higher than that of the freezer compartment 30, it is unnecessary to flow into the first and second tubes 111 and 112 at the same time. As described above, when the refrigerant flows into only the first tube 111, the temperature of the freezer compartment may be decreased. When the refrigerant flows into only the first tube 111, since an output of the compressor 50 may be decreased, power consumption may be reduced.

[0295] In the current example, when the refrigerant flows into only the first tube 111, it may be understood that only a portion of the evaporator 110 is operated as a whole.

[0296] In the current example, a reason in which the refrigerant flows into only the first tube 111 relatively away from the refrigerator compartment 40 in the first and second tubes 111 and 112 is for minimizing the heat-exchange between the refrigerator compartment 40 and the evaporator 110 (or evaporator accommodating part).

[0297] When the temperatures of the freezer compartment 30 and the freezer compartment 40 reach the set temperature during the supply of the cooling air into the freezer compartment 30 and the refrigerator compartment 40, the operations of the compressor 50 and the motor 132 are stopped.

[0298] As described above, when the cooling air exchanging heat with the evaporator 110 while passing through the evaporator 110, frost is deposited on the evaporator 110. When the frost is deposited on the evaporator 110, since the performance of the evaporator 110 is deteriorated, the frost should be removed. In this case, the refrigerator is operated in the defrosting mode.

[0299] When the refrigerator is operated in the defrosting mode, the valve 92 controls the refrigerant passage so that the high-temperature refrigerant discharged from the compressor 50 flows into the bypass tube 90. The refrigerant flowing into the bypass tube 90 is decompressed while passing through the decompression part 94 and is introduced into the evaporator 110. Here, the refrigerant within the bypass tube 90 may flow into one of the first and second tubes 111 and 112 or flow into the first and second tubes 111 and 112 at the same time. For example, when the amount of deposited frost is small, the refrigerant may flow into one of the plurality of tubes. Also, when the amount of deposited frost is large, the refrigerant may flow into each of the tubes at the same time.

[0300] In the current example, since conditions for the defrosting operation may use well-known conditions, their detailed descriptions will be omitted. The amount of deposited frost may be determined by a temperature sensor (not shown) for detecting a temperature of the evaporator or the evaporator accommodating part. For example, when the detected temperature is less than a first reference temperature and a second reference temperature (less than the first reference temperature), the bypassed refrigerant may flow into one of the plurality of tubes. Also, when the detected temperature is less than the second reference temperature, the bypassed refrigerant may flow into the plurality of tubes at the same time.

[0301] When the refrigerant within the bypass tube 90 flows into the evaporator 110, the frost generated on the evaporator 110 is removed while the refrigerant flows into the evaporator 110.

[0302] According to the current example, since the frost may be removed without providing a separate defrosting heater, the power consumption may be further reduced when compared to that according to a related art. In addition, since the refrigerant discharged from the compressor 50 is moved along the inside of the evaporator 110, the frost generated on the entire of the evaporator 110 may be quickly removed.

[0303] An evaporator having a structure different from that of the above-described evaporator may be applied to the current example. Hereinafter, the current example is the same as the foregoing examples and the embodiments of the invention except for positions of first and second tubes constituting an evaporator. Thus, characteristic portions of the current example will be described below.

[0304] Fig. 31 is a vertical sectional view illustrating another evaporator structure of the barrier according to the example.

[0305] Referring to Fig. 31, an evaporator 110 according to the current example includes a first tube 111 and a second tube 112.

[0306] Each of the first and second tubes 111 and 112 is bent several times and is vertically disposed. The second tube 112 is disposed at a side of the first tube 111. The first tube 111 is disposed adjacent to a freezer compartment 30 than the second tube 112.

[0307] A distance from a barrier cover 400 to a line L1 horizontally bisecting each of heat exchange fins 115 or a mounting structure 113 is greater than a distance from the barrier cover to a line L2 bisecting a horizontal distance between the first tube 111 and the second tube 112 which have the same height.

[0308] That is, in the evaporator 110, each of the tubes 111 and 112 are arranged close to the freezer compartment. This is done to minimize heat exchange between the evaporator 110 and the refrigerator compartment 40. That is, the more a distance between the tubes 111 and 112 and an end of the heat exchange fin adjacent to the refrigerator compartment 40 is away from, the more thermal conductivity is reduced. Thus, in the current example, each of the tubes 111 and 112 is disposed at a position adjacent to the freezer compartment 30 from the plurality of heat exchange fins.

[0309] Similarly to the first example, when the temperature of the freezer compartment 30 reaches the set temperature, but the temperature of refrigerator compartment 40 does not reach the set temperature during the supply of the cooling air into the freezer compartment 30 and the refrigerator compartment 40, the refrigerant flows into only the first tube 111.

[0310] An evaporator having a structure different from that of the above-described evaporator may be applied to the current example. Hereinafter, the current example is the same as the foregoing examples and the embodiments of the invention except for positions of first and second tubes constituting an evaporator. Thus, characteristic portions of the current example will be described below.

[0311] Fig. 32 is a perspective view illustrating another evaporator structure. embodiment.

[0312] Referring to Fig. 32, an evaporator 800 according to the current example includes first and second tubes 801 and 802 through which a refrigerant flows and a plurality of heat exchange fins 803 through which each of the tubes 801 and 802 passes.

[0313] In detail, the first tube 801 is bent several times. Also, the first tube 801 is disposed at a lower side with respect to a reference line vertically bisecting the plurality of heat exchange fins 803. The second tube 802 is bent several times. Also, the second tube 802 is disposed at an upper side with respect to the reference line vertically bisecting the plurality of heat exchange fins 803. That is, the second tube 802 is disposed downstream from the first tube 801 with respect to a flow direction A of air.

[0314] Thus, after exchanging heat with the first tube 801, cooling air is moved upward to exchange heat with the second tube 802.

[0315] Similarly to the sixth embodiment, when the temperature of the freezer compartment 30 reaches the set temperature, but the temperature of refrigerator compartment 40 does not reach the set temperature during the supply of the cooling air into the freezer compartment 30 and the refrigerator compartment 40, the refrigerant flows into only the first tube 111.

[0316] Although the examples and the embodiment of the invention have been described with reference to a number of illustrative examples thereof, it should be understood that numerous other modifications and embodiments can be devised by those skilled in the art that will fall within the scope of the principles of this disclosure. More particularly, various variations and modifications are possible in the component parts and/or arrangements of the subject combination arrangement within the scope of the disclosure, the drawings and the appended claims. In addition to variations and modifications in the component parts and/or arrangements, alternative uses will also be apparent to those skilled in the art.

Claims

1. A refrigerator, comprising:

a cabinet (10) having a storage space thereinside;
a barrier (100) vertically extending inside the cabinet to partition the storage space into a freezer compartment (30) and a refrigerator compartment (40) side by side;
an evaporator (110) disposed in the barrier to generate cooling air; and
a blower unit (130) disposed above the evaporator in the barrier to supply the cooling air towards the freezer compartment and/or the re-

frigerator compartment,
wherein the barrier includes:

a barrier main body (101) at one side of which the evaporator and the blower unit are disposed, the barrier main body (101) comprising:

a first case (170) defining a side of the refrigerator compartment;
a second case (180) coupled to the first case and defining a side of the freezing compartment;
a concave part (200) defined at the second case (180) and recessed towards the first case; and
an insulator disposed in a space which is defined between the first case and the second case; and

a barrier cover (400) coupled to the second case to cover the concave part (200),

wherein the concave part (200) includes:

an evaporator accommodating part (210) recessed to accommodate the evaporator;
a blower unit accommodating part (220) recessed to accommodate the blower unit; and
a cooling air passage (230) recessed and extending vertically from an upper end of the blower unit accommodating part (220) to allow a flow of cooling air generated by the evaporator,
characterized in that the insulator comprises:

a vacuum insulator (610) comprising a sealing part and a core material disposed in the sealing part, the sealing part comprising a thermal deposition layer; and
a polyurethane foam (620) at a side of the vacuum insulator.

2. The refrigerator according to claim 1, wherein the vacuum insulator is in contact with the second case.

3. The refrigerator according to claim 1, wherein the insulator comprises:

a first insulator part (310) at a side of the evaporator;
a second insulator part (320) at a side of the fan motor assembly; and
a third insulator part (330) at a side of the cooling-air passage.

4. The refrigerator according to claim 3, wherein the first and third insulator parts are thicker than the second insulator part.

5. The refrigerator according to claim 1, wherein the first case of the barrier main body comprises:

a cooling-air inlet (212) formed in an evaporator accommodating part (210) at a lower side of the evaporator to introduce cooling air from the refrigerator compartment; and
a cooling-air outlet formed at an upper side of the cooling-air passage to discharge cooling air to the freezer compartment and/or the refrigerator compartment.

Patentansprüche

1. Kühlschrank, mit:

einem Außengehäuse (10), das einen Lagerraum darin aufweist;
einer Barriere (100), die sich vertikal innerhalb des Gehäuses erstreckt, um den Lagerraum nebeneinander in ein Gefrierfach (30) und ein Kühlfach (40) zu unterteilen;
einem Verdampfer (110), der in der Barriere angeordnet ist, um Kühlluft zu erzeugen; und
einer Gebläseeinheit (130), die über dem Verdampfer in der Barriere angeordnet ist, um die Kühlluft zum Gefrierfach und/oder zum Kühlfach zu liefern,
wobei die Barriere aufweist:

einem Barrierenhauptkörper (101), auf dessen einer Seite der Verdampfer und die Gebläseeinheit angeordnet sind, wobei der Barrierenhauptkörper (101) aufweist:

ein erstes Gehäuse (170), das eine Seite des Kühlfachs definiert;
ein zweites Gehäuse (180), das mit dem ersten Gehäuse gekoppelt ist und das eine Seite des Gefrierfachs definiert;
einen konkaven Teil (200), der am zweiten Gehäuse (180) definiert ist und zum ersten Gehäuse vertieft ist; und
eine Dämmung, die in einem Raum angeordnet ist, der zwischen dem ersten Gehäuse und dem zweiten Gehäuse definiert ist; und

eine Barrierenabdeckung (400), die mit dem zweiten Gehäuse gekoppelt ist, um den konkaven Teil (200) abzudecken, wobei der konkave Teil (200) aufweist:

einen Verdampferaufnahmeteil (210), der vertieft ist, um den Verdampfer aufzunehmen;
einen Gebläseeinheitsaufnahmeteil (220), der vertieft ist, um die Gebläseeinheit aufzunehmen; und
einen Kühlluftkanal (230), der vertieft ist und sich vertikal von einem oberen Ende des Gebläseeinheitsaufnahmeteils (220) erstreckt, um einen Fluss der durch den Verdampfer erzeugten Kühlluft zu ermöglichen,

dadurch gekennzeichnet, dass die Dämmung aufweist:

eine Vakuumdämmung (610), die einen Dichtungsteil und ein Kernmaterial aufweist, das im Dichtungsteil angeordnet ist, wobei der Dichtungsteil eine thermische Abscheidungsschicht aufweist; und
einen Polyurethanschaumstoff (620) auf einer Seite der Vakuumdämmung .

2. Kühlschrank nach Anspruch 1, wobei die Vakuumdämmung mit dem zweiten Gehäuse in Kontakt steht.

3. Kühlschrank nach Anspruch 1, wobei die Dämmung aufweist:

einen ersten Dämmungsteil (310) auf einer Seite des Verdampfers;
einen zweiten Dämmungsteil (320) auf einer Seite der Gebläsemotoranordnung; und
einen dritten Dämmungsteil (330) auf einer Seite des Kühlluftkanals.

4. Kühlschrank nach Anspruch 3, wobei der erste und dritte Dämmungsteil dicker als der zweite Dämmungsteil sind.

5. Kühlschrank nach Anspruch 1, wobei das erste Gehäuse des Barrierenhauptkörpers aufweist:

einen Kühllufteinlass (212), der in einem Verdampferaufnahmeteil (210) auf einer unteren Seite des Verdampfers ausgebildet ist, um Kühlluft aus dem Kühlfach einzuleiten; und
einen Kühlluftauslass, der an einer oberen Seite des Kühlluftkanals ausgebildet ist, um Kühlluft zum Gefrierfach und/oder zum Kühlfach auszustoßen.

Revendications

1. Réfrigérateur, comprenant :

une carrosserie (10) contenant un espace de stockage ;
une cloison (100) s'étendant verticalement à l'intérieur de la carrosserie pour partager l'espace de stockage en un compartiment de congélation (30) et un compartiment de réfrigération (40) juxtaposés ;
un évaporateur (110) disposé dans la cloison pour produire de l'air de refroidissement ; et
une unité de ventilation (130) disposée dans la cloison au-dessus de l'évaporateur pour refouler l'air de refroidissement vers le compartiment de congélation et/ou le compartiment de réfrigération,
où la cloison comporte :

un corps principal de cloison (101) sur un côté duquel l'évaporateur et l'unité de ventilation sont disposés, ledit corps principal de cloison (101) comprenant :

un premier caisson (170) définissant un côté du compartiment de réfrigération ;
un deuxième caisson (180) raccordé au premier caisson et définissant un côté du compartiment de congélation ;
une section concave (200) définie sur le deuxième caisson (180) et renfoncée vers le premier caisson ; et
un isolant disposé dans un espace défini entre le premier caisson et le deuxième caisson ; et

un couvercle de cloison (400) raccordé au deuxième caisson pour recouvrir la section concave (200),

où la section concave (200) comporte :

une section de logement d'évaporateur (210) en renfoncement pour loger l'évaporateur ;
une section de logement d'unité de ventilation (220) en renfoncement pour loger l'unité de ventilation ; et
un passage d'air de refroidissement (230) en renfoncement et s'étendant verticalement depuis une extrémité supérieure de la section de logement d'unité de ventilation (220) pour permettre la circulation de l'air de refroidissement produit par l'évaporateur,

caractérisé en ce que l'isolant comporte :

un isolant à vide (610) comprenant une partie d'étanchéité et un matériau d'âme disposé dans la partie d'étanchéité, ladite partie d'étanchéité comprenant une couche à dépôt thermique ; et
une mousse polyuréthane (620) sur un côté de l'isolant à vide.

2. Réfrigérateur selon la revendication 1, où l'isolant à vide est en contact avec le deuxième caisson.

3. Réfrigérateur selon la revendication 1, où l'isolant comprend :

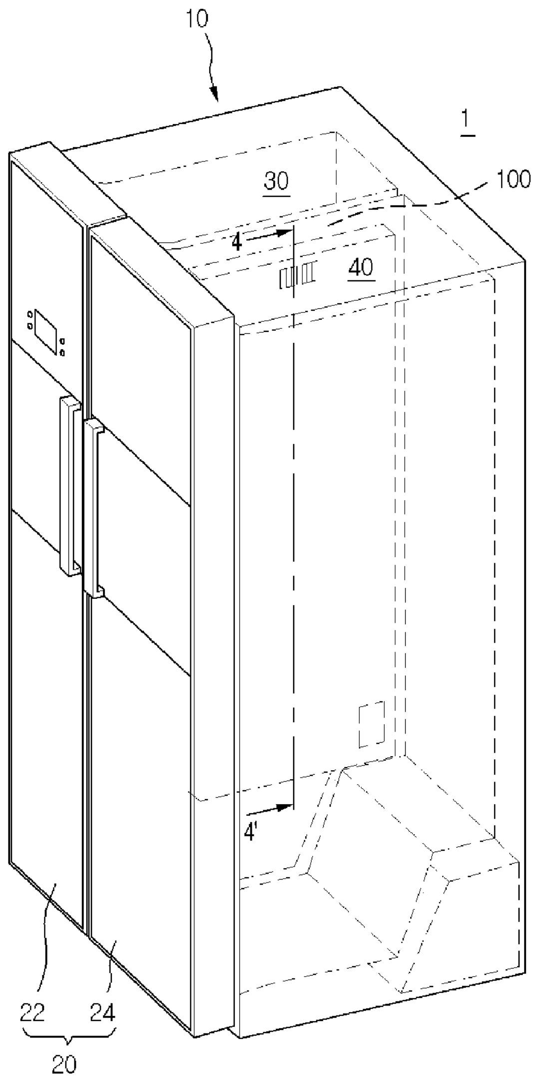
une première section d'isolant (310) sur un côté de l'évaporateur ;
une deuxième section d'isolant (320) sur un côté de l'unité de moteur de ventilateur ; et
une troisième section d'isolant (330) sur un côté du passage d'air de refroidissement.

4. Réfrigérateur selon la revendication 3, où la première et la troisième sections d'isolant sont plus épaisses que la deuxième section d'isolant.

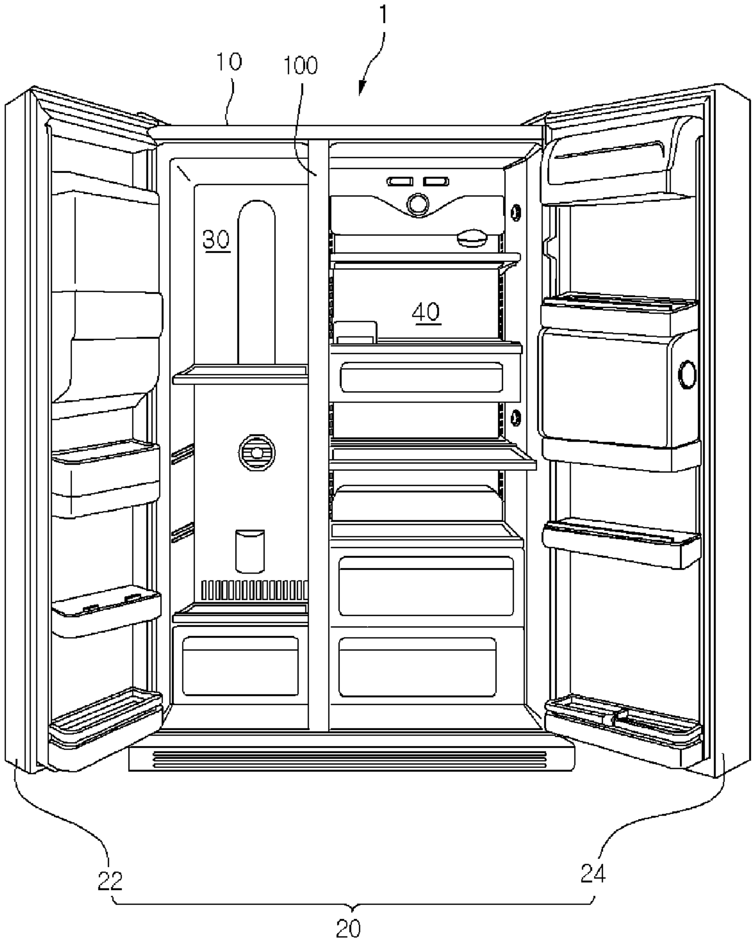
5. Réfrigérateur selon la revendication 1, où le premier caisson du corps principal de cloison comprend :

une entrée d'air de refroidissement (212) formée dans une section de logement d'évaporateur (210) sur un côté inférieur de l'évaporateur pour l'introduction de l'air de refroidissement du compartiment de réfrigération ; et
une sortie d'air de refroidissement formée sur un côté supérieur du passage d'air de refroidissement pour évacuer l'air de refroidissement vers le compartiment de congélation et/ou le compartiment de réfrigération.

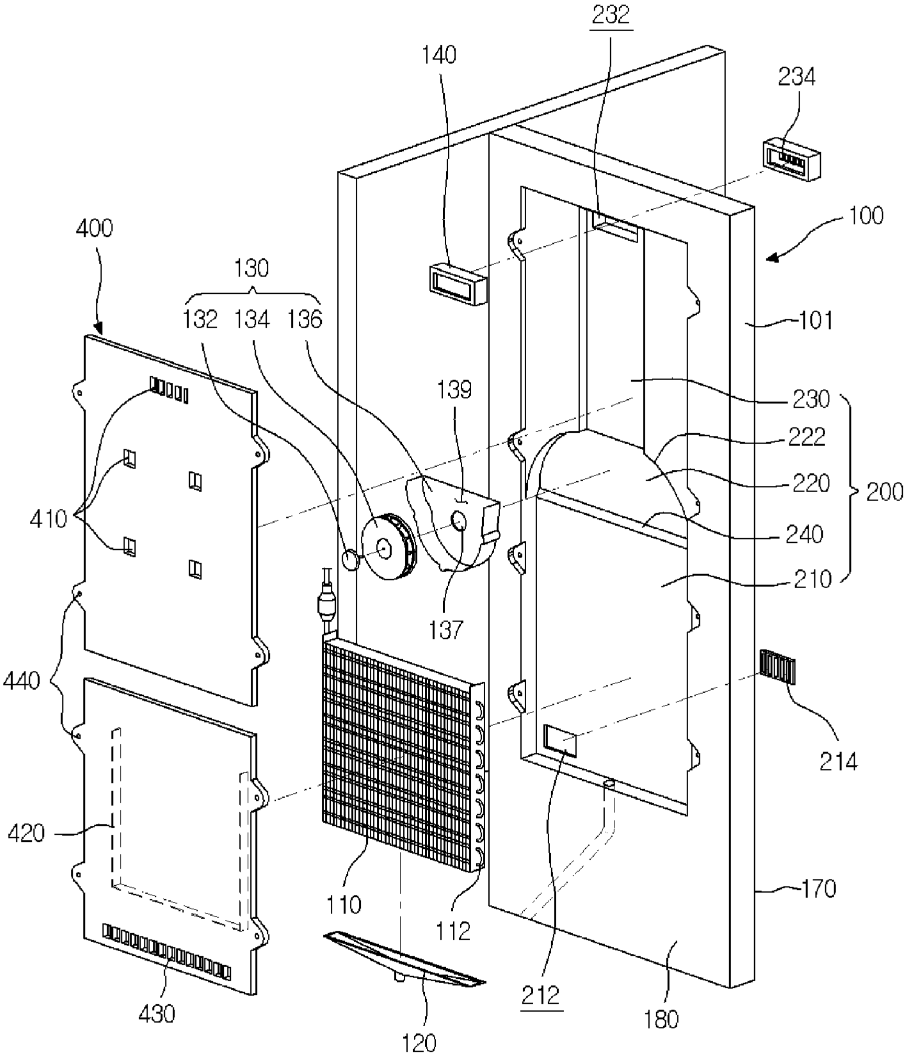
[Fig. 1]



[Fig. 2]



[Fig. 3]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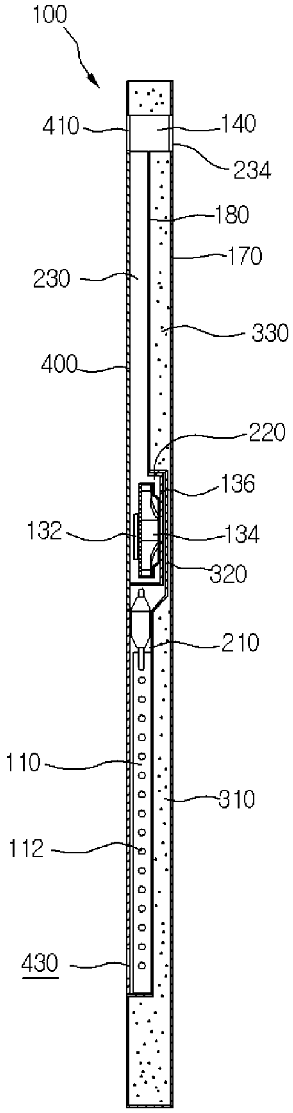
[Fig. 4]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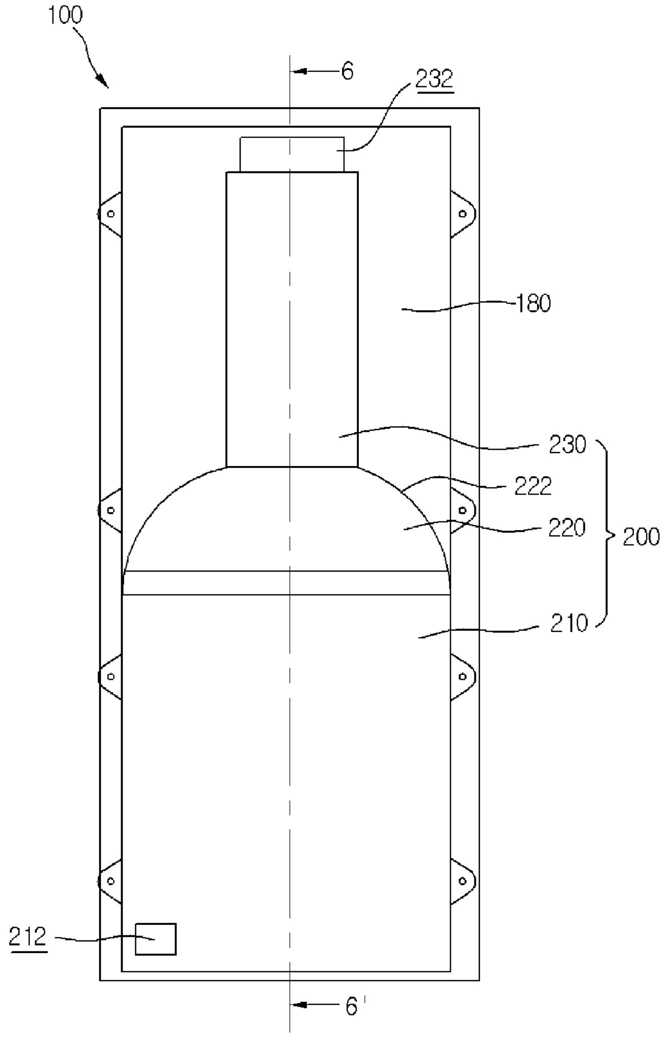
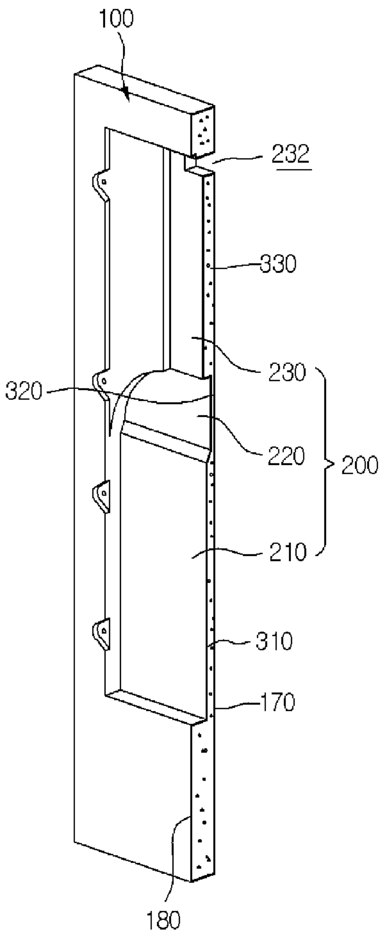
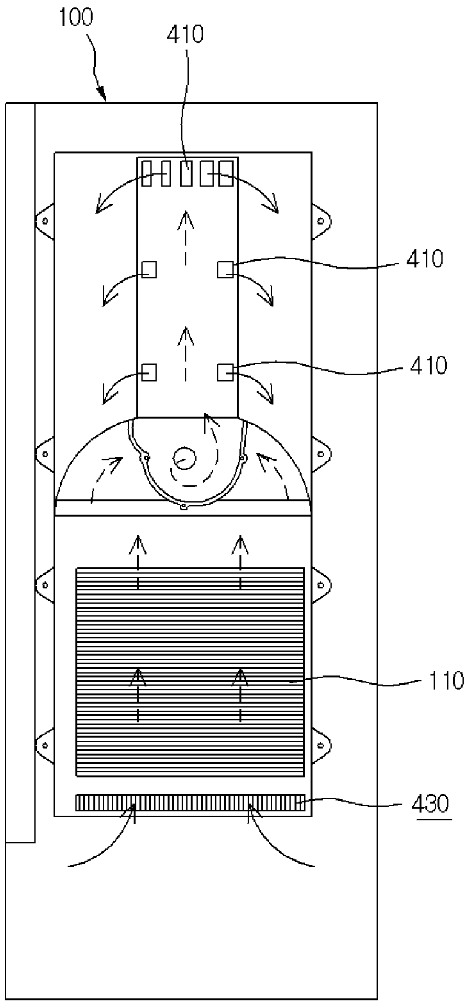
[Fig. 5]



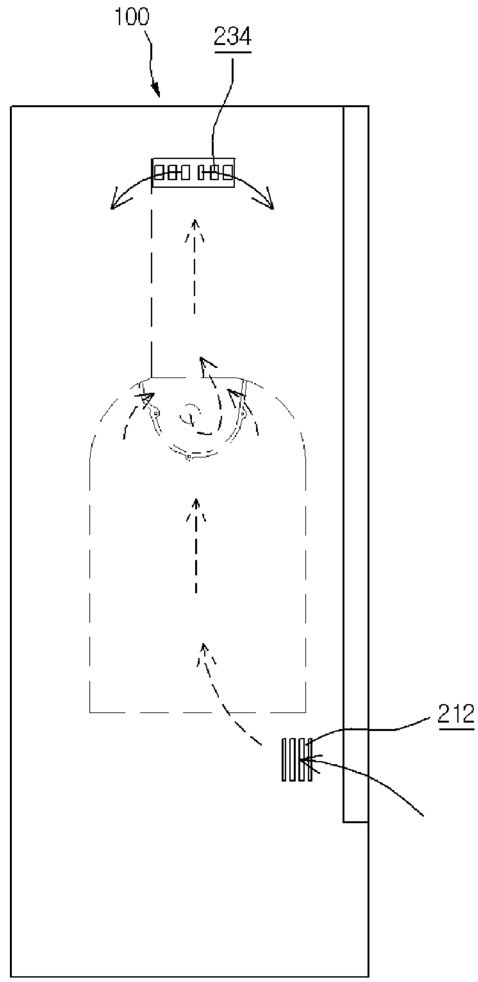
[Fig. 6]



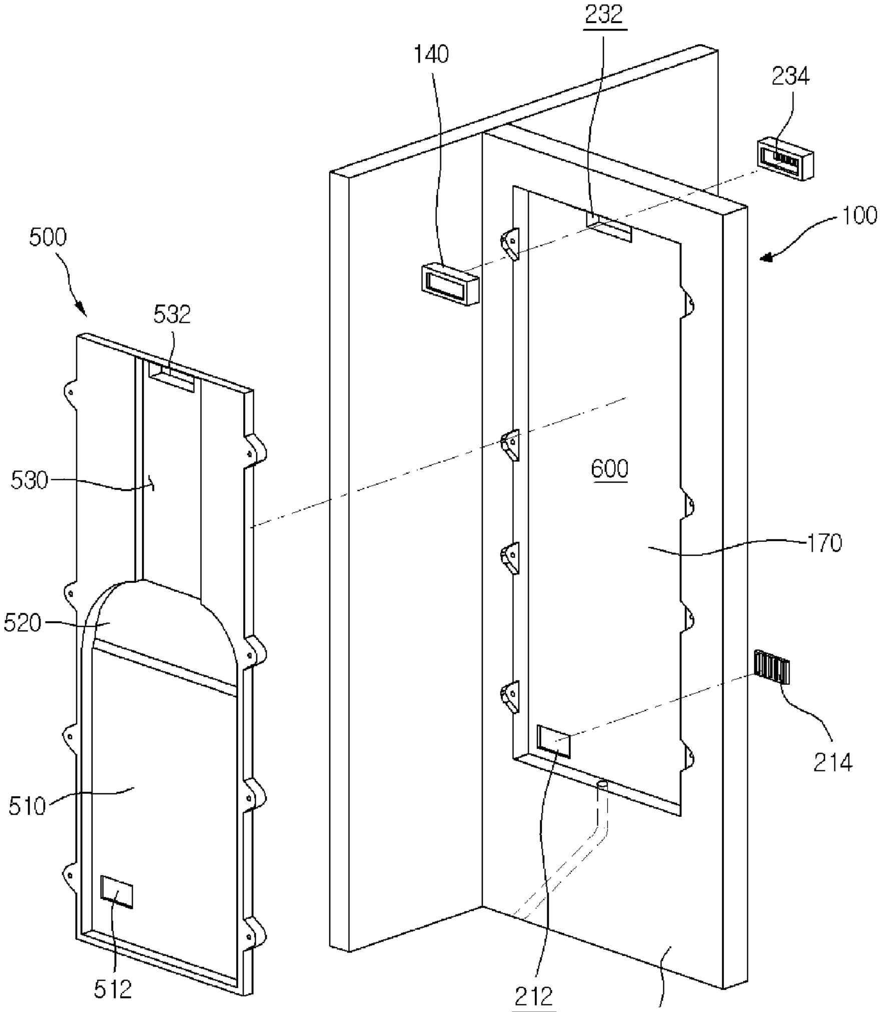
[Fig. 7]



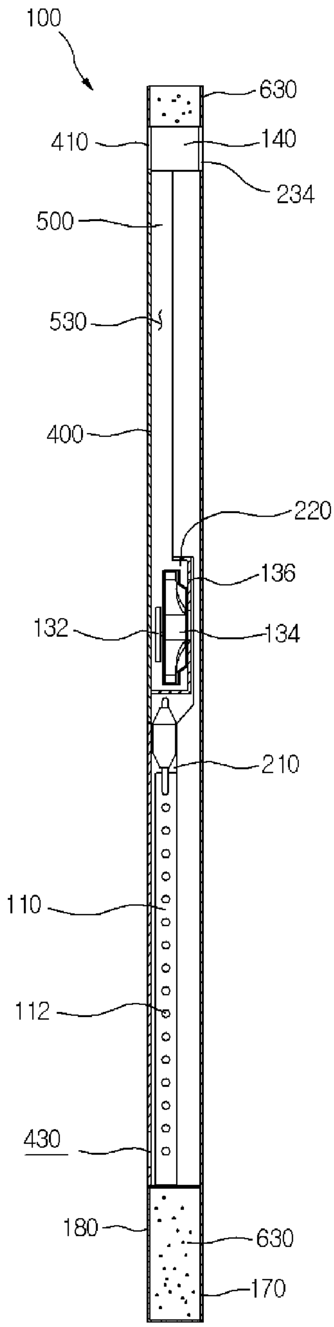
[Fig. 8]



[Fig. 9]



[Fig. 10]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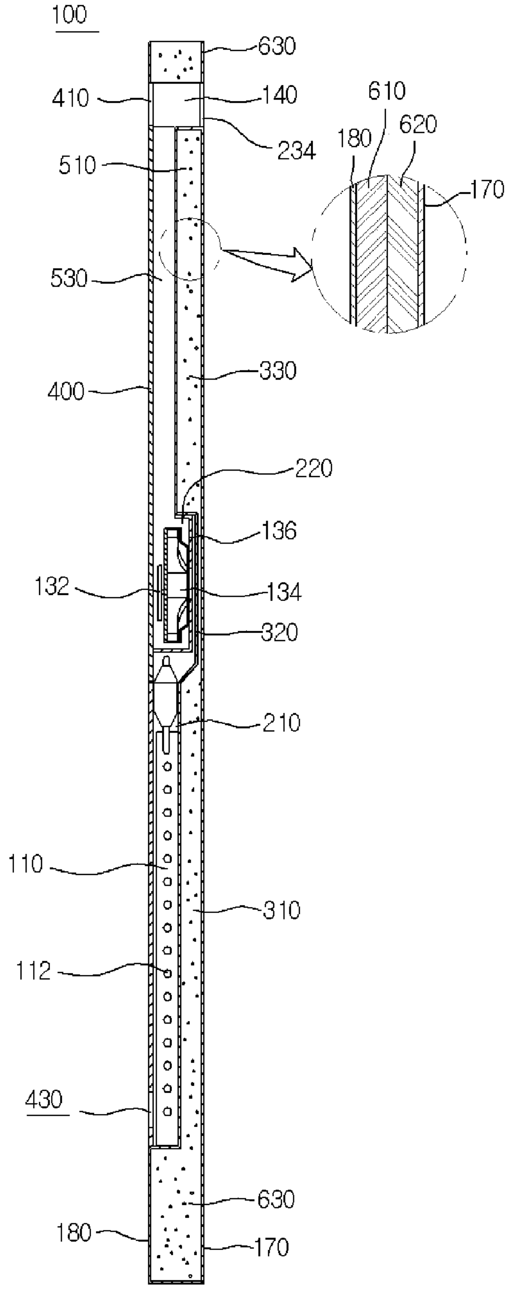
[Fig. 11]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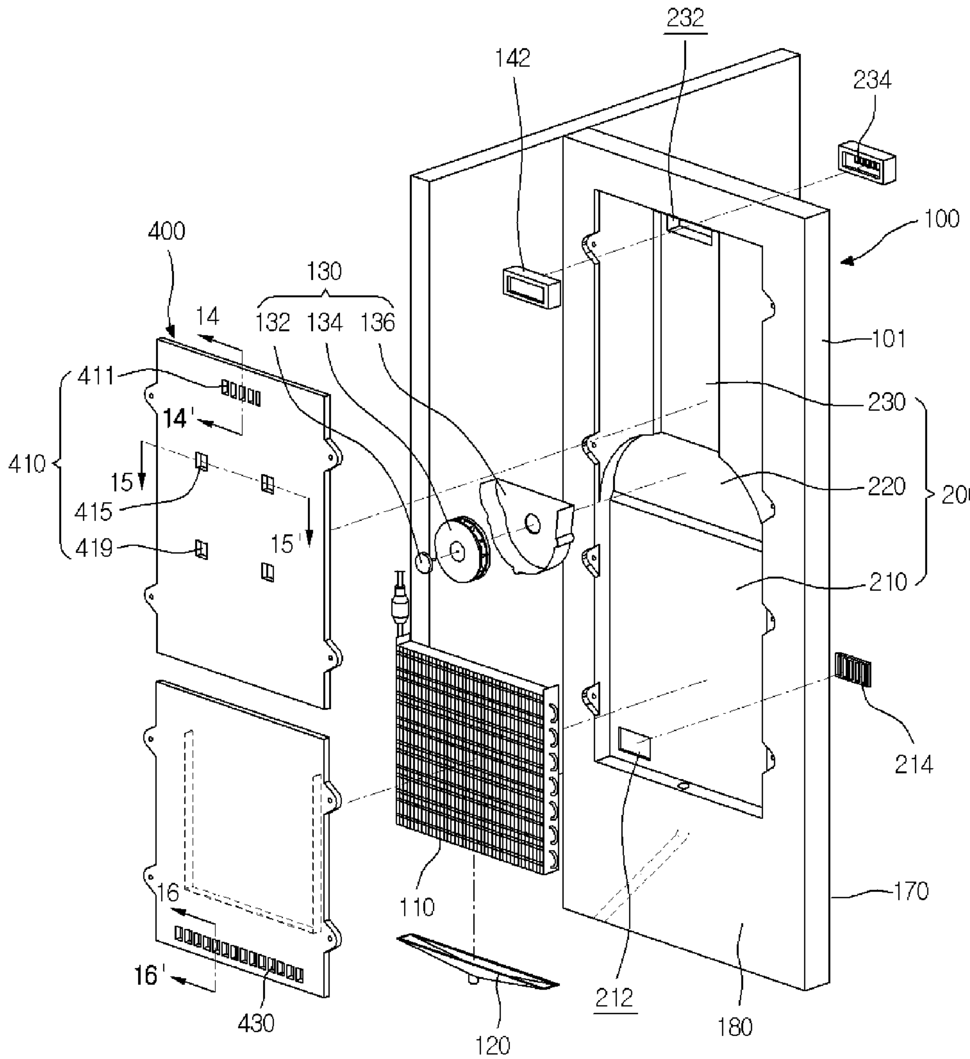
[Fig. 12]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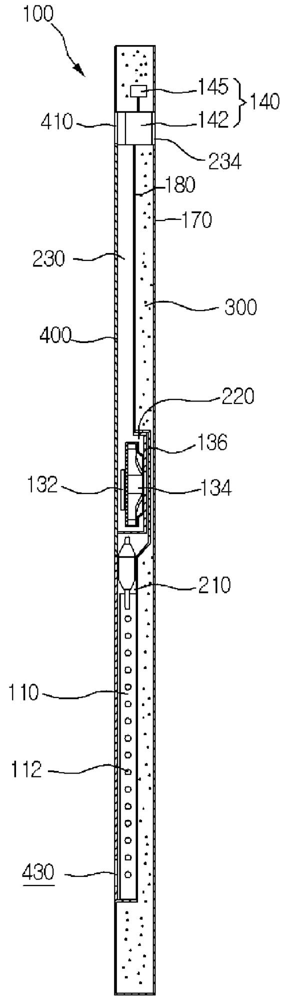
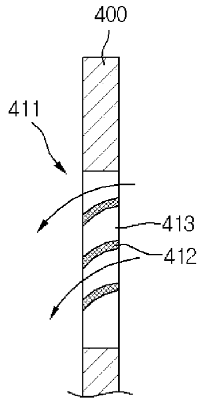
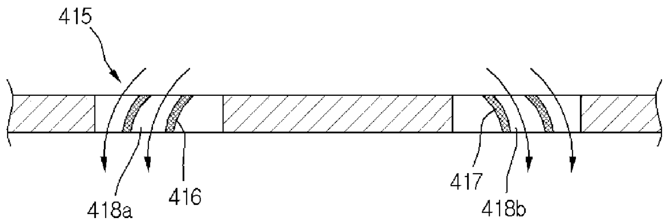
[Fig. 13]



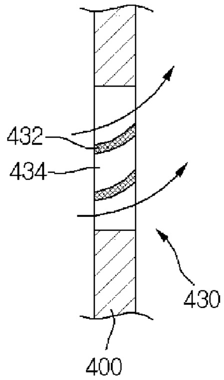
[Fig. 14]



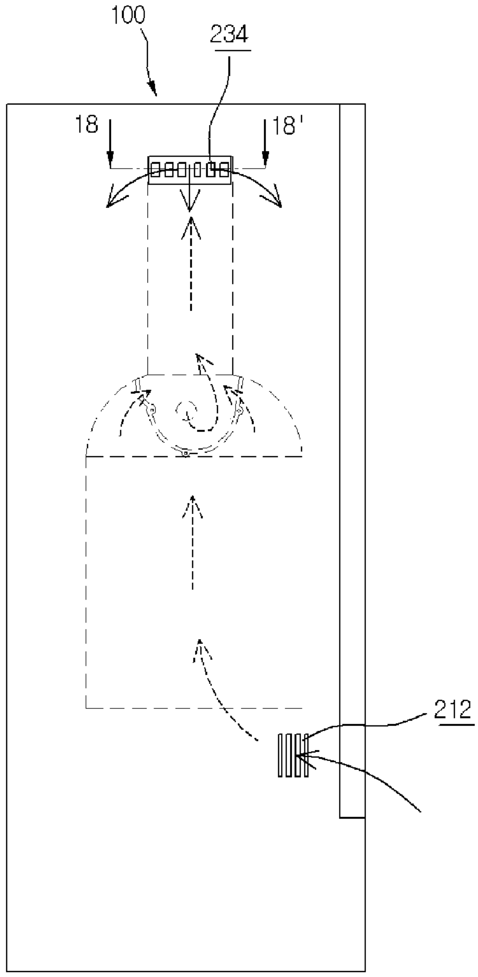
[Fig. 15]



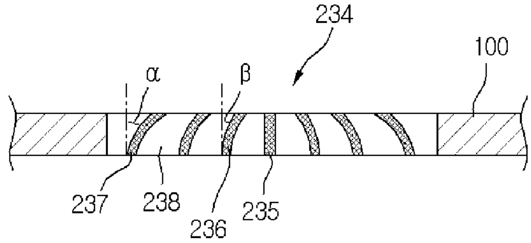
[Fig. 16]



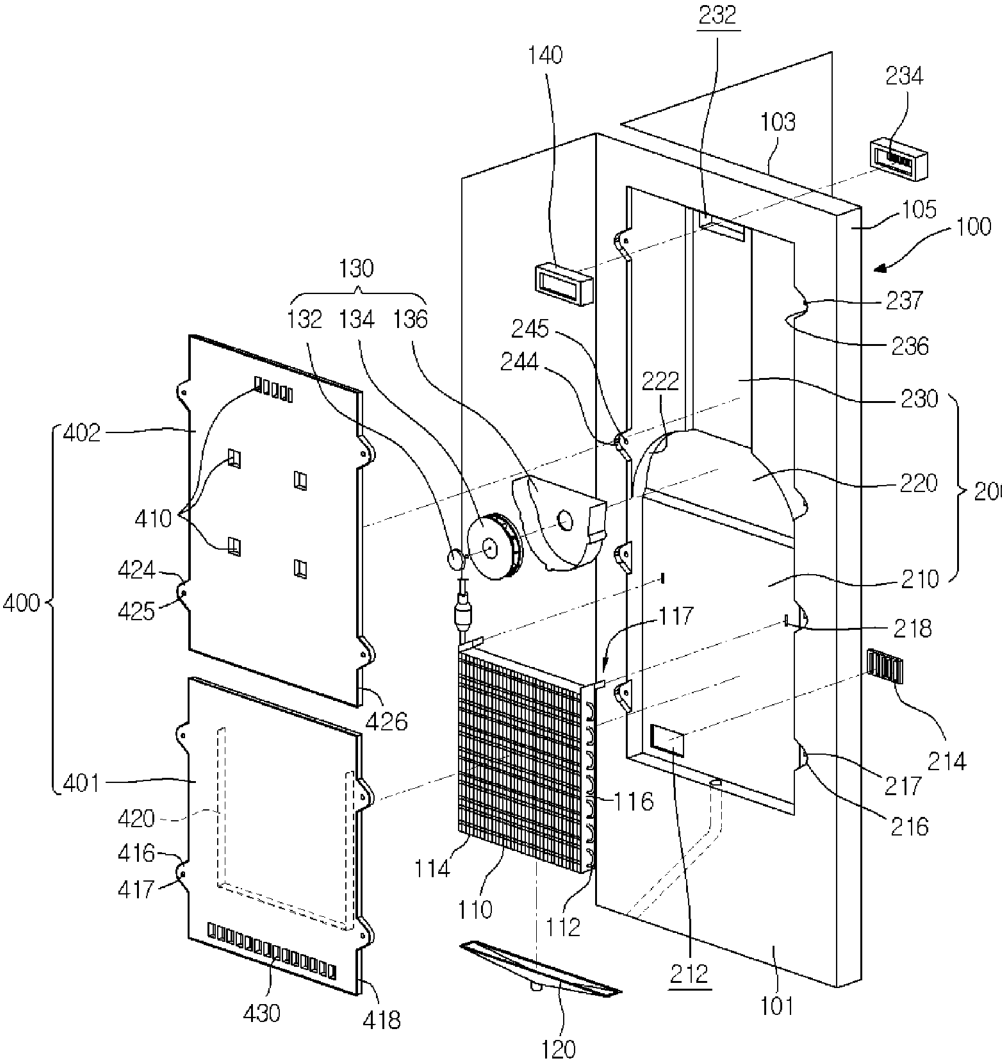
[Fig. 17]



[Fig. 18]



[Fig. 19]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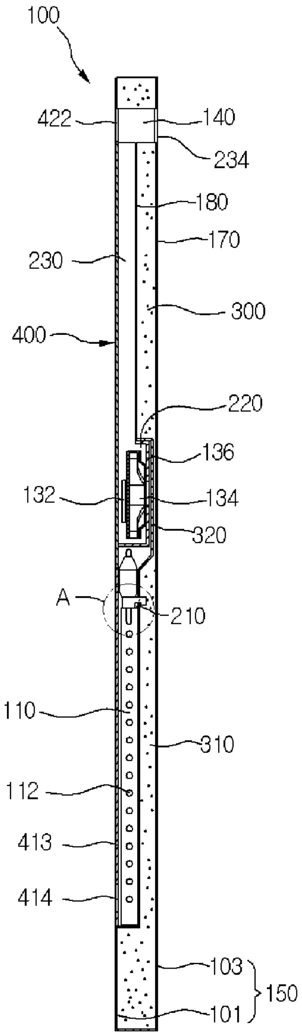
[Fig. 20]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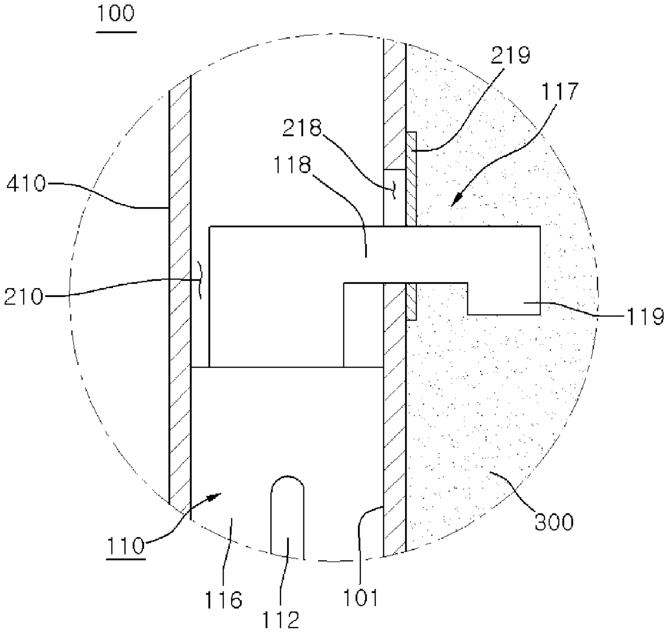
[Fig. 21]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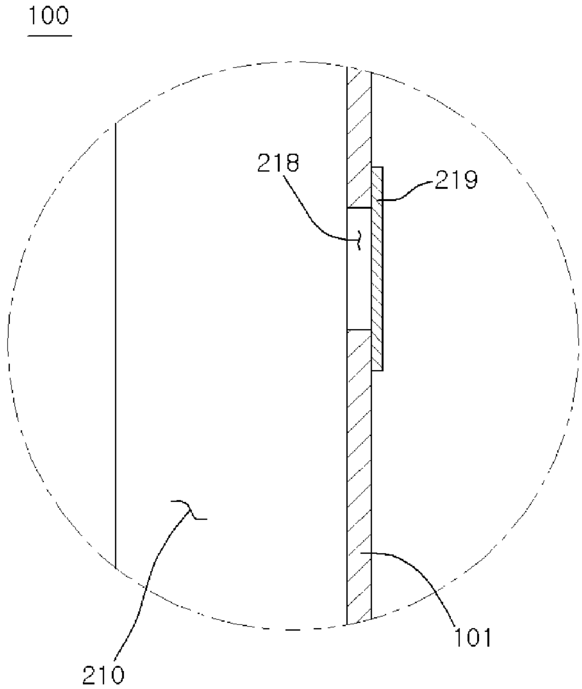
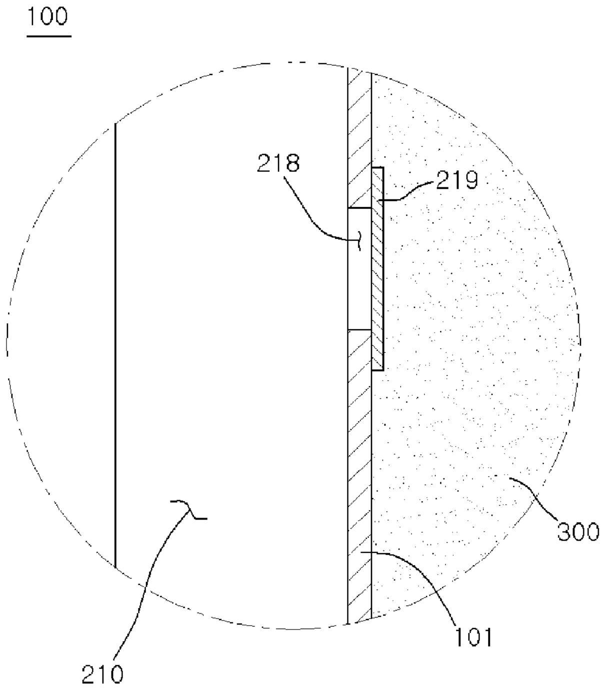
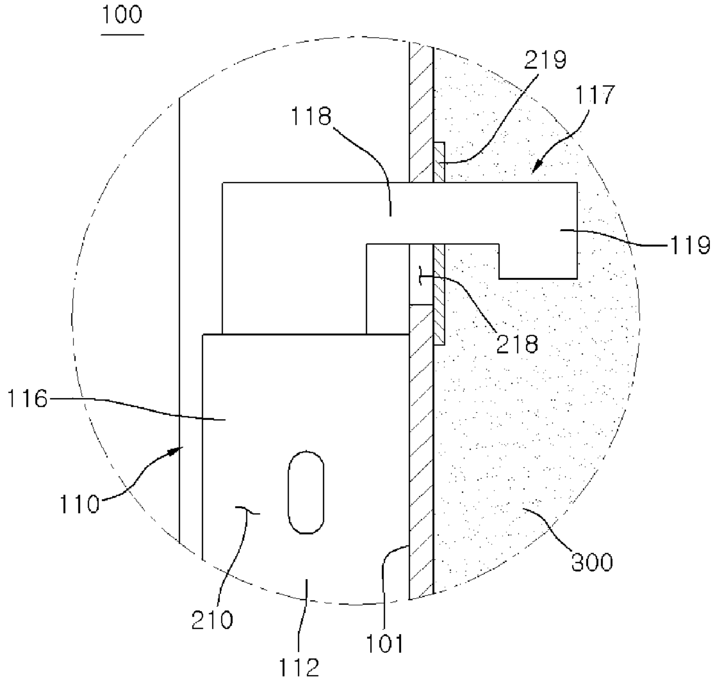
[Fig. 22]



[Fig. 23]



[Fig. 24]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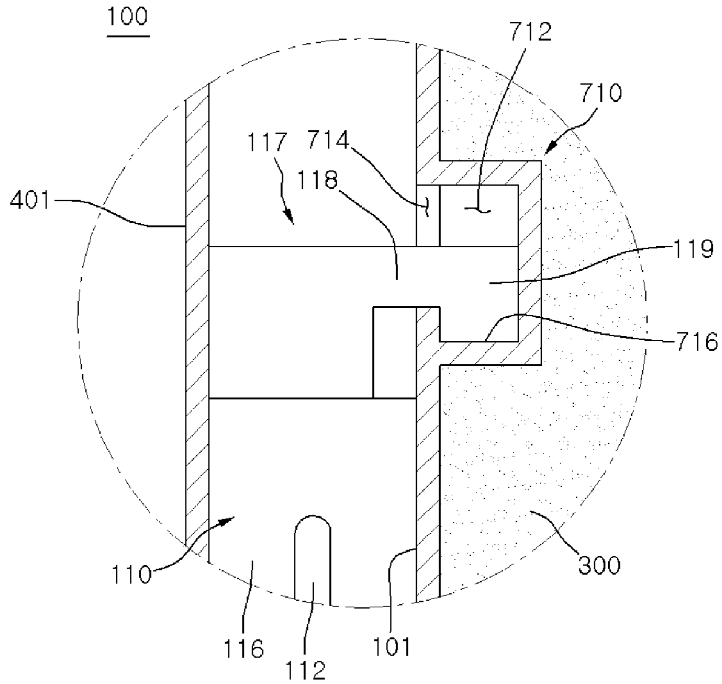
[Fig. 25]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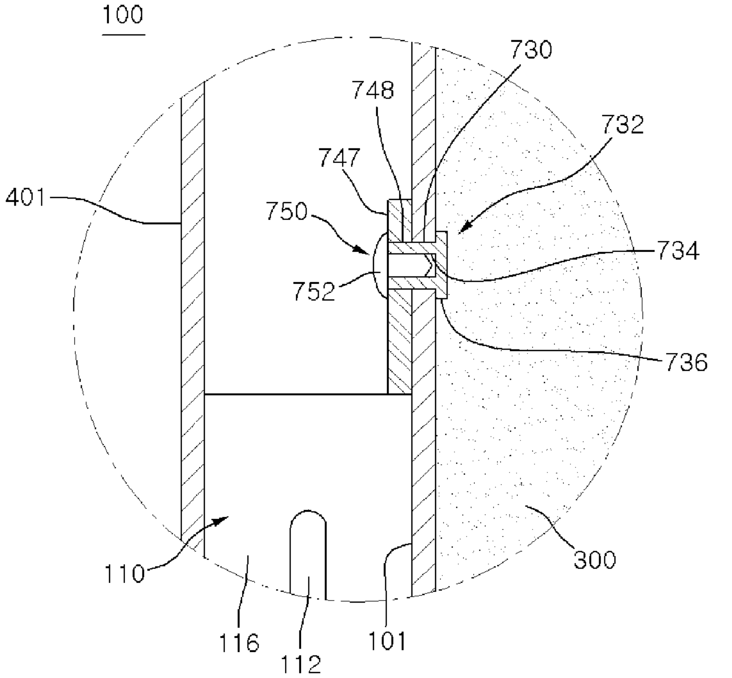
[Fig. 26]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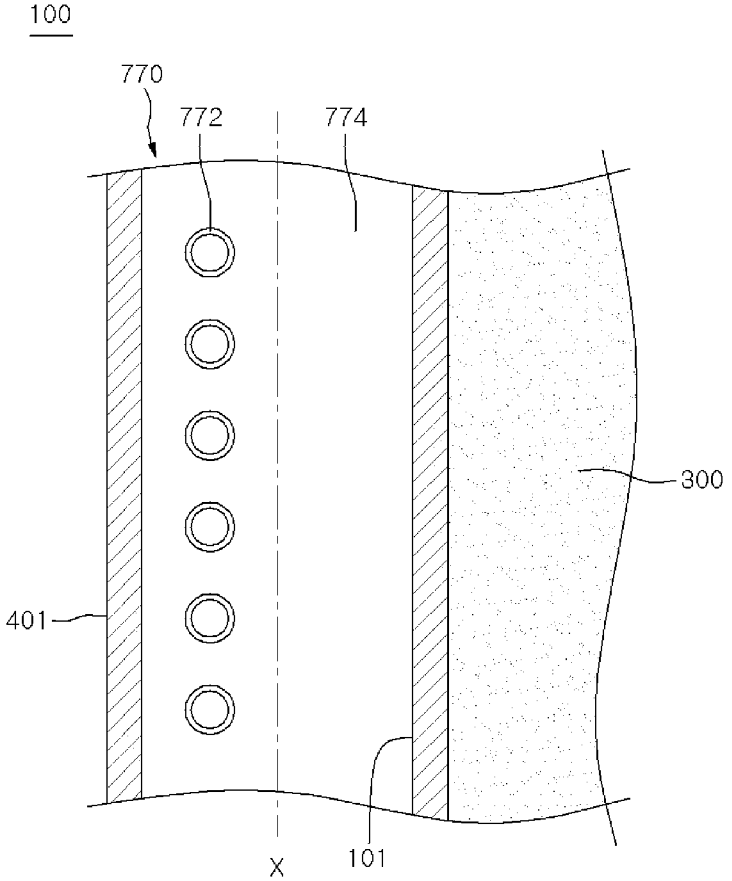
[Fig. 27]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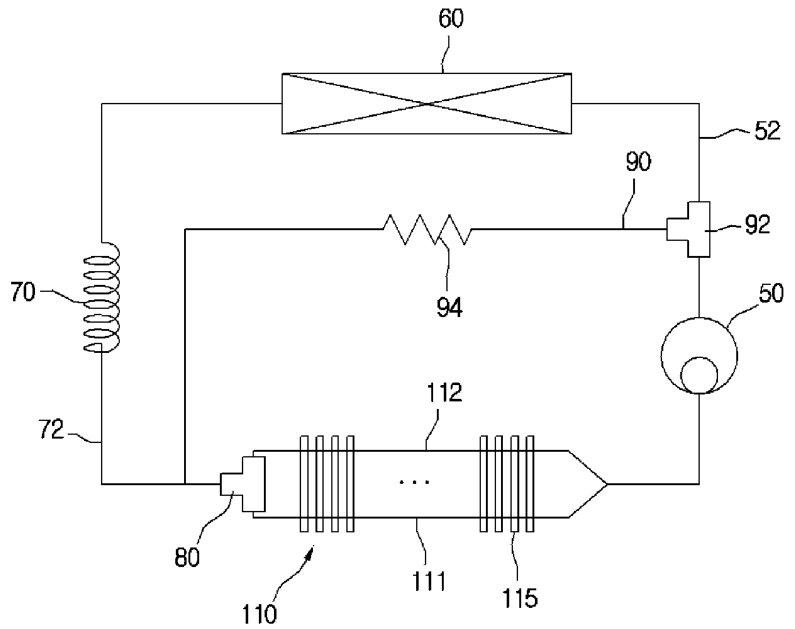
[Fig. 28]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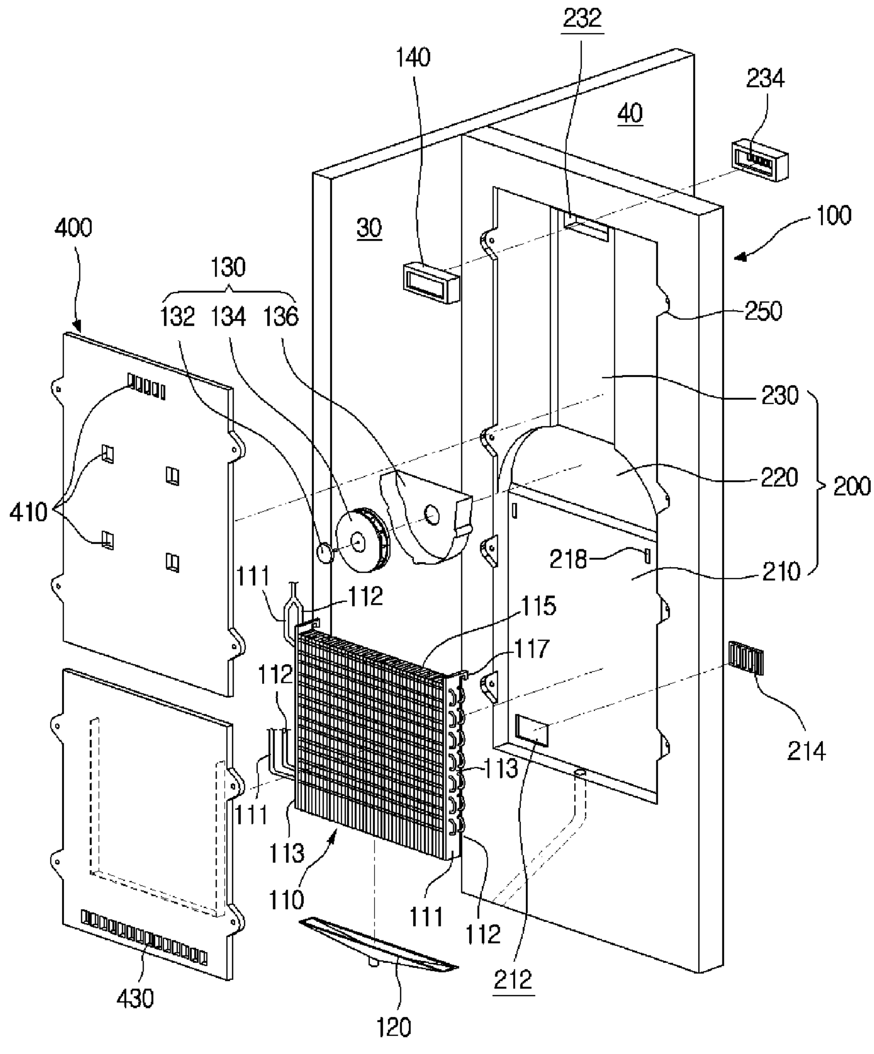
[Fig. 29]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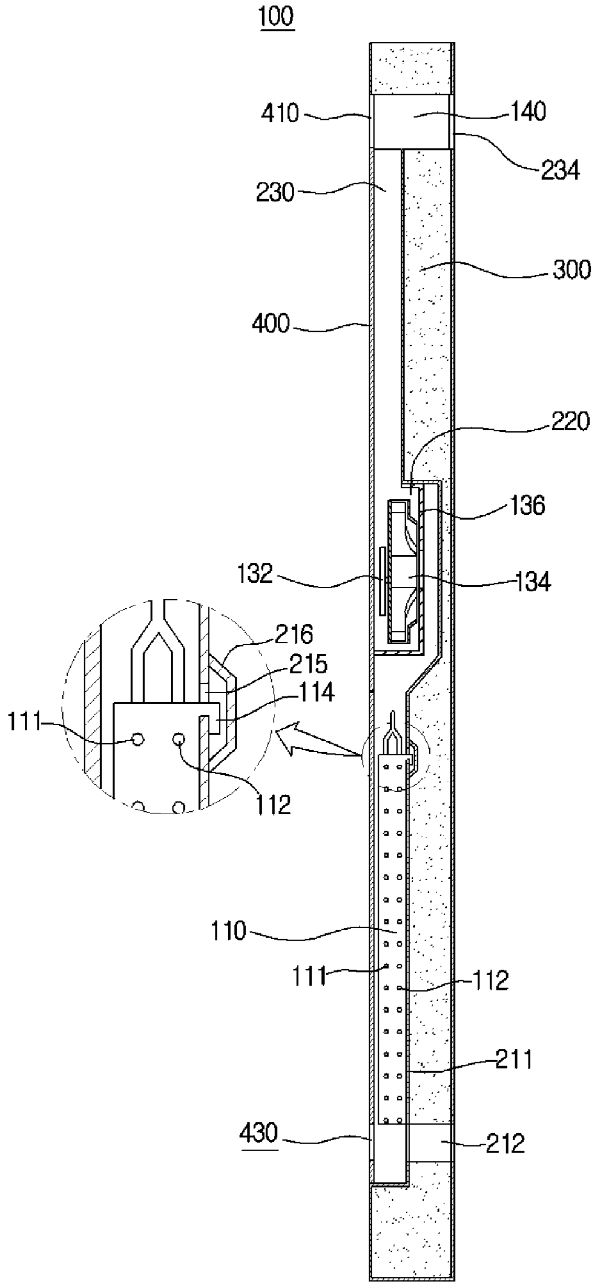
[Fig. 30]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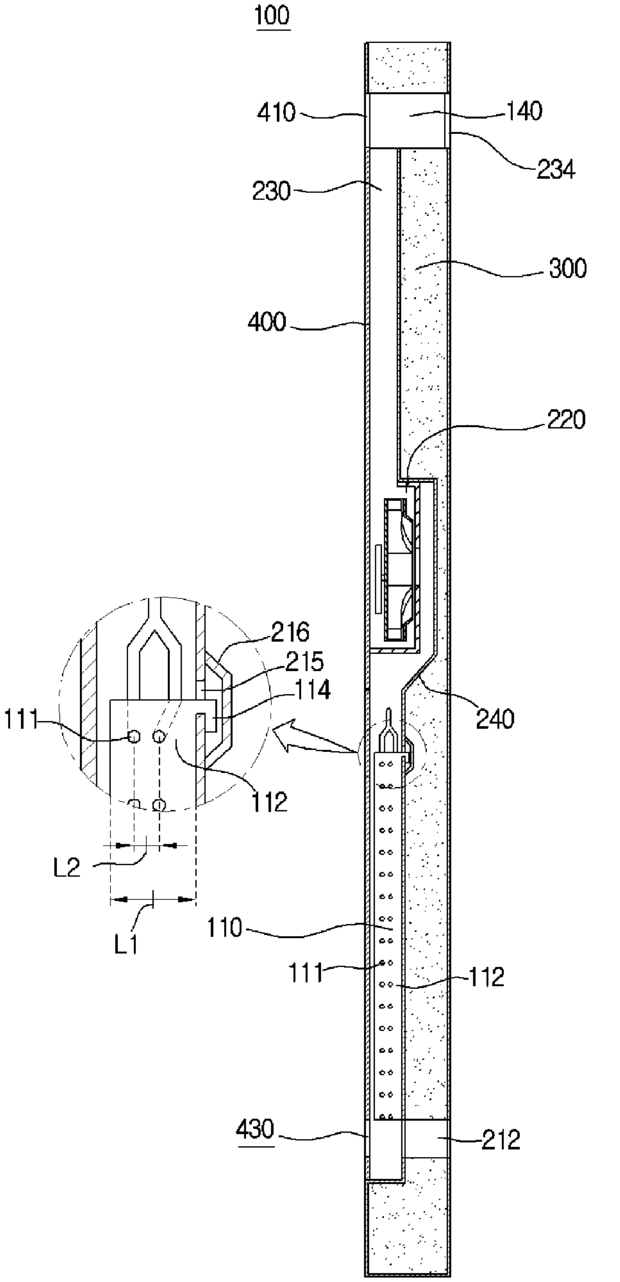
[Fig. 31]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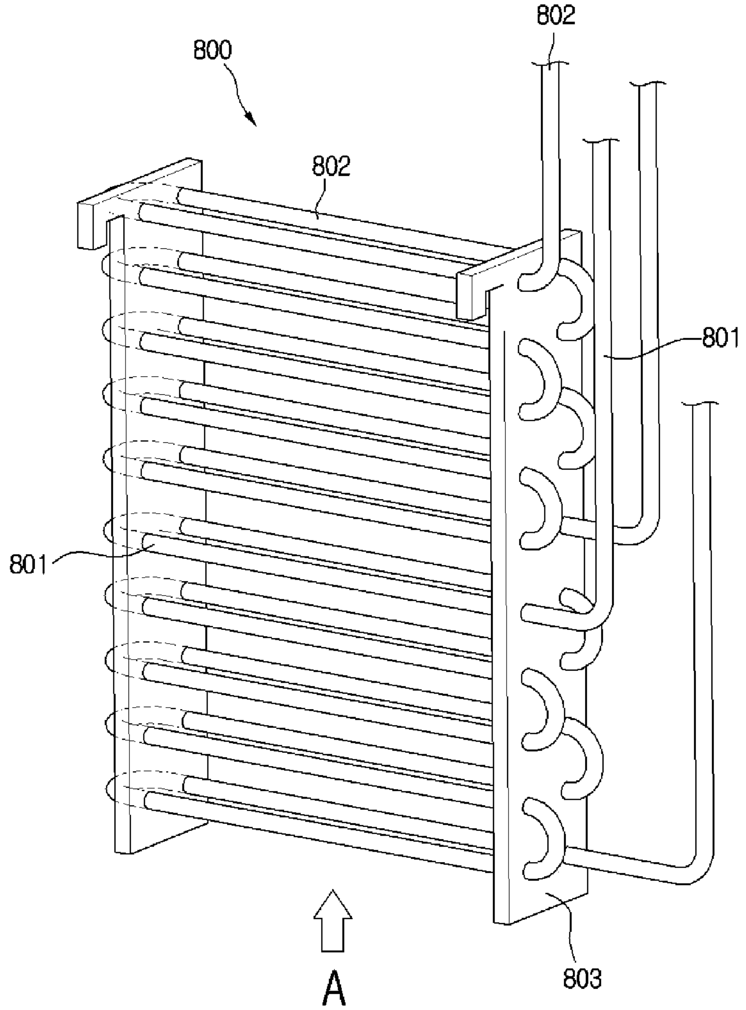
[Fig. 32]



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- KR 10039849 **[0007]**
- WO 2008146999 A1 **[0009]**
- WO 2009008613 A **[0010]**