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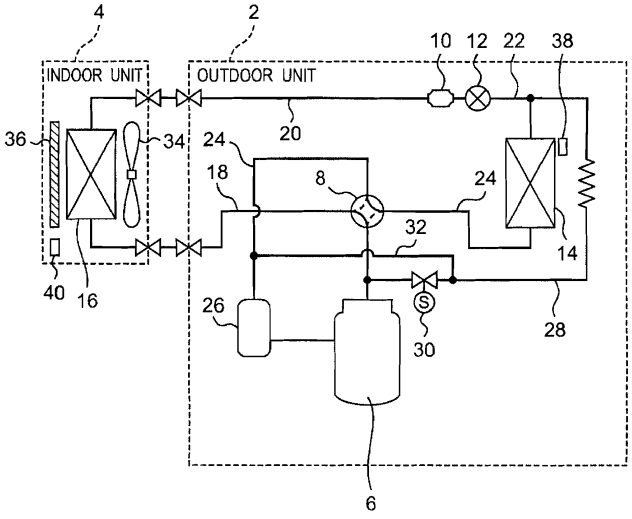
(54) AIR CONDITIONING APPARATUS

(57) An air conditioner includes an outdoor heat exchanger 14, an indoor heat exchanger 16, a four-way valve 8, and a compressor 6, and performs defrosting by melting frost deposited on the outdoor heat exchanger 14 with a refrigerant heated by the compressor 6. The air conditioner further includes an indoor fan 34 for blowing air heated by the indoor heat exchanger 16 into a room, and defrosting means for, upon decision that defrosting is required, performing the defrosting by controlling the four-way valve 8 so as to allow a heating cycle to be performed while controlling the indoor fan 34 so as to keep air blown into the room.

Fig.1



EP 2 615 389 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to an air conditioner which includes an indoor heat exchanger, an outdoor heat exchanger, a four-way valve, and a compressor and which is capable of melting frost deposited onto the outdoor heat exchanger.

BACKGROUND ART

[0002] Conventionally, there has been known an air conditioner which performs defrosting by a heating cycle when an outdoor heat exchanger is frosted (see, e.g., PTL 1). For execution of defrosting by a heating cycle, a refrigerant compressed and heated by a compressor is divided into two, and one is fed to the outdoor heat exchanger via the indoor heat exchanger while the other is fed directly to the outdoor heat exchanger without passing via the indoor heat exchanger. As a result, frost deposited on the outdoor heat exchanger is melted.

[0003] When such defrosting by a heating cycle as described above is executed, heating power of the air conditioner lowers naturally. Countermeasures to this may be as follows.

[0004] For example, heating power is temporarily stopped and the indoor fan for blowing air of around the indoor heat exchanger into indoor space as an example is stopped so as to reduce heat quantity fed from the indoor heat exchanger to the indoor space while increasing heat quantity fed to the outdoor heat exchanger with an aim of ending the defrosting in the shortest time. By doing so, the heating power before execution of the defrosting can be recovered promptly.

CITATION LIST

Patent Literature

[0005]

PTL 1: JP 2009-145032 A

SUMMARY OF INVENTION

Technical Problem

[0006] However, since time required for defrosting of the outdoor heat exchanger actually varies depending on various conditions such as outdoor temperature or compressor power, it is difficult for users to really feel that defrosting has ended in the shortest time as described above. In other words, since the shortest ending time of defrosting varies, the user cannot know that defrosting has been executed in the shortest time. Further, it is not often the case that the user obtains a sense of satisfaction from an ending of defrosting in the shortest time, and what is more, the user may feel uncomfortable by regarding a stop of the indoor fan as a stop of heating.

[0007] The invention having been accomplished in consideration of such problems of the prior arts, an object of the invention is to perform defrosting of an outdoor heat exchanger without giving uncomfortableness to indoor users.

Solution to Problem

[0008] In order to achieve the above object, in a first aspect of the invention, there is provided an air conditioner which includes an outdoor heat exchanger, an indoor heat exchanger, a four-way valve, and a compressor and which performs defrosting by melting frost deposited on the outdoor heat exchanger with a refrigerant heated by the compressor,
the air conditioner comprising:

an indoor fan for blowing air heated by the indoor heat exchanger into a room; and
defrosting means for, upon decision that defrosting is required, performing the defrosting by controlling the four-way valve so as to allow a heating cycle to be performed while controlling the indoor fan so as to keep air blown into the room.

Advantageous Effects of Invention

[0009] According to the invention, the indoor fan blows air into the room during the execution of defrosting of the outdoor heat exchanger. As a result, the defrosting of the outdoor heat exchanger can be executed without causing the user to feel uncomfortable by regarding a stop of the indoor fan as a stop of heating.

BRIEF DESCRIPTION OF DRAWINGS

[0010] The above aspects and features of the present invention will become more apparent from the following description of preferred embodiments thereof with reference to the accompanying drawings, and wherein:

Fig. 1 is a diagram showing a configuration of an air conditioner in accordance with an embodiment of the invention;
Fig. 2 is a schematic diagram showing operations and flow of a refrigerant in a defrosting operation of the air conditioner of Fig. 1; and
Fig. 3 is a flowchart showing a control flow in the defrosting operation.

DESCRIPTION OF EMBODIMENTS

[0011] In a first aspect, the invention provides an air conditioner which includes an outdoor heat exchanger, an indoor heat exchanger, a four-way valve, and a compressor and which performs defrosting by melting frost

deposited on the outdoor heat exchanger with a refrigerant heated by the compressor, the air conditioner comprising: an indoor fan for blowing air heated by the indoor heat exchanger into a room; and defrosting means for, upon decision that defrosting is required, performing the defrosting by controlling the four-way valve so as to allow a heating cycle to be performed while controlling the indoor fan so as to keep air blown into the room.

[0012] With this constitution, the indoor fan keeps blowing air into the room during execution of the defrosting of the outdoor heat exchanger. As a result, the defrosting of the outdoor heat exchanger can be executed without causing the user to feel uncomfortable by regarding a stop of the indoor fan as a stop of heating.

[0013] In a second aspect, the defrosting means calculates a heat quantity distributable to heating based on a heat quantity necessary for melting of frost , a power of the compressor, and a defrosting duration time, and then controls a rotation speed of the indoor fan based on the calculated heat quantity. Therefore, the rotation speed of the indoor fan can be controlled with preference given to the defrosting.

[0014] In a third aspect, the air conditioner further comprises a louver for directing a flow of air blown by the indoor fan, wherein upon decision that defrosting is required, the louver directs air blown from the indoor fan to an upward direction in the room. As a result, low-temperature air is prevented from being blown directly to users, so that the possibility that the users may feel uncomfortable is suppressed.

[0015] In a fourth aspect, the air conditioner further comprises human position detection means for detecting an indoor position at which a human is present, wherein upon decision that defrosting is required, the louver directs air blown from the indoor fan to a direction other than directions including any indoor position of human presence detected by the human position detection means. As a result, low-temperature air is prevented from being blown directly to users, so that the possibility that the users may feel uncomfortable is suppressed.

[0016] In a fifth aspect, the air conditioner further comprises outdoor temperature detection means for detecting outdoor temperature, wherein the defrosting means controls a rotation speed of the indoor fan based on an outdoor temperature detected by the outdoor temperature detection means. As a result, more heat quantity is supplied to the outdoor heat exchanger in a case of lower outdoor temperature, i.e., in a case where more heat quantity is required for defrosting.

[0017] Hereinbelow, embodiments of the invention will be described with reference to the accompanying drawings. The invention is not restricted by the embodiments below.

[0018] Fig. 1 shows a configuration of an air conditioner in accordance with an embodiment of the invention, and the air conditioner is composed of an outdoor unit 2 and an indoor unit 4 that are connected to each other through refrigerant pipes.

[0019] As shown in Fig. 1, a compressor 6, a four-way valve 8, a strainer 10, an expansion valve 12, and an outdoor heat exchanger 14 are provided in the outdoor unit 2, an indoor heat exchanger 16 is provided in the indoor unit 4, and those elements configure a refrigerating cycle by being connected to one another through refrigerant pipes.

[0020] In more detail, the compressor 6 and the indoor heat exchanger 16 are connected through a refrigerant pipe 18 in which the four-way valve 8 is provided, and the indoor heat exchanger 16 and the expansion valve 12 are connected through a refrigerant pipe 20 in which the strainer 10 is provided. The expansion valve 12 and the outdoor heat exchanger 14 are connected through a refrigerant pipe 22, and the outdoor heat exchanger 14 and the compressor 6 are connected through a refrigerant pipe 24.

[0021] The four-way valve 8 is placed in middle part of the refrigerant pipe 24, and an accumulator 26 for separation into liquid phase refrigerant and vapor phase refrigerant is provided in the refrigerant pipe 24 on refrigerant intake side of the compressor 6. The compressor 6 and the refrigerant pipe 22 are connected through a refrigerant pipe 28, and the refrigerant pipe 28 is provided with a solenoid valve 30. Further, a refrigerant pipe 32 is provided for feeding part of the refrigerant, which has been outputted from the compressor 6 and passed through the solenoid valve 30, to the refrigerant pipe 24 between the four-way valve 8 and the accumulator 26.

[0022] A blower fan 34 and a louver 36, in addition to the indoor heat exchanger 16, are provided in the indoor unit 4. The indoor heat exchanger 16 performs heat exchange between indoor air taken by the blower fan 34 into the indoor unit 4 and the refrigerant flowing in the indoor heat exchanger 16, so that the blower fan 34 blows the air heated by the heat exchange into the room in a heating operation, or blows the air cooled by the heat exchange into the room in a cooling operation. The louver 36 also includes upper-lower vanes and left-right vanes, and the upper-lower vanes alter direction of the air, blown off from the indoor unit 4, to upper or lower direction as required and the left-right vanes alter the direction of the air, blown off from the indoor unit 4, to leftward or rightward direction as required.

[0023] Furthermore, an outdoor heat exchanger temperature sensor 38 for detecting temperature in the outdoor heat exchanger 14 is provided in the outdoor unit 2 of the air conditioner in accordance with the embodiment. The temperature in the outdoor heat exchanger 14 corresponds to quantity of frost deposited on the outdoor heat exchanger 14, and thus the frost (quantity of frost) deposited on the outdoor heat exchanger 14 can be detected on the basis of the temperature detected by the outdoor heat exchanger temperature sensor 38. The outdoor heat exchanger temperature sensor 38 outputs a signal, corresponding to the detected temperature, to a control device for the air conditioner.

[0024] Also, a motion sensor 40 for detecting a human

(user) position in the room is provided in the indoor unit 4. The motion sensor 40 is a sensor that detects a position of a human being (user) in the room and may be, for example, an infrared sensor, an ultrasonic sensor, an illuminance sensor or the like. Upon detection of a position of a human in the room, the motion sensor 40 outputs a signal, corresponding to a detected position, to the control device (not shown) for the air conditioner. More specifically, the motion sensor 40 detects a direction in which a human is present relative to the indoor unit 4.

[0025] The control device for the air conditioner is so configured as to receive signals outputted from the outdoor heat exchanger temperature sensor 38 and the motion sensor 40 that have been described above and as to control the compressor 6, the four-way valve 8, the expansion valve 12, the solenoid valve 30, the blower fan 34, the louver 36 and the like on the basis of the received signals to thereby perform various operations.

[0026] Hereinbelow, a defrosting operation in accordance with the invention will be described.

[0027] The defrosting operation is an operation for melting frost deposited on the outdoor heat exchanger 14, and the control device for the air conditioner in accordance with the invention performs the defrosting operation by the heating cycle. In other words, the control device functions as defrosting means.

[0028] Also, the term "heating cycle" used herein refers to a cycle in which the refrigerant moves from the compressor 6 through the four-way valve 8 to the indoor heat exchanger 16, that is, a cycle in which heating is performed.

[0029] First, the defrosting operation will be described with reference to Fig. 2. In the figure, solid arrows designate flow of the refrigerant that relates to heating and dashed arrows designate flow of the refrigerant that relates to defrosting. In addition, functions of components of the air conditioner will be described.

[0030] With the deposition of frost on the outdoor heat exchanger 14 and growth of the deposited frost (to a specified quantity of frost), increase in draft resistance through the outdoor heat exchanger 14 causes decrease in airflow and decrease in the temperature in the outdoor heat exchanger 14 to a predetermined temperature (temperature that requires defrosting, which will hereinafter be referred to as "defrosting requiring temperature"). Upon detection of the defrosting requiring temperature by the outdoor heat exchanger temperature sensor 38, the defrosting operation is started.

[0031] Once the defrosting operation is started, the control device for the air conditioner exerts control for opening the solenoid valve 30 and controls the four-way valve 8 toward the heating cycle side. Thus a portion of the vapor phase refrigerant outputted from a discharge port of the compressor 6 flows into the refrigerant pipe 18 and the remainder thereof flows into the refrigerant pipe 28.

[0032] In the heating cycle without the defrosting, that is, an ordinary heating operation, for reference, the solenoid valve 30 is controlled so as to be closed.

[0033] As shown in Fig. 2, the vapor phase refrigerant having entered the refrigerant pipe 18 from the compressor 6 passes through the four-way valve 8, reaches the indoor heat exchanger 16, and undergoes heat exchange therein with indoor air through the indoor heat exchanger 16. The liquid phase refrigerant condensed with heat thereof taken by the heat exchange enters the refrigerant pipe 20, passes through the strainer 10 serving for prevention of intrusion of foreign matters into the expansion valve 12, and reaches the expansion valve 12. The refrigerant having its pressure reduced by the expansion valve 12 enters the outdoor heat exchanger 14 through the refrigerant pipe 22.

[0034] On the other hand, vapor phase refrigerant outputted from the discharge port of the compressor 6 and entering the refrigerant pipe 28 flows through the refrigerant pipe 28 and the solenoid valve 30, a portion thereof flows toward the outdoor heat exchanger 14, and the remainder enters the refrigerant pipe 32. The refrigerant flowing toward the outdoor heat exchanger 14 merges into refrigerant flowing in the refrigerant pipe 22, enters the outdoor heat exchanger 14, and undergoes heat exchange with outside air. The refrigerant having undergone the heat exchange in the outdoor heat exchanger 14 with the outside air and having been formed into liquid phase flows through the refrigerant pipe 24, the four-way valve 8, and the accumulator 26 and enters the intake port of the compressor 6.

[0035] On the other hand, the refrigerant having entered the refrigerant pipe 32 joins with the refrigerant flowing in the refrigerant pipe 24, passes through the accumulator 26, and enters the intake port of the compressor 6.

[0036] The liquid phase refrigerant from the outdoor heat exchanger 14 and the vapor phase refrigerant of high temperature from the refrigerant pipe 32 merge immediately before entering the accumulator 26, and thus facilitation of evaporation of the liquid phase refrigerant prevents the liquid phase refrigerant from passing through the accumulator 26 and returning to the compressor 6 and leads to improvement in reliability of the compressor 6.

[0037] With such a defrosting operation, the temperature of the outdoor heat exchanger 14, that was below freezing point at start of the operation due to the deposition of frost, is increased by melting of the frost while the heating power is ensured. The defrosting operation is ended once the outdoor heat exchanger temperature sensor 38 detects a temperature which is higher than the defrosting requiring temperature and at which frost cannot exist.

[0038] For execution of such defrosting operation as shown above, the control device for the air conditioner is so designed as to control the indoor fan 34 and the louver 36.

[0039] More specifically, the control device for the air conditioner executes the defrosting operation according

to a flowchart shown in Fig. 3.

[0040] First, in step S10, the control device determines whether the defrosting of the outdoor heat exchanger 14 is required or not. Specifically, if a temperature detected by the outdoor heat exchanger temperature sensor 38 as described above is lower than the defrosting requiring temperature, it is determined that the defrosting is required. If the defrosting is required, the flow proceeds to step S20. If not, the flow proceeds to RETURN and goes back to START.

[0041] Subsequently, in step S20, the control device calculates a heat quantity (compressor-generated heat quantity) Qc generated by the compressor 6.

[0042] For example, on condition that the duration time of defrosting operation is 9 minutes and the power consumption of the compressor 6 at a start of defrosting operation is 1300 W, then the compressor-generated heat quantity Qc is 1300 W x 9 min. x 60/1000 = 702 kJ.

[0043] In addition, the duration time of defrosting operation is determined by various conditions such as a temperature inside the outdoor heat exchanger, a compressor power set by the user (e.g., a power corresponding to an air flow rate set by the user), an outside air temperature (for this, an outside air temperature sensor is provided), a temperature of the indoor heat exchanger at a start of defrosting operation (i.e., heat quantity held by the indoor heat exchanger at a start of defrosting operation), and the like. The control device is made up so as to be ready for this determination.

[0044] Upon completion of the calculation of the compressor-generated heat quantity Qc, in step S30, the control device calculates a heat quantity (defrosting requiring heat quantity) Qm necessary for defrosting.

[0045] For example, quantities of deposited frost that require defrosting have been determined empirically or theoretically based on size and structure of the outdoor heat exchanger 14. As an example, a quantity of deposited frost that requires defrosting is assumed as 900 g.

[0046] A heat quantity Qm1 required to melt 900 g of frost can be calculated as 900 g x 0.3335 kJ/g = 300.15 kJ.

[0047] A heat quantity Qm2 required for temperature increase of 900 g of frost to 0°C, at which melting starts, is determined as 900 g x 0.002085 kJ/gK x (0-(-3))K = 5.63 kJ, where the mean temperature of frost at the start of defrosting operation is -3°C. In addition, the mean temperature of frost can be determined from temperatures detected by the outdoor heat exchanger temperature sensor 38 under the condition that correspondence to temperatures inside the outdoor heat exchanger 14 have previously been determined.

[0048] In contrast to this, a heat quantity Qm3 required for the temperature inside the outdoor heat exchanger 14 to increase up to a temperature at which frost cannot exist, e.g. 8°, is determined as 4.183 kJ/K x 8-(-6))K = 58.56 kJ on condition that the temperature at a start of defrosting operation is -6°C and the heat capacity is 4.183 kJ/K as an example.

[0049] Consequently, a defrosting requiring heat quantity Qm, which is given by a sum of Qm1, Qm2 and Qm3, is determined, in the above-described case, as 300.15 kJ + 58.56 kJ = 364.34 kJ.

[0050] Subsequently, in step S40, the control device calculates a heat quantity (heating-distributable heat quantity) Qh that can be distributed to heating is calculated. More specifically, the heating-distributable heat quantity Qh is a value resulting from subtracting the defrosting requiring heat quantity Qm calculated in step S30 from the compressor-generated heat quantity Qc calculated in step S20. In the case of the above example, the heating-distributable heat quantity Qh results in 702 kJ - 364.34 kJ = 337.66 kJ.

[0051] In step S50, the control device determines a rotation speed N of the indoor fan 34 based on the heating-distributable heat quantity Qh calculated in step S40.

[0052] More specifically, the control device exerts control so that even if the heating-distributable heat quantity Qh becomes smaller in the defrosting operation, the indoor fan 34 is rotated at more than a specified least rotation speed. That is, the indoor fan 34 is not fully stopped (the rotation speed N is not set to zero).

[0053] For explanation of this, an indoor user actually obtains a feeling of heating not only by directly receiving actual heat quantity (warm air) fed from the indoor unit 4 into the room, but also from air flow sounds (wind flow sounds) or rotational sounds of the indoor fan 34 without direct reception of the warm air from the indoor unit 4. Accordingly, as the rotation speed N of the indoor fan 34 becomes zero, the user may feel uncomfortable by feeling a heating stop.

[0054] In consideration of this user's feeling of heating, the control device exerts control so that even if the heating-distributable heat quantity Qh becomes small in the defrosting operation, the indoor fan 34 is rotated at a specified least rotation speed, i.e. such a rotation speed that the user can obtain a feeling of heating. In addition, the larger the heating-distributable heat quantity Qh becomes, the higher the rotation speed of the indoor fan 34 is controlled by the control device, where the high rotation speed does not surpass a set rotation speed (e.g., a rotation speed corresponding to an air flow rate set by the user) as an example. In order that such control is made implementable, the relationship between the heating-distributable heat quantity Qh and the rotation speed N of the indoor fan 34 has previously been determined empirically or statistically.

[0055] In step S60, the control device specifically determines a position of a user in a room on the basis of a signal from the motion sensor 40.

[0056] In step S70, the control device controls the louver 36 so that air flow is blown in a direction excluding the user's position specifically determined in step S60. That is, the indoor unit 4 blows air into the room with the user avoided.

[0057] As to the reason of this, since the air of lower temperatures as compared with ordinary heating operation is blown from the indoor unit 4 during the defrosting

operation, the user that directly receives the air of lower temperatures may lose the feeling of heating and thus feel uncomfortable.

[0058] According to this embodiment, the indoor fan 34 blows air into the room during the execution of defrosting of the outdoor heat exchanger 14. As a result, the defrosting of the outdoor heat exchanger 14 can be executed without causing the user to feel uncomfortable by regarding a stop of the indoor fan 34 as a stop of heating.

[0059] Also, a heat quantity distributable to the heating is calculated based on a heat quantity necessary for melting of frost on the outdoor heat exchanger 14, a power of the compressor 6, and a defrosting duration time, and the rotation speed of the indoor fan 34 is controlled based on the calculated heat quantity. Therefore, the rotation speed of the indoor fan 34 can be controlled with preference given to the defrosting.

[0060] Further, by the louver 36 and the motion sensor 40, the indoor fan 34 can provide air blow with users avoided in the defrosting operation. As a result, the possibility that the users may feel uncomfortable due to direct reception of low-temperature air is suppressed.

[0061] Hereinabove, the present invention has been fully described by way of embodiment thereof, but the invention is not limited to the embodiment.

[0062] For instance, the air conditioner of the above embodiment includes the motion sensor 40 for detecting a position of a human (user) in a room. Alternatively, in a case of an air conditioner including no motion sensor, the louver directs the air flow blown from the indoor fan to an upward direction in the room (e.g., toward the ceiling). As a result, low-temperature air is prevented from being blown directly to users in the defrosting operation, so that the possibility that the users may feel uncomfortable is suppressed as in the case where the motion sensor is included.

[0063] It is also allowable that, for example, an outdoor temperature sensor for detecting outdoor temperature is provided so that the rotation speed of the indoor fan can be controlled based on an outdoor temperature detected by the outdoor temperature sensor.

[0064] The heat quantity required for defrosting becomes higher under a lower outdoor temperature, than in cases of higher outdoor temperatures. Accordingly, under a lower outdoor temperature, it is preferable to exert control so that the rotation speed of the indoor fan becomes lower than those of higher-temperature cases, thereby allowing larger amounts of heat to be supplied to the outdoor heat exchanger.

[0065] Although the present invention has been fully described in connection with the preferred embodiments thereof with reference to the accompanying drawings, it is to be noted that various changes and modifications are apparent to those skilled in the art. Such Changes and modifications are to be understood as included within the scope of the present invention as defined by the appended claims unless they depart therefrom.

INDUSTRIAL APPLICABILITY

[0066] The present invention is applicable not only to such air conditioners composed of an outdoor unit and an indoor unit as in the above-described embodiment but also to integrated type air conditioners in which an outdoor unit and an indoor unit are integrated.

REFERENCE SIGNS LIST

[0067]

2 outdoor unit
4 indoor unit
6 compressor
8 four-way valve
10 strainer
12 expansion valve
14 outdoor heat exchanger
16 indoor heat exchanger
18 refrigerant pipe
20 refrigerant pipe
22 refrigerant pipe
24 refrigerant pipe
26 accumulator
28 refrigerant pipe
30 solenoid valve
32 refrigerant pipe
34 indoor fan
36 louver
38 quantity-of-frost detection means (outdoor heat exchanger temperature sensor)
40 human position detection means (motion sensor)

Claims

1. An air conditioner which includes an outdoor heat exchanger, an indoor heat exchanger, a four-way valve, and a compressor and which performs defrosting by melting frost deposited on the outdoor heat exchanger with a refrigerant heated by the compressor,
the air conditioner comprising:

an indoor fan for blowing air heated by the indoor heat exchanger into a room; and
defrosting means for, upon decision that defrosting is required, performing the defrosting by controlling the four-way valve so as to allow a heating cycle to be performed while controlling the indoor fan so as to keep air blown into the room.

2. The air conditioner according to Claim 1, wherein the defrosting means calculates a heat quantity distributable to heating based on a heat quantity necessary for melting of frost, a power of the compressor, and a defrosting duration time, and then controls

a rotation speed of the indoor fan based on the calculated heat quantity.

3. The air conditioner according to Claim 1 or 2, further comprising a louver for directing a flow of air blown by the indoor fan, wherein
upon decision that defrosting is required, the louver directs air blown from the indoor fan to an upward direction in the room.

4. The air conditioner according to Claim 3, further comprising human position detection means for detecting an indoor position at which a human is present, wherein
upon decision that defrosting is required, the louver directs air blown from the indoor fan to a direction other than directions including any indoor position of human presence detected by the human position detection means.

5. The air conditioner according to any one of Claims 1 to 4, further comprising outdoor temperature detection means for detecting outdoor temperature, wherein
the defrosting means controls a rotation speed of the indoor fan based on an outdoor temperature detected by the outdoor temperature detection means.

Fig.1

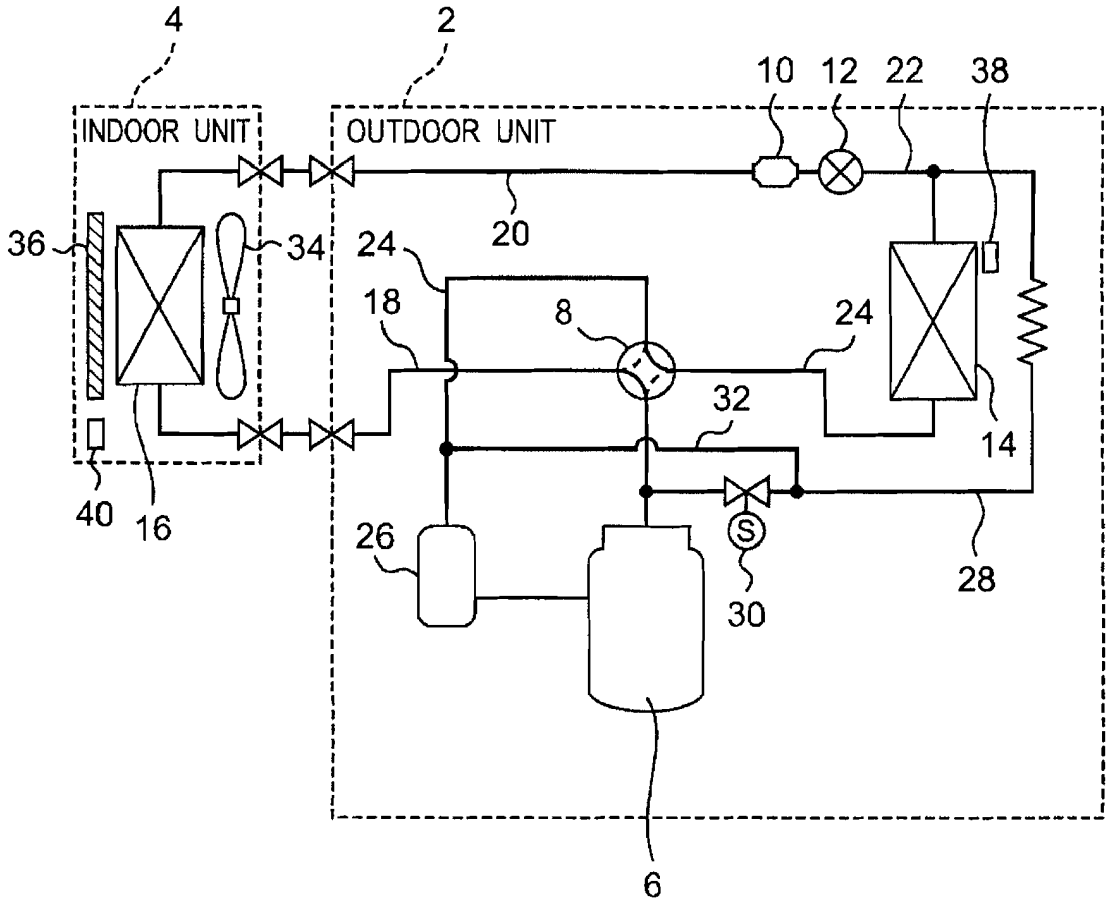

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Fig.2

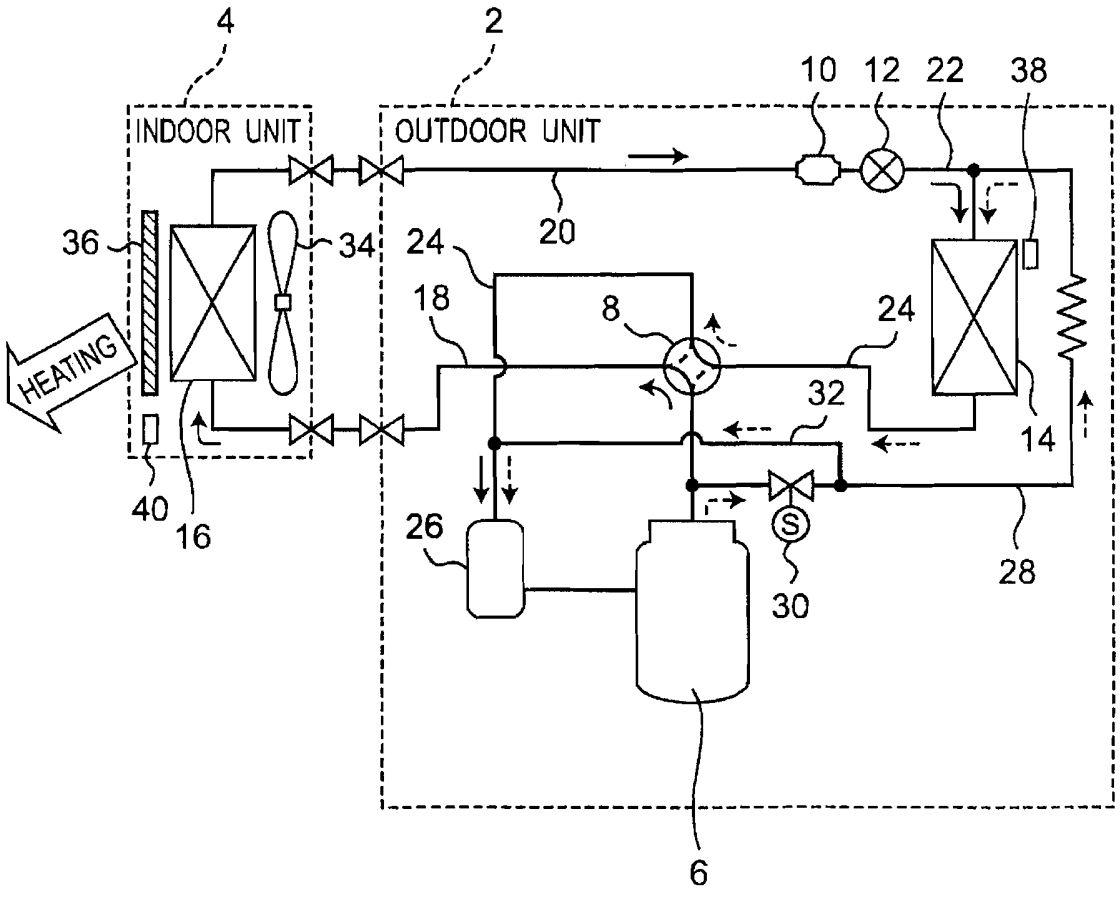
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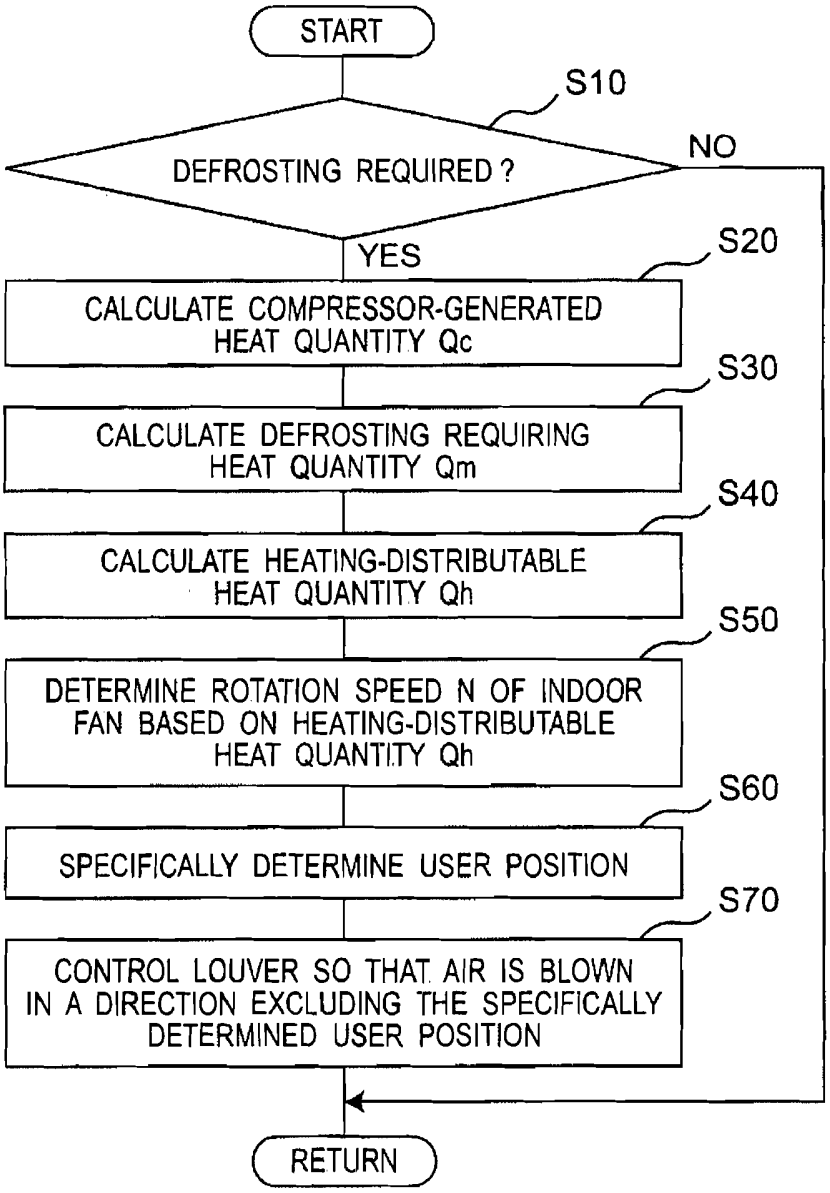
Fig.3


START
S10
DEFROSTING REQUIRED ?
NO
YES
S20
CALCULATE COMPRESSOR-GENERATED HEAT QUANTITY Qc
S30
CALCULATE DEFROSTING REQUIRING HEAT QUANTITY Qm
S40
CALCULATE HEATING-DISTRIBUTABLE HEAT QUANTITY Qh
S50
DETERMINE ROTATION SPEED N OF INDOOR FAN BASED ON HEATING-DISTRIBUTABLE HEAT QUANTITY Qh
S60
SPECIFICALLY DETERMINE USER POSITION
S70
CONTROL LOUVER SO THAT AIR IS BLOWN IN A DIRECTION EXCLUDING THE SPECIFICALLY DETERMINED USER POSITION
RETURN

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2011/001293

A. CLASSIFICATION OF SUBJECT MATTER
F24F11/02(2006.01)i, *F25B47/02*(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)
F24F11/02, F25B47/02

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	1996-2011
Kokai Jitsuyo Shinan Koho	1971-2011	Toroku Jitsuyo Shinan Koho	1994-2011

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.
X Y A	JP 4-3843 A (Fujitsu General Ltd.), 08 January 1992 (08.01.1992), entire text; fig. 1 to 3 (Family: none)	1 3,4 2,5
Y A	JP 2008-292034 A (Panasonic Corp.), 04 December 2008 (04.12.2008), paragraphs [0008], [0009] (Family: none)	3,4 1,2,5
A	JP 4-366341 A (Daikin Industries, Ltd.), 18 December 1992 (18.12.1992), entire text; all drawings (Family: none)	1-5

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

* Special categories of cited documents:
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Date of the actual completion of the international search	Date of mailing of the international search report
12 May, 2011 (12.05.11)	24 May, 2011 (24.05.11)
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2011/001293

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 2010-145020 A (Mitsubishi Electric Corp.), 01 July 2010 (01.07.2010), entire text; all drawings (Family: none)	1-5
A	JP 2007-285614 A (Matsushita Electric Industrial Co., Ltd.), 01 November 2007 (01.11.2007), paragraphs [0026] to [0031]; fig. 1 to 4 (Family: none)	2,5
A	JP 4-363536 A (Toshiba Corp.), 16 December 1992 (16.12.1992), entire text; all drawings (Family: none)	2,5

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REFERENCES CITED IN THE DESCRIPTION

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- JP 2009145032 A **[0005]**