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(71) Applicant: **Mitsubishi Heavy Industries, Ltd.**
Tokyo 108-8215 (JP)

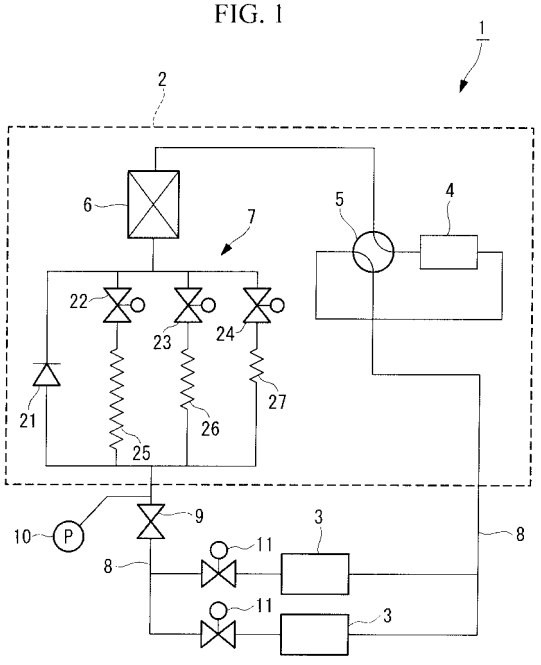
(72) Inventors:
- **YASUDA, Tatsuhiro**
  Kiyosu-shi
  Aichi 452-8561 (JP)
- **ISOZUMI, Shinichi**
  Kiyosu-shi
  Aichi 452-8561 (JP)
- **MITOMA, Keisuke**
  Kiyosu-shi
  Aichi 452-8561 (JP)
- **MAENO, Masashi**
  Nagoya-shi
  Aichi 453-8515 (JP)
- **WATANABE, Satoshi**
  Nagoya-shi
  Aichi 453-8515 (JP)
- **UEFUJI, Yoichi**
  Nagoya-shi
  Aichi 453-8515 (JP)

(74) Representative: **Intès, Didier Gérard André et al**
Cabinet Beau de Loménie
158, rue de l'Université
75340 Paris Cedex 07 (FR)

(54) MULTIPLE AIR CONDITIONER

(57) A liquid head pressure applied to an electronic expansion valve disposed in front (at the inlet) of an indoor heat exchanger is reduced so as to prevent failure in opening and closing (operation failure) of the electronic expansion valve. In a multi-unit air conditioner (1) including a single outdoor unit (2) and a plurality of indoor units (3) disposed below the outdoor unit (2) and connected to the outdoor unit (2) via a coolant pipe (8), a decompressing mechanism (7) including three electromagnetic on-off valves (22, 23, 24) and three capillary tubes (25, 26, 27) having different lengths is provided near an outlet, for cooling operation, of the outdoor unit (2), and a unit constituted of each electromagnetic on-off valve and each capillary tube connected to the electromagnetic on-off valve is arranged in parallel with the coolant pipe (8).

FIG. 1



EP 2 416 090 A1

Description

{Technical Field}

[0001] The present invention relates to multi-unit air conditioners, and particularly, to a multi-unit air conditioner in which a head difference of a liquid coolant occurs between an outdoor unit and an indoor unit disposed below the outdoor unit.

{Background Art}

[0002] A known example of a multi-unit air conditioner in which a head difference of a liquid coolant occurs between an outdoor unit and an indoor unit disposed below the outdoor unit is a type having an electronic expansion valve disposed in front of (i.e., at the inlet of) an indoor heat exchanger (for example, see PTL 1).

{Citation List}

{Patent Literature}

[0003]

{PTL 1}
Japanese Unexamined Patent Application, Publication No. 2008-185292

{Summary of Invention}

{Technical Problem}

[0004] However, if such a multi-unit air conditioner is installed in a tall building, the difference in elevation between the outdoor unit and the indoor unit can sometimes be nearly 100 m. In such a case, in the multi-unit air conditioner (refrigeration device) disclosed in PTL 1 mentioned above, an excessive liquid head pressure (i.e., a pressure due to the head difference of the liquid coolant) is applied to the electronic expansion valve, possibly resulting in an inability to open and close the electronic expansion valve.

[0005] In view of the circumstances described above, the present invention provides a multi-unit air conditioner that can reduce the liquid head pressure applied to the electronic expansion valve disposed in front (i.e., at the inlet) of the indoor heat exchanger so as to prevent failure in opening and closing (operation failure) of the electronic expansion valve.

{Solution to Problem}

[0006] In order to solve the aforementioned problems, the present invention employs the following solutions.
In a first aspect of a multi-unit air conditioner according to the present invention, the multi-unit air conditioner includes a single outdoor unit and a plurality of indoor units disposed below the outdoor unit and connected to the outdoor unit via a coolant pipe. A decompressing mechanism including at least two electromagnetic on-off valves and at least two capillary tubes is provided near an outlet, for cooling operation, of the outdoor unit. In the decompressing mechanism, a unit constituted of each electromagnetic on-off valve and the corresponding capillary tube connected to the electromagnetic on-off valve is arranged in parallel with the coolant pipe.

[0007] In a second aspect of a multi-unit air conditioner according to the present invention, the multi-unit air conditioner includes a single outdoor unit and a plurality of indoor units disposed below the outdoor unit and connected to the outdoor unit via a coolant pipe. A decompressing mechanism including three electromagnetic on-off valves and three capillary tubes having different lengths is provided near an outlet, for cooling operation, of the outdoor unit. In the decompressing mechanism, a unit constituted of each electromagnetic on-off valve and each capillary tube connected to the electromagnetic on-off valve is arranged in parallel with the coolant pipe.

[0008] In the multi-unit air conditioner of the first or second aspect according to the present invention, the lengths of the capillary tubes are set such that, for example, the decompression effect is "1" when all the capillary tubes are used by opening all the electromagnetic on-off valves, the decompression effect is "1/10" when the capillary tube with the largest length (referred to as "longest capillary tube" hereinafter) is used alone by only opening the electromagnetic on-off valve connected to the longest capillary tube, the decompression effect is "6/10" when the capillary tube with the smallest length (referred to as "shortest capillary tube" hereinafter) is used alone by only opening the electromagnetic on-off valve connected to the shortest capillary tube, and the decompression effect is "3/10" when the capillary tube (referred to as "intermediate-length capillary tube" hereinafter) that is shorter than the longest capillary tube but longer than the shortest capillary tube is used alone by only opening the electromagnetic on-off valve connected to the aforementioned capillary tube.
The decompression effect is "4/10" when the longest capillary tube and the intermediate-length capillary tube are used by opening the electromagnetic on-off valves connected to the longest capillary tube and the intermediate-length capillary tube, the decompression effect is "7/10" when the longest capillary tube and the shortest capillary tube are used by opening the electromagnetic on-off valves connected to the longest capillary tube and the shortest capillary tube, and the decompression effect is "9/10" when the intermediate-length capillary tube and the shortest capillary tube are used by opening the electromagnetic on-off valves connected to the intermediate-length capillary tube and the shortest capillary tube.
Specifically, by simply changing the combination (pattern) of electromagnetic on-off valves to be opened, the pressure of liquid coolant supplied (introduced) from the outdoor unit to the indoor units can be reduced in several

patterns.
Consequently, a liquid head pressure applied to an electronic expansion valve disposed in front (at the inlet) of an indoor heat exchanger can be reduced, thereby preventing failure in opening and closing (operation failure) of the electronic expansion valve.

[0009] In the multi-unit air conditioner of the first or second aspect, it is more preferable that the electromagnetic on-off valves be electrically connected to a controller that individually opens or closes the electromagnetic on-off valves, and that the controller open or close the electromagnetic on-off valves on the basis of a coolant pressure near the outlet of the outdoor unit during cooling operation, and also on the basis of the rotation speed of a compressor that constitutes the outdoor unit.

[0010] With such a multi-unit air conditioner, the electromagnetic on-off valves are immediately opened or closed on the basis of the coolant pressure near the outlet of the outdoor unit during cooling operation and also on the basis of the rotation speed of the compressor constituting the outdoor unit, so that the liquid head pressure applied to the electronic expansion valve disposed in front of the indoor heat exchanger can be maintained at an optimal pressure value.
Consequently, the electronic expansion valve disposed in front of the indoor heat exchanger can be prevented from receiving an excessive liquid head pressure, thereby reliably preventing failure in opening and closing (operation failure) of the electronic expansion valve.

{Advantageous Effects of Invention}

[0011] The multi-unit air conditioner according to the present invention achieves the advantage of reducing a liquid head pressure applied to an electronic expansion valve disposed in front (at the inlet) of an indoor heat exchanger so as to prevent failure in opening and closing (operation failure) of the electronic expansion valve.

{Brief Description of Drawings}

[0012]

{Fig. 1} Fig. 1 is a schematic system view of a multi-unit air conditioner according to an embodiment of the present invention.
{Fig. 2} Fig. 2 is an enlarged view of a relevant part of Fig. 1.
{Fig. 3} Fig. 3 is a table for explaining the lengths of capillary tubes and decompression effects thereof.
{Fig. 4A} Fig. 4A is a graph in which data stored as a database in a controller are visualized, and corresponds to when a measurement value measured by a high-pressure sensor is higher than a preset value.
{Fig. 4B} Fig. 4B is a graph in which the data stored as a database in the controller are visualized, and corresponds to when the measurement value measured by the high-pressure sensor is lower than the preset value.
{Fig. 5} Fig. 5 is a flow chart for operating the controller.

{Description of Embodiments}

[0013] An embodiment of a multi-unit air conditioner according to the present invention will be described below with reference to Figs. 1 to 5.
Fig. 1 is a schematic system view of the multi-unit air conditioner according to this embodiment. Fig. 2 is an enlarged view of a relevant part of Fig. 1. Fig. 3 is a table for explaining the lengths of capillary tubes and decompression effects thereof. Figs. 4A and 4B are graphs in which data stored as a database in a controller are visualized. Specifically, Fig. 4A is a graph corresponding to when a measurement value measured by a high-pressure sensor is higher than a preset value, whereas Fig. 4B is a graph corresponding to when the measurement value measured by the high-pressure sensor is lower than the preset value. Fig. 5 is a flow chart for operating the controller.
As shown in Fig. 1, a multi-unit air conditioner 1 according to this embodiment includes a single outdoor unit 2 and a plurality of (e.g., two) indoor units 3.

[0014] The outdoor unit 2 is, for example, disposed on a rooftop of a tall building, and includes a compressor 4, a four-way valve 5, an outdoor heat exchanger 6, an outdoor fan (not shown), and a decompressing mechanism 7.
The indoor units 3 are disposed inside a room located at a level (floor) that is, for example, 100 m below the rooftop at which the outdoor unit 2 is disposed, and each include an indoor heat exchanger (not shown) and an indoor fan (not shown).
The outdoor unit 2 and the indoor units 3 are connected via a coolant pipe 8, and a liquid control valve 9 is connected to an intermediate section of the coolant pipe 8 connected between the decompressing mechanism 7 and the indoor units 3. The liquid control valve 9 is disposed in the vicinity (i.e., at the outlet) of the outdoor unit 2, and a high-pressure sensor 10 for measuring the pressure in the pipe is attached to an intermediate section of the coolant pipe 8 connected between the decompressing mechanism 7 and the liquid control valve 9. The high-pressure sensor 10 is electrically connected to a controller 28, to be described later, and a measurement value (referred to as "high-pressure-sensor value" hereinafter) measured by the high-pressure sensor 10 is converted to an electrical signal before being output to the controller 28.
Electronic expansion valves 11 are connected to intermediate sections of the coolant pipe 8 connected between the liquid control valve 9 and the indoor units 3. Each electronic expansion valve (referred to as "EEV" hereinafter) 11 is disposed in the vicinity (i.e., at the inlet) of the corresponding indoor unit 3.

[0015] As shown in Fig. 2, the decompressing mech-

anism 7 includes a single check valve 21, a plurality of (e.g., three in this embodiment) electromagnetic on-off valves 22, 23, and 24, and a plurality of (three in this embodiment) capillary tubes 25, 26, and 27 having different lengths.

The electromagnetic on-off valve 22 is connected to the capillary tube 25, the electromagnetic on-off valve 23 is connected to the capillary tube 26, and the electromagnetic on-off valve 24 is connected to the capillary tube 27. The check valve 21, the electromagnetic on-off valve 22 and the capillary tube 25, the electromagnetic on-off valve 23 and the capillary tube 26, and the electromagnetic on-off valve 24 and the capillary tube 27 are arranged in parallel via the coolant pipe 8.

The electromagnetic on-off valves 22, 23, and 24 are electrically connected to the controller 28 such that the opening and closing thereof are controlled by an electrical signal output from the controller 28.

The check valve 21 is attached in a direction such that it permits flow from the liquid control valve 9 toward the outdoor heat exchanger 6 but inhibits flow from the outdoor heat exchanger 6 toward the liquid control valve 9.

[0016] The lengths of the capillary tubes 25, 26, and 27 are set such that, for example, the decompression effect is "1" when all the capillary tubes 25, 26, and 27 are used by opening all the electromagnetic on-off valves 22, 23, and 24 (see row 7 in Fig. 3), the decompression effect is "1/10" when the capillary tube 25 is used alone by only opening the electromagnetic on-off valve 22 (see row 1 in Fig. 3), the decompression effect is "3/10" when the capillary tube 26 is used alone by only opening the electromagnetic on-off valve 23 (see row 2 in Fig. 3), and the decompression effect is "6/10" when the capillary tube 27 is used alone by only opening the electromagnetic on-off valve 24 (see row 4 in Fig. 3).

The decompression effect is "4/10" when the capillary tubes 25 and 26 are used by opening the electromagnetic on-off valves 22 and 23 (see row 3 in Fig. 3), the decompression effect is "7/10" when the capillary tubes 25 and 27 are used by opening the electromagnetic on-off valves 22 and 24 (see row 5 in Fig. 3), and the decompression effect is "9/10" when the capillary tubes 26 and 27 are used by opening the electromagnetic on-off valves 23 and 24 (see row 6 in Fig. 3).

[0017] The controller 28 stores (accumulates) a database obtained by converting the graphs shown in Figs. 4A and 4B into data. The controller 28 opens or closes the electromagnetic on-off valves 22, 23, and 24 in accordance with a flow chart shown in Fig. 5 so as to adjust the pressure in front (at the inlets) of the EEVs 11.

Specifically, when the high-pressure-sensor value measured by the high-pressure sensor 10 is higher than or equal to a preset value and the compressor rotation speed (i.e., the rotation speed of the compressor 4) is lower than or equal to a preset value, the controller 28 opens or closes the electromagnetic on-off valves 22, 23, and 24 by selecting the electromagnetic on-off valves 22, 23, and 24 and the capillary tubes 25, 26, and 27 to be used on the basis of the database stored in the controller 28 so that the pressure in front (at the inlets) of the EEVs 11 becomes equal to a desired pressure value.

For example, when the high-pressure-sensor value measured by the high-pressure sensor 10 is higher than or equal to the preset value and the compressor rotation speed is lower than or equal to the preset value, and the high-pressure-sensor value at that time is higher than another preset value (second preset value) and the compressor rotation speed is within a highest region stored in the controller 28, the capillary tubes 25 and 27 are used by opening the electromagnetic on-off valves 22 and 24.

When the high-pressure-sensor value measured by the high-pressure sensor 10 is higher than or equal to the preset value and the compressor rotation speed is lower than or equal to the preset value, and the high-pressure-sensor value at that time is higher than the other preset value (second preset value) and the compressor rotation speed is within a lowest region, the capillary tube 26 is used alone by only opening the electromagnetic on-off valve 23.

[0018] With the multi-unit air conditioner 1 according to this embodiment, the lengths of the capillary tubes 25, 26, and 27 are set such that, for example, the decompression effect is "1" when all the capillary tubes 25, 26, and 27 are used by opening all the electromagnetic on-off valves 22, 23, and 24, the decompression effect is "1/10" when the longest capillary tube 25 is used alone by only opening the electromagnetic on-off valve 22 connected to the capillary tube 25, the decompression effect is "6/10" when the shortest capillary tube 27 is used alone by only opening the electromagnetic on-off valve 24 connected to the capillary tube 27, and the decompression effect is "3/10" when the capillary tube 26 that is shorter than the capillary tube 25 but longer than the capillary tube 27 is used alone by only opening the electromagnetic on-off valve 23 connected to the capillary tube 26.

The decompression effect is "4/10" when the capillary tubes 25 and 26 are used by opening the electromagnetic on-off valves 22 and 23 respectively connected to the capillary tubes 25 and 26, the decompression effect is "7/10" when the capillary tubes 25 and 27 are used by opening the electromagnetic on-off valves 22 and 24 respectively connected to the capillary tubes 25 and 27, and the decompression effect is "9/10" when the capillary tubes 26 and 27 are used by opening the electromagnetic on-off valves 23 and 24 respectively connected to the capillary tubes 26 and 27.

Specifically, by simply changing the combination (pattern) of electromagnetic on-off valves 22, 23, and 24 to be opened, the pressure of liquid coolant supplied (introduced) from the outdoor unit 2 to the indoor units 3 can be reduced in several patterns.

Consequently, a liquid head pressure applied to the EEVs 11 disposed in front (at the inlets) of the indoor heat exchangers can be reduced, thereby preventing failure in opening and closing (operation failure) of the EEVs

11.

[0019] Furthermore, the electromagnetic on-off valves 22, 23, and 24 are electrically connected to the controller 28 that individually opens or closes the electromagnetic on-off valves 22, 23, and 24, and the controller 28 is configured to open or close the electromagnetic on-off valves 22, 23, and 24 on the basis of the coolant pressure near the outlet of the outdoor unit 2 during cooling operation and also on the basis of the rotation speed of the compressor 4 constituting the outdoor unit 2.

Specifically, the electromagnetic on-off valves 22, 23, and 24 are immediately opened or closed on the basis of the coolant pressure near the outlet of the outdoor unit 2 during cooling operation and also on the basis of the rotation speed of the compressor 4 constituting the outdoor unit 2, so that the liquid head pressure applied to the EEVs 11 disposed in front of the indoor heat exchangers can be maintained at an optimal pressure value.

Consequently, the EEVs 11 disposed in front of the indoor heat exchangers can be prevented from receiving an excessive liquid head pressure, thereby reliably preventing failure in opening and closing (operation failure) of the EEVs 11.

[0020] The present invention is not limited to the above-described embodiment, and permits various modifications and alterations so long as they do not depart from the spirit of the invention.

For example, the above-described embodiment is directed to a specific example of the decompressing mechanism 7 having the three electromagnetic on-off valves 22, 23, and 24 and the three capillary tubes 25, 26, and 27 having different lengths. However, the present invention is not limited to this configuration; the decompressing mechanism 7 may alternatively be of a type that includes three electromagnetic on-off valves and three capillary tubes having the same length, a type that includes two electromagnetic on-off valves and two capillary tubes having different lengths, a type that includes two electromagnetic on-off valves and two capillary tubes having the same length, a type that includes four or more electromagnetic on-off valves and four or more capillary tubes having different lengths, or a type that includes four or more electromagnetic on-off valves and four or more capillary tubes having the same length.

{Reference Signs List}

[0021]

1 multi-unit air conditioner
2 outdoor unit
3 indoor unit
7 decompressing mechanism
8 coolant pipe
22 electromagnetic on-off valve
23 electromagnetic on-off valve
24 electromagnetic on-off valve
25 capillary tube
26 capillary tube
27 capillary tube
28 controller

Claims

1. A multi-unit air conditioner comprising a single outdoor unit and a plurality of indoor units disposed below the outdoor unit and connected to the outdoor unit via a coolant pipe,
wherein a decompressing mechanism including at least two electromagnetic on-off valves and at least two capillary tubes is provided near an outlet, for cooling operation, of the outdoor unit, wherein a unit constituted of each electromagnetic on-off valve and the corresponding capillary tube connected to the electromagnetic on-off valve is arranged in parallel with the coolant pipe.

2. A multi-unit air conditioner comprising a single outdoor unit and a plurality of indoor units disposed below the outdoor unit and connected to the outdoor unit via a coolant pipe,
wherein a decompressing mechanism including three electromagnetic on-off valves and three capillary tubes having different lengths is provided near an outlet, for cooling operation, of the outdoor unit, wherein a unit constituted of each electromagnetic on-off valve and each capillary tube connected to the electromagnetic on-off valve is arranged in parallel with the coolant pipe.

3. The multi-unit air conditioner according to Claim 1 or 2, wherein the electromagnetic on-off valves are electrically connected to a controller that individually opens or closes the electromagnetic on-off valves, and wherein the controller opens or closes the electromagnetic on-off valves on the basis of a coolant pressure near the outlet of the outdoor unit during cooling operation, and also on the basis of the rotation speed of a compressor that constitutes the outdoor unit.

FIG. 1

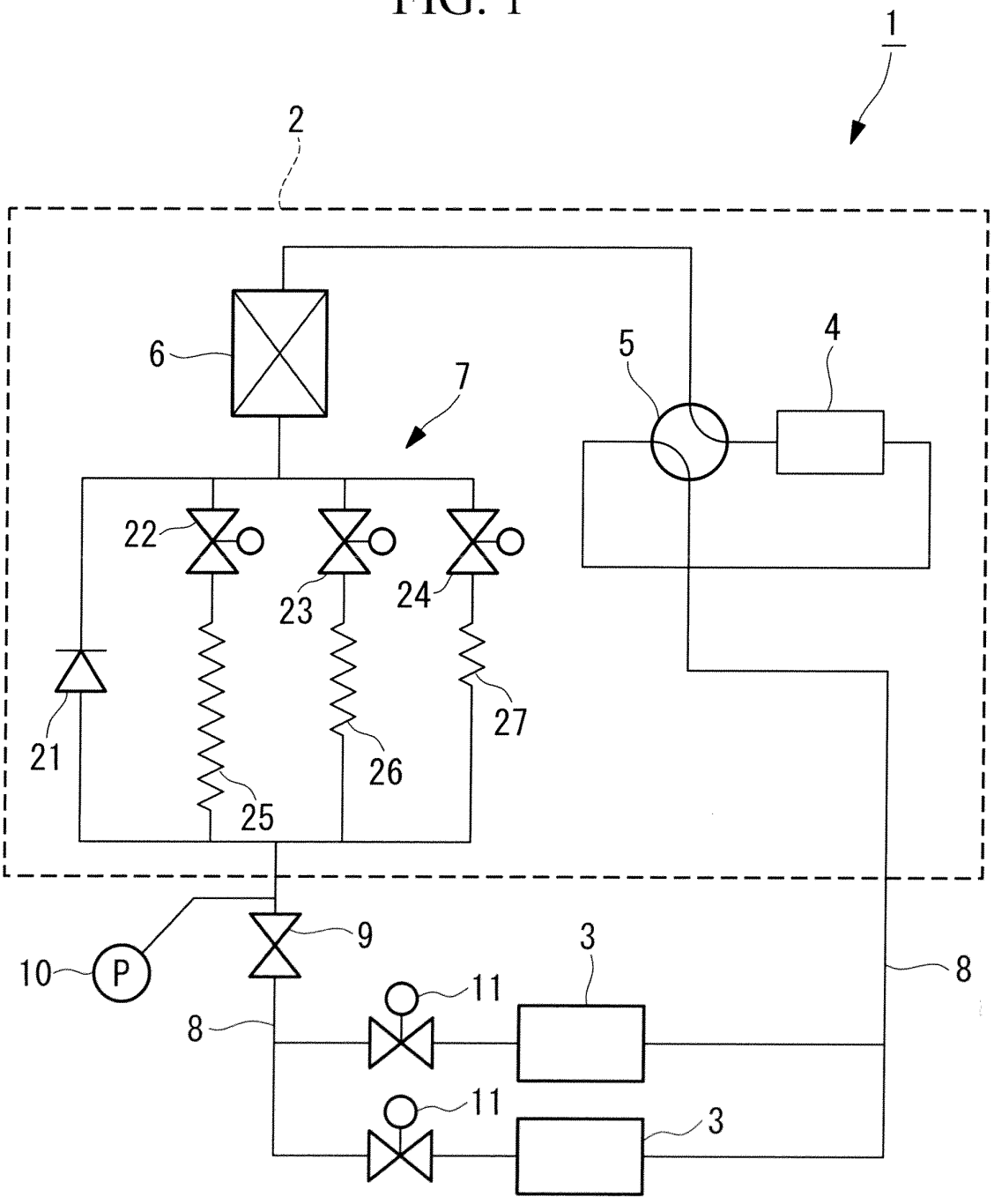


FIG. 2

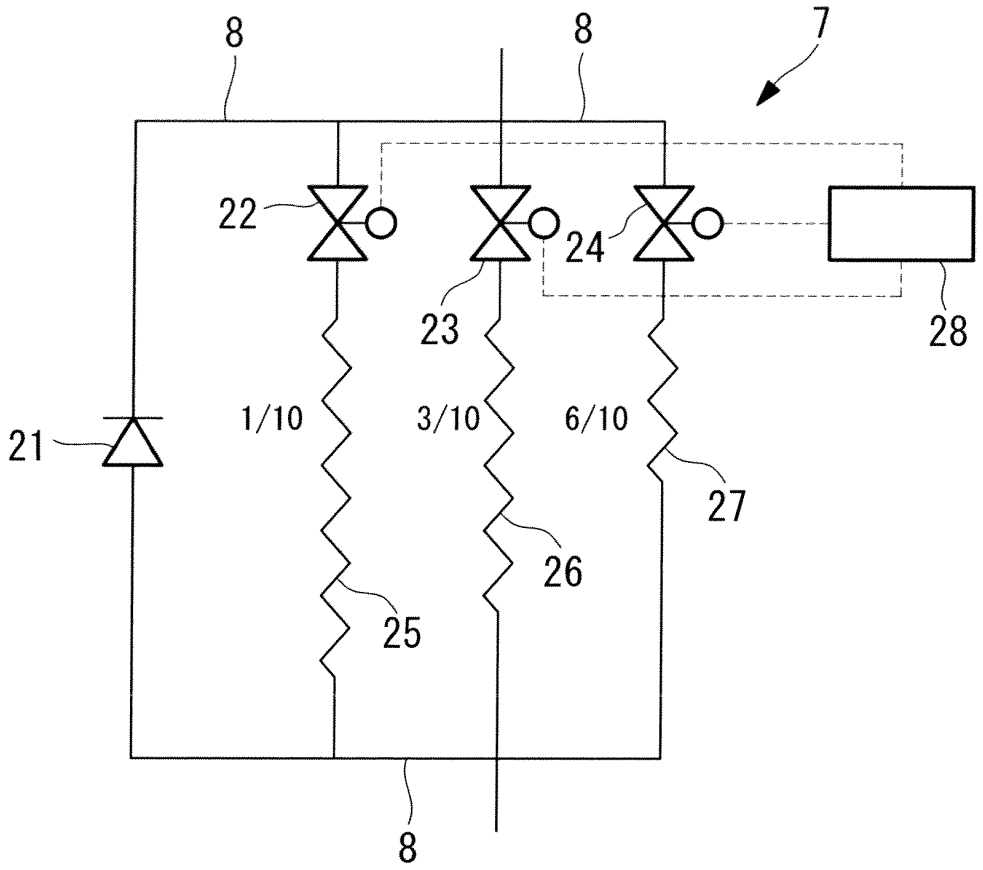


FIG. 3

1	1/10=	1/10
2	3/10=	3/10
3	1/10+3/10=	4/10
4	6/10=	6/10
5	1/10+6/10=	7/10
6	3/10+6/10=	9/10
7	1/10+3/10+6/10=	10/10

FIG. 4A

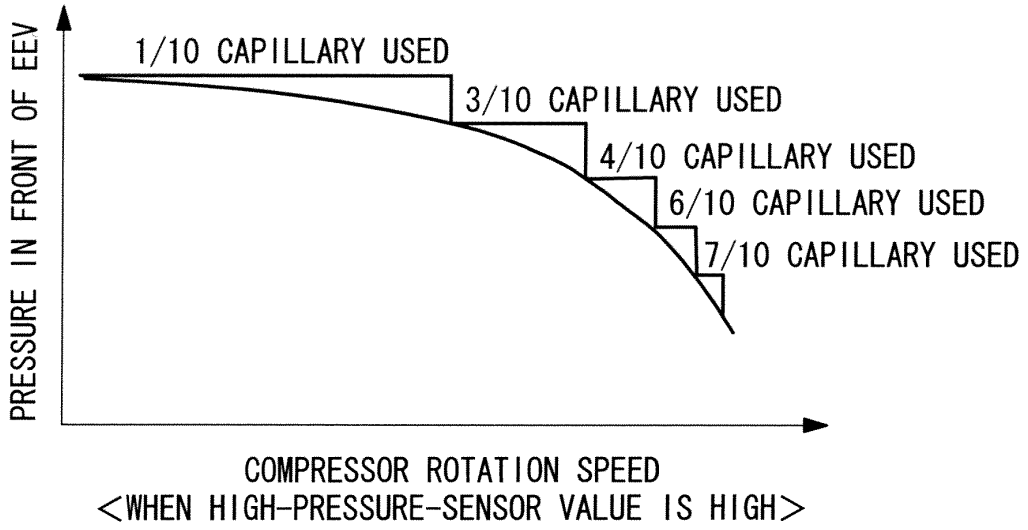

PRESSURE IN FRONT OF EEV
1/10 CAPILLARY USED
3/10 CAPILLARY USED
4/10 CAPILLARY USED
6/10 CAPILLARY USED
7/10 CAPILLARY USED
COMPRESSOR ROTATION SPEED
<WHEN HIGH-PRESSURE-SENSOR VALUE IS HIGH>

FIG. 4B

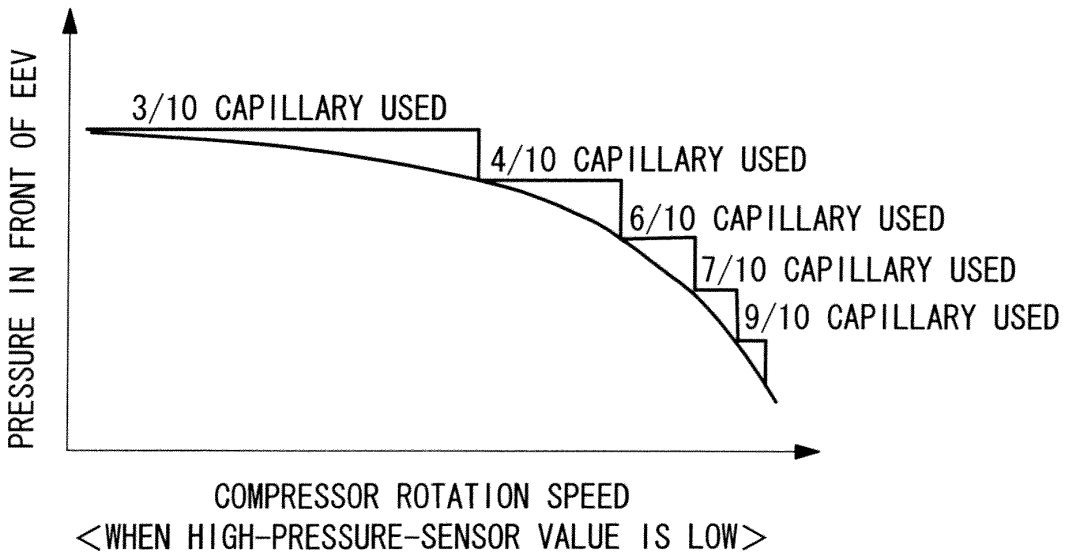
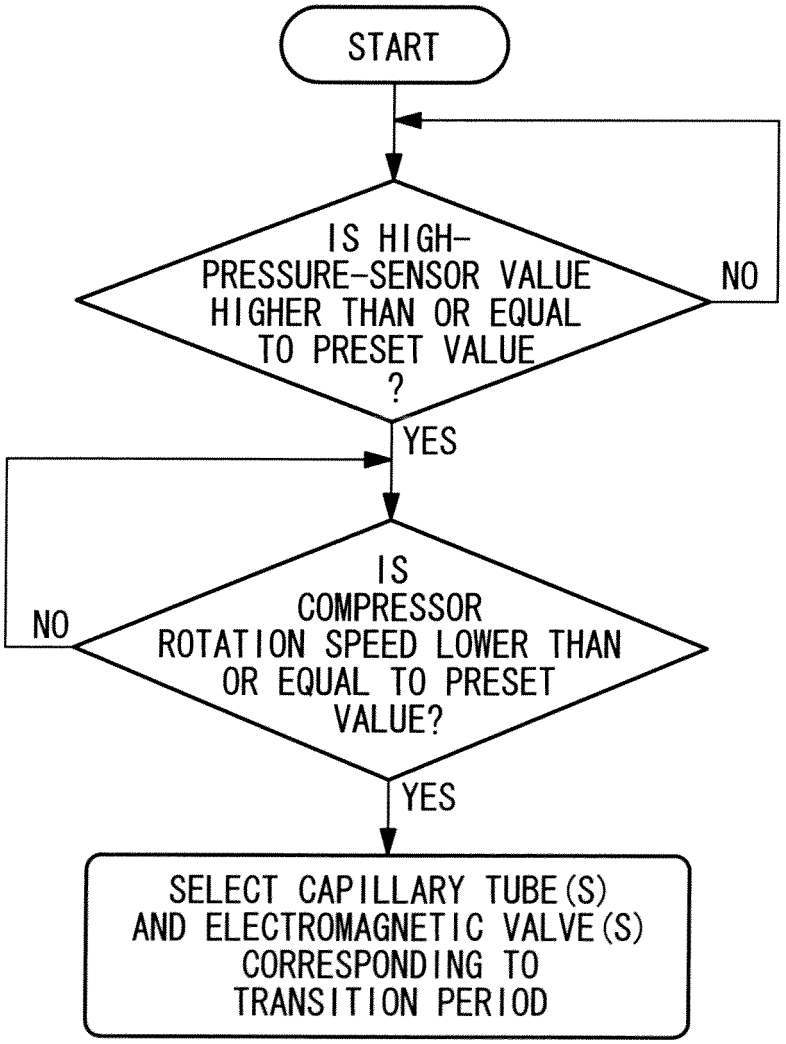

PRESSURE IN FRONT OF EEV
3/10 CAPILLARY USED
4/10 CAPILLARY USED
6/10 CAPILLARY USED
7/10 CAPILLARY USED
9/10 CAPILLARY USED
COMPRESSOR ROTATION SPEED
<WHEN HIGH-PRESSURE-SENSOR VALUE IS LOW>

FIG. 5


START
IS HIGH-PRESSURE-SENSOR VALUE HIGHER THAN OR EQUAL TO PRESET VALUE ?
NO
YES
IS COMPRESSOR ROTATION SPEED LOWER THAN OR EQUAL TO PRESET VALUE?
NO
YES
SELECT CAPILLARY TUBE(S) AND ELECTROMAGNETIC VALVE(S) CORRESPONDING TO TRANSITION PERIOD

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2010/055063

A. CLASSIFICATION OF SUBJECT MATTER
F25B1/00(2006.01)i, *F24F11/02*(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F25B1/00, F24F11/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2010
Kokai Jitsuyo Shinan Koho	1971-2010	Toroku Jitsuyo Shinan Koho	1994-2010

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2000-220891 A (Sanyo Electric Co., Ltd.), 08 August 2000 (08.08.2000), claims; paragraphs [0001] to [0054]; fig. 1 to 3	1-3
Y	JP 11-211255 A (Fujitsu General Ltd.), 06 August 1999 (06.08.1999), claims; paragraphs [0001] to [0020]; fig. 1 to 4	1-3
Y	JP 2004-286329 A (Sanyo Electric Co., Ltd.), 14 October 2004 (14.10.2004), claims; paragraphs [0001] to [0081]; fig. 1 to 5	1-3

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
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"&" document member of the same patent family

Date of the actual completion of the international search 17 June, 2010 (17.06.10)	Date of mailing of the international search report 29 June, 2010 (29.06.10)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2010/055063

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2008-185292 A (Daikin Industries, Ltd.), 14 August 2008 (14.08.2008), entire text; all drawings	1-3

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2010/055063

JP 2000-220891 A	2000.08.08	(Family: none)
JP 11-211255 A	1999.08.06	(Family: none)
JP 2004-286329 A	2004.10.14	US 2004/0216477 A1 2004.11.04 EP 1462740 A2 2004.09.29 DE 602004009355 T2 2007.11.22 KR 10-2004-0086562 A 2004.10.11 CN 1532472 A 2004.09.29 AT 375488 T 2007.10.15
JP 2008-185292 A	2008.08.14	US 2010/0024454 A1 2010.02.04 EP 2144018 A1 2010.01.13 WO 2008/093538 A1 2008.08.07 CN 101657686 A 2010.02.24

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2008185292 A **[0003]**