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Description**BACKGROUND OF THE INVENTION****Field of the Invention**

[0001] The present invention relates to a refrigerator and, more particularly, to a refrigerator which is improved in terms of power consumption.

Discussion of the Related Art

[0002] Generally, a refrigerator includes a machine room in the lower region of a main body. The machine room is generally installed in the lower region of the refrigerator, in consideration of the center of gravity of the refrigerator, easy of assembly, and vibration attenuation.

[0003] A refrigeration cycle device is installed in the machine room of the refrigerator and serves to keep the interior of the refrigerator in a frozen or refrigerated state using the characteristics of a refrigerant which absorbs external heat while varying from a low-pressure liquid state to a gaseous state, thereby realizing the stable storage of fresh food.

[0004] The refrigeration cycle device of the refrigerator includes, for example, a compressor which changes a low-temperature and low-pressure gas phase refrigerant into a high-temperature and high-pressure gas phase refrigerant, a condenser which changes the high-temperature and high-pressure gas phase refrigerant, acquired from the compressor, into a high-temperature and high-pressure liquid phase refrigerant, and an evaporator which absorbs external heat while changing a low-temperature and high-pressure liquid phase refrigerant, acquired from the condenser, into a gas phase refrigerant.

[0005] Recently produced refrigerators are increasing in storage capacity and, correspondingly, tend to consume more power. Studies with the aim of reducing the power consumption have been conducted.

[0006] A conventional refrigerator exhibits temperature distribution having the highest temperature in the uppermost shelf of a storage compartment. However, the compressor is driven based on the temperature of the upper region of the storage compartment even through the lower region of the storage compartment has a lower temperature than the upper region, which unnecessarily increases power consumption.

[0007] FR 2 778 733 A1 describes a refrigerated vending cabinet. The vending cabinet has shelves with double walls through which a coolant fluid is circulated from the back to the front of the shelves. The cooling air flowing inside the shelves escapes through openings located at the front of the shelves.

[0008] JP 2013 245842 A describes a refrigerator including a refrigerating chamber, a cooling mechanism for cooling air with constant power consumption during normal operation, and a heat storage member.

[0009] KR 2011 0089575 A discloses a refrigerator ac-

cording to the preamble of claim 1.

SUMMARY OF THE INVENTION

[0010] Accordingly, the present invention is directed to a refrigerator that substantially obviates one or more problems due to limitations and disadvantages of the related art.

[0011] One object of the present invention is to provide a refrigerator which is capable of exhibiting reduced power consumption.

[0012] In addition, another object of the present invention is to provide a refrigerator which is capable of achieving even temperature distribution within a storage compartment.

[0013] Additional advantages, objects, and features will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice. The objectives and other advantages may be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0014] The objects of the present invention are solved by the features of the independent claim 1.

[0015] The guide may undergo heat exchange with the cold air to be discharged to the storage compartment within the duct unit.

[0016] The compressor may supply the cold air having a lower temperature than the melting point of the phase change material, and the cold air, supplied to the storage compartment while the compressor is operated, may be increased in temperature by the guide.

[0017] The storage compartment may be lowered in temperature by the guide while the compressor is not operating.

[0018] The duct unit according to the present invention includes a duct cover configured to be exposed to the storage compartment, a first insulation member attached to the back of the duct cover, and a second insulation member installed to the back of the first insulation member so as to define a space for passage of the cold air between the first insulation member and the second insulation member, and the guide is installed between the first insulation member and the second insulation member.

[0019] The guide may include a tapered portion having an upwardly increasing cross sectional width.

[0020] The guide may include a body charged with the phase change material, and the body may have greater thermal conductivity than the phase change material.

[0021] The body may be formed of HDPE(5200B).

[0022] The body may not be charged in a lower end region thereof with the phase change material, and a guide member having a prescribed volume may be provided in the lower end region of the body.

[0023] The duct cover may be formed with a protrusion, and the first insulation member and the guide may be

respectively formed with through-holes for penetration and coupling of the protrusion.

[0024] The discharge holes may be formed in the duct cover and the first insulation member, and the discharge holes may be arranged at opposite sides of the guide interposed therebetween.

[0025] The guide may have a lowermost end located lower than a lowermost one of the discharge holes.

[0026] The storage compartment may be a refrigerating compartment, and the phase change material may have a melting point near 0°C.

[0027] The refrigerator may further include a temperature sensor configured to sense a temperature inside the storage compartment, a fan installed in the duct unit, and a controller configured to drive the fan when the temperature inside the storage compartment is increased to a prescribed temperature or higher.

[0028] The discharge holes may be continuously kept in an open state.

[0029] It is to be understood that both the foregoing general description and the following detailed description of the present invention are exemplary and explanatory and are intended to provide further explanation of the present invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] The accompanying drawings, which are included to provide a further understanding of the present invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the present invention and together with the description serve to explain the principle of the present invention. In the drawings:

FIG. 1 is a front view of a refrigerator according to an embodiment of the present invention;

FIG. 2 is an exploded perspective view illustrating major components according to the embodiment;

FIG. 3 is a detailed view of FIG. 2;

FIG. 4 is a view illustrating the coupled state of some major components according to the embodiment;

FIG. 5 is a view illustrating a guide according to the embodiment; and

FIG. 6 is a control block diagram according to another embodiment not forming part of the present invention but representing background art that is useful for understanding the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0031] Hereinafter, exemplary embodiments of the present invention will be described with reference to the accompanying drawings in order to concretely realize the objects as set forth above.

[0032] The size, shape, or the like of components illustrated in the drawings may be exaggerated for clarity and convenience of description. In addition, terms spe-

cially defined in consideration of the configuration and operation of the present invention may vary according to the intention of a user or an operator, or according to customs. Definitions related to these terms should be based on the content throughout the specification.

[0033] FIG. 1 is a front view of a refrigerator according to an embodiment of the present invention.

[0034] Referring to FIG. 1, the refrigerator according to the embodiment includes a cabinet 1 which defines the external appearance of the refrigerator.

[0035] The cabinet 1 is provided with a storage compartment 2 in which food may be stored.

[0036] The outer contour of the storage compartment 2 may be defined by an inner case 10 which is provided inside the cabinet 1. The inner case 10 may include an upper sidewall 12 and a lower sidewall 14, which form the inner surface of the storage compartment 2. The front side of the storage compartment 2 is open to allow a user to access the storage compartment 2 through the open front side of the storage compartment 2.

[0037] The cabinet 1 is provided at the front side thereof with a first door 20, which is pivotably installed to the cabinet 1 and is configured to open or close one side of the storage compartment 2, and a second door 40 which is pivotably installed to the cabinet 1 and is configured to open or close the opposite side of the storage compartment 2. At this time, when the first door 20 and the second door 40 close the front side of the storage compartment 2, the storage compartment 2 may be completely sealed.

[0038] The second door 20 may be provided with a pillar 100, which rotates so as to come into contact with the first door 20. The pillar 100 may generally have a cuboidal shape, and may be coupled to the second door 40 so as to be rotatable relative to the second door 40.

[0039] The first door 20 may be provided with a door dike 42, which defines the rear outer contour of the first door 20. In addition, the second door 40 may be provided with a door dike 22, which defines the rear outer contour of the second door 40.

[0040] Baskets 44 and 24 may be installed to the respective door dikes 42 and 22. The baskets 44 and 24 may be configured to store various shapes of food therein.

[0041] The storage compartment 2 may be provided with a first drawer 34, which is located toward the first door 20, and a second drawer 32, which is located toward the second door 40. At this time, the first drawer 34 and the second drawer 32 may be placed in the same horizontal plane. That is, the first drawer 34 and the second drawer 32 may be located in left and right sides at the same height within the storage compartment 2. The first drawer 34 and the second drawer 32 may be pulled out independently of each other.

[0042] A duct unit 200 is provided at the rear wall of the storage compartment 2, i.e. the rear wall of the inner case 10. At this time, the duct unit 200 may serve as a passage through which cold air, generated by a refriger-

ation cycle device that includes a compressor 600 installed in a machine room, is supplied to the storage compartment 2.

[0043] A temperature sensor 400 may be installed in the storage compartment 2 to measure the temperature inside the storage compartment 2. When the temperature inside the storage compartment 2, measured by the temperature sensor 400, rises to a set temperature, which is set either arbitrarily or by the user, the compressor 600 is driven to cool the storage compartment 2 to the set temperature or lower.

[0044] The duct unit 200 may generally extend lengthwise in the direction perpendicular to the longitudinal direction of the cabinet 1. Cold air supplied via the duct unit 200 may be supplied into the storage compartment 2 through a plurality of discharge holes 212 which are provided at different heights inside the storage compartment 2.

[0045] That is, the discharge holes 212 formed at various heights allow the cold air to be discharged at different heights within the storage compartment 2.

[0046] At this time, the storage compartment 2 may be a freezing compartment, but alternatively may be a refrigerating compartment. When the storage compartment 2 is a refrigerating compartment, cold air, which has a higher temperature than that in the freezing compartment, is merely supplied into the storage compartment 2.

[0047] The discharge holes 212 may be open, without the installation of a separate closure member, to provide continuous communication between the storage compartment 2 and the interior of the duct unit 200.

[0048] FIG. 2 is an exploded perspective view illustrating major components according to the embodiment, FIG. 3 is a detailed view of FIG. 2, and FIG. 4 is a view illustrating the coupled state of some major components according to the embodiment.

[0049] Referring to FIGs. 2 to 4, a machine room 5 is formed in the lower region of the cabinet 1 such that, for example, the compressor 600 used to compress a refrigerant is installed in the machine room 5. A refrigeration cycle device, which includes, for example, a condenser in addition to the compressor 600, may be installed in the machine room 5.

[0050] The duct unit 200 may include a duct cover 210 which is exposed to the storage compartment 2, a first insulation member 220 attached to the back of the duct cover 210, and a second insulation member 240 installed to the back of the first insulation member 220 so as to define a space for the passage of cold air between the first insulation member 220 and the second insulation member 240.

[0051] At this time, the front surface of the duct cover 210 may be exposed to the outside of the storage compartment 2. The discharge holes 212 are formed in the duct cover 210 such that cold air guided by the duct unit 200 may be supplied to the storage compartment 2 through the discharge holes 212.

[0052] Because the discharge holes 212 formed in the

duct cover 210 are arranged at different heights, cold air is supplied to different height regions of the storage compartment 2 while the compressor 600 is driven, which allows the interior of the storage compartment 2 to be evenly cooled to a constant temperature.

[0053] The first insulation member 220 and the second insulation member 240 may have prescribed thicknesses, which are required to prevent the cold air passing through the duct unit 200 from forming condensation due to the temperature difference between the duct unit 200 and the outside of the cabinet 1 or the storage compartment 2 located at the front side of the duct cover 210.

[0054] Generally, when the compressor 600 is driven to supply cold air via the duct unit 200, the temperature of the cold air may be lower than the temperature inside the storage compartment 2. In this case, the temperature difference between the front side of the duct cover 210 (i.e. the interior of the storage compartment 2) and the rear side of the duct cover 210 (i.e. the interior of the duct unit 200) increases, thus causing condensation.

[0055] Meanwhile, the first insulation member 220 and the second insulation member 240 may generally have a rectangular column shape in the coupled state thereof.

[0056] The first insulation member 220 is formed with discharge holes 222, which are provided in number and shape equal to the discharge holes 212 formed in the duct cover 210 and are located at positions corresponding to the discharge holes 212 formed in the duct cover 210.

[0057] Accordingly, cold air, moved to between the first insulation member 220 and the second insulation member 240, may pass through the discharge holes 222 formed in the first insulation member 220, and may thereafter be supplied to the storage compartment 2 through the discharge holes 212 formed in the duct cover 210.

[0058] The discharge holes 212 and 222 may be located at opposite sides of a guide 230 interposed therebetween. As such, the air, discharged through the discharge holes 212 and 222, may easily undergo heat exchange thanks to the guide 230.

[0059] Meanwhile, the guide 230 may be installed between the first insulation member 220 and the second insulation member 240 and serve to guide the cold air passing through between the first insulation member 220 and the second insulation member 240. The guide 230 may be received in the duct unit 200 to guide the cold air so that it is discharged to the storage compartment 2.

[0060] The duct cover 210 may be formed with a discharge port 214, which protrudes toward the rear surface of the duct cover 210, and the first insulation member 220 and the guide 230 may be formed with respective through-holes 224 and 234, through which the discharge port 214 penetrates and is coupled.

[0061] Since the discharge port 214 is inserted into and coupled to the through-holes 224 and 234, the duct cover 210, the first insulation member 220, and the guide 230 may be easily positioned at desired positions so as to be coupled into a single member.

[0062] Referring to FIG. 4, the guide 230 is generally oriented lengthwise in the height direction of the duct unit 200, but is shaped such that no structure is provided at the lower end thereof.

[0063] The guide 230 may function to guide the cold air, which moves from the bottom to the top of the duct unit 200, so that the cold air is divided into opposite directions. As such, the duct unit 200 may evenly discharge the cold air, introduced from the lower side thereof, through the discharge holes 212 that are formed in the duct cover 210 at different heights. At this time, the guide 230 may divide the cold air, moving upward from the lower side of the duct unit 200, so as to move in opposite directions from the center of the duct unit 200.

[0064] As exemplarily illustrated in FIG. 4, the cold air, introduced from the lower side of the duct unit 200, may be divided into opposite sides of the guide 230, thereby being supplied to the storage compartment 2 through the discharge holes 222 distributed at different heights.

[0065] FIG. 5 is a view illustrating the guide according to the embodiment.

[0066] Referring to FIG. 5a, the guide 230 may include a body 231 which defines the outer appearance of the entire guide 230, and a Phase Change Material (PCM) 233 inside the body 231.

[0067] Meanwhile, the through-hole 234 is formed in the center of the guide 230 to allow the discharge port 214 of the duct cover 210 to be inserted therein. At this time, although the through-hole 234 is a hole formed in the front surface and the rear surface of the guide 230, the body 231 may be formed so as to be sealed in order to prevent the phase change material 233 received therein from leaking to the outside.

[0068] The guide 230 may have a tapered portion 232, the cross sectional width of which gradually increases from the bottom to the top. At this time, the tapered portion 232 is a structure that is provided to sequentially cause variation in cross sectional area in order to reduce momentum loss due to the resistance by the guide 230 when the cold air, introduced from the lower side of the duct unit 200, moves to the top of the duct unit 200.

[0069] The lowermost end of the guide 230 may be located lower than the lowermost one of the discharge holes. This serves to increase the probability of heat exchange between the guide 230 and the air supplied through the duct unit 200.

[0070] At this time, the body 231 may have greater thermal conductivity than that of the phase change material 233. The phase change material 233 is a material that changes between a liquid phase and a solid phase on the basis of a particular temperature, and needs to be charged in the body 231.

[0071] The body 231 needs to successfully transfer variation in external temperature to the phase change material 233. In order to efficiently use the phase change material 233, the body 231 may have greater thermal conductivity than that of the phase change material 233, which ensures easy heat exchange between the outside

and the phase change material 233.

[0072] Specifically, the body 231 may be formed of HDPE(5200B). HDPE(5200B) has high stiffness and shows good resistance at low temperatures as well as chemical resistance. HDPE(5200B) is a material provided by HONAM PETROCHEMICAL CORP., and a detailed description thereof will be omitted herein.

[0073] Of course, the body 231 needs to be stiff to some extent in order to prevent the phase change material 233 from leaking to the outside due to external shocks or variation in volume depending on temperature variation applied to the phase change material 233.

[0074] The phase change material 233 may have a melting point at a lower temperature than the temperature inside the storage compartment 2, which is set to initiate the driving of the compressor 600. The phase change material 233 may discharge a great amount of cold air when changed from a solid phase to a liquid phase. While the compressor 600 is not driven and the temperature inside the storage compartment 2 is increasing, the phase change material 233 may supply accumulated cold air to the storage compartment 2 so that the temperature inside the storage compartment 2 is increased slowly until the temperature of the storage compartment 2 reaches the set temperature for the driving of the compressor 600. In this way, the driving initiation time of the compressor 600 may be delayed, which may reduce power consumption.

[0075] Meanwhile, assuming that the storage compartment 2 is a refrigerating compartment, which is a storage space in which food is stored at low temperatures above 0°C, the phase change material 233 may have a melting point near 0°C. The melting point refers to the temperature at which the change from a solid phase to a liquid phase occurs. The phase change material 233 may accumulate a greater amount of energy at the melting point or the freezing point, at which phase change occurs, than at other temperatures, and may then emit the energy to the outside. That is, when the melting point of the phase change material 233 is near 0°C, the phase change material 233 may absorb and discharge a greater amount of cold air near 0°C than that in a different temperature variation range.

[0076] FIG. 5B illustrates an embodiment that is different from that of FIG. 5A. Therefore, the following description focuses on the differences therebetween, and a description of configurations that are the same will be omitted.

[0077] In FIG. 5B, the body 231, into which the phase change material 233 is inserted, forms the upper region of the guide 230. The lower region of the guide 230, in which no phase change material 233 is inserted, is formed of a guide member 239 having a prescribed volume.

[0078] At this time, the guide member 239 may have the same shape as the lower region of the body 231 of FIG. 5A. However, there is a difference in that no phase change material is inserted in the guide member 239.

[0079] Generally, the storage compartment 2 shows a greater increase in temperature in the upper region than that in the lower region as time passes in the state in which the compressor 600 is not driven. This is because cold air has a strong tendency to stay in the lower region, rather than the upper region. In the present embodiment, the phase change material 233 is located at a relatively high height so that the temperature inside the storage compartment 2 is maintained constant without deviation between the upper region and the lower region due to the inclusion of cold air in the phase change material 23 of the guide 230.

[0080] This is because the phase change material 233 may accumulate cold air, and therefore the cold air may be supplied to the storage compartment 2 by the phase change material 233 when the temperature of the upper region of the storage compartment 2 increases.

[0081] Explaining the operating process according to the embodiment of the present invention described above with reference to FIGs. 1 to 5, when the temperature of the storage compartment 2 is increased in the state in which the compressor 600 is not driven, cold air that has accumulated in the phase change material 233 may be supplied to the storage compartment 2 through the discharge holes 212 and 222. While the temperature of the storage compartment 2 is increasing, the storage compartment 2 has a relatively high temperature and the phase change material 233 has a relatively low temperature, which may cause natural convection between the storage compartment 2 and the phase change material 233. Accordingly, an increase in the temperature of the storage compartment 2 is delayed compared to the case where no phase change material 233 is provided.

[0082] In this way, the frequency of the case where it is necessary to reduce the temperature of the storage compartment 2 by driving the compressor 600 may be reduced, or the driving initiation time of the compressor 600 may be delayed. That is, the total power consumption of the refrigerator may be reduced by the cold air accumulated in the phase change material 233.

[0083] FIG. 6 is a control block diagram according to another embodiment not forming part of the present invention but representing background art that is useful for understanding the invention.

[0084] Referring to FIG. 6, the temperature sensor 400 may be provided to measure the temperature inside the storage compartment 2. At this time, the temperature measured by the temperature sensor 400 may be transmitted to a controller 300.

[0085] Meanwhile, the controller 300 may drive a fan 500, which is capable of creating airflow within the duct unit 200, or may drive the compressor 600 in order to generate cold air.

[0086] In the case where the temperature inside the storage compartment 2, as measured by the temperature sensor 400, is a first set temperature or lower, the controller 300 may drive both the fan 500 and the compressor 600, or may drive only the compressor 600.

[0087] At this time, in the case where the temperature inside the storage compartment 2, as measured by the temperature sensor 400, is a second set temperature or lower, the controller 300 may drive only the fan 500, without driving the compressor 600.

[0088] Through the flow of air generated by the fan 500, the cold air accumulated in the phase change material 233 of the guide 230 may be supplied to the storage compartment 2 through the discharge holes 212.

[0089] The first set temperature may be higher than the second set temperature. That is, when the temperature inside the storage compartment 2 reaches the second set temperature, which is a relatively low temperature, the controller 300 may drive only the fan 500 so as to cool the storage compartment 2 using the cold air that has accumulated in the phase change material 233.

[0090] At this time, as the guide 230 undergoes heat exchange with the air discharged from the duct unit 200 to the storage compartment 2, the temperature inside the storage compartment 2 is lowered by the guide 230 while the refrigeration cycle device is not operating.

[0091] Of course, even if the controller 300 does not drive the fan 500, since the duct unit 200 and the storage compartment 2 are in communication with each other through the discharge holes, the phase change material 233 maintains a relatively low temperature and undergoes heat exchange with the surrounding air, thereby causing natural convection with air received in the storage compartment 2.

[0092] That is, since the fan 500 is driven to artificially cause convection, or since natural convection occurs even if the fan 500 is not driven, cooling of the storage compartment 2 may be implemented by the phase change material 233.

[0093] On the other hand, when the temperature inside the storage compartment 2 reaches the first set temperature, which is a relatively high temperature, the controller 300 may drive only the compressor 600, or may drive both the compressor 600 and the fan 500, so as to cool the storage compartment 2.

[0094] In this case, as the guide 230 undergoes heat exchange with the cold air discharged from the duct unit 200 to the storage compartment 2, the temperature of the cold air supplied to the storage compartment 2 may be increased by the guide 230 while the refrigeration cycle device is operated. The temperature of the cold air may be increased as the phase change material 233 is cooled because the cold air generated while the compressor 600 is driven has a lower temperature than the temperature of the phase change material 233.

[0095] When the compressor 600 is driven, the phase change material 233 may accumulate cold air.

[0096] The cold air supplied while the compressor 600 is driven generally has a lower temperature than the desired set temperature of the storage compartment 2. Thus, condensation may occur at the exterior of the duct unit 200, and more particularly, at the front surface of the duct cover 210 because of the considerable temperature

difference between the interior of the duct unit 200 and the exterior of the duct unit 200.

[0097] However, in the present embodiment, the temperature of the cold air passing through the duct unit 200 may be increased via heat exchange with the phase change material 233, which may prevent condensation at the duct unit 200.

[0098] Meanwhile, the compressor 600 may supply cold air having a lower temperature than the freezing point of the phase change material 233.

[0099] When controlling the temperature of the storage compartment 2, the temperature that is set to cause the compressor 600, which has stopped, to again be driven, may be lower than the temperature that is set to stop the driving of the compressor 600.

[0100] For example, the compressor 600 may be set to be driven when the temperature of the storage compartment 2 reaches 1°C. At this time, the cold air supplied to the storage compartment 2 by the compressor 600 may be set to -1°C. Meanwhile, the compressor 600 may be set to stop driving when the temperature of the storage compartment 2 reaches -0.5°C. The aforementioned temperatures are given by way of example, and it should be noted that the actual temperatures may be changed in various ways in the present invention.

[0101] In the case of the above-described embodiment, the freezing point (or the melting point) of the phase change material 233 may be -0.75 °C, which is higher than the temperature of the cold air supplied by the compressor 600. This is because the phase change material 233 may accumulate a great amount of cold air at temperatures close to the freezing point.

[0102] Accordingly, while the compressor 600 is driven, the phase change material 233 may accumulate cold air by being changed to a solid phase. While the compressor 600 is not driven, the phase change material 233 may discharge cold air by being changed to a liquid phase, thereby allowing the temperature inside the storage compartment 2 to be maintained for a prescribed length of time.

[0103] As is apparent from the above description, according to the present invention, it is possible to reduce the power consumption of a refrigerator.

[0104] In addition, according to the present invention, owing to the even temperature distribution within a storage compartment, it is possible to prevent a compressor from being unintentionally driven due to a relatively high temperature in some region of the storage compartment.

[0105] Although the exemplary embodiments have been illustrated and described as above, of course, it will be apparent to those skilled in the art that the embodiments are provided to assist understanding of the present invention and the present invention is not limited to the above described particular embodiments, and various modifications and variations can be made in the present invention without departing from the scope of the present invention as defined by the appended claims.

Claims

1. A refrigerator comprising:

a cabinet (1) having a storage compartment (2);
a duct unit (200) formed with a plurality of discharge holes (212, 222) for discharge of cold air to the storage compartment (2), the duct unit (200) providing a path for movement of the cold air;
a guide (230) provided inside the duct unit (200), the guide (230) being configured to guide the cold air to be discharged to the storage compartment (2) by dividing the cold air, moving to the top of the duct unit (200), into opposite sides; and
a compressor (600) configured to compress a refrigerant so as to supply the cold air to the duct unit (200),
the refrigerator being **characterized in that**
the guide (230) includes a Phase Change Material (PCM) having a melting point at a lower temperature than a temperature inside the storage compartment (2), the temperature inside the storage compartment (2) being set to initiate driving of the compressor (600),
in that the duct unit (200) includes:

a duct cover (210) configured to be exposed to the storage compartment (2);
a first insulation member (220) attached to the back of the duct cover (210); and
a second insulation member (240) installed to the back of the first insulation member (220) so as to define a space for passage of the cold air between the first insulation member (220) and the second insulation member (240), and
in that the guide (230) is installed between the first insulation member (220) and the second insulation member (240).

2. The refrigerator according to claim 1, wherein the guide (230) undergoes heat exchange with the cold air to be discharged to the storage compartment (2) within the duct unit (200).

3. The refrigerator according to claim 2, wherein the compressor (600) supplies the cold air having a lower temperature than the melting point of the phase change material, and
wherein the cold air, supplied to the storage compartment (2) while the compressor (600) is operated, is increased in temperature by the guide (230).

4. The refrigerator according to claim 2 or 3, wherein the storage compartment (2) is lowered in temperature by the guide (230) while the compressor (600) is not operating.

5. The refrigerator according to any one of the claims 1 to 4, wherein the guide (230) includes a tapered portion (232) having an upwardly increasing cross sectional width.
6. The refrigerator according to any one of the claims 1 to 5, wherein the guide (230) includes a body (231) charged with the phase change material (233), and wherein the body (231) has greater thermal conductivity than the phase change material.
7. The refrigerator according to claim 6, wherein the body (231) is formed of HDPE (5200B).
8. The refrigerator according to claim 6 or 7, wherein the body (231) is not charged in a lower end region thereof with the phase change material, and a guide member (239) is provided in the lower end region of the body (231).
9. The refrigerator according to any one of the claims 1 to 8, wherein the duct cover (210) is formed with a protrusion (214), and wherein the first insulation member (220) and the guide (230) are respectively formed with through-holes (224, 234) for penetration and coupling of the protrusion (214).
10. The refrigerator according to any one of the claims 1 to 9, wherein the discharge holes (212, 222) are formed in the duct cover (210) and the first insulation member (220), and wherein the discharge holes (212, 222) of the duct unit (200) are arranged at opposite sides of the guide (230) interposed therebetween.
11. The refrigerator according to claim 10, wherein the guide (230) has a lowermost end located lower than a lowermost one of the discharge holes (212, 222).
12. The refrigerator according to any one of the claims 1 to 11, wherein the storage compartment (2) is a refrigerating compartment, and wherein the phase change material has a melting point near 0°C.
13. The refrigerator according to any one of the claims 1 to 12, further comprising:
- a temperature sensor (400) configured to sense a temperature inside the storage compartment (2);
- a fan (500) installed in the duct unit (200); and
- a controller (300) configured to drive the fan (500) when the temperature inside the storage compartment (2) is increased to a prescribed temperature or higher.

14. The refrigerator according to any one of the claims 1 to 13, wherein the discharge holes (212, 222) are continuously kept in an open state.

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Patentansprüche

1. Kühlschrank, der Folgendes umfasst:

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ein Gehäuse (1), das ein Vorratsfach (2) aufweist;

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eine Leitungseinheit (200), die mit mehreren Austrittslöchern (212, 222) zum Abführen von kalter Luft zu dem Vorratsfach (2) ausgebildet ist, wobei die Leitungseinheit (200) einen Pfad für eine Bewegung der kalten Luft bereitstellt; eine Führung (230), die in der Leitungseinheit (200) vorgesehen ist, wobei die Führung (230) konfiguriert ist, die kalte Luft, die zu dem Vorratsfach (2) abgeführt werden soll, durch Trennen der kalten Luft und Bewegen zu der Oberseite der Leitungseinheit (200) in entgegengesetzte Seiten zu führen; und

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einen Kompressor (600), der konfiguriert ist, ein Kühlmittel zu komprimieren, um so die kalte Luft zu der Leitungseinheit (200) zuzuführen, wobei der Kühlschrank **dadurch gekennzeichnet ist, dass**

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die Führung (230) ein Phasenwechselmaterial (PCM) umfasst, das einen Schmelzpunkt bei einer niedrigeren Temperatur als eine Temperatur in dem Vorratsfach (2) hat, wobei die Temperatur in dem Vorratsfach (2) so eingestellt ist, dass sie ein Antreiben des Kompressors (600) auslöst,

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die Leitungseinheit (200) Folgendes umfasst:

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eine Leitungsabdeckung (210), die so konfiguriert ist, dass sie zu dem Vorratsfach (2) freiliegt;

ein erstes Isolierungselement (220), das an der Rückseite der Leitungsabdeckung (210) befestigt ist; und

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ein zweites Isolierungselement (240), das so an der Rückseite des ersten Isolierungselements (220) eingebaut ist, dass es einen Raum für einen Durchgang der kalten Luft zwischen dem ersten Isolierungselement (220) und dem zweiten Isolierungselement (240) definiert, und

die Führung (230) zwischen dem ersten Isolierungselement (220) und dem zweiten Isolierungselement (240) eingebaut ist.

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2. Kühlschrank nach Anspruch 1, wobei die Führung (230) in der Leitungseinheit (200) einem Wärmeaustausch mit der kalten Luft, die zu dem Vorratsfach (2) abgeführt werden soll, unterzogen wird.

3. Khlschrank nach Anspruch 2, wobei der Kompressor (600) die kalte Luft, die eine niedrigere Temperatur als der Schmelzpunkt des Phasenwechselmaterials hat, zufhrt, und
wobei die Temperatur der kalten Luft, die dem Vorratsfach (2) zugefhrt wird, whrend der Kompressor (600) arbeitet, durch die Fhrung (230) erhht wird. 5
4. Khlschrank nach Anspruch 2 oder 3, wobei die Temperatur des Vorratsfachs (2) durch die Fhrung (230) erniedrigt wird, whrend der Kompressor (600) nicht arbeitet. 10
5. Khlschrank nach einem der Ansprche 1 bis 4, wobei die Fhrung (230) einen konisch zulaufenden Abschnitt (232) aufweist, der eine nach oben zunehmende Querschnittsbreite hat. 15
6. Khlschrank nach einem der Ansprche 1 bis 5, wobei die Fhrung (230) einen Krper (231) umfasst, der mit dem Phasenwechselmaterial (233) befüllt ist, und
wobei der Krper (231) eine hhere Wrmeleitfhigkeit als das Phasenwechselmaterial hat. 20 25
7. Khlschrank nach Anspruch 6, wobei der Krper (231) aus HDPE (5200B) gebildet ist.
8. Khlschrank nach Anspruch 6 oder 7, wobei der Krper (231) in einem unteren Endbereich nicht mit dem Phasenwechselmaterial befüllt ist und wobei ein Fhrungselement (239) in dem unteren Endbereich des Krpers (231) vorgesehen ist. 30 35
9. Khlschrank nach einem der Ansprche 1 bis 8, wobei die Leitungsabdeckung (210) mit einem Vorsprung (214) ausgebildet ist und
wobei das erste Isolierungselement (220) und die Fhrung (230) jeweils mit Durchgangslchern (224, 234) ausgebildet sind, damit der Vorsprung (214) hindurchgehen und damit koppeln kann. 40
10. Khlschrank nach einem der Ansprche 1 bis 9, wobei die Austrittslcher (212, 222) in der Leitungsabdeckung (210) und in dem ersten Isolierungselement (220) ausgebildet sind, und
wobei die Austrittslcher (212, 222) der Leitungseinheit (200) an entgegengesetzten Seiten der dazwischenliegenden Fhrung (230) angeordnet sind. 45 50
11. Khlschrank nach Anspruch 10, wobei die Fhrung (230) ein unterstes Ende hat, das tiefer als ein unterstes der Austrittslcher (212, 222) angeordnet ist. 55
12. Khlschrank nach einem der Ansprche 1 bis 11, wobei das Vorratsfach (2) ein Khlfach ist, und
wobei das Phasenwechselmaterial einen Schmelz-

punkt nahe bei 0° C hat.

13. Khlschrank nach einem der Ansprche 1 bis 12, der ferner Folgendes umfasst:

einen Temperatursensor (400), der konfiguriert ist, eine Temperatur in dem Vorratsfach (2) zu messen;
ein Geblse (500), das in die Leitungseinheit (200) eingebaut ist; und
eine Steuerung (300), die konfiguriert ist, das Geblse (500) anzutreiben, wenn sich die Temperatur in dem Vorratsfach (2) auf eine vorgeschriebene Temperatur oder hher erhht.

14. Khlschrank nach einem der Ansprche 1 bis 13, wobei die Austrittslcher (212, 222) ununterbrochen in einem offenen Zustand gehalten werden.

Revendications

1. Rfrigrateur comprenant :

une carrosserie (1) ayant un compartiment de stockage (2) ;
une unit formant conduit (200) forme avec une pluralit de trous de dcharge (212, 222) pour la dcharge d'air froid vers le compartiment de stockage (2), l'unit formant conduit (200) assurant un trajet pour le mouvement de l'air froid ;
un guide (230) prvu  l'intrieur de l'unit formant conduit (200), le guide (230) tant configur pour guider l'air froid dcharg vers le compartiment de stockage (2) en divisant l'air froid, qui se dplace vers le sommet de l'unit formant conduit (200) vers des cts opposs ; et
un compresseur (600) configur pour comprimer un rfrigrant de manire  alimenter l'air froid  l'unit formant conduit (200),
le rfrigrateur tant **caractris en ce que** le guide (230) inclut un matriau  changement de phase (PCM) ayant un point de fusion  une temprature plus basse qu'une temprature  l'intrieur du compartiment de stockage (2), la temprature  l'intrieur du compartiment de stockage (2) tant fixe de manire  dmarrer l'entranement du compresseur (600),
en ce que l'unit formant conduit (200) inclut :

un couvre conduit (210) configur pour tre expos vers le compartiment de stockage (2) ;
un premier lment d'isolation (220) attach sur le dos du couvre conduit (210) ; et
un second lment d'isolation (240) install sur le dos du premier lment d'isolation (220) de manire  dfinir un espace pour

- le passage de l'air froid entre le premier élément d'isolation (220) et le second élément d'isolation (240), et
en ce que le guide (230) est installé entre le premier élément d'isolation (220) et le second élément d'isolation (240). 5
2. Réfrigérateur selon la revendication 1, dans lequel le guide (230) subit un échange de chaleur avec l'air froid à décharger vers le compartiment de stockage (2) à l'intérieur de l'unité formant conduit (200). 10
3. Réfrigérateur selon la revendication 2, dans lequel le compresseur (600) fournit l'air froid avec une température plus basse que le point de fusion du matériau à changement de phase, et dans lequel l'air froid, alimenté au compartiment de stockage (2) alors que le compresseur (600) est en fonctionnement, a une température augmentée par le guide (230). 15
4. Réfrigérateur selon la revendication 2 ou 3, dans lequel le compartiment de stockage (2) est abaissé en température par le guide (230) alors que le compresseur (600) n'est pas en fonctionnement. 25
5. Réfrigérateur selon l'une quelconque des revendications 1 à 4, dans lequel le guide (230) inclut une portion effilée (232) ayant une largeur de section transversale qui augmente vers le haut. 30
6. Réfrigérateur selon l'une quelconque des revendications 1 à 5, dans lequel le guide (230) inclut un corps (231) chargé avec le matériau à changement de phase (233), et dans lequel le corps (231) a une conductivité thermique plus élevée que le matériau à changement de phase. 35
7. Réfrigérateur selon la revendication 6, dans lequel le corps (231) est formé de HDPE (5200B). 40
8. Réfrigérateur selon la revendication 6 ou 7, dans lequel le corps (231) n'est pas chargé, dans une région à l'extrémité inférieure de lui-même, avec le matériau à changement de phase, et un élément de guidage (239) est prévu dans la région à l'extrémité inférieure du corps (231). 45
9. Réfrigérateur selon l'une quelconque des revendications 1 à 8, dans lequel le couvre conduit (210) est formé avec une projection (214), et dans lequel le premier élément d'isolation (220) et le guide (230) sont respectivement formés avec des trous traversants (224, 234) pour la pénétration et le couplage de la projection (214). 50
10. Réfrigérateur selon l'une quelconque des revendications 1 à 9, dans lequel les trous de décharge (212, 222) sont formés dans le couvre conduit (210) et le premier élément d'isolation (220), et dans lequel les trous de décharge (212, 222) de l'unité formant conduit (200) sont agencés sur des côtés opposés du guide (230) interposé entre eux. 55
11. Réfrigérateur selon la revendication 10, dans lequel le guide (230) a une extrémité tout à fait inférieure située plus basse qu'un trou tout à fait inférieur des trous de décharge (212, 222).
12. Réfrigérateur selon l'une quelconque des revendications 1 à 11, dans lequel le compartiment de stockage (2) est un compartiment de réfrigération, et dans lequel le matériau à changement de phase a un point de fusion proche de 0° C.
13. Réfrigérateur selon l'une quelconque des revendications 1 à 12, comprenant en outre :
 un capteur de température (400) configuré pour détecter une température à l'intérieur du compartiment de stockage (2) ;
 un ventilateur (500) installé dans l'unité formant conduit (200) ; et
 un contrôleur (300) configuré pour entraîner le ventilateur (500) quand la température à l'intérieur du compartiment de stockage (2) est augmentée à une température prescrite ou plus élevée.
14. Réfrigérateur selon l'une quelconque des revendications 1 à 13, dans lequel les trous de décharge (212, 222) sont continuellement maintenus dans un état ouvert.

FIG. 1

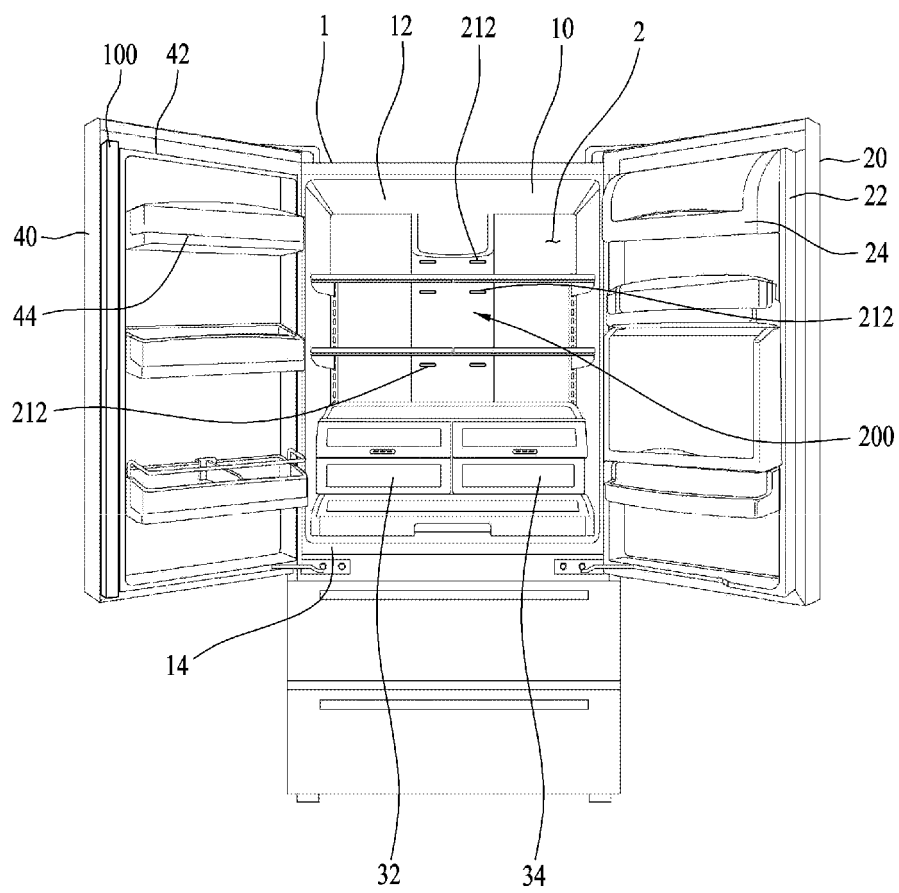


FIG. 2

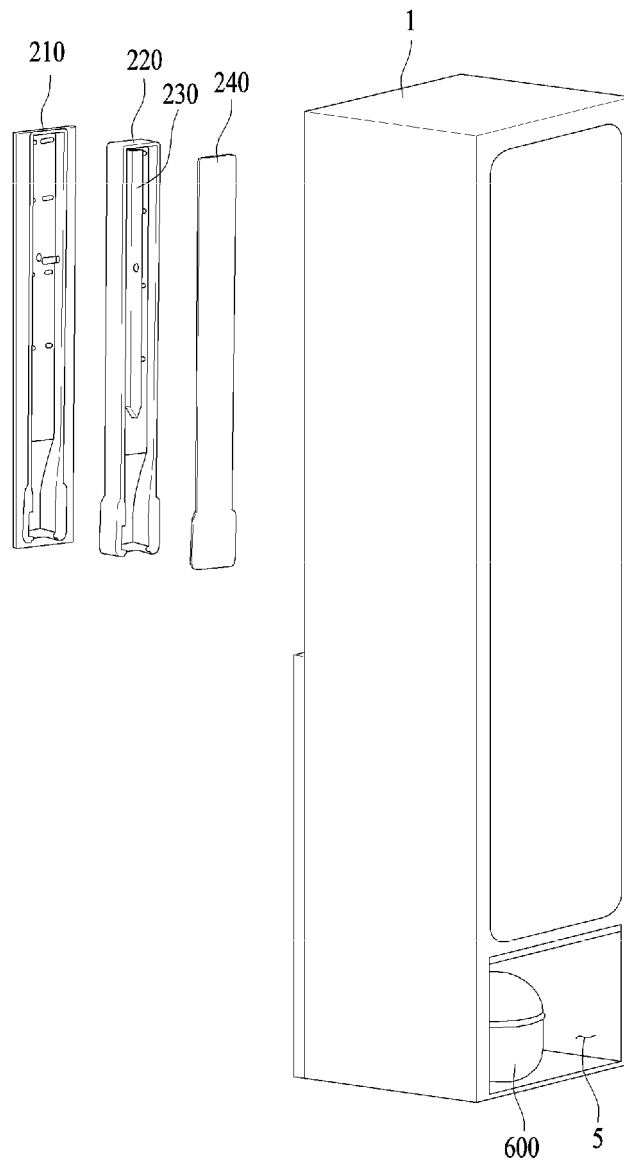


FIG. 3

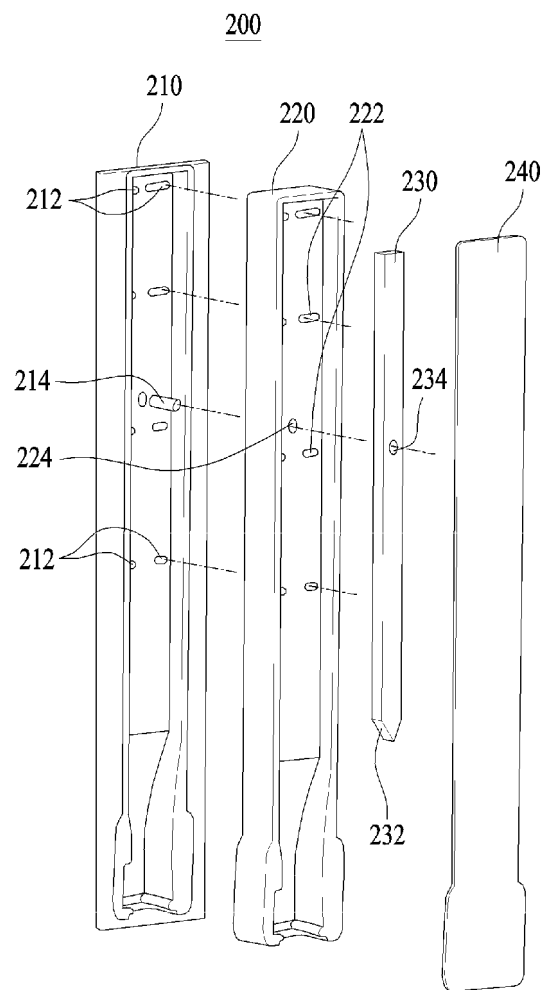


FIG. 4

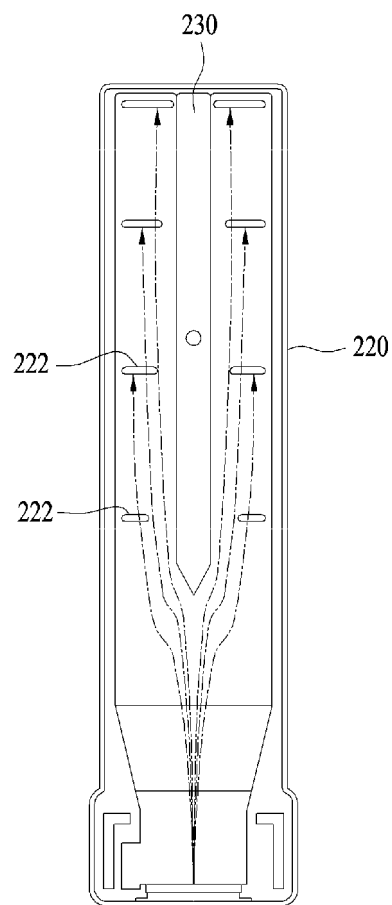


Fig. 5

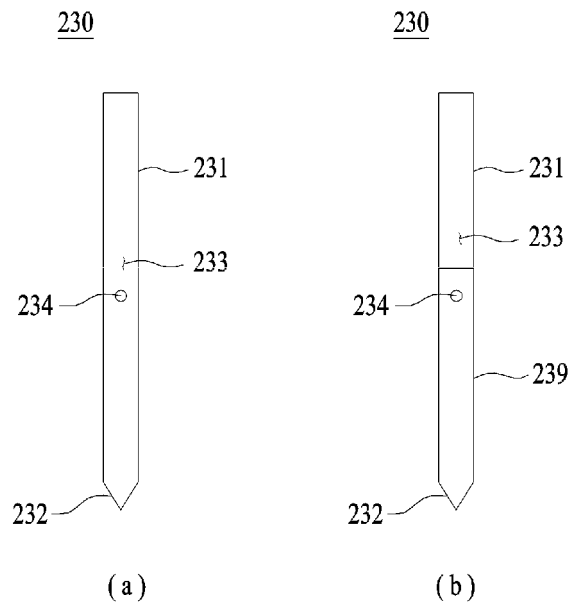
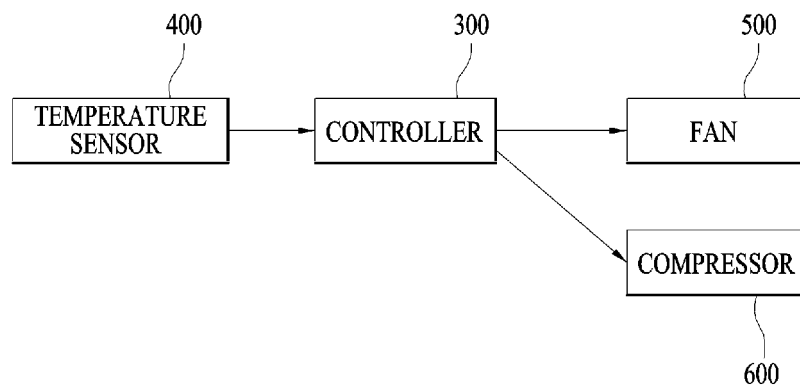


Fig. 6



REFERENCES CITED IN THE DESCRIPTION

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