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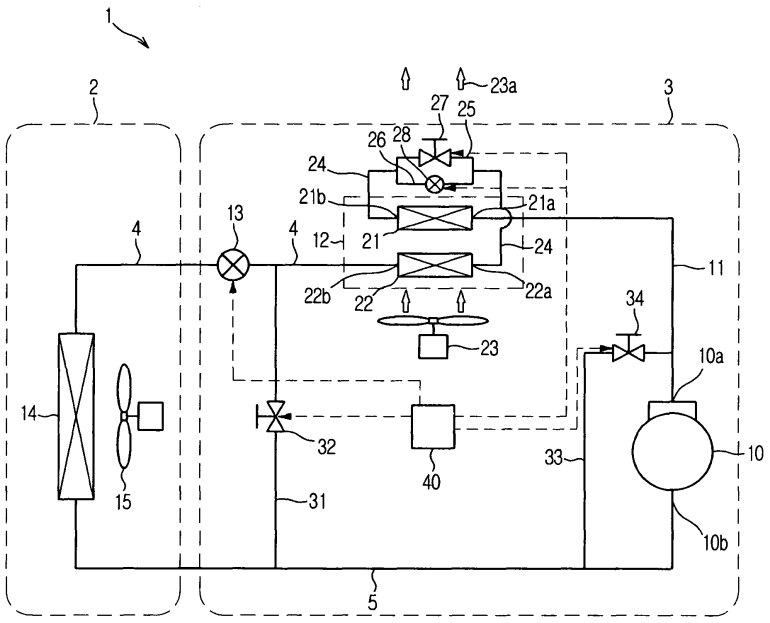
(54) Air conditioner

(57) An air conditioner capable of dehumidifying a space where an indoor unit is installed and even a space where an outdoor unit is installed is disclosed. The air conditioner includes a compressor for compressing refrigerant, an outdoor heat-exchanger including a first and a second heat-exchangers for performing heat-exchange of the refrigerant discharged from the compressor, a first decompression device installed at a pipe through which the refrigerant discharged from the outdoor heat-exchanger passes, an indoor heat-exchanger for performing heat-exchange of the refrigerant discharged from the outdoor heat-exchanger, a second decompression device installed at a pipe connected to the first and the second heat-exchangers, and a first two-way valve installed at a pipe for refrigerant to bypass the second decompression device.

Fig.3



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Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of Korean Patent Application No. 2006-2277, filed on January 9, 2006, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] The present invention relates to an air conditioner, and more particularly, to an air conditioner capable of dehumidifying a space where an indoor unit is installed and even a space where an outdoor unit is installed.

2. Description of the Related Art

[0003] A conventional air conditioner capable of dehumidifying basically includes a compressor 101, an outdoor heat-exchanger 102, and a first expansion device 103, which are installed in an outdoor unit 100a, and an indoor heat-exchanger 104 installed in an indoor unit 100b. Here, the outdoor unit 100a includes a four-way valve 105 for changing a flow direction of refrigerant stream for the switch between the refrigerating mode and the heating mode and a first two-way valve 106 for allowing the high-pressure refrigerant to bypass the first expansion device 103 in a dehumidifying mode, and the indoor unit 100a includes a heater 107 for heating cool air discharged from the indoor heat-exchanger 104 in the dehumidifying mode.

[0004] Moreover, the indoor heat-exchanger 104 includes a first heat-exchanger 104a for radiating heat by suctioning refrigerant mixed with high-pressure liquid gas and for discharging high-pressure liquid refrigerant, a second expansion device 108 for decompressing the high-pressure liquid refrigerant to be transformed into low-pressure liquid refrigerant, a second two-way valve 109 for allowing the high-pressure liquid refrigerant to bypass the second expansion device 108, and a second heat-exchanger 104b for discharging low-temperature-and-low-pressure refrigerant.

[0005] In the conventional air conditioner, the refrigerant compressed by the compressor 101 in the dehumidifying mode passes through the four-way valve 105 and enters the outdoor heat-exchanger 102. At that time, since an outdoor fan 110 rotates at a low rotation speed, the high-temperature-and-high-pressure liquid refrigerant is hardly compressed and enters the indoor heat-exchanger 104 through the first two-way valve 106 as it is.

[0006] When the second two-way valve 109 of the indoor heat-exchanger 104 is closed, the first heat-exchanger 104a discharges heat by suctioning the refrigerant mixed with the high-pressure liquid gas and discharges the high-pressure liquid refrigerant, and the second heat-exchanger 104b suctions the low-pressure liquid refrigerant through the second expansion device 108 and discharges the low-pressure-and-low-temperature refrigerant. Indoor air suctioned by an indoor fan 111 is dehumidified by heat-exchange while passing through the second heat-exchanger 104b and the dehumidified and cool dry air is heated by the first heat-exchanger 104a and the heater 107 and is discharged into the indoor.

[0007] Since the conventional air conditioner can dehumidify air introduced into the indoor heat-exchanger 104, dehumidification occurs only in the first indoor space where the indoor unit 100b is installed. However, in many households , laundry is usually dried in the balcony, which is usually an additional indoor space but separated from the first indoor space. The outdoor unit 100a is usually installed in the balcony. Accordingly, even though there is a need to dehumidify the balcony, it is not possible for the conventional air conditioner to dehumidify the balcony without causing inconvenience to the user as described below. Furthermore, the need to dehumidify the balcony is increased in the rainy season.

[0008] Although the conventional air conditioner can be used for dehumidifying of the balcony, i.e. the four-way valve can be used to change the direction of the refrigerant stream (air conditioner acts as a heat pump), this would mean that the indoor unit 100b discharges hot air so that the user becomes uncomfortable.

SUMMARY OF THE INVENTION

[0009] The present invention has been made in view of the above-mentioned problems, and an aspect of the invention is to provide an air conditioner capable of dehumidifying an indoor room where an indoor unit is installed as well as a space such as a balcony where an outdoor unit is installed.

[0010] In accordance with one aspect, the present invention provides an air conditioner including a compressor for compressing refrigerant, an outdoor heat-exchanger including a first and a second heat-exchangers for performing heat-exchange of the refrigerant discharged from the compressor, a first decompression device installed at a pipe through which the refrigerant discharged from the outdoor heat-exchanger passes, an indoor heat-exchanger for performing heat-exchange of the refrigerant discharged from the outdoor heat-exchanger, a second decompression device installed at a pipe connected to the first and the second heat-exchangers, and a first two-way valve installed at a pipe for refrigerant to bypass the second decompression device.

[0011] The air conditioner further includes a first bypass pipe for allowing the refrigerant to bypass the first decompression device and the indoor heat-exchanger, and a second two-way valve installed in the first bypass pipe.

[0012] The air conditioner further includes a second bypass pipe for connecting a discharge side of the com-

pressor to an inlet side of the compressor, and a third two-way valve installed in the second bypass pipe.

[0013] The air conditioner further includes a controller for controlling the first and the second decompression devices and the first, the second, and the third two-way valves.

[0014] The controller, in order to dehumidify only a first indoor space where the indoor heat-exchanger is installed in a first operation mode, opens the first decompression device at a predetermined degree, opens the second decompression device fully, opens the first two-way valve, and closes the second and the third two-way valves.

[0015] Moreover, the controller, in order to dehumidify a first indoor space where the indoor heat-exchanger is installed and a second indoor space where the outdoor heat-exchanger is installed in a second operation mode, opens the first and the second decompression devices and closes the first, the second, and the third two-way valves.

[0016] The controller, in order to dehumidify only a second indoor space where the outdoor heat-exchanger is installed in a third operation mode, closes the first decompression device, opens the second decompression device at a predetermined degree, closes the first two-way valve, and opens the second and the third two-way valves.

[0017] The air conditioner includes a first and a second heat-exchangers installed in an outdoor unit in a direction which an air stream flows, a decompression device installed a refrigerant path through which refrigerant flows from the first heat-exchanger to the second heat-exchanger, a bypass path for allowing the refrigerant the decompression device, and a two-way valve installed in the bypass path.

[0018] The outdoor unit includes a blower fan for forming an air stream to the first and the second heat-exchangers, and the blower fan, the second heat-exchanger, and the first heat-exchanger are sequentially installed.

[0019] Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] These and/or other aspects and advantages of the invention will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings in which:

FIG. 1 is a schematic view illustrating a conventional air conditioner;

FIG. 2 is a view illustrating an air conditioner according to a preferred embodiment of the present invention installed in a first room and a second room;

FIG. 3 is a schematic view illustrating the air conditioner in FIG. 2;

FIG. 4 is a view illustrating the circulation of refrigerant in a first operation mode of the air conditioner in FIG. 3;

FIG. 5 is a view illustrating the circulation of refrigerant in a second operation mode of the air conditioner in FIG. 3; and

FIG. 6 is a view illustrating the circulation of refrigerant in a third operation mode of the air conditioner in FIG. 3.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0021] Reference will now be made in detail to the embodiments of the present invention, examples of which are illustrated in the accompanying drawings. The embodiments are described below to explain the present invention by referring to the figures.

[0022] As shown in FIG. 2, an air conditioner 1 according to a preferred embodiment of the present invention includes an indoor unit 2 installed in a first indoor space A such as a room and an outdoor unit 3 installed in a second indoor space B such as a balcony. The indoor unit 2 is connected to the outdoor unit 3 via pipes 4 and 5 such that refrigerant circulates through them.

[0023] The indoor unit 2 suctions air in the first indoor space A and performs heat-exchange to discharge the suctioned air into the first indoor space A. The outdoor unit 3 suctions air in the second indoor space B and performs heat-exchange to discharge the suctioned air to outdoor C.

[0024] As shown in FIG. 3, in the outdoor unit 3, a discharge pipe 11 connected to a discharge port 10a of a compressor 10 is connected to an inlet port of an outdoor heat-exchanger 12. A discharge port of the outdoor heat-exchanger 12 is connected to the pipe 4 to which a first decompression device 13 is installed. The pipe 4 is connected to an indoor heat-exchanger 14 of the indoor unit 2, and the pipe 5 connected to the discharge port of the indoor heat-exchanger 14 is connected to an inlet port 10b of the compressor 10 to form a refrigerant circuit.

[0025] The outdoor heat-exchanger 12 includes a first heat-exchanger 21 and a second heat-exchanger 22, which are arranged in a path of an air stream 23a formed by a blower fan 23 in the order of the second heat-exchanger 22 and the first heat-exchanger 21. The first heat-exchanger 21 is formed with a refrigerant inlet port 21 a connected to the discharge pipe 11.

[0026] A discharge port 21 b of the first heat-exchanger 21 is connected to a pipe 24 which is branched into two branch pipes 25 and 26 halfway. The first branch pipe 25 is provided with a first two-way valve 27, and the second branch pipe 26 is provided with a second decompression device 28. The branch pipes 25 and 26 are combined into the pipe 24 again, and the pipe 24 is connected to an inlet port 22a of the second heat-exchanger 22.

[0027] The pipe 4 connected to the discharge port 22b

of the second heat-exchanger 22b is provided with the first decompression device 13 and is connected to the indoor unit 2. The indoor unit 2 includes the indoor heat-exchanger 14 and a blower fan 15 such that air in the indoor space A is suctioned and undergoes the heat-exchange, then the heat-exchanged air is discharged.

[0028] Meanwhile, in order for the refrigerant to bypass the first decompression device 13 and the indoor unit 14, there is provided a first bypass pipe 31 branched from the pipe 4 for connecting the second heat-exchanger 22 to the first decompression device 13 and connected to the pipe 5 connected to the inlet port 10b of the compressor 10. The first bypass 31 is provided with a second two-way valve 32 to interrupt the refrigerant passing through the first bypass pipe 31.

[0029] There is provided a second bypass pipe 33 branched from the discharge pipe 11 connected to the discharge port 10a of the compressor 10 and connected to the pipe 5 connected to the inlet port 10b of the compressor 10. The second bypass pipe 33 is provided with a third two-way valve 34 to interrupt the refrigerant passing through the second bypass pipe 33.

[0030] The first decompression device 13, the second decompression device 28, the first, the second, and the third two-way valves 27, 32, and 34 are controlled by a single controller 40.

[0031] Hereinafter, operation of the air conditioner according to the preferred embodiment of the present invention will be described.

[0032] In a first operation mode where only the first indoor space A is refrigerated or dehumidified, the controller 40 opens the first two-way valve 27 and closes the second and the third two-way valves 32 and 34. Moreover, the controller 40 opens the first decompression device 13 at a predetermined degree and closes the second decompression device 28 to circulate the refrigerant as shown in FIG. 4.

[0033] When the compressor 10 is driven, high-pressure refrigerant gas discharged from the compressor 10 enters the outdoor heat-exchanger 12. Since the first two-way valve 27 installed between the first heat-exchanger 21 and the second heat-exchanger 22 forming the outdoor heat-exchanger 12 is opened and the second decompression device 28 is closed, the high-pressure refrigerant gas is not expanded but is condensed into the refrigerant liquid after passing through the first and the second heat-exchangers 21 and 22.

[0034] The refrigerant liquid is transformed into decompressed two-phased refrigerant while passing through the first decompression device 13 and enters the indoor unit 2. The two-phased refrigerant entering the indoor unit 2 is evaporated in the indoor heat-exchanger 14 by heat-exchange with an air stream blown by the blower fan 15 and enters the compressor 10 again. In other words, in the first operation mode, a refrigerant circuit as that of the conventional air conditioner is formed.

[0035] In a second operation mode where the first indoor space A is refrigerated or dehumidified and the second indoor space B is dehumidified, the controller 40 closes the first, the second, and the third two-way valves 27, 32, and 34, and opens the first and the second decompression devices 13 and 28 at a predetermined degree to circulate the refrigerant as shown in FIG. 5.

[0036] When the compressor 10 is driven, the high-pressure refrigerant gas discharged from the compressor 10 enters the outdoor heat-exchanger 12. Since the first two-way valve 27 installed between the first and the second heat-exchangers 21 and 22 of the outdoor heat-exchanger 12 is closed and the second decompression device 28 is opened, the high-pressure refrigerant gas is condensed while passing through the first heat-exchanger 21 and undergoes phase-transform into the decompressed two-phased refrigerant while passing through the second decompression device 28.

[0037] The two-phased refrigerant discharged from the second decompression device 28 is evaporated in the second heat-exchanger 22 by heat-exchange with an air stream introduced by the blower fan 23 while the air stream introduced by the blower fan 23 is dehumidified and refrigerated due to heat absorption.

[0038] The air dehumidified and refrigerated by the second heat-exchanger 22 is sent to the surroundings of the first heat-exchanger 21 and is discharged into the second indoor space B as dehumidified air reheated by heat radiation of the first heat-exchanger 21.

[0039] Meanwhile, some of the two-phased refrigerant which is not evaporated in the second heat-exchanger 22 enters the indoor unit 22 and is evaporated in the indoor heat-exchanger 14 once again, and the air stream introduced by the blower fan 15 is dehumidified and refrigerated due to the heat absorption.

[0040] In other words, since, in the second operation mode, the heat-exchanger 21 serves as a condenser and the second heat-exchanger 22 and the indoor heat-exchanger 14 serve as evaporators, the first and the second indoor space A and B can be simultaneously dehumidified.

[0041] In a third operation mode where the second indoor space B is strongly dehumidified such as in a case in rainy seasons, the controller 40 closes the first two-way valve 27 and opens the second and the third two-way valves 32 and 34. Moreover, the controller 40 closes the first decompression device 13 and opens the second decompression device 28 at a predetermined degree to circulate the refrigerant as shown in FIG. 6.

[0042] When the compressor 10 is driven, the high-pressure refrigerant gas discharged from the compressor 10 enters the outdoor heat-exchanger 12. Since the first two-way valve 27 installed between the first and the second heat-exchangers 21 and 22 of the outdoor heat-exchanger 12 is closed and the second decompression device 28 is opened, the high-pressure refrigerant gas is condensed while passing through the first heat-exchanger 21 and undergoes phase-transform into the decompressed two-phased refrigerant while passing through the second decompression device 28.

[0043] The two-phased refrigerant discharged from the second decompression device 28 is evaporated in the second heat-exchanger 22 by heat-exchange with an air stream introduced by the blower fan 23 while the air stream introduced by the blower fan 23 is dehumidified and refrigerated due to heat absorption.

[0044] Meanwhile, the refrigerant discharged from the second heat-exchanger 22 does not enter the indoor unit 22 because the first decompression device 13 is closed but enters the inlet port 10b of the compressor 10 through the first bypass pipe 31.

[0045] In the third operation mode, since the refrigerant does not enter the indoor unit 2, a length of a path through which the refrigerant circulates is substantially shortened and quantity of refrigerant in the length of the refrigerant path is less than the total quantity of the refrigerant. In order to solve the problem, some of the refrigerant discharged from the compressor 10 is bypassed through the second bypass pipe 23 to secure a sufficient length of the refrigerant path, so that the problem that the total quantity of the refrigerant is much more in comparison to quantity of refrigerant in the length of the refrigerant path can be solved.

[0046] Particularly, in the third operation mode, since only the second heat-exchanger 22 serves as an evaporator and time of the refrigerant circulating is shortened, the second heat-exchanger 22 strongly dehumidifies air in the second indoor space B.

[0047] Although according to the air conditioner of the present invention a single indoor heat-exchanger 14 is provided in the indoor unit 2 to refrigerate and/or dehumidify the first indoor space A, the air conditioner of the present invention may be implemented with multiple heat -exchangers with out departing from the spirit of the invention.

[0048] More specifically, the air conditioner of the present invention may be provided with two heat-exchangers in the indoor heat-exchanger 14, branched refrigerant paths are formed between the two heat-exchangers, and two-way valves and decompression devices are respectively installed in the refrigerant paths such that the dehumidified air is reheated and discharged.

[0049] Furthermore, the outdoor unit 3 may be implemented with a different number of heat exchangers than the preferably disclosed two heat exchangers. It is further noted that various different elements may also be implemented in a different way by one of ordinarily skilled in the art without departing from the spirit of the invention.

[0050] As described above, according to the air conditioner of the present invention, the first indoor space where the indoor unit is installed and the second indoor space where the outdoor unit is installed are dehumidified simultaneously or selectively.

[0051] Particularly, even when the second indoor space where the outdoor unit is installed is dehumidified, the user does not feel uncomfortable.

[0052] Although a few embodiments of the present invention have been shown and described, it would be appreciated by those skilled in the art that changes may be made in this embodiment without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.

Claims

1. An air conditioner comprising:

   a compressor for compressing refrigerant;
   an outdoor heat-exchanger including a first and a second heat-exchangers for performing heat-exchange of the refrigerant discharged from the compressor;
   a first decompression device installed at a pipe through which the refrigerant discharged from the outdoor heat-exchanger passes;
   an indoor heat-exchanger for performing heat-exchange of the refrigerant discharged from the outdoor heat-exchanger;
   a second decompression device installed at a pipe connected to the first and the second heat-exchangers; and
   a first two-way valve installed at a pipe for refrigerant to bypass the second decompression device.

2. The air conditioner according to claim 1, further comprising:

   a first bypass pipe for allowing the refrigerant to bypass the first decompression device and the indoor heat-exchanger; and
   a second two-way valve installed in the first bypass pipe.

3. The air conditioner according to claim 2, further comprising:

   a second bypass pipe for connecting a discharge side of the compressor to an inlet side of the compressor; and
   a third two-way valve installed in the second bypass pipe.

4. The air conditioner according to claim 3, further comprising a controller for controlling the first and the second decompression devices and the first, the second, and the third two-way valves.

5. The air conditioner according to claim 4, wherein the controller, in order to dehumidify only a first indoor space where the indoor heat-exchanger is installed in a first operation mode, opens the first decompression device at a predetermined degree, closes the second decompression device fully, opens the first

two-way valve, and closes the second and the third two-way valves.

6. The air conditioner according to claim 4, wherein the controller, in order to dehumidify a first indoor space where the indoor heat-exchanger is installed and a second indoor space where the outdoor heat-exchanger is installed in a second operation mode, opens the first and the second decompression devices at a predetermined degree and closes the first, the second, and the third two-way valves.

7. The air conditioner according to claim 4, wherein the controller, in order to dehumidify only a second indoor space where the outdoor heat-exchanger is installed in a third operation mode, closes the first decompression device, opens the second decompression device at a predetermined degree, closes the first two-way valve, and opens the second and the third two-way valves.

8. An air conditioner comprising:

a first and a second heat-exchangers installed in an outdoor unit in a direction which an air stream flows;
a decompression device installed in a refrigerant path through which refrigerant flows from the first heat-exchanger to the second heat-exchanger;
a bypass path for allowing the refrigerant to bypass the decompression device; and
a two-way valve installed in the bypass path.

9. The air conditioner according to claim 8, wherein the outdoor unit comprises a blower fan for forming an air stream to the first and the second heat-exchangers, and the blower fan, the second heat-exchanger, and the first heat-exchanger are sequentially installed.

10. An air conditioner comprising:

a compressor for compressing refrigerant;
an outdoor heat-exchanger including at a plurality of heat-exchangers for performing heat-exchange of the refrigerant discharged from the compressor;
a first decompression device installed at a pipe through which the refrigerant discharged from the outdoor heat-exchanger passes;
an indoor heat-exchanger for performing heat-exchange of the refrigerant discharged from the outdoor heat-exchanger;
a second decompression device installed at a pipe connected between the plurality of heat-exchangers; and
a first two-way valve installed at a pipe for refrigerant to bypass the second decompression device.

11. The air conditioner according to claim 10, further comprising:

a first bypass pipe for allowing the refrigerant to bypass the first decompression device and the indoor heat-exchanger; and
a second two-way valve installed in the first bypass pipe.

12. The air conditioner according to claim 11, further comprising:

a second bypass pipe for connecting a discharge side of the compressor to an inlet side of the compressor; and
a third two-way valve installed in the second bypass pipe.

13. The air conditioner according to claim 12, wherein said indoor heat exchanger and said outdoor heat exchanger are located in first and second space respectively, said first and said second space capable of being separated.

14. The air conditioner according to claim 13, further comprising:

a controller for controlling said first and said second decompression device as well as said first, second and third two-way valve to selectively dehumidify said first and/or second space.

Fig.1

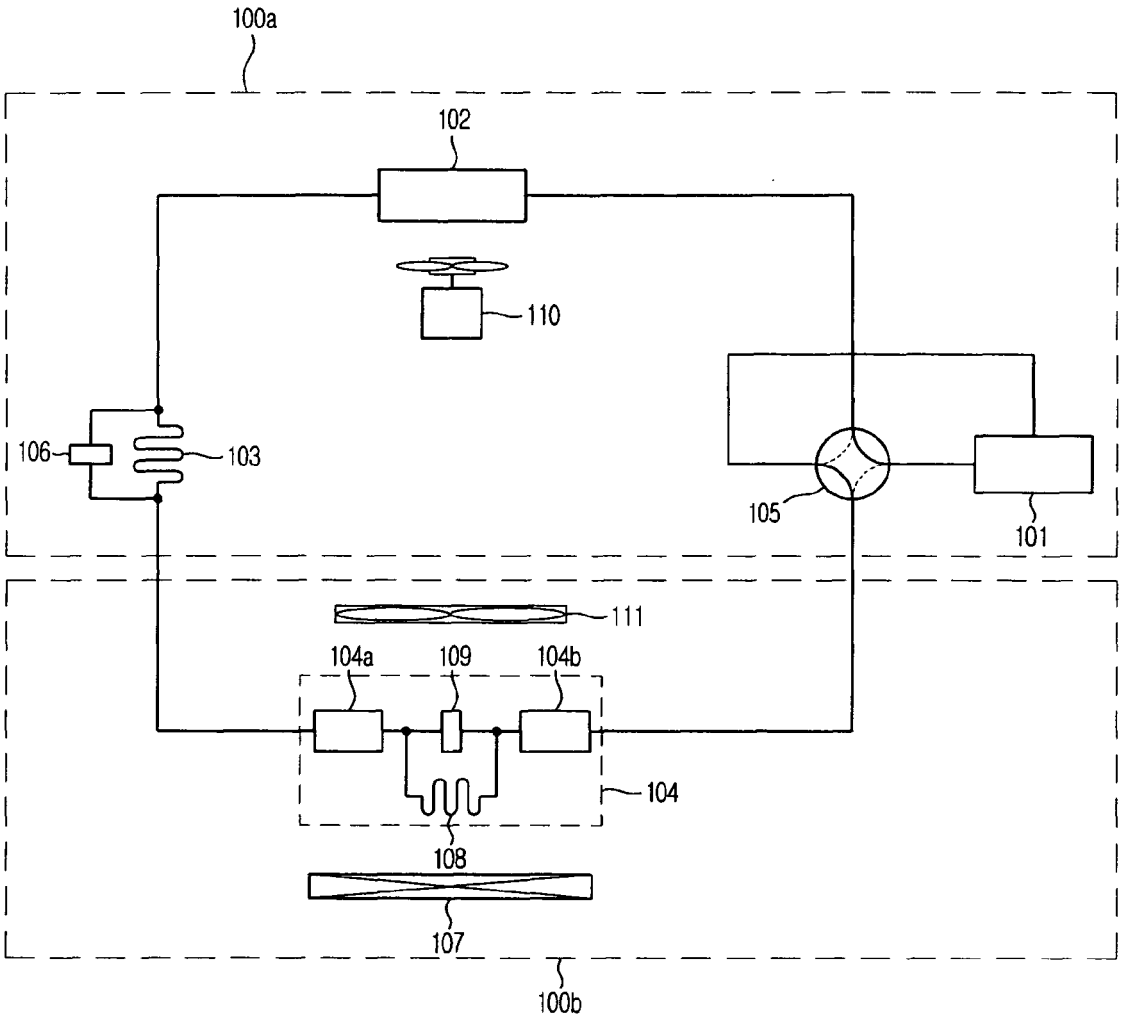

Fig.2

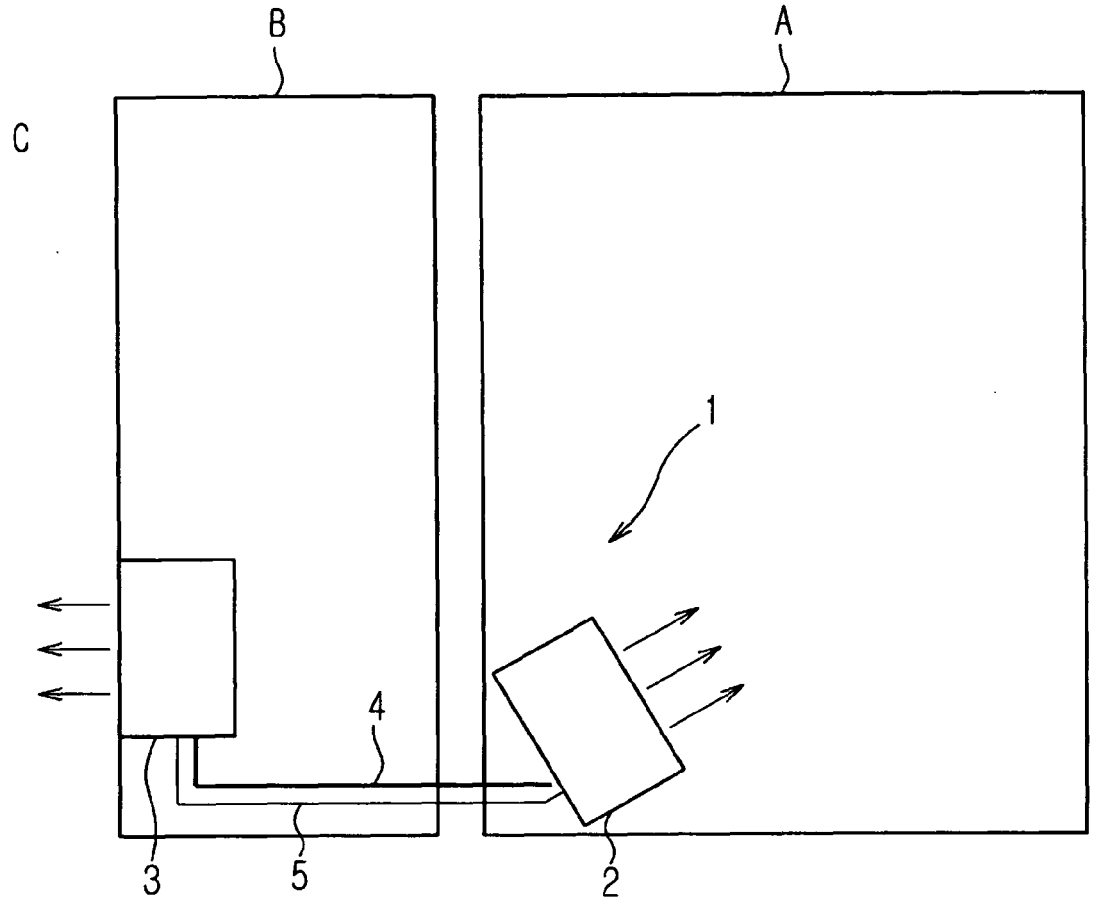

Fig.3

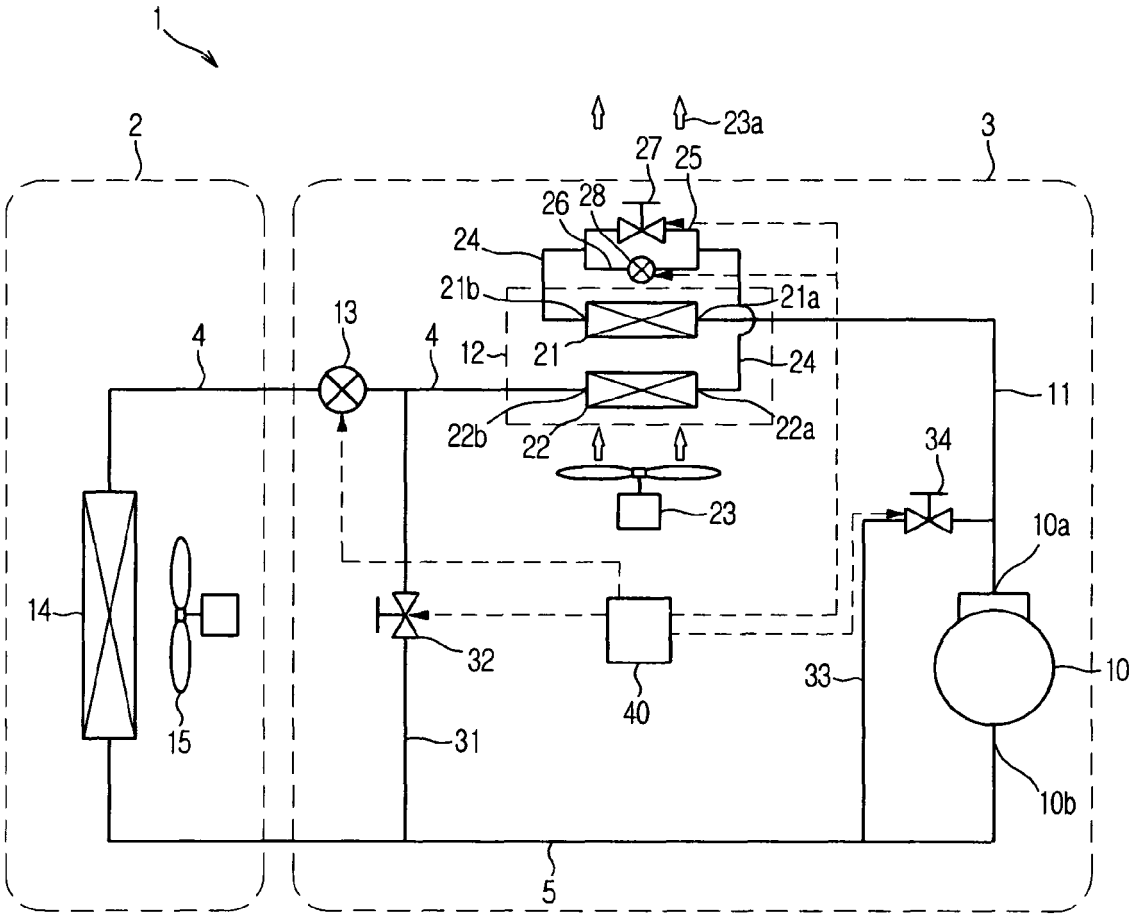
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Fig.4

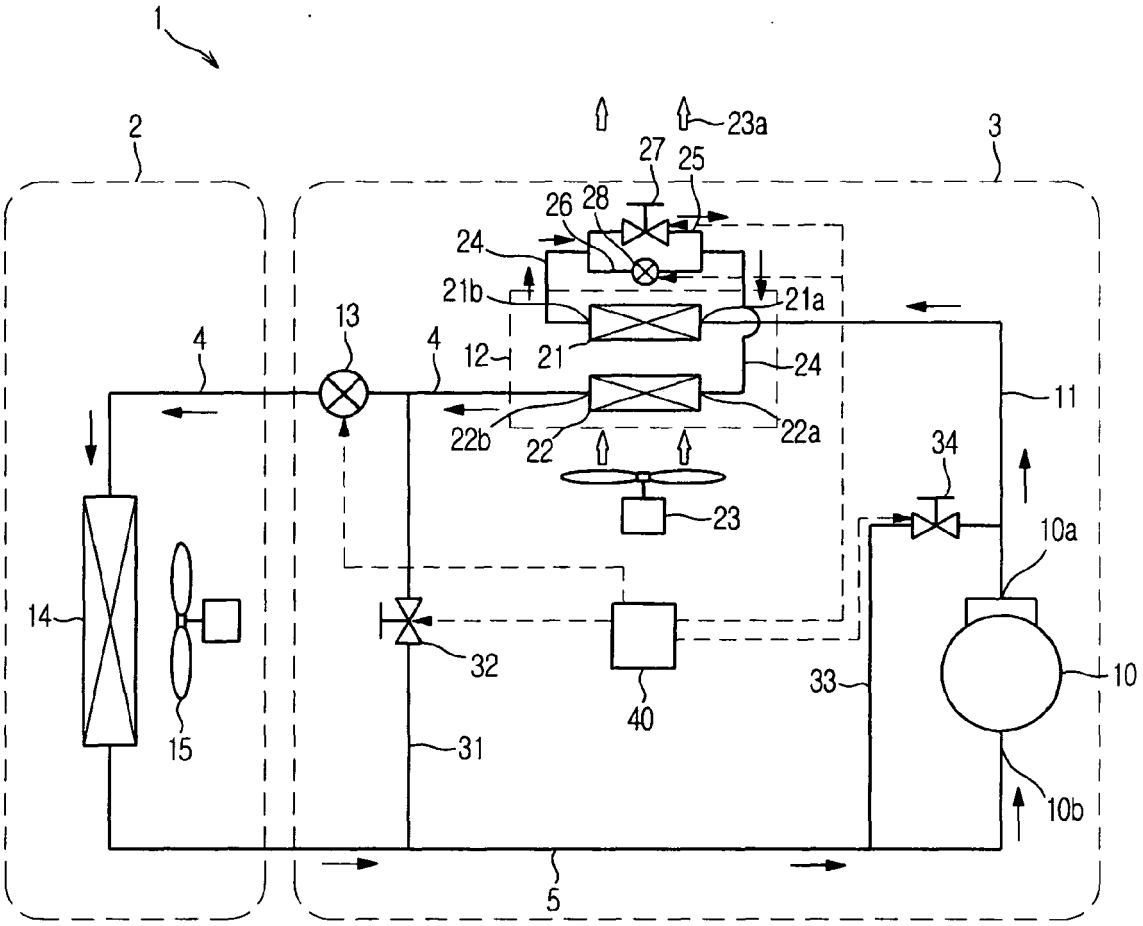
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Fig.5

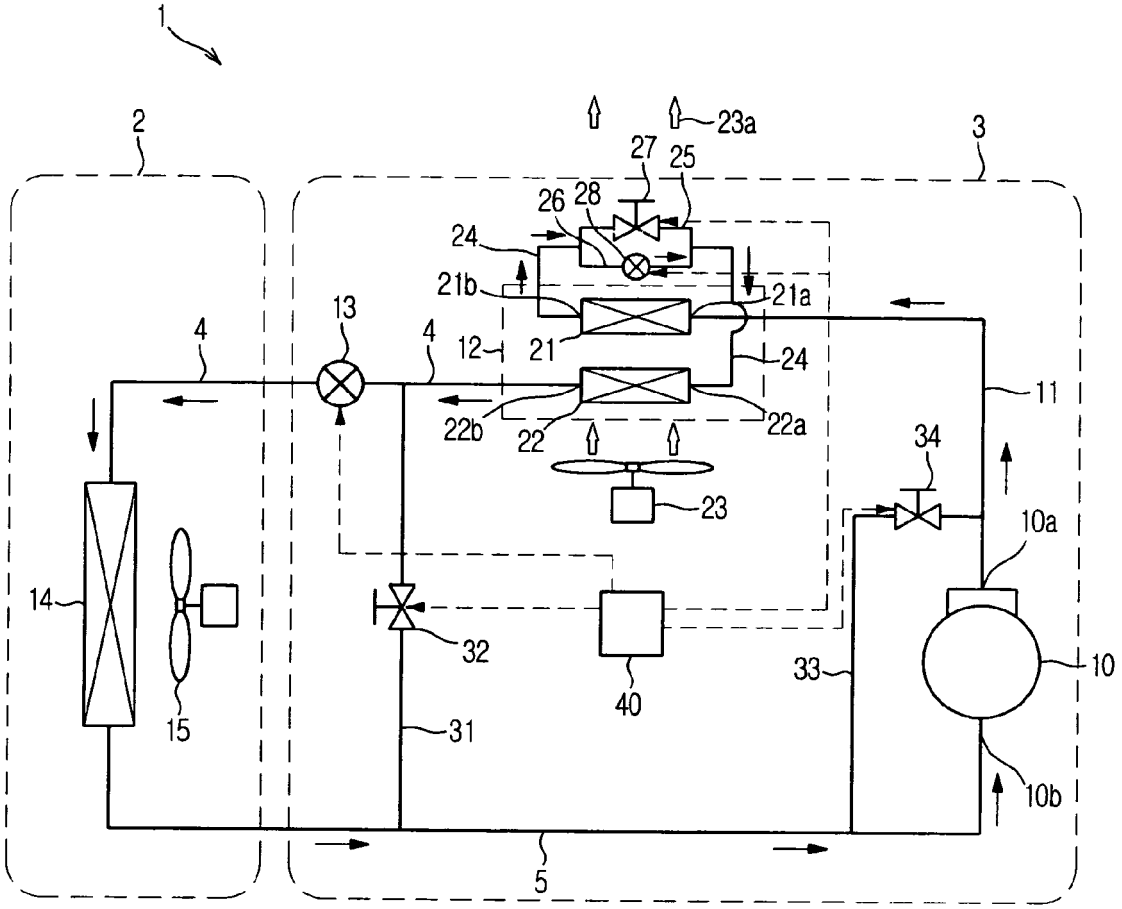
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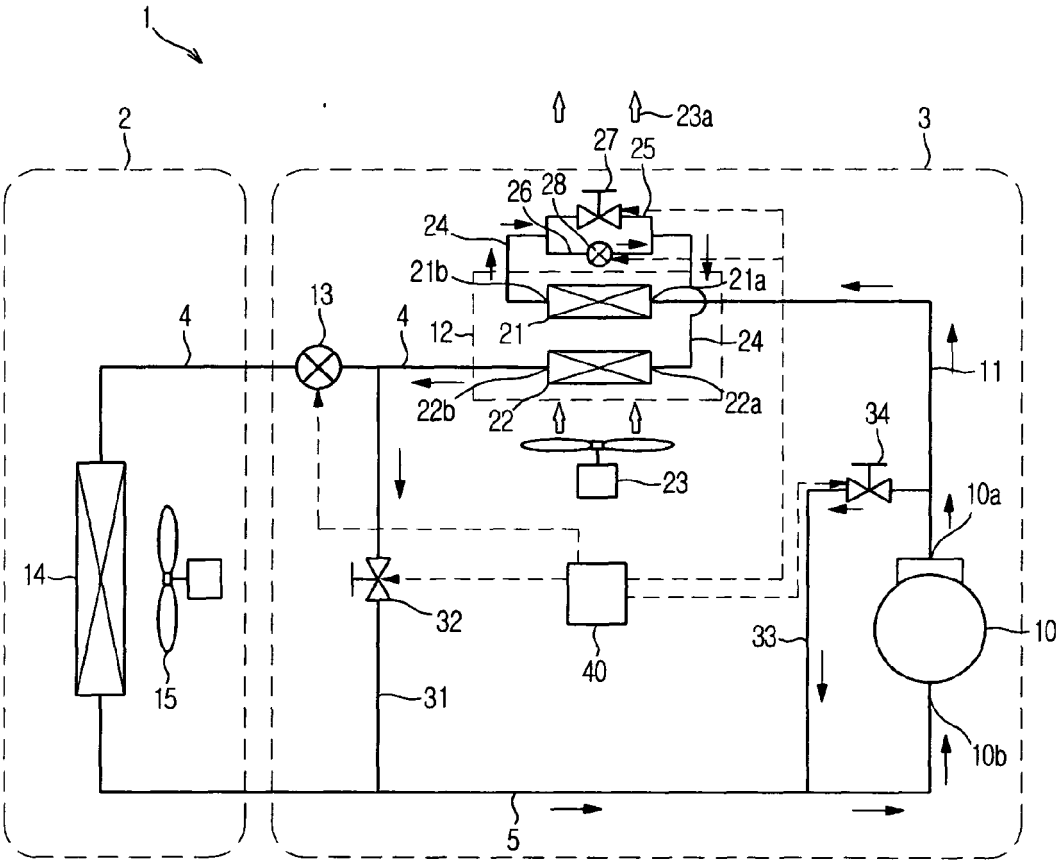
Fig.6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European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 01 1515

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 526 341 A1 (SAMSUNG ELECTRONICS CO LTD [KR]) 27 April 2005 (2005-04-27) * figure 2 *	1-7	INV. F24F3/153
A	JP 2001 330274 A (MITSUBISHI HEAVY IND LTD) 30 November 2001 (2001-11-30) * abstract *	1-14	
A	JP 59 150240 A (MATSUSHITA ELECTRIC IND CO LTD) 28 August 1984 (1984-08-28) * abstract *	1-14	
A	JP 2003 130387 A (FUJITSU GENERAL LTD) 8 May 2003 (2003-05-08) * abstract *	1-14	
A	JP 55 116058 A (SANYO ELECTRIC CO; TOKYO SANYO ELECTRIC CO) 6 September 1980 (1980-09-06) * abstract *	1-14	
			TECHNICAL FIELDS SEARCHED (IPC) F24F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	16 April 2007	Valenza, Davide

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

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16-04-2007

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1526341 A1	27-04-2005	CN 1609527 A	27-04-2005
		DE 602004001501 T2	22-02-2007
		JP 3857274 B2	13-12-2006
		JP 2005127687 A	19-05-2005
		KR 20050038115 A	27-04-2005
JP 2001330274 A	30-11-2001	NONE	
JP 59150240 A	28-08-1984	NONE	
JP 2003130387 A	08-05-2003	NONE	
JP 55116058 A	06-09-1980	JP 1176865 C	14-11-1983
		JP 58009895 B	23-02-1983

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- KR 20062277 **[0001]**