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Description

TECHNICAL FIELD

[0001] The present invention relates to a refrigerator, and more specifically to a structure of the refrigerator provided with two temperature zones and configured to prevent returning air used to cool one of compartments from escaping into another of the compartments.

BACKGROUND ART

[0002] Fig. 4 is a schematic diagram of a refrigeration cycle of a conventional refrigerator. In Fig. 4, the refrigeration cycle comprises refrigerant circuit 5 having compressor 1, condenser 2, pressure reducing device 3 and cooling unit 4 connected in series, and cold-air flow path 6. Cold-air flow path 6 allows cold air to flow through a freezer compartment of low temperature zone (not shown) and a refrigerator compartment of high temperature zone (not shown) wherein the two temperature zones are controlled by regulating cooling time and the like.

[0003] Cold-air flow path 6 includes cooling unit 4, cooling fan 7, freezer-compartment flow damper 8a, refrigerator-compartment flow damper 9a, freezer-compartment return damper 8b, and refrigerator-compartment return damper 9b. Cooling fan 7 circulates the cold air to interiors of the refrigerator. Freezer-compartment flow damper 8a, refrigerator-compartment flow damper 9a, freezer-compartment return damper 8b and refrigerator-compartment return damper 9b are disposed to their respective locations in airflow path 6a and return flow path 6b so that the cold air can be circulated selectively to the freezer compartment and the refrigerator compartment.

[0004] In the refrigerator of such structure, compressor 1 and cooling fan 7 are driven to operate the refrigeration cycle, when a temperature of the freezer compartment becomes higher than a preset temperature, and it becomes necessary to cool only the freezer compartment. In addition, freezer-compartment flow damper 8a and freezer-compartment return damper 8b are opened whereas refrigerator-compartment flow damper 9a and refrigerator-compartment return damper 9b are kept closed, to cool only the freezer compartment.

[0005] On the other hand, when a temperature of the refrigerator compartment becomes higher than a preset temperature and it becomes necessary to cool only the refrigerator compartment, refrigerator-compartment flow damper 9a and refrigerator-compartment return damper 9b are opened while freezer-compartment flow damper 8a and freezer-compartment return damper 8b are closed, to cool only the refrigerator compartment.

[0006] Refrigerators hitherto disclosed include such a function capable of preventing cold air of a higher temperature from flowing into a freezer compartment of lower temperature zone by controlling in the above manner when cooling a refrigerator compartment of higher temperature zone, thereby suppressing a temperature rise of the freezer compartment to a minimum possible extent (refer to Patent Literature 1, for example).

[0007] Also available in the market are refrigerators of such a structure that prevents backflow of cold air to a freezer compartment by drawing the cold air used to cool a refrigerator compartment from a lower backside of cooling unit 4 whereas a return flow path of the freezer compartment side is opened in a location lower than that, as another method.

[0008] In the above structure of conventional art, however, it is necessary to have freezer-compartment return damper 8b and refrigerator-compartment return damper 9b for preventing flow of the cold air. There are such drawbacks for this reason that the cost increases, the refrigerator duct becomes complex, a volume of storage compartment become smaller due to the need of extra spaces for the dampers and the airflow path, the reliability decreases due to increase in number of the movable components, all attributed to the addition of the dampers.

[0009] Alternatively, an intake opening may be located at a back surface of cooling unit 4. However, such a structure will require additional measures of increasing fin pitches or eliminating some fins in lower part of cooling unit 4 when a cooling unit of fin and tube type is used, in order to prevent cooling unit 4 from being clogged due to formation of frost. It thus gives rise to problems that a capacity of cooling unit 4 decreases, and a size of cooling unit 4 increases in order to maintain the capacity that makes a volume of the compartment smaller.

[0010] Patent literature 2 forming the closest prior art from which the present invention starts, discloses a refrigerator wherein the opening part lower face of a freezing chamber return air passage is upward arranged by a distance on the opening part lower face of the freezing chamber return air passage of an evaporator cover and the lower face of the evaporator. Frost due to return of cold air from the refrigeration chamber and the vegetable chamber adheres from an innermost face below the evaporator. Moreover, frost due to a return of cold air from the freezing chamber adheres from a middle lower step on a front face of the evaporator to prevent clocking due to concentrated frost adhesion in a lower part of the evaporator and increases therefore the cooling capacity when frost adheres.

Citation List:

Patent Literature

[0011]

PTL 1: Japanese Patent Unexamined Publication No. 2004-9245.
PTL 2: Japanese Patent Unexamined Publication No. 2004-085070

SUMMARY OF THE INVENTION

[0012] A refrigerator of the present invention is defined in claim 1. In particular, the refrigerator comprises a first storage compartment, a second storage compartment, a cooling chamber, a cooling unit, a cooling fan, a first discharge flow path, a second discharge flow path, a first return flow path, and a second return flow path. The first storage compartment and the second storage compartment are surrounded by an insulation wall, and provided with an opening in a front face. The cooling chamber is located at a back-face side of the second storage compartment. The cooling unit is disposed inside the cooling chamber. The cooling fan forces cold air produced by the cooling unit to circulate to the first storage compartment and the second storage compartment. The first discharge flow path guides cooling air sent by the cooling fan into the first storage compartment. The second discharge flow path guides the cooling air sent by the cooling fan into the second storage compartment. The first return flow path guides the cooling air used to cool the first storage compartment back to the cooling chamber. The second return flow path guides the cooling air used to cool the second storage compartment back to the cooling chamber. The refrigerator of the present invention further comprises a first opening and a second opening. The first opening guides the cooling air from the first return flow path to the cooling chamber. The second opening is provided in a surface confronting the first opening in a depth direction, and guides the cooling air from the second return flow path to the cooling chamber. There is an inflow barrier wall disposed in a position forward of a plane projected in a direction perpendicularly downward from the cooling unit. . The inflow barrier wall prevents the cooling air discharged through the first opening from getting into the second opening, flowing backward through the second return flow path and entering the second storage compartment.

[0013] This structure can prevent the cold air used to cool the first storage compartment from flowing into the second storage compartment, and it can hence suppress a temperature rise of the second storage compartment with simple structure.

BRIEF DESCRIPTION OF DRAWINGS

[0014]

Fig. 1 is a longitudinal sectional view of a refrigerator according to first exemplary embodiment of the present invention.

Fig. 2 is a front view of the refrigerator with a door open according to the first embodiment of the invention.

Fig. 3 is a sectional view of a return flow path and vicinity thereof in the refrigerator according to the first embodiment of the invention.

Fig. 4 is a schematic diagram of a refrigeration cycle of a conventional refrigerator.

DESCRIPTION OF EMBODIMENT

FIRST EXEMPLARY EMBODIMENT

[0015] Fig. 1 is a longitudinal sectional view of a refrigerator according to the first exemplary embodiment of the present invention. Fig. 2 is a front view of the refrigerator with a door open according to the first embodiment of the invention. Fig. 3 is a sectional view of a return flow path and the vicinity thereof in the refrigerator according to the first embodiment of the invention.

[0016] In Fig. 1 to Fig. 3, refrigerator main cabinet 11 constructed with insulation wall includes refrigerator compartment 12 at an upper section and freezer compartment 13 at a lower section. Refrigerator main cabinet 11 is also provided internally with a refrigerant circuit having compressor 1, a condenser (not shown), a pressure reducing device (not shown), and cooling unit 4.

[0017] Freezer compartment 13 has cooling chamber 14 in which cooling unit 4 is disposed. Cooling chamber 14 is separated from an interior of freezer compartment 13 by cooling unit cover 15.

[0018] There are cooling fan 7, refrigerator-compartment flow damper 9a and freezer-compartment flow damper 8a, all disposed above cooling unit 4 for selectively circulating cold air (i.e., cooling air) produced by cooling unit 4 to refrigerator compartment 12 and freezer compartment 13.

[0019] Refrigerator-compartment flow damper 9a and an interior of refrigerator compartment 12 are connected via refrigerator-compartment discharge flow path 16, so that refrigerator compartment 12 and cooling chamber 14 come into continuity when refrigerator-compartment flow damper 9a opens. In other words, refrigerator-compartment flow damper 9a selectively closes and opens refrigerator-compartment discharge flow path 16. Refrigerator-compartment discharge flow path 16 guides the cooling air sent by cooling fan 7 toward refrigerator compartment 12.

[0020] Freezer-compartment flow damper 8a and the interior of freezer compartment 13 are connected via freezer-compartment discharge flow path 17, so that freezer compartment 13 and cooling chamber 14 come into continuity when freezer-compartment flow damper 8a opens. That is, freezer-compartment flow damper 8a selectively closes and opens freezer-compartment discharge flow path 17. Freezer-compartment discharge flow path 17 guides the cooling air sent by cooling fan 7 toward freezer compartment 13. Both refrigerator-compartment flow damper 9a and freezer-compartment flow damper 8a do not open simultaneously during operation of cooling fan 7.

[0021] Refrigerator-compartment intake opening 18 is provided in a back face of cooling chamber 14 below cooling unit 4, and freezer-compartment intake opening 19 is provided in a front face of cooling chamber 14, and

they are opened to communicate with refrigerator-compartment return flow path 20 and freezer-compartment return flow path 21 respectively. In other words, freezer-compartment intake opening 19 is provided in the surface confronting refrigerator-compartment intake opening 18 in a depth direction. Refrigerator-compartment return flow path 20 that has a width nearly equal to or larger than a width of cooling unit 4 is disposed between cooling chamber 14 and refrigerator main cabinet 11. Refrigerator-compartment return flow path 20 guides the cold air used to cool refrigerator compartment 12 back again to cooling chamber 14. Freezer-compartment return flow path 21 is disposed under cooling unit cover 15. Freezer-compartment return flow path 21 guides the cold air used to cool freezer compartment 13 back again to cooling chamber 14.

[0022] Heating unit 22 such as a radiant heater is disposed below cooling unit 4 at a position between an upper edge and a lower edge of an opening of refrigerator-compartment intake opening 18, for melting frost built up on cooling unit 4 during refrigerating operation. There are also drip tray 23 and drain pipe 24 provided below heating unit 22 for draining the water resulting from the melted frost to the outside.

[0023] In addition, water cutting edge 15a of a ridge shape is formed downward at one side facing cooling unit 4 of the lower end of cooling unit cover 15.

[0024] Inflow barrier wall 25 is provided at a lower part of cooling unit cover 15. Inflow barrier wall 25 has a shape of rectangular plate with a width that is at least larger than a width of refrigerator-compartment intake opening 18. In addition, inflow barrier wall 25 has fitting portion 25a at a lower side thereof for engagement with a front wall of drip tray 23. This is to eliminate a gap between inflow barrier wall 25 and drip tray 23, and reduce variation in position of inflow barrier wall 25.

[0025] Inflow barrier wall 25 is disposed at a position forward of a plane projected in a direction perpendicularly downward from cooling unit 4 with its surface inclined such that an upper edge is closer to a back-face side of refrigerator main cabinet 11 than a lower edge. Inflow barrier wall 25 prevents the cold air discharged through refrigerator-compartment intake opening 18 from flowing backward into freezer-compartment intake opening 19 and entering freezer compartment 13 through freezer-compartment return flow path 21.

[0026] The refrigerator constructed above operates in a manner as described hereinafter.

[0027] When a temperature inside freezer compartment 13 exceeds a reference temperature due to temperature rise in the compartment, and it becomes necessary to cool down freezer compartment 13 during operation of the refrigerator, compressor 1 is started to operate if it is not in operation. If compressor 1 is already in operation, on the other hand, the operation of compressor 1 is continued. At the same time, cooling fan 7 is operated, freezer-compartment flow damper 8a is opened, and refrigerator-compartment flow damper 9a is closed.

[0028] As a result, the cold air produced by cooling unit 4 flows into freezer compartment 13 from freezer-compartment flow damper 8a through freezer-compartment discharge flow path 17, and cools the interior of freezer compartment 13.

[0029] At this time, the cold air that has cooled freezer compartment 13 is drawn into freezer-compartment return flow path 21 and freezer-compartment intake opening 19 in this order, and discharged by cooling fan 7 into the interior of freezer compartment 13 from freezer-compartment flow damper 8a and freezer-compartment discharge flow path 17 after it is cooled again by cooling unit 4.

[0030] On the other hand, when a temperature inside refrigerator compartment 12 exceeds a reference temperature and it becomes necessary to cool down refrigerator compartment 12, cooling fan 7 is operated, refrigerator-compartment flow damper 9a is opened, and freezer-compartment flow damper 8a is closed.

[0031] As a result, the cold air produced by cooling unit 4 flows into refrigerator compartment 12 from refrigerator-compartment flow damper 9a through refrigerator-compartment discharge flow path 16, and cools the interior of refrigerator compartment 12.

[0032] At this time, the cold air that has cooled refrigerator compartment 12 is drawn into refrigerator-compartment return flow path 20 and refrigerator-compartment intake opening 18 in this order, and the cold air discharged from refrigerator-compartment intake opening 18 is forced by inflow barrier wall 25 to change its direction of flow toward cooling unit 4. The cold air is again cooled thereafter, and discharged by cooling fan 7 into the interior of refrigerator compartment 12 from refrigerator-compartment flow damper 9a and refrigerator-compartment discharge flow path 16.

[0033] If inflow barrier wall 25 is not provided here, the cold air drawn from refrigerator-compartment intake opening 18 climbs over a front wall of drip tray 23, flows backward and enters freezer compartment 13 from freezer-compartment intake opening 19 and freezer-compartment return flow path 21. At this time, the cold air entering from refrigerator compartment intake opening 18 is higher in temperature than that inside freezer compartment 13 because it has cooled refrigerator compartment 12, it causes the temperature of freezer compartment 13 to rise.

[0034] When inflow barrier wall 25 is provided, on the other hand, the cold air drawn from refrigerator-compartment intake opening 18 is forced to flow along inflow barrier wall 25 from drip tray 23. Since the cold air is forced to change the direction of flow toward cooling unit 4, the cold air does not flow into freezer-compartment intake opening 19.

[0035] Therefore, freezer compartment 13 never become warmed up by the cold air already used to cool refrigerator compartment 12 during the cooling operation of refrigerator compartment 12, even though freezer-

compartment intake opening 19 is not provided with a damper like the example of conventional art. It becomes possible for this reason to suppress reliably the temperature rise of freezer compartment 13 with a less-costly structure, which can provide the refrigerator of high refrigerating performance.

[0036] Besides, refrigerator-compartment return flow path 20 is disposed between cooling chamber 14 and the insulation wall on the back face of refrigerator main cabinet 11, and so configured as to have the width nearly equal to or larger than the width of cooling unit 4. This configuration can reduce a difference in the temperatures between the outside air through the insulation wall and inside of refrigerator main cabinet 11. As a result, a temperature of the cold air that flows in refrigerator-compartment return flow path 20 increases as compared to the structure of conventional art although an amount of heat transfer decreases and the insulating effect increases.

[0037] In addition, it is so configured that the cold air is circulated only through refrigerator compartment 12 by keeping freezer-compartment flow damper 8a closed when cooling refrigerator compartment 12. For this reason, the temperature of cooling unit 4 can be increased as compared with other cases in which freezer-compartment flow damper 8a is not provided or freezer-compartment flow damper 8a is not closed during cooling operation of refrigerator compartment 12. As a consequence, the temperature of the cold air that flows in refrigerator-compartment return flow path 20 increases even further, though the efficiency of the cooling cycle increases during the cooling operation of refrigerator compartment 12.

[0038] Even in such a structure, leakage of the cold air into freezer compartment 13 can be prevented reliably.

[0039] It is therefore possible to suppress the temperature rise of freezer compartment 13 even of the refrigerator having a high insulating property, and hence provide the refrigerator of high refrigerating performance.

[0040] In the refrigerator according to this exemplary embodiment, both refrigerator-compartment intake opening 18 and freezer-compartment intake opening 19 are opened in an area perpendicularly below cooling unit 4. As a result, leakage of the cold air into freezer compartment 13 can be prevented without reducing a number of fins in a lower part of cooling unit 4.

[0041] The temperature rise of freezer compartment 13 can therefore be suppressed without impairing the efficiency of cooling unit 4, thereby providing the refrigerator of high refrigerating performance.

[0042] Moreover, inflow barrier wall 25 is fixed to drip tray 23 by engagement of fitting portion 25a. Therefore, the cold air used to cool refrigerator compartment 12 can be directed toward cooling unit 4 by drip tray 23 and inflow barrier wall 25. As a result, drip tray 23 can be used as an airflow path, and this helps reduce the size of inflow barrier wall 25. In addition, this structure does not allow any gap to arise between drip tray 23 and inflow barrier wall 25 due to variations in their dimensions and assembling, and to cause any leakage of the cold air into freezer compartment 13 through such a gap, since inflow barrier wall 25 is fixed to drip tray 23 by the engagement of fitting portion 25a.

[0043] It is thus possible to suppress the temperature rise of freezer compartment 13 more reliably with a less-costly structure, which can provide the refrigerator of high refrigerating performance.

[0044] Inflow barrier wall 25 is formed as an integral structure with cooling unit cover 15. This helps make inflow barrier wall 25 even less costly since it can decrease a number of the components.

[0045] It is hence possible to suppress the temperature rise of freezer compartment 13 with even less-costly structure, and it can provide the refrigerator of high refrigerating performance.

[0046] Furthermore, refrigerator-compartment intake opening 18 is opened across an area from a position higher than heating unit 22 to a position lower than the same. Because of this configuration, the cold air used to cool refrigerator compartment 12 is discharged from refrigerator-compartment intake opening 18, in which a part of the cold air from the position lower than heating unit 22 is guided along drip tray 23 toward inflow barrier wall 25 and drawn into cooling unit 4, and another part of the cold air from the position higher than heating unit 22 is drawn directly into cooling unit 4.

[0047] Contrary to the above, if refrigerator-compartment intake opening 18 is opened only in one position higher than heating unit 22, the cold air from refrigerator-compartment intake opening 18 is forced to change the direction sharply when being drawn into cooling unit 4, which results in a large loss of the pressure.

[0048] On the other hand, if refrigerator-compartment intake opening 18 is opened only in another position lower than heating unit 22, all the cold air discharged from refrigerator-compartment intake opening 18 flows from drip tray 23 toward inflow barrier wall 25, which increases a velocity of the air. It therefore becomes necessary to tilt inflow barrier wall 25 further toward cooling unit 4 in order to prevent the cold air from escaping into freezer compartment 13, which also results in a large loss of the pressure.

[0049] When choosing another structure in which heating unit 22 is spaced away from refrigerator-compartment intake opening 18 to reduce the pressure loss, it is necessary to maintain a certain distance between heating unit 22 and adjacent components to ensure safety. This requires an increase in size of cooling chamber 14, which decreases an internal volume of the compartment.

[0050] Accordingly, when refrigerator-compartment intake opening 18 is opened at such height dimensions from the position higher than heating unit 22 to the position lower than the heating unit 22, the temperature rise of freezer compartment 13 can be suppressed by reducing the pressure loss in the airflow path without decreasing the internal volume of the compartment, thereby providing the refrigerator of high refrigerating performance.

[0051] Since inflow barrier wall 25 is located outside

of the plane projected in the direction perpendicularly downward from cooling unit 4, melted water produced during defrosting operation of the frost built up on cooling unit 4 never goes out along inflow barrier wall 25 to escape into freezer compartment 13.

[0052] Additionally, cooling unit cover 15 is provided with water cutting edge 15a. Because of this structure, the water melted on the surface of cooling unit 4 drips down from water cutting edge 15a even when it flows along the surface of cooling unit cover 15. Therefore, there is never any leakage of water along cooling unit cover 15 and escape into freezer compartment 13. In this instance, inflow barrier wall 25 is so configured that an upper edge of inflow barrier wall 25 is situated further toward the front side of refrigerator main cabinet 11 than water cutting edge 15a. This configuration prevents the water that drips down from water cutting edge 15a from escaping along inflow barrier wall 25 and into freezer compartment 13.

[0053] It is thus possible to suppress the temperature rise of freezer compartment 13 more reliably while preventing the water from escaping into freezer compartment 13, thereby providing the refrigerator of high refrigerating performance.

[0054] Although the refrigerator described in this embodiment is configured to have freezer compartment 13 at the bottom and refrigerator compartment 12 at the top, similar advantages can be achieved with other configurations such that freezer compartment 13 and refrigerator compartment 12 are disposed side by side, so long as the refrigerator has two temperature zones.

[0055] Moreover, although the refrigerator described in this embodiment is provided with two storage compartments, i.e., freezer compartment 13 and refrigerator compartment 12, similar advantages can also be achieved with any refrigerator having a plurality of storage compartments so long as the refrigerator includes an intake opening in both the front side and the backside of cooling chamber 14.

[0056] Furthermore, although the refrigerator described in this embodiment is provided with the refrigeration system for producing cold air with a refrigerant-compression type refrigeration cycle using compressor 1, similar advantages can also be achieved with any refrigeration system capable of producing cold air with cooling unit 4.

[0057] As described above, the refrigerator of the present invention comprises a first storage compartment, a second storage compartment, a cooling chamber, a cooling unit, a cooling fan, a first discharge flow path, a second discharge flow path, a first return flow path, and a second return flow path. The first storage compartment and the second storage compartment are surrounded by an insulation wall, and provided with an opening in a front face. The cooling chamber is located at a back-face side of the second storage compartment. The cooling unit is disposed inside the cooling chamber. The cooling fan forces cold air produced by the cooling unit to circulate to the first storage compartment and the second storage compartment. The first discharge flow path guides cooling air sent by the cooling fan into the first storage compartment. The second discharge flow path guides the cooling air sent by the cooling fan into the second storage compartment. The first return flow path guides the cooling air used to cool the first storage compartment back to the cooling chamber. The second return flow path guides the cooling air used to cool the second storage compartment back to the cooling chamber. The refrigerator of the present invention further comprises a first opening and a second opening. The first opening guides the cooling air from the first return flow path to the cooling chamber. The second opening is located in a surface confronting the first opening in a depth direction, and guides the cooling air from the second return flow path toward the cooling chamber. The inflow barrier wall prevents the cooling air discharged through the first opening from getting into the second opening, flowing backward through the second return flow path and entering the second storage compartment.

[0058] It becomes possible by virtue of this structure to avoid the cold air used to cool the first storage compartment from flowing into the second storage compartment, and it can hence suppress a temperature rise of the second storage compartment with simple structure.

[0059] In addition, the inflow barrier wall in the refrigerator of this invention causes the cooling air discharger from the first opening to change the direction toward the cooling unit.

[0060] This structure lets the cold air used to cool the first storage compartment flow entirely into the cooling unit without allowing it to flow toward the return flow-path side of the first storage compartment, thereby suppressing the temperature rise of the second storage compartment reliably.

[0061] In the refrigerator of the present invention, the first return flow path is disposed to the back-face side of the cooling chamber, and the second return flow path is disposed to the front-face side of the cooling chamber.

[0062] This configuration makes up a structure of high insulation property by having the return flow path of a temperature higher than that of the cooling unit between the cooling unit and the insulation wall, thereby suppressing even further the temperature rise of the second storage compartment.

[0063] Moreover, the first opening and the second opening are located in the positions perpendicularly below the cooling unit, in the refrigerator of the present invention.

[0064] This configuration draws the returning cold air from under the cooling unit, and allows the cold air to flow efficiently through the entire cooling unit.. As a result, it can improve the cooling efficiency of the refrigerator.

[0065] Furthermore, the refrigerator of the present invention is provided with a dish-like drip tray for catching water resulting from melted frost built up on the cooling unit. The cooling air discharged from the first opening is

guided in a direction of the cooling unit by a wall on the second opening side of the drip tray and the inflow barrier wall.

[0066] This structure can make use of the drip tray and the inflow barrier wall to guide the cold air that has cooled the refrigerator compartment smoothly toward the cooling unit, and thereby reduce a size of the inflow barrier wall. The structure can hence suppress the temperature rise of the second storage compartment.

[0067] The refrigerator of the present invention is also provided with a first flow-path choke device for selectively opening and closing the first discharge flow path, and a second flow-path choke device for selectively opening and closing the second discharge flow path. The first flow-path choke device and the second flow-path choke device are not opened simultaneously while the cooling fan is in operation.

[0068] The structure can prevent the cold air that has cooled the first storage compartment all by itself from entering the second storage compartment. It thus becomes possible to increase an evaporating temperature when cooling the first storage compartment, and improve the efficiency of the refrigeration cycle.

[0069] In the refrigerator of the present invention, a temperature of the first storage compartment is higher than that of the second storage compartment.

[0070] It is thus possible to make a structure of high thermal insulation property provided with a return flow path from the refrigerator compartment of a higher temperature between the cooling unit and the insulation wall. The temperature rise of the freezer compartment can be further suppressed, as a result.

[0071] In the refrigerator of the present invention, the inflow barrier wall is located outside of a plane projected in a direction perpendicularly downward from the cooling unit.

[0072] Because of this structure, the water resulting from melted frost of the cooling unit never goes along the inflow barrier wall and flows into the freezer compartment. This can prevent an excessive built-up of frost and freeze-up inside the freezer compartment.

[0073] The refrigerator of the present invention is also provided with a fitting portion between the inflow barrier wall and the drip tray.

[0074] This structure can form an airflow path without leaving any gap between the inflow barrier wall and the drip tray. It thus eliminates any leakage of the cold air between the inflow barrier wall and the drip tray, and further suppresses the temperature rise of the freezer compartment.

[0075] The refrigerator of the present invention is also provided internally with a first discharge flow path, a first return flow path, a first choke device, and a second choke device. Also provided is a cover that separates the cooling unit and the second storage compartment, and that the cover and the inflow barrier wall are formed into an integral structure.

[0076] This structure can reduce a number of components. Because of this structure, the airflow path can be configured with a low cost, in addition to reducing variations in assembling, and further suppressing the temperature rise of the freezer compartment with a far less cost.

[0077] Furthermore, the refrigerator of the present invention has a heating unit disposed at a position between an upper edge and a lower edge of the first opening, for melting the frost built up on the cooling unit.

[0078] This structure allows the cold air to flow through both the upper and lower sides of the heating unit, which reduces a resistance in the airflow path and limits a decrease in volume of the airflow by the cooling fan. As a result, this can provide the refrigerator with high refrigeration efficiency.

INDUSTRIAL APPLICABILITY

[0079] The present invention pertains to a refrigerator having two storage compartments, and provides the refrigerator with capability of refrigerating these storage compartments highly efficiently. The present invention is therefore applicable to refrigerators of various kinds and sizes for domestic use, commercial use and the like.

REFERENCE MARKS IN THE DRAWINGS

[0080]

4 cooling unit
7 cooling fan
8a freezer-compartment flow damper (second flow-path choke device)
9a refrigerator-compartment flow damper (first flow-path choke device)
11 refrigerator main cabinet
12 refrigerator compartment (first storage compartment)
13 freezer compartment (second storage compartment)
14 cooling chamber
15 cooling unit cover
16 refrigerator compartment discharge flow path (first discharge flow path)
17 freezer-compartment discharge flow path (second discharge flow path)
18 refrigerator-compartment intake opening (first opening)
19 freezer-compartment intake opening (second opening)
20 refrigerator-compartment return flow path (first return flow path)
21 freezer-compartment return flow path (second return flow path)
22 heating unit
23 drip tray
24 drain pipe
25 inflow barrier wall
25a fitting portion

Claims

1. A refrigerator, comprising:

   a first storage compartment (12) and a second storage compartment (13) surrounded by an insulation wall, and provided with an opening in a front face thereof;
   a cooling chamber (14) disposed at a back-face side of the second storage compartment (13);
   a cooling unit (4) disposed inside the cooling chamber (14);
   a cooling fan (7) for circulating cold air produced by the cooling unit (4) to the first storage compartment (12) and the second storage compartment (13);
   a first discharge flow path (16) for guiding cooling air by the cooling fan (7) into the first storage compartment (12);
   a second discharge flow path (17) for guiding the cooling air by the cooling fan (7) into the second storage compartment (13);
   a first return flow path (20) for guiding the cooling air used to cool the first storage compartment (12) back to the cooling chamber (14); and
   a second return flow path (21) for guiding the cooling air used to cool the second storage compartment (13) back to the cooling chamber (14),

   wherein the refrigerator further includes:

   a first opening (18) provided in a back face of cooling chamber (14) below cooling unit (4) for guiding the cooling air from the first return flow path (20) into the cooling chamber (14); and
   a second opening (19) provided in a front face of cooling chamber (14) and in a surface confronting the first opening (18) in a depth direction, and guiding the cooling air from the second return flow path (21) into the cooling chamber (14);

   characterized by
   the second opening (19) provided below cooling unit (4);
   an inflow barrier wall (25) disposed in a position forward of a plane projected in a direction perpendicularly downward from cooling unit (4) with its surface inclined such that an upper edge is closer to a back-face side of refrigerator main cabinet (11) than a lower edge and preventing the cooling air discharged from the first opening (18) from getting into the second opening (19), flowing backward through the second return flow path (21) and entering the second storage compartment (13).

2. The refrigerator of claim 1, wherein the first return flow path (20) is disposed at a back-face side of the cooling chamber (14), and the second return flow path (21) is disposed at a front-face side of the cooling chamber (14).

3. The refrigerator of claim 1, further comprising a dish-like drip tray (23) disposed below the cooling unit (4) with one wall on at least its second opening (19) side for catching water resulting from melted frost built up on the cooling unit (4), wherein the cooling air discharged from the first opening (18) is guided in a direction of the cooling unit (4) by a wall on second opening (19) side of the drip tray (23) and the inflow barrier wall (25).

4. The refrigerator of claim 1, further comprising a first flow-path choke device (9a) for selectively opening and closing the first discharge flow path (16), and a second flow-path choke device (8a) for selectively opening and closing the second discharge flow path (17), wherein the first flow-path choke device (9a) and the second flow-path choke device (8a) are not opened simultaneously while the cooling fan (7) is in operation.

5. The refrigerator of claim 1, wherein a temperature of the first storage compartment (12) is higher than a temperature of the second storage compartment (13).

6. The refrigerator of claim 1, wherein the inflow barrier wall (25) is located outside of the plane projected perpendicularly downward from cooling unit (4).

7. The refrigerator of claim 3, wherein a fitting portion (25a) is provided between the inflow barrier wall (25) and the drip tray (23).

8. The refrigerator of claim 6, further comprising a cover (15) separating the cooling unit (4) and the second storage compartment (13),
   wherein the cover (15) and the inflow barrier wall (25) are formed into an integral structure.

9. The refrigerator of claim 1, further comprising a heating unit (22) disposed between an upper edge and a lower edge of the first opening (18), for melting frost built up on the cooling unit (4).

Patentansprüche

1. Kühlschrank umfassend:

   ein erstes Lagerabteil (12) und ein zweites Lagerabteil (13) umgeben von einer Isolationswand, und mit einer Öffnung an einer Vorderseite davon versehen;
   eine Kühlkammer (14) positioniert an einer rück-

wärtigen Seite des zweiten Lagerabteils (13);
eine Kühleinheit (4) positioniert innerhalb der Kühlkammer (14);
ein Kühlgebläse (7) zum Zirkulieren kalter Luft, welche durch die Kühleinheit (4) produziert wird, zu dem ersten Lagerabteil (12) und zu dem zweiten Lagerabteil (13);
einen ersten Auslassflusspfad (16) zum Leiten von Kühlluft durch das Kühlgebläse (7) in das erste Lagerabteil (12);
einen zweiten Auslassflusspfad (17) zum Leiten der Kühlluft durch das Kühlgebläse (7) in das zweite Lagerabteil (13);
einen ersten Rücklaufflusspfad (20) zum Leiten der Kühlluft, die zum Kühlen des ersten Lagerabteils (12) benutzt wurde, zurück zu der Kühlkammer (14); und
einen zweiten Rücklaufflusspfad (21) zum Leiten der Kühlluft, die zum Kühlen des zweiten Lagerabteils (13) benutzt wurde, zurück zu der Kühlkammer (14);

wobei der Kühlschrank ferner umfasst:

eine erste Öffnung (18), welche an einer Rückseite der Kühlkammer (14) unterhalb der Kühleinheit (4) vorgesehen ist, zum Führen der Kühlluft von dem ersten Rücklaufflusspfad (20) in die Kühlkammer (14); und
eine zweite Öffnung (19), welche an einer Vorderseite der Kühlkammer (14) und an einer Oberfläche, die der ersten Öffnung (18) in einer Tiefenrichtung gegenüber liegt, vorgesehen ist und die die Kühlluft von dem zweiten Rücklaufflusspfad (21) in die Kühlkammer (14) führt;

dadurch gekennzeichnet, dass die zweite Öffnung (19) unterhalb der Kühleinheit (4) vorgesehen ist, und
gekennzeichnet durch eine Zuflussbarrierewand (25), die an einer Position angeordnet ist, die vor einer Ebene, welche in einer Richtung senkrecht abwärts der Kühleinheit (4) erstreckt ist, liegt, wobei ihre Oberfläche derart geneigt ist, dass eine obere Kante dichter an einer rückwärtigen Seite des Kühlschrank-Hauptschrankes (11) ist als eine untere Kante, und die verhindert, dass die Kühlluft, die von der ersten Öffnung (18) ausgelassen wird, in die zweite Öffnung (19) gelangt, **durch** den zweiten Rücklaufflusspfad (21) zurückfließt und in das zweite Lagerabteil (13) eintritt.

2. Kühlschrank nach Anspruch 1, wobei der erste Rücklaufflusspfad (20) an einer rückwärtigen Seite der Kühlkammer (14) positioniert ist, und der zweite Rücklaufflusspfad (21) an einer vorderen Seite der Kühlkammer (14) positioniert ist.

3. Kühlschrank nach Anspruch 1, ferner umfassend eine tellerartige Tropfschale (23), die unter der Kühleinheit (4) positioniert ist, mit einer Wand an wenigstens der Seite seiner zweiten Öffnung (19) zum Auffangen von Wasser, das aus dem Schmelzen von Frost, der sich an der Kühleinheit (4) gebildet hat, resultiert, wobei die Kühlluft, die von der ersten Öffnung (18) ausgelassen wird, durch eine Wand der Tropfschale (23) an der Seite der zweiten Öffnung (19) und die Zuflussbarrierewand (25) in eine Richtung der Kühleinheit (4) geleitet wird.

4. Kühlschrank nach Anspruch 1, ferner umfassend eine erste Flusspfaddrosselvorrichtung (9a) zum selektiven Öffnen und Schließen des ersten Auslassflusspfads (16), und eine zweite Flusspfaddrosselvorrichtung (8a) zum selektiven Öffnen und Schließen des zweiten Auslassflusspfads (17), wobei die erste Flusspfaddrosselvorrichtung (9a) und die zweite Flusspfaddrosselvorrichtung (8a) nicht gleichzeitig geöffnet sind, während das Kühlgebläse (7) in Betrieb ist.

5. Kühlschrank nach Anspruch 1, wobei die Temperatur des ersten Lagerabteils (12) höher ist als die Temperatur des zweiten Lagerabteils (13).

6. Kühlschrank nach Anspruch 1, wobei die Zuflussbarrierewand (25) außerhalb der Ebene lokalisiert ist, die von der Kühleinheit (4) senkrecht nach unten erstreckt ist.

7. Kühlschrank nach Anspruch 3, wobei ein Passteil (25a) zwischen der Zuflussbarrierewand (25) und der Tropfschale (23) bereitgestellt wird.

8. Kühlschrank nach Anspruch 6, ferner umfassend eine Abdeckung (15), die die Kühleinheit (4) und das zweite Lagerabteil (13) trennt,
wobei die Abdeckung (15) und die Zuflussbarrierewand (25) in eine integrale Struktur ausgebildet sind.

9. Kühlschrank nach Anspruch 1, ferner umfassend eine Heizeinheit (22), die zwischen einer oberen Kante und einer unteren Kante der ersten Öffnung (18) angeordnet ist, zum Schmelzen von Frost, der sich an der Kühleinheit (4) gebildet hat.

Revendications

1. Réfrigérateur comprenant:

un premier compartiment de stockage (12) et un deuxième compartiment de stockage (13) entourés d'une paroi d'isolation et pourvus d'une ouverture sur une face avant de ceux-ci;
une chambre de refroidissement (14) disposée

sur une face arrière du deuxième compartiment de stockage (13);
une unité de refroidissement (4) disposée à l'intérieur de la chambre de refroidissement (14);
un ventilateur de refroidissement (7) destiné à faire circuler de l'air froid produit par l'unité de refroidissement (4) vers le premier compartiment de stockage (12) et le deuxième compartiment de stockage (13);
un premier trajet d'écoulement d'évacuation (16) pour guider de l'air de refroidissement par le ventilateur de refroidissement (7) dans le premier compartiment de stockage (12);
un deuxième trajet d'écoulement d'évacuation (17) pour guider l'air de refroidissement par le ventilateur de refroidissement (7) dans le deuxième compartiment de stockage (13);
un premier trajet d'écoulement de retour (20) pour ramener à la chambre de refroidissement (14) l'air de refroidissement utilisé pour refroidir le premier compartiment de stockage (12); et
un deuxième trajet d'écoulement de retour (21) pour ramener à la chambre de refroidissement (14) l'air de refroidissement utilisé pour refroidir le deuxième compartiment de stockage (13),

dans lequel le réfrigérateur comprend en outre:

une première ouverture (18) qui est prévue sur une face arrière de la chambre de refroidissement (14) au-dessous de ladite unité de refroidissement (4) et destinée à guider l'air de refroidissement depuis le premier trajet d'écoulement de retour (20) dans la chambre de refroidissement (14); et
une deuxième ouverture (19) qui est prévue sur une face avant de la chambre de refroidissement (14) et sur une surface située en regard de la première ouverture (18) dans une direction de profondeur, et qui guide l'air de refroidissement depuis le deuxième trajet d'écoulement de retour (21) dans la chambre de refroidissement (14);

caractérisé par le fait que ladite deuxième ouverture (19) est prévue au-dessous de l'unité de refroidissement (4), et
caractérisé par une paroi de barrière d'entrée (25) qui est disposée sur une position située en avant d'un plan projeté dans une direction perpendiculairement vers le bas à partir de l'unité de refroidissement (4), sa surface étant inclinée de telle manière qu'un bord supérieur est plus proche d'une face arrière de l'armoire principale de réfrigérateur (11) qu'un bord inférieur, et qui empêche l'air de refroidissement évacué par la première ouverture (18) de pénétrer dans la deuxième ouverture (19), de retourner à travers le deuxième trajet d'écoulement de retour (21) et d'entrer dans le deuxième compartiment de stockage (13).

2. Réfrigérateur selon la revendication 1, dans lequel le premier trajet d'écoulement de retour (20) est disposé sur une face arrière de la chambre de refroidissement (14) et le deuxième trajet d'écoulement de retour (21) est disposé sur une face avant de la chambre de refroidissement (14).

3. Réfrigérateur selon la revendication 1, comprenant en outre un bac égouttoir (23) de type plat qui est disposé au-dessous de l'unité de refroidissement (4), avec une paroi sur au moins le côté de sa deuxième ouverture (19) pour recueillir de l'eau résultant de la fusion de givre qui s'est formé sur l'unité de refroidissement (4), dans lequel l'air de refroidissement évacué par la première ouverture (18) est guidé dans une direction de l'unité de refroidissement (4) par une paroi du bac égouttoir (23), sur le côté de la deuxième ouverture (19), et ladite paroi de barrière d'entrée (25).

4. Réfrigérateur selon la revendication 1, comprenant en outre un premier dispositif d'étranglement de trajet d'écoulement (9a) pour ouvrir et fermer sélectivement le premier trajet d'écoulement d'évacuation (16), et un deuxième dispositif d'étranglement de trajet d'écoulement (8a) pour ouvrir et fermer sélectivement le deuxième trajet d'écoulement d'évacuation (17), dans lequel le premier dispositif d'étranglement de trajet d'écoulement (9a) et le deuxième dispositif d'étranglement de trajet d'écoulement (8a) ne sont pas ouverts simultanément pendant que le ventilateur de refroidissement (7) est en marche.

5. Réfrigérateur selon la revendication 1, dans lequel la température du premier compartiment de stockage (12) est supérieure à la température du deuxième compartiment de stockage (13).

6. Réfrigérateur selon la revendication 1, dans lequel la paroi de barrière d'entrée (25) est située en dehors du plan projeté perpendiculairement vers le bas à partir de l'unité de refroidissement (4).

7. Réfrigérateur selon la revendication 3, dans lequel une partie d'ajustement (25a) est prévu entre la paroi de barrière d'entrée (25) et le bac égouttoir (23).

8. Réfrigérateur selon la revendication 6, comprenant en outre une couverture (15) qui sépare l'unité de refroidissement (4) et le deuxième compartiment de stockage (13),
dans lequel ladite couverture (15) et la paroi de barrière d'entrée (25) sont formées de manière à former une structure intégrale.

9. Réfrigérateur selon la revendication 1, comprenant en outre une unité de chauffage (22) qui est disposée entre un bord supérieur et un bord inférieur de la première ouverture (18) et destinée à faire fondre du givre qui s'est formé sur l'unité de refroidissement (4).

FIG. 1

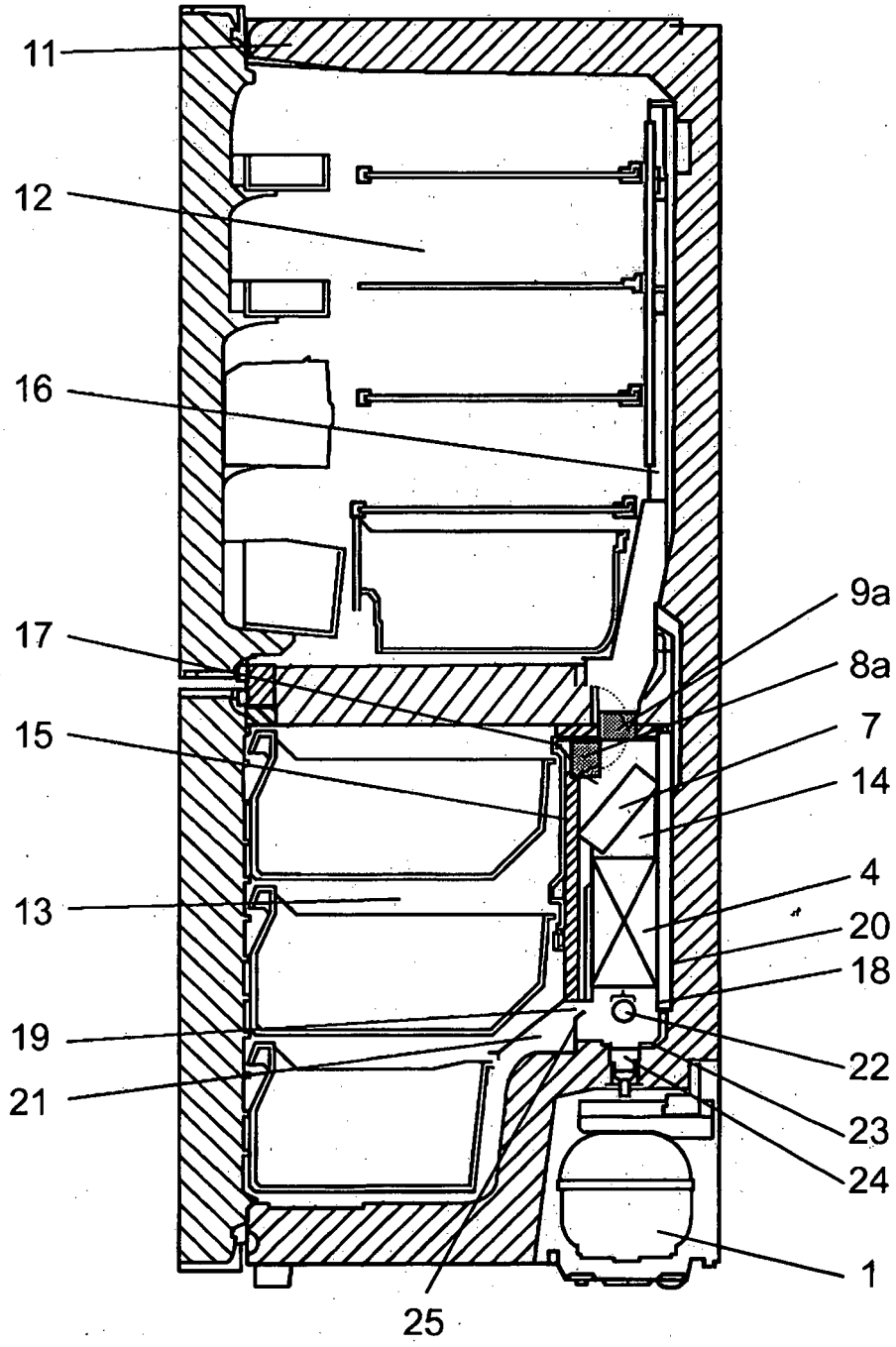


FIG. 2

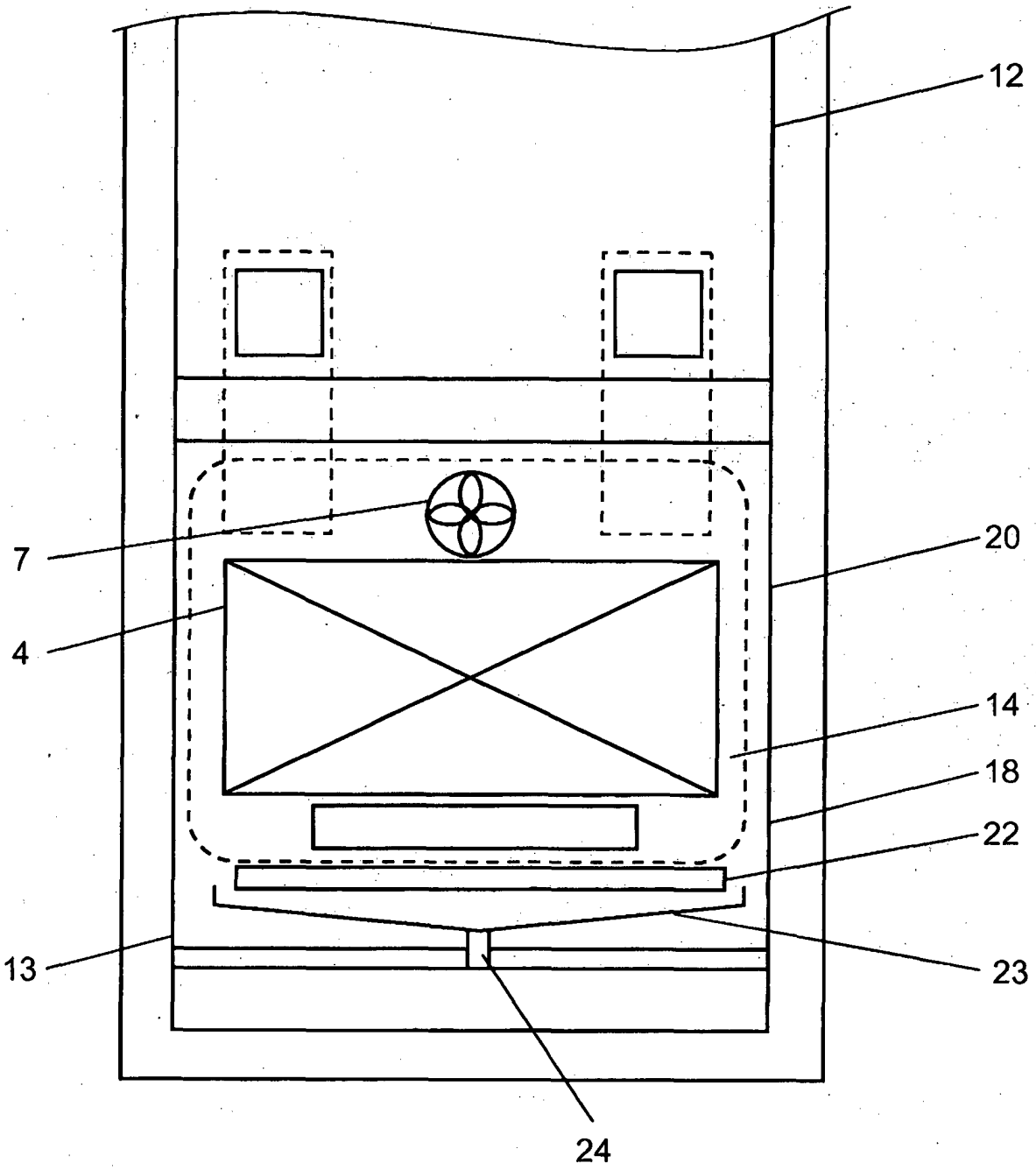


FIG. 3

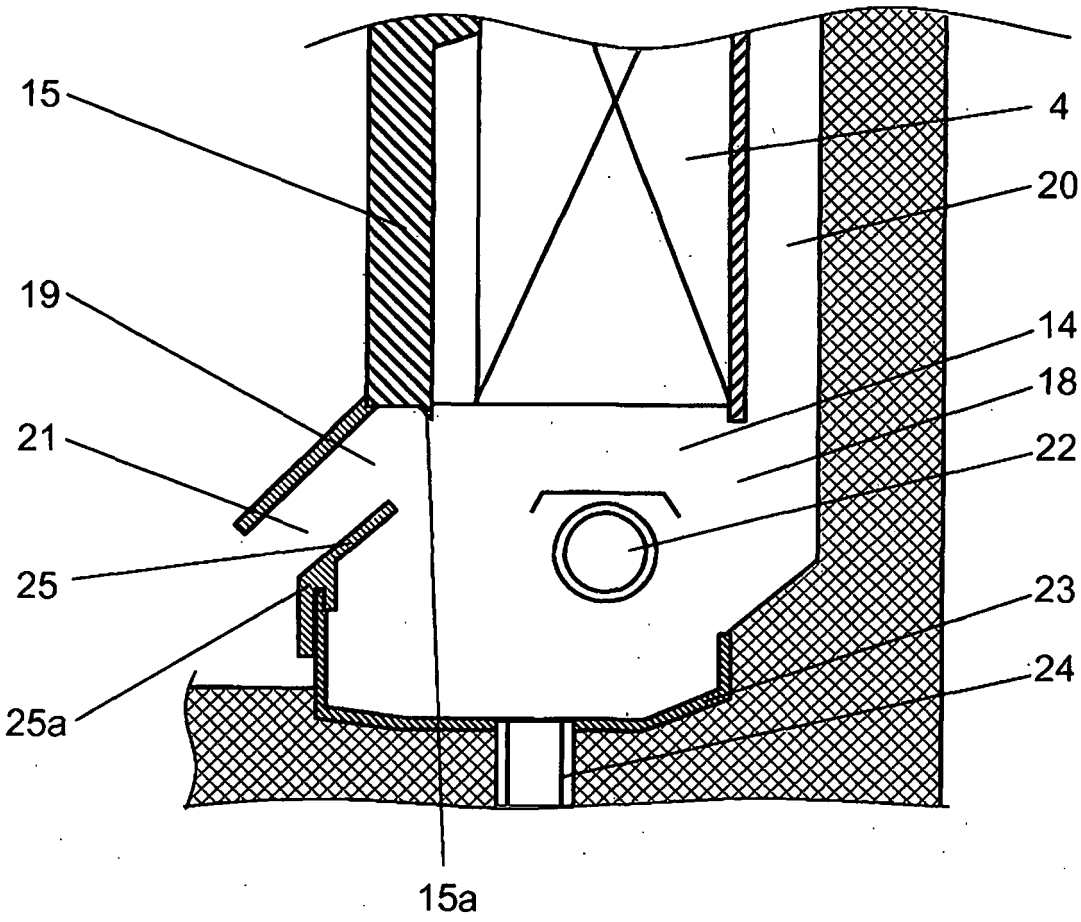
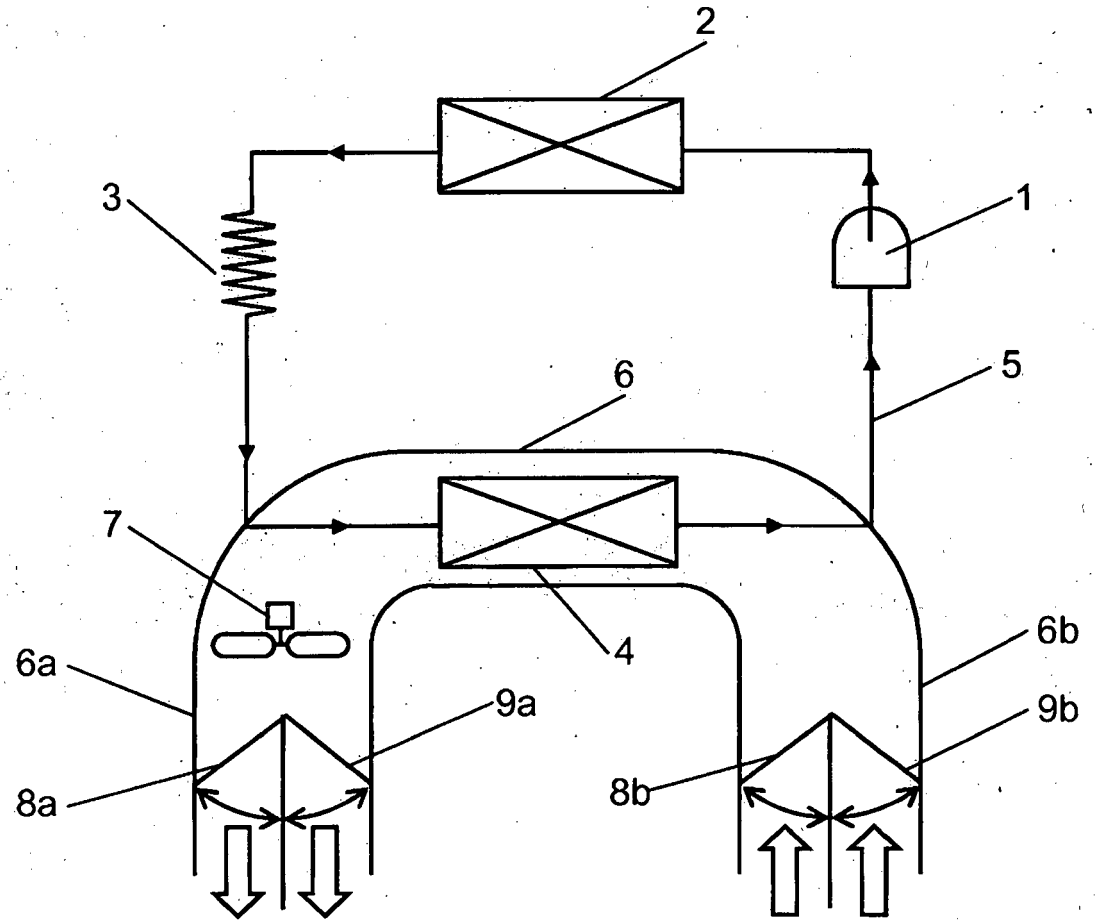


FIG. 4



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