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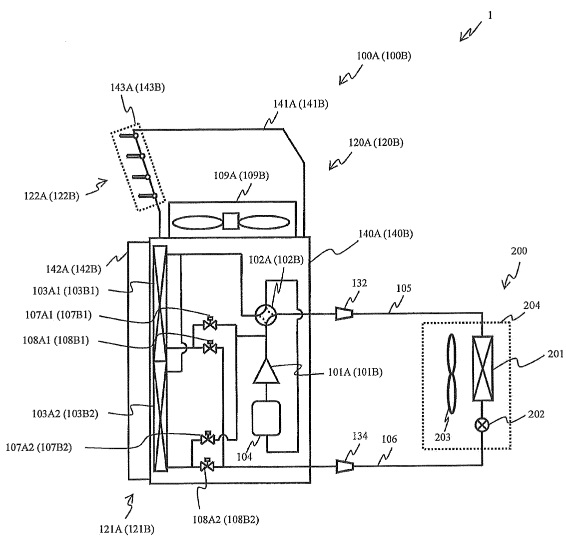
(54) HEAT SOURCE-SIDE UNIT AND AIR CONDITIONING DEVICE

(57) A heat-source-side unit 100A includes a body case 120A having an air inlet 121 A and an air outlet 122A, a heat exchanger 103A1 contained in the body case 120A and disposed to an air passage between the air inlet 121 A and the air outlet 122A, and a damper 143A disposed above the heat exchanger 103A1 and configured to open and close the air passage. The damper 143A is closed in a defrosting operation that removes frost on the heat exchanger 103A1.

FIG. 2



EP 3 106 768 A1

Description

Technical Field

[0001] The present invention relates to a heat-source-side unit and an air-conditioning apparatus.

Background Art

[0002] When an air-conditioning apparatus performs a heating operation at a low outside air temperature, frost may form on a fin surface of an outdoor heat exchanger functioning as an evaporator and also on refrigerant pipes. A problem here is that if frost forms on the fin surface of the outdoor heat exchanger and on the refrigerant pipes, the resulting increase in pressure loss in an air passage of the outdoor heat exchanger degrades the performance of heat transfer.

[0003] For the problem described above, for example, a conventional technique disclosed in Patent Literature 1 divides an outdoor heat exchanger into a plurality of outdoor heat exchangers vertically arranged. The conventional technique disclosed in Patent Literature 1 allows part of gas discharged from a compressor to flow into the plurality of outdoor heat exchangers while switching the flow, so that heating and defrosting are performed at the same time.

Citation List

Patent Literature

[0004] Patent Literature 1: Japanese Unexamined Patent Application Publication No. H09-318206 (page 5, Fig. 1)

Summary of Invention

Technical Problem

[0005] However, in the conventional technique disclosed in Patent Literature 1, an outdoor heat exchanger that functions as an evaporator and an outdoor heat exchanger that performs a defrosting operation are arranged in the same air passage. As a result, in the conventional technique disclosed in Patent Literature 1, if a fan is driven during the defrosting operation, since the outdoor heat exchanger that performs the defrosting operation exchanges heat with outside air, the amount of heat used for the defrosting decreases.

[0006] In the conventional technique disclosed in Patent Literature 1, if the fan is stopped to reduce heat exchange between the outdoor heat exchanger that performs the defrosting operation and the outside air, the resulting decrease in the amount of the heat exchange in the outdoor heat exchanger that functions as the evaporator lowers the heating capacity.

[0007] Also in the conventional technique disclosed in Patent Literature 1, air warmed during the defrosting operation is released from above the outdoor heat exchanger. It is thus difficult to eliminate the risk of degrading the efficiency of the defrosting operation.

[0008] The present invention has been made to solve at least one of the problems described above. An object of the present invention is to obtain a heat-source-side unit that is capable of the defrosting in a suitable manner.

Solution to Problem

[0009] A heat-source-side unit according to the present invention includes a body case having an air inlet and an air outlet, a heat exchanger contained in the body case and disposed in an air passage between the air inlet and the air outlet, and a damper disposed above the heat exchanger and configured to open and close the air passage. The damper is closed in a defrosting operation that removes frost on the heat exchanger.

Advantageous Effects of Invention

[0010] The present invention can provide a heat-source-side unit in which, by closing the damper disposed above the heat exchanger during the defrosting operation, heat dissipated during the defrosting operation is stored in the body case to increase the ambient temperature of the heat exchanger that performs defrosting, thereby performing the defrosting in a suitable manner.

Brief Description of Drawings

[0011]

[Fig. 1] Fig. 1 is a schematic diagram illustrating an example of a refrigerant circuit of an air-conditioning apparatus according to Embodiment 1 of the present invention.

[Fig. 2] Fig. 2 is a schematic view of an arrangement of main components of the air-conditioning apparatus illustrated in Fig. 1.

Description of Embodiments

[0012] With reference to the drawings, Embodiment 1 of the present invention will be described. In the drawings, the same or corresponding components are denoted by the same reference numerals, and their description will be omitted or simplified as appropriate. The sizes and arrangement of the components illustrated in each drawing can be appropriately changed within the scope of the present invention.

Embodiment 1

[0013] Fig. 1 is a schematic diagram illustrating an example of a refrigerant circuit of an air-conditioning apparatus 1 according to Embodiment 1. The air-conditioning apparatus 1 is installed, for example, in a building, a condominium or the like. The air-conditioning apparatus 1 can supply a cooling load and a heating load by using a refrigeration cycle (heat pump cycle) that circulates refrigerant (refrigerant for air conditioning).

[0014] The air-conditioning apparatus 1 includes heat-source-side units (outdoor units) 100A and 100B and a load-side unit (indoor unit) 200. The heat-source-side units 100A and 100B and the load-side unit 200 are connected to each other through headers 132 and 134 and refrigerant pipes to form a main refrigerant circuit. The air-conditioning apparatus 1 may be configured to include one heat-source-side unit or may be configured to include three or more heat-source-side units. When the air-conditioning apparatus 1 includes a plurality of heat-source-side units, the air-conditioning apparatus 1 can perform a defrosting operation while performing a heating operation, as described below. The air-conditioning apparatus 1 may be configured to include two or more load-side units.

[0015] The refrigerant pipes, for example, include a gas pipe 105 through which gaseous refrigerant (gas refrigerant) flows, and a liquid pipe 106 through which liquid refrigerant (or two-phase gas-liquid refrigerant) flows. The refrigerant circulated in the refrigerant circuit is not particularly limited and is, for example, an HFC-based refrigerant such as R410A or R404A, a hydrofluoroolefin (HFO) or the like, or a natural refrigerant such as CO_2 or ammonia.

[0016] The heat-source-side unit 100A includes a compressor 101 A, a four-way valve 102A, a first heat exchanger 103A1, a second heat exchanger 103A2, an accumulator 104A, a first valve 107A1, a second valve 107A2, a third valve 108A1, a fourth valve 108A2, an air-sending device 109A, a first temperature sensor 110A1, and a second temperature sensor 110A2, which are contained in a body case 120A.

[0017] The compressor 101 A is configured to compress suctioned refrigerant into a high-temperature and high-pressure state. The four-way valve 102A is configured to switch the flow of refrigerant in the refrigerant circuit between cooling and heating operations.

[0018] The first heat exchanger 103A1 is configured to exchange heat between the ambient air and the refrigerant flowing in the first heat exchanger 103A1. For example, the first heat exchanger 103A1 functions as an evaporator, and evaporates and gasifies the refrigerant. Alternatively, the first heat exchanger 103A1 functions as a radiator (condenser), and condenses and liquefies the refrigerant. The description of the second heat exchanger 103A2 will be omitted here, as the second heat exchanger 103A2 has the same configuration as the first heat exchanger 103A1. Although Embodiment 1 describes an example where the heat-source-side unit 100A includes two heat exchangers, the first heat exchanger 103A1 and the second heat exchanger 103A2, the heat-source-side unit 100A may be configured to include one heat exchanger, or may be configured to include three or more heat exchangers.

[0019] The air-sending device 109A is configured to send air to the first heat exchanger 103A1 and the second heat exchanger 103A2. The accumulator 104A is disposed between the four-way valve 102A and the compressor 101 A, and configured to accumulate excess refrigerant. The accumulator 104A is, for example, a container that accumulates excess refrigerant.

[0020] The first valve 107A1, the second valve 107A2, the third valve 108A1, and the fourth valve 108A2 each are, for example, a solenoid valve, whose opening degree is regulated to control the flow rate of refrigerant in the refrigerant circuit. The first valve 107A1 is disposed to a flow passage between the compressor 101 A and the first heat exchanger 103A1. The second valve 107A2 is disposed to a flow passage between the compressor 101 A and the second heat exchanger 103A2. The third valve 108A1 is disposed to a flow passage between a heat exchanger 201 and the first heat exchanger 103A1. The fourth valve 108A2 is disposed to a flow passage between the heat exchanger 201 and the second heat exchanger 103A2.

[0021] The first temperature sensor 110A1 is, for example, a thermistor, and is configured to detect the temperature of refrigerant flowing through the first heat exchanger 103A1. The first temperature sensor 110A1 is, for example, attached to the first heat exchanger 103A1. The first temperature sensor 110A1 is disposed between the first heat exchanger 103A1 and the four-way valve 102A to detect the refrigerant temperature on the refrigerant outlet side during the cooling operation or the defrosting operation, and to also detect the refrigerant temperature on the refrigerant inlet side during the heating operation. Therefore, a determination of whether the heat-source-side unit 100A is either in the defrosting operation or the heating operation can be made in accordance with the result of detection by the first temperature sensor 110A1.

[0022] Like the first temperature sensor 110A1, the second temperature sensor 110A2 is, for example, a thermistor, and is configured to detect the temperature of refrigerant flowing through the second heat exchanger 103A2. The second temperature sensor 110A2 is, for example, attached to the second heat exchanger 103A2. The second temperature sensor 110A2 is disposed between the second heat exchanger 103A2 and the four-way valve 102A to detect the refrigerant temperature on the refrigerant outlet side during the cooling operation or the defrosting operation, and to also detect the refrigerant temperature on the refrigerant inlet side during the heating operation. Therefore, a determination of whether the heat-source-side unit 100A is either in the defrosting operation or the heating operation can be made in accordance with the result of detection by the second temperature sensor 110A2.

[0023] The heat-source-side unit 100B includes a compressor 101 B, a four-way valve 102B, a first heat exchanger 103B1, a second heat exchanger 103B2, an accumulator 104B, a first valve 107B1, a second valve 107B2, a third valve 108B1, a fourth valve 108B2, an air-sending device 109B, a first temperature sensor 110B1, and a second temperature sensor 110B2, which are contained in a body case 120B.

[0024] For example, the compressor 101 B of the heat-source-side unit 100B corresponds to the compressor 101A of the heat-source-side unit 100A. Also, the four-way valve 102B, the first heat exchanger 103B1, the second heat exchanger 103B2, the accumulator 104B, the first valve 107B1, the second valve 107B2, the third valve 108B1, the fourth valve 108B2, the air-sending device 109B, the first temperature sensor 110B1, and the second temperature sensor 110B2 correspond to those denoted by the same numbers in the heat-source-side unit 100A.

[0025] The detailed description of the heat-source-side unit 100B will be omitted here, as the heat-source-side unit 100B has the same configuration as the heat-source-side unit 100A.

[0026] The heat-source-side unit 100A and the heat-source-side unit 100B may be disposed in the same housing.

[0027] The load-side unit 200 includes the heat exchanger 201, an expansion unit 202, and an air-sending device 203, which are contained in a housing 204. The heat exchanger 201 and the expansion unit 202 are connected in series. The heat exchanger 201 is configured to exchange heat between the ambient air and the refrigerant flowing in the heat exchanger 201. For example, the heat exchanger 201 functions as the evaporator, and evaporates and gasifies the refrigerant. Alternatively, the heat exchanger 201 functions as the radiator (condenser), and condenses and liquefies the refrigerant.

[0028] The expansion unit 202 functions as a pressure reducing valve or an expansion valve, and is configured to reduce the pressure of the refrigerant to expand the refrigerant. The expansion unit 202 is, for example, an electronic expansion valve having a variably controllable opening degree and capable of precisely controlling the flow rate by regulating the opening degree. Alternatively, the expansion unit 202 may be an inexpensive refrigerant flow control unit, such as a capillary tube.

[0029] Fig. 2 is a schematic view of an arrangement of main components of the air-conditioning apparatus 1 illustrated in Fig. 1. As described above, the heat-source-side unit 100A and the heat-source-side unit 100B have the same configuration. To facilitate understanding of the present invention, only the heat-source-side unit 100A will be described and the description of the heat-source-side unit 100B will be omitted in the following description.

[0030] As illustrated in Fig. 2, the body case 120A includes a housing 140A, an outlet-side hood 141 A, and an inlet-side hood 142A. The housing 140A contains the first heat exchanger 103A1 and the second heat exchanger 103A2. The first heat exchanger 103A1 and the second heat exchanger 103A2 are disposed, for example, on the front side of the housing 140A (on the left side in the drawing). The first heat exchanger 103A1 is disposed above the second heat exchanger 103A2. The housing 140A is open on the front side thereof, so that outside air can be taken into the housing 140A.

[0031] The inlet-side hood 142A is mounted to the front side of the housing 140A. The inlet-side hood 142A protrudes from the front of the housing 140A to prevent rain, snow, or wind, etc. from entering through the front opening of the body case 120A. The inlet-side hood 142A is open on the lower side to form an air inlet 121 A. The air inlet 121 A is preferably formed below the first heat exchanger 103A1 and the second heat exchanger 103A2.

[0032] The housing 140A is open on the upper side thereof (on the upper side in the drawing), where the air-sending device 109A is provided. The air-sending device 109A may be disposed at any desired location in the body case 120A, but is preferably disposed above the first heat exchanger 103A1 and the second heat exchanger 103A2. The air-sending device 109A is driven by a drive control unit which is not shown. The air-sending device 109A is driven for the cooling operation and the heating operation, and stopped for the defrosting operation.

[0033] The outlet-side hood 141 A is mounted to the upper side of the housing 140A. The outlet-side hood 141 A covers the upper side of the housing 140A and the air-sending device 109A to prevent rain, snow, or wind, etc. from entering through the upper opening of the body case 120A. The outlet-side hood 141 A has an air outlet 122A on the front side thereof (on the left side in the drawing). The air outlet 122A preferably protrudes on the upper side thereof. The air outlet 122A is formed above the air inlet 121 A, the first heat exchanger 103A1, the second heat exchanger 103A2, and the air-sending device 109A.

[0034] A movable damper 143A that performs an opening and closing operation is disposed above the first heat exchanger 103A1 and the second heat exchanger 103A2. The movable damper 143A opens and closes the air passage between the air inlet 121 A and the air outlet 122A. In Embodiment 1, the movable damper 143A is disposed to the air outlet 122A. The movable damper 143A is driven, for example, by a drive control unit which is not shown, and opens and closes the air outlet 122A. Opening and closing the movable damper 143A opens and closes the air passage between the air inlet 121 A and the air outlet 122A.

[0035] The movable damper 143A is driven, for example, by the drive control unit which is not shown, and is opened for the cooling operation and the heating operation and closed for the defrosting operation. If the air-sending device 109A is driven while the movable damper 143A is in the open state, the outside air is taken in through the air inlet 121 A. The outside air taken in through the air inlet 121 A passes through the first heat exchanger 103A1 and the second heat exchanger 103A2 and is blown out through the air outlet 122A.

[0036] Next, the operation of the air-conditioning apparatus 1 during the heating operation will be described. In the following description, "high pressure" or "low pressure" is a relative term indicating the level of pressure in the refrigerant circuit. The same applies to temperature, that is, "high temperature" or "low temperature" is a relative term indicating the level of temperature in the refrigerant circuit.

[0037] High-temperature and high-pressure gas refrigerant pressurized by the compressors 101 A and 101 B of the heat-source-side units 100A and 100B passes through the four-way valve 102A and flows into the header 132. The refrigerant pressurized by the compressor 101 A and the refrigerant pressurized by the compressor 101 B join together at the header 132 to flow into the load-side unit 200.

[0038] The refrigerant flowing into the load-side unit 200 passes through the heat exchanger 201 to exchange heat with the ambient air, and is condensed. The pressure of the refrigerant flowing into the heat exchanger 201 of the load-side unit 200 is regulated by the expansion unit 202. After passing through the heat exchanger 201, liquid or two-phase gas-liquid refrigerant under intermediate pressure is split into streams by the header 134 to flow into the heat-source-side unit 100A and the heat-source-side unit 100B.

[0039] After flowing into the heat-source-side units 100A and 100B, the streams of refrigerant pass through the respective first heat exchangers 103A1 and 103B1 and the respective second heat exchangers 103A2 and 103B2 to exchange heat with the ambient air, thereby evaporating into streams of gas refrigerant. The streams of gas refrigerant pass through the respective four-way valves 102A and 102B and the respective accumulators 104A and 104B, and are suctioned into the respective compressors 101 A and 101 B. The streams of refrigerant suctioned into the compressors 101 A and 101 B are pressurized again and discharged.

[0040] Next, the operation of the air-conditioning apparatus 1 during the defrosting operation will be described. The following description deals with an example where the heat-source-side unit 100A performs the defrosting operation. In this case, the heat-source-side unit 100B performs the heating operation. Alternatively, the heat-source-side unit 100B may perform the defrosting operation and the heat-source-side unit 100A may perform the heating operation. Thus, one of the heat-source-side unit 100A and the heat-source-side unit 100B performs the defrosting operation and the other of the heat-source-side unit 100A and the heat-source-side unit 100B performs the heating operation, whereby the defrosting operation can be performed while the heating operation is being performed.

[0041] When the heat-source-side unit 100A performs the defrosting operation, the first valve 107A1 and the second valve 107A2 are opened and the third valve 108A1 and the fourth valve 108A2 are closed. This allows part of high-temperature refrigerant discharged from the compressor 101 A to pass through the first valve 107A1 and the second valve 107A2 and flow into the first heat exchanger 103A1 and the second heat exchanger 103A2. The remaining high-temperature refrigerant discharged from the compressor 101 A and not flowing into the first heat exchanger 103A1 and the second heat exchanger 103A2 flows into the heat exchanger 201 of the load-side unit 200.

[0042] After the high-temperature refrigerant flows into the first heat exchanger 103A1 and the second heat exchanger 103A2, a heat exchange takes place between high-temperature gas refrigerant and frost on the first heat exchanger 103A1 and the second heat exchanger 103A2. Specifically, the frost on the first heat exchanger 103A1 and the second heat exchanger 103A2 receives heat from the high-temperature gas refrigerant. This causes the frost on the first heat exchanger 103A1 and the second heat exchanger 103A2 to melt and flow down. At this point, the third valve 108A1 and the fourth valve 108A2 are in a closed state as described above. Therefore, low-temperature refrigerant from the liquid pipe 106 does not flow into the first heat exchanger 103A1 and the second heat exchanger 103A2.

[0043] During the defrosting operation in the heat-source-side unit 100A, the heat-source-side unit 100B performs the heating operation. That is, high-temperature and high-pressure gas refrigerant pressurized by the compressor 101 B passes through the gas pipe 105 and flows into the heat exchanger 201 of the load-side unit 200. After passing through the heat exchanger 201, liquid or two-phase gas-liquid refrigerant under intermediate pressure passes through the liquid pipe 106, further passes through the first heat exchanger 103B1 and the second heat exchanger 103B2 of the heat-source-side unit 100B, and turns into gas refrigerant. The gas refrigerant is suctioned into the compressor 101 A again, pressurized, and discharged.

[0044] As described above, in the air-conditioning apparatus 1 according to Embodiment 1, in the heat-source-side unit 100A that performs the defrosting operation, the movable damper 143A disposed to the air passage between the air inlet 121 A and the air outlet 122A is closed. For example, the first valve 107A1, the second valve 107A2, the third valve 108A1, and the fourth valve 108A2 of the heat-source-side unit 100A are switched such that the defrosting operation is performed at predetermined intervals. In this case, for example, the drive control unit for the movable damper 143A closes the movable damper 143A in accordance with the results of detection by the first temperature sensor 110A1 and the second temperature sensor 110A2.

[0045] In Embodiment 1, since the movable damper 143A is in a closed state during the defrosting operation, there is no airflow from the air inlet 121 A through the heat exchangers 103A1 and 103A2 toward the air outlet 122A in the heat-source-side unit 100A that performs the defrosting operation. Also, since the air outlet 122A disposed above the heat exchangers 103A1 and 103A2 is closed, air that rises by being heated by the heat exchangers 103A1, 103A2 and the like in the body case 120A does not escape to the outside of the body case 120A. Additionally, since the air inlet 121 A is formed below the heat exchangers 103A1 and 103A2, cold air outside the body case 120A does not easily enter the body case 120A. Therefore, in the heat-source-side unit 100A according to Embodiment 1, warm air is stored in the body case 120A. As a result, in Embodiment 1, it is possible to raise the ambient temperature of the heat exchangers 103A1 and 103A2 that perform the defrosting, and to carry out the defrosting operation in a suitable manner.

[0046] Also, in Embodiment 1, the air-sending device 109A is not in operation in the heat-source-side unit 100A that performs the defrosting operation. For example, the first valve 107A1, the second valve 107A2, the third valve 108A1, and the fourth valve 108A2 of the heat-source-side unit 100A are switched such that the defrosting operation is performed at predetermined intervals. In this case, for example, the drive control unit for the air-sending device 109A stops the air-sending device 109A in accordance with the results of detection by the first temperature sensor 110A1 and the second temperature sensor 110A2.

[0047] In Embodiment 1, since the air-sending device 109A is not in operation during the defrosting operation, the airflow in the body case 120A is reduced in the heat-source-side unit 100A that performs the defrosting operation. This reduces the heat exchange between air in the body case 120A and the heat exchangers 103A1 and 103A2. Thus, Embodiment 1 allows the heat exchange to be suitably performed between the refrigerant flowing through the heat exchangers 103A1 and 103A2 and the frost on the heat exchangers 103A1 and 103A2.

[0048] Also, since the air-sending device 109A is disposed above the heat exchangers 103A1 and 103A2, air warmed by the heat exchangers 103A1 and 103A2 does not easily escape upward. Thus, since the space inside the body case 120A is suitably warmed, the heat-source-side unit 100A according to Embodiment 1 can perform the defrosting operation in a suitable manner.

[0049] In the defrosting operation, for example, as illustrated in Fig. 2, the opening degree of the second valve 107A2 is preferably made larger than the opening degree of the first valve 107A1 to make the resistance value of the second valve 107A2 smaller than the resistance value of the first valve 107A1. By thus adjusting the first valve 107A1 and the second valve 107A2, a larger amount of high-temperature refrigerant from the compressor 101 A flows through the second heat exchanger 103A2 disposed below the first heat exchanger 103A1. By allowing the larger amount of high-temperature refrigerant to flow through the second heat exchanger 103A2 than through the first heat exchanger 103A1, it is possible to accelerate defrosting in the second heat exchanger 103A2 having a lower ambient temperature than the first heat exchanger 103A1 disposed above the second heat exchanger 103A2. The time required for the defrosting operation can thus be shortened.

[0050] The present invention is not limited to Embodiment 1 described above, and can be variously modified within the scope of the present invention. That is, the configuration of Embodiment 1 may be appropriately modified, and at least part of it may be replaced by another configuration. Additionally, a component whose location is not specified does not necessarily need to be disposed at the location disclosed in Embodiment 1, and may be disposed at any location that allows the component to perform its function.

[0051] For example, although the air outlet 122A is formed above the air inlet 121 A in Embodiment 1, the air inlet may be formed above the air outlet. Even in this case, in the defrosting operation, the movable damper disposed above the heat exchangers is closed to close the air passage between the air inlet and the air outlet, whereby warm air can be stored in the body case. Thus, the defrosting operation can be performed in a suitable manner.

[0052] Also, for example, although the movable damper 143A is disposed to the air outlet 122A in Embodiment 1, the movable damper may be disposed at any location, as long as it is above the heat exchangers and the air passage between the air inlet and the air outlet can be closed. This is because positioning the movable damper as described above allows warm air to be stored in the body case, and thus makes it possible to perform the defrosting operation in a suitable manner. For example, the movable damper may be disposed above the heat exchangers and below the air-sending device.

Reference Signs List

[0053] 1: air-conditioning apparatus, 100A: heat-source-side unit, 100B: heat-source-side unit, 101 A: compressor, 101B: compressor, 102A: four-way valve, 102B: four-way valve, 103A1: first heat exchanger, 103A2: second heat exchanger, 103B1: first heat exchanger, 103B2: second heat exchanger, 104A: accumulator, 104B: accumulator, 105: gas pipe, 106: liquid pipe, 107A1: first valve, 107A2: second valve, 107B1: first valve, 107B2: second valve, 108A1: third valve, 108A2: fourth valve, 108B1: third valve, 108B2: fourth valve, 109A: air-sending device, 109B: air-sending device, 110A1: first temperature sensor, 110A2: second temperature sensor, 110B1: first temperature sensor, 110B2: second temperature sensor, 120A: body case, 120B: body case, 121 A: air inlet, 121B: air inlet, 122A: air outlet, 122B: air outlet, 132: header, 134: header, 140A: housing, 140B: housing, 141 A: outlet-side hood, 141B: outlet-side hood, 142A: inlet-side hood, 142B: inlet-side hood, 143A: movable damper, 143B: movable damper, 200: load-side unit, 201: heat exchanger, 202: expansion unit, 203: air-sending device, 204: housing

Claims

1. A heat-source-side unit comprising:

a body case having an air inlet and an air outlet;
a heat exchanger contained in the body case

and disposed to an air passage between the air inlet and the air outlet; and
a damper disposed above the heat exchanger and configured to open and close the air passage,

wherein the damper is closed in a defrosting operation that removes frost on the heat exchanger.

2. The heat-source-side unit of claim 1, wherein the air outlet is formed above the air inlet and the heat exchanger.

3. The heat-source-side unit of claim 1 or 2, wherein the air inlet is formed below the heat exchanger.

4. The heat-source-side unit of any one of claims 1 to 3, further comprising an air-sending device configured to generate an airflow such that air outside the body case is taken in through the air inlet, passed through the heat exchanger, and blown out through the air outlet, wherein the air-sending device is stopped in the defrosting operation.

5. The heat-source-side unit of claim 4, wherein the air-sending device is disposed between the heat exchanger and the damper.

6. The heat-source-side unit of any one of claims 1 to 5, wherein the body case includes an outlet-side hood configured to cover an upper part of the body case; and
the air outlet is formed on a side of the outlet-side hood.

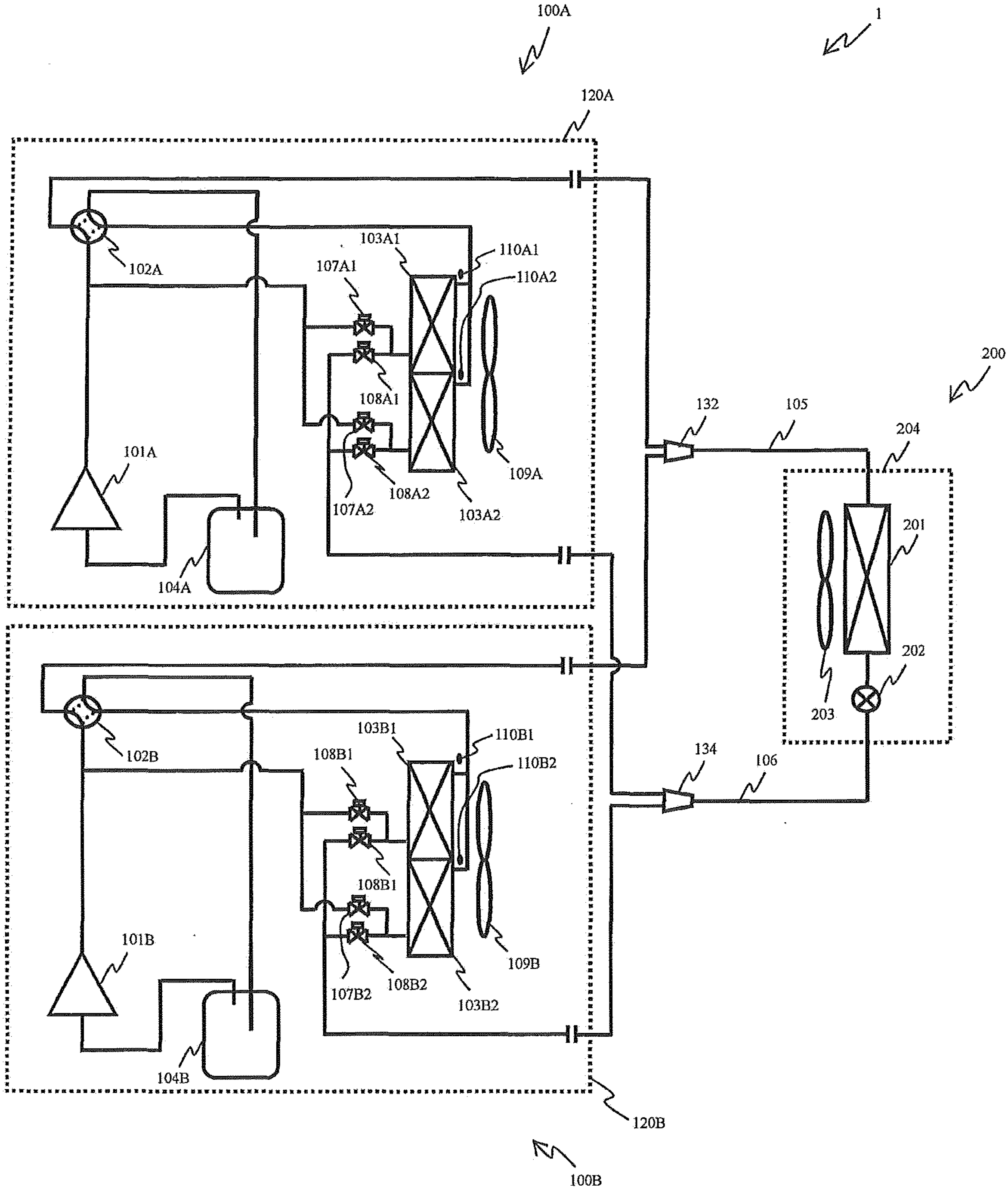
7. The heat-source-side unit of any one of claims 1 to 6, wherein the damper is disposed to the air outlet.

8. The heat-source-side unit of any one of claims 1 to 7, wherein the body case includes an inlet-side hood protruding from a side face of the body case; and
the air inlet is formed in an opening on a lower side of the inlet-side hood.

9. The heat-source-side unit of any one of claims 1 to 8, wherein the heat exchanger includes a plurality of heat exchangers vertically arranged;
a valve is connected to each of the plurality of heat exchangers, the valve being configured to regulate a flow rate of refrigerant discharged from a compressor and flowing into each of the plurality of heat exchangers; and
in the defrosting operation, the valve is adjusted to allow more refrigerant discharged from the compressor to flow into a second heat exchanger of the plurality of heat exchangers than into a first heat exchanger of the plurality of heat exchangers, the second heat exchanger being disposed below the first heat exchanger.

10. An air-conditioning apparatus comprising a plurality of heat-source-side units of any one of claims 1 to 9.

FIG. 1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1
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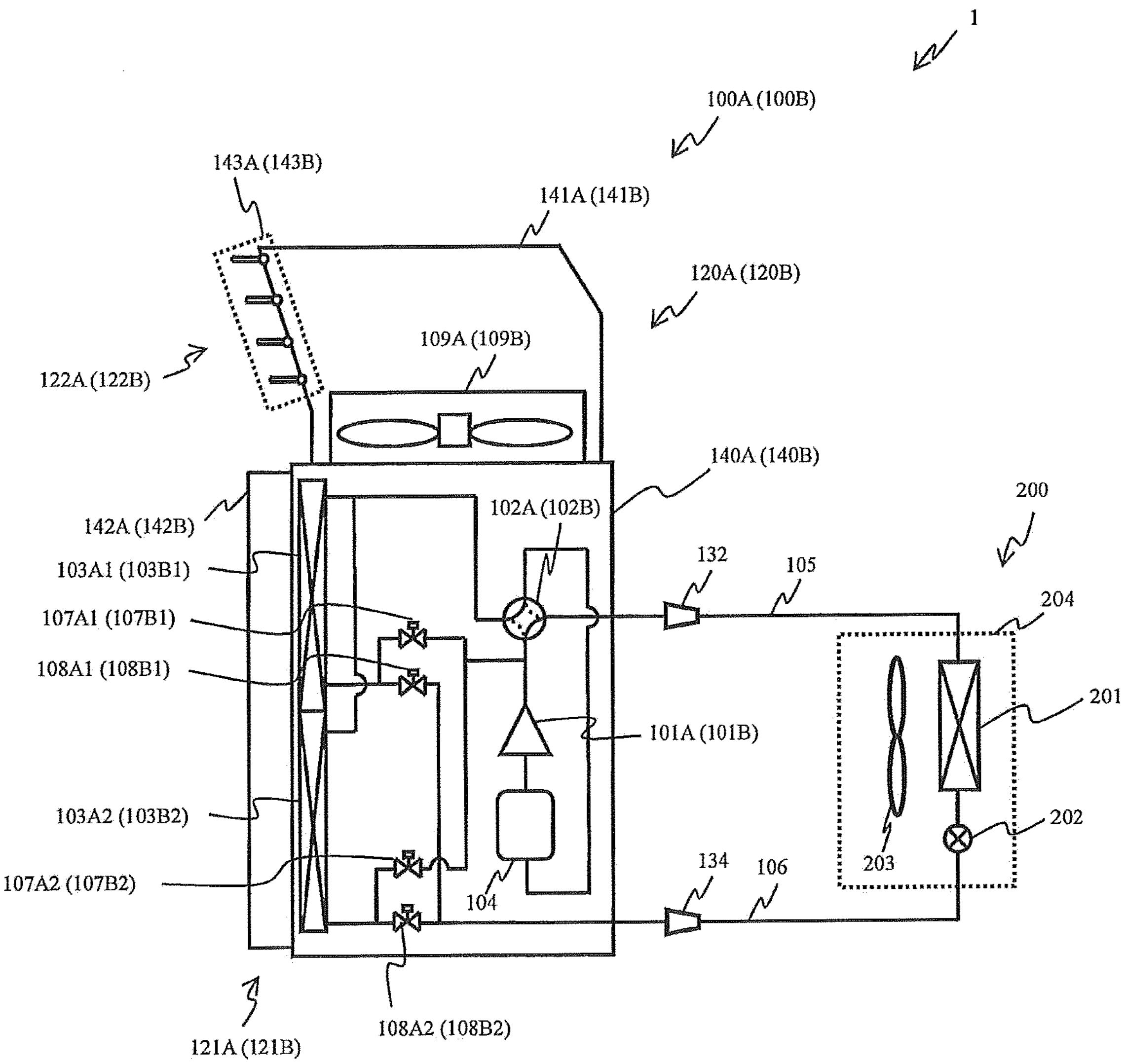
102A
103A1
110A1
110A2
107A1
108A1
200
132
105
204
101A
109A
107A2
108A2
103A2
201
104A
202
203
102B
103B1
110B1
110B2
108B1
134
106
108B1
101B
109B
107B2
108B2
103B2
104B
120B
100B

FIG. 2


1
100A (100B)
143A (143B)
141A (141B)
120A (120B)
109A (109B)
122A (122B)
140A (140B)
142A (142B)
102A (102B)
200
103A1 (103B1)
132
105
107A1 (107B1)
204
108A1 (108B1)
201
101A (101B)
103A2 (103B2)
202
107A2 (107B2)
134
106
203
104
121A (121B)
108A2 (108B2)

INTERNATIONAL SEARCH REPORT

International application No. PCT/JP2014/053534

A. CLASSIFICATION OF SUBJECT MATTER
F24F11/02(2006.01)i, *F24F1/16*(2011.01)i, *F25B47/02*(2006.01)i, *F25D21/06*(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F24F11/02, F24F1/16, F25B47/02, F25D21/06

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2014
Kokai Jitsuyo Shinan Koho	1971-2014	Toroku Jitsuyo Shinan Koho	1994-2014

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2010-249335 A (Mitsubishi Electric Corp.), 04 November 2010 (04.11.2010), entire text; all drawings (Family: none)	1-10
Y	JP 2008-175468 A (Toyo Engineering Works, Ltd.), 31 July 2008 (31.07.2008), paragraphs [0016], [0026], [0027]; fig. 1, 2 (Family: none)	1-10
Y	JP 2997504 B2 (Hitachi, Ltd.), 11 January 2000 (11.01.2000), column 5, lines 16 to 19; fig. 1 (Family: none)	4-10

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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- "&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 March, 2014 (28.03.14)	08 April, 2014 (08.04.14)

Name and mailing address of the ISA/	Authorized officer
Japanese Patent Office	
Facsimile No.	Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2014/053534

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2010-276313 A (Daikin Industries, Ltd.), 09 December 2010 (09.12.2010), paragraphs [0054], [0055] (Family: none)	9-10
Y	JP 2000-9370 A (Fujitsu General Ltd.), 14 January 2000 (14.01.2000), paragraph [0011]; fig. 2 (Family: none)	9-10
Y	JP 2002-89980 A (Fujitsu General Ltd.), 27 March 2002 (27.03.2002), paragraphs [0002] to [0010]; fig. 1, 2 (Family: none)	9-10
Y	JP 2013-178046 A (Hitachi Appliances, Inc.), 09 September 2013 (09.09.2013), paragraphs [0010] to [0012]; fig. 1 (Family: none)	10
A	JP 2013-160483 A (Daikin Industries, Ltd.), 19 August 2013 (19.08.2013), entire text; all drawings (Family: none)	1
A	JP 63-311062 A (Taisei Kogyo Kabushiki Kaisha), 19 December 1988 (19.12.1988), entire text; all drawings (Family: none)	1

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REFERENCES CITED IN THE DESCRIPTION

Patent documents cited in the description

- JP H09318206 A **[0004]**