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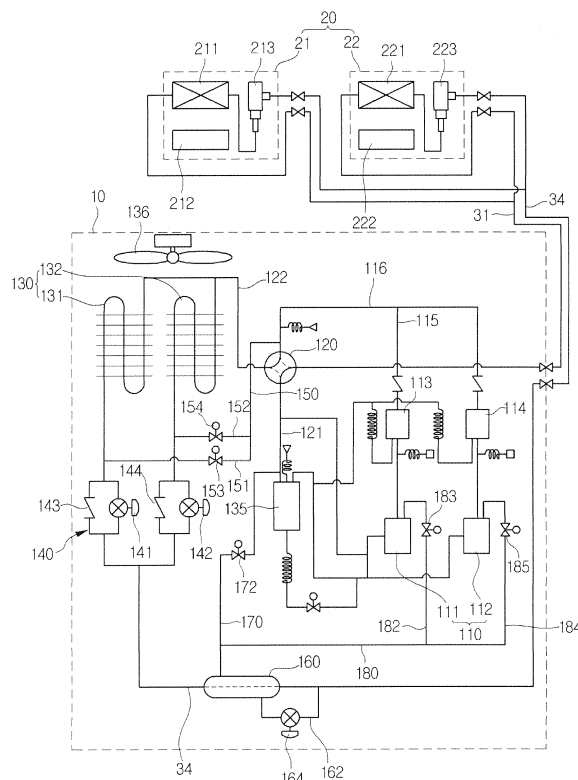
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(57) Provided is an air conditioner. The air conditioner includes an indoor unit and an outdoor unit. The outdoor unit includes a compressor, an outdoor heat exchanger, a supercooling unit for supercooling a refrigerant, a first refrigerant pipe allowing the supercooling unit to communicate with a suction side of the compressor, a first valve disposed in the first refrigerant pipe, a second

refrigerant pipe connecting the compressor to the first refrigerant pipe, and a second valve disposed in the second refrigerant pipe. In a first refrigerant flow mode, a refrigerant flowing into the supercooling unit is introduced into the compressor through the second refrigerant pipe. In a second refrigerant flow mode, a refrigerant compressed by the compressor is discharged into the second refrigerant pipe.

Fig.1

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Description

[0001] The present disclosure relates to an air conditioner.

[0002] In general, air conditioners are apparatuses for cooling/heating an indoor space or purifying air using a refrigerant cycle including a compressor, condenser, an expansion mechanism, and an evaporator.

[0003] Air conditioners are classified into air conditioner in which a single indoor unit is connected to a single outdoor unit and multi-type air conditioners in which a plurality of indoor units are connected to one or more outdoor units to provide the effect of a plurality of air conditioners.

[0004] The present invention provides an air conditioner according to claim 1. Preferred embodiments are defined in the dependent claims.

[0005] In one embodiment, the air conditioner comprises an indoor unit; and an outdoor unit, wherein the outdoor unit comprises: at least one compressor; an outdoor heat exchanger; a supercooling unit configured to supercool a refrigerant; a first refrigerant pipe allowing the supercooling unit to communicate with a suction side of the at least one compressor; a first valve disposed at the first refrigerant pipe; a second refrigerant pipe connecting the at least one compressor to the first refrigerant pipe; and a second valve disposed at the second refrigerant pipe, wherein, in a first refrigerant flow mode, a refrigerant flowing into the supercooling unit is introduced into the at least one compressor through the second refrigerant pipe, and in a second refrigerant flow mode, a refrigerant compressed by the at least one compressor is discharged into the second refrigerant pipe.

[0006] The details of one or more embodiments are set forth in the accompanying drawings and the description below. Other features will be apparent from the description and drawings, and from the claims.

[0007] Fig. 1 is a view illustrating a refrigerant cycle of an air conditioner according to an embodiment.

[0008] Fig. 2 is a view illustrating a flow of a refrigerant when an air conditioner is operate in a normal mode according to an embodiment.

[0009] Fig. 3 is a view illustrating a flow of a refrigerant when an air conditioner is operated in an injection mode according to an embodiment.

[0010] Fig. 4 is a view illustrating a flow of a refrigerant when an air conditioner is operated in a refrigerant bypass mode according to an embodiment.

[0011] Hereinafter, exemplary embodiments of the present disclosure will be described with reference to the accompanying drawings. Regarding the reference numerals assigned to the elements in the drawings, it should be noted that the same elements will be designated by the same reference numerals, wherever possible, even though they are shown in different drawings. Also, in the description of embodiments, detailed description of well-known related structures or functions will be omitted when it is deemed that such description will cause am-

biguous interpretation of the present disclosure.

[0012] Also, in the description of embodiments, terms such as first, second, A, B, (a), (b) or the like may be used herein when describing components of the present invention. Each of these terminologies is not used to define an essence, order or sequence of a corresponding component but used merely to distinguish the corresponding component from other component(s). It should be noted that if it is described in the specification that one component is "connected," "coupled" or "joined" to another component, the former may be directly "connected," "coupled," and "joined" to the latter or "connected," "coupled", and "joined" to the latter via another component.

[0013] Fig. 1 is a view illustrating a refrigerant cycle of an air conditioner according to an embodiment.

[0014] Referring to Fig. 1, an air conditioner according to an embodiment may include an outdoor unit 10 and an indoor unit 20 connected to the outdoor unit 10 through a refrigerant pipe.

[0015] The indoor unit 20 includes a plurality of indoor units 21 and 22. For convenience of description, although one outdoor unit is connected to two indoor units in the current embodiment, the present disclosure is not limited to the number of indoor unit and outdoor unit. That is, two or more indoor units may be connected to two or more outdoor units or one indoor unit may be connected to one outdoor unit.

[0016] The outdoor unit 10 includes a compression unit 110 for compressing a refrigerant and an outdoor heat exchanger 130 in which outdoor air is heat-exchanged with the refrigerant.

[0017] The compression unit 110 may include one or more compressors. In the current embodiment, the compression unit 110 including a plurality of compressors 111 and 112 will be described as an example. A portion of the plurality of compressors 111 and 112 may be an inverter compressor 111 having variable capacity and the other portion may be a constant-speed compressor 112. Alternatively, the whole compressors 111 and 112 may be the constant-speed compressors or the inverter compressors. The plurality of compressors 111 and 112 may be disposed in parallel. A portion of the plurality of compressors 111 and 112 or the whole compressors 111 and 112 may be operated according to the capacity of the indoor unit 20.

[0018] A discharge side pipe of each of the compressors 111 and 112 includes an individual pipe 115 and a joint pipe 116. That is, the individual pipe 115 of each of the compressors 111 and 112 is jointed to the joint pipe 116. Oil separators 113 and 114 for separating oil from the refrigerant may be disposed on the individual pipe 115. The oil separated by the oil separators 113 and 114 may return to an accumulator 135 or each of the compressors 111 and 112.

[0019] The joint pipe 116 is connected to a four-way valve 120 for switching a flow of the refrigerant. The four-way valve 120 is connected to the outdoor heat ex-

changer 130 through a connection pipe 122. Also, the four-way valve 120 may be connected to the accumulator 135, and the accumulator 135 may be connected to the compression unit 110.

[0020] The outdoor heat exchanger 130 includes a first heat exchanger part 131 and a second heat exchanger part 132. The first and second heat exchanger parts 131 and 132 may be independent heat exchangers separated from each other or a heat exchanger divided into two parts in a single outdoor heat exchanger based on a refrigerant flow. The first and second heat exchanger parts 131 and 132 may be horizontally or vertically disposed with respect to each other. Also, the first and second heat exchanger parts 131 and 132 may have the same thermal capacity or capacities different from each other.

[0021] The refrigerant within the outdoor heat exchanger 130 may be heat-exchanged with outdoor air blowing by a fan motor assembly 140 (including an outdoor fan and a fan motor). The fan motor assembly may be provided in one or plurality. For example, Fig. 1 illustrates on outdoor fan motor assembly.

[0022] The outdoor unit 10 further includes an outdoor expansion mechanism 140. The outdoor expansion mechanism 140 does not expand a refrigerant when the refrigerant passing through the outdoor heat exchanger 130 passes, but expands a refrigerant when the refrigerant which does not pass through the outdoor heat exchanger 130 passes.

[0023] The outdoor expansion mechanism 140 includes a first outdoor expansion valve 141 connected to the first heat exchanger part 131 and a second outdoor expansion valve 142 connected to the second heat exchanger part 132. Also, the first check valve 143 is parallelly disposed with respect to the first outdoor expansion valve 141, and the second check valve 144 is parallelly disposed with respect to the second outdoor expansion valve 142.

[0024] The refrigerant expanded by the first outdoor expansion valve 141 may flow into the first heat exchanger part 131, and the refrigerant expanded by the second outdoor expansion valve 142 may flow into the second heat exchanger part 132. For example, each of the outdoor expansion valves 141 and 142 may be an electronic expansion valve (EEV).

[0025] A bypass pipe unit is connected to the joint pipe 116. The bypass pipe unit connects each of the heat exchanger parts 131 and 132 to each of the outdoor expansion valves 141 and 142. The bypass pipe unit may include a common pipe 150 connected to the joint pipe 116 and first and second bypass pipes 151 and 152 branched from the common pipe 150. The first bypass pipe 151 is connected to a pipe connecting the first heat exchanger part 131 to the first outdoor expansion valve 141, and the second bypass pipe 152 is connected to a pipe connecting the second heat exchanger part 132 to the second outdoor expansion valve 142.

[0026] Also, a first bypass valve 153 is disposed in the first bypass pipe 151, and a second bypass valve 154 is

disposed in the second bypass pipe 152. For example, each of the bypass valves 153 and 154 may be a solenoid valve through which a flow rate is adjustable. For another example, the common pipe may be omitted in the bypass pipe unit, and the first and second bypass pipes 151 and 152 may be connected to the joint pipe.

[0027] The bypass valves 153 and 154 may be opened during a heating operation. When the bypass valves 153 and 154 are opened, a high-temperature refrigerant compressed by the compression unit 110 may flow into the bypass pipes 151 and 152. When the high-temperature flows into the bypass pipes 151 and 152, frosts on the outdoor heat exchanger 130 may be removed by the high-temperature refrigerant.

[0028] The outdoor expansion mechanism 140 may be connected to a supercooler 160 through a liquid pipe 34. A supercooling pipe 162 for bypassing the refrigerant passing through the supercooler 160 into the supercooler 160 is connected to the liquid pipe 34. Since a structure of the supercooler 160 and a connection relationship between the pipes may be realized by a previously well known structure, their detailed descriptions will be omitted. A supercooling valve 164 which adjusts a flow rate of the refrigerant and expands the refrigerant is disposed in the supercooling pipe 162. The supercooling valve 164 may adjust a flow rate of the refrigerant flowing into a first refrigerant pipe 170 that will be described later.

[0029] In the current embodiment, the supercooler 160, the supercooling pipe 162, and the supercooling valve 164 supercool a refrigerant. Thus, the supercooler 160, the supercooling pipe 162, and the supercooling valve 164 may be commonly called a supercooling unit.

[0030] The first refrigerant pipe 170 communicating with the supercooling pipe 162 and connected to the accumulator 135 is connected to the supercooler 160. For example, the first refrigerant pipe 170 may be connected to a pipe 121 connecting the four-way valve 120 to the accumulator 135. Also, a first valve 172 is disposed in the first refrigerant pipe 170. For example, the first valve 172 may be a solenoid valve. Although the first refrigerant pipe 170 is connected to a pipe 121 connected to the accumulator 135 in the current embodiment, the present disclosure is not limited thereto. For example, the first refrigerant pipe 170 may be connected to the accumulator 135 or between the compression unit 110 and the accumulator 135. That is, in the current embodiment, the first refrigerant pipe 170 may allow the supercooling unit to communicate with a suction side of the compression unit 110.

[0031] A second refrigerant pipe is connected to the first refrigerant pipe 170. The second refrigerant pipe includes a common pipe 180 and first and second branch pipes 182 and 184 branched from the common pipe 180. The first branch pipe 182 is connected to the first compressor 111, and the second branch pipe 184 is connected to the second compressor 112.

[0032] In the current embodiment, each of the compressors 111 and 112 may be a compressor which ena-

bles the refrigerant to be compressed in multi-stages. Also, each of the branch pipes 182 and 184 may communicate with a specific compression chamber (a compression chamber in which a refrigerant compressed more than once is introduced) of a plurality of compression chambers. For example, in case where the compressor has two compression chambers (here, a refrigerant compressed in a first compression chamber is compressed again in a second compression), the each of the branch pipes 182 and 184 may communicate with the second compression chamber. Also, in case where the compressor has three or more compression chambers, each of the branch pipes 182 and 184 may communicate with one of the second compression chamber and the next compression chamber. A lower-pressure region is defined at a suction side of the compressor, and a high-pressure region is defined at a discharge side of the compressor. A region in which each of the branch pipes 183 and 185 is connected may be a middle-pressure region.

[0033] Also, a first branch valve 183 is disposed in the first branch pipe 182, and a second branch valve 185 is disposed in the second branch pipe 184. For example, each of the branch valves 183 and 185 may be a solenoid valve. The first and second branch valves 183 and 185 may be called a second valve in reference to the first valve 172.

[0034] For another example, a valve may be omitted in the branch pipe, and a valve may be disposed in the common pipe.

[0035] For another example, each of the branch pipes 183 and 185 may be connected to the first refrigerant pipe.

[0036] The outdoor unit 10 may be connected to the indoor unit 20 through a gas pipe 31 and the liquid pipe 34. The substrate 31 may be connected to the four-way valve 120, and the liquid pipe 34 may be connected to the outdoor expansion mechanism 140. That is, a pipe connected to both sides of the supercooler 160 may be called the liquid pipe 34.

[0037] Each of the indoor units 21 and 22 may include indoor heat exchangers 211 and 221, indoor fans 212 and 222, and indoor expansion mechanisms 213 and 223. For example, each of the indoor expansion mechanisms 213 and 223 may be an EEV.

[0038] Hereinafter, a refrigerant flow within the air conditioner according to the embodiment will be described.

[0039] An operation mode of the air conditioner may include a normal mode (a normal cooling mode, a normal heating mode, or a third refrigerant flow mode), an injection mode (or a first refrigerant flow mode), and a refrigerant bypass mode (a second refrigerant flow mode). The above-described modes may be classified according to a flow direction of the refrigerant.

[0040] Fig. 2 is a view illustrating a flow of a refrigerant when an air conditioner is operated in a normal mode according to an embodiment. For example, Fig. 2 illustrates a refrigerant flow when the air conditioner is operated in a cooling mode.

[0041] Referring to Fig. 2, when the air conditioner is operated in the normal cooling mode, a high-temperature high-pressure refrigerant discharged from the compression unit 110 of the outdoor unit 10 may flow toward the outdoor heat exchanger 130 by switching the refrigerant flow through the flow-way valve 120.

[0042] The refrigerant flowing toward the outdoor heat exchanger 130 is condensed while flowing into each of the heat exchanger parts 131 and 132. Here, in the normal cooling mode of the air conditioner, the bypass valves 153 and 154 and the outdoor expansion valves 141 and 142 are closed.

[0043] Thus, the refrigerant discharged from the compression unit 110 does not pass through each of the bypass pipes 151 and 152. Also, the refrigerant discharged from each of the heat exchanger parts 131 and 132 passes through each of the check valves 143 and 144.

[0044] Then, the condensed refrigerant flows into the supercooler 160. A portion of the refrigerant passing through the supercooler 160 is expanded by the supercooling valve 164 while flowing into the supercooling pipe 162. The refrigerant expanded by the supercooling valve 164 is introduced into the supercooler 160 and heat-exchanged with the condensed refrigerant flowing along the liquid pipe 34.

[0045] According to the current embodiment, the refrigerant flowing along the supercooling pipe 162 may drop in temperature and pressure while passing through the supercooling valve 164. Thus, the refrigerant passing through the supercooling valve 164 has a temperature relatively less than that of the refrigerant flowing into the liquid pipe 34. Thus, the condensed refrigerant is supercooled while passing through the supercooler 160. As the condensed refrigerant is supercooled, a low-temperature refrigerant may be introduced into the indoor heat exchanger. Thus, a quantity of heat absorbed from the indoor air may further increase to improve the overall cooling performance of the air conditioner.

[0046] Here, in case where the air conditioner is operated in a normal heating mode, the refrigerant may be supercooled also. Here, the supercooled refrigerant is introduced into the outdoor heat exchanger. Thus, the heating performance of the air conditioner may be improved.

[0047] The refrigerant within the supercooling pipe 162 passes through the supercooler 160 to flow into the first refrigerant pipe 170. Here, in the normal cooling mode of the air conditioner, the first valve 172 is opened, and the each of the branch valves 183 and 185 is closed (which have the same state in the normal heating mode). Thus, the refrigerant introduced into the supercooling pipe 162 is introduced into the accumulator 135 without being bypassed to each of the compressors 111 and 112.

[0048] The refrigerant flowing into the liquid pipe 34 is introduced into each of the indoor units 21 and 22. The refrigerant introduced into each of the indoor units 21 and 22 is introduced into each of the indoor heat exchangers 211 and 221 after the refrigerant is expanded by the in-

door expansion mechanisms 213 and 223. The refrigerant is evaporated while flowing into each of the indoor heat exchangers 211 and 221 and then is moved into the outdoor unit 10 along the gas pipe 31. Then, the refrigerant is introduced into the accumulator 135 via the four-way valve 120. A gaseous refrigerant of the refrigerant introduced into the accumulator 135 is introduced into the compression unit 110.

[0049] Fig. 3 is a view illustrating a flow of a refrigerant when an air conditioner is operated in an injection mode according to an embodiment. For example, Fig. 3 illustrates a refrigerant flow when the air conditioner is operated in the injection mode.

[0050] Referring to Fig. 3, the injection mode of the air conditioner is basically equal to the normal cooling mode except for operations of the first valve 172 and the branch valves 183 and 185. Thus, only the features different from those of the normal cooling mode of the air conditioner will be described below.

[0051] In case where a differential pressure between a high pressure and a low pressure of the compression unit 110 is equal to or greater than a reference pressure (the high pressure is equal to or greater than the reference pressure or the low pressure is equal to or less than the reference pressure) or a compression ratio (a ratio of a high pressure to a low pressure) is equal to or less than a reference compression ratio during the normal cooling mode of the air conditioner, the first valve 172 is closed and each of the branch valves 183 and 185 are opened.

[0052] Thus, the refrigerant discharged from the supercooler 160 into the first refrigerant pipe 170 is injected into each of the compressors 111 and 112 along the common pipe 180 and each of the branch pipes 182 and 184. Here, the refrigerant injected into the compressors 111 and 112 has a middle pressure corresponding to a pressure between a pressure of the discharge side of the compressor and a pressure of the suction side of the compressor.

[0053] In the current embodiment, since the refrigerant having the middle pressure is injected into each of the compressors 111 and 112, the differential pressure between the high pressure and the low pressure of each of the compressors 111 and 112 is reduced. Thus, the refrigerant discharged from the compressors 111 and 112 to flow into the condenser (the outdoor heat exchanger during the cooling or the indoor heat exchanger during the heating) increases in flow rate to improve the cycle performance.

[0054] In case where a differential pressure between a high pressure and a low pressure is less than the reference pressure or a compression ratio (a ratio of a high pressure to a low pressure) is greater than the reference compression ratio during the injection mode of the air conditioner, the branch valves 183 and 185 are closed and the first valve 172 is opened. Thus, the air conditioner is operated in the normal cooling mode.

[0055] Fig. 4 is a view illustrating a flow of a refrigerant

when an air conditioner is operated in a refrigerant bypass mode according to an embodiment. For example, Fig. 4 illustrates a refrigerant flow when the air conditioner is switched from the cooling mode into the refrigerant bypass mode.

[0056] Referring to Fig. 4, the refrigerant bypass mode of the air conditioner is basically equal to the normal cooling mode except for operations of the branch valves 183 and 185 and the supercooling valve 164. Thus, only the features different from those of the normal cooling mode of the air conditioner will be described below.

[0057] In case where a cycle load increases (for example, a high pressure of the compression unit is greater than the reference pressure) during the normal cooling mode of the air conditioner, the supercooling valve 164 is closed and each of the branch valves 183 and 185 are opened.

[0058] Thus, the middle-pressure refrigerant compressed in a portion of the plurality of compression chambers of each of the compressors 111 and 112 is bypassed to the branch pipes 182 and 184. The refrigerant bypassed to the branch pipes 182 and 184 is introduced into the first refrigerant pipe 170 via the common pipe 180. Then, the refrigerant is introduced into the accumulator via the first refrigerant pipe 170.

[0059] According to the current embodiment, since the middle-pressure refrigerant within the compressors 111 and 112 is discharged from the compressors 111 and 112 to flow into the accumulator 135, a flow rate of each of the compressors 111 and 112 decreases. Thus, the high-pressure refrigerant within the compressors 111 and 112 may decrease in pressure to reduce the cycle load.

[0060] Also, according to the current embodiment, since the branch pipes serve as channels for injecting the refrigerant as well as channels for discharging the middle-pressure refrigerant, it is unnecessary to provide a separate pipe for bypassing the refrigerant. Thus, the refrigerant cycle may be simplified in structure and manufacturing costs may be reduced.

[0061] Also, since middle-pressure refrigerant is bypassed in the compressors 111 and 112, a flow rate of the bypassed refrigerant is less than that of the bypassed high-pressure refrigerant. Thus, it is unnecessary to provide a separate capillary in the second refrigerant pipe.

[0062] In case where the cycle load decreases (for example, the compression unit has a high pressure equal to or less than the reference pressure) during the refrigerant bypass mode of the air conditioner, the branch valves 183 and 185 are closed and the supercooling valve 164 is opened. Thus, the air conditioner is operated in the normal cooling mode.

[0063] Although the case in which the air conditioner is operated in the normal cooling mode is described as example in the foregoing embodiment, the present disclosure is not limited thereto. For example, the foregoing embodiment may be applied to a case in which the air conditioner is operated in a normal heating mode. That

is, the normal heating mode of the air conditioner may be switched into the injection mode or the refrigerant bypass mode.

[0064] Even though all the elements of the embodiments are coupled into one or operated in the combined state, the present disclosure is not limited to such an embodiment. That is, all the elements may be selectively combined with each other without departing the scope of the invention. Furthermore, when it is described that one comprises (or includes or has) some elements, it should be understood that it may comprise (or include or has) only those elements, or it may comprise (or include or have) other elements as well as those elements if there is no specific limitation. Unless otherwise specifically defined herein, all terms including technical or scientific terms are to be given meanings understood by those skilled in the art. Like terms defined in dictionaries, generally used terms needs to be construed as meaning used in technical contexts and are not construed as ideal or excessively formal meanings unless otherwise clearly defined herein.

[0065] Although embodiments have been described with reference to a number of illustrative embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the scope of the invention as defined by the appended claims. Therefore, the preferred embodiments should be considered in descriptive sense only and not for purposes of limitation, and also the technical scope of the invention is not limited to the embodiments. Furthermore, is defined not by the detailed description of the invention but by the appended claims, and all differences within the scope will be construed as being comprised in the present disclosure.

Claims

1. An air conditioner comprising:

an indoor unit (20); and
an outdoor unit (10),

wherein the outdoor unit (10) comprises:

at least one compressor (111, 112);
an outdoor heat exchanger (130);
a supercooling unit (160) configured to supercool a refrigerant;
a first refrigerant pipe (170) allowing the supercooling unit (160) to communicate with a suction side of the at least one compressor (111, 112);
a first valve (172) disposed at the first refrigerant pipe (170);
a second refrigerant pipe (180) connecting the at least one compressor (111, 112) to the first refrigerant pipe (170); and
a second valve disposed at the second refriger-

ant pipe (180), wherein, in a first refrigerant flow mode, a refrigerant flowing into the supercooling unit (160) is introduced into the at least one compressor (111, 112) through the second refrigerant pipe (180), and

in a second refrigerant flow mode, a refrigerant compressed by the at least one compressor (111, 112) is discharged into the second refrigerant pipe (180).

2. The air conditioner according to claim 1, wherein, in a third refrigerant flow mode, the refrigerant flowing into the supercooling unit (160) flows toward the suction side of the at least one compressor (111, 112) via the first refrigerant pipe (170).

3. The air conditioner according to claim 2, wherein the air conditioner is configured to perform the first refrigerant flow mode in a case where a differential pressure between a high pressure and a low pressure of the at least one compressor (111, 112) exceeds a reference pressure or a compression ratio of the high pressure to the low pressure is equal to or less than a reference compression ratio.

4. The air conditioner according to claim 3, wherein, when a starting condition of the first refrigerant flow mode is satisfied during the third refrigerant flow mode, the air conditioner is configured to perform the first refrigerant flow mode.

5. The air conditioner according to claim 3, wherein, when a starting condition of the second refrigerant flow mode is satisfied during the third refrigerant flow mode, the air conditioner is configured to perform the second refrigerant flow mode.

6. The air conditioner according to claim 2, wherein, in the first refrigerant flow mode, the first valve (172) is closed and the second valve is opened.

7. The air conditioner according to claim 2, wherein the air conditioner is configured to perform the second refrigerant flow mode in a case where a high-pressure of the at least one compressor (111, 112) exceeds a reference pressure.

8. The air conditioner according to claim 7, wherein the supercooling unit (160) further comprises a supercooling valve (164) for adjusting a flow rate of the refrigerant flowing into the first refrigerant pipe (170), and
in the second refrigerant flow mode, the supercooling valve (164) is closed and the first (172) and second valves are opened.

9. The air conditioner according to claim 8, wherein, in the third refrigerant flow mode, the supercooling

valve (164) and the first valve (172) are opened and the second valve is closed.

10. The air conditioner according to claim 1, wherein the at least one compressor (111, 112) comprises a plurality of compression chambers for compressing the refrigerant in multi-stages, and the second refrigerant pipe (180) communicates with one of the plurality of compression chambers in which the refrigerant compressed more than once is introduced of the plurality of compression chambers. 5 10
11. The air conditioner according to claim 1, wherein the compressor is provided in plurality, and the second refrigerant pipe comprises a common pipe (180) connected to the first refrigerant pipe (170) and a plurality of branch pipes (182, 184) branched from the common pipe (180) and respectively connected to the compressors (111, 112). 15 20
12. The air conditioner according to claim 11, wherein the second valve is disposed in the common pipe.
13. The air conditioner according to claim 11, wherein the second valve (183, 185) is disposed in each of the branch pipes (182, 184). 25
14. The air conditioner according to claim 1, wherein the compressor is provided in plurality, the second refrigerant pipe comprises branch pipes connected to the first refrigerant pipe (170) and each of the compressors (111, 112), and the second valve is disposed in each of the branch pipes. 30 35

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Fig.1

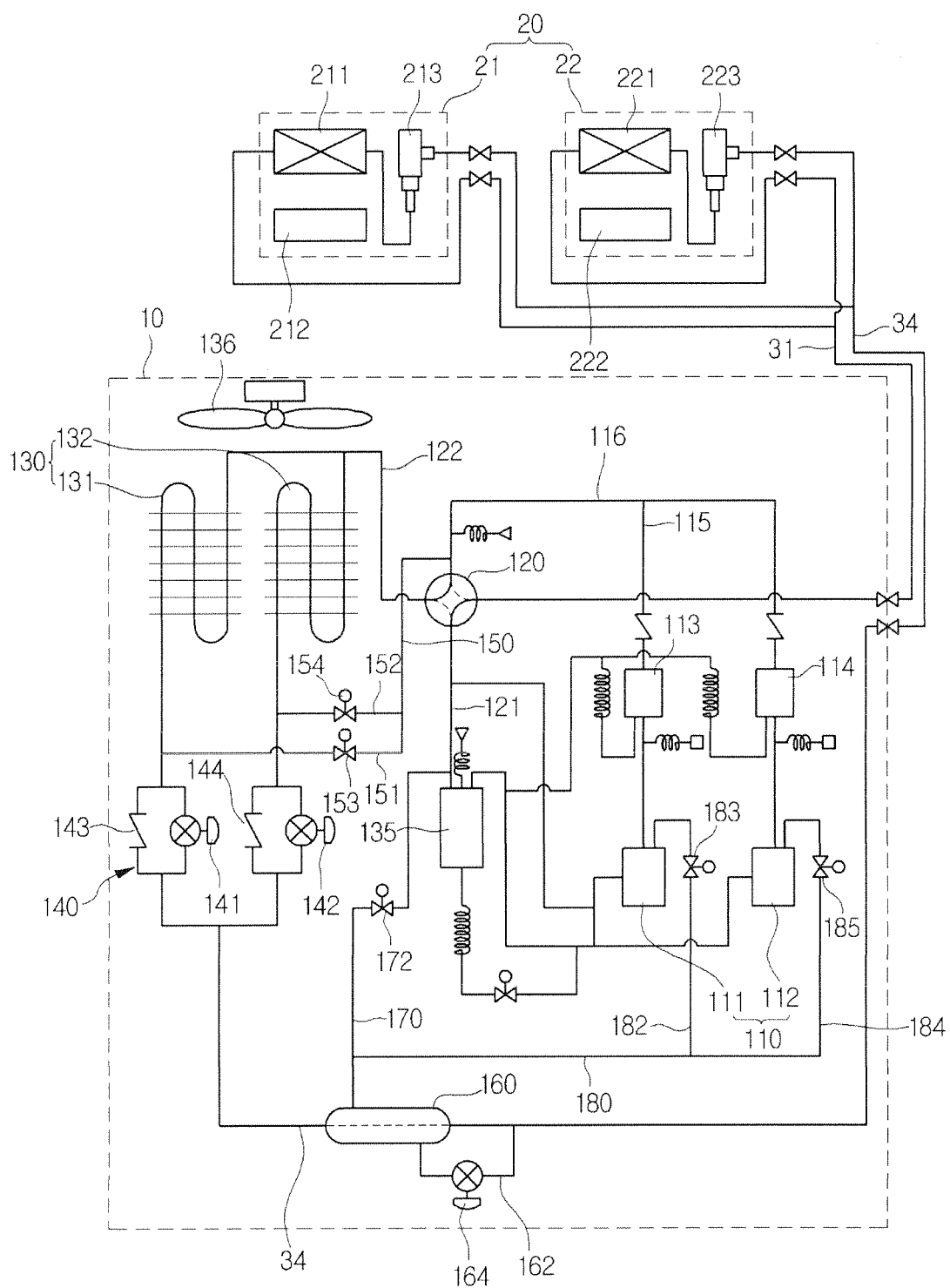


Fig.2

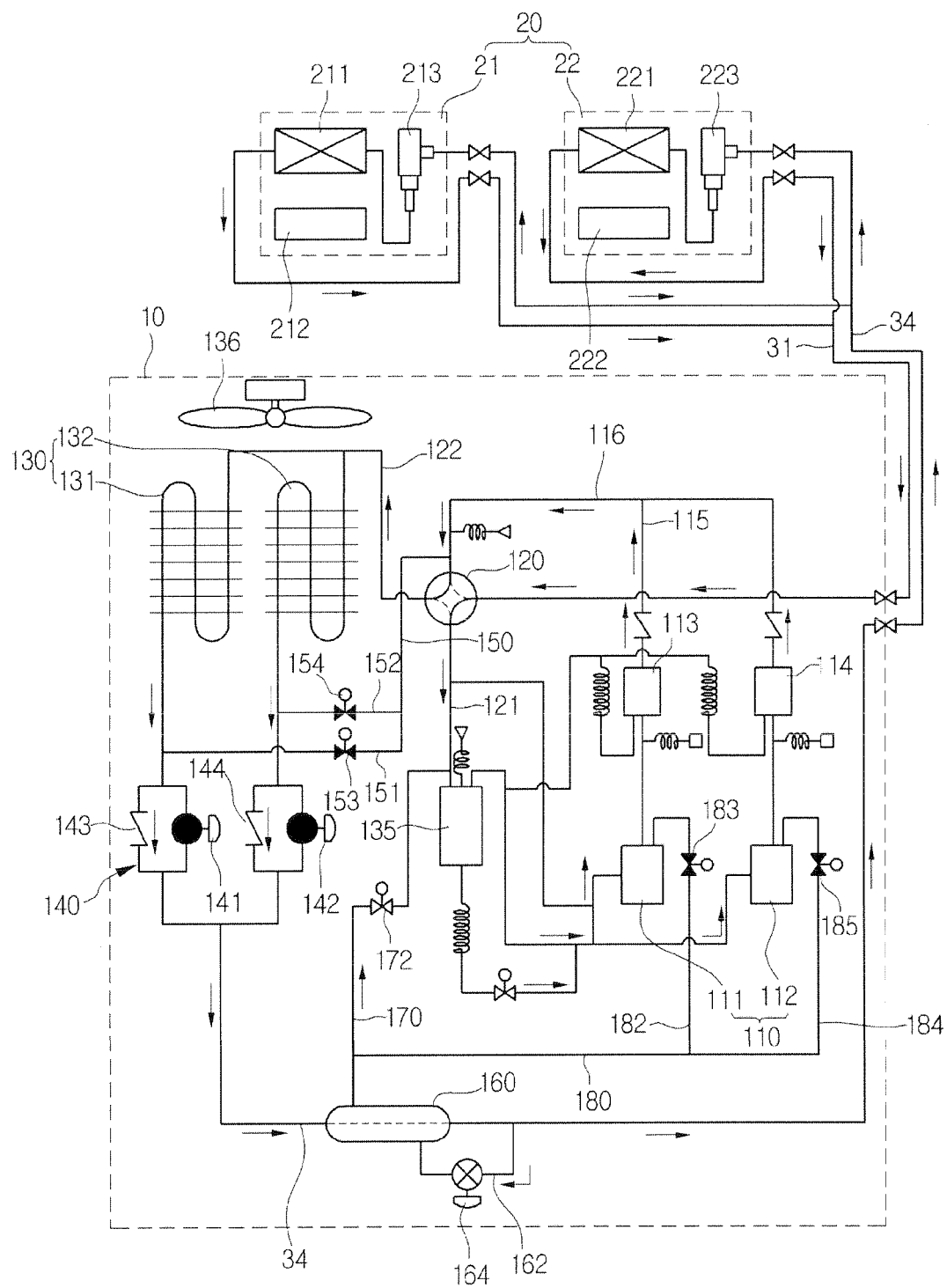


Fig.3

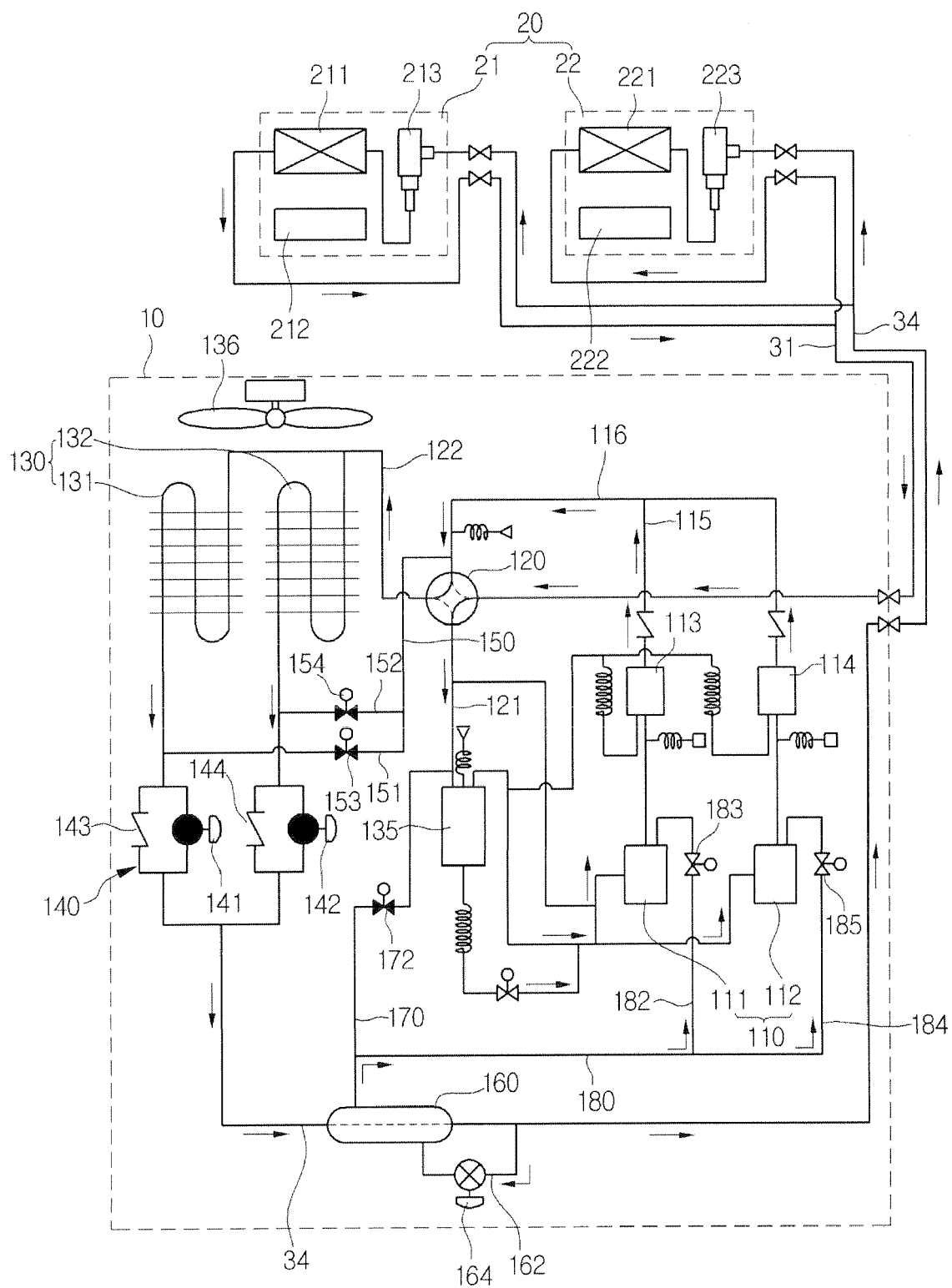


Fig.4

