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(71) Applicant: **LG Electronics Inc.
Yongdungpo-gu
Seoul (KR)**

(72) Inventors:
• **Park, Bong-Soo
Gwanak-Gu
Seoul (KR)**

- **Oh, Sai-Kee
Dongan-Gu,
Anyang,
Gyeonggi-Do (KR)**
- **Song, Chi-Woo
Incheon (KR)**
- **Kim, Ju-Won
Gyeongsangnam-Do (KR)**
- **Chung, Baik-Young
Yongjong-Dong
Gyeyang-Gu
Incheon (KR)**
- **Chang, Se-Dong
Gyeonggi-Do (KR)**

(74) Representative: **Beyer, Andreas et al
Wuesthoff & Wuesthoff
Patent- und Rechtsanwälte
Schweigerstrasse 2
81541 München (DE)**

(54) **Air conditioning system**

(57) An air conditioning system comprises an indoor unit in which a first refrigerant flows, a first tank connected to an outlet side refrigerant line of the indoor unit for sucking a first refrigerant, a second tank connected to an inlet side refrigerant line of the indoor unit and directly connected to the first tank at a position lower than the first tank for feeding back the first refrigerant stored in the first tank to the indoor unit, a connection line disposed between the first tank and the second tank, a pressure

equalizing line disposed between the first tank and the second tank, a heat source cycle for cooling the first refrigerant inside the first tank by circulating a second refrigerant and heating the first refrigerant of the second tank, and a controller for controlling a plurality of switching valves installed at the connection line and the pressure equalizing line.

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to an air conditioning system, and more particularly, to an air conditioning system having an improved refrigerant circulation structure capable of smoothly feeding back a refrigerant that circulates a refrigerant circulation system.

2. Description of the Background Art

[0002] FIG. 1 is a construction view showing an air conditioning system in accordance with the conventional art.

[0003] As shown, the conventional air conditioning system comprises an indoor unit 111 for introducing a first refrigerant, a suction tank 121 connected to an outlet side refrigerant line 111b of the indoor unit 111 for sucking a first refrigerant, a discharge tank 141 disposed to be lower than the suction tank 121 and connected to an inlet side refrigerant line 111a of the indoor unit 111 for discharging a first refrigerant to the indoor unit 111, a middle tank 131 installed between the suction tank 121 and the discharge tank 141 for feeding back the first refrigerant stored in the suction tank 121 to the discharge tank 141, and a heat source cycle 150 for depressurizing and cooling the first refrigerant of the suction tank 121 by circulating a second refrigerant, and heating the first refrigerant of the discharge tank 141.

[0004] The discharge tank 141 is positioned to be lower than the middle tank 131, and the middle tank 131 is positioned to be lower than the suction tank 121. That is, the suction tank 121, the middle tank 131, and the discharge tank 141 are sequentially positioned.

[0005] A first connection line 125 for connecting a lower portion of the suction tank 121 to a lower portion of the middle tank 131 is installed between the suction tank 121 and the middle tank 131. A switching valve 137 is installed at the first connection line 125.

[0006] A first pressure equalizing line 123 for connecting a lower portion of the suction tank 121 to an upper portion of the middle tank 131 is installed between the suction tank 121 and the middle tank 131. The switching valve 137 is installed at the first pressure equalizing line 123.

[0007] A second connection line 135 for connecting a lower portion of the middle tank 131 to a lower portion of the discharge tank 141 is installed between the middle tank 131 and the discharge tank 141. The switching valve 137 is installed at the second connection line 135.

[0008] A second pressure equalizing line 133 for connecting an upper portion of the middle tank 131 to an upper portion of the discharge tank 141 is installed between the middle tank 131 and the discharge tank 141. The switching valve 137 is installed at the second pres-

sure equalizing line 133.

[0009] The heat source cycle 150 comprises a compressor 151 for compressing a second refrigerant, a condenser 153 connected to an outlet side refrigerant line 151a of the compressor 151 and heat-exchanging with a first refrigerant inside the discharge tank 141, an evaporator 155 connected to an inlet side refrigerant line 151b of the compressor 151 and heat-exchanging with a first refrigerant inside the suction tank 121, and an outdoor expansion valve 157 installed at an outlet side refrigerant line 153a of the condenser 153.

[0010] In the conventional air conditioning system, in case of the heat source cycle 150, a second refrigerant provided from the compressor 151 passes through the condenser 153, the outdoor expansion valve 157, and the evaporator 155, and then is returned to the compressor 151, which is repeated.

[0011] In case of a heat driving system 110, a first refrigerant supplied from the discharge tank 141 passes through the indoor unit 111, and then is fed back to the suction tank 121, the middle tank 131, and the discharge tank 141, which is repeated.

[0012] The first refrigerant inside the discharge tank 141 is heat-exchanged by the condenser 153 thus to be introduced into the indoor unit 111. Then, the first refrigerant introduced into the indoor unit 111 is heat-exchanged via an indoor expansion valve 115 and an indoor heat exchanger 113, thereby heating or cooling an indoor room.

[0013] The first refrigerant having passed through the indoor unit 111 is introduced into the suction tank 121, and then is heat-exchanged by the evaporator thus to be condensed. When the first refrigerant having an amount more than a certain degree is stored in the suction tank 121, a controller (not shown) controls each switching valve 137 of the first pressure equalizing line 123 and the first connection line 125. Accordingly, the first refrigerant stored in the suction tank 121 is fed back to the middle tank 131 by a height difference between the suction tank 121 and the middle tank 131 and by a gravitation.

[0014] Next, the controller controls each switching valve 137 of the second pressure equalizing line 133 and the second connection line 135 in the same manner as the aforementioned manner. Accordingly, the first refrigerant stored in the middle tank 131 is fed back to the discharge tank 141.

[0015] However, in the conventional air conditioning system, the first liquid refrigerant stored in the suction tank is fed back to the discharge tank via the middle tank. Accordingly, an entire volume of the air conditioning system is increased and an entire height of the air conditioning system is increased, thereby having a limitation in installing the air conditioning system and increasing a fabrication cost.

[0016] Furthermore, in the conventional air conditioning system, the first refrigerant has to be fed back by a height difference among the suction tank, the middle tank, and the discharge tank and by gravitation. Accord-

ingly, the first refrigerant more than a certain amount has to be stored in the suction tank and the discharge tank.

BRIEF DESCRIPTION OF THE INVENTION

[0017] Therefore, an object of the present invention is to provide an air conditioning system capable of simplifying an entire structure thereof, facilitating to be installed, and reducing a fabrication cost.

[0018] Another object of the present invention is to provide an air conditioning system capable of minimizing an amount of a first refrigerant stored in a first tank and a second tank.

[0019] To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described herein, there is provided an air conditioning system, comprising: an indoor unit in which a first refrigerant flows; a first tank (a suction tank) connected to an outlet side refrigerant line of the indoor unit for sucking a first refrigerant; a second tank (a discharge tank) disposed to be lower than the suction tank and connected to an inlet side refrigerant line of the indoor unit for feeding back the first refrigerant stored in the first tank to the indoor unit; a connection line disposed between the first tank and the second tank; a pressure equalizing line disposed between the first tank and the second tank; a heat source cycle for cooling the first refrigerant inside the suction tank by circulating a second refrigerant, and heating the first refrigerant of the discharge tank; and a controller for controlling a plurality of switching valves installed at the connection line and the pressure equalizing line.

[0020] On a heat driving system including the indoor unit, the first tank, and the second tank, the first refrigerant flows. However, on the heat source cycle, the second refrigerant flows.

[0021] In the heat driving system, the first refrigerant discharged from the second tank is introduced into the first tank via the indoor unit. The first gaseous refrigerant introduced into the first tank is cooled and depressurized by a cooling unit of the heat source cycle that will be later explained, and thus is condensed into a first liquid refrigerant. The first liquid refrigerant is directly fed back to the second tank without passing through a middle tank differently from the conventional art. Then, the first liquid refrigerant is introduced into the indoor unit via a cooling line at the time of a cooling operation, or is converted into a first gaseous refrigerant at the time of a heating operation thus to be introduced into the indoor unit via a heating line. The above circulation process is repeatedly performed.

[0022] The first tank is provided with a diaphragm therein, the diaphragm for dividing an inner space of the first tank into an upper space and a lower space.

[0023] A first liquid refrigerant feed back line is installed in the first tank, and a check valve for preventing a back-flow of a first liquid refrigerant is installed at the first liquid refrigerant feed back line.

[0024] One side of the connection line is connected to a lower portion of the first tank, and another side thereof is connected to a lower portion of the second tank. One side of the pressure equalizing line is connected to a lower portion of the first tank, and another side of the pressure equalizing line is connected to an upper portion of the second tank. The pressure equalizing line is positioned to be higher than the connection line.

[0025] A refrigerant level sensor for detecting a level of the first liquid refrigerant inside the first tank is installed in the lower space of the first tank.

[0026] The controller controls the switching valves according to a detected result of the refrigerant level sensor.

[0027] A cooling line is installed between the indoor unit and the second tank. One side of the cooling line is connected to a lower portion of the second tank and another side thereof is connected to the indoor unit so as to introduce a first liquid refrigerant into the indoor unit.

[0028] A heating line is installed between the indoor unit and the second tank. One side of the heating line is connected to an upper portion of the second tank and another side thereof is connected to the indoor unit so as to introduce a first gaseous refrigerant into the indoor unit. A heating line switching valve for switching the heating line is installed at the heating line.

[0029] The heat source cycle comprises a cooling unit installed at the first tank, a heating unit connected to the cooling unit and installed at the second tank, a compressor for supplying a second refrigerant to the cooling unit and the heating unit, a first four-way valve installed at an outlet side refrigerant line of the compressor, an accumulator installed between the compressor and the first four-way valve for introducing a second gaseous refrigerant to the compressor, an outdoor heat exchanger for selectively radiating a second refrigerant discharged from the compressor, a second four-way valve installed at an inlet side refrigerant line of the second tank, and an expansion valve installed at a refrigerant line between the cooling unit and the heating unit.

[0030] The foregoing and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention.

[0032] In the drawings:

FIG. 1 is a construction view showing an air conditioning system in accordance with the conventional

art;

FIG. 2 is a construction view showing an air conditioning system according to a preferred embodiment of the present invention, which shows a refrigerant flow at the time of a cooling operation;

FIG. 3 is a block diagram showing a control process of the air conditioning system of FIG. 2; and

FIG. 4 is a construction view showing the air conditioning system according to a preferred embodiment of the present invention, which shows a refrigerant flow at the time of a heating operation.

DETAILED DESCRIPTION OF THE INVENTION

[0033] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

[0034] Hereinafter, an air conditioning system according to a preferred embodiment of the present invention will be explained with reference to the attached drawings.

[0035] FIG. 2 is a construction view showing an air conditioning system according to a preferred embodiment of the present invention, which shows a refrigerant flow at the time of a cooling operation, FIG. 3 is a block diagram showing a control process of the air conditioning system of FIG. 2, and FIG. 4 is a construction view showing the air conditioning system according to a preferred embodiment of the present invention, which shows a refrigerant flow at the time of a heating operation.

[0036] As shown, the air conditioning system according to the present invention comprises an indoor unit 11 for introducing a first refrigerant, a first tank 21 connected to an outlet side refrigerant line 11a of the indoor unit 11 for sucking a first refrigerant, a second tank 41 directly connected to the first tank 21 at a position lower than the first tank 21 and connected to an inlet side refrigerant line 11b of the indoor unit 11 for feeding back the first refrigerant stored in the first tank 21 to the indoor unit, a connection line 31 disposed between the first tank 21 and the second tank 41, a pressure equalizing line 35 disposed between the first tank 21 and the second tank 41, a heat source cycle 2 for cooling the first refrigerant inside the first tank 21 by circulating a second refrigerant and heating the first refrigerant of the second tank 41, and a controller 65 for controlling a plurality of switching valves 33 and 37 installed at the connection line 31 and the pressure equalizing line 35.

[0037] The indoor unit 11 is installed at an indoor room in order to perform a cooling operation or a heating operation. An indoor heat exchanger 13 and an indoor expansion valve 15 are installed in the indoor unit 11.

[0038] On a heat driving system 1 including the indoor unit 11, the first tank 21, and the second tank 41, the first refrigerant flows. However, on the heat source cycle 2, the second refrigerant flows. The first refrigerant and the second refrigerant are converted into a liquid phase and a gaseous phase while flowing on the heat driving system and the heat source cycle, respectively, thereby perform-

ing a heat exchange.

[0039] In the heat driving system 1, the first refrigerant discharged from the second tank 41 is introduced into the first tank 21 via the indoor unit 11. A first gaseous refrigerant of the first refrigerant introduced into the first tank 21 is cooled and depressurized by a cooling unit 54 of the heat source cycle 2 that will be later explained, and thus is condensed into a first liquid refrigerant. The first liquid refrigerant is directly fed back to the second tank 41 by the controller 65 without passing through a middle tank differently from the conventional art.

[0040] Then, the first liquid refrigerant fed back to the second tank 41 is introduced into the indoor unit 11 via a cooling line 43 with a low temperature and pressure state at the time of a cooling operation. On the contrary, at the time of a heating operation, the first gaseous refrigerant of an upper space 41a of the second tank 41 is introduced into the indoor unit 11 via a heating line 47 with a high temperature and pressure state. The above circulation process is repeatedly performed.

[0041] The first tank 21 is provided with a diaphragm 23 therein, the diaphragm for dividing an inner space of the first tank 21 into an upper space 21a and a lower space 21b.

[0042] A first liquid refrigerant feed back line 25 for feeding back the first liquid refrigerant disposed on the diaphragm 23 of the upper space 21a to the lower space 21b is installed in the first tank 21.

[0043] Also, a check valve 27 for preventing a backflow of the first liquid refrigerant is installed at the first liquid refrigerant feed back line 25.

[0044] Preferably, the diaphragm 23 is horizontally installed for the following reason. The first gaseous refrigerant introduced into the first tank 21 is condensed into a first liquid refrigerant, and then is disposed on the diaphragm 23. The first liquid refrigerant disposed on the diaphragm 23 is smoothly fed back to the second tank 41 through the first liquid refrigerant feed back line 25 and a connection line 31 that will be later explained.

[0045] One side of the connection line 31 is connected to a lower portion of the first tank 21, and another side thereof is connected to a lower portion of the second tank 41. The switching valve 33 for selectively opening or closing the connection line 31 is installed at the connection line 31.

[0046] One side of the pressure equalizing line 35 is connected to a lower portion of the first tank 21, and another side of the pressure equalizing line 35 is connected to an upper portion of the second tank 41. The switching valve 37 for selectively opening or closing the pressure equalizing line 35 is installed at the pressure equalizing line 35. The pressure equalizing line 35 is positioned to be higher than the connection line 31.

[0047] A refrigerant level sensor 28 for detecting a level of the first liquid refrigerant inside the first tank 21 is installed in the lower space 21b of the first tank 21.

[0048] The controller 65 controls a first four-way valve and a second four-way valve at the time of a cooling

operation and a heating operation. Also, the controller 65 controls the switching valves 33 and 37 according to a detected result of the refrigerant level sensor 28.

[0049] The cooling line 43 is installed between the indoor unit 11 and the second tank 41. One side of the cooling line 43 is connected to a lower portion of the second tank 41 and another side thereof is connected to the indoor unit 11 so that the first liquid refrigerant can be introduced into the indoor unit 11. A switching valve 45 for selectively opening or closing the cooling line 43 is installed at the cooling line 43.

[0050] The heating line 47 is installed between the indoor unit 11 and the second tank 41. One side of the heating line 47 is connected to an upper portion of the second tank 41 and another side thereof is connected to the indoor unit 11 so that the first liquid refrigerant can be introduced into the indoor unit 11. A switching valve 49 for selectively opening or closing the heating line 47 is installed at the heating line 43.

[0051] The heat source cycle comprises a cooling unit 54 installed at the first tank 21, a heating unit 52 connected to the cooling unit 54 and installed at the second tank 41, a compressor 51 for supplying a second refrigerant to the cooling unit 54 and the heating unit 52, a first four-way valve 53 installed at an outlet side refrigerant line 51a of the compressor 51 for converting a second refrigerant line, an accumulator 59 installed between the compressor 51 and the first four-way valve 53 for introducing a second gaseous refrigerant to the compressor 51, an outdoor heat exchanger 55 for selectively radiating a second refrigerant discharged from the compressor 51, a second four-way valve 61 installed at an inlet side refrigerant line 41a of the second tank 41 for converting a second refrigerant line, and an expansion valve 63 installed at a refrigerant line between the cooling unit 54 and the heating unit 52.

[0052] The cooling unit 54 is installed in the first tank 21, and the heating unit 52 is installed in the second tank 41.

[0053] Besides the structure that the cooling unit 54 is installed in the first tank 21 and the heating unit 52 is installed in the second tank 41, any structure for cooling the first refrigerant of the first tank 21 and heating the first refrigerant of the second tank 41 is possible. An unexplained reference numeral 57 denotes a fan.

[0054] An operation of the air conditioning system according to the preferred embodiment of the present invention will be explained.

[0055] As shown in FIG. 2, the second refrigerant that circulates on the heat source cycle 2 is compressed by the compressor 51 at the time of a cooling operation. Then, the refrigerant passes through the first four-way valve 53, the outdoor heat exchanger 55, the second four-way valve 61, the heating unit 52, the outdoor expansion valve 63, the cooling unit 54, the second four-way valve 61, the first four-way valve 53, and the accumulator 59, and then is introduced into the compressor 51. The above circulation process is repeatedly per-

formed.

[0056] The controller 65 closes the heating line switching valve 49, but opens the cooling line switching valve 45. Accordingly, the first liquid refrigerant stored in the second tank 41 is introduced into the indoor unit 11 through the cooling line 43 and the inlet side refrigerant line 11b of the indoor unit 11. The first liquid refrigerant introduced into the indoor unit 11 passes through the indoor expansion valve 15 and the indoor heat exchanger 13 thus to be expanded and heat-exchanged. Then, the first liquid refrigerant absorbs latent heat, and thereby cools the indoor room.

[0057] A first gaseous refrigerant vaporized after passing through the indoor expansion valve 15 is introduced into the first tank 21 via the outlet side refrigerant line 11b of the indoor unit 11. Then, the first gaseous refrigerant is cooled by the cooling unit 54, depressurized, condensed into a first liquid refrigerant, and then is disposed on the diaphragm 23.

[0058] When a certain amount of the first liquid refrigerant is stored in the lower space 21b of the first tank 21 by a pressure difference that will be later explained, the refrigerant level sensor 28 detects the first liquid refrigerant.

[0059] The controller 65 opens the switching valves 33 and 37, and opens the connection line 31 and the pressure equalizing line 35, thereby feeding back the first liquid refrigerant stored in the lower space 21b to the second tank 41.

[0060] Since the second tank 41 is positioned to be lower than the first tank 21, the first liquid refrigerant is fed-back to the second tank 41 from the first tank 21 by a gravitation difference.

[0061] The first gaseous refrigerant of the second tank 41 is introduced into the lower space 21b of the first tank 21 through the pressure equalizing line 35. Then, when the controller 65 closes the connection line 31 and the pressure equalizing line 35, the first gaseous refrigerant introduced into the lower space 21b of the first tank 21 loses its heat by the first liquid refrigerant stored in the upper space 21a of the first tank 21 thereby to be condensed into a first liquid refrigerant. Under the state, a pressure difference between the upper space 21a and the lower space 21b of the first tank 21 is generated. Accordingly, the first liquid refrigerant disposed on the diaphragm 23 in the upper space 21a is introduced into the lower space 21b of the first tank 21 through the first liquid refrigerant line 25. The first liquid refrigerant stored in the lower space 21b of the first tank 21 is fed-back to the second tank 41 in the same manner as the aforementioned manner.

[0062] The first liquid refrigerant fed-back to the second tank 41 thus to be stored in the lower space 41b of the second tank 41 is introduced into the indoor unit 11 through the cooling line 43. Then, the first liquid refrigerant passes through the indoor expansion valve 15 and the indoor heat exchanger 13 thus to be expanded and heat-exchanged, thereby cooling the indoor room.

[0063] The first gaseous refrigerant is introduced into the first tank 21 via the outlet side refrigerant line 11b of the indoor unit 11. Then, the first gaseous refrigerant is cooled by the cooling unit 54, depressurized, condensed into a first liquid refrigerant, and then is disposed on the diaphragm 23 of the first tank 21. The above circulation process is repeatedly performed.

[0064] As shown in FIG. 4, the second refrigerant that circulates on the heat source cycle 2 is compressed by the compressor 51 at the time of a heating operation. Then, the refrigerant passes through the first four-way valve 53, the second four-way valve 61, the heating unit 52, the outdoor expansion valve 63, the cooling unit 54, the second four-way valve 61, the outdoor heat exchanger 55, the first four-way valve 53, and the accumulator 59, and then is introduced into the compressor 51. The above circulation process is repeatedly performed.

[0065] The controller 65 closes the switching valve 45, but opens the switching valve 49. Accordingly, the first gaseous refrigerant stored in the second tank 41 is introduced into the indoor unit 11 through the heating line 47 and the inlet side refrigerant line 11a of the indoor unit 11. The first gaseous refrigerant introduced into the indoor unit 11 passes through the indoor expansion valve 15 and is heat-exchanged by the indoor heat exchanger 13, thereby heating the indoor room.

[0066] The first gaseous refrigerant having passed through the indoor heat exchanger 13 is introduced into the first tank 21 via the outlet side refrigerant line 11a of the indoor unit 11. Then, the first gaseous refrigerant is cooled by the cooling unit 54, depressurized, condensed into a first liquid refrigerant, and then is disposed on the diaphragm 23 of the first tank 21.

[0067] The first liquid refrigerant disposed on the diaphragm 23 inside the upper space 21a is introduced into the lower space 21b of the first tank 21 by the aforementioned pressure difference between the upper space 21a and the lower space 21b. When a certain amount of the first liquid refrigerant is stored in the lower space 21b, the controller 65 feeds back the first liquid refrigerant inside the lower space 21b of the first tank 21 to the second tank 41.

[0068] The first liquid refrigerant fed-back to the second tank 41 thus to be stored in the lower space 41b of the second tank 41 is introduced into the indoor unit 11 through the heating line 47. Then, the first liquid refrigerant passes through the indoor expansion valve 15 and the indoor heat exchanger 13 thus to heat-exchanged, thereby heating the indoor room.

[0069] The first gaseous refrigerant having passed through the indoor heat exchanger 13 is introduced into the upper space 21a of the first tank 21 through the outlet side refrigerant line 11a of the indoor unit 11. Then, the first gaseous refrigerant is cooled by the cooling unit 54, depressurized, condensed into a first liquid refrigerant, and then is disposed on the diaphragm 23 of the first tank 21.

[0070] As aforementioned, in the present invention,

the first liquid refrigerant stored in the first tank is fed-back to the second tank without passing through a middle tank. Accordingly, a height difference between the first tank and the second tank is decreased, thereby simplifying an entire structure of the air conditioning system, facilitating to install the air conditioning system, and reducing a fabrication cost.

[0071] Furthermore, in the present invention, since the first refrigerant is fed-back not only by the height difference between the first tank and the second tank but also by the diaphragm installed in the first tank, an amount of the first refrigerant stored in the first tank and the second tank is more decreased than in the conventional art.

[0072] As the present invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, it should also be understood that the above-described embodiments are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be construed broadly within its spirit and scope as defined in the appended claims, and therefore all changes and modifications that fall within the metes and bounds of the claims, or equivalence of such metes and bounds are therefore intended to be embraced by the appended claims.

Claims

1. An air conditioning system, comprising:

an indoor unit in which a first refrigerant flows;
a first tank connected to an outlet side refrigerant line of the indoor unit for sucking a first refrigerant;
a second tank connected to an inlet side refrigerant line of the indoor unit and directly connected to the first tank at a position lower than the first tank for feeding back the first refrigerant stored in the first tank to the indoor unit;
a connection line disposed between the first tank and the second tank;
a pressure equalizing line disposed between the first tank and the second tank;
a heat source cycle for cooling the first refrigerant inside the first tank by circulating a second refrigerant, and heating the first refrigerant of the second tank; and
a controller for controlling a plurality of switching valves installed at the connection line and the pressure equalizing line.

2. The air conditioning system of claim 1, wherein the heat source cycle comprises:

a cooling unit installed at the first tank;
a heating unit connected to the cooling unit and installed at the second tank;
a compressor for supplying a second refrigerant

- to the cooling unit and the heating unit;
 a first four-way valve installed at an outlet side
 refrigerant line of the compressor;
 an accumulator installed between the compres- 5
 sor and the first four-way valve for introducing a
 second gaseous refrigerant to the compressor;
 an outdoor heat exchanger for selectively radi-
 ating a second refrigerant discharged from the
 compressor;
 a second four-way valve installed at an inlet side 10
 refrigerant line of the second tank; and
 an expansion valve installed at a refrigerant line
 between the cooling unit and the heating unit.
3. The air conditioning system of claim 2, wherein the 15
 cooling unit is installed in the first tank, and the heat-
 ing unit is installed in the second tank.
4. The air conditioning system of claim 1, further com- 20
 prising:
- a diaphragm installed in the first tank for dividing
 an inner space of the first tank into an upper
 space and a lower space;
 a first liquid refrigerant feed back line connecting 25
 the upper space to the lower space and installed
 in the first tank, for feeding back the first liquid
 refrigerant of the first tank into the second tank;
 and
 a check valve installed at the first liquid refriger- 30
 ant feed back line.
5. The air conditioning system of claim 4, wherein the 35
 diaphragm is horizontally disposed.
6. The air conditioning system of claim 1, wherein one 40
 side of the connection line is connected to a lower
 portion of the first tank and another side of the con-
 nection line is connected to a lower portion of the
 second tank, one side of the pressure equalizing line
 is connected to a lower portion of the first tank and 45
 another side of the pressure equalizing line is con-
 nected to an upper portion of the second tank, and
 the pressure equalizing line is positioned to be higher
 than the connection line.
7. The air conditioning system of claim 1, wherein a 50
 refrigerant level sensor for detecting a level of the
 first liquid refrigerant inside the first tank is installed
 in the first tank.
8. The air conditioning system of claim 1, further com-
 prising:
- a cooling line having one side connected to a 55
 lower portion of the second tank and another
 side connected to the indoor unit, for introducing
 a first liquid refrigerant into the indoor unit.
- a cooling line switching valve installed at the
 cooling line for selectively opening or closing the
 cooling line;
 a heating line having one side connected to an
 upper portion of the second tank and another
 side connected to the indoor unit, for introducing
 a first gaseous refrigerant into the indoor unit;
 and
 a heating line switching valve installed at the
 heating line for selectively opening or closing
 the heating line.

FIG. 1

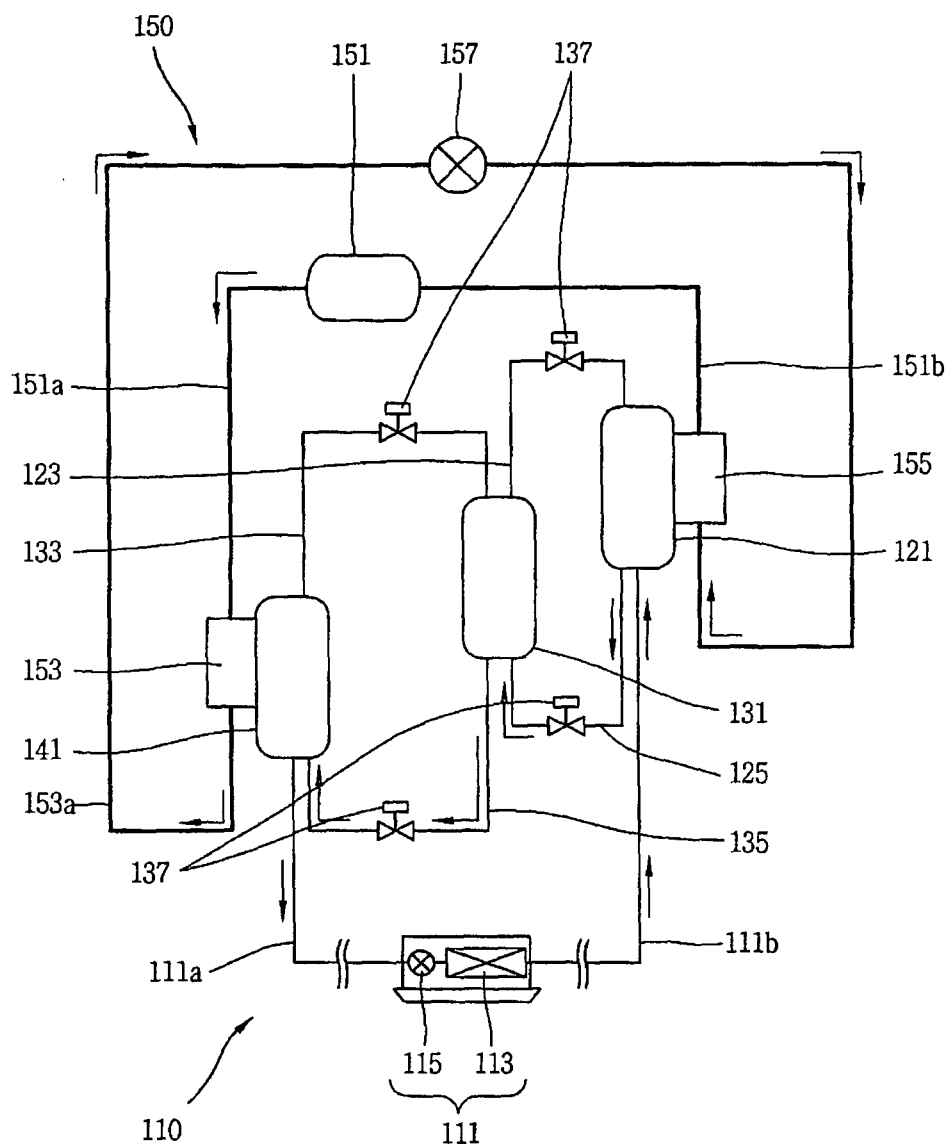


FIG. 2

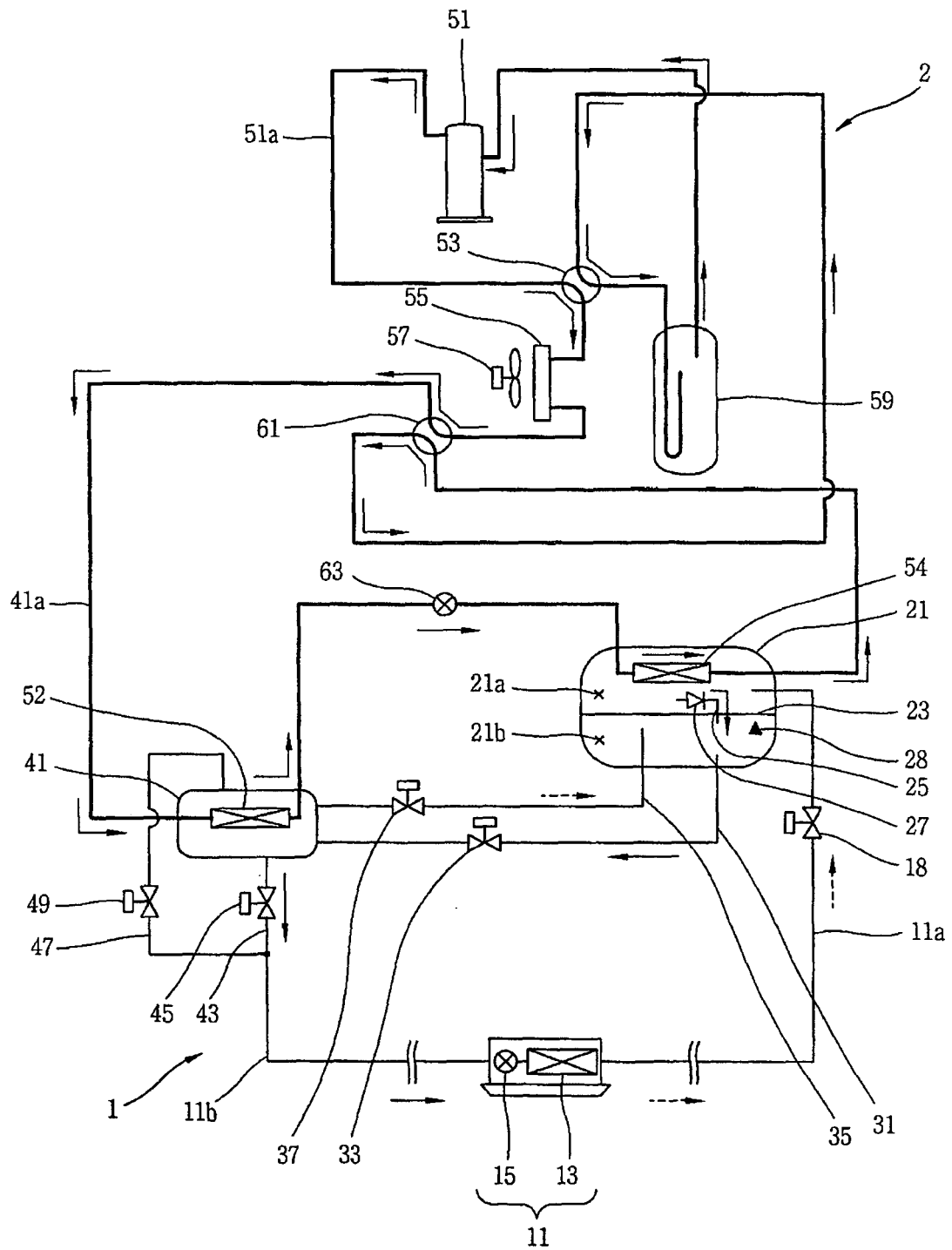


FIG. 3

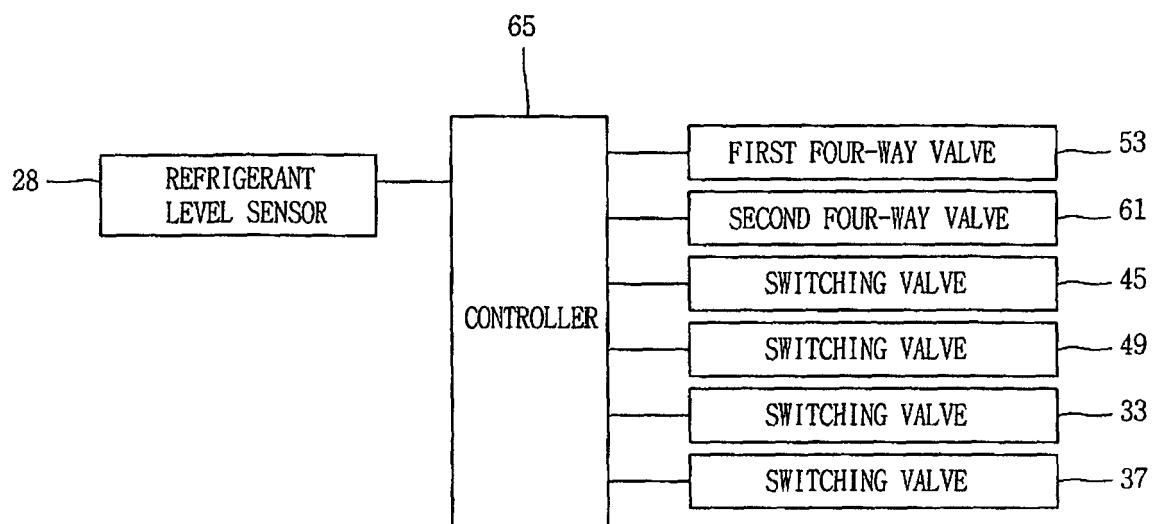
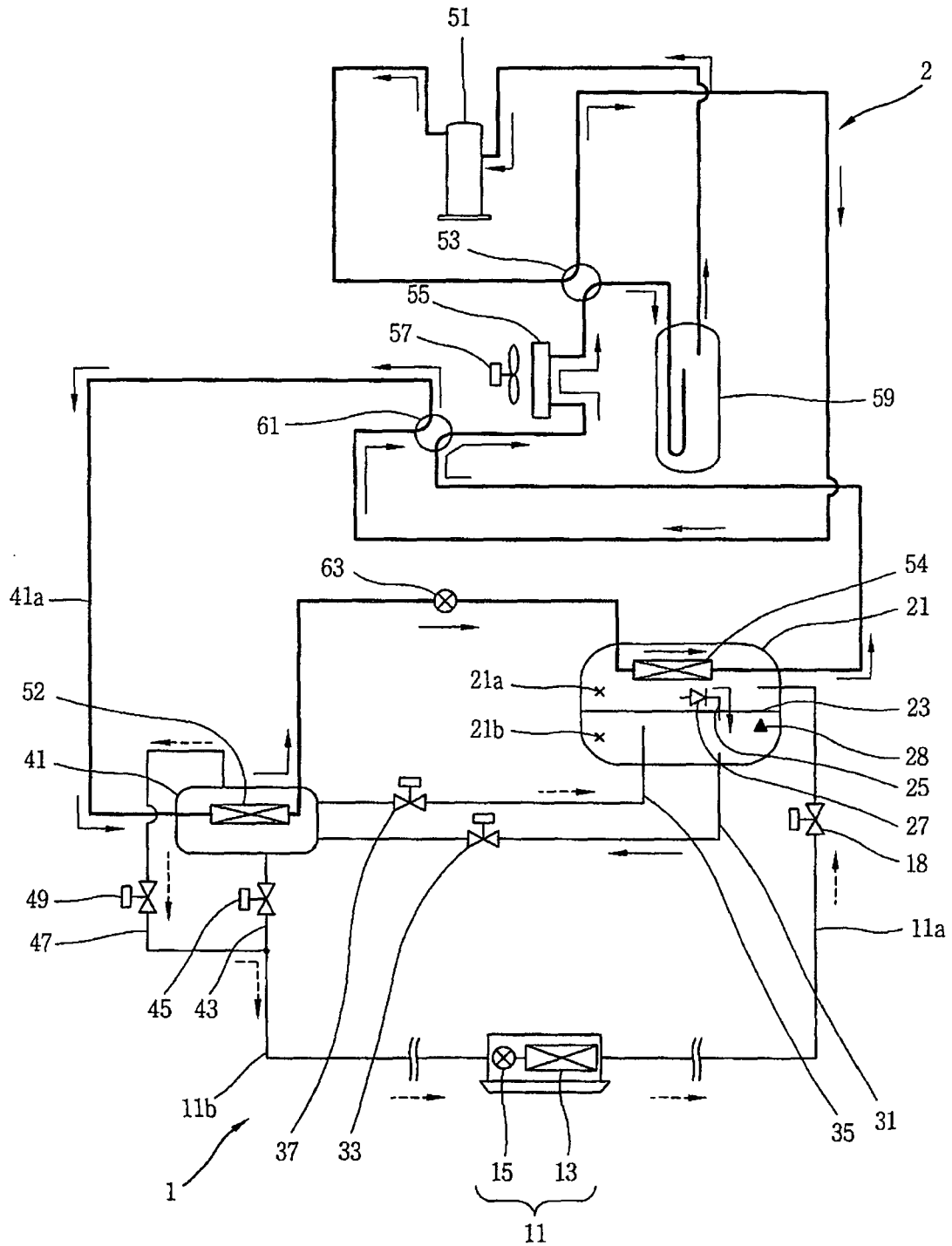


FIG. 4





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 02 5348

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 3 March 2006	Examiner Valenza, D
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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