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(54) **Air conditioning system**

Klimaanlage

Système de conditionnement d’air

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Description

[0001] The present invention relates to an air conditioner, and more particularly to an air conditioner provided with a reheat dehumidification function.

[0002] An air conditioner forms a refrigerating cycle by connecting an outdoor unit provided with a compressor, an outdoor heat exchanger and the like, and an indoor unit provided with an indoor expansion valve, an indoor heat exchanger and the like by a piping so as to circulate a refrigerant. As the air conditioner mentioned above, there has been known an air conditioner provided with a so-called reheat dehumidification function of reheating an air cooled and dehumidified by the indoor heat exchanger to a temperature near a room temperature so as to blow in the room under a cooling operation mode. The reheat dehumidification function is achieved by installing a reheat coil within the indoor unit on an upstream side of the indoor expansion valve. In other words, each of the outdoor heat exchanger and the reheat coil is operated as a condenser, whereby the air cooled and dehumidified by the indoor heat exchanger is reheated to the temperature near the room temperature on the basis of a heat exchange by the reheat coil. Further, a reheat dehumidification operation and a cooling operation accompanying no reheat and dehumidification are switched by setting a piping bypassing the reheat coil and an indoor electromagnetic valve opening and closing the piping. In other words, when the indoor electromagnetic valve is closed, the reheat coil operates as a part of the condenser, thereby executing the reheat dehumidification operation. When the indoor electromagnetic valve is opened, the reheat coil is bypassed, thereby executing the cooling operation accompanying no reheat dehumidification function.

[0003] It is possible to achieve the dehumidification preventing an excessive cooling by executing such the reheat dehumidification operation, however, there is a case that a cooling capacity of the indoor heat exchanger is increased at a time when the indoor is exposed to a high dehumidifying load, and the reheating capacity is insufficient in the reheating device.

[0004] JP-A-7-294060 describes a structure provided with a piping bypassing the outdoor heat exchanger, and a regulating valve regulating an amount of a refrigerant flowing through the bypass piping. In accordance with this structure, it is described to be possible to regulate the reheating capacity of the reheat coil by regulating a flow rate of the refrigerant bypassing the outdoor heat exchanger and keeping a high specific enthalpy so as to circulate to the reheat coil at a time of the reheat dehumidification operation, whereby it is possible to regulate finely the humidity and the temperature.

[0005] However, since the technique described in JP-A-7-294060 requires the piping bypassing the outdoor heat exchanger, the regulating valve for regulating the amount of the refrigerant flowing through the bypass piping and the like, the refrigeration cycle is complicated. Further, in the conventional structure of the air conditioner provided with the reheat dehumidification function, a necessary amount of refrigerant for the cooling cycle is increased. If the amount of the refrigerant supplied to the cooling cycle is increased in correspondence to this, a surplus refrigerant is generated at a time of a heating operation or the like in which the necessary amount of the refrigerant is small, and there is a case that a compressor damage is caused by liquid-back compression at a start time, which lowers reliability.

[0006] JP 2005-283058 discloses an air conditioner in which an outdoor unit having a compressor, a four-way valve, an outdoor heat exchanger and a receiver is connected to an indoor unit having a first indoor heat exchanger, a check valve, an indoor decompression device and a second indoor heat exchanger. The indoor unit is further provided with piping bypassing the first indoor heat exchanger and the check valve. A valve located in the piping allows the air conditioner to be switched from a cooling mode of operation to a reheating dehumidifying mode.

[0007] An object of the present invention is to control a reheating capacity of the reheat coil on the basis of a simple structure.

[0008] Another object of the present invention is to improve a reliability by suppressing a necessary amount of a refrigerant at a time of a cooling operation.

[0009] In order to achieve the objects mentioned above, in accordance with the present invention, there is provided an air conditioner in which a cooling cycle is formed by arranging an outdoor unit provided with an accumulator, a compressor, a four-way valve and an outdoor heat exchanger, and an indoor unit provided with a first indoor heat exchanger, a check valve, an indoor expansion valve, a second indoor heat exchanger and an indoor electromagnetic valve formed in a piping bypassing the first indoor heat exchanger and the check valve, in a piping circulating a refrigerant, wherein said compressor is provided on an outlet side of said accumulator, for compressing refrigerant from said accumulator; and said air conditioner further comprises a control means for enlarging an opening degree of the indoor expansion valve on the basis of a signal generated by closing of the indoor electromagnetic valve, at a time of a reheat dehumidification operation.

[0010] If the temperature of the refrigerant is lowered on the discharge side of the compressor, the refrigerant in a wet state having an increased rate of liquid refrigerant is circulated to the accumulator as is apparent from a Mollier diagram. Accordingly, since the liquid refrigerant is reserved in the accumulator, and the amount of the refrigerant circulating in the outdoor heat exchanger is reduced, the outdoor heat exchanger comes to a refrigerant lack state. Therefore, since the refrigerant in the outlet of the outdoor heat exchanger comes to a two-phase state, and an enthalpy difference in the first indoor heat exchanger corresponding to the reheat coil is increased, it is possible to improve the reheating capacity of the reheating device. In other words, it is possible to control the reheating capacity of the reheat coil on the basis of the simple structure which is not provided with the piping bypassing the outdoor heat exchanger, the regulating valve for regulating the amount of the refrigerant flowing through the bypass piping, and the like.

[0011] The objects mentioned above can be achieved by the control means for enlarging an opening degree of the indoor expansion valve since an amount of a reduced pressure of the refrigerant in the indoor expansion valve becomes smaller by enlarging the opening degree of the indoor expansion valve, an evaporating pressure in the second indoor heat exchanger corresponding to the evaporator comes to a high pressure, and an evaporating temperature becomes higher. Accordingly, a heat quantity exchanged by the second indoor heat exchanger becomes smaller, and the refrigerant circulating to the accumulator comes to the refrigerant in the wet state having the increased rate of the liquid cooling medium. As a result, the liquid refrigerant is reserved in the accumulator in the same manner as mentioned above, and the outdoor heat exchanger comes to the refrigerant lack state. Therefore, since the refrigerant in the outlet of the outdoor heat exchanger comes to the two-phase state, and the enthalpy difference in the first indoor heat exchanger corresponding to the reheat coil is increased, it is possible to improve the reheating capacity of the reheating device. In other words, it is possible to control the reheating capacity of the reheat coil on the basis of the simple structure which is not provided with the piping bypassing the outdoor heat exchanger, the regulating valve for regulating the amount of the refrigerant flowing through the bypass piping, and the like.

[0012] Further, there is provided an air conditioner in which a cooling cycle is formed by arranging an outdoor unit provided with an accumulator, a compressor, a four-way valve, an outdoor heat exchanger and an outdoor expansion valve, and an indoor unit provided with a first indoor heat exchanger, a check valve, an indoor expansion valve, a second indoor heat exchanger and an indoor electromagnetic valve formed in a piping bypassing the first indoor heat exchanger and the check valve, in a piping circulating a refrigerant,
wherein said compressor is provided on an outlet side of said accumulator, for compressing refrigerant from said accumulator; and said air conditioner further comprises a control means for controlling an opening degree of the indoor expansion valve on the basis of a signal generated by closing of the indoor electromagnetic valve, at a time of a reheat dehumidification operation, and controlling an opening degree of the outdoor expansion valve on the basis of a signal generated by opening of the indoor electromagnetic valve, at a time of a cooling operation.

[0013] In accordance with this structure, when the indoor electromagnetic valve is open, the first indoor heat exchanger is bypassed, and the cooling operation accompanying no reheat and dehumidification is executed, however, a part of the refrigerant is circulated to the first indoor heat exchanger side. Accordingly, a part of the refrigerant under the low-pressure two-phase state is circulated to the first indoor heat exchanger by controlling the opening degree of the outdoor expansion valve provided on an upstream side of the first indoor heat exchanger so as to reduce the pressure of the cooling medium. In other words, since the first indoor heat exchanger serves as the evaporator in place of the reheat coil by employing the structure mentioned above, the reservation of the liquid refrigerant is not generated. Accordingly, it is possible to suppress the necessary amount of the refrigerant at a time of the cooling operation, and it is possible to improve the reliability.

[0014] In accordance with the present invention, it is possible to control the reheating capacity of the reheat coil on the basis of the simple structure, and it is possible to improve the reliability by suppressing the necessary amount of the refrigerant at a time of the cooling operation.

[0015] IN THE DRAWINGS:

Fig. 1 is a view showing a structure of an air conditioner in accordance with the present embodiment;
Fig. 2 is a view showing a structure of an accumulator in accordance with the present embodiment;
Fig. 3 is a view showing an operation characteristic of the accumulator in accordance with the present embodiment;
Fig. 4 is a view showing a cooling cycle of a reheat dehumidification operation in the case of setting a temperature of a compressor discharge gas similar to that of a cooling operation time;
Fig. 5 is a view showing a cooling cycle of the reheat dehumidification operation in the case of setting the temperature of the compressor discharge gas lower than that of the cooling operation time; and
Fig. 6 is a view showing a concept of a set value of the temperature of the compressor discharge gas.

[0016] A description will be given below of an embodiment of an air conditioner to which the present invention is applied, with reference to Figs. 1 to 6.

[0017] Fig. 1 is a view showing a structure of the air conditioner in accordance with the present embodiment. As shown in Fig. 1, an air conditioner 1 is constituted by an outdoor unit 2, an indoor unit 3, and a gas side connection piping 4 and a liquid side connection piping 5 which connect the outdoor unit 2 and the indoor unit 3 annularly.

[0018] The outdoor unit 2 is formed by connecting a four-way valve 6, an accumulator 7, a compressor 8, an outdoor heat exchanger 9 and an outdoor expansion valve 10 by a piping circulating a cooling medium. Further, a compressor discharge gas temperature sensor 11 and a high-pressure pressure sensor 12 are provided on a discharge side of the compressor 8, and the outdoor heat exchanger 9 is provided with an outdoor blower 13 blowing an outdoor air to the outdoor heat exchanger 9.

[0019] The indoor unit 3 is formed by connecting a first indoor heat exchanger 15, a check valve 16, an indoor expansion valve 17 and a second indoor heat exchanger 18 by a piping circulating the cooling medium. Further, there is provided a piping 19 bypassing the first heat exchanger and the check valve 16, and the piping 19 is provided with an indoor electromagnetic valve 20 opening and closing the piping 19. Further, the second indoor heat exchanger 18 is provided with a blower 21 blowing an indoor air to the second indoor heat exchanger 18 and the first indoor heat exchanger 15 in this order. Further, an indoor air temperature sensor 25 and an indoor air humidity sensor 26 are provided on an indoor air suction side of the second indoor heat exchanger 18, and an indoor blow-off air temperature sensor 27 is provided on an indoor air blow-off side of the first indoor heat exchanger 15.

[0020] Next, a description will be given of details of the accumulator 7 with reference to Figs. 2 and 3. Fig. 2 is a view showing a structure of the accumulator 7. The accumulator 7 is constituted by a container 30, and an introduction pipe 31 and a U-shaped pipe 32 provided within the container 30. The U-shaped pipe 32 is provided with an oil return hole 33 in a lower portion, and with a pressure equalization hole 34 in an upper portion.

[0021] If the refrigerant and a lubricating oil are returned to an inner side of the container 30 from the four-way valve 6 through the introduction pipe 31 while circulating the cooling cycle, the lubricating oil dissolving in the refrigerant is temporarily reserved in a lower portion of the container 30. The U-shaped pipe 32 lets out the gas refrigerant in the upper portion and sucks the lubricating oil in the lower portion from the oil return hole 33 so as to return to a suction side of the compressor 8. Fig. 3 is a view showing an example of an operation characteristic of the accumulator 7. As shown in Fig. 3, a quality (dry degree) of the refrigerant returning to the suction side of the compressor is changed by a circulating amount of the refrigerant and a height HL of a liquid surface. In other words, in the case that the quality of the refrigerant in an inlet of the accumulator 7 is low, the liquid refrigerant reserved within the accumulator 7 is increased. On the contrary, in the case that the quality is high, the liquid refrigerant reserved in the accumulator 7 is reduced. As mentioned above, an amount of the refrigerant reserved within the accumulator 7 is determined in accordance with a state of the refrigerant in the inlet of the accumulator 7.

[0022] Next, a description will be given of an operation motion at a time of the cooling operation. At a time of the cooling operation, the four-way valve 6 is switched as shown by a solid line in Fig. 1, thereby connecting the discharge side of the compressor 8 and the outdoor heat exchanger 9, and the accumulator 7 and the gas side connection piping 4. Accordingly, the high-pressure gas refrigerant discharged from the compressor 8 is heat exchanged with the outdoor air in the outdoor heat exchanger 9 after passing through the four-way valve 6 so as to be condensed. The refrigerant depressurized by the outdoor expansion valve 10 so as to form low-pressure two phases passes through the liquid side connection piping 5 and is fed to the indoor unit 3. In the indoor unit 3, the refrigerant passes through the opened indoor electromagnetic valve 20 and the fully-opened indoor expansion valve 17, and flows into the second indoor heat exchanger 18. The refrigerant cooling and dehumidifying the indoor air in the second indoor heat exchanger 18 so as to be evaporated passes through the gas side connection piping 4, is again returned to the outdoor unit 2, is sucked to the compressor 8 from the accumulator 7 via the four-way valve 6, and makes a circuit of the cycle.

[0023] In this case, a part of the refrigerant flows into the first indoor heat exchanger 15, however, since the refrigerant is depressurized by the outdoor expansion valve 10 so as to be in a low pressure state, the first indoor heat exchanger is operated as the evaporator. Accordingly, since the refrigerant is gasified, and the reservation of the liquid refrigerant is not generated, it is possible to reduce a sealing amount of the cooling medium. As a result, since a liquid return or the like is not generated at a time of starting the compressor, it is possible to improve a reliability.

[0024] Next, a description will be given of a motion at a time of the reheat dehumidification operation. At a time of the reheat dehumidification operation, the four-way valve 6 is switched in the same direction as that of the cooling operation time. Accordingly, the high-pressure gas refrigerant discharged from the compressor 8 passes through the four-way valve 6 and is heat exchanged with the outdoor air in the outdoor heat exchanger 9 so as to be condensed, in the same manner as that of the cooling operation. The outdoor expansion valve 10 is fully opened, the gas refrigerant is hardly depressurized and is fed to the indoor unit 3. Since the indoor electromagnetic valve 20 is closed in the indoor unit 3, the refrigerant flows into the first indoor heat exchanger 15. The refrigerant circulating the first indoor heat exchanger 15 is heat exchanged with the indoor air cooled in the second indoor heat exchanger 18 so as to be cooled. In other words, the first indoor heat exchanger 15 is operated as a reheat coil heating the indoor air. The refrigerant condensed or excessively cooled by the first indoor heat exchanger 15 is depressurized by the indoor expansion valve 17, and flows into the second indoor heat exchanger 18. The refrigerant circulating in the second indoor heat exchanger 18 is heat exchanged with the indoor air so as to be heated. In other words, the second indoor heat exchanger 18 is operated as a cooling coil cooling and dehumidifying the indoor air. The refrigerant heated by the indoor air in the second indoor heat exchanger 18 is evaporated so as to be returned to the outdoor unit 2 via the gas side connection piping 4. In the outdoor unit 2, the refrigerant is returned to the suction side piping of the compressor 8 from the four-way valve 6 via the accumulator 7, and makes a circuit of the cycle.

[0025] In this case, a description will be given of details of an operation state at a time of the reheat dehumidification operation by using a Mollier diagram in Figs. 4 and 5. Fig. 4 is a view showing a cooling cycle of the reheat dehumidification operation in the case of setting the compressor discharge gas temperature in the same as that of the cooling operation time. In this case, the opening degree of the indoor expansion valve 17 is controlled in such a manner that the quality of the accumulator comes to about 0.95. The compressor discharge gas temperature at this time is controlled as shown in Fig. 6. In this case, the temperature detected by the compressor discharge gas temperature sensor 11 is controlled by the opening degree of the indoor expansion valve 17 in such a manner as to come to a temperature higher at a constant temperature with respect to a condensing temperature of the discharge gas pressure detected by the high-pressure pressure sensor 12, and a target temperature of discharge gas is shown by the following formula.

$$Tdo = Tc(Pd) + SHa \qquad (1)$$

[0026] In this case, Tdo denotes a target temperature of discharge gas at a normal time, Tc denotes a condensing temperature, Pd denotes a discharge gas pressure, and SHa denotes a normal superheat degree of discharge gas.

[0027] In this case, the normal superheat degree of discharge gas SHa is normally set to about 25 to 40°C. Further, in the target temperature of discharge gas at the normal time Tdo, an upper limit Tdomax and a lower limit Tdomin are set as the following expression for securing a reliability of the compressor.

$$Tdomin < Tdo < Tdomax \qquad (2)$$

[0028] Since the opening degree of the indoor expansion valve 17 is controlled in such a manner that the quality of the accumulator 7 comes to about 0.95, the liquid refrigerant is not reserved within the accumulator 7 and the accumulator 7 is operated, as shown in Fig. 3. Accordingly, a necessary amount of refrigerant is supplied to the outdoor heat exchanger 9 serving as the condenser. Therefore, a completely condensed liquid refrigerant state is established in an outlet of the outdoor heat exchanger 9. Accordingly, an enthalpy difference in the first indoor heat exchanger 15 corresponding to the reheat coil becomes smaller as shown in the Mollier diagram in Fig. 4, and the reheating capacity becomes smaller.

[0029] On the contrary, the cooling cycle of the reheat dehumidification operation shown in the Mollier diagram in Fig. 5 corresponds to an operation state in the case of setting the discharge gas temperature lower than the normal temperature of discharge gas. As shown in Fig. 6, the target discharge gas set temperature is shown by the following expression.

$$Tdor = Tc(Pd) + SHb \qquad (3)$$

[0030] In this case, Tdor denotes a target temperature of discharge gas at a reheat dehumidification operation, Tc denotes a condensing temperature, Pd denotes a discharge gas pressure, and SHb denotes a superheat degree of discharge gas at a reheat dehumidification operation time.

[0031] Further, in the same manner as mentioned above, in the target temperature of discharge gas at the reheat dehumidification operation time Tdor, an upper limit Tdomax and a lower limit Tdomin are set as shown by the following expression, for securing a reliability of the compressor.

$$Tdomin < Tdor < Tdomax \qquad (4)$$

[0032] In this case, the superheat degree of discharge gas at the reheat dehumidification operation time SHb is set lower than the normal superheat degree of discharge gas SHa, for example, about 15 to 25°C. Further, ΔPL in Figs. 4 and 5 indicates a pressure loss in the liquid side connection piping 5 in a simulation manner.

[0033] Since the refrigerant in the wet state is returned to the accumulator 7 by controlling the temperature of the discharge gas low as mentioned above, the liquid refrigerant is reserved within the accumulator 7 on the basis of the characteristic of the accumulator 7 shown in Fig. 3. Accordingly, since the outdoor heat exchanger 9 comes to a refrigerant lack state, the refrigerant on the outlet side of the outdoor heat exchanger 9 comes to the two-phase state, the enthalpy difference in the reheat coil is increased and the reheating amount is increased, as shown in Fig. 5. Accordingly, it is possible to achieve a high dehumidifying capacity as well as the cooling capacity is suppressed, whereby it is possible to achieve a low humidity which does not lower the room temperature excessively, even at a high dehumidifying load time.

[0034] Further, it is possible to change the control target value of the discharge gas temperature on the basis of the detection values of the indoor air temperature sensor 25 and the indoor blow-off air temperature sensor 27. In accordance with this control method, for example, it is possible to uniformly control the air temperature difference between the suction and the blow-off, it is possible to control a necessary cooling amount, and it is possible to achieve a room temperature and humidity control having a higher accuracy.

[0035] Further, it is possible to change the control target value of the discharge gas temperature on the basis of a detected value of the indoor air humidity sensor 26. For example, in the case that the room temperature is close to a set temperature, and the indoor humidity is widely higher than a set humidity or a comfortable humidity, the discharge gas temperature is controlled low in such a manner that the air temperature difference between the suction and the blow-off becomes small. In accordance with this control method, it is possible to execute the indoor temperature and humidity control to a comfortable humidity range.

[0036] In Fig. 1 showing the structure of the air conditioner in accordance with the present embodiment, the check valve 16 installed within the indoor unit 3 is provided for the purpose of preventing the refrigerant from flowing into the first indoor heat exchanger 15 at a time of the heating operation so as to suppress the capacity reduction, however, it can be replaced by a hydraulic resisting means such as an electromagnetic valve, a capillary or the like. Further, it is possible to reduce a circulation resistance of the indoor electromagnetic valve 20 by fully opening the indoor expansion valve 17 at a time of the heating operation, and achieving the depressurizing effect by the outdoor expansion valve 10. In this case, it is possible to omit a circulation preventing means such as the check valve 16 or the like.

Claims

1. An air conditioner (1) in which a cooling cycle is formed by arranging an outdoor unit (2) provided with an accumulator (7), a compressor (8), a four-way valve (6) and an outdoor heat exchanger (9), and an indoor unit (3) provided with a first indoor heat exchanger (15), a check valve (16), an indoor expansion valve (17), a second indoor heat exchanger (18) and an indoor electromagnetic valve (20) formed in a piping (19) bypassing the first indoor heat exchanger (15) and the check valve (16), in a piping circulating a refrigerant,
   characterised in that said compressor (8) is provided on an outlet side of said accumulator (7), for compressing refrigerant from said accumulator (7); and **in that** said air conditioner further comprises a control means for enlarging an opening degree of the indoor expansion valve (17) on the basis of a signal generated by closing of the indoor electromagnetic valve (20), at a time of a reheat dehumidification operation.

2. An air conditioner (1) in which a cooling cycle is formed by arranging an outdoor unit (2) provided with an accumulator (7), a compressor (8), a four-way valve (6), an outdoor heat exchanger (9) and an outdoor expansion valve (10), and an indoor unit (3) provided with a first indoor heat exchanger (15), a check valve (16), an indoor expansion valve (17), a second indoor heat exchanger (18) and an indoor electromagnetic valve (20) formed in a piping (19) bypassing the first indoor heat exchanger (15) and the check valve (16), in a piping circulating a refrigerant,
   characterised in that said compressor (8) is provided on an outlet side of said accumulator (7), for compressing refrigerant from said accumulator (7); and **in that** said air conditioner further comprises a control means for controlling an opening degree of the indoor expansion valve (17) on the basis of a signal generated by closing of the indoor electromagnetic valve (20), at a time of a reheat dehumidification operation, and controlling an opening degree of the outdoor expansion valve (10) on the basis of a signal generated by opening of the indoor electromagnetic valve (20), at a time of a cooling operation.

Patentansprüche

1. Klimagerät (1), bei dem in einem Leitungssystem, in dem ein Kühlmittel zirkuliert, eine mit einem Speicher (7), einem Kompressor (8), einem Vierwegeventil (6) und einem Außen-Wärmetauscher (9) versehene Außeneinheit (2) sowie eine mit einem ersten Innen-Wärmetauscher (15), einem Rückschlagventil (16), einem Innen-Expansionsventil (17), einem zweiten Innen-Wärmetauscher (18) und einem Innen-Elektromagnetventil (20) versehene Inneneinheit (3) angeordnet sind, wobei das Innen-Elektromagnetventil (20) in einer den ersten Innen-Wärmetauscher (15) und das Rückschlagventil (16) umgehenden Leitung (19) vorgesehen sind,
   dadurch gekennzeichnet, dass der Kompressor (8) an der Auslassseite des Speichers (7) zum Komprimieren von Kühlmittel aus dem Speicher (7) vorgesehen ist und dass das Klimagerät ferner eine Steuereinheit aufweist, die den Öffnungsgrad des Innen-Expansionsventils (17) aufgrund eines durch das Schließen des Innen-Elektromagnetventils (20) erzeugten Signals während eines Aufheiz-Entfeuchtungsvorgangs vergrößert.

2. Klimagerät (1), bei dem in einem Leitungssystem, in dem ein Kühlmittel zirkuliert, eine mit einem Speicher (7), einem

Kompressor (8), einem Vierwegeventil (6) einem Außen-Wärmetauscher (9) und einem Außen-Expansionsventil (10) versehene Außeneinheit (2) sowie eine mit einem ersten Innen-Wärmetauscher (15), einem Rückschlagventil (16), einem Innen-Expansionsventil (17), einem zweiten Innen-Wärmetauscher (18) und einem Innen-Elektromagnetventil (20) versehene Inneneinheit (3) angeordnet sind, wobei das Innen-Elektromagnetventil (20) in einer den ersten Innen-Wärmetauscher (15) und das Rückschlagventil (16) umgehenden Leitung (19) vorgesehen sind,
dadurch gekennzeichnet, dass der Kompressor (8) an der Auslassseite des Speichers (7) zum Komprimieren von Kühlmittel aus dem Speicher (7) vorgesehen ist und dass das Klimagerät ferner eine Steuereinheit aufweist, die den Öffnungsgrad des Innen-Expansionsventils (17) aufgrund eines durch das Schließen des Innen-Elektromagnetventils (20) erzeugten Signals während eines Aufheiz-Entfeuchtungsvorgangs vergrößert und den Öffnungsgrad des Außen-Expansionsventils (10) aufgrund eines durch das Öffnen des Innen-Elektromagnetventils (20) erzeugten Signals während eines Kühlvorgangs steuert.

Revendications

1. Climatiseur (1) dans lequel un cycle de refroidissement est formé en agençant une unité extérieure (2) munie d'un accumulateur (7), d'un compresseur (8), d'un distributeur progressif à quatre voies (6) et d'un échangeur de chaleur extérieur (9), et une unité intérieure (3) munie d'un premier échangeur de chaleur intérieur (15), d'un clapet antiretour (16), d'un détendeur intérieur (17), d'un second échangeur de chaleur intérieur (18) et d'une vanne électromagnétique intérieure (20) formée dans une tuyauterie (19) en faisant dériver le premier échangeur de chaleur intérieur (15) et le clapet antiretour (16) dans une tuyauterie dans laquelle circule un réfrigérant,
caractérisé en ce que ledit compresseur (8) est agencé sur un côté d'écoulement dudit accumulateur (7), pour compresser un réfrigérant provenant dudit accumulateur (7), et **en ce que** ledit climatiseur comporte en outre des moyens de commande pour agrandir un degré d'ouverture du détendeur intérieur (17) sur la base d'un signal généré en fermant la vanne électromagnétique intérieure (20), au moment d'une opération de déshumidification-réchauffage.

2. Climatiseur (1) dans lequel un cycle de refroidissement est formé en agençant une unité extérieure (2) munie d'un accumulateur (7), d'un compresseur (8), d'un distributeur progressif à quatre voies (6) et d'un échangeur de chaleur extérieur (9), et une unité intérieure (3) munie d'un premier échangeur de chaleur intérieur (15), d'un clapet antiretour (16), d'un détendeur intérieur (17), d'un second échangeur de chaleur intérieur (18) et d'une vanne électromagnétique intérieure (20) formée dans une tuyauterie (19) en faisant dériver le premier échangeur de chaleur intérieur (15) et le clapet antiretour (16) dans une tuyauterie dans laquelle circule un réfrigérant,
caractérisé en ce que ledit compresseur (8) est agencé sur un côté d'écoulement dudit accumulateur (7), pour compresser un réfrigérant provenant dudit accumulateur (7), et **en ce que** ledit climatiseur comporte en outre des moyens de commande pour commander un degré d'ouverture du détendeur intérieur (17) sur la base d'un signal généré en fermant la vanne électromagnétique intérieure (20), au moment d'une opération de déshumidification-réchauffage, et commander un degré d'ouverture du détendeur extérieur (10) sur la base d'un signal généré par l'ouverture de la vanne électromagnétique intérieure (20), au moment d'une opération de refroidissement.

FIG.1

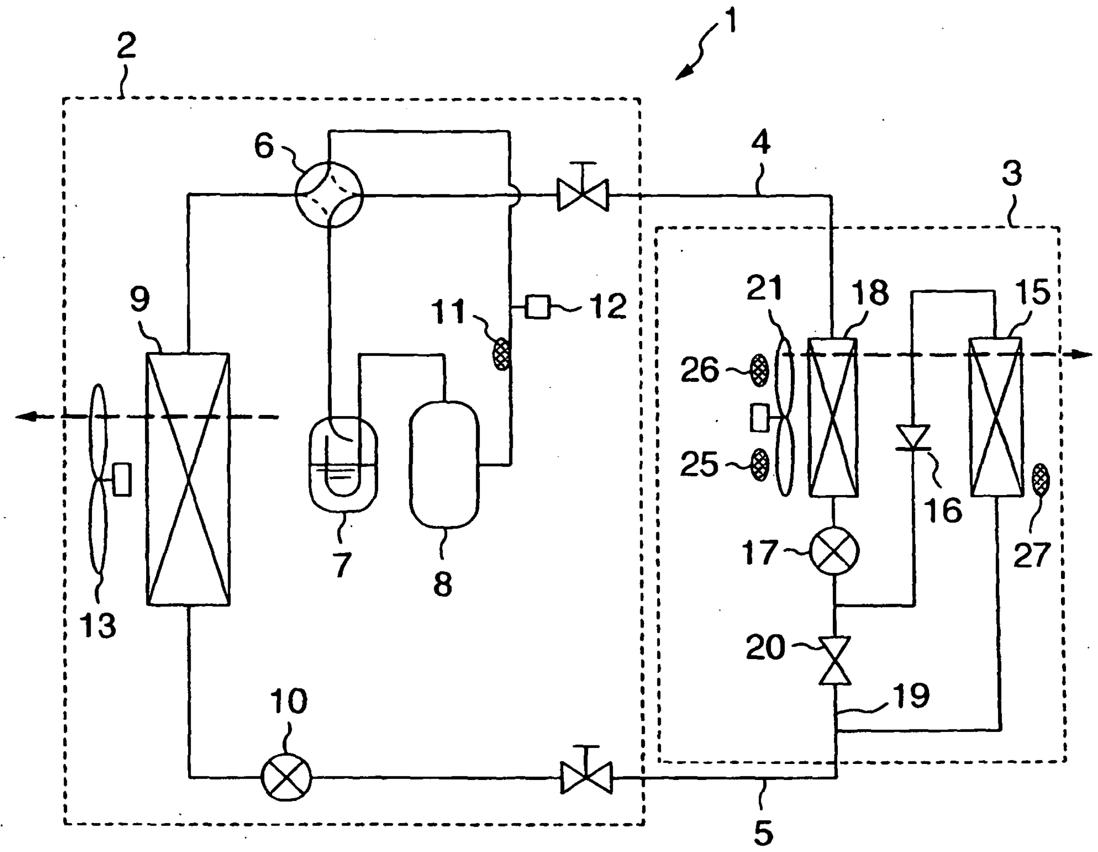


FIG.2

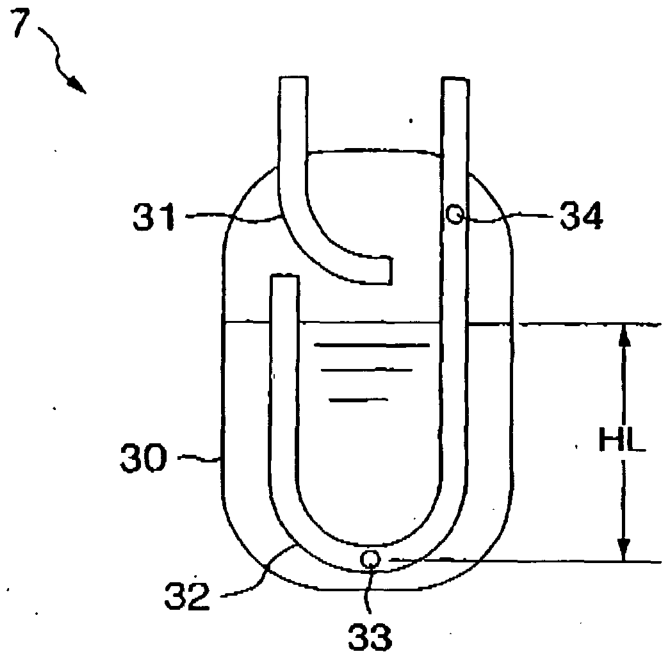

7
31
34
30
HL
32
33

FIG.3

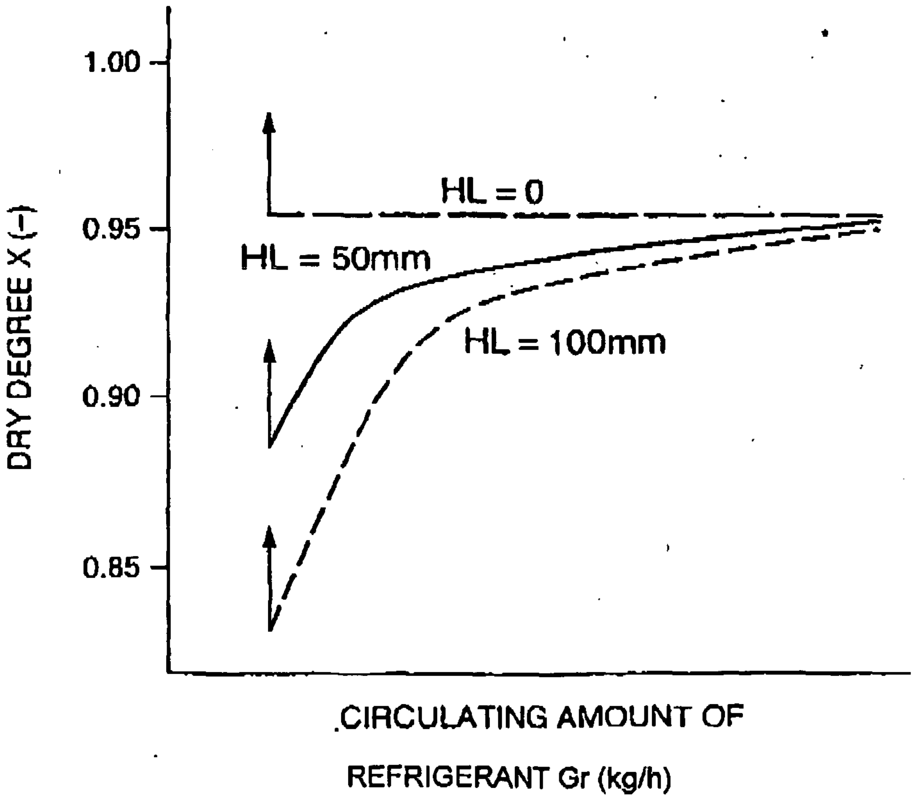

1.00
0.95
0.90
0.85
DRY DEGREE X (-)
HL = 0
HL = 50mm
HL = 100mm
.CIRCULATING AMOUNT OF
REFRIGERANT Gr (kg/h)

FIG.4

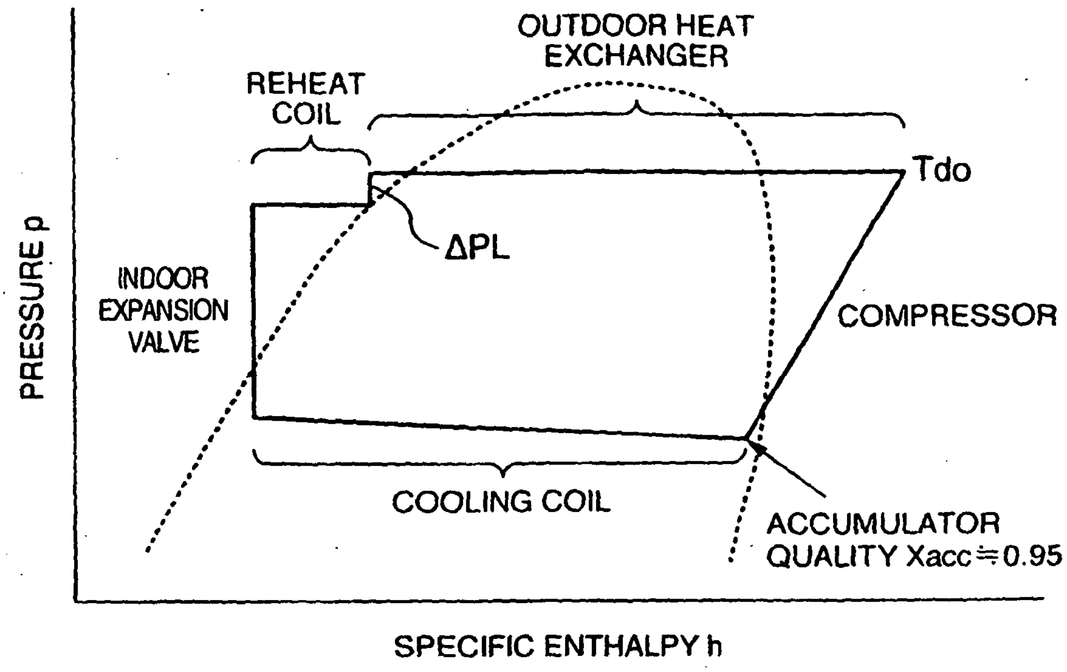

OUTDOOR HEAT EXCHANGER
REHEAT COIL
Tdo
ΔPL
PRESSURE p
INDOOR EXPANSION VALVE
COMPRESSOR
COOLING COIL
ACCUMULATOR QUALITY Xacc≒0.95
SPECIFIC ENTHALPY h

FIG.5

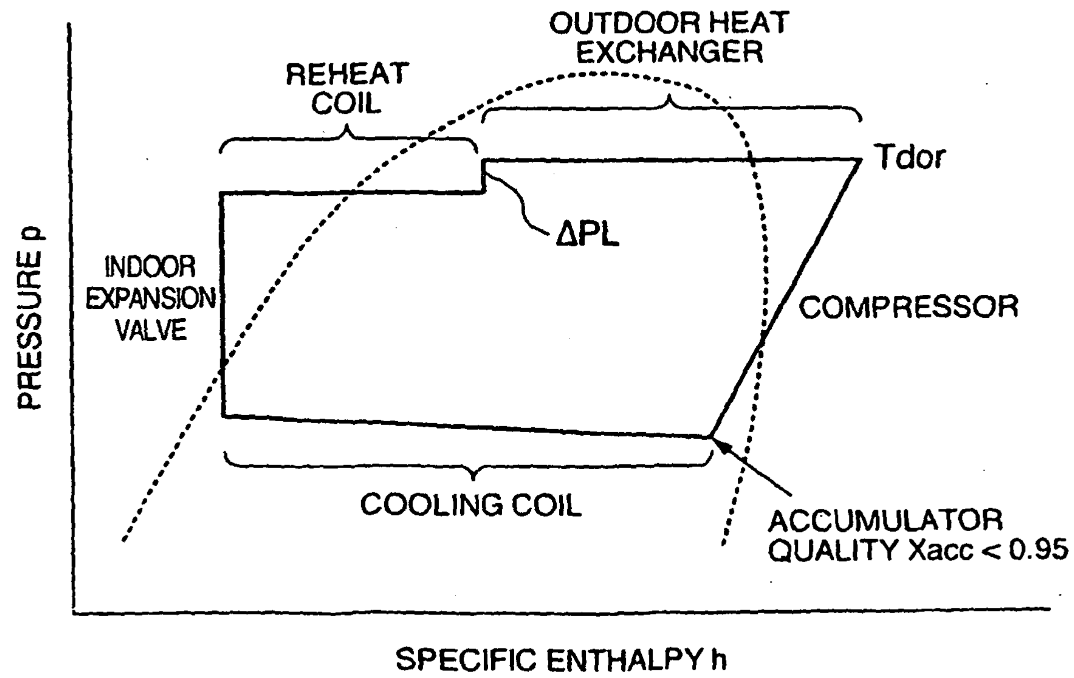
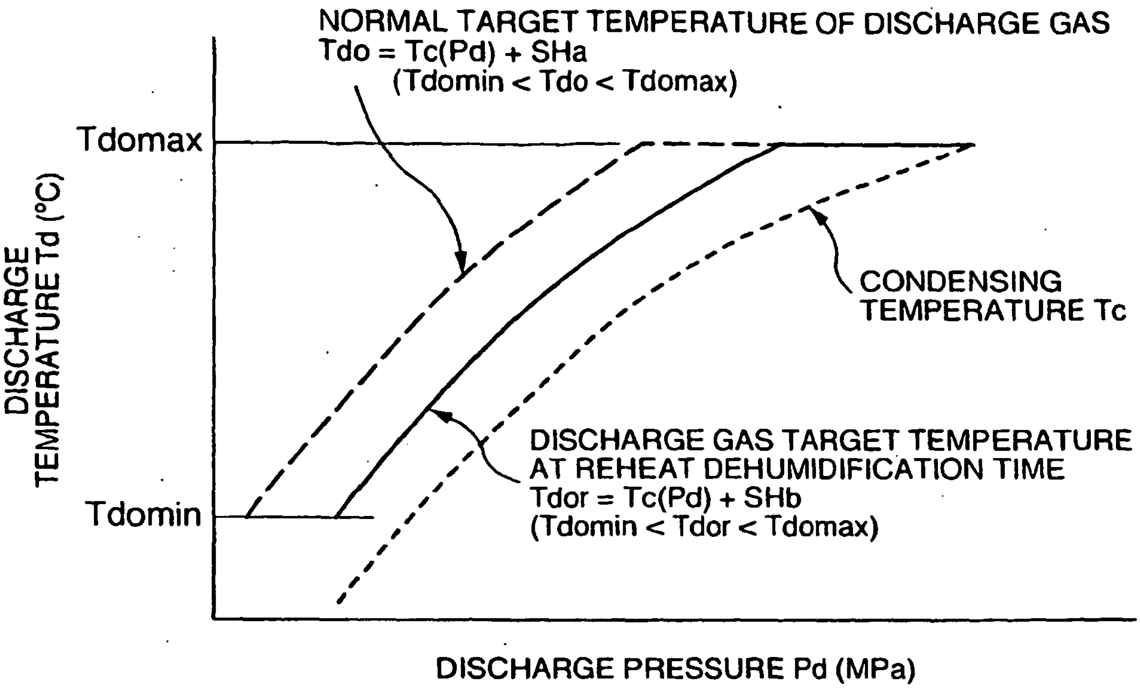

OUTDOOR HEAT EXCHANGER
REHEAT COIL
Tdor
ΔPL
PRESSURE p
INDOOR EXPANSION VALVE
COMPRESSOR
COOLING COIL
ACCUMULATOR QUALITY Xacc < 0.95
SPECIFIC ENTHALPY h

FIG.6


NORMAL TARGET TEMPERATURE OF DISCHARGE GAS
Tdo = Tc(Pd) + SHa
(Tdomin < Tdo < Tdomax)
Tdomax
Tdomin
DISCHARGE TEMPERATURE Td (°C)
CONDENSING TEMPERATURE Tc
DISCHARGE GAS TARGET TEMPERATURE AT REHEAT DEHUMIDIFICATION TIME
Tdor = Tc(Pd) + SHb
(Tdomin < Tdor < Tdomax)
DISCHARGE PRESSURE Pd (MPa)

REFERENCES CITED IN THE DESCRIPTION

Patent documents cited in the description

- JP 7294060 A **[0004] [0005]**
- JP 2005283058 A **[0006]**