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(54) **Air conditioning system and method of controlling the same**

Klimaanlagensystem und Steuerverfahren dafür

Système de climatisation et son control

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Description

[0001] The present invention relates to an air conditioning system according to the preamble of claim 1. Such an air conditioning system is known from document EP-A-1 645 817. More particularly, the present invention relates to an air conditioning system that can perform a defrosting mode while continuously performing a heating mode.

[0002] Generally, an air conditioner is a system that is used to control a temperature of an indoor space. The air conditioner performs a cooling mode or a heating mode depending on a circulation direction of a refrigerant. In the air conditioner, frost is formed on an outdoor heat exchanger when a temperature of an outdoor side is reduced to be less than a predetermined temperature during the heating mode operation. This causes the deterioration of the performance of the outdoor heat exchanger.

[0003] The conventional air conditioner has however the following problems.

[0004] In order to perform the defrosting mode, the conventional air conditioner must be changed into a cooling cycle after a heating cycle is stopped. Therefore, the air conditioner cannot keep operating with the heating cycle. In addition, since cool air is discharged into an indoor space during the defrosting mode, a user may feel discomfort.

[0005] Further, since an indoor heat exchanger is cooled during the defrosting mode, the indoor heat exchanger must be reheated whenever the heating mode starts again after the defrosting mode is finished. This causes increase of the electric power consumption.

[0006] Furthermore, since the frost forming speed increases exponentially as an outdoor temperature is reduced, a defrosting mode performing period is shortened.

[0007] Accordingly, the present invention is directed to an air conditioning system and a method of controlling the same that substantially obviate one or more problems due to limitations and disadvantages of the related art.

[0008] An object of the present invention is to provide an air conditioning system that can perform a defrosting mode for an outdoor heat exchanger while keeping performing a heating mode and a method of controlling the air conditioning system.

[0009] Another object of the present invention is to provide an air conditioning system in which there is no need to reheat an indoor heat exchanger even after the defrosting of an outdoor heat exchange is completed and a method of controlling the air conditioning system.

[0010] Still another object of the present invention is to provide an air conditioning system that can prolong a defrosting mode performing period for an outdoor heat exchanger and a method of controlling the air conditioning system.

[0011] Additional advantages, objects, and features of the invention will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention. The objectives and other advantages of the invention may be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0012] To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, there is provided an air conditioning system An air conditioning system including: a compression unit for compressing a refrigerant; an indoor heat exchange unit connected to the compression unit; an expansion unit connected to the indoor heat exchange unit; an outdoor heat exchange unit disposed on a refrigerant tube between the expansion unit and an inlet side of the compression unit; a bypass tube branched off from an outlet side of the compression unit and connecting an outlet side of the expansion unit to an inlet side of the compression unit in a heating mode; and a valve disposed on the bypass tube.

[0013] In another aspect of the present invention, there is provided an air conditioning system including: a compression unit for compressing a refrigerant; a conversion unit for converting the refrigerant discharged from the compression unit; an indoor heat exchange unit connected to the conversion unit; an expansion unit connected to the indoor heat exchange unit; an outdoor heat exchange unit disposed on a refrigerant tube between the expansion unit and the conversion unit; a bypass tube branched off from a refrigerant tube between an outlet side of the compression unit and the conversion unit and connecting an outlet side of the expansion unit to an inlet side of the compression unit in a heating mode; and a valve disposed on the bypass tube.

[0014] According to the present invention, there is provided an air conditioning system including: a compression unit having at least two compressors; an indoor heat exchange unit connected to the compression unit; an expansion unit connected to the indoor heat exchange unit; an outdoor heat exchange unit disposed on a refrigerant tube between the expansion unit and an inlet side of the compression unit; a bypass tube branched off from an outlet side refrigerant tube of at least one of the compressors of the compression unit and connecting an outlet side of the expansion unit to an inlet side of the compression unit in a heating mode; and a valve disposed on the bypass tube.

[0015] The bypass tube may be connected to an inlet side refrigerant tube of the outdoor heat exchange unit in the heating mode.

[0016] A pressure regulating unit for regulating pressure of the refrigerant may be disposed on the bypass tube.

[0017] The bypass tube may be connected to a refrigerant tube between the inlet side of the compression unit and the outdoor heat exchange unit.

[0018] A valve may be installed on a refrigerant tube between a branched portion of the bypass tube and the

conversion unit.

[0019] In still yet another aspect of the present invention, there is provided a method of controlling an air conditioning system, including: starting a heating mode; determining if an outdoor heat exchange unit reaches a preset defrosting condition; and allowing, when it is determined that the outdoor heat exchange unit reaches the preset defrosting condition, a portion of a refrigerant discharged from a compression unit to be directed to an inlet side of the outdoor heat exchange unit by opening a valve.

[0020] When a temperature of the outdoor heat exchange unit is equal to or less than a preset reference temperature, it may be determined that the outdoor heat exchange unit reaches the preset defrosting condition.

[0021] It is to be understood that both the foregoing general description and the following detailed description of the present invention are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

[0022] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment (s) of the invention and together with the description serve to explain the principle of the invention. In the drawings:

[0023] FIG. 1 is a circuit diagram of an air conditioning system according to a first embodiment of the present invention;

[0024] FIG. 2 is a flowchart illustrating a method of controlling the air conditioning system of FIG. 1;

[0025] FIG. 3 is a P-h graph of the air conditioning system of FIG. 1;

[0026] FIG. 4 is a circuit diagram of an air conditioning system according to a second embodiment of the present invention;

[0027] FIG. 5 is a P-h graph of the air conditioning system of FIG. 3; and

[0028] FIG. 6 is a circuit diagram of an air conditioning system according to a third embodiment of the present invention.

[0029] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. The invention may, however, be embodied in many different forms and should not be construed as being limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the concept of the invention to those skilled in the art.

[0030] The following will describe an indoor unit of an air conditioning system according to a first embodiment of the present invention.

[0031] FIG. 1 is a circuit diagram of an air conditioning system according to a first embodiment of the present invention, FIG. 2 is a flowchart illustrating a method of controlling the air conditioning system of FIG. 1, and FIG. 3 is a P-h graph of the air conditioning system of FIG. 1.

[0032] Referring to FIG. 1, the air conditioning system includes a compression unit 10. The compression unit 10 includes a main compressor 11 and a sub-compressor 12. The main compressor 12 operates in all of modes and the sub-compressor 12 operates if required.

[0033] A check valve 15 for preventing a refrigerant discharged from the compression unit 10 from reversely flowing is disposed on an outlet side refrigerant tube 111.

[0034] A conversion unit 20 is connected to the outlet side refrigerant tube 111 of the compression unit 10. A 4-way valve may be used as the conversion unit 20. The conversion unit 20 controls a circulation direction of the refrigerant.

[0035] An indoor heat exchange unit 30 is connected to the conversion unit 20. An expansion unit 40 is connected to the indoor heat exchange unit 30. A linear expansion valve (LEV) or a capillary tube may be used as the expansion unit 40.

[0036] An outdoor heat exchange unit 50 is connected to the expansion unit 40. The conversion unit 20 is connected to the outdoor heat exchanger 50.

[0037] An accumulator 60 is disposed on an inlet side refrigerant tube 114 of the conversion unit 20 and the compression unit 10. The accumulator 60 provides only a gas-phase refrigerant of the refrigerant directed from the conversion unit 20 to the compression unit 10. A separate heating unit (not shown) for heating the refrigerant may be installed on the accumulator 60.

[0038] A bypass tube 110 is breached off from the outlet side refrigerant tube 111 of the compression unit 10. At this point, the bypass tube 110 is branched off from the outlet side refrigerant tube 111 of the compressor 12 of the compression unit 10. That is, the bypass tube 110 is branched off from the outlet side refrigerant tube 111 of one or all of the compressors 11 and 12.

[0039] The bypass tube 110 may be connected to a refrigerant tube 112 connecting an outlet side of the expansion unit 40 to an inlet side of the compression unit 10. For example, in the heating mode, the bypass tube 110 is connected between the outlet side of the expansion unit 40 and the inlet side refrigerant tube 112 of the outdoor heat exchange unit 50.

[0040] A first valve 101 is disposed on the bypass tube 110. At this point, when the bypass tubes 110 are branched off from the outlet side refrigerant tubes of the compressors 11 and 12, the first valves 101 is disposed on the respective bypass tubes 110. An opening/closing valve for opening and closing the bypass tube 110 may be used as the first valve 101.

[0041] A pressure regulating unit 103 may be disposed on the bypass tube 110. The pressure regulating unit 103 regulates the refrigerant discharged through the bypass tube 110 such that pressure of the refrigerant becomes similar to that of the refrigerant passing through the expansion unit 40.

[0042] In addition, a second valve 102 is further installed between a branch portion of the bypass tube 110 and the conversion unit 20. The second valve 102 func-

tions to discharge the refrigerant discharged from the compressors 11 and 12 only to the bypass tube 110.

[0043] The following will describe an operation of the above-described air conditioning system that can selectively operate with a cooling or heating mode. The following will describe the heating mode.

[0044] Referring to FIGs. 1 and 2, when the air conditioning system operates with the heating mode (S11), the refrigerant is compressed to a high pressure by the compression unit 10. At this point, only the main compressor 11 or both of the main compressor 11 and the sub compressor 12 can be operated depending on the heating capacity.

[0045] The compressed refrigerant is directed to the indoor heat exchange unit 30 by the conversion unit 20. At this point, the first valve 101 is closed and the second valve 102 is opened.

[0046] The refrigerant and the indoor air are heat-exchanged with each other in the indoor heat exchange unit 30. At this point, the refrigerant passing through the indoor heat exchange unit 30 is condensed by the heat exchange. Subsequently, the indoor air heat-exchanged in the indoor heat exchange unit 30 is discharged into the indoor space to heat the indoor space.

[0047] The refrigerant discharged from the heat exchange unit 30 is directed to the expansion unit 40. The refrigerant expands to a low temperature/low pressure state while passing through the expansion unit 40. The expanded refrigerant is directed to the outdoor heat exchange unit 50. The refrigerant of the outdoor heat exchange unit 50 absorbs heat from outdoor air to phase-changed into a gas-phase state.

[0048] The refrigerant discharged from the outdoor heat exchange unit 50 is directed into the conversion unit 20. The conversion unit 20 allows the refrigerant to be directed into the accumulator 60. The accumulator 60 allows only the gas-phase refrigerant to be directed into the compression unit 10.

[0049] Meanwhile, when the heating mode is performed in a state where the outdoor temperature is low, the surface of the outdoor heat exchange unit 50 is damp with humidity contained in the outdoor air. The humidity is changed into frost as the temperature of the outdoor heat exchange unit 50 is reduced. At this point, since the outdoor heat exchange unit 50 functions as an evaporator, the frost formed on the outdoor heat exchange unit 50 causes the deterioration of the heat exchange between the refrigerant and the outdoor air in the outdoor heat exchange unit 50. Therefore, since the temperature of the refrigerant discharged from the outdoor heat exchange unit 50 is lowered, the temperature of the refrigerant directed into the compression unit 10 is also lowered. Accordingly, the temperature of the refrigerant discharged from the compression unit 10 is lowered and thus the heating efficiency of the air conditioning system is deteriorated.

[0050] In order to prevent the deterioration in the heating efficiency of the air conditioning system, a defrosting mode for melding the frost formed on the outdoor heat exchange unit 50 is performed when a predetermined amount of the frost is formed on the outdoor heat exchange unit 50. At this point, the temperature of the outdoor heat exchange unit 50 is detected to determine if the detected temperature is lower than a reference temperature (S12). When the detected temperature is lower than the reference temperature, the defrosting mode is performed.

[0051] When the heating mode is performed for a predetermined time, the defrosting mode may be performed. At this point, the heating mode performing times will be preset in a control unit (not shown) to correspond to respective outdoor temperatures.

[0052] When the defrosting mode starts, the refrigerant discharged from the compression unit 10 flows successively along the conversion unit 20, the indoor heat exchange unit 30, the expansion unit 40, and the outdoor heat exchange unit 50. At this point, the high temperature refrigerant discharged from the compression unit 10 is continuously directed to the indoor heat exchange unit 30 to heat the indoor space. This refrigerant flow is substantially identical to that in the heating mode.

[0053] At the same time, the first valve 101 is opened (S13), and the second valve 102 is closed. At this point, a portion of the refrigerant in the compression unit 10 flows along the bypass tube 110. The pressure of the refrigerant in the bypass tube 110 is uniformly regulated by the pressure regulating unit 103. In addition, by slightly opening the second valve 102, an amount of the refrigerant directed to the conversion unit 20 may be increased.

[0054] The high temperature refrigerant in the bypass tube 110 is directed to the inlet side refrigerant tube 112 of the outdoor heat exchange unit 50. At this point, the high temperature refrigerant in the bypass tube 110 is mixed with a low temperature refrigerant discharged from the expansion unit 40. Therefore, the temperature of the mixed refrigerant in the inlet side refrigerant tube 112 of the outdoor heat exchange unit 50 becomes significantly higher than the refrigerant discharged from the expansion unit 40.

[0055] The mixed refrigerant in the refrigerant tube 112 is directed into the outdoor heat exchange unit 50. The mixed refrigerant melts the frost formed on the surface of the outdoor heat exchange unit 50. At this point, the refrigerant discharged from the outdoor heat exchange unit 50 has a higher temperature than that of the refrigerant discharged in the heating mode. Therefore, the temperature of the refrigerant increases at the inlet side of the compression unit 10, the overall performance of the air conditioning system is improved.

[0056] As described above, by bypassing the high temperature refrigerant at the inlet side of the outdoor heat exchange unit 50, the indoor space can be heated and at the same time the frost formed on the outdoor heat exchange unit 50 can be removed (S14). Therefore, there is no need to stop the heating mode operation for the

defrosting mode operation.

[0057] In the above description, although the mode for removing the frost from the outdoor heat exchange unit 50 is referred to as the defrosting mode, the defrosting mode substantially means that the heating and defrosting modes are simultaneously performed.

[0058] Referring to FIG. 3, when it is assumed that the heating mode cycle and the defrosting mode cycle are ideally performed, the refrigerant varies along a line C1- C2- C3- C4- C1 in the heating mode cycle and varies along a line C6- C7- C3- C5- C7 in the defrosting mode cycle.

[0059] At this point, in the heating mode cycle, the outlet side pressure of the compression unit becomes P1 and the outlet side pressure of the expansion unit 40 becomes P2.

[0060] On the other hand, when the defrosting mode cycle is performed, the outlet side pressure of the compression unit becomes P1. At this point, a portion of the compressed refrigerant bypasses to the inlet side refrigerant 111 of the outdoor heat exchange unit 50 through the bypass tube 110 and thus the pressure of the refrigerant becomes P3 while passing through the expansion valve 40. In addition, the bypassing refrigerant is mixed with the outlet side refrigerant of the expansion unit 40 and thus the pressure of the mixed refrigerant increases to P3 and the temperature thereof also increases. At this point, since the inlet side temperature of the outdoor heat exchange unit 50 is higher than that in the heating mode cycle, the frost formed on the surface of the outdoor heat exchange unit 50 increases. Accordingly, the defrosting mode cycle moves upward and thus the overall efficiency of the air conditioning system is improved.

[0061] The following will describe an air conditioning system according to a second embodiment of the present invention.

[0062] FIG. 4 is a circuit diagram of an air conditioning system according to a second embodiment of the present invention, and FIG. 5 is a P-h graph of the air conditioning system of FIG. 3.

[0063] Referring to FIG. 4, an air conditioning system of this second embodiment is identical to that of the first embodiment except that a bypass tube 120 is connected to a refrigerant tube 113 between an outlet side of an outdoor heat exchange unit 50 and a conversion unit 20. Like elements in the first and second embodiments will be assigned with like reference numbers and will not be described.

[0064] When the defrosting mode starts, the refrigerant discharged from the compression unit 10 flows successively along the conversion unit 20, the indoor heat exchange unit 30, the expansion unit 40, and the outdoor heat exchange unit 50. At this point, the high temperature refrigerant discharged from the compression unit 10 is continuously directed to the indoor heat exchange unit 30 to heat the indoor space.

[0065] At the same time, the first valve 101 is opened, and the second valve 102 is closed. At this point, a portion of the refrigerant in the compression unit 10 flows along the bypass tube 120. For example, the refrigerant discharged from the compressor 11 is directed to the conversion unit 20 and the refrigerant discharged from the compressor 12 flows along the bypass tube 120. The pressure of the refrigerant in the bypass tube 120 is uniformly regulated by the pressure regulating unit 103 to be identical or similar to that of the refrigerant in the outlet side refrigerant tube 113.

[0066] The high temperature refrigerant in the bypass tube 120 is directed to the outlet side refrigerant tube 113 of the outdoor heat exchange unit 50. At this point, the high temperature refrigerant in the bypass tube 110 is mixed with a low temperature refrigerant discharged from the outdoor heat exchange unit 40. Therefore, the temperature of the mixed refrigerant becomes significantly higher than the refrigerant discharged from the outdoor heat exchange unit 50.

[0067] The mixed refrigerant in the refrigerant tube 113 is directed into the accumulator 60 through the conversion unit 20. Therefore, since the temperature of the refrigerant at the inlet side of the compression unit 10 increases, the compression efficiency of the compression unit is improved.

[0068] The outlet side refrigerant of the compression unit 10 becomes higher than that in the heating mode. The refrigerant discharged from the compression unit 10 flows along the conversion unit 20, the indoor heat exchange unit 30, and the expansion unit 40 successively.

[0069] At this point, the inlet side refrigerant of the outdoor heat exchange unit 50 has a higher temperature than that of the refrigerant discharged in the heating mode. Therefore, the forming of the frost on the surface of the outdoor heat exchange unit 50 is retarded as the refrigerant flows through the outdoor heat exchange unit 50. As described above, as the defrosting cycle increases and thus the defrosting period can be prolonged.

[0070] Referring to FIG. 5, the refrigerant varies along a line C11- C12- C13- C14- C11 in the heating mode cycle and varies along a line C15- C16- C17- C18- C15 in the defrosting mode cycle.

[0071] At this point, in the heating mode cycle, the outlet side pressure of the compression unit 10 becomes P1 and the outlet side pressure of the expansion unit 40 becomes P2.

[0072] On the other hand, since the refrigerant compressed in the compression unit 10 bypasses to the outlet side of the outdoor heat exchange unit 50 through the bypass tube 120, the pressure of the refrigerant at the outlet side of the outdoor heat exchange unit 50 becomes P4 and the inlet side refrigerant of the compression unit 10 becomes P4. At this point, since the pressure P5 of the refrigerant discharged from the compression unit 10 becomes higher than that in the heating mode, the pressure P4 of the inlet side refrigerant of the outdoor heat exchange unit 50 also increases. In addition, the temperature of the refrigerant directed to the outdoor heat exchange unit 50 increases, the temperature of the surface

of the outdoor heat exchange unit 50 increases. Accordingly, the forming of the frost on the outdoor heat exchange unit 50 can be retarded. Since the defrosting mode cycle moves upward, the overall efficiency of the air conditioning system is improved.

[0073] The following will describe an air conditioning system according to a third embodiment of the present invention.

[0074] FIG. 6 is a circuit diagram of an air conditioning system according to a third embodiment of the present invention.

[0075] Referring to FIG. 6, an air conditioning system of this second embodiment is identical to that of the first embodiment except that a bypass tube 130 is connected to a refrigerant tube 114 between a refrigerant outlet side of a conversion unit 20 and an inlet side of an accumulator 60. Like elements in the first and second embodiments will be assigned with like reference numbers and a detailed description thereof will be omitted herein. The third embodiment is identical in an operation to the second embodiment in that the bypass tube 130 is connected to the outlet side refrigerant tube 114 of the outdoor heat exchange unit 50, the operation of the third embodiment will not be described herein.

[0076] As described above, by bypassing the high temperature refrigerant at the outlet side of the outdoor heat exchange unit 50, the indoor air is heated and at the same time the forming of the frost on the outdoor heat exchange unit 50 can be prevented.

[0077] The air conditioning system of the present invention has the following effects.

[0078] Since the refrigerant discharged from the compression unit partly bypasses to the inlet side refrigerant tube of the outdoor heat exchange unit, the heating and defrosting modes can be simultaneously performed. Furthermore, there is no need to stop the heating mode operation for performing the defrosting mode operation.

[0079] In addition, since the refrigerant discharged from the compression unit partly bypasses to the outlet side refrigerant tube of the outdoor heat exchange unit, the defrosting mode performing period can be prolonged.

[0080] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

Claims

1. An air conditioning system comprising:

a compression unit (10) for compressing a refrigerant, the compression unit (10) including;
a main compressor (11) that operates in all of modes; and
a conversion unit (20) that is connected to a discharge side of the compression unit (10) to control the circulation direction of the refrigerant;
an indoor heat exchange unit (30) connected to the compression unit (10);
an expansion unit (40) connected to the indoor heat exchange unit (30);
an outdoor heat exchange unit (50) of which an inlet end is connected to the expansion unit (40) and an outlet end is connected to the compression unit (10) through the conversion unit (20);

characterized in that the compression unit (10) including a sub-compressor (12) that operates if required; and
an accumulator (60) disposed between the conversion unit and the compression unit; and
a bypass tube (110) which allows the refrigerant from the sub-compressor (12) to flow in a defrosting mode,
wherein an inlet end of the bypass tube (110) is connected to a predetermined position that is between the discharge side of the sub-compressor (12) and the conversion unit (20), and an outlet end of the bypass tube (110) is connected to a predetermined position that is between an outlet side of the expansion valve and an inlet side of the accumulator,
the air conditioning system further comprising:

a first valve (101) provided at the bypass tube (110) to prevent the refrigerant from flowing towards the bypass tube (110) in a heating mode; and
a second valve (102) provided at a position of an outlet side refrigerant tube (111) to allow the refrigerant from the sub-compressor (12) to flow only along the bypass unit (110) in the defrosting mode,
wherein the second valve (102) is located at a portion between the position which the bypass unit (110) branches off and the conversion unit (20).

2. The air conditioning system according to claim 1, further comprising a pressure regulating unit (103) located at the bypass tube (110),
wherein the pressure regulating unit (103) is configured such that the refrigerant flowing along the bypass tube (110) by opening the first valve (101) is regulated uniformly to a pressure similar to that of the refrigerant in the outlet side of the expansion unit (40) .

3. The air conditioning system according to claim 1, wherein the bypass tube (110) is connected to a refrigerant tube (113) at an outlet side of the outdoor heat exchange unit (50).

4. The air conditioning system according to claim 1,

wherein the bypass tube (110) is connected to an inlet side refrigerant tube (114) between the accumulator (60) and the conversion unit (20).

5. The air conditioning system according to claim 1, wherein the system is configured such that the first valve (101) is opened and the second valve (102) is closed in the defrosting operation.

6. The air conditioning system according to claim 1, wherein the system is configured such that the first valve (101) is closed and the second valve (102) is opened in a heating operation.

7. The air conditioning system according to claim 1, wherein the system is configured such that the first valve (101) is opened and the second valve (102) is partially closed in the defrosting operation.

Patentansprüche

1. Klimaanlagensystem mit:

einer Kompressionseinheit (10) zum Komprimieren eines Kältemittels, wobei die Kompressionseinheit (10) aufweist:

einen Hauptkompressor (11), der in allen Modi arbeitet; und

einer Umwandlungseinheit (20), die mit einer Austrittseite der Kompressionseinheit (10) verbunden ist, um die Zirkulationsrichtung des Kältemittels zu steuern;
einer Innenraum-Wärmetauschereinheit (30), die mit der Kompressionseinheit (10) verbunden ist;
einer Expansionseinheit (40), die mit der Innenraum-Wärmetauschereinheit (30) verbunden ist;
einer Außenbereich-Wärmetauschereinheit (50), von der ein Einlassende mit der Expansionseinheit (40) verbunden ist und ein Auslassende mit der Kompressionseinheit (10) über die Umwandlungseinheit (20) verbunden ist;

dadurch gekennzeichnet, dass die Kompressionseinheit (10) aufweist: einen Teilkompressor (12), der bei Bedarf arbeitet; und
einen Sammler (60), der zwischen der Umwandlungseinheit und der Kompressionseinheit angeordnet ist; und
eine Bypassleitung (110), die dem Kältemittel vom Teilkompressor (12) ermöglicht, in einem Abtaumodus zu strömen,
wobei ein Einlassende der Bypassleitung (110) mit einer vorbestimmten Position verbunden ist, die zwischen der Abgabeseite des Teilkompressors (12) und der Umwandlungseinheit (20) liegt, und ein Auslassende der Bypassleitung (110) mit einer vorbestimmten Position verbunden ist, die zwischen einer Auslassseite des Expansionsventils und einer Einlassseite des Sammlers liegt,
wobei das Klimaanlagensystem ferner aufweist:

ein erstes Ventil (101), das an der Bypassleitung (110) vorgesehen ist, um das Kältemittel daran zu hindern, zur Bypassleitung (110) in einem Heizmodus zu strömen; und
ein zweites Ventil (102), das an einer Position einer auslassseitigen Kältemittelleitung (111) vorgesehen ist, um dem Kältemittel vom Teilkompressor (12) zu ermöglichen, nur entlang der Bypasseinheit (110) im Abtaumodus zu strömen,
wobei das zweite Ventil (102) an einem Abschnitt zwischen der Position, an der die Bypasseinheit (110) abzweigt, und der Umwandlungseinheit (20) liegt.

2. Klimaanlagensystem nach Anspruch 1, ferner mit einer Druckregeleinheit (103), die an der Bypassleitung (110) liegt,
wobei die Druckregeleinheit (103) so konfiguriert ist, dass das Kältemittel, das durch Öffnen des ersten Ventils (101) entlang der Bypassleitung (110) strömt, gleichmäßig auf einen Druck geregelt wird, der dem des Kältemittels in der Auslassseite der Expansionseinheit (40) ähnelt.

3. Klimaanlagensystem nach Anspruch 1, wobei die Bypassleitung (110) mit einer Kältemittelleitung (113) an einer Auslassseite der Außenluft-Wärmetauschereinheit (50) verbunden ist.

4. Klimaanlagensystem nach Anspruch 1, wobei die Bypassleitung (110) mit einer einlassseitigen Kältemittelleitung (114) zwischen dem Sammler (60) und der Umwandlungseinheit (20) verbunden ist.

5. Klimaanlagensystem nach Anspruch 1, wobei das System so konfiguriert ist, dass im Abtaubetrieb das erste Ventil (101) geöffnet und das zweite Ventil (102) geschlossen ist.

6. Klimaanlagensystem nach Anspruch 1, wobei das System so konfiguriert ist, dass in einem Heizbetrieb das erste Ventil (101) geschlossen und das zweite Ventil (102) geöffnet ist.

7. Klimaanlagensystem nach Anspruch 1, wobei das System so konfiguriert ist, dass im Abtaubetrieb das erste Ventil (101) geöffnet und das zweite Ventil (102) teilweise geschlossen ist.

Revendications

1. Système de climatisation comprenant:

une unité de compression (10) pour comprimer un réfrigérant, l'unité de compression (10) comprenant:

un compresseur principal (11) qui fonctionne dans tous les modes; et
une unité de conversion (20) qui est raccordée à un côté de décharge de l'unité de compression (10) pour contrôler la direction de circulation du réfrigérant;
une unité d'échange de chaleur intérieure (30) raccordée à l'unité de compression (10);
une unité d'expansion (40) raccordée à l'unité d'échange de chaleur intérieure (30);
une unité d'échange de chaleur extérieure (50) dont une extrémité d'entrée est raccordée à l'unité d'expansion (40) et une extrémité de sortie est raccordée à l'unité de compression (10) par le biais de l'unité de conversion (20);

caractérisé en ce que l'unité de compression (10) comprend un compresseur auxiliaire (12) qui fonctionne, si nécessaire; et
un accumulateur (60) disposé entre l'unité de conversion et l'unité de compression; et
un tube de dérivation (110) qui permet au réfrigérant provenant du compresseur auxiliaire (12) de s'écouler dans un mode de dégivrage,
dans lequel une extrémité d'entrée du tube de dérivation (110) est raccordée à une position prédéterminée qui est entre le côté de décharge du compresseur auxiliaire (12) et l'unité de conversion (20) et une extrémité de sortie du tube de dérivation (110) est raccordée à une position prédéterminée qui est entre un côté de sortie de la valve d'expansion et un côté d'entrée de l'accumulateur,
le système de climatisation comprenant en outre:

une première valve (101) prévue au niveau du tube de dérivation (110) pour empêcher le réfrigérant de s'écouler vers le tube de dérivation (110) dans un mode de chauffage; et
une seconde valve (102) prévue dans une position d'un tube de réfrigérant (111) du côté de la sortie pour permettre au réfrigérant provenant du compresseur auxiliaire (12) de s'écouler uniquement le long de l'unité de dérivation (110) dans le mode de dégivrage,
dans lequel la seconde valve (102) est positionnée au niveau d'une partie située entre la position dans laquelle l'unité de dérivation (110) bifurque et l'unité de conversion (20).

2. Système de climatisation selon la revendication 1, comprenant en outre une unité de régulation de pression (103) positionnée au niveau du tube de dérivation (110),
dans lequel l'unité de régulation de pression (103) est configurée de sorte que le réfrigérant s'écoulant le long du tube de dérivation (110) en ouvrant la première valve (101) est régulé uniformément sur une pression similaire à celle du réfrigérant du côté de la sortie de l'unité d'expansion (40).

3. Système de climatisation selon la revendication 1, dans lequel le tube de dérivation (110) est raccordé à un tube de réfrigérant (113) d'un côté de sortie de l'unité d'échange de chaleur extérieure (50).

4. Système de climatisation selon la revendication 1, dans lequel le tube de dérivation (110) est raccordé à un tube de réfrigérant (114) du côté de l'entrée entre l'accumulateur (60) et l'unité de conversion (20).

5. Système de climatisation selon la revendication 1, dans lequel le système est configuré de sorte que la première valve (101) est ouverte et la seconde valve (102) est fermée lors de l'opération de dégivrage.

6. Système de climatisation selon la revendication 1, dans lequel le système est configuré de sorte que la première valve (101) est fermée et la seconde valve (102) est ouverte lors d'une opération de chauffage.

7. Système de climatisation selon la revendication 1, dans lequel le système est configuré de sorte que la première valve (101) est ouverte et la seconde valve (102) est partiellement fermée lors de l'opération de dégivrage.

FIG. 1

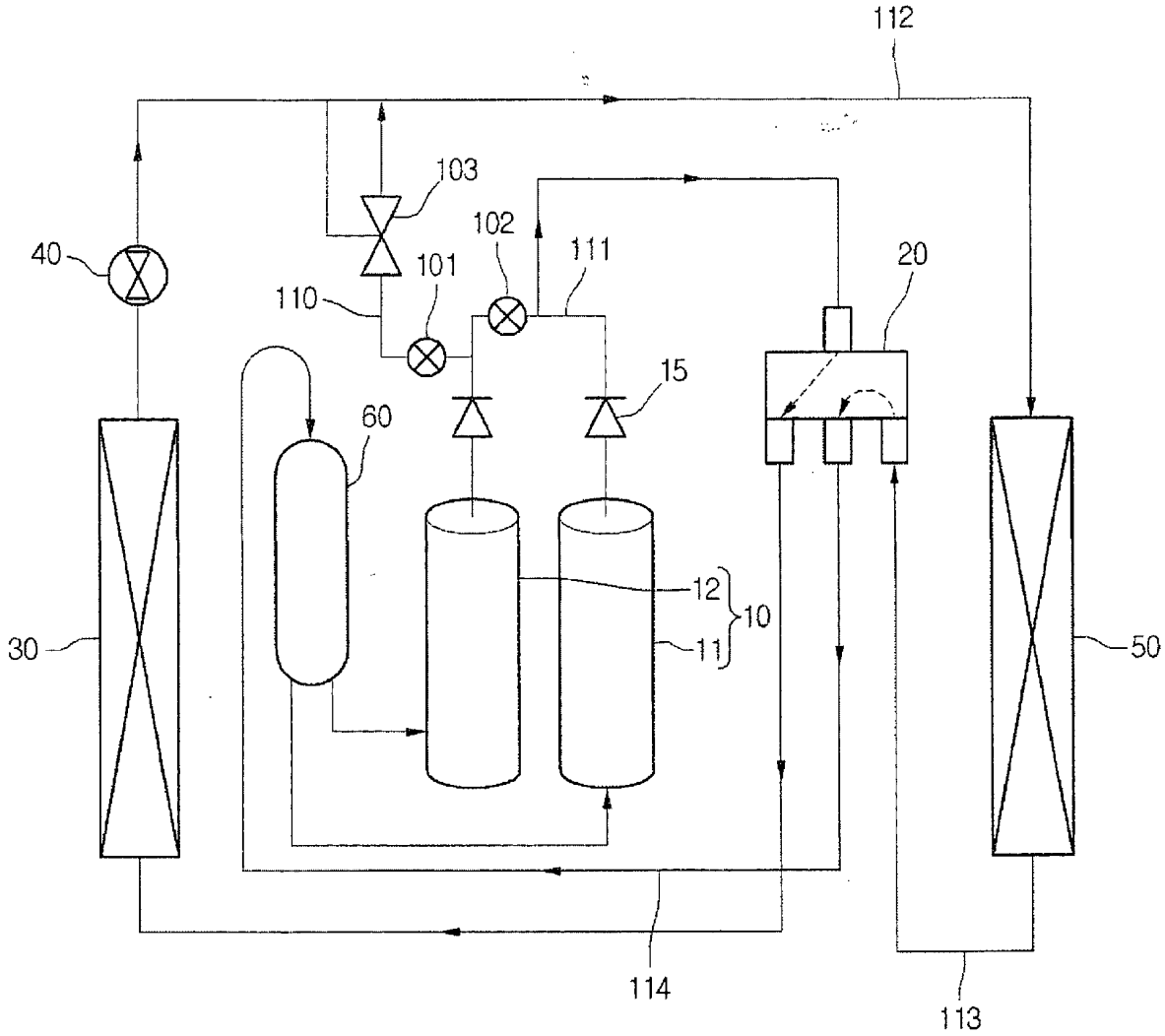


FIG. 2

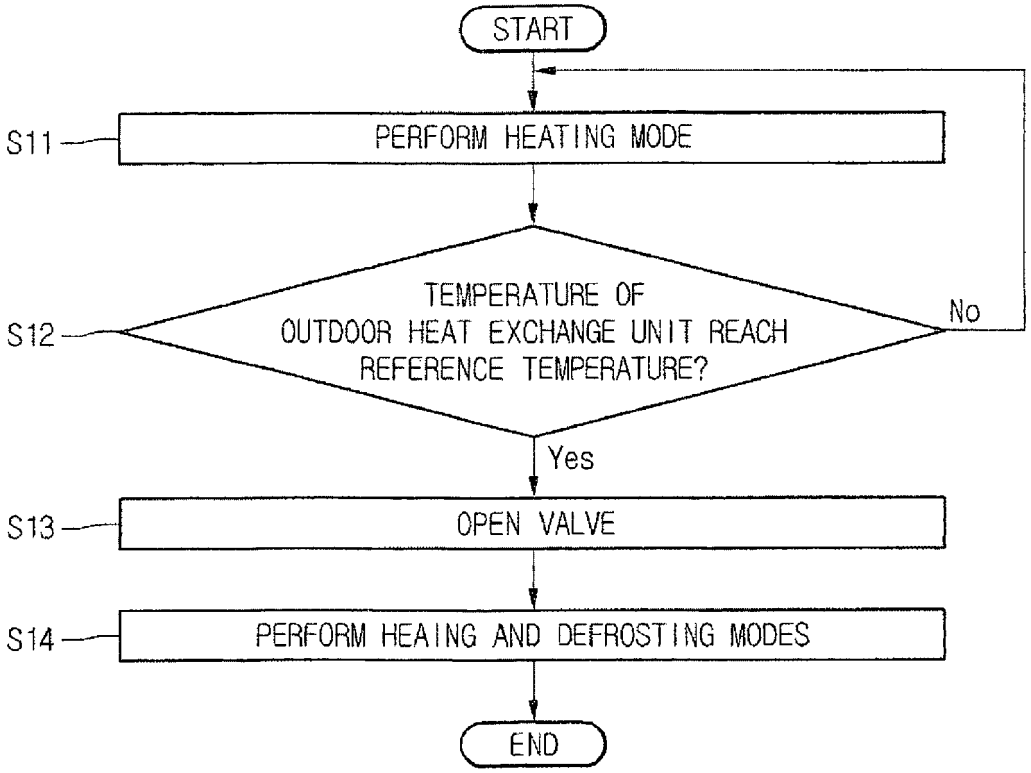

START
S11
PERFORM HEATING MODE
S12
TEMPERATURE OF OUTDOOR HEAT EXCHANGE UNIT REACH REFERENCE TEMPERATURE?
No
Yes
S13
OPEN VALVE
S14
PERFORM HEAING AND DEFROSTING MODES
END

FIG. 3

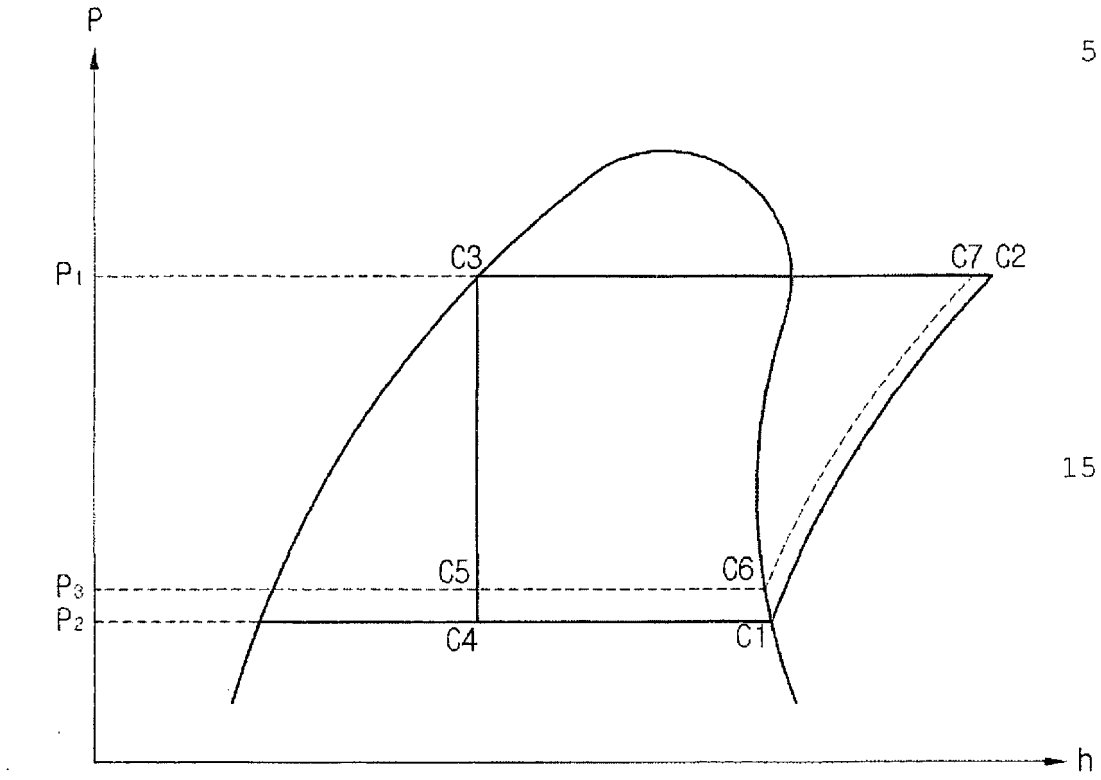


FIG. 4

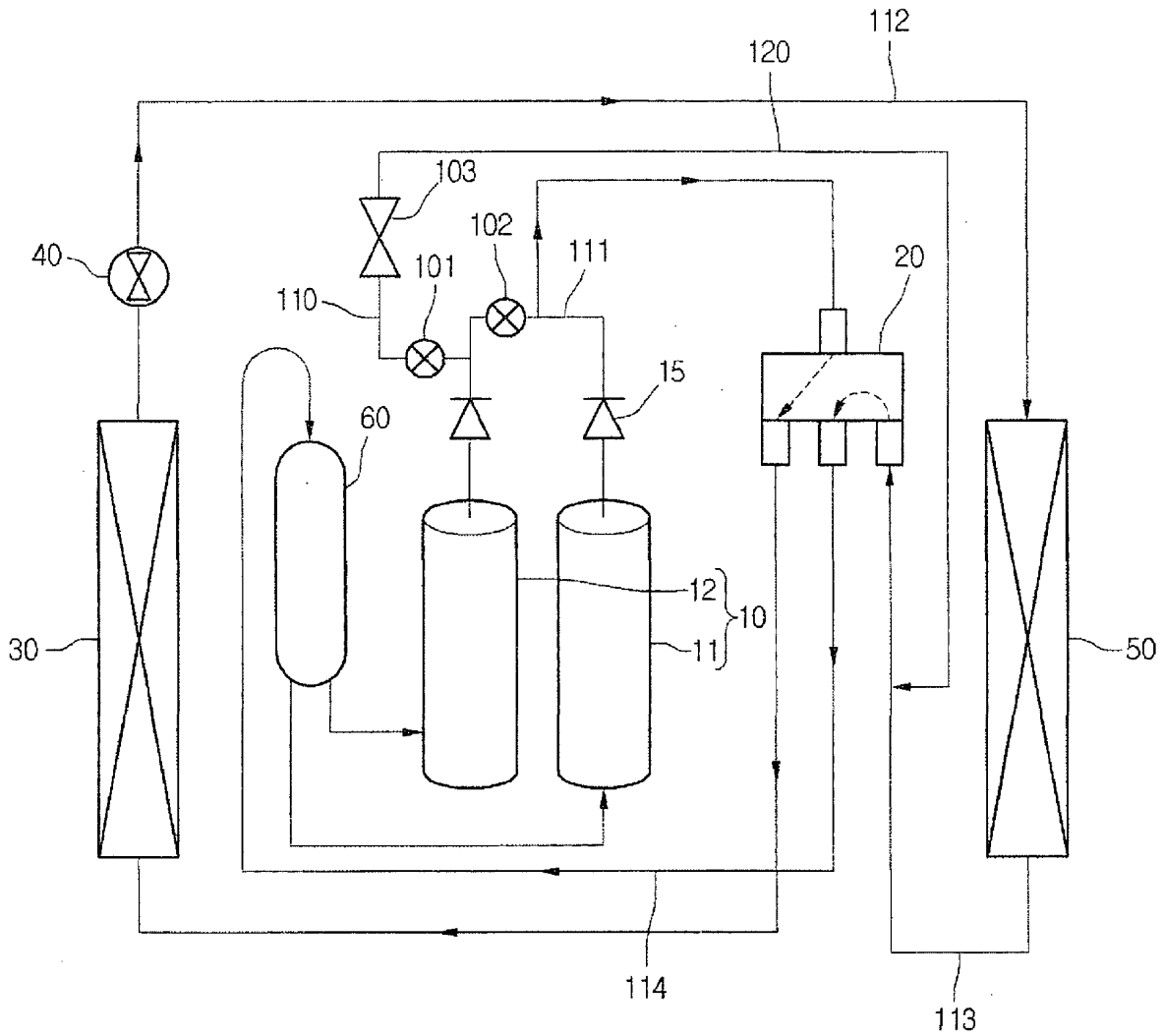


FIG. 5

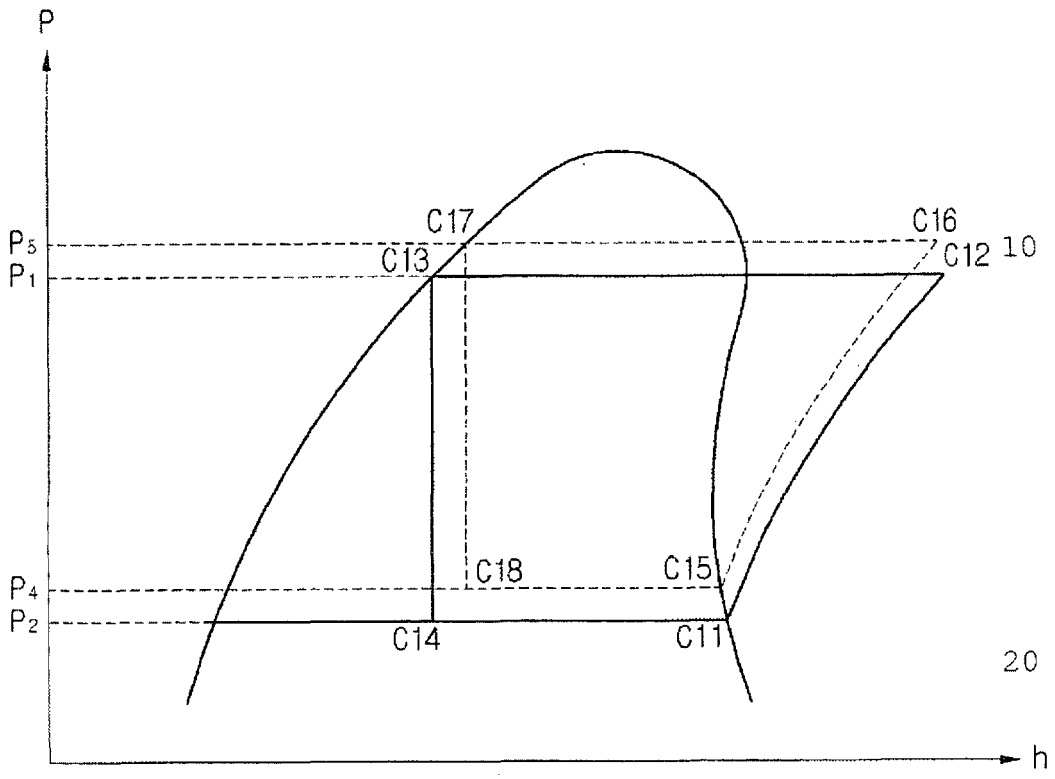
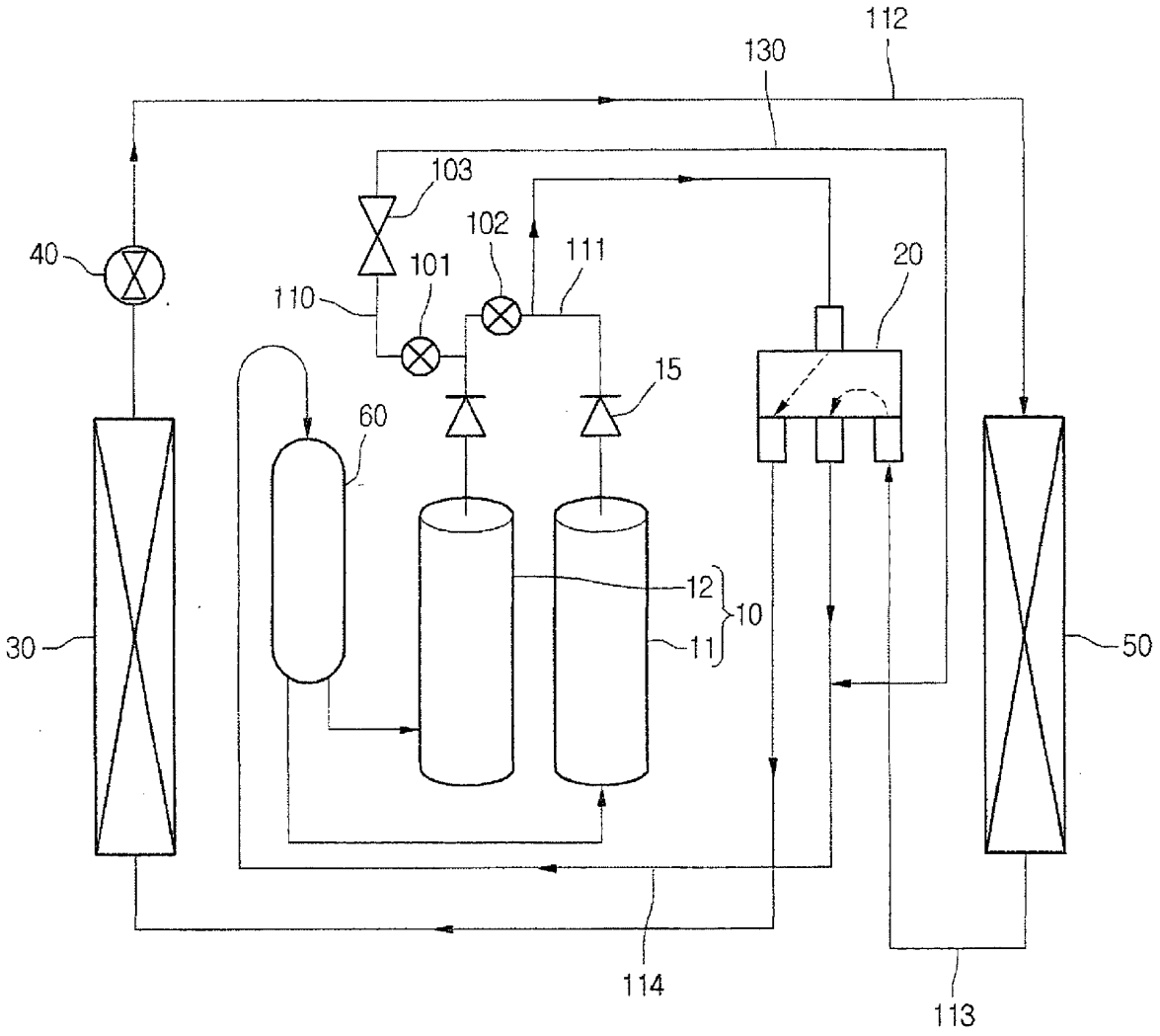


FIG. 6



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Patent documents cited in the description

- EP 1645817 A **[0001]**