



(11) **EP 1 528 332 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention
of the grant of the patent:
30.04.2008 Bulletin 2008/18

(51) Int Cl.:
F24F 3/06 ^(2006.01) **F24F 11/00** ^(2006.01)
F25B 13/00 ^(2006.01) **F25B 49/02** ^(2006.01)

(21) Application number: **04024799.1**

(22) Date of filing: **19.10.2004**

(54) **air conditioner having multiple outdoor units and control method thereof**

klimaanlage mit mehreren ausseneinheiten und steuerungsverfahren dafür

climatiseur équipé de plusieurs unités extérieures et procédé de commande de celui-ci

(84) Designated Contracting States:
DE FR GB IT

(30) Priority: **27.10.2003 KR 2003075248**

(43) Date of publication of application:
04.05.2005 Bulletin 2005/18

(73) Proprietor: **LG ELECTRONICS INC.**
Seoul (KR)

(72) Inventors:
• **Song, Jin-Seob**
Gunpo
Gyeonggi-Do (KR)
• **Jang, Sae-Dong**
Gwangmyeong
Gyeonggi-Do (KR)
• **Hwang, Il-Nahm**
Sanghyun-Dong
Yongin
Gyeonggi-Do (KR)

• **Chung, Balk-Young**
213-2, Yongjong-Dong
Gyeyang-Gu
Incheon (KR)

(74) Representative: **Schippan, Ralph**
COHAUSZ & FLORACK
Patent- und Rechtsanwälte
Bleichstrasse 14
40211 Düsseldorf (DE)

(56) References cited:
EP-A- 0 668 474 **EP-A- 0 715 132**
EP-A- 0 744 581

• **PATENT ABSTRACTS OF JAPAN** vol. 2002, no.
10, 10 October 2002 (2002-10-10) & JP 2002
181370 A (SANYO ELECTRIC CO LTD), 26 June
2002 (2002-06-26)

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 1 528 332 B1

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to an air conditioner having multiple outdoor units and a control method thereof, and more particularly to, an air conditioner having multiple outdoor units which can improve performance by preventing refrigerants from being concentrated on operated outdoor units, when part of the outdoor units are operated, and a control method thereof.

2. Description of the Background Art

[0002] In general, a heat-pump type air conditioner can perform both cooling and heating (See for example patent document EP-A-0744581). That is, the heat-pump type air conditioner provided with an indoor heat exchanger and an outdoor heat exchanger can be used as a cooling apparatus, and also used as a heating apparatus by inverting a flow of refrigerants of a refrigeration cycle.

[0003] Fig. 1 is a structure diagram illustrating a conventional heat-pump type air conditioner.

[0004] The conventional air conditioner includes a plurality of outdoor units 110 and 120 disposed outdoors and connected in parallel to each other, and at least one indoor unit 130 connected to the outdoor units 110 and 120 through refrigerant tubes 112 and 114, and disposed indoors, for exchanging heat with indoor air.

[0005] The outdoor units 110 and 120 each respectively includes an outdoor heat exchanger 116 for exchanging heat with outdoor air, a four-way valve 118 for switching a flow of refrigerants in the forward or backward direction, an expansion valve 122 for changing a refrigerant gas supplied to the indoor unit 130 into low temperature low pressure, compressors 124 and 126 for compressing the refrigerants into high temperature high pressure, and an accumulator 128 for separating the refrigerants into gas and liquid, and supplying gas phase refrigerants to each compressor 124 and 126.

[0006] Here, check valves 132 for preventing an inverse flow of the refrigerants and oil separators 134 for separating oil are installed at the discharge sides of the compressors 124 and 126, respectively.

[0007] Receivers 138 for preventing oil from being accumulated in the indoor unit 130 by separating oil contained in the refrigerants supplied to the indoor unit 130 are installed at discharge tubes 136 of the outdoor units 110 and 120.

[0008] The discharge tubes 136 of the outdoor units 110 and 120 are connected in parallel to the refrigerant tube 114, and the suction tubes 140 of the outdoor units 110 and 120 are connected in parallel to the refrigerant tube 112. The refrigerant tubes 112 and 114 are connected to the suction and discharge sides of the indoor

unit 130, respectively.

[0009] In the conventional air conditioner, part of the outdoor units 110 and 120 are operated according to load of the indoor unit 130 or indoor and outdoor environment, and a number of the outdoor units in operation are controlled according to load variations.

[0010] However, when part of the outdoor units are operated, the refrigerants flow toward the operated outdoor units and finally exceed a proper refrigerant amount of the operated outdoor units. As a result, performance and durability of the conventional air conditioner are deteriorated.

SUMMARY OF THE INVENTION

[0011] Therefore, an object of the present invention is to provide an air conditioner having multiple outdoor units which can improve performance and durability by preventing refrigerants from being excessively concentrated on operated outdoor units by compressing and storing the refrigerants in non-operated outdoor units, when part of the outdoor units are operated, and a control method thereof.

[0012] 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 conditioner having multiple outdoor units, including: a plurality of outdoor units disposed outdoors; at least one indoor unit connected to the plurality of outdoor units through refrigerant tubes, for exchanging heat with indoor air; and when part of the outdoor units are operated, a control unit for storing refrigerants in non-operated outdoor units, so that a proper amount of refrigerants can be supplied to the operated outdoor units.

[0013] Preferably, the outdoor units each respectively includes: an outdoor heat exchanger for exchanging heat with outdoor air; a four-way valve for switching a flow of the refrigerants in the forward or backward direction; compressors for changing the refrigerants into high temperature high pressure by compression; and a plurality of accumulators for separating the refrigerants supplied to the compressors into gas and liquid.

[0014] Preferably, first valves for opening or closing discharge tubes of the outdoor units are mounted on the discharge tubes, and second valves for opening or closing suction tubes of the outdoor units are mounted on the suction tubes.

[0015] Preferably, the control unit includes: a sensing unit for sensing an amount of refrigerants supplied to the operated outdoor units; and a controller for compressing and storing the refrigerants in the non-operated outdoor units, by controlling the first open/close valves and the second open/close valves installed at the suction and discharge tubes of the non-operated outdoor units according to the signal from the sensing unit.

[0016] According to another aspect of the present invention, a control method of an air conditioner having multiple outdoor units includes: in a partial load operation

in which part of the outdoor units are operated, a first step for measuring an amount of refrigerants supplied to the operated outdoor units; when the amount of the refrigerants supplied to the operated outdoor units exceeds a set amount in the first step, a second step for compressing and storing the refrigerants in non-operated outdoor units, by closing discharge tubes of the non-operated outdoor units; and when the refrigerants are compressed and stored in the non-operated outdoor units and the amount of the refrigerants supplied to the operated outdoor units reaches the set amount in the second step, a third step for closing suction tubes of the non-operated outdoor units.

[0017] Preferably, the first step includes the sub-steps of: sensing load of an indoor unit; when the indoor unit has a partial load state, driving part of the outdoor units; and sensing refrigerant pressures in the operated outdoor units.

[0018] Preferably, the second step includes the sub-steps of: comparing refrigerant pressures in the high and low pressure sides of the operated outdoor units with a set pressure; when the refrigerant pressures of the operated outdoor units are higher than the set pressure, converting the non-operated outdoor units into a cooling mode; and storing the refrigerants sucked into the non-operated outdoor units in the non-operated outdoor units, by preventing discharge of the refrigerants by closing the discharge tubes of the non-operated outdoor units.

[0019] Preferably, the third step includes the sub-steps of: deciding whether the refrigerant pressures in the high and low pressure sides of the operated outdoor units reach the set pressure; and when the refrigerant pressures of the operated outdoor units reach the set pressure, compressing and storing the refrigerants in the non-operated outdoor units, by blocking suction lines of the non-operated outdoor units.

[0020] 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

[0021] 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.

[0022] In the drawings:

Fig. 1 is a structure diagram illustrating a conventional air conditioner;

Fig. 2 is a structure diagram illustrating an air conditioner in accordance with a preferred embodiment of the present invention;

Fig. 3 is a block diagram illustrating a control unit of

the air conditioner in accordance with the preferred embodiment of the present invention; and

Fig. 4 is a flowchart showing sequential steps of a control method of an air conditioner in accordance with a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0023] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

[0024] Fig. 2 is a structure diagram illustrating an air conditioner in accordance with the preferred embodiment of the present invention.

[0025] The air conditioner includes a plurality of outdoor units 10 and 20 disposed outdoors, at least one indoor unit 30 connected to the plurality of outdoor units 10 and 20 through refrigerant tubes 12 and 14, and disposed indoors, for exchanging heat with indoor air, and when part of the outdoor units 10 and 20 are operated according to load of the indoor unit 30, a control unit for controlling a proper amount of refrigerants to be supplied to the operated outdoor units.

[0026] The outdoor units 10 and 20 each respectively includes an outdoor heat exchanger 22 for exchanging heat with outdoor air, a four-way valve 24 for switching a flow of the refrigerants in the forward or backward direction, compressors 26 and 28 for changing the refrigerants into high temperature high pressure by compression, a plurality of accumulators 32 for separating the refrigerants supplied to the compressors 26 and 28 into gas and liquid, and an expansion valve 34 for changing the refrigerants supplied to the indoor unit 30 into low temperature low pressure.

[0027] Check valves 36 for preventing an inverse flow of the refrigerants and oil separators 38 for separating oil contained in the refrigerants discharged from the compressors 26 and 28 are installed at the discharge sides of the compressors 26 and 28, respectively.

[0028] Receivers 42 for preventing oil from being accumulated in the indoor unit 30 by separating oil contained in the refrigerants supplied to the indoor unit 30 are installed at discharge tubes 40 of the outdoor units 10 and 20.

[0029] In the outdoor units 10 and 20, the discharge tubes 40 for discharging the refrigerants to the indoor unit 30 and the suction tubes 44 for sucking the refrigerants from the indoor unit 30 are connected respectively. Here, each of the discharge tubes 40 is connected in parallel to the first refrigerant tube 14, and the first refrigerant tube 14 is connected to the suction side of the indoor unit 30. In addition, each of the suction tubes 44 is connected in parallel to the second refrigerant tube 12, and the second refrigerant tube 12 is connected to the discharge side of the indoor unit 30.

[0030] First valves 50 are installed at the discharge

tubes 40, respectively, for opening or closing the discharge tubes 40 for discharging the refrigerants from the outdoor units 10 and 20, and second valves 52 are installed at the suction tubes 44, respectively, for opening or closing the suction tubes 44 for sucking the refrigerants into the outdoor units 10 and 20.

[0031] Referring to Fig. 3, the control unit includes a load sensor 60 for sensing load of the indoor unit 30, sensors 62 and 64 for sensing an amount of refrigerants supplied to each outdoor unit 10 and 20, and a controller 70 for controlling driving of the compressors 26 and 28 according to the signals from the load sensor 60 and the sensors 62 and 64, and also controlling a proper amount of refrigerants to be supplied to the operated outdoor units, by adjusting the first valves 50 and the second valves 52.

[0032] Preferably, the first and second valves 50 and 52 are solenoid valves for opening or closing the discharge tubes 40 and the suction tubes 44 according to the signals from the controller 70.

[0033] When the load sensor 60 senses the load of the indoor unit 30 and applies the sensed load to the controller 70, the controller 70 wholly or partially operates the plurality of outdoor units 10 and 20 according to the load of the indoor unit 30.

[0034] The first sensor 62 is a high pressure side pressure sensor installed at the refrigerant tube for discharging the refrigerants compressed in the compressors 26 and 28, for sensing a pressure of the compressed refrigerants.

[0035] The second sensor 64 is a low pressure side pressure sensor installed at the refrigerant tube for supplying the refrigerants to the compressors 26 and 28, for sensing a pressure of the refrigerants before compression.

[0036] The operation of the air conditioner having the multiple outdoor units in accordance with the present invention will now be described.

[0037] Fig. 4 is a flowchart showing sequential steps of the control method of the air conditioner in accordance with the preferred embodiment of the present invention.

[0038] Decided is whether the indoor unit 30 performs the partial load operation (S10).

[0039] That is, the load sensor 60 senses the load of the indoor unit 30, and applies the sensed load to the controller 70. The controller 70 decides the number of the operated outdoor units 10 and 20 according to the signal from the load sensor 60.

[0040] If the indoor unit 30 performs the partial load operation, the amount of the refrigerants supplied to the operated outdoor unit 10 is sensed, and whether the amount of the refrigerants supplied to the operated outdoor unit 10 is larger than a set amount is decided (S20) (It is presumed that the outdoor unit 10 is the operated outdoor unit 10 and the outdoor unit 20 is the non-operated outdoor unit).

[0041] That is, the first sensor 62 installed at the operated outdoor unit 10 senses a pressure of the refriger-

ants compressed and discharged from the compressors 26 and 28 in the high pressure side, and the second sensor 64 senses a pressure of the refrigerants in the low pressure side before the refrigerants are supplied to the compressors 26 and 28. Whether a proper amount of refrigerants are supplied to the operated outdoor unit 10 is decided by comparing the sensed pressures with a set pressure.

[0042] If the amount of the refrigerants supplied to the operated outdoor unit 10 is larger than the set amount, the refrigerants are compressed and stored in the non-operated outdoor unit 20, and thus not concentrated on the operated outdoor unit 10.

[0043] That is, the controller 70 switches the non-operated outdoor unit 20 into a cooling mode, by driving the four-way valve 24 of the non-operated outdoor unit 20, and closes the discharge tube 40 of the non-operated outdoor unit 20 by closing the first valve 50 mounted on the non-operated outdoor unit 20 (S30). Therefore, the refrigerants are not discharged from the non-operated outdoor unit 20 to the indoor unit 30.

[0044] Here, the outdoor unit 10 is operated, and the refrigerants discharged from the outdoor unit 10 are supplied to the indoor unit 30, pass through the indoor unit 30 and exchange heat with indoor air. The refrigerants discharged from the indoor unit 30 are supplied to the suction tube 44 of the non-operated outdoor unit 20 as well as the suction tube 44 of the operated outdoor unit 10 through the first refrigerant tube 12.

[0045] The refrigerants sucked into the non-operated outdoor unit 20 are supplied to each element of the non-operated outdoor unit 20, namely, the accumulator 32, the compressors 26 and 28 and the receiver 42. Since the discharge tube 40 of the non-operated outdoor unit 20 is closed by the first valve 50, the refrigerants supplied to the non-operated outdoor unit 20 are compressed and stored in each element of the non-operated outdoor unit 20.

[0046] If the amount of the refrigerants supplied to the operated outdoor unit 10 reaches the set amount, a predetermined amount of refrigerants are stored in the non-operated outdoor unit 20 by closing the suction tube 44 of the non-operated outdoor unit 20, and a proper amount of refrigerants are supplied to the operated outdoor unit 10 (S40 and S50).

[0047] That is, when the controller 70 decides that the refrigerant pressures in the high and low pressure sides of the operated outdoor unit 10 reach the set pressure according to the signals from the first and second sensors 62 and 64 mounted on the operated outdoor unit 10, the controller 70 closes the suction tube 44 of the non-operated outdoor unit 20 by operating the second valve 52 mounted on the suction tube 44. Accordingly, the predetermined amount of refrigerants are compressed and stored in the non-operated outdoor unit 20. In addition, the proper amount of refrigerants are supplied to the operated outdoor unit 10, so that the air conditioner can be efficiently driven.

[0048] As discussed earlier, in accordance with the present invention, the air conditioner having the multiple outdoor units can improve performance and durability by preventing the refrigerants from being concentrated on the operated outdoor units by compressing and storing some refrigerants in the non-operated outdoor units in the partial load operation in which part of the outdoor units are operated.

[0049] As the present invention may be embodied in several forms without departing from the 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 scope as defined in the appended claims, and therefore all changes and modifications that fall within the metes and bounds of the claims are therefore intended to be embraced by the appended claims.

Claims

1. An air conditioner having multiple outdoor units (10,20), comprising:

a plurality of outdoor units (10,20) disposed outdoors;

at least one indoor unit (30) connected to the plurality of outdoor units (10,20) through refrigerant tubes (12,14), for exchanging heat with indoor air; and

first valves (50) for opening or closing the discharge tubes (40) of the outdoor units (10,20) mounted on the discharge tubes (40), and second valves (52) for opening or closing suction tubes (44) of the outdoor units mounted on the suction tubes (44);

characterized in that the air conditioner further comprises a control unit which controls non-operated outdoor units (20), when a part of the outdoor units (10,20) is operated, so as to compress refrigerants and then store the refrigerants therein by closing discharge tubes (40) of the non-operated outdoor units (20) by controlling the first valves (50) and the second valves (52).

2. The air conditioner of claim 1, **characterized in that** the outdoor units (10,20) each respectively comprises:

an outdoor heat exchanger (22) for exchanging heat with outdoor air;

a four-way valve (24) for switching a flow of the refrigerants in the forward or backward direction; compressors (26,28) for changing the refrigerants into high temperature high pressure by compression; and

a plurality of accumulators (32) for separating

the refrigerants supplied to the compressors (26,28) into gas and liquid.

3. The air conditioner of claim 1, **characterized in that** the first and second valves (50,52) are solenoid valves operated when power is applied thereto.

4. The air conditioner of claim 1, **characterized in that** the control unit comprises:

a sensing unit for sensing an amount of refrigerants supplied to the operated outdoor units (10); and

a controller (70) for compressing and storing the refrigerants in the non-operated outdoor units (20), by controlling the first valves (50) and the second valves (52) installed at the suction and discharge tubes (40,44) of the non-operated outdoor units (20) according to the signal from the sensing unit.

5. The air conditioner of claim 4, **characterized in that** the control unit further comprises a load sensor (60) for sensing load of the indoor unit (30).

6. The air conditioner of claim 4, **characterized in that** the sensing unit comprises:

a first pressure sensor (62) installed at the refrigerant tubes for discharging the refrigerants from the compressors (26,28), for sensing a pressure of the refrigerants passing through the compressors (26,28); and

a second pressure sensor (64) installed at the refrigerant tubes for sucking the refrigerants into the compressors (26,28), for sensing a pressure of the refrigerants supplied to the compressors (26,28).

7. A control method of an air conditioner having multiple outdoor units (10,20), comprising:

in a partial load operation in which part of the outdoor units (10,20) are operated, a first step for measuring an amount of refrigerants supplied to the operated outdoor units (10);

when the amount of the refrigerants supplied to the operated outdoor units (10) exceeds a set amount in the first step, a second step for compressing and storing the refrigerants in non-operated outdoor units (20), by closing discharge tubes (40) of the non-operated outdoor units (20); and

when the refrigerants are compressed and stored in the non-operated outdoor units (20) and the amount of the refrigerants supplied to the operated outdoor units (10) reaches the set amount in the second step, a third step for clos-

ing suction tubes (44) of the non-operated outdoor units (20).

8. The method of claim 7, **characterized in that** the first step comprises the sub-steps of:

sensing load of an indoor unit (30);
when the indoor unit (30) has a partial load state,
driving part of the outdoor units (10,20); and
sensing refrigerant pressures in the operated outdoor units (10).

9. The method of claim 8, **characterized in that** the step for sensing the refrigerant pressures senses the pressure of the refrigerants supplied to the compressors (26,28) of the operated outdoor units (10) in the low pressure sides and the pressure of the refrigerants compressed in the compressors (26,28) in the high pressure sides, respectively.

10. The method of claim 7, **characterized in that** the second step comprises the sub-steps of:

comparing refrigerant pressures in the high and low pressure sides of the operated outdoor units (10) with a set pressure;
when the refrigerant pressures of the operated outdoor units (10) are higher than the set pressure, converting the non-operated outdoor units (20) into a cooling mode; and
compressing the refrigerants sucked into the non-operated outdoor units (20), and then storing the refrigerants in the non-operated outdoor units (20), by preventing discharge of the refrigerants by closing the discharge tubes (40) of the non-operated outdoor units (20).

11. The method of claim 10, **characterized in that** first valves are installed at the discharge tubes (40), for closing the discharge tubes (40) according to the signal from the controller (26,28).

12. The method of claim 7, **characterized in that** the third step comprises the sub-steps of:

deciding whether the refrigerant pressures in the high and low pressure sides of the operated outdoor units (10) reach the set pressure; and
when the refrigerant pressures of the operated outdoor units (10) reach the set pressure, compressing and storing the refrigerants in the non-operated outdoor units (20), by blocking suction lines of the non-operated outdoor units (20).

13. The method of claim 12, **characterized in that** second valves (52) are installed at the suction lines of the non-operated outdoor units (20), for blocking the suction lines according to the signal from the con-

troller (26,28).

Patentansprüche

1. Klimaanlage mit mehreren Außeneinheiten (10, 20), enthaltend:

eine Vielzahl von Außeneinheiten (10, 20), die außen angeordnet sind; und
mindestens eine Inneneinheit (30), die mit der Vielzahl von Außeneinheiten (10, 20) durch Kühlmittleitungen (12, 14) zum Wärmeaustausch mit der Innenluft verbunden ist; und
erste Ventile (50), um die Abflussleitungen (40) der Außeneinheiten (10, 20) zu öffnen und zu schließen, die an den Abflussleitungen (40) montiert sind, und zweite Ventile (52) zum Öffnen oder Schließen von Ansaugleitungen (44) der Außeneinheiten, die an den Ansaugleitungen montiert sind;

dadurch gekennzeichnet, dass die Klimaanlage ferner eine Steuereinheit enthält, die nicht betriebene Außeneinheiten (20) steuert, wenn ein Teil der Außeneinheiten (10, 20) betrieben wird, so dass Kühlmittel komprimiert werden und dann die Kühlmittel darin gelagert werden, indem die Abflussleitungen (40) der nicht betriebenen Außeneinheiten (20) geschlossen werden, indem die ersten Ventile (50) und die zweiten Ventile (52) gesteuert werden.

2. Klimaanlage nach Anspruch 1, **dadurch gekennzeichnet, dass** die Außeneinheiten (10, 20) jeweils enthalten:

einen Außen-Wärmetauscher (22) zum Wärmeaustausch mit der Außenluft;
ein Vierwegeventil (24) zum Umschalten eines Flusses der Kühlmittel in Vorwärts- oder Rückwärtsrichtung;
Kompressoren (26, 28) zum Umwandeln der Kühlmittel in Hochdruck-Hochtemperatur durch Kompression; und
eine Vielzahl von Akkumulatoren (32) zum Trennen der den Kompressoren (26, 28) zugeführten Kühlmittel in Gas und Flüssigkeit.

3. Klimaanlage nach Anspruch 1, **dadurch gekennzeichnet, dass** die ersten und die zweiten Ventile (50, 52) Solenoidventile sind, die betätigt werden, wenn Leistung daran angelegt wird.

4. Klimaanlage nach Anspruch 1, **dadurch gekennzeichnet, dass** die Steuereinheit enthält:

eine Sensoreinheit zum Erfassen einer Menge von Kühlmitteln, die den betriebenen Außenein-

- heiten (10) zugeliefert werden; und eine Steuereinrichtung (70) zum Komprimieren und Speichern der Kühlmittel in den nicht betriebenen Außeneinheiten (20), indem die ersten Ventile (50) und die zweiten Ventile (52), die in den Ansaug- und Abflussleitungen (40, 44) der nicht betriebenen Außeneinheiten (20) eingebaut sind, gemäß dem Signal von der Sensoreinheit gesteuert werden.
5. Klimaanlage nach Anspruch 4, **dadurch gekennzeichnet, dass** die Steuereinheit ferner einen Lastsensor (60) zum Erfassen der Last der Inneneinheit (30) enthält.
6. Klimaanlage nach Anspruch 4, **dadurch gekennzeichnet, dass** die Sensoreinheit enthält:
- einen ersten Drucksensor (62), der in den Kühlmittelleitungen für das Ableiten der Kühlmittel von den Kompressoren (26,28) eingebaut ist, um einen Druck der durch die Kompressoren (26, 28) fließenden Kühlmittel zu erfassen; und einen zweiten Drucksensor (64), der in den Kühlmittelleitungen zum Ansaugen der Kühlmittel in die Kompressoren (26, 28) eingebaut ist, um einen Druck der den Kompressoren (26, 28) zugelieferten Kühlmittel zu erfassen.
7. Steuerungsverfahren für eine Klimaanlage mit mehreren Außeneinheiten (10, 20), enthaltend:
- in einem Teillastbetrieb, in dem ein Teil der Außeneinheiten (10, 20) betrieben wird, einen ersten Schritt zum Messen einer Menge der den betriebenen Außeneinheiten (10) zugelieferten Kühlmittel;
- wenn eine Menge der den betriebenen Außeneinheiten (10) zugelieferten Kühlmittel eine eingestellte Menge in dem ersten Schritt übersteigt, einen zweiten Schritt zum Komprimieren und Speichern der Kühlmittel in nicht betriebenen Außeneinheiten (20), indem Abflussleitungen (40) der nicht betriebenen Außeneinheiten (20) geschlossen werden; und
- wenn die Kühlmittel in den nicht betriebenen Außeneinheiten (20) komprimiert und gespeichert werden und die Menge der den betriebenen Außeneinheiten (10) zugelieferten Kühlmittel die eingestellte Menge in dem zweiten Schritt erreicht, einen dritten Schritt zum Schließen der Ansaugleitungen (44) der nicht betriebenen Außeneinheiten (20).
8. Verfahren nach Anspruch 7, **dadurch gekennzeichnet, dass** der erste Schritt die Unterschritte enthält:
- Erfassen der Last einer Inneneinheit (30) ; wenn die Inneneinheit (30) einen Teillastzustand hat, Ansteuern eines Teils der Außeneinheiten (10, 20); und Erfassen der Kühlmitteldrücke in den betriebenen Außeneinheiten (10).
9. Verfahren nach Anspruch 8, **dadurch gekennzeichnet, dass** der Schritt des Erfassens der Kühlmitteldrücke den Druck der den Kompressoren (26, 28) der betriebenen Außeneinheiten (10) zugelieferten Kühlmittel auf der Niederdruckseite und den Druck der in den Kompressoren (26, 28) komprimierten Kühlmittel auf der Hochdruckseite jeweils misst.
10. Verfahren nach Anspruch 7, **dadurch gekennzeichnet, dass** der zweite Schritt die Unterschritte enthält:
- Vergleichen von Kühlmitteldrücken auf der Hoch- und Niederdruckseite der betriebenen Außeneinheiten (10) mit einem vorgegebenen Druck;
- wenn die Kühlmitteldrücke der betriebenen Außeneinheiten (10) höher sind als der eingestellte Druck, Umstellen der nicht betriebenen Außeneinheiten (20) in einen Kühlmodus; und Komprimieren der in die nicht betriebenen Außeneinheiten (20) angesaugten Kühlmittel und anschließend Speichern der Kühlmittel in den nicht betriebenen Außeneinheiten (20), indem die Abgabe der Kühlmittel durch Schließen der Abflussleitungen (40) der nicht betriebenen Außeneinheiten (20) verhindert wird.
11. Verfahren nach Anspruch 10, **dadurch gekennzeichnet, dass** die ersten Ventile in den Abflussleitungen (40) eingebaut sind, um die Abflussleitungen (40) gemäß dem Signal von der Steuereinrichtung (26, 28) zu schließen.
12. Verfahren nach Anspruch 7, **dadurch gekennzeichnet, dass** der dritte Schritt die Unterschritte enthält:
- Entscheiden, ob die Kühlmitteldrücke auf der Hoch- und Niederdruckseite der betriebenen Außeneinheiten (10) den voreingestellten Druck erreichen; und wenn die Kühlmitteldrücke der betriebenen Außeneinheiten (10) den voreingestellten Druck erreichen, Komprimieren und Speichern der Kühlmittel in den nicht betriebenen Außeneinheiten (20), indem die Ansaugleitungen der nicht betriebenen Außeneinheiten (20) gesperrt werden.
13. Verfahren nach Anspruch 12, **dadurch gekennzeichnet,**

zeichnet, dass die zweiten Ventile (52) in den Ansaugleitungen der nicht betriebenen Außeneinheiten (20) eingebaut sind, um die Ansaugleitungen gemäß dem Signal von der Steuereinrichtung (26, 28) zu sperren.

Revendications

1. Climatiseur ayant de multiples unités extérieures (10, 20), comprenant :

une pluralité d'unités extérieures (10, 20) disposées à l'extérieur ;
au moins une unité intérieure (30) raccordée à la pluralité d'unités extérieures (10, 20) par des tubes de réfrigérant (12, 14) pour échanger de la chaleur avec l'air intérieur ; et
des premières soupapes (50) pour ouvrir ou fermer les tubes de décharge (40) des unités extérieures (10, 20), montées sur les tubes de décharge (40) et des deuxièmees soupapes (52) pour ouvrir ou fermer des tubes d'aspiration (44) des unités extérieures, montées sur les tubes d'aspiration (44) ;
caractérisé en ce que le climatiseur comprend en outre une unité de commande qui commande les unités extérieures non en fonctionnement (20), lorsqu'une partie des unités extérieures (10, 20) est en cours de fonctionnement, de manière à comprimer les réfrigérants et à y stocker ensuite les réfrigérants par fermeture des tubes de décharge (40) des unités extérieures non en fonctionnement (20) par commande des premières soupapes (50) et des secondes soupapes (52).

2. Climatiseur selon la revendication 1, **caractérisé en ce que** les unités extérieures (10, 20) comprennent chacune respectivement :

un échangeur de chaleur extérieur (22) pour échanger de la chaleur avec l'air extérieur ;
une soupape à quatre voies (24) pour faire passer un écoulement des réfrigérants dans le sens avant ou dans le sens arrière ;
des compresseurs (26, 28) pour faire passer les réfrigérants à une température élevée et à une pression élevée par compression ; et
une pluralité d'accumulateurs (32) pour séparer les réfrigérants fournis aux compresseurs (26, 28) en gaz et en liquide.

3. Climatiseur selon la revendication 1, **caractérisé en ce que** les premières et les secondes soupapes (50, 52) sont des électrovannes actionnées lorsque de l'énergie y est appliquée.

4. Climatiseur selon la revendication 1, **caractérisé en ce que** l'unité de commande comprend :

une unité de détection pour détecter une quantité de réfrigérants fournie aux unités extérieures en cours de fonctionnement (10) ; et
un dispositif de commande (70) pour comprimer et stocker les réfrigérants dans les unités extérieures non en fonctionnement (20) par commande des premières soupapes (50) et des secondes soupapes (52) installées sur les tubes d'aspiration et les tubes de décharge (40, 44) des unités extérieures non en fonctionnement (20) conformément au signal de l'unité de détection.

5. Climatiseur selon la revendication 4, **caractérisé en ce que** l'unité de commande comprend en outre un capteur de charge (60) pour détecter la charge de l'unité intérieure (30).

6. Climatiseur selon la revendication 4, **caractérisé en ce que** l'unité de commande comprend :

un premier capteur de pression (52) installé sur les tubes de réfrigérants pour décharger les réfrigérants des compresseurs (26, 28) afin de détecter une pression des réfrigérants fournis aux compresseurs (26, 28) ; et
un second capteur de pression (64) installé sur les tubes de réfrigérants pour aspirer les réfrigérants dans les compresseurs (26, 28) afin de détecter une pression des réfrigérants fournis aux compresseurs (26, 28).

7. Procédé de commande d'un climatiseur ayant de multiples unités extérieures (10, 20), comprenant :

dans une exploitation à charge partielle, dans laquelle une partie des unités extérieures (10, 20) est mise en fonctionnement, une première étape de mesure d'une quantité de réfrigérants fournie aux unités extérieures en cours de fonctionnement (10) ;
lorsque la quantité des réfrigérants fournie aux unités extérieures en cours de fonctionnement (10) dépasse une quantité de consigne dans la première étape, une deuxième étape pour comprimer et stocker les réfrigérants dans les unités extérieures non en fonctionnement (20) par fermeture des tubes de décharge (40) des unités extérieures non en fonctionnement (20) ; et,
lorsque les réfrigérants sont comprimés et stockés dans les unités extérieures non en fonctionnement (20) et que la quantité des réfrigérants fournie aux unités extérieures en cours de fonctionnement (10) atteint la quantité de consigne à la deuxième étape, une troisième étape pour

fermer les tubes d'aspiration (44) des unités extérieures non en fonctionnement (20).

8. Procédé selon la revendication 7, **caractérisé en ce que** la première étape comprend les sous-étapes suivantes :

la détection de la charge d'une unité intérieure (30) ;
lorsque l'unité intérieure (30) a un état de charge partiel, la commande d'une partie des unités extérieures (10, 20) ; et
la détection de pressions des réfrigérants dans les unités extérieures en cours de fonctionnement (10).

9. Procédé selon la revendication 8, **caractérisé en ce que** l'étape de détection des pressions de réfrigérants détecte la pression des réfrigérants fournis aux compresseurs (26, 28) des unités extérieures en cours de fonctionnement (10) sur les côtés de basse pression et la pression des réfrigérants comprimés dans les compresseurs (26, 28) sur les côtés à pression élevée, respectivement.

10. Procédé selon la revendication 7, **caractérisé en ce que** la deuxième étape comprend les sous-étapes suivantes :

la comparaison des pressions de réfrigérants sur les côtés à pression élevée et à basse pression des unités extérieures en cours de fonctionnement (10) avec une pression de consigne ;
lorsque les pressions de réfrigérant des unités extérieures en cours de fonctionnement (10) sont supérieures à la pression de consigne, la conversion des unités extérieures non en fonctionnement (20) en un mode de refroidissement ; et
la compression des réfrigérants aspirés dans les unités extérieures non en fonctionnement (20), suivie du stockage des réfrigérants dans les unités extérieures non en fonctionnement (20), en empêchant la décharge des réfrigérants par fermeture des tubes de décharges (40) des unités extérieures non en fonctionnement (20).

11. Procédé selon la revendication 10, **caractérisé en ce que** les premières soupapes sont installées sur les tubes de décharge (40) pour fermer les tubes de décharge (40) conformément au signal du dispositif de commande (26, 28).

12. Procédé selon la revendication 7, **caractérisé en ce que** la troisième étape comprend les sous-étapes suivantes :

on décide si les pressions de réfrigérants sur les côtés à pression élevée et à basse pression des unités extérieures en cours de fonctionnement (10) atteignent la pression de consigne ; et, lorsque les pressions de réfrigérants des unités extérieures en cours de fonctionnement (10) atteignent la pression de consigne, on comprime et on stocke les réfrigérants dans les unités extérieures non en fonctionnement (20) par blocage des conduites d'aspiration des unités extérieures non en fonctionnement (20).

13. Procédé selon la revendication 12, **caractérisé en ce que** des secondes soupapes (52) sont installées sur les conduites d'aspiration des unités extérieures non en fonctionnement (20) pour bloquer les conduites d'aspiration conformément au signal du dispositif de commande réglage (26, 28).

FIG. 1

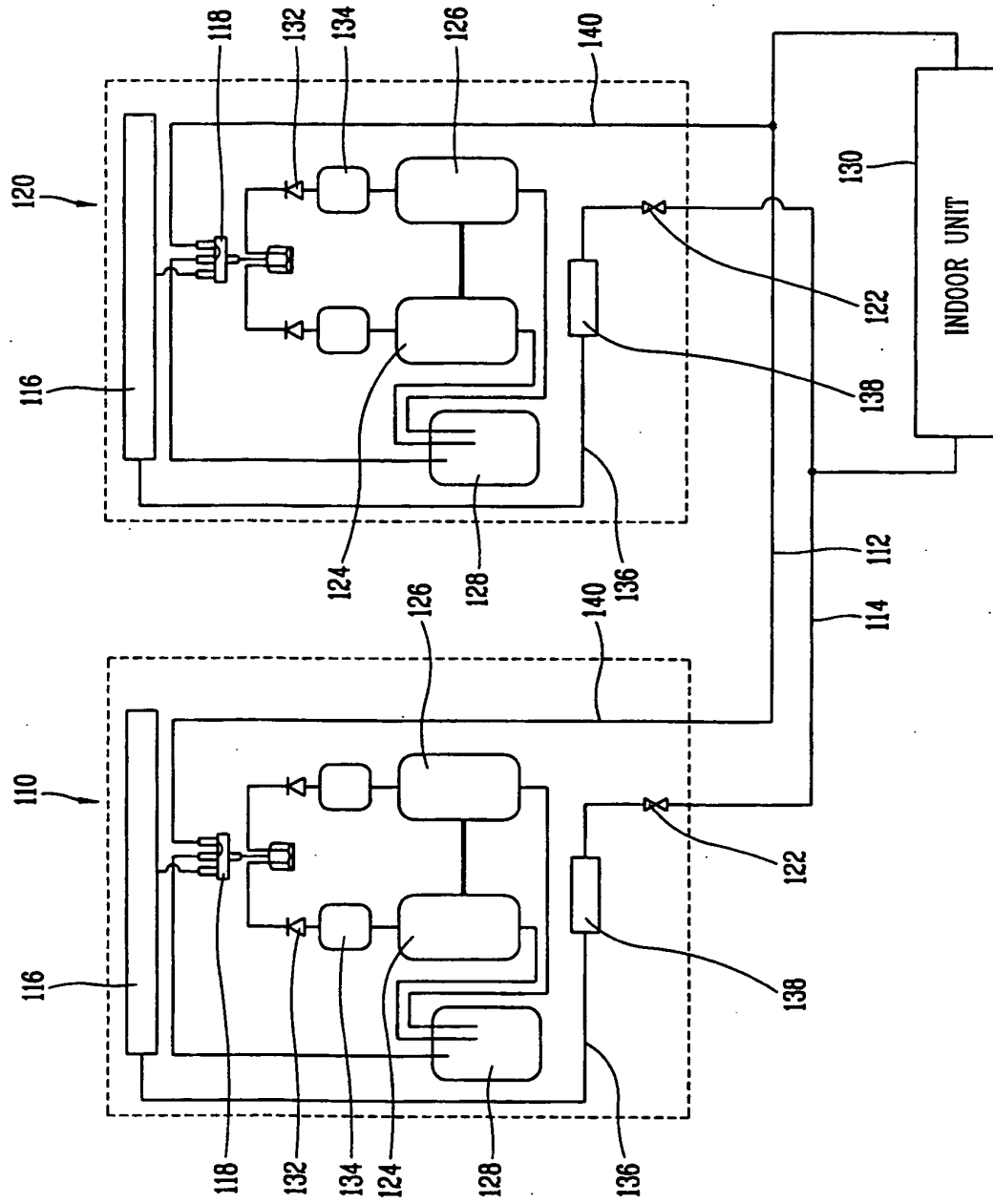


FIG. 2

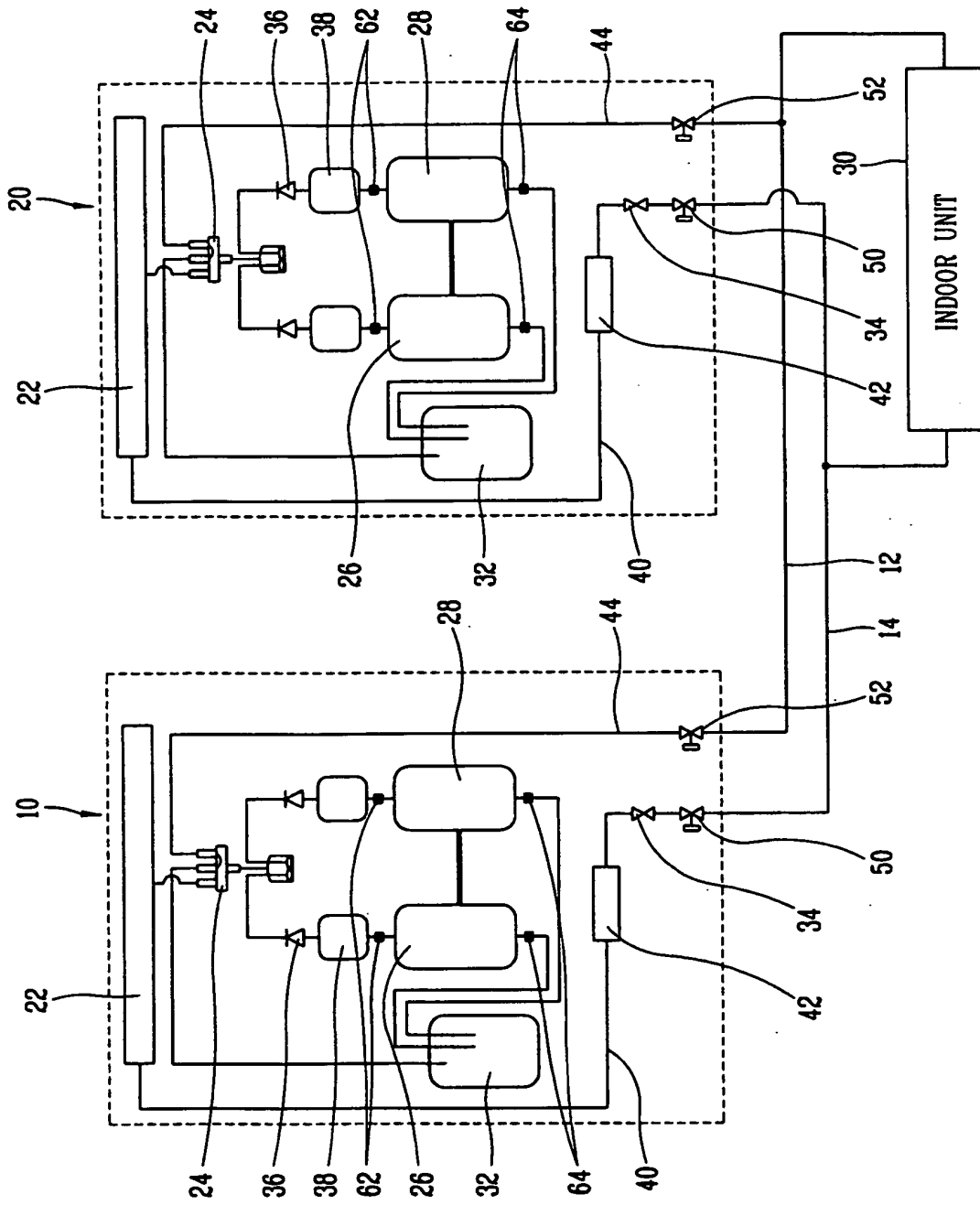


FIG. 3

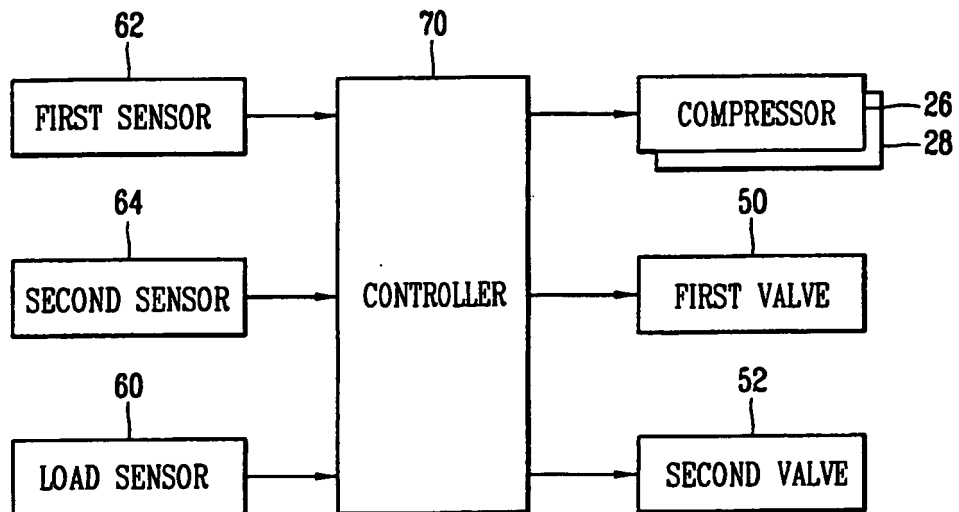
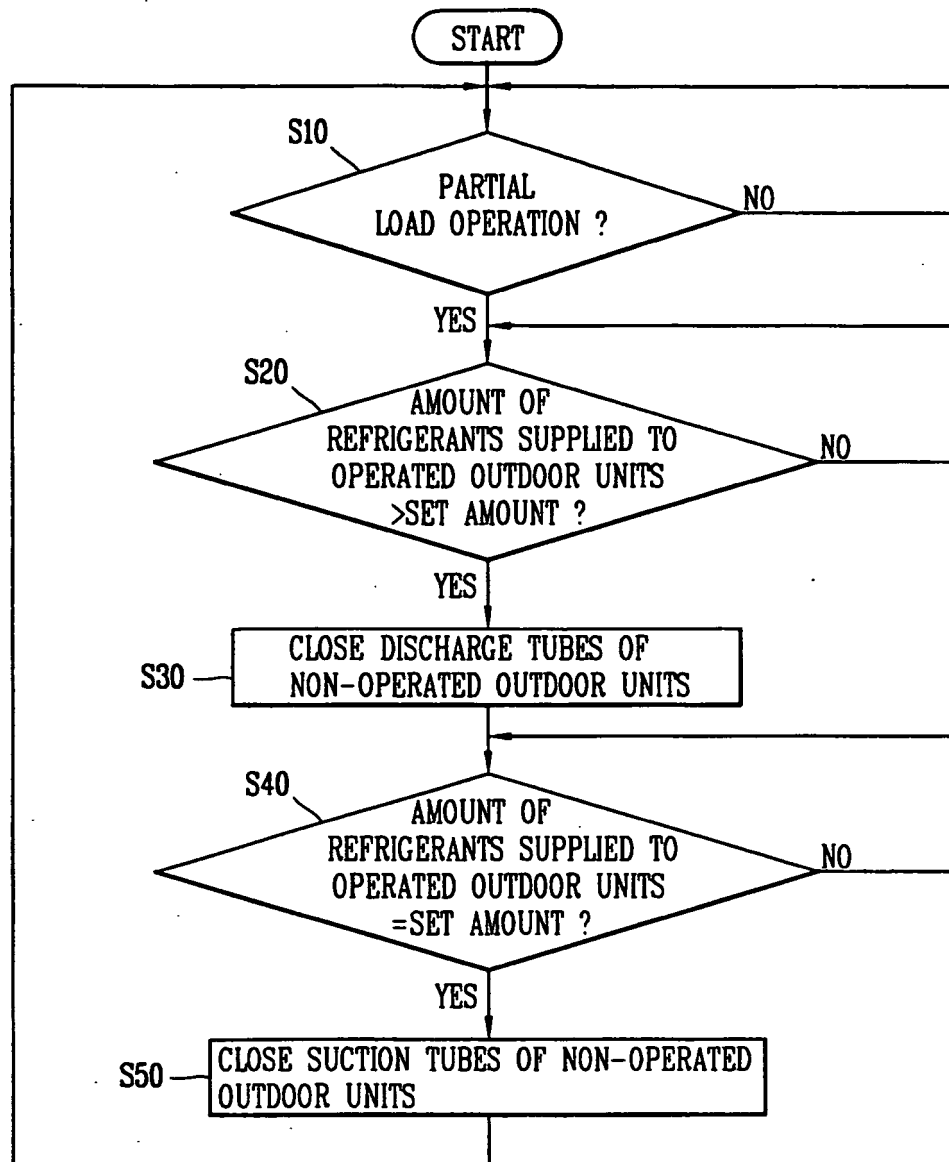


FIG. 4



REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 0744581 A [0002]