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(54) HEAT PUMP-TYPE HEATING AND HOT-WATER SUPPLY APPARATUS

HEIZ- UND WARMWASSERVERSORGUNGSVORRICHTUNG VOM WÄRMEPUMPENTYP

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Description

BACKGROUND

1. Technical Field

[0001] The present invention relates to a heat pump-type heating and hot-water supply apparatus that exchanges heat between refrigerant and water.

2. Description of the Related Art

[0002] A heat pump-type heating and hot-water supply apparatus has conventionally been known which uses hot water generated by heat exchange between refrigerant and water for heating and hot-water supply. Such heat pump-type heating and hot-water supply apparatuses include one having a plurality of heat pump circuits and a hot-water supply circuit (see, for example, JP-A-2005-337626). The heat pump circuit includes a compressor, a water/refrigerant heat exchanger that exchanges heat between refrigerant and water, an expansion valve, a heat source side heat exchanger, and a refrigerant pipe that connects them sequentially. The hot-water supply circuit supplies, by a circulation pump, hot water heated by the water/refrigerant heat exchangers to a heating load such as a floor heating panel or bathroom heating apparatus, or a hot-water supply load such as a water storage tank.

[0003] In the heat pump-type heating and hot-water supply apparatus described in JP-A-2005-337626, at least one of the plurality of heat pump circuits supplies the hot water to the hot-water supply load. Furthermore, a heat pump circuit other than the above heat pump circuit supplies the hot water to the heating load. In the heat pump-type heating and hot-water supply apparatus, the hot-water supply load and the heating load can be operated simultaneously.

[0004] The heat load of the hot-water supply load is generally larger than the heat load of the heating operation. This is because the hot water supply temperature of the hot-water supply load is higher than the set temperature of the heating load (a room temperature being a target temperature of a room where the heating load is installed). When the heat load of the hot-water supply load is larger than the heat load of the heating operation, the temperature of the hot water flowing out of the water/refrigerant heat exchanger of the heat pump circuit that supplies the hot water to the hot-water supply load (hereinafter described as the going temperature) is higher than the going temperature at the water/refrigerant heat exchanger of the heat pump circuit that supplies the hot water to the heating load. At this point, heat is exchanged with the water in the water/refrigerant heat exchanger of the heat pump circuit that supplies the hot water to the hot-water supply load, and the temperature of the refrigerant flowing out of the water/refrigerant heat exchanger may become higher than the going tempera-

ture at the water/refrigerant heat exchanger of the heat pump circuit that supplies the hot water to the heating load.

[0005] As described above, the temperature of the refrigerant flowing out of the water/refrigerant heat exchanger of the heat pump circuit that supplies the hot water to the hot-water supply load may be higher than the going temperature at the water/refrigerant heat exchanger of the heat pump circuit that supplies the hot water to the heating load. Even in this case, in the heat pump-type heating and hot-water supply apparatus described in JP-A-2005-337626, the refrigerant flowing out of the water/refrigerant heat exchanger of the heat pump circuit that supplies the hot water to the hot-water supply load goes through the heat source side heat exchanger, and is simply suctioned again by the compressor. Hence, it cannot be said that the heat of the refrigerant flowing out of the hot-water supply load can be effectively used.

[0006] The present invention has been made to solve the above problem. An object of the present invention is to provide a heat pump-type heating and hot-water supply apparatus that effectively uses the heat of refrigerant flowing out of a hot-water supply load to improve the operating efficiency.

SUMMARY

[0007] To solve the above problem, a heat pump-type heating and hot-water supply apparatus according to an aspect of the present invention includes: a first heat pump circuit including a first compressor, a first water/refrigerant heat exchanger, first flow rate adjustment means, a first heat source side heat exchanger, and a first refrigerant pipe connecting them sequentially; a second heat pump circuit including a second compressor, a second water/refrigerant heat exchanger, second flow rate adjustment means, a second heat source side heat exchanger, and a second refrigerant pipe connecting them sequentially; a heating hot-water circuit including a heating load, a circulation pump, the first water/refrigerant heat exchanger, the second water/refrigerant heat exchanger, and a hot water pipe connecting them sequentially; a hot-water supply refrigerant circuit including a hot-water supply load, an outgoing refrigerant pipe through which refrigerant flowing from the second compressor to the hot-water supply load flows, and a return refrigerant pipe through which refrigerant flowing from the hot-water supply load to the second flow rate adjustment means flows; and a third water/refrigerant heat exchanger configured to exchange heat between the refrigerant flowing through the return refrigerant pipe and water flowing through the hot water pipe.

[0008] In the heat pump-type heating and hot-water supply apparatus of the present invention, when the heating load and the hot-water supply load are operated simultaneously, heat is exchanged between the refrigerant flowing out of the hot-water supply load and flowing through the return refrigerant pipe and the water circu-

lating through the heating hot-water circuit. Consequently, the operating efficiency of the heat pump-type heating and hot-water supply apparatus upon the simultaneous operation of the heating load and the hot-water supply load can be improved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

Fig. 1 is a configuration diagram of a heat pump-type heating and hot-water supply apparatus in an embodiment of the present invention, and represents the flows of refrigerant and hot water of when only an indoor unit is being operated;

Fig. 2 is a configuration diagram of the heat pump-type heating and hot-water supply apparatus in the embodiment of the present invention, and represents the flows of the refrigerant and the hot water of when the operation of the indoor unit and the water heating operation of a water storage tank are being performed simultaneously;

Fig. 3 is a configuration diagram of a heat pump-type heating and hot-water supply apparatus in another embodiment of the present invention, and represents the flows of refrigerant and hot water of when only an indoor unit is being operated; and

Fig. 4 is a configuration diagram of the heat pump-type heating and hot-water supply apparatus in the other embodiment of the present invention, and represents the flows of the refrigerant and the hot water of when the operation of the indoor unit and the water heating operation of a water storage tank are being performed simultaneously.

DESCRIPTION OF THE EMBODIMENTS

[0010] In the following detailed description, for purpose of explanation, numerous specific details are set forth in order to provide a thorough understanding of the disclosed embodiments. It will be apparent, however, that one or more embodiments may be practiced without these specific details. In other instances, well-known structures and devices are schematically shown in order to simplify the drawing.

[0011] Hereinafter, embodiments of the present invention are described in detail with reference to the accompanying drawings. A description is given of the embodiments taking a heat pump-type heating and hot-water supply apparatus as an example. The heat pump-type heating and hot-water supply apparatus includes an indoor unit being a heating load and a water storage tank being a hot-water supply load, which are of the present invention. In the heat pump-type heating and hot-water supply apparatus, the hot water that has exchanged heat with refrigerant in a water/refrigerant heat exchanger is circulated to the indoor unit to heat a room. Moreover, in the heat pump-type heating and hot-water supply appa-

ratus, refrigerant is circulated to a heat exchange unit installed inside the water storage tank to heat the water stored in the water storage tank. The present invention is not limited to the following embodiments. Various modifications can be made to the embodiments of the present invention without departing from the gist of the present invention.

[First Embodiment]

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[0012] Fig. 1 illustrates a configuration of a heat pump-type heating and hot-water supply apparatus 100 according to an embodiment. The heat pump-type heating and hot-water supply apparatus 100 includes a first heat pump circuit 10a, a second heat pump circuit 10b, a heating hot-water circuit 30, and a hot-water supply refrigerant circuit 40. Each of the first heat pump circuit 10a and the second heat pump circuit 10b can be operated independently. The second heat pump circuit 10b operates as a heat pump circuit for supplying hot water.

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[0013] The first heat pump circuit 10a includes a compressor (first compressor) 1a, a water/refrigerant heat exchanger (first water/refrigerant heat exchanger) 2a, an expansion valve (first flow rate adjustment means) 3a, a heat source side heat exchanger (first heat source side heat exchanger) 4a, an accumulator 5a, and a refrigerant pipe (first refrigerant pipe) 11a that connects them sequentially. The compressor 1a is a variable capacity compressor. In other words, the operating capacity of the compressor 1a is variable by an unillustrated motor, whose speed is controlled by an inverter, driving the compressor 1a. The water/refrigerant heat exchanger 2a includes a refrigerant side flow passage 2aa connected to the refrigerant pipe 11a, and a water side flow passage 2ab connected to a hot water pipe 31 of the heating hot-water circuit 30 described below. The water/refrigerant heat exchanger 2a exchanges heat between the refrigerant flowing through the refrigerant side flow passage 2aa and the water flowing through the water side flow passage 2ab. The expansion valve 3a is an electronic expansion valve. The opening degree of the expansion valve 3a is adjusted to adjust the amount of refrigerant flowing into the heat source side heat exchanger 4a. The heat source side heat exchanger 4a exchanges heat between the refrigerant and the air flowing into the heat source side heat exchanger 4a by the rotation of an outdoor fan 6a placed in the vicinity of the heat source side heat exchanger 4a. The accumulator 5a separates the refrigerant having flowed from the heat source side heat exchanger 4a into liquid refrigerant and gas refrigerant, and causes the compressor 1a to suction only the gas refrigerant.

[0014] Moreover, the first heat pump circuit 10a includes a discharge temperature sensor 51a, a refrigerant temperature sensor 52a, a heat exchange temperature sensor 53a, and an outside temperature sensor 54a. The discharge temperature sensor 51a is provided to the refrigerant pipe 11a in the vicinity of a refrigerant discharge

side of the compressor 1a, and detects the temperature of the refrigerant discharged from the compressor 1a. The refrigerant temperature sensor 52a is provided to the refrigerant pipe 11a between the water/refrigerant heat exchanger 2a and the expansion valve 3a, and detects the temperature of the refrigerant flowing out of the water/refrigerant heat exchanger 2a. The heat exchange temperature sensor 53a is provided to the refrigerant pipe 11a between the expansion valve 3a and the heat source side heat exchanger 4a, and detects the temperature of the refrigerant flowing into the heat source side heat exchanger 4a. The outside temperature sensor 54a is placed in the vicinity of the heat source side heat exchanger 4a, and detects the outside temperature being the outdoor temperature.

[0015] The second heat pump circuit 10b includes a compressor (second compressor) 1b, a first three-way valve (first flow passage switching means) 7, a water/refrigerant heat exchanger (second water/refrigerant heat exchanger) 2b, a second three-way valve (second flow passage switching means) 8, an expansion valve (second flow rate adjustment means) 3b, a heat source side heat exchanger (second heat source side heat exchanger) 4b, an accumulator 5b, and a refrigerant pipe (second refrigerant pipe) 11b that connects them sequentially. The compressor 1b is a variable capacity compressor. In other words, the operating capacity of the compressor 1b is variable by an unillustrated motor, whose speed is controlled by an inverter, driving the compressor 1b. The water/refrigerant heat exchanger 2b includes a refrigerant side flow passage 2ba connected to the refrigerant pipe 11b, and a water side flow passage 2bb connected to a hot water pipe 31 of the heating hot-water circuit 30 described below. The water/refrigerant heat exchanger 2b exchanges heat between the refrigerant flowing through the refrigerant side flow passage 2ba and the water flowing through the water side flow passage 2bb. The expansion valve 3b is an electronic expansion valve. The opening degree of the expansion valve 3b is adjusted to adjust the amount of refrigerant flowing into the heat source side heat exchanger 4b. The heat source side heat exchanger 4b exchanges heat between the refrigerant and the air flowing into the heat source side heat exchanger 4b by the rotation of an outdoor fan 6b placed in the vicinity of the heat source side heat exchanger 4b. The accumulator 5b separates the refrigerant having flowed from the heat source side heat exchanger 4b into liquid refrigerant and gas refrigerant, and causes the compressor 1b to suction only the gas refrigerant.

[0016] The first three-way valve 7 includes three ports: a port a, a port b, and a port c. The port a is connected by the refrigerant pipe 11b to a refrigerant discharge side of the compressor 1b. The port b is connected by the refrigerant pipe 11b to one end of the refrigerant side flow passage 2ba of the water/refrigerant heat exchanger 2b. The port c is connected to one end of an outgoing refrigerant pipe 41 described below. Therefore, the first three-way valve 7 is configured to flow the refrigerant dis-

charged from the compressor 1b to the outgoing refrigerant pipe 41 or the water/refrigerant heat exchanger 2b. In the first three-way valve 7 illustrated in Fig. 1, the port c is closed (the closed port c is filled in with black in Fig. 1), and the port a communicates with the port b.

[0017] The second three-way valve 8 includes three ports: a port d, a port e, and a port f. The port d is connected by the refrigerant pipe 11b to the other end of the refrigerant side flow passage 2ba of the water/refrigerant heat exchanger 2b. The port e is connected by the refrigerant pipe 11b to the expansion valve 3b. The port f is connected to one end of a return refrigerant pipe 42 described below. Therefore, the second three-way valve 8 is configured to switch the refrigerant to flow into the expansion valve 3b between the refrigerant from the water/refrigerant heat exchanger 2b and the refrigerant from the return refrigerant pipe 42. In the second three-way valve 8 illustrated in Fig. 1, the port f is closed (the closed port f is filled in with black in Fig. 1), and the port d communicates with the port e.

[0018] Moreover, the second heat pump circuit 10b includes a discharge temperature sensor 51b, a refrigerant temperature sensor 52b, a heat exchange temperature sensor 53b, and an outside temperature sensor 54b. The discharge temperature sensor 51b is provided to the refrigerant pipe 11b in the vicinity of a refrigerant discharge port of the compressor 1b, and detects the temperature of the refrigerant discharged from the compressor 1b. The refrigerant temperature sensor 52b is provided to the refrigerant pipe 11b between the water/refrigerant heat exchanger 2b and the expansion valve 3b, and detects the temperature of the refrigerant flowing out of the water/refrigerant heat exchanger 2b. The heat exchange temperature sensor 53b is provided to the refrigerant pipe 11b between the expansion valve 3b and the heat source side heat exchanger 4b, and detects the temperature of the refrigerant flowing into the heat source side heat exchanger 4b. The outside temperature sensor 54b is placed in the vicinity of the heat source side heat exchanger 4b, and detects the outside temperature being the outdoor temperature.

[0019] The heating hot-water circuit 30 includes an indoor unit 21 being a heating load, a circulation pump 22, the water/refrigerant heat exchanger 2a, a third three-way valve (third flow passage switching means) 9, the water/refrigerant heat exchanger 2b, an auxiliary water/refrigerant heat exchanger (third water/refrigerant heat exchanger) 23, and the hot water pipe 31 that connects them sequentially. The indoor unit 21 is a floor heating panel or radiator. The hot water flowing through the indoor unit 21 heats the air of a room where the indoor unit 21 is installed, and accordingly the room is heated. The circulation pump 22 is a variable capacity pump. The circulation pump 22 is driven to circulate the hot water in the heating hot-water circuit 30. The water/refrigerant heat exchangers 2a and 2b are placed between the circulation pump 22 and the auxiliary water/refrigerant heat exchanger 23. The water side flow passage 2ab of the

water/refrigerant heat exchanger 2a and the water side flow passage 2bb of the water/refrigerant heat exchanger 2b are respectively connected to the hot water pipe 31. The auxiliary water/refrigerant heat exchanger 23 includes a water side flow passage 23a connected to the hot water pipe 31, and a refrigerant side flow passage 23b connected to the return refrigerant pipe 42 of the hot-water supply refrigerant circuit 40 described below. The auxiliary water/refrigerant heat exchanger 23 exchanges heat between the refrigerant flowing through the refrigerant side flow passage 23b (the return refrigerant pipe 42) and the water flowing through the water side flow passage 23a (the hot water pipe 31).

[0020] The third three-way valve 9 includes three ports: a port g, a port h, and a port j. The port g is connected by the hot water pipe 31 to the water side flow passage 2ab of the water/refrigerant heat exchanger 2a. The port h is connected by the hot water pipe 31 to the water side flow passage 2bb of the water/refrigerant heat exchanger 2b. The port j is connected to one end of a bypass pipe 32 that bypasses the water/refrigerant heat exchanger 2b. The other end of the bypass pipe 32 is connected to the hot water pipe 31 between the water/refrigerant heat exchanger 2b and the auxiliary water/refrigerant heat exchanger 23. In the third three-way valve 9 illustrated in Fig. 1, the port j is closed (the closed port j is filled in with black in Fig. 1), and the port g communicates with the port h. As described below, the third three-way valve 9 is configured to switch an outlet for water from the water/refrigerant heat exchanger 2a between the water/refrigerant heat exchanger 2b and the auxiliary water/refrigerant heat exchanger 23. When the heating operation is performed by the indoor unit 21 while the hot-water supply operation (water heating operation) by a water storage tank 24 is stopped, the third three-way valve 9 sets the outlet for the water from the water/refrigerant heat exchanger 2a to the water/refrigerant heat exchanger 2b. Moreover, when the heating operation by the indoor unit 21 and the hot-water supply operation by the water storage tank 24 are performed, the third three-way valve 9 sets the outlet for the water from the water/refrigerant heat exchanger 2a to the auxiliary water/refrigerant heat exchanger 23.

[0021] Further, the heating hot-water circuit 30 includes a first going temperature sensor 55, a second going temperature sensor 56, and a third going temperature sensor 57. The first going temperature sensor 55 is provided to the hot water pipe 31 in the vicinity of the water/refrigerant heat exchanger 2a on the third three-way valve 9 side. The first going temperature sensor 55 detects a first going temperature being the temperature of the water flowing out of the water/refrigerant heat exchanger 2a. The second going temperature sensor 56 is provided to the hot water pipe 31 in the vicinity of the water/refrigerant heat exchanger 2b on the auxiliary water/refrigerant heat exchanger 23 side. The second going temperature sensor 56 detects a second going temperature being the temperature of the water flowing out of

the water/refrigerant heat exchanger 2b. The third going temperature sensor 57 is provided to the hot water pipe 31 in the vicinity of the auxiliary water/refrigerant heat exchanger 23 on the indoor unit 21 side. The third going temperature sensor 57 detects a third going temperature being the temperature of the water flowing out of the auxiliary water/refrigerant heat exchanger 23.

[0022] The hot-water supply refrigerant circuit 40 includes the first three-way valve 7, the water storage tank 24 being the hot-water supply load, the auxiliary water/refrigerant heat exchanger 23, the second three-way valve 8, and the outgoing refrigerant pipe 41 and the return refrigerant pipe 42 that connect them. The water storage tank 24 includes a heat exchange unit 25, a water inlet 26, a hot-water outlet 27, and a water storage sensor 58. The heat exchange unit 25 is formed into a spiral shape and is placed in a lower part of the water storage tank 24.

[0023] A lower end of the heat exchange unit 25 is connected to the other end of the outgoing refrigerant pipe 41. Moreover, the one end of the outgoing refrigerant pipe 41 is connected to the port c of the first three-way valve 7 as described above. Therefore, the refrigerant flowing from the compressor 1b to the water storage tank 24 (the heat exchange unit 25) flows through the outgoing refrigerant pipe 41. On the other hand, an upper end of the heat exchange unit 25 is connected to the other end of the return refrigerant pipe 42. Moreover, the one end of the return refrigerant pipe 42 is connected to the port f of the second three-way valve 8 as described above. Therefore, the refrigerant flowing from the water storage tank 24 to the expansion valve 3b flows through the return refrigerant pipe 42.

[0024] The water inlet 26 is provided at the bottom of the water storage tank 24. The water inlet 26 is directly coupled to an unillustrated water pipe. Water is supplied into the water storage tank 24 from the water pipe via the water inlet 26. The hot-water outlet 27 is provided at the top of the water storage tank 24. The hot-water outlet 27 is connected to a hot water pipe connected to an unillustrated bathtub, wash basin faucet, or the like. The hot water stored in the water storage tank 24 is supplied from the hot-water outlet 27 to the bathtub, wash basin faucet, or the like. The water storage sensor 58 detects the temperature of the hot water stored in the water storage tank 24.

[0025] The refrigerant side flow passage 23b of the auxiliary water/refrigerant heat exchanger 23 is connected to the return refrigerant pipe 42. The auxiliary water/refrigerant heat exchanger 23 exchanges heat between the refrigerant flowing through the refrigerant side flow passage 23b and the water flowing through the water side flow passage 23a.

[0026] Next, a description is given of the operational workings of the heat pump-type heating and hot-water supply apparatus 100 in the embodiment. Firstly, a description is given, using Fig. 1, of the operation of each member and the flows of the refrigerant and the hot water in the first heat pump circuit 10a, the second heat pump

circuit 10b, and the heating hot-water circuit 30 of when only the heating operation by the indoor unit 21 is being performed. Next, a description is given, using Fig. 2, of the operation of each member and the flows of the refrigerant and the hot water in the first heat pump circuit 10a, the second heat pump circuit 10b, the heating hot-water circuit 30, and the hot-water supply refrigerant circuit 40 of when the heating operation by the indoor unit 21 and the water heating operation to heat the water stored in the water storage tank 24 to a predetermined temperature are being performed simultaneously. In Figs. 1 and 2, arrows represent refrigerant and hot water flow directions in the circuits. Moreover, the closed port of each three-way valve is filled in with black.

[0027] As illustrated in Fig. 1, a description is given of the case where only the heating operation is being performed (while the heating operation is being performed, the hot-water supply operation is being stopped) in the heat pump-type heating and hot-water supply apparatus 100. In this case, the port c is closed and the port a communicates with the port b in the first three-way valve 7 of the second heat pump circuit 10b. Moreover, the port f is closed and the port d communicates with the port e in the second three-way valve 8 of the second heat pump circuit 10b. Moreover, the port j is closed and the port g communicates with the port h in the third three-way valve 9 of the heating hot-water circuit 30. The compressor 1a of the first heat pump circuit 10a, the compressor 1b of the second heat pump circuit 10b, and the circulation pump 22 of the heating hot-water circuit 30 are driven.

[0028] In the following description, a set temperature T_i of the heating operation of the indoor unit 21, which is set by a user, is assumed to be 24°C as an example. Furthermore, a target hot water temperature T_t being a target value of the temperature of the hot water flowing into the indoor unit 21 for achieving the set temperature T_i is assumed to be 40°C.

[0029] In the first heat pump circuit 10a (the second heat pump circuit 10b), the refrigerant compressed and discharged from the compressor 1a (1b) flows into the refrigerant side flow passage 2aa (2ba) of the water/refrigerant heat exchanger 2a (2b). The refrigerant having flowed into the refrigerant side flow passage 2aa (2ba) of the water/refrigerant heat exchanger 2a (2b) is condensed by the heat exchange with the water flowing through the water side flow passage 2ab (2bb) of the water/refrigerant heat exchanger 2a (2b), and flows out of the water/refrigerant heat exchanger 2a (2b).

[0030] The refrigerant having flowed out of the water/refrigerant heat exchanger 2a (2b) is decompressed upon passage through the expansion valve 3a (3b) and flows into the heat source side heat exchanger 4a (4b). The refrigerant having flowed into the heat source side heat exchanger 4a (4b) evaporates by the heat exchange with the air flowing into the heat source side heat exchanger 4a (4b) by the rotation of the outdoor fan 6a (6b), and flows out of the heat source side heat exchanger 4a (4b). The refrigerant having flowed out of the heat source

side heat exchanger 4a (4b) is then suctioned by the compressor 1a (1b) via the accumulator 5a (5b), and compressed again.

[0031] On the other hand, in the heating hot-water circuit 30, the water having flowed into the water side flow passage 2ab of the water/refrigerant heat exchanger 2a by the drive of the circulation pump 22 is heated by the heat exchange with the refrigerant flowing through the refrigerant side flow passage 2aa of the water/refrigerant heat exchanger 2a, and becomes a hot water at a first predetermined temperature T_1 (for example, 30°C) that is lower than the target hot water temperature T_t . The hot water flows out of the water/refrigerant heat exchanger 2a. The hot water having flowed out of the water/refrigerant heat exchanger 2a flows into the water side flow passage 2bb of the water/refrigerant heat exchanger 2b via the third three-way valve 9.

[0032] The water having flowed into the water side flow passage 2bb of the water/refrigerant heat exchanger 2b is further heated by the heat exchange with the refrigerant flowing through the refrigerant side flow passage 2ba of the water/refrigerant heat exchanger 2b, and becomes a hot water at a second predetermined temperature T_2 (= the target hot water temperature T_t : 40°C). The hot water flows out of the water/refrigerant heat exchanger 2b. The hot water having flowed out of the water/refrigerant heat exchanger 2b flows into the indoor unit 21 via the auxiliary water/refrigerant heat exchanger 23. The heat of the hot water having flowed into the indoor unit 21 is dissipated to heat the room where the indoor unit 21 is installed.

[0033] Here, in the first heat pump circuit 10a, the speed of the compressor 1a, the opening degree of the expansion valve 3a, and the speed of the outdoor fan 6a are respectively controlled in such a manner that the temperature of the water flowing out of the water/refrigerant heat exchanger 2a reaches the above-mentioned first predetermined temperature T_1 , in other words, that the hot water temperature detected by the first going temperature sensor 55 reaches the first predetermined temperature T_1 . Moreover, in the second heat pump circuit 10b, the speed of the compressor 1b, the opening degree of the expansion valve 3b, and the speed of the outdoor fan 6b are respectively controlled in such a manner that the temperature of the water flowing out of the water/refrigerant heat exchanger 2b reaches the above-mentioned second predetermined temperature T_2 , in other words, that the hot water temperature detected by the second going temperature sensor 56 reaches the second predetermined temperature T_2 .

[0034] As described above, when the hot-water supply operation is stopped while the heating operation is performed (when the water heating operation by the water storage tank 24 is stopped while the heating operation by the indoor unit 21 is performed) in the heat pump-type heating and hot-water supply apparatus 100, the first heat pump circuit 10a and the second heat pump circuit 10b are operated to increase the temperature of the hot

water flowing into the indoor unit 21 to the target hot water temperature T_t . Therefore, an optimum load can be shared by the first heat pump circuit 10a and the second heat pump circuit 10b compared to a case of operating the first heat pump circuit 10a or the second heat pump circuit 10b to increase the temperature of the hot water flowing into the indoor unit 21 to the target hot water temperature T_t . For example, in the share of the optimum load in the embodiment, the first heat pump circuit 10a increases the temperature of water to the first predetermined temperature T_1 . Furthermore, the second heat pump circuit 10b increases the temperature of the hot water heated by the first heat pump circuit 10a to the second predetermined temperature T_2 . Hence, the operating efficiency of the heat pump-type heating and hot-water supply apparatus 100 improves.

[0035] Next, as illustrated in Fig. 2, a description is given of the case where the heating operation by the indoor unit 21 and the water heating operation by the water storage tank 24 are simultaneously being performed. In this case, the port b is closed and the port a communicates with the port c in the first three-way valve 7 of the second heat pump circuit 10b. Moreover, the port d is closed and the port e communicates with the port f in the second three-way valve 8 of the second heat pump circuit 10b. Moreover, the port h is closed and the port g communicates with the port j in the third three-way valve 9 of the heating hot-water circuit 30. The compressor 1a of the first heat pump circuit 10a, the compressor 1b of the second heat pump circuit 10b, and the circulation pump 22 of the heating hot-water circuit 30 are driven.

[0036] In the following description, a set temperature T_i of the heating operation of the indoor unit 21, which is set by a user, is assumed to be 24°C as an example. Furthermore, a target hot water temperature T_t being a target value of the temperature of the hot water flowing into the indoor unit 21 for achieving the set temperature T_i is assumed to be 40°C . Furthermore, a water heating temperature T_b being a target temperature upon heating the water stored in the water storage tank 24 is assumed to be 60°C .

[0037] The flow of the refrigerant in the first heat pump circuit 10a is the same as the above-mentioned case where the heating operation is performed. Accordingly, its description is omitted. In the second heat pump circuit 10b, the refrigerant compressed and discharged from the compressor 1b flows from the refrigerant pipe 11b through the outgoing refrigerant pipe 41 via the first three-way valve 7, and flows into the heat exchange unit 25 of the water storage tank 24. The refrigerant having flowed into the heat exchange unit 25 exchanges heat with the water stored in the water storage tank 24, and flows out of the heat exchange unit 25.

[0038] The refrigerant having flowed out of the heat exchange unit 25 flows through the return refrigerant pipe 42, flows into the refrigerant side flow passage 23b of the auxiliary water/refrigerant heat exchanger 23, is condensed by the heat exchange with the water flowing

through the water side flow passage 23a of the auxiliary water/refrigerant heat exchanger 23, and flows out of the auxiliary water/refrigerant heat exchanger 23.

[0039] The refrigerant having flowed out of the auxiliary water/refrigerant heat exchanger 23 flows through the return refrigerant pipe 42 and flows into the refrigerant pipe 11b via the second three-way valve 8. The refrigerant having flowed into the refrigerant pipe 11b is decompressed upon passage through the expansion valve 3b, and flows into the heat source side heat exchanger 4b. The refrigerant having flowed into the heat source side heat exchanger 4b evaporates by the heat exchange with the air flowing into the heat source side heat exchanger 4b by the rotation of the outdoor fan 6b, and flows out of the heat source side heat exchanger 4b. The refrigerant having flowed out of the heat source side heat exchanger 4b is then suctioned by the compressor 1b via the accumulator 5b, and compressed again.

[0040] On the other hand, in the heating hot-water circuit 30, the water having flowed into the water side flow passage 2ab of the water/refrigerant heat exchanger 2a by the drive of the circulation pump 22 is heated by the heat exchange with the refrigerant flowing through the refrigerant side flow passage 2aa of the water/refrigerant heat exchanger 2a, and becomes the hot water at the first predetermined temperature T_1 (for example, 30°C) that is lower than the target hot water temperature T_t . The hot water flows out of the water/refrigerant heat exchanger 2a.

[0041] The hot water having flowed out of the water/refrigerant heat exchanger 2a flows from the hot water pipe 31 into the bypass pipe 32 via the third three-way valve 9, and flows back into the hot water pipe 31 from the bypass pipe 32. In other words, the hot water having flowed out of the water/refrigerant heat exchanger 2a flows in such a manner as to bypass the water/refrigerant heat exchanger 2b.

[0042] The hot water having flowed from the bypass pipe 32 into the hot water pipe 31 flows into the water side flow passage 23a of the auxiliary water/refrigerant heat exchanger 23. Furthermore, the hot water is further heated by the heat exchange with the refrigerant flowing through the refrigerant side flow passage 23b of the auxiliary water/refrigerant heat exchanger 23, and becomes the hot water at the second predetermined temperature T_2 (= the target hot water temperature T_t : 40°C). The hot water flows out of the auxiliary water/refrigerant heat exchanger 23. The hot water having flowed out of the auxiliary water/refrigerant heat exchanger 23 flows into the indoor unit 21. The heat of the hot water having flowed into the indoor unit 21 is dissipated to heat the room where the indoor unit 21 is installed.

[0043] Here, in the first heat pump circuit 10a, the speed of the compressor 1a, the opening degree of the expansion valve 3a, and the speed of the outdoor fan 6a are respectively controlled in such a manner that the temperature of the water flowing out of the water/refrigerant heat exchanger 2a reaches the above-mentioned first

predetermined temperature T1, in other words, that the hot water temperature detected by the first going temperature sensor 55 reaches the first predetermined temperature T1. Moreover, in the second heat pump circuit 10b, the speed of the compressor 1b, the opening degree of the expansion valve 3b, and the speed of the outdoor fan 6b are respectively controlled in such a manner that the temperature of the hot water stored in the water storage tank 24 (in other words, the temperature of the hot water detected by the water storage sensor 58) reaches the above-mentioned water heating temperature Tb.

[0044] When the heating operation by the indoor unit 21 and the water heating operation by the water storage tank 24 are simultaneously being performed as in the embodiment, if the water heating temperature Tb (60°C) is higher than the target hot water temperature Tt (40°C), the temperature of the refrigerant flowing out of the heat exchange unit 25 becomes higher than the target hot water temperature Tt. For example, when the temperature of the hot water stored in the water storage tank 24 is 55°C during the water heating operation, the temperature of the refrigerant flowing out of the heat exchange unit 25 is also approximately 55°C. Accordingly, the refrigerant flowing out of the heat exchange unit 25 can heat the hot water flowing out of the water/refrigerant heat exchanger 2a. Therefore, even if the first heat pump circuit 10a is operated in such a manner that the temperature of the hot water flowing out of the water/refrigerant heat exchanger 2a reaches, for example, 30°C (= the first predetermined temperature T1), it is possible to heat the hot water to the second predetermined temperature T2 (= the target hot water temperature Tt: 40°C) in the auxiliary water/refrigerant heat exchanger 23. In other words, 10°C, which is a difference in temperature from the target hot water temperature Tt, can be compensated by the heating with the refrigerant flowing out of the heat exchange unit 25 in the auxiliary water/refrigerant heat exchanger 23.

[0045] The amount of the heat exchange between the refrigerant and the water in the heat exchange unit 25 may be increased due to reasons such as a large difference between the temperature of the hot water stored in the water storage tank 24 and the water heating temperature Tb. In this case, the temperature of the refrigerant flowing out of the heat exchange unit 25 is decreased so that the amount of the heat exchange between the refrigerant and the water in the auxiliary water/refrigerant heat exchanger 23 is decreased. Therefore, in this case, it may become difficult to heat the hot water flowing out of the auxiliary water/refrigerant heat exchanger 23 to the target hot water temperature Tt. Therefore, in this case, the speed of the compressor 1a, the opening degree of the expansion valve 3a, and the speed of the outdoor fan 6a are controlled in such a manner as to increase the temperature of the hot water flowing out of the water/refrigerant heat exchanger 2a by the difference between the temperature of the hot water flowing out of the auxiliary water/refrigerant heat exchanger 23 (the

temperature being detected by the third going temperature sensor 57) and the target hot water temperature Tt.

[0046] As described above, when the heating operation by the indoor unit 21 and the water heating operation by the water storage tank 24 are simultaneously performed (when the heating operation and the hot-water supply operation are performed in the heat pump-type heating and hot-water supply apparatus 100), the first heat pump circuit 10a is operated to heat the hot water flowing into the indoor unit 21. Furthermore, the second heat pump circuit 10b is operated to circulate the refrigerant through the heat exchange unit 25 of the water storage tank 24 and heat the water stored in the water storage tank 24 to the water heating temperature Tb. In the auxiliary water/refrigerant heat exchanger 23, heat is exchanged between the refrigerant having flowed out of the heat exchange unit 25 and the hot water having flowed out of the water/refrigerant heat exchanger 2a. Consequently, the temperature of the hot water flowing into the indoor unit 21 is increased to the target hot water temperature Tt.

[0047] In this manner, in the embodiment, the refrigerant having flowed out of the heat exchange unit 25 does not simply flow into the heat source side heat exchanger 4b and evaporate, but flows into the auxiliary water/refrigerant heat exchanger 23 before flowing into the heat source side heat exchanger 4b. Heat is then exchanged in the auxiliary water/refrigerant heat exchanger 23 between the refrigerant and the hot water flowing out of the water/refrigerant heat exchanger 2a and flowing into the indoor unit 21. Hence, there is no need to increase the temperature of the hot water flowing out of the water/refrigerant heat exchanger 2a to the target hot water temperature Tt. Therefore, the capacity of the first heat pump circuit 10a to be exerted can be reduced. Accordingly, the operating efficiency of the heat pump-type heating and hot-water supply apparatus 100 improves.

[Second Embodiment]

[0048] Next, a second embodiment of the heat pump-type heating and hot-water supply apparatus of the present invention is described with reference to Figs. 3 and 4. A heat pump-type heating and hot-water supply apparatus 200 in the embodiment is the same of the heat pump-type heating and hot-water supply apparatus 100 of the first embodiment in terms of including the first heat pump circuit 10a, the second heat pump circuit 10b, the indoor unit 21, and the water storage tank 24, and being able to perform only the heating operation and to simultaneously perform the heating operation and the water heating operation. The differences between the heat pump-type heating and hot-water supply apparatuses 200 and 100 are as follows: In other words, the heat pump-type heating and hot-water supply apparatus 200 does not include the second three-way valve 8, the third three-way valve 9, the bypass pipe 32, and the auxiliary water/refrigerant heat exchanger 23, which are included

in the heat pump-type heating and hot-water supply apparatus 100.

[0049] Furthermore, in the heat pump-type heating and hot-water supply apparatus 200, the connection point of the return refrigerant pipe 42 on the second heat pump circuit 10b side is changed to the refrigerant pipe 11b between (the port b of) the first three-way valve 7 and (the refrigerant side flow passage 2ba of) the water/refrigerant heat exchanger 2b. Furthermore, in the heat pump-type heating and hot-water supply apparatus 200, an electromagnetic on-off valve (opening/closing means) 60 is provided to the return refrigerant pipe 42 of the hot-water supply refrigerant circuit 40.

[0050] The electromagnetic on-off valve 60 controls the flow of the refrigerant from the return refrigerant pipe 42 to the water/refrigerant heat exchanger 2b. As described below, the electromagnetic on-off valve 60 shuts off the flow of the refrigerant from the return refrigerant pipe 42 to the water/refrigerant heat exchanger 2b when the heating operation by the indoor unit 21 is performed while the hot-water supply operation by the water storage tank 24 is stopped. On the other hand, the electromagnetic on-off valve 60 flows the refrigerant from the return refrigerant pipe 42 to the water/refrigerant heat exchanger 2b when the heating operation by the indoor unit 21 and the hot-water supply operation by the water storage tank 24 are performed.

[0051] The operational workings of the heat pump-type heating and hot-water supply apparatus 200 in the embodiment are hereinafter described. In the following description, a point that the flows of the refrigerant and the hot water are different from those in the first embodiment due to the differences in the configuration from the first embodiment will be focused and described. Moreover, in Figs. 3 and 4, arrows represent refrigerant and hot water flow directions in the circuits. Moreover, the closed port of the first three-way valve 7 is filled in with black. Moreover, while the closed electromagnetic on-off valve 60 is filled in with black, the open electromagnetic on-off valve 60 is hollow.

[0052] Firstly, a case where only the heating operation is being performed (the heating operation is being performed and the hot-water supply operation is not being performed) in the heat pump-type heating and hot-water supply apparatus 200 is described with reference to Fig. 3. As illustrated in Fig. 3, in this case, the port c is closed and the port a communicates with the port b in the first three-way valve 7 of the second heat pump circuit 10b. Moreover, the electromagnetic on-off valve 60 is closed. The compressor 1a of the first heat pump circuit 10a, the compressor 1b of the second heat pump circuit 10b, and the circulation pump 22 of the heating hot-water circuit 30 are driven.

[0053] In the following description, a set temperature T_i of the heating operation of the indoor unit 21, which is set by a user, is assumed to be 24°C as an example, as in the case described in the first embodiment. Furthermore, a target hot water temperature T_t being a target

value of the temperature of the hot water flowing into the indoor unit 21 for achieving the set temperature T_i is assumed to be 40°C.

[0054] The flow of the refrigerant and the operation of each device in the first heat pump circuit 10a and the second heat pump circuit 10b are the same as the first embodiment. Therefore, their descriptions are omitted. In the heating hot-water circuit 30, the water having flowed into the water side flow passage 2ab of the water/refrigerant heat exchanger 2a by the drive of the circulation pump 22 is heated by the heat exchange with the refrigerant flowing through the refrigerant side flow passage 2aa of the water/refrigerant heat exchanger 2a, and becomes a hot water at a first predetermined temperature T_1 (for example, 30°C) that is lower than the target hot water temperature T_t . The hot water flows out of the water/refrigerant heat exchanger 2a. The hot water having flowed out of the water/refrigerant heat exchanger 2a flows into the water side flow passage 2bb of the water/refrigerant heat exchanger 2b.

[0055] The water having flowed into the water side flow passage 2bb of the water/refrigerant heat exchanger 2b is further heated by the heat exchange with the refrigerant flowing through the refrigerant side flow passage 2ba of the water/refrigerant heat exchanger 2b, and becomes a hot water at a second predetermined temperature T_2 (= the target hot water temperature T_t : 40°C). The hot water flows out of the water/refrigerant heat exchanger 2b. The hot water having flowed out of the water/refrigerant heat exchanger 2b flows into the indoor unit 21. The heat of the hot water having flowed into the indoor unit 21 is dissipated to heat the room where the indoor unit 21 is installed.

[0056] Here, in the first heat pump circuit 10a, the speed of the compressor 1a, the opening degree of the expansion valve 3a, and the speed of the outdoor fan 6a are respectively controlled in such a manner that the temperature of the water flowing out of the water/refrigerant heat exchanger 2a reaches the above-mentioned first predetermined temperature T_1 , in other words, that the hot water temperature detected by the first going temperature sensor 55 reaches the first predetermined temperature T_1 . Moreover, in the second heat pump circuit 10b, the speed of the compressor 1b, the opening degree of the expansion valve 3b, and the speed of the outdoor fan 6b are respectively controlled in such a manner that the temperature of the water flowing out of the water/refrigerant heat exchanger 2b reaches the above-mentioned second predetermined temperature T_2 , in other words, that the hot water temperature detected by the second going temperature sensor 56 reaches the second predetermined temperature T_2 .

[0057] As described above, when the hot-water supply operation is stopped while the heating operation is performed (when the water heating operation by the water storage tank 24 is stopped while the heating operation by the indoor unit 21 is performed) in the heat pump-type heating and hot-water supply apparatus 200, the first

heat pump circuit 10a and the second heat pump circuit 10b are operated to increase the temperature of the hot water flowing into the indoor unit 21 to the target hot water temperature T_t . Therefore, an optimum load can be shared by the first heat pump circuit 10a and the second heat pump circuit 10b compared to a case of operating the first heat pump circuit 10a or the second heat pump circuit 10b to increase the temperature of the hot water flowing into the indoor unit 21 to the target hot water temperature T_t . For example, in the share of the optimum load in the embodiment, the first heat pump circuit 10a increases the temperature of water to the first predetermined temperature T_1 . Furthermore, the second heat pump circuit 10b increases the temperature of the hot water heated by the first heat pump circuit 10a to the second predetermined temperature T_2 . Hence, the operating efficiency of the heat pump-type heating and hot-water supply apparatus 200 improves.

[0058] Next, as illustrated in Fig. 4, a description is given of the case where the heating operation by the indoor unit 21 and the water heating operation by the water storage tank 24 are simultaneously being performed. In this case, the port b is closed and the port a communicates with the port c in the first three-way valve 7 of the second heat pump circuit 10b. Moreover, the electromagnetic on-off valve 60 is opened. The compressor 1a of the first heat pump circuit 10a, the compressor 1b of the second heat pump circuit 10b, and the circulation pump 22 of the heating hot-water circuit 30 are driven.

[0059] In the following description, a set temperature T_i of the heating operation of the indoor unit 21, which is set by a user, is assumed to be 24°C as an example, as in the case described in the first embodiment. Furthermore, a target hot water temperature T_t being a target value of the temperature of the hot water flowing into the indoor unit 21 for achieving the set temperature T_i is assumed to be 40°C . Furthermore, a water heating temperature T_b being a target temperature upon heating the water stored in the water storage tank 24 is assumed to be 60°C .

[0060] The flow of the refrigerant in the first heat pump circuit 10a is the same as the above-mentioned case where the heating operation is performed. Accordingly, its description is omitted. In the second heat pump circuit 10b, the refrigerant compressed and discharged from the compressor 1b flows from the refrigerant pipe 11b through the outgoing refrigerant pipe 41 via the first three-way valve 7, and flows into the heat exchange unit 25 of the water storage tank 24. The refrigerant having flowed into the heat exchange unit 25 exchanges heat with the water stored in the water storage tank 24, and flows out of the heat exchange unit 25.

[0061] The refrigerant having flowed out of the heat exchange unit 25 flows through the return refrigerant pipe 42, passes through the opened electromagnetic on-off valve 60, and flows into the refrigerant pipe 11b. The refrigerant having flowed into the refrigerant pipe 11b flows into the refrigerant side flow passage 2ba of the

water/refrigerant heat exchanger 2b. The refrigerant is condensed by the heat exchange with the water flowing through the water side flow passage 2bb of the water/refrigerant heat exchanger 2b, and flows out of the water/refrigerant heat exchanger 2b.

[0062] The refrigerant having flowed out of the water/refrigerant heat exchanger 2b is decompressed upon passage through the expansion valve 3b, and flows into the heat source side heat exchanger 4b. The refrigerant having flowed into the heat source side heat exchanger 4b evaporates by the heat exchange with the air flowing into the heat source side heat exchanger 4b by the rotation of the outdoor fan 6b, and flows out of the heat source side heat exchanger 4b. The refrigerant having flowed out of the heat source side heat exchanger 4b is then suctioned by the compressor 1b via the accumulator 5b, and compressed again.

[0063] On the other hand, in the heating hot-water circuit 30, the water having flowed into the water side flow passage 2ab of the water/refrigerant heat exchanger 2a by the drive of the circulation pump 22 is heated by the heat exchange with the refrigerant flowing through the refrigerant side flow passage 2aa of the water/refrigerant heat exchanger 2a, and becomes the hot water at the first predetermined temperature T_1 (for example, 30°C) that is lower than the target hot water temperature T_t . The hot water flows out of the water/refrigerant heat exchanger 2a.

[0064] The hot water having flowed out of the water/refrigerant heat exchanger 2a flows into the water side flow passage 2bb of the water/refrigerant heat exchanger 2b, and is further heated by the heat exchange with the refrigerant flowing through the refrigerant side flow passage 2ba of the water/refrigerant heat exchanger 2b, and becomes the hot water at the second predetermined temperature T_2 (= the target hot water temperature T_t : 40°C). The hot water flows out of the water/refrigerant heat exchanger 2b. The hot water having flowed out of the water/refrigerant heat exchanger 2b flows into the indoor unit 21. The heat of the hot water flowing into the indoor unit 21 is dissipated to heat the room where the indoor unit 21 is installed.

[0065] Here, in the first heat pump circuit 10a, the speed of the compressor 1a, the opening degree of the expansion valve 3a, and the speed of the outdoor fan 6a are respectively controlled in such a manner that the temperature of the water flowing out of the water/refrigerant heat exchanger 2a reaches the above-mentioned first predetermined temperature T_1 , in other words, that the hot water temperature detected by the first going temperature sensor 55 reaches the first predetermined temperature T_1 . Moreover, in the second heat pump circuit 10b, the speed of the compressor 1b, the opening degree of the expansion valve 3b, and the speed of the outdoor fan 6b are respectively controlled in such a manner that the temperature of the hot water stored in the water storage tank 24 (in other words, the temperature of the hot water detected by the water storage sensor 58) reaches

the above-mentioned water heating temperature Tb.

[0066] When the heating operation by the indoor unit 21 and the water heating operation by the water storage tank 24 are simultaneously being performed as in the embodiment, if the water heating temperature Tb (60°C) is higher than the target hot water temperature Tt (40°C), the temperature of the refrigerant flowing out of the heat exchange unit 25 becomes higher than the target hot water temperature Tt. For example, when the temperature of the hot water stored in the water storage tank 24 is 55°C during the water heating operation, the temperature of the refrigerant flowing out of the heat exchange unit 25 is also approximately 55°C. Accordingly, the refrigerant flowing out of the heat exchange unit 25 can heat the hot water flowing out of the water/refrigerant heat exchanger 2a. Therefore, even if the first heat pump circuit 10a is operated in such a manner that the temperature of the hot water flowing out of the water/refrigerant heat exchanger 2a reaches, for example, 30°C (= the first predetermined temperature T1), it is possible to heat the hot water to the second predetermined temperature T2 (= the target hot water temperature Tt: 40°C) in the water/refrigerant heat exchanger 2b. In other words, 10°C, which is a difference in temperature from the target hot water temperature Tt, can be compensated by the heating with the refrigerant flowing out of the heat exchange unit 25 in the water/refrigerant heat exchanger 2b.

[0067] The amount of the heat exchange between the refrigerant and the water in the heat exchange unit 25 may be increased due to reasons such as a large difference between the temperature of the hot water stored in the water storage tank 24 and the water heating temperature Tb. In this case, the temperature of the refrigerant flowing out of the heat exchange unit 25 is decreased so that the amount of the heat exchange between the refrigerant and the water in the water/refrigerant heat exchanger 2b is decreased. Therefore, in this case, it may become difficult to heat the hot water flowing out of the water/refrigerant heat exchanger 2b to the target hot water temperature Tt. Therefore, in this case, the speed of the compressor 1a, the opening degree of the expansion valve 3a, and the speed of the outdoor fan 6a are controlled in such a manner as to increase the temperature of the hot water flowing out of the water/refrigerant heat exchanger 2a by the difference between the temperature of the hot water flowing out of the water/refrigerant heat exchanger 2b (the temperature being detected by the second going temperature sensor 56) and the target hot water temperature Tt.

[0068] As described above, when the heating operation by the indoor unit 21 and the water heating operation by the water storage tank 24 are simultaneously performed (when the heating operation and the hot-water supply operation are performed in the heat pump-type heating and hot-water supply apparatus 100), the first heat pump circuit 10a is operated to heat the hot water flowing into the indoor unit 21. Furthermore, the second

heat pump circuit 10b is operated to circulate the refrigerant through the heat exchange unit 25 of the water storage tank 24 and heat the water stored in the water storage tank 24 to the water heating temperature Tb. In the water/refrigerant heat exchanger 2b, heat is exchanged between the refrigerant having flowed out of the heat exchange unit 25 and the hot water having flowed out of the water/refrigerant heat exchanger 2a. Consequently, the temperature of the hot water flowing into the indoor unit 21 is increased to the target hot water temperature Tt.

[0069] In this manner, in the embodiment, the refrigerant having flowed out of the heat exchange unit 25 does not simply flow into the heat source side heat exchanger 4b and evaporate, but flows into the water/refrigerant heat exchanger 2b before flowing into the heat source side heat exchanger 4b. Heat is then exchanged in the water/refrigerant heat exchanger 2b between the refrigerant and the hot water flowing out of the water/refrigerant heat exchanger 2a and flowing into the indoor unit 21. Hence, there is no need to increase the temperature of the hot water flowing out of the water/refrigerant heat exchanger 2a to the target hot water temperature Tt. Therefore, the capacity of the first heat pump circuit 10a to be exerted can be reduced. Accordingly, the operating efficiency of the heat pump-type heating and hot-water supply apparatus 200 improves.

[0070] As described above, in the heat pump-type heating and hot-water supply apparatus of the present invention, when the heating load and the hot-water supply load are operated simultaneously, heat is exchanged between the refrigerant flowing out of the hot-water supply load and flowing through the return refrigerant pipe and the water circulating through the heating hot-water circuit. Consequently, the operating efficiency of the heat pump-type heating and hot-water supply apparatus upon the simultaneous operation of the heating load and the hot-water supply load can be improved.

[0071] In the embodiments described above, the heat pump-type heating and hot-water supply apparatus including two heat pump circuits are described as an example. The heat pump-type heating and hot-water supply apparatus of the present invention may include three or more heat pump circuits instead. If three or more heat pump circuits are included, for example, they may be configured in such a manner that, when the heat load of the heating load is larger than the heat load of the hot-water supply load, the number of heat pump circuits for heating (the first heat pump circuits) is set to be more than one while the number of heat pump circuits for hot-water supply (the second heat pump circuits) is set to be one. Moreover, they may be configured in such a manner that when the heat load of the heating load is smaller than the heat load of the hot-water supply load, the number of heat pump circuits for heating (the first heat pump circuits) is set to be one while the number of heat pump circuits for hot-water supply (the second heat pump circuits) is set to be more than one. In this manner, the

number of the heat pump circuits for heating (the first heat pump circuits) and the number of the heat pump circuits for hot-water supply (the second heat pump circuits) may be increased or decreased as appropriate in accordance with the balance between the heat load of the heating load and the heat load of the hot-water supply load.

[0072] Moreover, the heat pump-type heating and hot-water supply apparatus according to the embodiments of the present invention may be the following first to third heat pump-type heating and hot-water supply apparatuses. The first heat pump-type heating and hot-water supply apparatus is a heat pump-type heating and hot-water supply apparatus including a plurality of heat pump circuits, a heating hot-water circuit, and a hot-water supply refrigerant circuit, in which each of the plurality of heat pump circuits is configured by sequentially connecting a compressor, a water/refrigerant heat exchanger, flow rate adjustment means, and a heat source side heat exchanger by a refrigerant pipe, the heating hot-water circuit is configured by sequentially connecting a heating load, a circulation pump, a plurality of the water/refrigerant heat exchangers, an auxiliary water/refrigerant heat exchanger by a hot-water supply pipe, in the hot-water supply refrigerant circuit, a hot-water supply load and the auxiliary water/refrigerant heat exchanger are connected to a heat pump circuit for hot-water supply configured of at least one of the plurality of heat pump circuits by an outgoing refrigerant pipe through which refrigerant flowing into the hot-water supply load flows and by a return refrigerant pipe through which refrigerant flowing out of the hot-water supply load flows, and when a heating operation by the heating load and a hot-water supply operation by the hot-water supply load are simultaneously performed, while heat is exchanged between the refrigerant circulating through the heat pump circuit and the water circulating through the heating hot-water circuit in the water/refrigerant heat exchangers of all the heat pump circuits except the heat pump circuit for hot-water supply, and the hot-water supply operation is performed by the hot-water supply load with the refrigerant flowing from the heat pump circuit for hot-water supply into the hot-water supply load via the outgoing refrigerant pipe, heat is exchanged in the auxiliary water/refrigerant heat exchanger between the refrigerant flowing out of the heating load and returning to the heat pump circuit for hot-water supply via the return refrigerant pipe and the water circulating through the heating hot-water circuit.

[0073] In the second heat pump-type heating and hot-water supply apparatus according to the first heat pump-type heating and hot-water supply apparatus, the heat pump circuit for hot-water supply includes first flow passage switching means and second flow passage switching means, each of the first flow passage switching means and the second flow passage switching means includes at least three connection ports: a first connection port, a second connection port, and a third connection port, the first connection port of the first flow passage

switching means is connected by the refrigerant pipe to a refrigerant discharge side of the compressor, the second connection port is connected by the refrigerant pipe to a refrigerant inflow side of the water/refrigerant heat exchanger, the third connection port is connected to one end of the outgoing refrigerant pipe, the first connection port of the second flow passage switching means is connected by the refrigerant pipe to a refrigerant outflow side of the water/refrigerant heat exchanger, the second connection port is connected by the refrigerant pipe to a refrigerant inflow side of the flow rate adjustment means, the third connection port is connected to one end of the return refrigerant pipe, the other end of the outgoing refrigerant pipe and the other end of the return refrigerant pipe are respectively connected to the hot-water supply load, the return refrigerant pipe is provided with the auxiliary water/refrigerant heat exchanger, the first flow passage switching means and the second flow passage switching means are switched in such a manner as to prevent the refrigerant from flowing through the outgoing refrigerant pipe and the return refrigerant pipe when only the heating operation is performed by the heating load, and the first flow passage switching means and the second flow passage switching means are switched in such a manner as to flow the refrigerant through the outgoing refrigerant pipe and the return refrigerant pipe when the heating operation by the heating load and the hot-water supply operation by the hot-water supply load are simultaneously performed.

[0074] In the third heat pump-type heating and hot-water supply apparatus, when the water/refrigerant heat exchanger in the heat pump circuit for hot-water supply also acts as the auxiliary water/refrigerant heat exchanger, one end of the return refrigerant pipe is connected between the first flow passage switching means and the water/refrigerant heat exchanger, the return refrigerant pipe includes opening/closing means that can shut off the flow of the refrigerant in the return refrigerant pipe, and the opening/closing means is closed when only the heating operation by the heating load is performed, and is open when the heating operation by the heating load and the hot-water supply operation by the hot-water supply load are simultaneously performed.

[0075] The foregoing detailed description has been presented for the purposes of illustration and description. Many modifications and variations are possible in light of the above teaching. It is not intended to be exhaustive or to limit the subject matter described herein to the precise form disclosed. Although the subject matter has been described in language specific to structural features and/or methodological acts, it is to be understood that the subject matter defined in the appended claims is not necessarily limited to the specific features or acts described above. Rather, the specific features and acts described above are disclosed as example forms of implementing the claims appended hereto

Claims

1. A heat pump-type heating and hot-water supply apparatus (100, 200) comprising:

a first heat pump circuit (10a) including a first compressor (1a), a first water/refrigerant heat exchanger (2a), first flow rate adjustment means (3a), a first heat source side heat exchanger (4a), and a first refrigerant pipe (11a) connecting them sequentially;

a second heat pump circuit (10b) including a second compressor (1b), a second water/refrigerant heat exchanger (2b), second flow rate adjustment means (3b), a second heat source side heat exchanger (4b), and a second refrigerant pipe (11b) connecting them sequentially; and
a heating hot-water circuit (30) including a heating load (21), a circulation pump (22), the first water/refrigerant heat exchanger (2a), the second water/refrigerant heat exchanger (2b), and a hot water pipe (31) connecting them sequentially;

characterized in that the heat pump-type heating and hot-water supply apparatus (100, 200) comprises:

a hot-water supply refrigerant circuit (40) including a hot-water supply load (24), an outgoing refrigerant pipe (41) through which refrigerant flowing from the second compressor (1b) to the hot-water supply load (24) flows, and a return refrigerant pipe (42) through which refrigerant flowing from the hot-water supply load (24) to the second flow rate adjustment means (3b) flows; and
a third water/refrigerant heat exchanger (23) configured to exchange heat between the refrigerant flowing through the return refrigerant pipe (42) and water flowing through the hot water pipe (31).

2. The heat pump-type heating and hot-water supply apparatus (100) according to claim 1, wherein the second heat pump circuit (10b) includes

first flow passage switching means (7) configured to flow the refrigerant discharged from the second compressor (1b) to the outgoing refrigerant pipe (41) or the second water/refrigerant heat exchanger (2b), and
second flow passage switching means (8) configured to switch the refrigerant to flow into the second flow rate adjustment means (3b) between the refrigerant from the second water/refrigerant heat exchanger (2b) and the refrigerant from the return refrigerant pipe (42),

upon a heating operation by the heating load (21) being performed while a hot-water supply operation by the hot-water supply load (24) being stopped, the first flow passage switching means (7) flows the refrigerant discharged from the second compressor (1b) to the second water/refrigerant heat exchanger (2b) and the second flow passage switching means (8) switches the refrigerant to flow into the second flow rate adjustment means (3b) to the refrigerant from the second water/refrigerant heat exchanger (2b), and

upon the heating operation by the heating load (21) and the hot-water supply operation by the hot-water supply load (24) being performed, the first flow passage switching means (7) flows the refrigerant discharged from the second compressor (1b) to the outgoing refrigerant pipe (41) and the second flow passage switching means (8) switches the refrigerant to flow into the second flow rate adjustment means (3b) to the refrigerant from the return refrigerant pipe (42).

3. The heat pump-type heating and hot-water supply apparatus (100) according to claim 2, wherein the heating hot-water circuit (30) includes third flow passage switching means (9) configured to switch an outlet for water from the first water/refrigerant heat exchanger (2a) between the second water/refrigerant heat exchanger (2b) and the third water/refrigerant heat exchanger (23), and
the third flow passage switching means (9) sets the outlet for the water from the first water/refrigerant heat exchanger (2a) to the second water/refrigerant heat exchanger (2b) upon the heating operation by the heating load (21) being performed while the hot-water supply operation by the hot-water supply load (24) being stopped, and sets the outlet for the water from the first water/refrigerant heat exchanger (2a) to the third water/refrigerant heat exchanger (23) upon the heating operation by the heating load (21) and the hot-water supply operation by the hot-water supply load (24) being performed.

4. The heat pump-type heating and hot-water supply apparatus (200) according to claim 1, wherein the second water/refrigerant heat exchanger (2b) also acts as the third water/refrigerant heat exchanger (23),
the hot-water supply refrigerant circuit (40) includes opening/closing means (60) configured to control the flow of the refrigerant from the return refrigerant pipe (42) to the second water/refrigerant heat exchanger (2b),
the opening/closing means (60) shuts off the flow of the refrigerant from the return refrigerant pipe (42) to the second water/refrigerant heat exchanger (2b) upon a heating operation by the heating load (21) being performed while a hot-water supply operation by the hot-water supply load (24) being stopped, and

the opening/closing means (60) flows the refrigerant from the return refrigerant pipe (42) to the second water/refrigerant heat exchanger (2b) upon the heating operation by the heating load (21) and the hot-water supply operation by the hot-water supply load (24) being performed.

5. The heat pump-type heating and hot-water supply apparatus (200) according to claim 4, wherein the second heat pump circuit (10b) includes first flow passage switching means (7) configured to flow the refrigerant discharged from the second compressor (1b) to the outgoing refrigerant pipe (41) or the second water/refrigerant heat exchanger (2b), the first flow passage switching means (7) flows the refrigerant discharged from the second compressor (1b) to the second water/refrigerant heat exchanger (2b) upon the heating operation by the heating load (21) being performed while the hot-water supply operation by the hot-water supply load (24) being stopped, and the first flow passage switching means (7) flows the refrigerant discharged from the second compressor (1b) to the outgoing refrigerant pipe (41) upon the heating operation by the heating load (21) and the hot-water supply operation by the hot-water supply load (24) being performed.

Patentansprüche

1. Wärmepumpheiz- und Warmwasserzuführvorrichtung (100, 200), umfassend:

einen ersten Wärmepumpkreislauf (10a), der einen ersten Verdichter (1a), einen ersten Wasser/Kühlmittel-Wärmetauscher (2a), erste Strömungsrate-Einstellmittel (3a), einen ersten Wärmequellenseite-Wärmetauscher (4a) und ein erstes Kühlmittelrohr (11a), das sie sequentiell verbindet, aufweist, einen zweiten Wärmepumpkreislauf (10b), der einen zweiten Verdichter (1b), einen zweiten Wasser/Kühlmittel-Wärmetauscher (2b), zweite Strömungsrate-Einstellmittel (3b), einen zweiten Wärmequellenseite-Wärmetauscher (4b) und ein zweites Kühlmittelrohr (11b), das sie sequentiell verbindet, aufweist, und einen Heizwarmwasserkreislauf (30), der eine Heizlast (21), eine Umwälzpumpe (22), den ersten Wasser/Kühlmittel-Wärmetauscher (2a), den zweiten Wasser/Kühlmittel-Wärmetauscher (2b) und ein Warmwasserrohr (31), das sie sequentiell verbindet, aufweist, **dadurch gekennzeichnet, dass** die Wärmepumpheiz- und Warmwasserzuführvorrichtung (100, 200) Folgendes umfasst:

einen Warmwasserzuführkühlmittelkreislauf (40), der eine Warmwasserzuführlast (24), ein herausführendes Kühlmittelrohr (41), durch das Kühlmittel strömt, das von dem zweiten Verdichter (1b) zu der Warmwasserzuführlast (24) strömt, und ein Rückführkühlmittelrohr (42), durch das Kühlmittel strömt, das von der Warmwasserzuführlast (24) zu den zweiten Strömungsrate-Einstellmitteln (3b) strömt, aufweist, und einen dritten Wasser/Kühlmittel-Wärmetauscher (23), der ausgestaltet ist, um Wärme zwischen dem Kühlmittel, das durch das Rückführkühlmittelrohr (42) strömt, und Wasser, das durch das Warmwasserrohr (31) strömt, auszutauschen.

2. Wärmepumpheiz- und Warmwasserzuführvorrichtung (100) nach Anspruch 1, wobei der zweite Wärmepumpkreislauf (10b) Folgendes aufweist:

erste Strömungsdurchgang-Umschaltmittel (7), die ausgestaltet sind, um das Kühlmittel, das von dem zweiten Verdichter (1b) abgegeben wird, zu dem herausführenden Kühlmittelrohr (41) oder dem zweiten Wasser/Kühlmittel-Wärmetauscher (2b) strömen zu lassen, und zweite Strömungsdurchgang-Umschaltmittel (8), die ausgestaltet sind, um das Kühlmittel umzuschalten, um in die zweiten Strömungsrate-Einstellmittel (3b) zu strömen, zwischen dem Kühlmittel von dem zweiten Wasser/Kühlmittel-Wärmetauscher (2b) und dem Kühlmittel von dem Rückführkühlmittelrohr (42), bei einem Heizvorgang durch die Heizlast (21), der durchgeführt wird, während ein Warmwasserzuführvorgang durch die Warmwasserzuführlast (24) angehalten wird, das erste Strömungsdurchgang-Umschaltmittel (7) das Kühlmittel, das von dem zweiten Verdichter (1b) abgegeben wird, zu dem zweiten Wasser/Kühlmittel-Wärmetauscher (2b) strömen lässt und das zweite Strömungsdurchgang-Umschaltmittel (8) das Kühlmittel umschaltet, das in das zweite Strömungsrate-Einstellmittel (3b) zu dem Kühlmittel von dem zweiten Wasser/Kühlmittel-Wärmetauscher (2b) strömen soll, und bei dem Heizvorgang durch die Heizlast (21) und dem Warmwasserzuführvorgang durch die Warmwasserzuführlast (24), die durchgeführt werden, das erste Strömungsdurchgang-Umschaltmittel (7) das Kühlmittel, das von dem zweiten Verdichter (1b) abgegeben wird, zu dem herausführenden Kühlmittelrohr (41) strömen lässt, und das zweite Strömungsdurchgang-Umschaltmittel (8) das Kühlmittel umschaltet, das in das

zweite Strömungsrate-Einstellmittel (3b) zu dem Kühlmittel von dem Rückführkühlmittelrohr (42) strömen soll.

3. Wärmepumpeheiz- und Warmwasserzuführvorrichtung (100) nach Anspruch 2, wobei der Heizwarmwasserkreislauf (30) dritte Strömungsdurchgang-Umschaltmittel (9) aufweist, die ausgestaltet sind, um einen Auslass für Wasser von dem ersten Wasser/Kühlmittel-Wärmetauscher (2a) zwischen dem zweiten Wasser/Kühlmittel-Wärmetauscher (2b) und dem dritten Wasser/Kühlmittel-Wärmetauscher (23) umzuschalten, und das dritte Strömungsdurchgang-Umschaltmittel (9) den Auslass für das Wasser von dem ersten Wasser/Kühlmittel-Wärmetauscher (2a) zu dem zweiten Wasser/Kühlmittel-Wärmetauscher (2b) bei dem Heizvorgang durch die Heizlast (21) einstellt, der durchgeführt wird, während der Warmwasserzuführvorgang durch die Warmwasserzuführlast (24) angehalten wird, und den Auslass für das Wasser von dem ersten Wasser/Kühlmittel-Wärmetauscher (2a) zu dem dritten Wasser/Kühlmittel-Wärmetauscher (23) bei dem Heizvorgang durch die Heizlast (21) und dem Warmwasserzuführvorgang durch die Warmwasserzuführlast (24), die durchgeführt werden, einstellt.
4. Wärmepumpeheiz- und Warmwasserzuführvorrichtung (200) nach Anspruch 1, wobei der zweite Wasser/Kühlmittel-Wärmetauscher (2b) auch als der dritte Wasser/Kühlmittel-Wärmetauscher (23) agiert, der Warmwasserzuführkühlmittelkreislauf (40) Öffnungs-/Schließmittel (60) aufweist, die ausgestaltet sind, um die Strömung des Kühlmittels von dem Rückführkühlmittelrohr (42) zu dem zweiten Wasser/Kühlmittel-Wärmetauscher (2b) zu steuern, das Öffnungs-/Schließmittel (60) die Strömung des Kühlmittels von dem Rückführkühlmittelrohr (42) zu dem zweiten Wasser/Kühlmittel-Wärmetauscher (2b) bei einem Heizvorgang durch die Heizlast (21), der durchgeführt wird, während ein Warmwasserzuführvorgang durch die Warmwasserzuführlast (24) angehalten wird, absperrt und das Öffnungs-/Schließmittel (60) das Kühlmittel von dem Rückführkühlmittelrohr (42) zu dem zweiten Wasser/Kühlmittel-Wärmetauscher (2b) bei dem Heizvorgang durch die Heizlast (21) und dem Warmwasserzuführvorgang durch die Warmwasserzuführlast (24), die durchgeführt werden, strömen lässt.
5. Wärmepumpeheiz- und Warmwasserzuführvorrichtung (200) nach Anspruch 4, wobei der zweite Wärmepumpkreislauf (10b) erste Strömungsdurchgang-Umschaltmittel (7) aufweist, die ausgestaltet sind, um das Kühlmittel, das von dem zweiten Verdichter (1b) abgegeben wird, zu dem he-

rausführenden Kühlmittelrohr (41) oder dem zweiten Wasser/Kühlmittel-Wärmetauscher (2b) strömen zu lassen, und

das erste Strömungsdurchgang-Umschaltmittel (7) das Kühlmittel, das von dem zweiten Verdichter (1b) abgegeben wird, zu dem zweiten Wasser/Kühlmittel-Wärmetauscher (2b) bei dem Heizvorgang durch die Heizlast (21), der durchgeführt wird, während der Warmwasserzuführvorgang durch die Warmwasserzuführlast (24) angehalten wird, strömen lässt und

das erste Strömungsdurchgang-Umschaltmittel (7) das Kühlmittel, das von dem zweiten Verdichter (1b) abgegeben wird, zu dem herausführenden Kühlmittelrohr (41) bei dem Heizvorgang durch die Heizlast (21) und dem Warmwasserzuführvorgang durch die Warmwasserzuführlast (24), die durchgeführt werden, strömen lässt.

Revendications

1. Appareil de chauffage et d'alimentation en eau chaude de type pompe à chaleur (100, 200) comprenant :

un premier circuit de pompe à chaleur (10a) comportant un premier compresseur (1a), un premier échangeur de chaleur eau-fluide frigorigène (2a), un premier moyen de réglage de débit (3a), un premier échangeur de chaleur côté source de chaleur (4a), et une première conduite de fluide frigorigène (11a) les reliant de façon séquentielle ;

un second circuit de pompe à chaleur (10b) comportant un second compresseur (1b), un deuxième échangeur de chaleur eau-fluide frigorigène (2b), un second moyen de réglage de débit (3b), un second échangeur de chaleur côté source de chaleur (4b), et une seconde conduite de fluide frigorigène (11b) les reliant de façon séquentielle ; et

un circuit d'eau chaude de chauffage (30) comportant une charge de chauffage (21), une pompe de circulation (22),

le premier échangeur de chaleur eau-fluide frigorigène (2a), le deuxième échangeur de chaleur eau-fluide frigorigène (2b), et une conduite d'eau chaude (31) les reliant de manière séquentielle,

caractérisé en ce que l'appareil de chauffage et d'alimentation en eau chaude de type pompe à chaleur (100, 200) comprend :

un circuit de fluide frigorigène d'alimentation en eau chaude (40) comportant une charge d'alimentation en eau chaude (24), une conduite de départ de fluide frigorigène (41) à travers laquelle s'écoule le fluide fri-

gorigène s'écoulant du second compres-
 seur (1b) à la charge d'alimentation en eau
 chaude (24), et une conduite de retour de
 fluide frigorigène (42) à travers laquelle
 s'écoule le fluide frigorigène s'écoulant de
 la charge d'alimentation en eau chaude (24)
 au second moyen de réglage de débit (3b) ;
 et
 un troisième échangeur de chaleur eau-flui-
 de frigorigène (23) conçu pour échanger de
 la chaleur entre le fluide frigorigène s'écou-
 lant à travers la conduite de retour de fluide
 frigorigène (42) et l'eau s'écoulant à travers
 la conduite d'eau chaude (31).

2. Appareil de chauffage et d'alimentation en eau chau-
 de de type pompe à chaleur (100) selon la revend-
 cation 1, dans lequel :

le second circuit de pompe à chaleur (10b)
 comporte :

un premier moyen de commutation de pas-
 sage d'écoulement (7) conçu pour faire cir-
 culer le fluide frigorigène refoulé par le se-
 cond compresseur (1b) vers la conduite de
 départ de fluide frigorigène (41) ou le
 deuxième échangeur de chaleur eau-fluide
 frigorigène (2b), et
 un deuxième moyen de commutation de
 passage d'écoulement (8) conçu pour com-
 muter le fluide frigorigène devant s'écouler
 dans le second moyen de réglage de débit
 (3b) entre le fluide frigorigène issu du
 deuxième échangeur de chaleur eau-fluide
 frigorigène (2b) et le fluide frigorigène issu
 de la conduite de retour de fluide frigorigène
 (42),

lors d'une opération de chauffage au moyen de
 la charge de chauffage (21), effectuée tandis
 qu'une opération d'alimentation en eau chaude
 au moyen de la charge d'alimentation en eau
 chaude (24) est arrêtée, le premier moyen de
 commutation de passage d'écoulement (7) fait
 circuler le fluide frigorigène refoulé par le second
 compresseur (1b) vers le deuxième échangeur
 de chaleur eau-fluide frigorigène (2b) et le
 deuxième moyen de commutation de passage
 d'écoulement (8) commute le fluide frigorigène
 devant s'écouler dans le second moyen de ré-
 glage de débit (3b) sur le fluide frigorigène issu
 du deuxième échangeur de chaleur eau-fluide
 frigorigène (2b), et

lors de la réalisation de l'opération de chauffage
 au moyen de la charge de chauffage (21) et de
 l'opération d'alimentation en eau chaude au
 moyen de la charge d'alimentation en eau chau-

de (24), le premier moyen de commutation de
 passage d'écoulement (7) fait circuler le fluide
 frigorigène refoulé par le second compresseur
 (1b) vers la conduite de départ de fluide frigori-
 gène (41) et le deuxième moyen de commuta-
 tion de passage d'écoulement (8) commute le
 fluide frigorigène devant s'écouler dans le se-
 cond moyen de réglage de débit (3b) sur le fluide
 frigorigène issu de la conduite de retour de fluide
 frigorigène (42).

3. Appareil de chauffage et d'alimentation en eau chau-
 de de type pompe à chaleur (100) selon la revend-
 cation 2, dans lequel :

le circuit d'eau chaude de chauffage (30) com-
 porte un troisième moyen de commutation de
 passage d'écoulement (9) conçu pour commu-
 ter une sortie d'eau issue du premier échangeur
 de chaleur eau-fluide frigorigène (2a) entre le
 deuxième échangeur de chaleur eau-fluide fri-
 gorigène (2b) et le troisième échangeur de cha-
 leur eau-fluide frigorigène (23), et
 le troisième moyen de commutation de passage
 d'écoulement (9) règle la sortie d'eau issue du
 premier échangeur de chaleur eau-fluide frigo-
 rigène (2a) sur le deuxième échangeur de cha-
 leur eau-fluide frigorigène (2b), lors de l'opéra-
 tion de chauffage au moyen de la charge de
 chauffage (21), effectuée tandis que l'opération
 d'alimentation en eau chaude au moyen de la
 charge d'alimentation en eau chaude (24) est
 arrêtée, et règle la sortie d'eau issue du premier
 échangeur de chaleur eau-fluide frigorigène
 (2a) sur le troisième échangeur de chaleur eau-
 fluide frigorigène (23) lors de la réalisation de
 l'opération de chauffage au moyen de la charge
 de chauffage (21) et de l'opération d'alimenta-
 tion en eau chaude au moyen de la charge d'alimen-
 tation en eau chaude (24).

4. Appareil de chauffage et d'alimentation en eau chau-
 de de type pompe à chaleur (200) selon la revend-
 cation 1, dans lequel :

le deuxième échangeur de chaleur eau-fluide
 frigorigène (2b) fait également fonction de troi-
 sième échangeur de chaleur eau-fluide frigori-
 gène (23),
 le circuit de fluide frigorigène d'alimentation en
 eau chaude (40) comporte un moyen d'ouver-
 ture-fermeture (60) conçu pour commander
 l'écoulement du fluide frigorigène de la conduite
 de retour de fluide frigorigène (42) au deuxième
 échangeur de chaleur eau-fluide frigorigène
 (2b),
 le moyen d'ouverture-fermeture (60) arrête
 l'écoulement du fluide frigorigène de la conduite

de retour de fluide frigorigène (42) au deuxième échangeur de chaleur eau-fluide frigorigène (2b) lors d'une opération de chauffage au moyen de la charge de chauffage (21), effectuée tandis qu'une opération d'alimentation en eau chaude au moyen de la charge d'alimentation en eau chaude (24) est arrêtée, et le moyen d'ouverture-fermeture (60) fait circuler le fluide frigorigène de la conduite de retour de fluide frigorigène (42) au deuxième échangeur de chaleur eau-fluide frigorigène (2b), lors de la réalisation de l'opération de chauffage au moyen de la charge de chauffage (21) et de l'opération d'alimentation en eau chaude au moyen de la charge d'alimentation en eau chaude (24).

5. Appareil de chauffage et d'alimentation en eau chaude de type pompe à chaleur (200) selon la revendication 4, dans lequel :

le second circuit de pompe à chaleur (10b) comporte un premier moyen de commutation de passage d'écoulement (7) conçu pour faire circuler le fluide frigorigène refoulé par le second compresseur (1b) vers la conduite de départ de fluide frigorigène (41) ou le deuxième échangeur de chaleur eau-fluide frigorigène (2b), le premier moyen de commutation de passage d'écoulement (7) fait circuler le fluide frigorigène refoulé par le second compresseur (1b) vers le deuxième échangeur de chaleur eau-fluide frigorigène (2b), lors de l'opération de chauffage au moyen de la charge de chauffage (21), effectuée tandis que l'opération d'alimentation en eau chaude au moyen de la charge d'alimentation en eau chaude (24) est arrêtée, et le premier moyen de commutation de passage d'écoulement (7) fait circuler le fluide frigorigène refoulé par le second compresseur (1b) vers la conduite de départ de fluide frigorigène (41), lors de la réalisation de l'opération de chauffage au moyen de la charge de chauffage (21) et de l'opération d'alimentation en eau chaude au moyen de la charge d'alimentation en eau chaude (24).

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FIG. 1

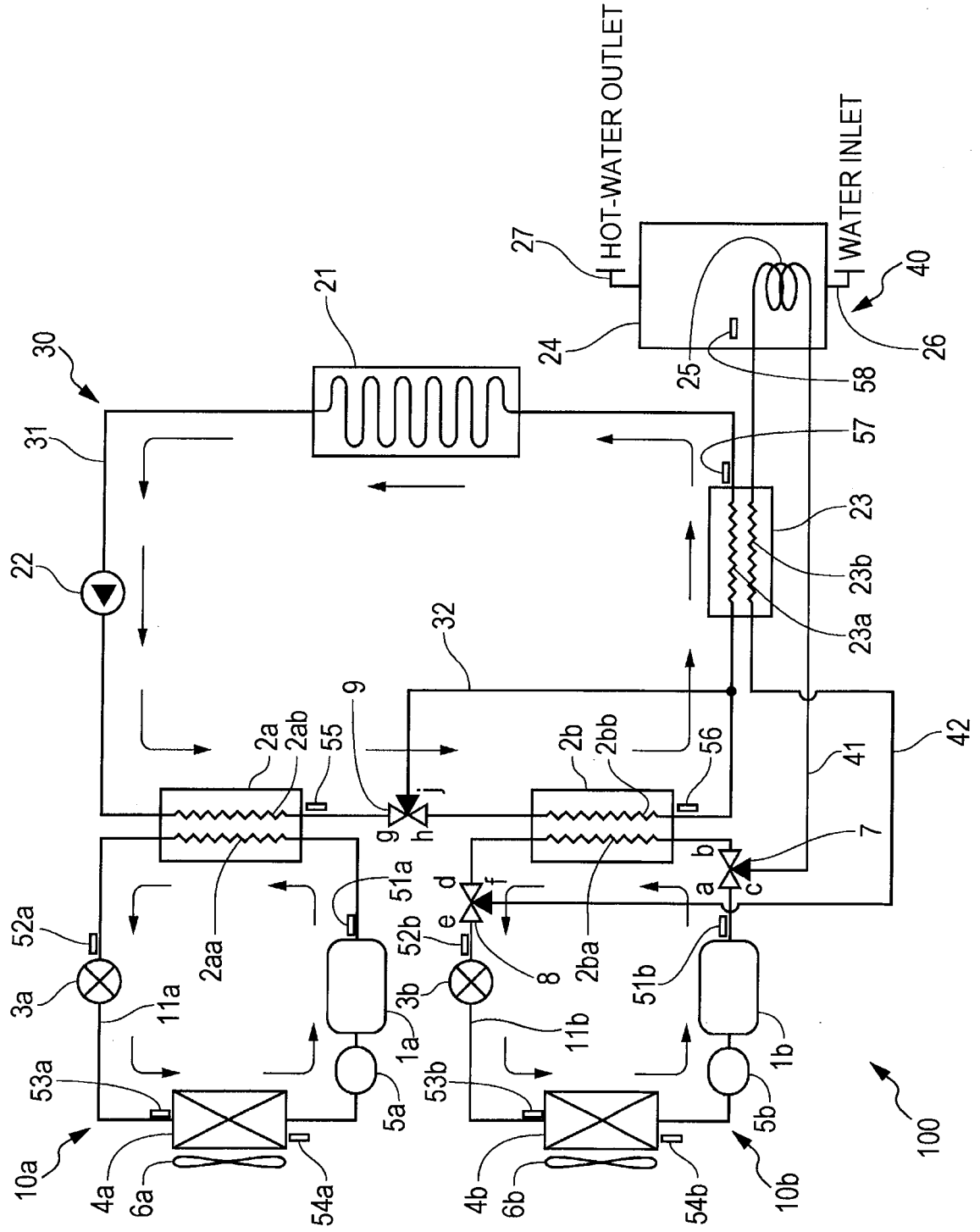


FIG. 2

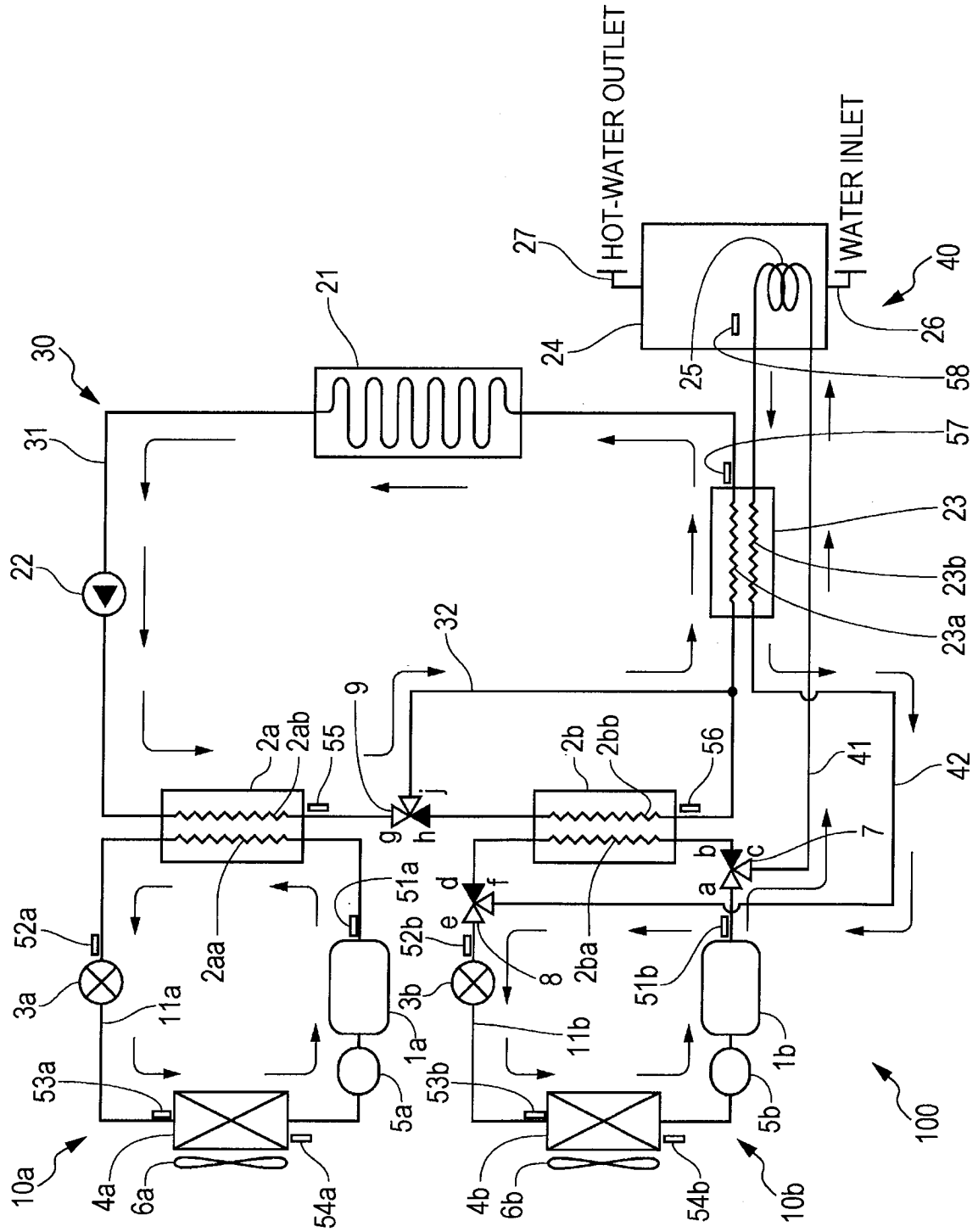


FIG. 3

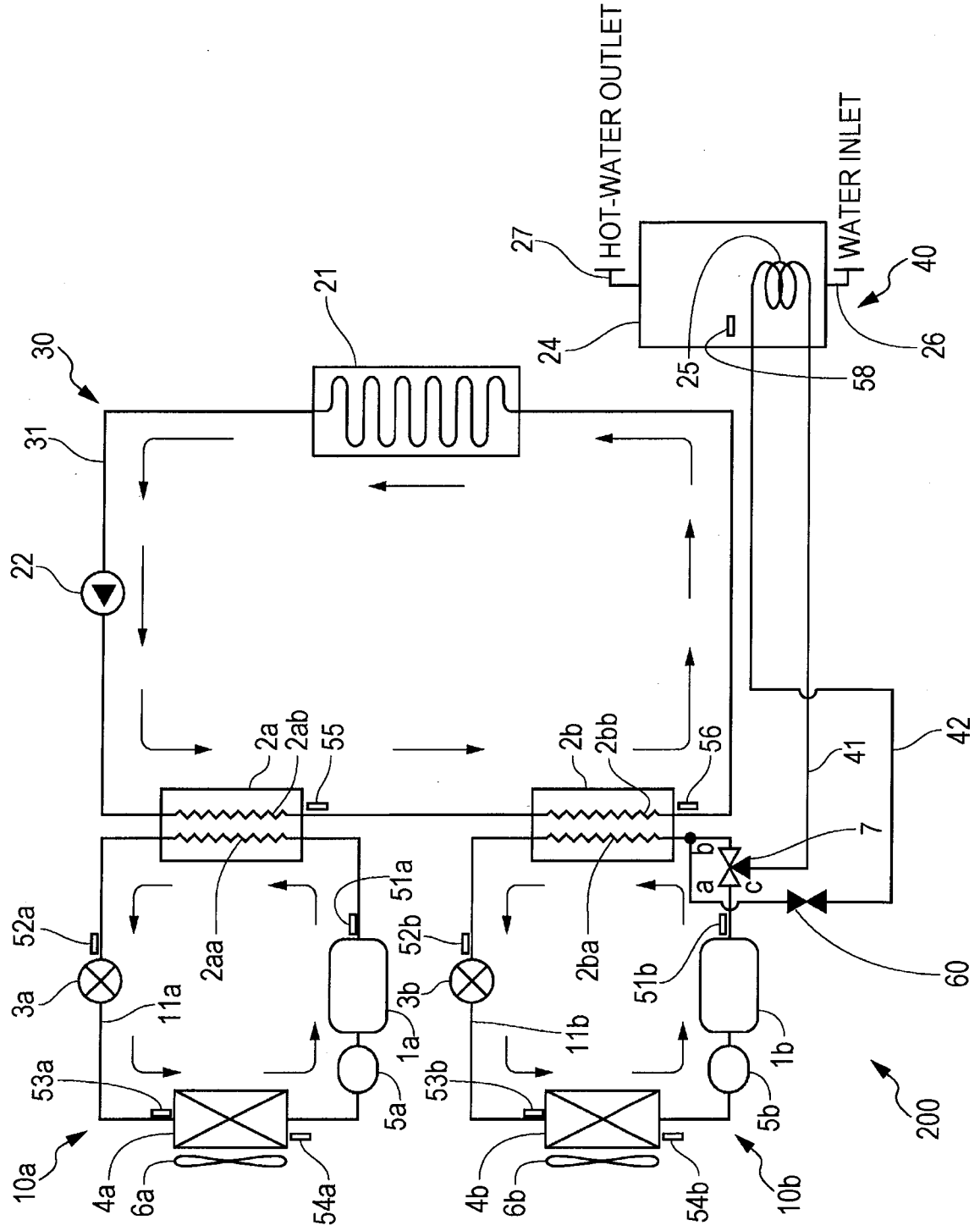
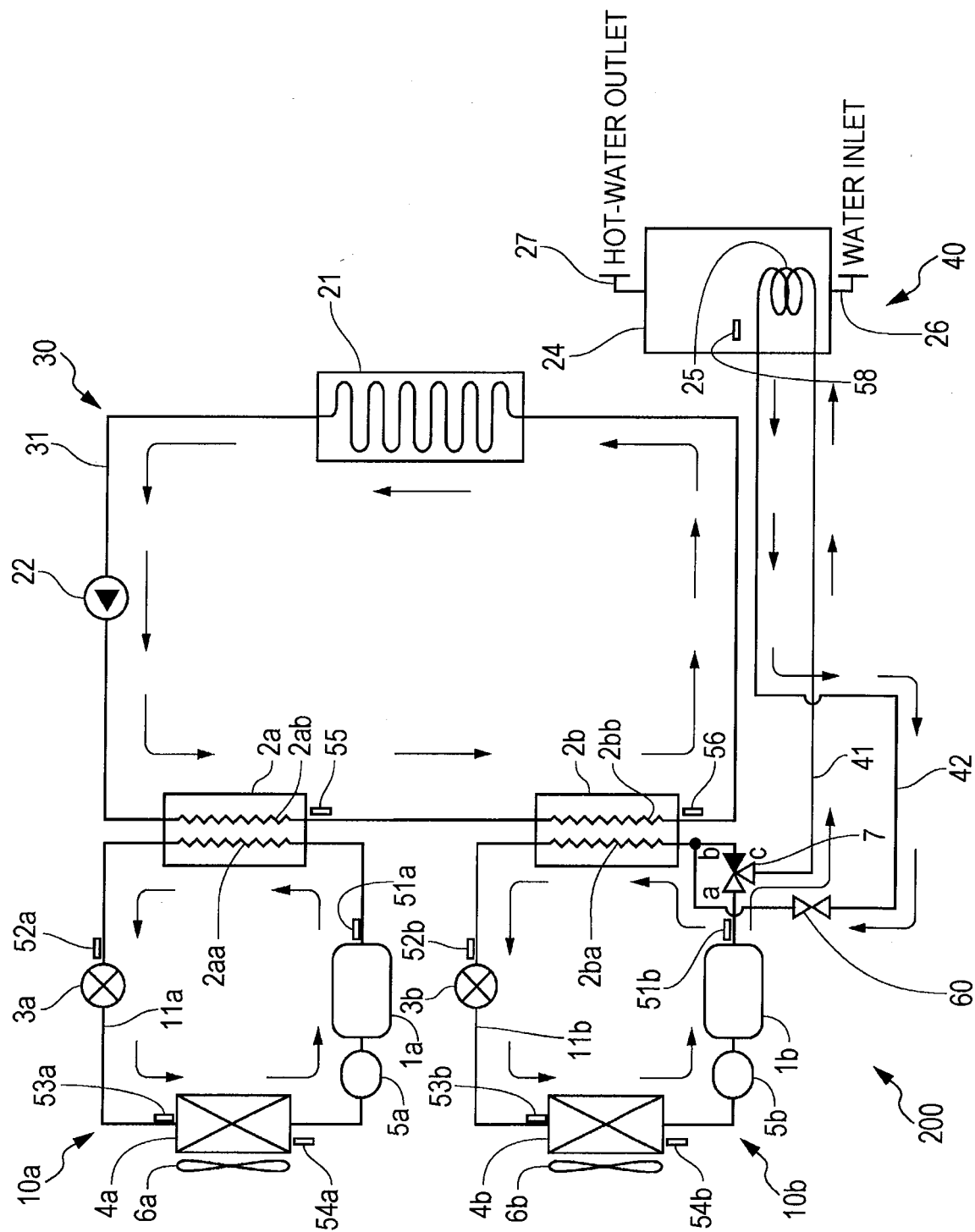


FIG. 4



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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