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(54) **Refrigerator**

Kühlschrank

Réfrigérateur

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(56) References cited:
WO-A1-97/24565
CA-A1- 2 530 567
DE-A1- 2 153 651
DE-A1- 2 236 480
DE-A1- 2 823 395
US-A- 3 184 926
US-A- 3 633 378
US-A- 4 474 026
US-A- 4 503 685
US-A- 4 644 758
US-A- 4 979 371
US-A1- 2006 168 996

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Description

[0001] The present invention relates to refrigerators, and more particularly, to a refrigerator which can reduce power consumption of the refrigerator at the time of defrosting an evaporator.

[0002] In general, the refrigerator, used for frozen or refrigerated storage of food, is provided with a case which forms partitioned spaces of a freezing chamber and a refrigerating chamber, and parts, such as a compressor, a condenser, an evaporator, a capillary tube, and so on for forming a refrigerating cycle to lower temperatures of the freezing chamber and the refrigerating chamber.

[0003] The case has a door mounted to one side thereof for opening/closing the freezing chamber and the refrigerating chamber.

[0004] The refrigerator performs refrigerating operation with a refrigerating cycle in which low temperature and low pressure gaseous refrigerant is compressed to high temperature and high pressure gaseous refrigerant by the compressor, the high temperature and high pressure gaseous refrigerant compressed thus is turned to high pressure liquidus refrigerant as the high temperature and high pressure gaseous refrigerant passes through the condenser, the high pressure liquidus refrigerant is involved in temperature and pressure drop as the high pressure liquidus refrigerant passes through the capillary tube, and the refrigerant having the temperature and pressure dropped thus cools down air around the evaporator as the refrigerant is turned to low temperature and low pressure gaseous refrigerant while absorbing heat from the air around the evaporator.

[0005] If a related art refrigerator forms frost at the evaporator, a heater adjacent to the evaporator is put into operation for defrosting the evaporator.

[0006] However, the defrosting with the heater causes a problem in that power consumption of the heater increases refrigerator power consumption. And, if the heater is operated excessively to introduce the heat from the heater to the refrigerating chamber or the freezing chamber, it is required to drive the compressor again for running the refrigerating cycle, which requires consumption of additional energy.

[0007] DE 2 236 480 A1 discloses a combined cooling device having a freezing compartment with a heat exchanger and a cooling unit which also is provided with a heat exchanger, wherein both heat exchangers are normally connected in series or parallel and wherein defrosting of the freezing compartment is done by providing hot air directly to the heat exchanger for the freezing compartment. The document discloses the following features of claim 1: a refrigerator comprising:a compressor unit for compressing refrigerant;a condensing unit for passing the refrigerant compressed thus; and a first heat exchanger unit and a second heat exchanger unit each for making heat exchange as the refrigerant passes there through, a first three-way valve configured to guide the refrigerant compressed by the compressor;a first expansion valve for the second heat exchanger unit and a second expansion valve for the first heat exchanger unit.

[0008] DE 28 23 395 A1 describes a method and apparatus for defrosting a refrigeration system wherein, to defrost a selected evaporator, in a system including at least two evaporators, the system condenser is isolated from the compressor and the selected evaporator receives hot, compressed refrigerant vapour directly from the compressor.

[0009] According to the present invention the above objective is solved by the features of claim 1. To solve the problems, an object of the present invention is to provide a refrigerator which has no heater for defrosting the evaporator.

[0010] Another object of the present invention is, to provide a refrigerator which can reduce power consumption of the refrigerator in defrosting, more particularly, to provide a refrigerator which enables to run a refrigerating cycle by using energy consumed for defrosting.

[0011] Additional advantages, objects, and features of the disclosure 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 of the invention. The objectives and other advantages of the invention may be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0012] To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, a refrigerator includes a compressor unit for compressing refrigerant, a condensing unit for passing the refrigerant compressed thus, and a first heat exchanger unit and a second heat exchanger unit each for making heat exchange as the refrigerant passes therethrough, wherein, if a defrosting mode is performed for one of the first heat exchanger unit and a second heat exchanger unit, the refrigerant compressed at the compressor unit is supplied to one of the first heat exchanger unit and the second heat exchanger unit, and then the refrigerant is supplied to the other one of the first heat exchanger unit and the second heat exchanger unit after the refrigerant is passed through an expansion valve.

[0013] If the defrosting mode is performed for the first heat exchanger unit, heat is supplied to the first heat exchanger unit by the refrigerant, and cold is supplied to the second heat exchanger.

[0014] If the defrosting mode is performed for the second heat exchanger unit, heat is supplied to the second heat exchanger unit by the refrigerant, and the cold is supplied to the first heat exchanger.

[0015] If the defrosting mode is performed, one of the first heat exchanger unit and the second heat exchanger unit becomes a high temperature part having a relatively high temperature, and the other one of the first heat exchanger unit and the second heat exchanger unit becomes a low temperature part having a relatively low tem-

perature.

[0016] The first heat exchanger unit is provided for supplying the cold to a refrigerating chamber, and the second heat exchanger unit is provided for supplying the cold to a freezing chamber.

[0017] In the meantime, if the defrosting mode is performed, the refrigerant can pass through an expansion valve between the first heat exchanger unit and the second heat exchanger unit.

[0018] And, if the defrosting mode is performed, the refrigerant which does not pass through the condensing unit can pass through one of the first heat exchanger unit and the second heat exchanger unit.

[0019] In a cold supply mode on the first heat exchanger unit, the refrigerant passed through the condensing unit can be introduced to the first heat exchanger unit after passing through the expansion valve.

[0020] In the cold supply mode on the second heat exchanger unit, the refrigerant passed through the condensing unit can be introduced to the second heat exchanger unit after passing through the expansion valve.

[0021] Especially, in the cold supply mode, the refrigerant can be introduced to one of the first heat exchanger unit and the second heat exchanger unit selectively after the refrigerant passes through the condensing unit.

[0022] The compressor unit includes a first compressor unit for supplying the refrigerant to the first heat exchanger unit in the cold supply mode, and a second compressor unit for supplying the refrigerant to the second heat exchanger unit.

[0023] In the defrosting mode on the first heat exchanger unit, the second compressor unit can supply the refrigerant in order of the first heat exchanger unit and the second heat exchanger unit, and, in the defrosting mode on the second heat exchanger unit, the first compressor unit can supply the refrigerant in order of the second heat exchanger unit and the first heat exchanger unit.

[0024] Opposite to this, the second heat exchanger unit can be provided with a cold accumulation unit having a phase change material placed therein, and the cold accumulation unit can be provided to supplement the cold to the freezing chamber or the refrigerating chamber.

[0025] 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 invention as claimed. The invention is defined by the claims.

[0026] The accompanying drawings, which are included to provide a further understanding of the invention, illustrate embodiments of the invention and together with the description serve to explain the principle of the invention.

FIG. 1 illustrates a diagram showing a state a cold supply mode is performed in accordance with a preferred embodiment of the present invention.

FIG. 2 illustrates a diagram showing a state a defrosting mode on a second heat exchanger unit in FIG. 1 is performed.

FIG. 3 illustrates a diagram showing a state a defrosting mode on a first heat exchanger unit in FIG. 1 is performed.

FIG. 4 illustrates a diagram showing a state a cold supply mode is performed in accordance with another preferred embodiment of the present invention.

FIG. 5 illustrates a diagram showing a state a defrosting mode on a second heat exchanger unit in FIG. 4 is performed.

FIG. 6 illustrates a diagram showing a state a defrosting mode on a first heat exchanger unit in FIG. 4 is performed.

FIG. 7 illustrates a diagram showing a state a cold supply mode is performed in accordance with another preferred embodiment of the present invention.

[0027] Reference will now be made in detail to the specific embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

[0028] For convenience and clarity of description, a size or a shape of an element shown in the drawing may be exaggerated. Terms specially defined taking a configuration and operation of the present invention into account may vary with intentions or usual practices of the user and operator. It is required that definition on such terms is made with reference to entire description of the present invention.

[0029] A word of "cold" used in this specification as a noun has a meaning opposite to a word of "heat" used as a noun which means warmth or hotness.

[0030] FIG. 1 illustrates a diagram showing a state a cold supply mode is performed in accordance with a preferred embodiment of the present invention.

[0031] Referring to FIG. 1, the refrigerator includes a compressor unit 10 for compressing the refrigerant, a condensing unit 20 for passing the refrigerant compressed thus, and a first heat exchanger unit 24 and a second heat exchanger unit 28 for making heat exchange as the refrigerant passes therethrough.

[0032] In the meantime, a plurality of pipelines connect various valves, the condensing unit 20, the compressor unit 10, the first heat exchanger unit 24, and the second heat exchanger unit 28 for enabling to move the refrigerant.

[0033] In this case, the compressor unit 10 includes a first compressor unit 12 for supplying the refrigerant to the first heat exchanger unit 24 and a second compressor unit 14 for supplying the refrigerant to the second heat exchanger unit 28 in a cold supply mode.

[0034] The cold supply mode is a regular refrigerator operation state in which the cold is supplied to an inside of the refrigerator through the first heat exchanger unit 24 or the second heat exchanger unit 28. In the cold supply mode of the first heat exchanger unit 24, the cold is supplied to the inside of the refrigerator through the first heat exchanger unit24, and, in the cold supply mode

on the second heat exchanger unit 28, the cold is supplied to the inside of the refrigerator through the second heat exchanger unit28.

[0035] The first heat exchanger unit 24 may be provided to supply the cold to the refrigerating chamber, and the second heat exchanger unit 28 may be provided to supply the cold to the freezing chamber. That is, the refrigerating chamber may be cooled by the cold supplied from the first heat exchanger unit 24, and the freezing chamber may be cooled by the cold supplied from the second heat exchanger unit 28. It is viable that the first heat exchanger unit 24 is an element matched to a refrigerating chamber evaporator, and the second heat exchanger unit 28 is an element matched to a freezing chamber evaporator. In this case, the first compressor unit 12 may be driven when the cold is supplied to the refrigerating chamber evaporator which is the first heat exchanger unit 24, and the second compressor unit 14 may be driven when the cold is supplied to the freezing chamber evaporator which is the second heat exchanger unit 28.

[0036] A system for embodying the cold supply mode in which the cold is supplied to the refrigerating chamber will be described. If the refrigerant is compressed by the first compressor unit 12, the refrigerant is guided to the condensing unit 20 by a first three-way valve 30. Heat exchange of the refrigerant is made at the condensing unit 20. Then, the refrigerant may pass through an expansion valve 22 for the first heat exchanger unit by the second three way valve 32, and guided to the first heat exchanger unit 24. That is, since heat exchange is made at the first heat exchanger unit 24, the cold can be supplied to the refrigerating chamber through the first heat exchanger unit 24. The refrigerant passed through the first heat exchanger unit 24 may be guided to the first compressor unit 12 to embody the refrigerating cycle.

[0037] It is viable that the cold supply mode in which the cold is supplied to the refrigerating chamber has a concept the same with the cold supply mode on the first heat exchanger unit 24. In the cold supply mode on the first heat exchanger unit 24, the refrigerant passed through the condensing unit 20 is introduced to the first heat exchanger unit 24 after the refrigerant passes through the expansion valve 22 for the first heat exchanger unit.

[0038] Next, a system for embodying the cold supply mode in which the cold is supplied to the freezing chamber will be described. If the refrigerant is compressed by the second compressor unit 14, the refrigerant compressed thus can pass the first compressor unit 12 without any change. Of course, the refrigerant compressed at the second compressor unit 14 may be compressed at the first compressor unit 12, further. In this case, since the refrigerant is compressed at the second compressor unit 14 and the first compressor unit 12 in succession, a compression load on the second compressor unit 14 can be reduced. Moreover, since the refrigerant is compressed at the second compressor unit 14 and the first compressor unit 12, a compression performance can be improved.

[0039] The refrigerant passes through the condensing unit 20 by the first three way valve 30. And, the refrigerant may be guided to the expansion valve 26 for the second heat exchanger unit and forwarded to the second heat exchanger unit 28 by the second three way valve 32. Since heat exchange is made at the second heat exchanger unit 28, the cold can be supplied to the freezing chamber, finally. The refrigerant passed through the second heat exchanger unit 28 may be guided to the second compressor unit 14 again to embody the refrigerating cycle.

[0040] It is viable that the cold supply mode in which the cold is supplied to the freezing chamber has a concept the same with the cold supply mode on the second heat exchanger unit 28. In the cold supply mode on the second heat exchanger unit 28, the refrigerant passed through the condensing unit 20 is introduced to the second heat exchanger unit 28 after the refrigerant passes through an expansion valve 26 for the second heat exchanger unit.

[0041] That is, in the embodiment described with reference to FIG. 1, since a flow path of the refrigerant can be guided by the second three way valve 32, the cold can be supplied to the freezing chamber or the refrigerating chamber by the second three way valve 32. In the cold supplied mode, the refrigerant passed through the compressor unit 10 may be introduced to any one of the first heat exchanger unit 24 or the second heat exchanger unit 28 after the refrigerant passes through the condensing unit 20, selectively.

[0042] FIG. 2 illustrates a diagram showing a state a defrosting mode on a second heat exchanger unit in FIG. 1 is performed.

[0043] Referring to FIG. 2, if the second heat exchanger unit 28 is frosted, defrosting of the second heat exchanger unit 28 is required.

[0044] Therefore, the first compressor unit 12 is put into operation to compress the refrigerant. The refrigerant compressed thus is guided to the second heat exchanger unit 28 through the first three way valve 30. In this case, in order to make the refrigerant to move from the first three way valve 30 to the second heat exchanger unit 28, a pipeline is connected between the first three way valve 30 and the second heat exchanger unit 28.

[0045] The refrigerant guided to the second compressor unit 28 after passing through the first three way valve is at a relatively high temperature because the refrigerant does not pass through the expansion valve before the refrigerant passes through the second heat exchanger unit 28. Since the refrigerant compressed at the first compressor unit 12 has a reduced volume, the refrigerant has an increased temperature. Therefore, as heat is supplied to the second heat exchanger unit 28, the second heat exchanger unit 28 can be heated to a relatively high temperature. That is, ice stuck to the second heat exchanger unit 28 can be melted to defrost the second heat

exchanger unit 28.

[0046] In the meantime, the refrigerant passed through the second heat exchanger unit 28 is guided to the first heat exchanger unit 24, passing through a check valve 36. The refrigerant passes the expansion valve 22 for the first heat exchanger unit before the refrigerant passes through the first heat exchanger unit 24. Therefore, the refrigerant is changed at the expansion valve 22 for the first heat exchanger unit to enable to supply the cold to the first heat exchanger unit 24. The refrigerant can cool the refrigerating chamber connected to the first heat exchanger unit 24 as the refrigerant passes through the first heat exchanger unit 24.

[0047] That is, the refrigerator of the present invention puts the first compressor unit 12 into operation to compress the refrigerant for defrosting the second heat exchanger unit 28. However, since the cold is supplied to the first heat exchanger unit 24 by using the refrigerant compressed thus, a space in communication with the first heat exchanger unit 24 can be cooled. In other words, since the refrigerator of the present invention utilizes energy for defrosting the second heat exchanger unit 28 for embodying the refrigerating cycle on the first heat exchanger unit 24, energy efficiency can be improved.

[0048] The refrigerator of the present invention can use the energy for defrosting, not only for defrosting, but also for supplying the cold to other parts.

[0049] And, while defrosting for the second heat exchanger unit 28 is performed, though the first heat exchanger unit 24 becomes a relatively low temperature part, the second heat exchanger unit 28 becomes a relatively high temperature part.

[0050] FIG. 3 illustrates a diagram showing a state a defrosting mode on a first heat exchanger unit in FIG. 1 is performed.

[0051] Referring to FIG. 3, if the first heat exchanger unit 24 is frosted, it is required to defrost the first heat exchanger unit 24.

[0052] Therefore, the second compressor unit 14 is put into operation to compress the refrigerant. The refrigerant compressed thus is, not passed through the first compressor unit 12, but guided to the first heat exchanger unit 24. Since the first compressor unit 12 is not in operation, the refrigerant compressed at the second compressor unit 14 can not pass the first compressor unit 12, but can move to the first heat exchanger unit 24.

[0053] The refrigerant guided to the first heat exchanger unit 24 is at a relatively high temperature state because the refrigerant does not pass through the expansion valve before the refrigerant passes through the first heat exchanger unit 24. Since the refrigerant compressed at the first compressor unit 12 has a reduced volume, the refrigerant has an increased temperature. Therefore, as heat is supplied to the first heat exchanger unit 24, the first heat exchanger unit 24 can be heated to a relatively high temperature. That is, ice stuck to the first heat exchanger unit 24 may be melted to defrost the first heat exchanger unit 24.

[0054] In the meantime, the refrigerant passed through the first heat exchanger unit 24 is guided to the second heat exchanger unit 28. In this case, the refrigerant passes through a first two-way valve 34 mounted to a pipeline which is connected between the first heat exchanger unit 24 and the expansion valve 26 for the second heat exchanger unit. The first two-way valve 34 opens a flow passage for the refrigerant to pass through. The refrigerant passes through the expansion valve 26 for the second heat exchanger unit before the refrigerant passes through the second heat exchanger unit 28. Therefore, the refrigerant is changed at the expansion valve 26 for the second heat exchanger unit for the refrigerant to supply the cold to the second heat exchanger unit 28. The refrigerant can cool down the freezing chamber connected to the second heat exchanger unit 28 as the refrigerant passes through the second heat exchanger unit 28.

[0055] That is, the refrigerator of the present invention puts the second compressor unit 14 into operation to compress the refrigerant for defrosting the first heat exchanger unit 24. However, since the cold is supplied to the second heat exchanger unit 28 by using the refrigerant compressed thus, a space in communication with the second heat exchanger unit 28 can be cooled. In other words, since the refrigerator of the present invention utilizes energy for defrosting the first heat exchanger unit 24 for embodying the refrigerating cycle on the second heat exchanger unit 28, energy efficiency can be improved.

[0056] The refrigerator of the present invention can use the energy for defrosting, not only for defrosting, but also for supplying the cold to other parts.

[0057] And, while defrosting for the first heat exchanger 24 is performed, though the second heat exchanger unit 28 becomes a relatively low temperature part, the first heat exchanger unit 24 becomes a relatively high temperature part.

[0058] If the defrosting mode is performed, since the refrigerant passes through the expansion valve between the first heat exchanger unit 24 and the second heat exchanger unit 28, the refrigerator of the present invention can supply the cold from the first heat exchanger unit 24 or the second heat exchanger unit 28 to which the refrigerant is introduced after the refrigerant passes through a relevant expansion valve.

[0059] In the meantime, if the defrosting is performed, since the refrigerant which does not pass through the condensing unit 20 passes through one of the first heat exchanger unit 24 and the second heat exchanger unit 28, the refrigerator of the present invention can defrost the first heat exchanger unit 24 or the second heat exchanger unit 28.

[0060] FIG. 4 illustrates a diagram showing a state a cold supply mode is performed in accordance with another preferred embodiment of the present invention.

[0061] Different from the refrigerator in accordance with a preferred embodiment of the present invention shown in FIG. 1, the refrigerator in accordance with an-

other preferred embodiment of the present invention shown in FIG. 4 has a big difference in that the compressor unit is one. Since the compressor unit is one, in order to change over flow passages through which the refrigerant moves, a plurality of valves are provided in a system different from a system in the embodiment shown in FIG. 1. Alike the refrigerator in accordance with a preferred embodiment of the present invention shown in FIG. 1, the refrigerator in accordance with another preferred embodiment of the present invention shown in FIG. 4 has various valves and elements connected with pipelines through which the refrigerant can move.

[0062] For convenience's sake, description on an art which can be embodied identical to the refrigerator in accordance with a preferred embodiment of the present invention described above will be omitted. Accordingly, the description made in the refrigerator in accordance with a preferred embodiment of the present invention may also be applied to the refrigerator in accordance with another preferred embodiment of the present invention in the same fashion.

[0063] A cold supply mode will be described, in which the cold is supplied to the first heat exchanger unit 24. The refrigerant compressed by the compressor unit 10 is guided to the condensing unit 20 through a four way change over valve 40. Then, the refrigerant is guided to the first heat exchanger unit 24 through a third three way valve 42. The refrigerant passes through the expansion valve 22 for the first heat exchanger unit before the refrigerant moves to the first heat exchanger unit 24. According to this, the cold can be supplied to an inside of the refrigerator through the first heat exchanger unit 24.

[0064] The refrigerant passed through the first heat exchanger unit 24 is guided to the compressor unit 10 through a second two way valve 44. In this case, the second two way valve 44 opens a flow passage of a pipeline connected between the first heat exchanger unit 24 and the compressor unit 10. Opposite to this, a third two way valve 48 connected between the compressor unit 10 and the second heat exchanger unit 28 closes a passage of a pipeline. According to this, the refrigerant is not guided to the pipeline having the third two way valve 48 mounted thereto, but guided to the compressor unit 10 to embody a refrigerating cycle, finally.

[0065] In the meantime, a cold supply mode will be described, in which the cold is supplied to the second heat exchanger unit 28. The refrigerant compressed by the compressor unit 10 is guided to the condensing unit 20 through the four way change over valve 40. Then, the refrigerant is guided to the second heat exchanger unit 28 through the third three way valve 42. The refrigerant passes through the expansion valve 26 for the second heat exchanger unit before the refrigerant moves to the second heat exchanger unit 28. According to this, the cold can be supplied to an inside of the refrigerator through the second heat exchanger unit 28.

[0066] The refrigerant passed through the second heat exchanger unit 28 thus is guided to the compressor unit 10 through the third two way valve 48. In this case, the third two way valve 48 opens a flow passage of a pipeline connected between the second heat exchanger unit 28 and the compressor unit 10. Opposite to this, the second two way valve 44 connected between the compressor unit 10 and the first heat exchanger unit 24 closes a passage of a pipeline. According to this, the refrigerant is not guided to the pipeline having the second two way valve 44 mounted thereto, but guided to the compressor unit 10 to embody a refrigerating cycle, finally.

[0067] In the meantime, in a cold supply mode for supplying the cold to the first heat exchanger unit 24 or the second heat exchanger unit 28, it is provided that a fourth two way valve 46 mounted to a pipeline connected between the first heat exchanger unit 24 and the expansion valve 26 for the second heat exchanger unit closes a flow passage of the pipeline.

[0068] FIG. 5 illustrates a diagram showing a state a defrosting mode on a second heat exchanger unit in FIG. 4 is performed.

[0069] Referring to FIG. 5, the refrigerant compressed at the compressor unit 10 is guided to the second heat exchanger unit 28 after passing through the four way change over valve 40. In this case, the refrigerant does not pass through the expansion valve 26 for the second heat exchanger unit and the condensing unit 20 before the refrigerant is guided to the second heat exchanger unit 28. Since the refrigerant compressed at the compressor unit 10 moves, the second heat exchanger unit 28, having heat transferred thereto, can be heated to a high temperature, relatively.

[0070] The refrigerant is guided to a pipeline having a check valve 49 mounted thereto. In this case, since the third two way valve 48 mounted to the pipeline connected between the second heat exchanger unit 28 and the compressor unit 10 closes the flow passage, the refrigerant is not guided to the pipeline having the third two way valve 48 mounted thereto.

[0071] After passing through the check valve 49, the refrigerant is guided to the first heat exchanger unit 24 through the expansion valve 22 for the first heat exchanger. In this case, since the refrigerant emits the cold, the first heat exchanger unit 24 can supply the cold. Since the second two way valve 44 opens a flow passage, the refrigerant is guided to the compressor unit 10 after passing through the second two way valve 44. Opposite to this, since the third two way valve 48 is handled to close the flow passage, the refrigerant is not guided to the third two way valve 48, but is lead to the compressor unit 10. Alikely, the fourth two way valve 46 mounted to a pipeline connected between the first heat exchanger unit 24 and the expansion valve 26 for the second heat exchanger unit closes the flow passage for preventing the refrigerant from flowing to the pipeline.

[0072] In the defrosting mode on the second heat exchanger unit too, while the second heat exchanger unit 28 falls under the high temperature part since the second heat exchanger unit 28 has a relatively high temperature,

the first heat exchanger unit 24 falls under the low temperature part since the first heat exchanger unit 24 has a relatively low temperature. Therefore, ice and the like stuck to the second heat exchanger unit 28 can be removed.

[0073] In order to defrost the second heat exchanger unit 28, the compressor unit 10 is put into operation, and, the cold can be supplied to the first heat exchanger unit 24 by using the refrigerant compressed by the compressor unit 10. According to this, energy efficiency can be improved.

[0074] FIG. 6 illustrates a diagram showing a state a defrosting mode on a first heat exchanger unit in FIG. 4 is performed.

[0075] Referring to FIG. 6, the refrigerant compressed by the compressor unit 10 is guided to the first heat exchanger unit 24 by the four way change over valve 40. The refrigerant does not pass through the condensing unit 20 or the expansion valve 22 for the first heat exchanger unit before the refrigerant is guided to the first heat exchanger unit 24.

[0076] The second two way valve 44 mounted to the pipeline connected between the first heat exchanger unit 24 and the compressor unit 10 closes the flow passage. Opposite to this, the fourth two way valve 46 mounted to the pipeline connected between the first heat exchanger unit 24 and the expansion valve 26 for the second heat exchanger unit opens the flow passage. According to this, the refrigerant is guided, not to pass through the second two way valve 44, but to pass the fourth two way valve 46.

[0077] After passing through the expansion valve 26 for the second heat exchanger unit, the refrigerant is guided to the second heat exchanger unit 28. In the meantime, the third two way valve 48 connected between the compressor unit 10 and the second heat exchanger unit 28 opens the third two way valve 48. The refrigerant passed through the second heat exchanger unit 28 is guided to the compressor unit 10 through the pipeline having the third two way valve 48 mounted thereto.

[0078] In the defrosting mode on the first heat exchanger unit too, while the first heat exchanger unit 24 falls under the high temperature part since the first heat exchanger unit 24 has a relatively high temperature, the second heat exchanger unit 28 falls under the low temperature part since the second heat exchanger unit 28 has a relatively low temperature. Therefore, ice and the like stuck to the first heat exchanger unit 24 can be removed.

[0079] In order to defrost the first heat exchanger unit 24, the compressor unit 10 is put into operation, and, the cold can be supplied to the second heat exchanger unit 28 by using the refrigerant compressed by the compressor unit 10. According to this, energy efficiency can be improved.

[0080] FIG. 7 illustrates a diagram showing a state a cold supply mode is performed in accordance with another preferred embodiment of the present invention.

[0081] Different from the refrigerator in accordance with a preferred embodiment of the present invention in FIG. 1, the refrigerator in accordance with another preferred embodiment of the present invention in FIG. 7 includes a cold accumulation unit 60 in the second heat exchanger unit 28. In this case, to make cold accumulation, the cold accumulation unit 60 may have a PCM (Phase Change Material) placed therein.

[0082] The PCM has a phase changing from liquid to gas, from solid to gas, or from gas to solid at a certain temperature. Even though a material shows no temperature change at a melting point or a boiling point, since the material absorbs or discharges much energy for changing the state of the material, the PCM can be used for storage of energy within a particular temperature range.

[0083] At first, a cold supply mode for supplying the cold to the first heat exchanger unit 24 will be described. The compressor unit 10 is put into operation to compress the refrigerant, and the refrigerant compressed thus is guided to the condensing unit 20 through a fourth three way valve 50. Then, after passing through the expansion valve 22 for the first heat exchanger unit, the refrigerant is guided to the first heat exchanger unit 24 to supply the cold thereto. Then, the refrigerant is guided to the compressor unit 10 through a fifth three way valve 52 to embody the refrigerating cycle.

[0084] Next, a cold supply mode for supplying the cold to the second heat exchanger unit 28 will be described. The compressor unit 10 is put into operation to compress the refrigerant, and the refrigerant compressed thus is guided to the condensing unit 20 through the fourth three way valve 50. Then, the refrigerant is guided to the first heat exchanger unit 24 after passing through the expansion valve 22 for the first heat exchanger unit to supply the cold thereto. Then, after passing through the fifth three way valve 52, the refrigerant is guided to the expansion valve 26 for the second heat exchanger unit. After passing through the expansion valve 26 for the second heat exchanger unit, the refrigerant moves to the second heat exchanger unit 28. Therefore, the refrigerant supplies the cold to the second heat exchanger unit 28, too.

[0085] In this case, since the second heat exchanger unit 28 is in contact with the cold accumulation unit 60, the cold can be accumulated at the cold accumulation unit 60.

[0086] In the meantime, the cold accumulation unit 60 may be provided to the freezing chamber or the refrigerating chamber.

[0087] For an example, if the cold accumulation unit 60 is provided to the refrigerating chamber, the second heat exchanger unit 28 may be mounted to the refrigerating chamber, to supply the cold to the refrigerating chamber. In this case, different from the second heat exchanger unit 28, the first hat exchanger unit 24 may be mounted to the freezing chamber for supplying the cold to the freezing chamber. Since the cold accumula-

tion unit 60 is mounted to the refrigerating chamber, if the refrigerating cycle is not in operation by the compressor unit 10, the cold accumulated at the cold accumulation unit 60 may be supplied to the refrigerating chamber.

[0088] Opposite to this, the cold accumulation unit 60 may be provided to the freezing chamber. In this case, it is possible that the second heat exchanger unit 28 supplies the cold to the cold accumulation unit 60 for storage of the cold therein. Of course, it is also possible to cool down the freezing chamber with the cold supplied from the second heat exchanger unit 28. In this case, the first heat exchanger unit 24 may be mounted, to the refrigerating chamber for supplying the cold to the refrigerating chamber, or to the freezing chamber for supplying the cold to the freezing chamber.

[0089] Since the cold accumulation unit 60 is mounted to the freezing chamber, if the refrigerating cycle is not in operation by the compressor unit 10, the cold accumulated at the cold accumulation unit 60 may be supplied to the freezing chamber.

[0090] A defrosting mode on the first heat exchanger unit 24 in accordance with another preferred embodiment of the present invention will be described.

[0091] The refrigerant compressed by the compressor unit 10 is guided to the first heat exchanger unit 24 through the fourth three way valve 50. In this case, the refrigerant guided to the first heat exchanger unit 24 does not pass through the condensing unit 20 and the expansion valve 22 for the first heat exchanger unit. According to this, the first heat exchanger unit 24 may form the high temperature part which has a relatively high temperature.

[0092] Since the first heat exchanger unit 24 is heated to the relatively high temperature, the ice stuck thereto can be melted to remove the ice therefrom. According to this, the defrosting on the first heat exchanger unit 24 can be achieved.

[0093] The refrigerant passed through the first heat exchanger unit 24 is guided to the expansion valve 26 for the second heat exchanger unit through the fifth three way valve 52. Then, the refrigerant may be guided to the second heat exchanger unit 28 to supply the cold to the second heat exchanger unit 28. In this case, since the refrigerant supplies the cold to the second heat exchanger unit 28, the second heat exchanger unit 28 can form the low temperature part which has a relatively low temperature.

[0094] As has been described, the refrigerator of the present invention can reduce power consumed during defrosting of the evaporator.

[0095] Moreover, the refrigerator of the present invention can improve energy efficiency of the refrigerator because a refrigerating cycle can be embodied by utilizing energy consumed for performing the defrosting.

[0096] Moreover, the refrigerator of the present invention permits to supply the cold to one of the refrigerating chamber and the freezing chamber while defrosting the other one of the refrigerating chamber and the freezing chamber.

Claims

1. A refrigerator comprising:

a compressor unit (10) for compressing refrigerant;
a condensing unit (20) for passing the refrigerant compressed thus; and
a first heat exchanger unit (24) and a second heat exchanger unit (28) each for making heat exchange as the refrigerant passes therethrough,

a first three-way valve (30) configured to guide the refrigerant compressed by the compressor;
a second three way valve (32) configured to guide the refrigerant passed through the condensing unit (20);
a first expansion valve (26) for the second heat exchanger unit (28); and
a second expansion valve (22) for the first heat exchanger unit (24);
a check valve (36) configured to guide the refrigerant passed through the second heat exchanger unit (28) to the first heat exchanger unit (24) via the second expansion valve (22);
a first two-way valve (34) mounted to a pipeline between the first heat exchanger unit (24) and the first expansion valve (26) for the second heat exchanger unit (28) and being configured to open a flow passage for the refrigerant to pass through,

wherein the compressor unit (10) comprises a first compressor unit (12) and a second compressor unit (14), wherein

the first compressor unit (12) is for supplying the refrigerant to the first heat exchanger unit (24) in the cold supply mode, and
the second compressor unit (14) is for supplying the refrigerant to the second heat exchanger unit (28),

wherein, if a defrosting mode is performed for one of the first heat exchanger unit (24) and a second heat exchanger unit (28), the refrigerator is configured to supply refrigerant compressed at the compressor unit (10) to one of the first heat exchanger unit (24) and the second heat exchanger unit (28), and to then supply the refrigerant to the other one of the first heat exchanger unit (24) and the second heat exchanger unit (28) after the refrigerant is passed through the first or second expansion valve (22, 26), respectively,

wherein, if the defrosting mode is performed for the first heat exchanger unit (24), the refrigerator is configured to supply heat to the first heat exchanger unit (24) by the refrigerant, and to supply cold to the second heat exchanger unit (28), wherein, if the defrosting mode is performed for the second heat exchanger unit (28), the refrigerator is configured to supply heat to the second heat exchanger unit (28) by the refrigerant, and to supply the cold to the first heat exchanger unit (24),

wherein, if the defrosting mode is performed, one of the first heat exchanger unit (24) and the second heat exchanger unit (28) is configured to become a high temperature part having a relatively high temperature, and the other one of the first heat exchanger unit (24) and the second heat exchanger unit (28) to become a low temperature part having a relatively low temperature, and

wherein the first heat exchanger unit (24) is provided for supplying the cold to a refrigerating chamber, and the second heat exchanger unit (28) is provided for supplying the cold to a freezing chamber, wherein the first three-way valve (30) is configured to guide the refrigerant to the condensing unit (20), and, if the refrigerant is compressed by the first compression unit (12), to the second heat exchanger unit (28), and the second three-way valve (32) is configured to guide the refrigerant to the expansion valve (26) for the second heat exchanger (28) or to the expansion valve (22) for the first heat exchanger (24).

2. The refrigerator as claimed in claim 1, wherein, if the defrosting mode is performed, the refrigerator is configured to pass refrigerant through the second expansion valve (26) between the first heat exchanger unit (24) and the second heat exchanger unit (28).

3. The refrigerator as claimed in claim 1 or 2, wherein, if the defrosting mode is performed, the refrigerant which does not pass through the condensing unit (20) passes through one of the first heat exchanger unit (24) and the second heat exchanger unit (28).

4. The refrigerator as claimed in any one of claims 1 to 3, wherein, in a cold supply mode on the first heat exchanger unit (24), the refrigerator is configured to introduce the refrigerant passed through the condensing unit (20) to the first heat exchanger unit (24) after passing through the first expansion valve (22).

5. The refrigerator as claimed in any one of claims 1 to 4, wherein, in the cold supply mode on the second heat exchanger unit (28), the refrigerator is configured to introduce the refrigerant passed through the condensing unit (20) to the second heat exchanger unit (28) after passing through the second expansion valve (26).

6. The refrigerator as claimed in any one of claims 1 to 5, wherein, in the cold supply mode, the refrigerator is configured to introduce the refrigerant to one of the first heat exchanger unit (24) and the second heat exchanger unit (28) selectively after the refrigerant passes through the condensing unit (20).

7. The refrigerator as claimed in any one of claims 1 to 6, wherein, in the defrosting mode on the first heat exchanger unit (24), the second compressor unit (14) supplies the refrigerant in order of the first heat exchanger unit (24) and the second heat exchanger unit (28).

8. The refrigerator as claimed in any one of claims 1 to 7, wherein, in the defrosting mode on the second heat exchanger unit (28), the first compressor unit (12) supplies the refrigerant in order of the second heat exchanger unit (28) and the first heat exchanger unit (24).

9. The refrigerator as claimed in any one of claims 1 to 8, wherein the second heat exchanger unit (28) is provided with a cold accumulation unit (60) having a phase change material placed therein.

10. The refrigerator as claimed in claim 9, wherein the cold accumulation unit (60) is provided to supplement the cold to the freezing chamber or the refrigerating chamber.

Patentansprüche

1. Kühlschrank, der aufweist:

eine Kompressoreinheit (10) zum Komprimieren von Kältemittel;
eine Kondensatoreinheit (20), um das so komprimierte Kältemittel durchlaufen zu lassen; und
eine erste Wärmetauschereinheit (24) und eine zweite Wärmetauschereinheit (28), die jeweils dazu dienen, einen Wärmeaustausch durchzuführen, während das Kältemittel sie durchläuft;
ein erstes Dreiwegeventil (30), das konfiguriert ist, um das von dem Kompressor komprimierte Kältemittel zu leiten;
ein zweites Dreiwegeventil (32), das konfiguriert ist, um das Kältemittel, das die Kondensatoreinheit (20) durchlaufen hat, zu leiten;
ein erstes Expansionsventil (26) für die zweite Wärmetauschereinheit (28); und
ein zweites Expansionsventil (22) für die erste Wärmetauschereinheit (24);

ein Rückschlagventil (36), das konfiguriert ist, um das Kältemittel, das die zweite Wärmetauschereinheit (28) durchlaufen hat, über das zweite Expansionsventil (22) zu der ersten Wärmetauschereinheit (24) zu leiten;
ein erstes Zweiwegeventil (34), das an einer Rohrleitung zwischen der ersten Wärmetauschereinheit (24) und dem ersten Expansionsventil (26) für die zweite Wärmetauschereinheit (28) montiert ist und konfiguriert ist, um einen Strömungsweg zu öffnen, damit das Kältemittel durchläuft,
wobei die Kompressoreinheit (10) eine erste Kompressoreinheit (12) und eine zweite Kompressoreinheit (14) aufweist, wobei
die erste Kompressoreinheit (12) dazu dient, das Kältemittel in der Kälteversorgungsbetriebsart an die erste Wärmetauschereinheit (24) zuzuführen, und
die zweite Kompressoreinheit (14) dazu dient, das Kältemittel an die zweite Wärmetauschereinheit (28) zuzuführen,
wobei der Kühlschrank konfiguriert ist, um, wenn für eine der ersten Wärmetauschereinheit (24) und der zweiten Wärmetauschereinheit (28) eine Entfrostungsbetriebsart durchgeführt wird, in der Kompressoreinheit (10) komprimiertes Kältemittel an eine der ersten Wärmetauschereinheit (24) und der zweiten Wärmetauschereinheit (28) zuzuführen und das Kältemittel dann, nachdem das Kältemittel jeweils das erste oder zweite Expansionsventil (22, 26) durchlaufen hat, an die andere der ersten Wärmetauschereinheit (24) und der zweiten Wärmetauschereinheit (28) zuzuführen,
wobei der Kühlschrank, wenn die Entfrostungsbetriebsart für die erste Wärmetauschereinheit (24) durchgeführt wird, konfiguriert ist, um durch das Kältemittel Wärme an die erste Wärmetauschereinheit (24) zuzuführen und an die zweite Wärmetauschereinheit (28) Kälte zuzuführen,
wobei der Kühlschrank, wenn die Entfrostungsbetriebsart für die zweite Wärmetauschereinheit (28) durchgeführt wird, konfiguriert ist, um durch das Kältemittel Wärme an die zweite Wärmetauschereinheit (28) zuzuführen und an die erste Wärmetauschereinheit (24) die Kälte zuzuführen,
wobei, wenn die Entfrostungsbetriebsart durchgeführt wird, eine der ersten Wärmetauschereinheit (24) und der zweiten Wärmetauschereinheit (28) konfiguriert ist, um ein Hochtemperaturteil mit einer relativ hohen Temperatur zu werden, und die andere der ersten Wärmetauschereinheit (24) und der zweiten Wärmetauschereinheit (28) konfiguriert ist, um ein Niedertemperaturteil mit einer relativ niedrigen Temperatur zu werden, und
wobei die erste Wärmetauschereinheit (24) bereitgestellt ist, um die Kälte an eine Kühlkammer zuzuführen, und die zweite Wärmetauschereinheit (28) bereitgestellt ist, um die Kälte an eine Gefrierkammer zuzuführen, wobei das erste Dreiwegeventil (30) konfiguriert ist, um das Kältemittel zu der Kondensatoreinheit (20) zu leiten, und, wenn das Kältemittel von der ersten Kompressoreinheit (12) komprimiert wird, zu der zweiten Wärmetauschereinheit (28) zu leiten, und wobei das zweite Dreiwegeventil (32) konfiguriert ist, um das Kältemittel zu dem Expansionsventil (26) für den zweiten Wärmetauscher (28) oder zu dem Expansionsventil (22) für den ersten Wärmetauscher (24) zu leiten.

2. Kühlschrank nach Anspruch 1, wobei der Kühlschrank konfiguriert ist, um, wenn die Entfrostungsbetriebsart durchgeführt wird, Kältemittel durch das zweite Expansionsventil (26) zwischen der ersten Wärmetauschereinheit (24) und der zweiten Wärmetauschereinheit (28) laufen zu lassen.

3. Kühlschrank nach Anspruch 1 oder 2, wobei, wenn die Entfrostungsbetriebsart durchgeführt wird, das Kältemittel, das die Kondensatoreinheit (20) nicht durchläuft, durch eine der ersten Wärmetauschereinheit (24) und der zweiten Wärmetauschereinheit (28) läuft.

4. Kühlschrank nach einem der Ansprüche 1 bis 3, wobei der Kühlschrank konfiguriert ist, um in einer Kältebereitstellungsbetriebsart auf der ersten Wärmetauschereinheit (24) das Kältemittel, das die Kondensatoreinheit (20) durchlaufen hat, zu der ersten Wärmetauschereinheit (24) einzuleiten, nachdem es das erste Expansionsventil (22) durchlaufen hat.

5. Kühlschrank nach einem der Ansprüche 1 bis 4, wobei der Kühlschrank in der Kältebereitstellungsbetriebsart auf der zweiten Wärmetauschereinheit (28) konfiguriert ist, um das Kältemittel, das die Kondensatoreinheit (20) durchlaufen hat, zu der zweiten Wärmetauschereinheit (28) einzuleiten, nachdem es das zweite Expansionsventil (26) durchlaufen hat.

6. Kühlschrank nach einem der Ansprüche 1 bis 5, wobei der Kühlschrank in der Kältebereitstellungsbetriebsart konfiguriert ist, um das Kältemittel wahlweise zu einer der ersten Wärmetauschereinheit (24) und der zweiten Wärmetauschereinheit (28) einzuleiten, nachdem es die Kondensatoreinheit (20) durchlaufen hat.

7. Kühlschrank nach einem der Ansprüche 1 bis 6, wobei die zweite Kompressoreinheit (14) in der Entfrostungsbetriebsart auf der ersten Wärmetauschereinheit (24) das Kältemittel in der Reihenfolge der ers-

ten Wärmetauschereinheit (24) und der zweiten Wärmetauschereinheit (28) zuführt.

8. Kühlschrank nach einem der Ansprüche 1 bis 7, wobei die erste Kompressoreinheit (12) in der Entfrostungsbetriebsart auf der zweiten Wärmetauschereinheit (28) das Kältemittel in der Reihenfolge der zweiten Wärmetauschereinheit (28) und der ersten Wärmetauschereinheit (24) zuführt.

9. Kühlschrank nach einem der Ansprüche 1 bis 8, wobei die zweite Wärmetauschereinheit (28) mit einer Kälteakkumulationseinheit (60), die ein Phasenänderungsmaterial darin angeordnet hat, versehen ist.

10. Kühlschrank nach Anspruch 9, wobei die Kälteakkumulationseinheit (60) bereitgestellt ist, um die Kälte an die Gefrierkammer oder die Kühlkammer zu ergänzen.

Revendications

1. Réfrigérateur comprenant :

une unité de compresseur (10) pour comprimer un réfrigérant ;
une unité de condensation (20) pour faire passer le réfrigérant ainsi comprimé ; et
une première unité d'échangeur de chaleur (24) et une seconde unité d'échangeur de chaleur (28) pour procéder chacune à un échange de chaleur lorsque le réfrigérant passe à travers elles,
une première vanne à trois voies (30) configurée pour guider le réfrigérant comprimé par le compresseur ;
une seconde vanne à trois voies (32) configurée pour guider le réfrigérant passé à travers l'unité de condensation (20) ;
une première vanne d'expansion (26) pour la seconde unité d'échangeur de chaleur (28) ; et une seconde vanne d'expansion (22) pour la première unité d'échangeur de chaleur (24) ;
un clapet anti-retour (36) configuré pour guider le réfrigérant passé à travers la seconde unité d'échangeur de chaleur (28) vers la première unité d'échangeur de chaleur (24) par l'intermédiaire de la seconde vanne d'expansion (22) ;
une première vanne à deux voies (34) montée sur un tuyau entre la première unité d'échangeur de chaleur (24) et la première vanne d'expansion (26) pour la seconde unité d'échangeur de chaleur (28) et étant configurée pour ouvrir un passage d'écoulement pour que le réfrigérant passe à travers,
dans lequel l'unité de compresseur (10) comprend une première unité de compresseur (12) et une seconde unité de compresseur (14), dans lequel la première unité de compresseur (12) est destinée à fournir le réfrigérant à la première unité d'échangeur de chaleur (24) dans le mode de fourniture de froid, et la seconde unité de compresseur (14) est destinée à fournir le réfrigérant à la seconde unité d'échangeur de chaleur (28),
dans lequel, si un mode de dégivrage est exécuté pour l'une parmi la première unité d'échangeur de chaleur (24) et une seconde unité d'échangeur de chaleur (28), le réfrigérateur est configuré pour fournir du réfrigérant comprimé au niveau de l'unité de compresseur (10) à l'une parmi la première unité d'échangeur de chaleur (24) et la seconde unité d'échangeur de chaleur (28), et pour ensuite fournir le réfrigérant à l'autre parmi la première unité d'échangeur de chaleur (24) et la seconde unité d'échangeur de chaleur (28) après que le réfrigérant est passé à travers la première ou la seconde vanne d'expansion (22, 26), respectivement,
dans lequel, si le mode de dégivrage est exécuté pour la première unité d'échangeur de chaleur (24), le réfrigérateur est configuré pour fournir de la chaleur à la première unité d'échangeur de chaleur (24) par le réfrigérant, et pour fournir du froid à la seconde unité d'échangeur de chaleur (28),
dans lequel, si le mode de dégivrage est exécuté pour la seconde unité d'échangeur de chaleur (28), le réfrigérateur est configuré pour fournir de la chaleur à la seconde unité d'échangeur de chaleur (28) par le réfrigérant, et pour fournir le froid à la première unité d'échangeur de chaleur (24),
dans lequel, si le mode de dégivrage est exécuté, l'une parmi la première unité d'échangeur de chaleur (24) et la seconde unité d'échangeur de chaleur (28) est configurée pour devenir une partie à température élevée ayant une température relativement élevée, et l'autre parmi la première unité d'échangeur de chaleur (24) et la seconde unité d'échangeur de chaleur (28) pour devenir une partie à basse température ayant une température relativement basse, et
dans lequel la première unité d'échangeur de chaleur (24) est prévue pour fournir le froid à une chambre réfrigérante, et la seconde unité d'échangeur de chaleur (28) est prévue pour fournir le froid à une chambre de congélation,
dans lequel la première vanne à trois voies (30) est configurée pour guider le réfrigérant vers l'unité de condensation (20), et, si le réfrigérant est comprimé par la première unité de compresseur (12), vers la seconde unité d'échangeur de chaleur (28), et la seconde vanne à trois voies (32) est configurée pour guider le réfrigérant

vers la vanne d'expansion (26) pour le second échangeur de chaleur (28) ou vers la vanne d'expansion (22) pour le premier échangeur de chaleur (24).

2. Réfrigérateur selon la revendication 1, dans lequel, si le mode de dégivrage est exécuté, le réfrigérateur est configuré pour faire passer un réfrigérant à travers la seconde vanne d'expansion (26) entre la première unité d'échangeur de chaleur (24) et la seconde unité d'échangeur de chaleur (28).

3. Réfrigérateur selon la revendication 1 ou 2, dans lequel, si le mode de dégivrage est exécuté, le réfrigérant qui ne passe pas à travers l'unité de condensation (20) passe à travers l'une parmi la première unité d'échangeur de chaleur (24) et la seconde unité d'échangeur de chaleur (28).

4. Réfrigérateur selon l'une quelconque des revendications 1 à 3, dans lequel, dans un mode de fourniture de froid sur la première unité d'échangeur de chaleur (24), le réfrigérateur est configuré pour introduire le réfrigérant passé à travers l'unité de condensation (20) dans la première unité d'échangeur de chaleur (24) après être passé par la première vanne d'expansion (22).

5. Réfrigérateur selon l'une quelconque des revendications 1 à 4, dans lequel, dans le mode de fourniture de froid sur la seconde unité d'échangeur de chaleur (28), le réfrigérateur est configuré pour introduire le réfrigérant passé à travers l'unité de condensation (20) dans la seconde unité d'échangeur de chaleur (28) après être passé à travers la seconde vanne d'expansion (26).

6. Réfrigérateur selon l'une quelconque des revendications 1 à 5, dans lequel, dans le mode de fourniture de froid, le réfrigérateur est configuré pour introduire le réfrigérant dans l'une parmi la première unité d'échangeur de chaleur (24) et la seconde unité d'échangeur de chaleur (28) sélectivement après que le réfrigérant passe à travers l'unité de condensation (20).

7. Réfrigérateur selon l'une quelconque des revendications 1 à 6, dans lequel, dans le mode de dégivrage sur la première unité d'échangeur de chaleur (24), la seconde unité de compresseur (14) fournit le réfrigérant dans l'ordre de la première unité d'échangeur de chaleur (24) et de la seconde unité d'échangeur de chaleur (28).

8. Réfrigérateur selon l'une quelconque des revendications 1 à 7, dans lequel, dans le mode de dégivrage sur la seconde unité d'échangeur de chaleur (28), la première unité de compresseur (12) fournit le réfrigérant dans l'ordre de la seconde unité d'échangeur de chaleur (28) et de la première unité d'échangeur de chaleur (24).

9. Réfrigérateur selon l'une quelconque des revendications 1 à 8, dans lequel la seconde unité d'échangeur de chaleur (28) est prévue avec une unité d'accumulation de froid (60) ayant un matériau à changement de phase placé à l'intérieur de celle-ci.

10. Réfrigérateur selon la revendication 9, dans lequel l'unité d'accumulation de froid (60) est prévue pour apporter un supplément de froid à la chambre de congélation ou la chambre réfrigérante.

FIG. 1

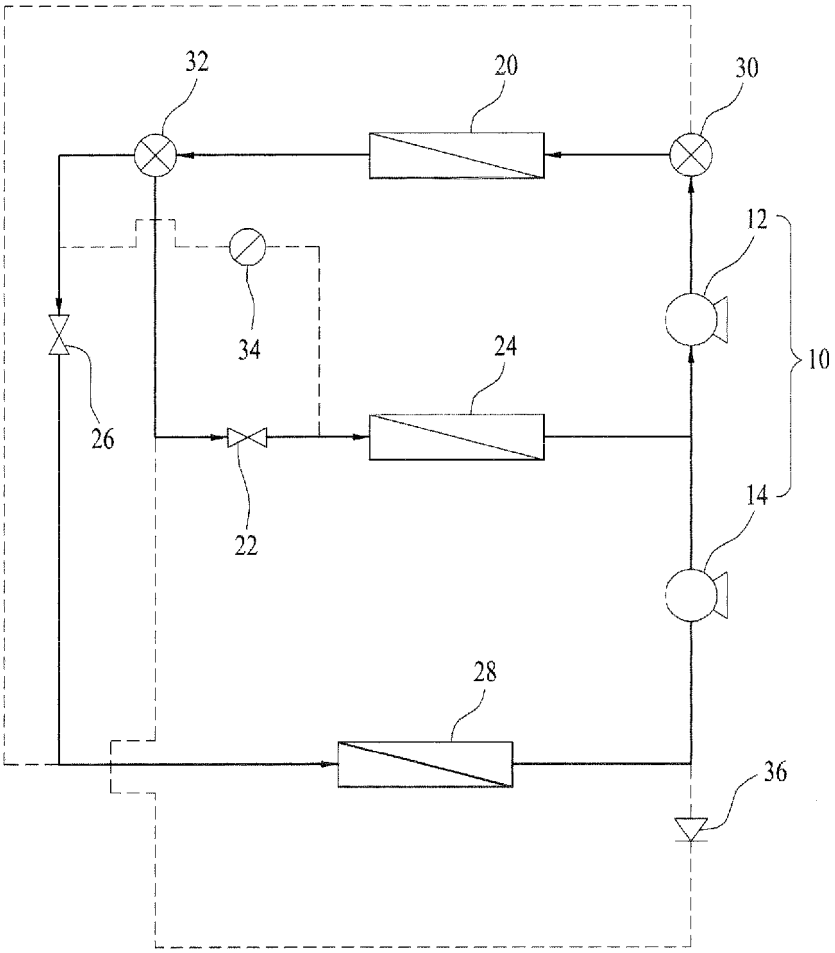


FIG. 2

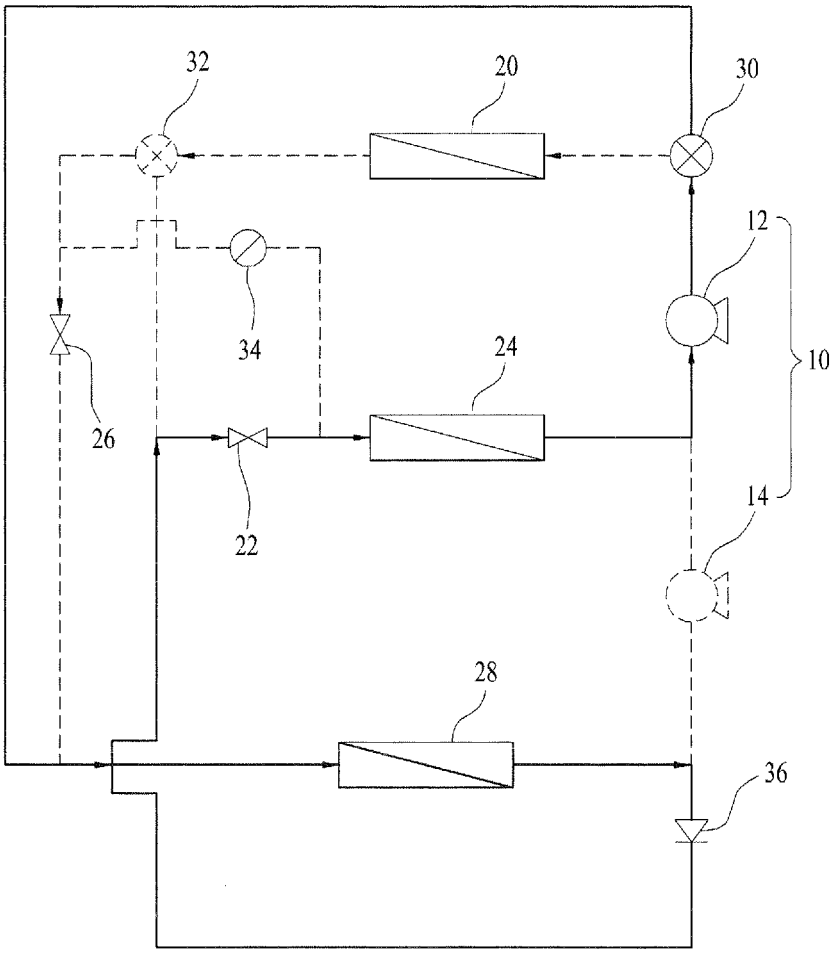


FIG. 3

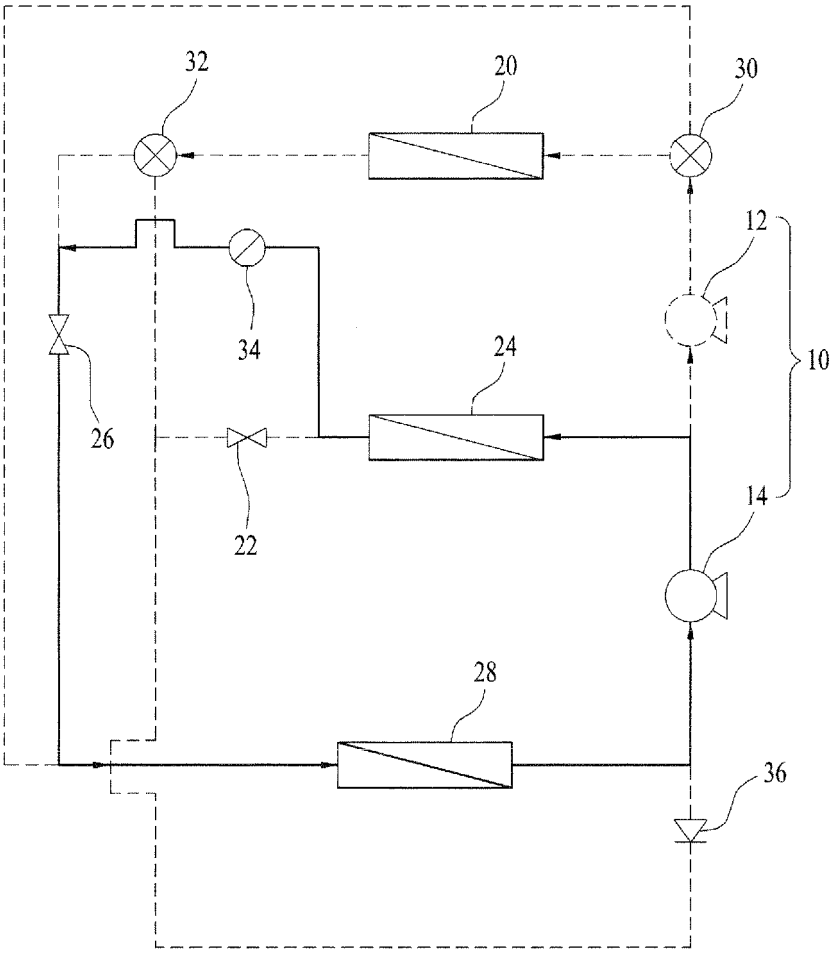


FIG. 4

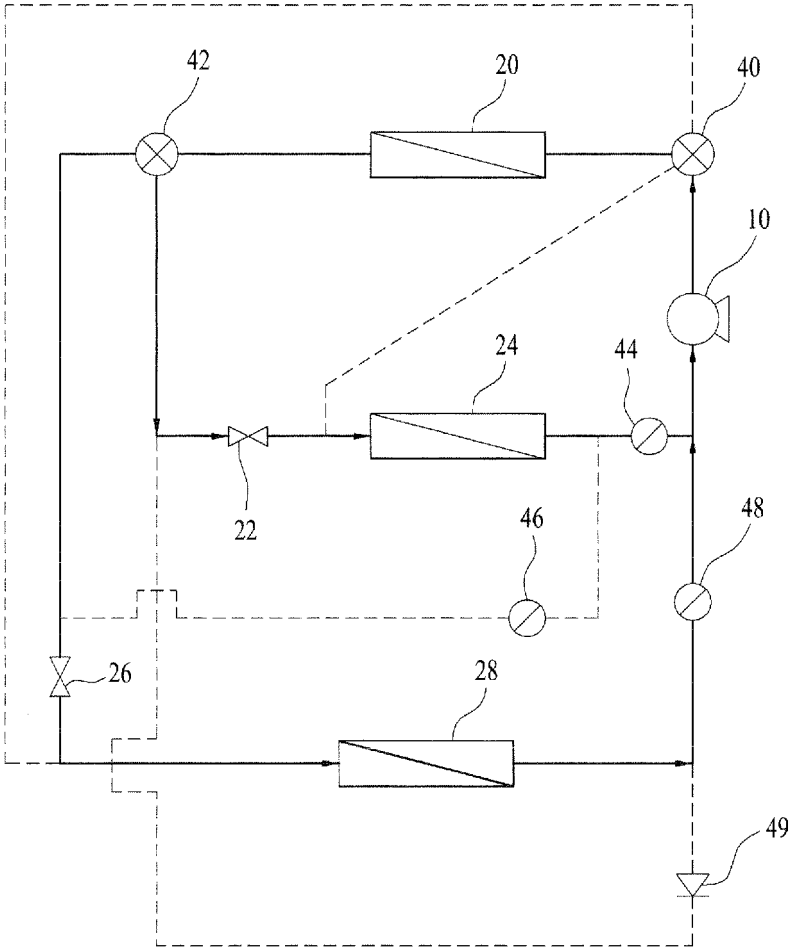


FIG. 5

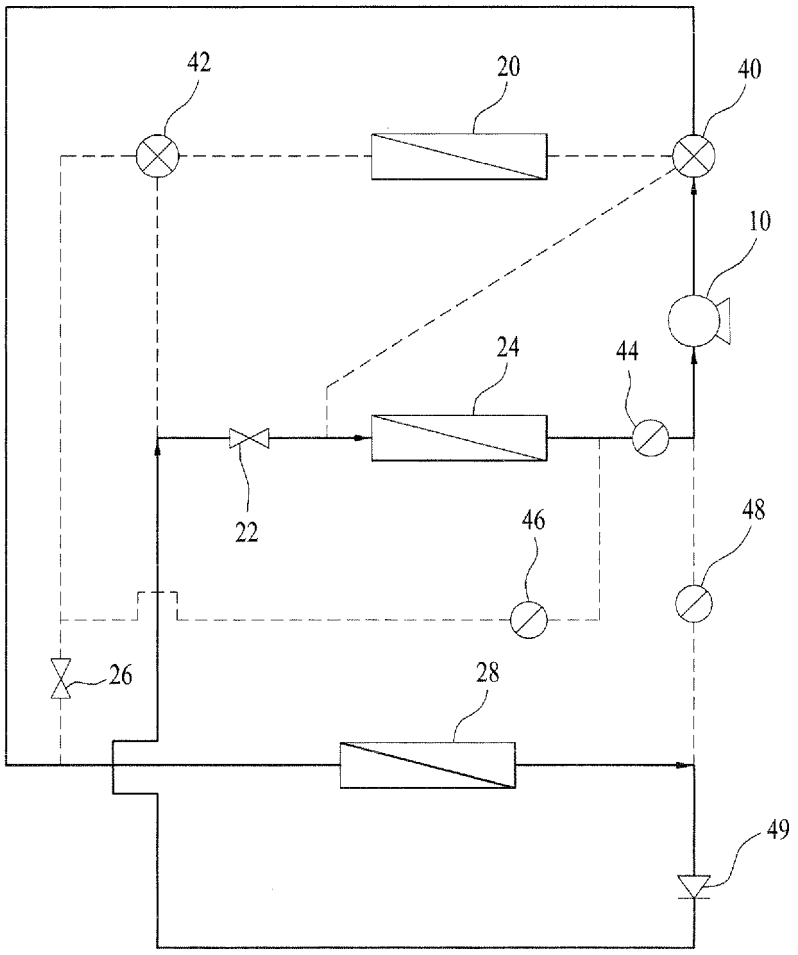


FIG. 6

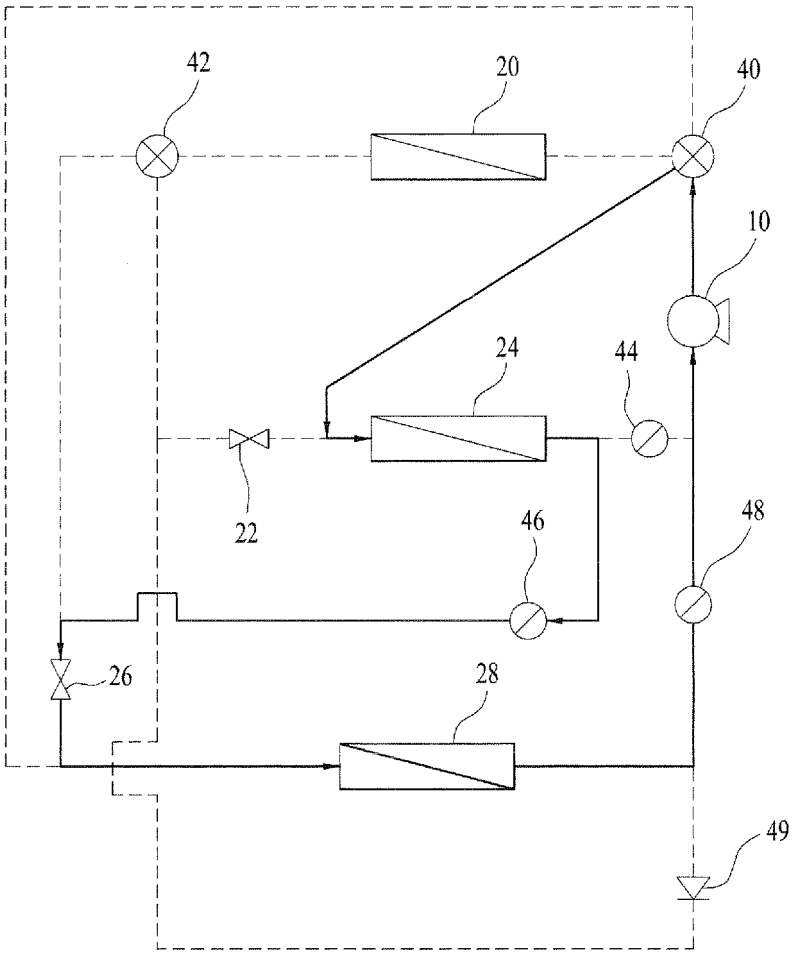
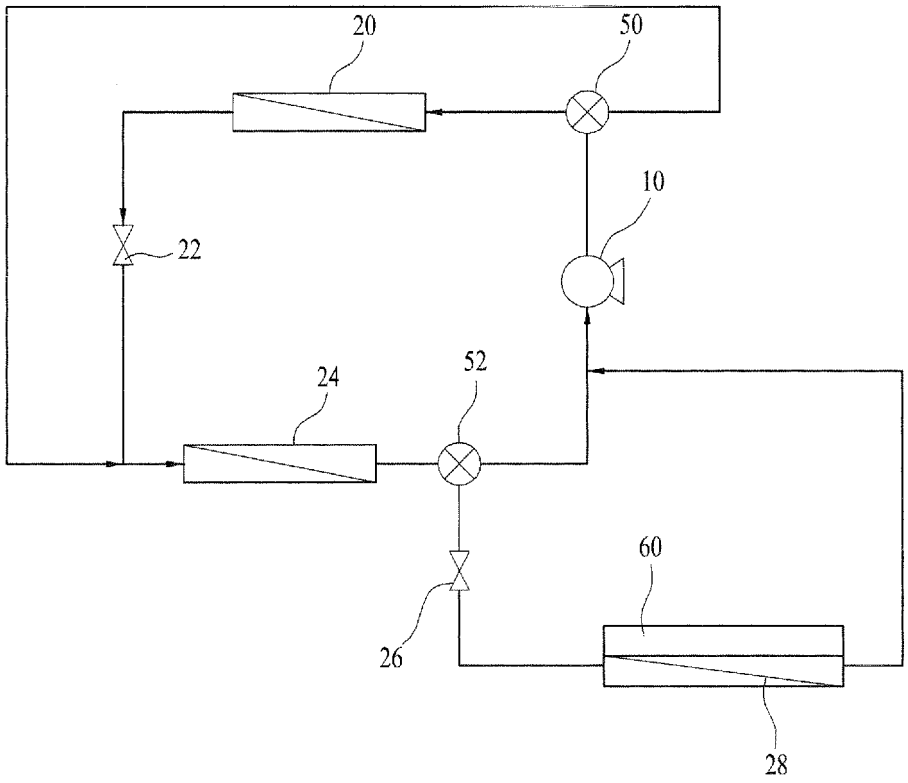


FIG. 7



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- DE 2236480 A1 **[0007]**
- DE 2823395 A1 **[0008]**