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(54) **CONTROL SYSTEM FOR ADJUSTING AIR TEMPERATURE, HUMIDITY AND WATER TEMPERATURE BY AN OUTDOOR AIR HEAT EXCHANGER**

STEUERUNGSSYSTEM ZUR ANPASSUNG DER LUFTTEMPERATUR, FEUCHTIGKEIT UND WASSERTEMPERATUR DURCH EINEN AUSSENLUFTWÄRMETAUSCHER

SYSTÈME DE COMMANDE DE RÉGLAGE DE LA TEMPÉRATURE DE L'AIR, DE L'HUMIDITÉ ET LA TEMPÉRATURE DE L'EAU À L'AIDE D'UN ÉCHANGEUR DE CHALEUR D'AIR EXTÉRIEUR

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Description

TECHNICAL FIELD

[0001] The present invention relates to the field of air conditioning and energy utilization, particularly to a two-way circulation control system with an outdoor air heat exchanger. More particularly, the present invention relates to a control system for adjusting air temperature, humidity and water temperature by an outdoor air heat exchanger according to the preamble of independent claim 1, such as it is e.g. known from EP 3 415 839 A1, EP 3 299 734 A1 or EP 3 205 955 A1.

BACKGROUND ART

[0002] Indoor air conditioning is usually performed through the use of an evaporator. The refrigerating coil in the evaporator dehumidifies and cools indoor air in high humidity or indoor air mixed with outdoor air, and transfers the heat absorbed at the refrigerating coil to a heating coil to reheat the cooled air, which returns to the indoor space as dehumidified air. In a dehumidifying process, refrigerant cyclically recovers latent heat and reheats cold air, which is then supplied to the indoor space. The heat absorbed at the refrigerating coil in the evaporator may also be led to a water heat exchange apparatus to heat water in a building or water in a swimming pool. When the air temperature and water temperature in the building both meet requirements, an outdoor air heat exchanger may be used to reject heat and release surplus heat recovered in a dehumidifying process.

[0003] However, in winter, particularly when humidity meets requirements and is lower than an expected value, the foregoing dehumidifying process cannot be used to generate latent heat, and auxiliary electric heating devices are needed to raise indoor air temperature and water temperature.

SUMMARY OF THE INVENTION

[0004] The present invention intends to provide to a control system for adjusting air temperature, humidity and water temperature by an outdoor air heat exchanger.

[0005] In order to solve this problem, the invention provides a control system for adjusting air temperature, humidity and water temperature by an outdoor air heat exchanger according to independent claim 1. The dependent claims relate to advantageous embodiments.

[0006] Firstly, the present invention provides a control system for adjusting air temperature, humidity and water temperature by an outdoor air heat exchanger, comprising an air conditioning apparatus, a heat exchange apparatus and said outdoor air heat exchanger; the air conditioning apparatus comprises in turn: an air recovery apparatus, an air refrigerating and dehumidifying apparatus, an air supply apparatus and a compressor unit; the air refrigerating and dehumidifying apparatus and the compressor unit are connected in series to a first heat exchange apparatus to form a refrigerant system; the outdoor air heat exchanger is connected in parallel to the refrigerant system; the control system is enabled when indoor humidity is lower than a set value, i.e.: when indoor humidity is lower than a set value and water temperature and/or room temperature is lower than a set value, a heat absorption mode of the outdoor air heat exchanger will be enabled, refrigerant in the outdoor air heat exchanger will be inputted to the compressor unit via the outdoor air heat exchanger, the refrigerant in the compressor unit will be converted into a heating medium, and the heating medium will be inputted to the heat exchange apparatus and raise water temperature and/or room temperature through the first heat exchange apparatus.

[0007] When indoor humidity is lower than a set value and water temperature and/or room temperature is higher than a set value, a heat dissipation mode of the outdoor air heat exchanger will be enabled, the refrigerant in the outdoor air heat exchanger will perform heat dissipation by outdoor air, and the refrigerant after heat dissipation will be inputted to the heat exchange apparatus and reduce water temperature and/or room temperature via the first heat exchange apparatus.

[0008] In the system according to the invention when indoor humidity is higher than a set value and water temperature and/or room temperature is lower than a set value, a mode of dehumidifying heat pump will be enabled, the refrigerant will absorb heat via the air refrigerating and dehumidifying apparatus and then be inputted to the compressor unit and converted into a heating medium in the compressor unit, and the heating medium will be inputted to the heat exchange apparatus and raise water temperature and/or room temperature via the first heat exchange apparatus.

[0009] When indoor humidity is higher than a set value, water temperature and/or room temperature is higher than a set value, a mode of dehumidifying heat pump will be enabled, the refrigerant will reduce water temperature and/or room temperature via the first heat exchange apparatus and/or the air refrigerating and dehumidifying apparatus, the refrigerant after heat absorption will be inputted to the compressor unit, the refrigerant in the compressor unit will be converted into a heating medium, and the heating medium will be inputted to the outdoor air heat exchanger for heat dissipation by outdoor air.

[0010] The first heat exchange apparatus may be the air reheating apparatus arranged inside an air conditioning

apparatus; the refrigerant system is connected in parallel to a second heat exchanger, which is connected to a water system or a water tower.

[0011] Based on the foregoing solution, the control system may further comprise a first three-way valve, a second three-way valve, a four-way valve and a liquid storage tank;

and the compressor unit may be connected to an inlet of the first three-way valve, and an outlet 1 of the first three-way valve is connected to an inlet of the air reheating apparatus; an outlet 2 of the first three-way valve is connected to an inlet of the four-way valve, and the four-way valve comprises a first outlet, a second outlet and a third outlet in turn;

[0012] The first outlet of the four-way valve may be connected to an outdoor air heat exchanger, the second outlet of the four-way valve may be connected to a compressor, and the third outlet of the four-way valve is connected to a water heat exchange apparatus;

[0013] The other ends of the outdoor air heat exchanger, the air reheating apparatus and the second heat exchanger are connected to the liquid storage tank respectively;

[0014] The liquid storage tank is connected to an inlet of a second three-way valve, an outlet 1 of the second three-way valve is connected to a second expansion valve, the second expansion valve is connected to an inlet of an air refrigerating and dehumidifying apparatus, an outlet of the air refrigerating and dehumidifying apparatus is connected to a compressor unit, or the air refrigerating and dehumidifying apparatus is connected to an air reheating apparatus via a valve; and an outlet 2 of the second three-way valve is connected to a first expansion valve, and the first expansion valve is connected to an outdoor air heat exchanger;

[0015] A heat absorption mode of the outdoor air heat exchanger is enabled, refrigerant in the outdoor air heat exchanger is inputted to the four-way valve via the outdoor air heat exchanger, then to the compressor unit via the four-way valve, and converted into a heating medium in the compressor unit, and the heating medium is inputted to an inlet of the first three-way valve, and to the air reheating apparatus via the first three-way valve and/or to the second heat exchanger connected to the four-way valve; the heating medium after heat exchange flows back to the liquid storage tank via the air reheating apparatus and/or the second heat exchanger, and then flows to the outdoor air heat exchanger via the second three-way valve.

[0016] Further, on the basis of the foregoing solution, a refrigerant filter is arranged between the liquid storage tank and the second three-way valve.

[0017] Further, on the basis of the foregoing solution, an inlet-end outdoor exhaust fan is arranged at the air recovery apparatus.

[0018] Meanwhile, the present invention further provides the following few advanced solutions:
On the basis of the foregoing solution, the air conditioning apparatus is provided with a water cooling system before or after air treatment of the refrigerant system.

[0019] Alternatively, on the basis of the foregoing solution, the air conditioning apparatus is provided with a water heating system before or after air treatment of the refrigerant system.

[0020] Alternatively, on the basis of the foregoing solution, the air conditioning apparatus is provided with a water cooling system before air treatment of the refrigerant system, and is provided with a water heating system after air treatment of the refrigerant system.

[0021] Alternatively, the second heat exchanger is connected in series to a third heat exchanger, and the third heat exchanger is connected to chilled water. The air conditioning apparatus is provided with a water cooling system before air treatment of the refrigerant system, a third three-way valve is arranged at an inlet of the water cooling system, and an outlet 2 of the third three-way valve is connected to an inlet of the third heat exchanger; a fourth three-way valve is arranged at the inlet of the third heat exchanger, the outlet 2 of the third three-way valve is connected to an inlet of the fourth three-way valve, and an outlet 2 of the fourth three-way valve is connected to chilled water.

[0022] Technical effect generated by the present invention: The present invention discloses various types of indoor refrigerant systems connected in parallel to an outdoor air heat exchanger. When humidity is high in summer, the indoor refrigerant system will perform dehumidification and cooling and use absorbed heat to adjust indoor air and indoor water systems (e.g., swimming pool or bath water). When indoor humidity, temperature and pool water temperature all meet requirements, surplus heat recovered in a dehumidifying process will be removed through an outdoor air heat exchanger. In winter, following the decrease of demand for dehumidification, recovered latent heat is restricted. A "reverse circulation" system runs a refrigerant loop as an air source heat pump, providing enough heat for reheating of air and reheating of pool water. Under the reverse circulation system, the outdoor air heat exchanger acts as a "heat pump" and absorbs outdoor heat to heat indoor air and water. The generated latent heat (from the reverse circulation system) subsequently is transferred to an air reheater and used to heat the hall and water of the swimming pool. The use of a reverse circulation system saves operating cost in winter by more than 60% than an auxiliary electric heating device does.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023]

FIG. 1 is a schematic view of the overall structure of a control system for adjusting air temperature, humidity and water temperature by an outdoor air heat exchanger according to the present invention.

FIG. 2 to FIG. 10 show embodiments of the control system for adjusting air temperature, humidity and water temperature by an outdoor air heat exchanger according to the present invention.

DETAILED DESCRIPTION

[0024] Below the specific embodiments, structure, features and effects of the control system for adjusting air temperature, humidity and water temperature by an outdoor air heat exchanger according to the present invention will be illustrated by referring to accompanying drawings.

[0025] The present invention provides a control system for adjusting air temperature, humidity and water temperature by an outdoor air heat exchanger according to claim 1.

[0026] FIG. 1 is a schematic view of the overall structure of a control system for adjusting air temperature, humidity and water temperature by an outdoor air heat exchanger according to the present invention, which comprises an indoor unit and an outdoor unit. The indoor unit comprises an air conditioning apparatus 10, which comprises an air recovery apparatus 11, an air filter 12, an air refrigerating and dehumidifying apparatus 13, an air reheating apparatus 14, an air supply apparatus 15 and a compressor unit. The compressor unit comprises a compressor 16 and an air-liquid separator 17 connected to the compressor 16. The indoor unit further comprises a water heat exchange apparatus 18 and a liquid storage tank 19. The outdoor unit comprises an outdoor air heat exchanger 20.

[0027] The indoor unit further comprises a first three-way valve 31, a second three-way valve 32 and a four-way valve 33, the compressor 16 is connected to an inlet 31a of the first three-way valve, and an outlet 31b of the first three-way valve is connected to an inlet of the air reheating apparatus 14; an outlet 2 31c of the first three-way valve is connected to an inlet 33a of the four-way valve, and the four-way valve 33 comprises a first outlet 33b, a second outlet 33c and a third outlet 33d in turn. The first outlet 33b of the four-way valve is connected to a first indoor ball valve 36a. The first indoor ball valve 36a is connected to a first outdoor ball valve 37a, and the first outdoor ball valve 37a is connected to an outdoor air heat exchanger 20. The second outlet 33c of the four-way valve is connected to an air-liquid separator 17. The air-liquid separator 17 is connected to a compressor 16. The compressor 16 is connected to the inlet 31a of the first three-way valve. The third outlet 33d of the four-way valve is connected to a water heat exchange apparatus 18.

[0028] The other end of the water heat exchange apparatus 18 is connected to a liquid storage tank 19 via a first check valve 34a. The other end of the air reheating apparatus 14 is connected to the liquid storage tank 19 via a second check valve 34b. The other end of the outdoor air heat exchanger is connected to a first expansion valve 38 and a fourth check valve 34d, which are connected to each other in parallel and then is connected to a second outdoor ball valve 37b. The second outdoor ball valve 37b is connected to a second indoor ball valve 36b. The second indoor ball valve 36b is connected to a third check valve 34c. The third check valve 34c is connected to a liquid storage tank 19.

[0029] The liquid storage tank 19 is connected to an inlet 32a of a second three-way valve 32a. An outlet 1 32b of the second three-way valve is connected to a second expansion valve 39. The second expansion valve 39 is connected to an inlet of an air refrigerating and dehumidifying apparatus 13. An outlet of the air refrigerating and dehumidifying apparatus13 is connected to an air-liquid separator 17. The air-liquid separator 17 is connected to a compressor 16. The air refrigerating and dehumidifying apparatus 13 may further be connected to an inlet of an air reheating apparatus 14 via a valve 35. An outlet 2 32c of the second three-way valve is connected to a second indoor ball valve 36b. The second indoor ball valve 36b is connected to a second outdoor ball valve 37b. The second outdoor ball valve 37b is connected to a first expansion valve 38 and a fourth check valve 34d, which are connected to each other in parallel. The first expansion valve 38 and the fourth check valve 34d in parallel are connected to an outdoor air heat exchanger 20. A refrigerant filter 21, a sight glass 22 and a third indoor ball valve 36c are arranged between the liquid storage tank 19 and the second three-way valve 32.

[0030] The control system is enabled when indoor humidity is lower than a set value, i.e.: when indoor humidity is lower than a set value, and air temperature and/or room temperature is lower than a set value, a heat absorption mode of the outdoor air heat exchanger will be enabled, refrigerant in an outdoor air heat exchanger is inputted to a four-way valve via an outdoor air heat exchanger and then to a compressor via the four-way valve, and converted into a heating medium inside the compressor. The heating medium is inputted to an inlet of a first three-way valve and to an air reheating apparatus via the first three-way valve and/or to a water heat exchange apparatus connected to a four-way valve; after heat exchange the heating medium flows back to a liquid storage tank via the air reheating apparatus and/or the water heat exchange apparatus, and then flows to the outdoor air heat exchanger via a second three-way valve.

[0031] When indoor humidity is lower than a set value, and water temperature and/or room temperature is higher than a set value, a heat dissipation mode of the outdoor air heat exchanger 20 will be enabled, the refrigerant in the outdoor air heat exchanger will circulate clockwise into an air heat exchanger 20, for heat dissipation by outdoor air. The refrigerant liquid after heat dissipation is collected to a liquid storage tank 19, and then reduces room temperature and/or water temperature through an air refrigerating and dehumidifying apparatus 13 and/or a water heat exchange apparatus 18.

[0032] The control system is enabled when indoor humidity is higher than a set value, i.e.: when indoor humidity is higher than a set value and water temperature and/or room temperature is lower than a set value, a mode of dehumidifying heat pump will be enabled, refrigerant liquid will be collected to a liquid storage tank 19 and then perform refrigeration and dehumidification through an expansion valve 39 and an air refrigerating and dehumidifying apparatus 13. The refrigerant air after heat absorption is inputted to a compressor unit. After compression, the refrigerant air inside the compressor 16 is converted into a heating medium. The heating medium is inputted to a heat exchange apparatus and raises room temperature and/or water temperature through an air reheating apparatus 14 and/or a water heat exchange apparatus 18.

[0033] When indoor humidity is higher than a set value, and water temperature and/or room temperature is higher than a set value, a mode of dehumidifying heat pump will be enabled, refrigerant liquid will be collected to a liquid storage tank 19 and then perform refrigeration and dehumidification through an expansion valve 39 and an air refrigerating and dehumidifying apparatus 13. The refrigerant air after heat absorption is inputted to a compressor unit. After compression, the refrigerant air inside the compressor 16 is converted into a heating medium. A heat dissipation mode of the outdoor air heat exchanger is enabled, and the refrigerant in the outdoor air heat exchanger circulates clockwise into an air heat exchanger 20, for heat dissipation by outdoor air.

[0034] Without electric heating of air or reheating and without electric heating of boiler pool water, heat can be absorbed outdoors in winter. The use of reverse circulation may save energy cost by more than 60%.

[0035] The operational logic is to open (open/close) valves for reverse circulation and turn an outdoor air heat exchanger into a "heat pump" to absorb outdoor heat to heat indoor air and water. The control logic of "heat pump" operation is shown in the table below:

Table 1: Summer mode:

Summer mode: ↓= lower than a set value ↑= higher than a set value													
Indoor heat pump unit											Outdoor air heat exchanger		
Humidity	Air temperature	water	Supply fan	Compressor	Refrigerating coil	Heating coil	Water heat exchange	Four-way valve	First three-way	Second	Heat rejection	Heat absorption	Fan
↑	↓	↑	On	On	On	On	Off	Off	On	Off	Off	NA	Off
↑	↑	↓	On	On	On	Off	On	On	Off	Off	Off	NA	Off
↓	↑	↑	On	On	On	Off	Off	Off	Off	Off	On	NA	On
↑	↓	↓	On	On	On	Off	On	On	Off	Off	Off	NA	Off
↓	↑	↓	On	On	On	Off	On	On	Off	Off	Off	NA	Off
↓	↓	↑	On	Off	Off	Off	Off	Off	Off	Off	Off	NA	Off
↓	↓	↓	On	Off	Off	Off	Off	Off	Off	Off	Off	NA	Off

Table 2: Winter mode:

Winter mode: ↓= lower than a set value ↑= higher than a set value	
Indoor heat pump unit	Outdoor air heat exchanger

Humidity	Air temperature	water temperature	Supply fan	Compressor	Refrigerating coil	Heating coil	Water heat exchange	Four-way valve	First three-way	Second three-way	Heat rejection	Heat absorption	Fan
↑	↑	↑	On	On	On	Off	Off	Off	Off	Off	On	NA	On
↑	↓	↑	On	On	On	On	Off	On	On	Off	Off	NA	Off
↑	↑	↓	On	On	On	Off	On	On	Off	Off	Off	NA	Off
↓	↑	↑	On	Off	Off	Off	Off	On	Off	Off	Off	NA	Off
↑	↓	↓	On	On	On	Off	On	On	Off	Off	Off	NA	Off
↓	↑	↓	On	On	Off	Off	On	On	Off	On	NA	On	On
↓	↓	↑	On	On	Off	On	Off	On	On	On	NA	On	On
↓	↓	↓	On	On	Off	On	On	On	On	On	NA	On	On

[0036] Please refer to FIG. 2, which shows an embodiment of the present invention, comprising an air conditioning apparatus 10 and an outdoor air heat exchanger 20. The air conditioning apparatus 10 comprises an air recovery apparatus 11, an air filter 12, an air refrigerating and dehumidifying apparatus 13, an air reheating apparatus 14, an air supply apparatus 15 and an inlet-end outdoor exhaust fan 15-1. The air refrigerating and dehumidifying apparatus 13 and the air reheating apparatus 14 are connected to a compressor 16 in series to form a refrigerant system 100. In this solution, an outdoor air heat exchanger 20 serves as a heat reject and heat absorption component. When indoor humidity is lower than a set value, refrigerant in the outdoor air heat exchanger will be inputted to a compressor unit via the outdoor air heat exchanger, and converted into a heating medium inside the compressor unit, and the heating medium will be inputted to a heat exchange apparatus, and adjust temperature through the air reheating apparatus 14.

[0037] Please refer to FIG. 3, which shows another embodiment of the present invention.

[0038] Different from the embodiment disclosed in FIG. 2, in this embodiment a second heat exchanger 40 is connected to the refrigerant system in parallel, which may be a condenser, and exchanges heat with indoor water systems, such as swimming pool water and bath water.

[0039] Please refer to FIG. 4, which shows another embodiment of the present invention. Different from the embodiment disclosed in FIG. 3, in this embodiment a second heat exchanger 40 is connected to the refrigerant system in parallel and connected to a water tower 50, for energy storage and heat dissipation.

[0040] Please refer to FIG. 5 and FIG. 6, which show another two embodiments of the present invention. Different from the embodiment disclosed in FIG. 3, in this embodiment the air conditioning apparatus is provided with a water cooling

system 13-1 before air treatment of the refrigerant system, as shown in FIG. 5, or a water cooling system 13-1 is added after air treatment of the refrigerant system and before air supply, and the water cooling system 13-1 is a refrigerating coil, and chilled water is delivered into the refrigerating coil to cool the air.

[0041] Please refer to FIG. 7, which shows another embodiment of the present invention. Different from the embodiment disclosed in FIG. 3, in this embodiment the air conditioning apparatus is provided with a water cooling system 13-1 before air treatment of the refrigerant system, and is provided with a water heating system 14-1 after air treatment of the refrigerant system and before air supply. The water heating system 14-1 is a hot water coil and may be communicable to hot water for heating to raise temperature of the air.

[0042] Please refer to FIG. 8, which shows another embodiment of the present invention. Different from the embodiment disclosed in FIG. 7, in this embodiment the air conditioning apparatus is provided with a water heating system 14-1 after air treatment of the refrigerant system and before air supply.

[0043] Please refer to FIG. 9, which shows another embodiment of the present invention. The second heat exchanger 40 is connected in series to a third heat exchanger 60 and used to heat swimming pool water. The third heat exchanger 60 is communicable to chilled water. The air conditioning apparatus is provided with a water cooling system 13-1 before air treatment of the refrigerant system. A third three-way valve 23 is arranged at an inlet of the water cooling system 13-1. An inlet 23a of the third three-way valve 23 is communicable to chilled water. An outlet 1 23b of the third three-way valve is connected to a refrigerating coil of the water cooling system 13-1. An outlet 2 23c of the third three-way valve is connected to an inlet of a third heat exchanger 60. A fourth three-way valve 24 is arranged at the inlet of the third heat exchanger 60, the outlet 2 23c of the third three-way valve is connected to an inlet 24a of the fourth three-way valve, or an outlet of the refrigerating coil of the water cooling system 13-1 is connected to the inlet 24a of the fourth three-way valve, an outlet 1 24b of the fourth three-way valve is connected to the inlet of the third heat exchanger 60, and an outlet 2 24c of the fourth three-way valve is communicable to chilled water.

[0044] Please refer to FIG. 10, which shows another embodiment of the present invention. Here, a first heat exchanger in a refrigerant system 100 is not the air reheating apparatus 14 in the air conditioning apparatus in the foregoing embodiments, but a separate condenser. When indoor air meets the conditions for dehumidification and cooling, the condenser will reject heat to a gas reheating apparatus 14 connected to the condenser. When indoor air does not meet the conditions for dehumidification and cooling, for example, the indoor humidity is lower than a set value in winter, a heat absorption mode of an outdoor air heat exchanger 20 will be enabled, refrigerant in the outdoor air heat exchanger will be inputted to a compressor unit via the outdoor air heat exchanger, and converted into a heating medium in the compressor unit, the heating medium will be inputted to a second heat exchanger 40, and the second heat exchanger 40 will exchange heat with an air reheating apparatus 14 or a water heat exchange apparatus 18 to adjust room temperature and water temperature.

[0045] Above a plurality of embodiments and various kinds of indoor refrigerant systems connected in parallel to an outdoor air heat exchanger have been disclosed. When humidity is high in summer, the indoor refrigerant system will perform dehumidification and cooling and use absorbed heat to adjust indoor air and indoor water systems (e.g., swimming pool or bath water), and when indoor humidity, temperature and pool water temperature all meet requirements, surplus heat recovered in a dehumidifying process will be removed through an outdoor air heat exchanger. In winter, following the decrease of demand for dehumidification, recovered latent heat is restricted. A "reverse circulation" system runs a refrigerant loop as an air source heat pump, providing enough heat for reheating of air and reheating of pool water. Under the reverse circulation system, the outdoor air heat exchanger acts as a "heat pump" and absorbs outdoor heat to heat indoor air and water. The generated latent heat (from the reverse circulation system) subsequently is transferred to an air reheater and used to heat the hall and water of the swimming pool. The use of a reverse circulation system saves operating cost in winter by more than 60% in winter than an auxiliary electric heating device does.

Claims

1. A control system for adjusting air temperature, humidity and water temperature by an outdoor air heat exchanger (20), said system comprising an air conditioning apparatus (10), a heat exchange apparatus and said outdoor air heat exchanger (20), wherein

   the air conditioning apparatus (10) comprises in turn: an air recovery apparatus (11), an air refrigerating and dehumidifying apparatus (13), an air supply apparatus (15) and a compressor unit;
   the air refrigerating and dehumidifying apparatus (13) and the compressor unit are connected in series to the heat exchange apparatus to form a refrigerant system (100);
   the outdoor air heat exchanger (20) is connected in parallel to the refrigerant system (100);
   the control system is configured to be enabled when indoor humidity is lower than a set value, i.e.:

when indoor humidity is lower than a set value and water temperature and/or room temperature is lower than a set value, a heat absorption mode of the outdoor air heat exchanger (20) will be enabled, refrigerant in the outdoor air heat exchanger (20) will be inputted to the compressor unit via the outdoor air heat exchanger (20), the refrigerant in the compressor unit may be converted into a heating medium, and the heating medium may be inputted to the heat exchange apparatus and raise water temperature and/or room temperature through the first heat exchange apparatus; and

when indoor humidity is lower than a set value and water temperature and/or room temperature is higher than a set value, a heat dissipation mode of the outdoor air heat exchanger (20) will be enabled, refrigerant in the outdoor air heat exchanger (20) will perform heat dissipation by outdoor air, and the refrigerant after heat dissipation will be inputted to the heat exchange apparatus) to reduce water temperature and/or room temperature via the heat exchange apparatus.,

characterized in that

the system is configured such that when indoor humidity is higher than a set value and water temperature and/or room temperature is lower than a set value, a mode of dehumidifying heat pump will be enabled, so that the refrigerant will absorb heat via the air refrigerating and dehumidifying apparatus (13) and then be inputted to a compressor unit and converted into a heating medium in the compressor unit, and the heating medium will be inputted to a heat exchange apparatus and raise water temperature and/or room temperature via a first heat exchange apparatus;

when indoor humidity is higher than a set value and water temperature and/or room temperature is higher than a set value, a mode of dehumidifying heat pump will be enabled, the refrigerant will reduce water temperature and/or room temperature via the heat exchange apparatus being a first heat exchanger (18) and/or the air refrigerating and dehumidifying apparatus (13), the refrigerant after heat absorption will be inputted to a compressor unit, the refrigerant in the compressor unit will be converted into a heating medium, and the heating medium will be inputted to the outdoor air heat exchanger (20) for heat dissipation by outdoor air.

2. The control system for adjusting air temperature, humidity and water temperature by an outdoor air heat exchanger (20) as described in claim 1, wherein

the first heat exchanger (18) is the air reheating apparatus (14) arranged inside an air conditioning apparatus (10); and

the refrigerant system (100) is connected in parallel to a second heat exchanger (40), which is connected to a water system or a water tower (50).

3. The control system for adjusting air temperature, humidity and water temperature by an outdoor air heat exchanger (20) as described in claim 2, wherein

the control system further comprises a first three-way valve, a second three-way valve, a four-way valve and a liquid storage tank (19);

the compressor unit is connected to an inlet (23a, 24a, 31a, 32a, 33a) of the first three-way valve, and an outlet 1 of the first three-way valve is connected to an inlet (23a, 24a, 31a, 32a, 33a) of the gas reheating apparatus (14); an outlet 2 of the first three-way valve is connected to an inlet (23a, 24a, 31a, 32a, 33a) of the four-way valve, and the four-way valve comprises a first outlet (33b), a second outlet (33c) and a third outlet (33d) in turn;

the first outlet (33b) of the four-way valve is connected to an outdoor air heat exchanger (20), the second outlet (33c) of the four-way valve is connected to a compressor, and the third outlet (33d) of the four-way valve is connected to the first heat exchanger (18) which is a water heat change apparatus;

the other ends of the outdoor air heat exchanger (20), the air reheating apparatus (14) and the second heat exchanger (40) are connected to the liquid storage tank (19) respectively;

the liquid storage tank (19) is connected to an inlet (23a, 24a, 31a, 32a, 33a) of the second three-way valve, an outlet 1 of the second three-way valve is connected to a second expansion valve (39), the second expansion valve (39) is connected to an inlet (23a, 24a, 31a, 32a, 33a) of the air refrigerating and dehumidifying apparatus (13), an outlet of the air refrigerating and dehumidifying apparatus (13) is connected to a compressor unit, or the air refrigerating and dehumidifying apparatus (13) is connected to the air reheating apparatus (14) via a valve; and an outlet 2 of the second three-way valve is connected to a first expansion valve (38), and the first expansion valve (38) is connected to an outdoor air heat exchanger (20);

a heat absorption mode of the outdoor air heat exchanger (20) is enabled, refrigerant in the outdoor air heat exchanger (20) is inputted to the four-way valve via the outdoor air heat exchanger (20), then to the compressor unit via the four-way valve, and converted into a heating medium in the compressor unit, and the heating medium

is inputted to an inlet (23a, 24a, 31a, 32a, 33a) of the first three-way valve, and to the air reheating apparatus (14) via the first three-way valve and/or to the second heat exchanger (40) connected to the four-way valve; the heating medium after heat exchange flows back to the liquid storage tank (19) via the air reheating apparatus (14) and/or the second heat exchanger (40), and then flows to the outdoor air heat exchanger (20) via the second three-way valve.

4. The control system for adjusting air temperature, humidity and water temperature by an outdoor air heat exchanger (20) as described in any of claims 1 to 3, wherein the air conditioning apparatus (10) is configured to be provided with a water cooling system (13-1) before or after air treatment of the refrigerant system (100).

5. The control system for adjusting air temperature, humidity and water temperature by an outdoor air heat exchanger (20) as described in any of claims 1 to 3, wherein the air conditioning apparatus (10) is configured to be provided with a water heating system (14-1) before or after air treatment of the refrigerant system (100).

6. The control system for adjusting air temperature, humidity and water temperature by an outdoor air heat exchanger (20) as described in any of claims 1 to 3, wherein the air conditioning apparatus (10) is configured to be provided with a water cooling system (13-1) before air treatment of the refrigerant system (100), and is configured to be provided with a water heating system (14-1) after air treatment of the refrigerant system (100).

7. The control system for adjusting air temperature, humidity and water temperature by an outdoor air heat exchanger (20) as described in any of claims 1 to 3, wherein the second heat exchanger (40) is connected in series to a third heat exchanger (60), and the third heat exchanger (60) is connected to chilled water.

8. The control system for adjusting air temperature, humidity and water temperature by an outdoor air heat exchanger (20) as described in claim 7, wherein the air conditioning apparatus (10) is configured to be provided with a water cooling system (13-1) before air treatment of the refrigerant system (100), a third three-way valve is configured to be arranged at an inlet (23a, 24a, 31a, 32a, 33a) of the water cooling system (13-1), and an outlet 2 of the third three-way valve is configured to be connected to an inlet (23a, 24a, 31a, 32a, 33a) of a third heat exchanger (60); a fourth three-way valve is configured to be arranged at the inlet (23a, 24a, 31a, 32a, 33a) of the third heat exchanger (60), the outlet 2 of the third three-way valve is configured to be connected to an inlet (23a, 24a, 31a, 32a, 33a) of the fourth three-way valve, and an outlet 2 of the fourth three-way valve is configured to be connected to chilled water.

Patentansprüche

1. Steuerungssystem zum Anpassen von Lufttemperatur, Feuchtigkeit und Wassertemperatur durch einen Außenluft-Wärmetauscher (20), wobei das System eine Klimaanlage (10), eine Wärmeaustauschvorrichtung und den Außenluft-Wärmetauscher (20) umfasst, wobei

die Klimaanlage (10) der Reihe nach Folgendes umfasst: eine Luftrückgewinnungsvorrichtung (11), eine Luftkühlungs- und -entfeuchtungsvorrichtung (13), eine Luftzuführungsvorrichtung (15) und eine Verdichtereinheit, die Luftkühlungs- und -entfeuchtungsvorrichtung (13) und die Verdichtereinheit in Reihe mit der Wärmeaustauschvorrichtung verbunden sind, um ein Kältemittelsystem (100) zu bilden,
der Außenluft-Wärmetauscher (20) parallel mit dem Kältemittelsystem (100) verbunden ist,
das Steuerungssystem dafür konfiguriert ist, aktiviert zu werden, wenn die Innenfeuchtigkeit niedriger ist als ein Sollwert, d. h.:

wenn die Innenfeuchtigkeit niedriger ist als ein Sollwert und eine Wassertemperatur und/oder eine Raumtemperatur niedriger sind als ein Sollwert, ein Wärmeabsorptionsmodus des Außenluft-Wärmetauschers (20) aktiviert werden wird, ein Kältemittel in dem Außenluft-Wärmetauscher (20) über den Außenluft-Wärmetauscher (20) der Verdichtereinheit zugeführt werden wird, das Kältemittel in der Verdichtereinheit in ein Heizmedium umgewandelt werden kann und das Heizmedium der Wärmeaustauschvorrichtung zugeführt werden und durch die erste Wärmeaustauschvorrichtung die Wassertemperatur und/oder die Raumtemperatur erhöhen kann und,
wenn die Innenfeuchtigkeit niedriger ist als ein Sollwert und die Wassertemperatur und/oder die Raumtemperatur höher sind als ein Sollwert, ein Wärmeableitungsmodus des Außenluft-Wärmetauschers (20) aktiviert werden wird, das Kältemittel in dem Außenluft-Wärmetauscher (20) eine Wärmeableitung durch Außenluft durchführen wird und das Kältemittel nach der Wärmeableitung der Wärmeaustauschvorrichtung

zugeführt werden wird, um über die Wärmeaustauschvorrichtung die Wassertemperatur und/oder die Raumtemperatur zu verringern,
dadurch gekennzeichnet, dass
das System derart konfiguriert ist, dass, wenn die Innenfeuchtigkeit höher ist als ein Sollwert und die Wassertemperatur und/oder die Raumtemperatur niedriger sind als ein Sollwert, ein Modus einer entfeuchtenden Wärmepumpe aktiviert werden wird, so dass das Kältemittel über die Luftkühlungs- und -entfeuchtungsvorrichtung (13) Wärme absorbieren und danach einer Verdichtereinheit zugeführt und in der Verdichtereinheit zu einem Heizmedium umgewandelt werden wird und das Heizmedium einer Wärmeaustauschvorrichtung zugeführt werden und über eine erste Wärmeaustauschvorrichtung die Wassertemperatur und/oder die Raumtemperatur erhöhen wird,
wenn die Innenfeuchtigkeit höher ist als ein Sollwert und die Wassertemperatur und/oder die Raumtemperatur höher sind als ein Sollwert, ein Modus einer entfeuchtenden Wärmepumpe aktiviert werden wird, das Kältemittel die Wassertemperatur und/oder die Raumtemperatur über die Wärmeaustauschvorrichtung, die ein erster Wärmetauscher (18) und/oder die Luftkühlungs- und -entfeuchtungsvorrichtung (13) sein kann, verringern wird, das Kältemittel nach der Wärmeabsorption einer Verdichtereinheit zugeführt werden wird, das Kältemittel in der Verdichtereinheit zu einem Heizmedium umgewandelt werden wird und das Heizmedium zur Wärmeableitung durch Außenluft dem Außenluft-Wärmetauscher (20) zugeführt werden wird.

2. Steuerungssystem zum Anpassen von Lufttemperatur, Feuchtigkeit und Wassertemperatur durch einen Außenluft-Wärmetauscher (20) nach Anspruch 1, wobei

der erste Wärmetauscher (18) die Luftnachheizungsvorrichtung (14) ist, die innerhalb einer Klimaanlage (10) angeordnet ist, und
das Kältemittelsystem (100) parallel mit einem zweiten Wärmetauscher (40) verbunden ist, der mit einem Wassersystem oder einem Wasserturm (50) verbunden ist.

3. Steuerungssystem zum Anpassen von Lufttemperatur, Feuchtigkeit und Wassertemperatur durch einen Außenluft-Wärmetauscher (20) nach Anspruch 2, wobei

das Steuerungssystem ferner ein erstes Dreiwegeventil, ein zweites Dreiwegeventil, ein Vierwegeventil und einen Flüssigkeitsspeichertank (19) umfasst,
die Verdichtereinheit mit einem Einlass (23a, 24a, 31a, 32a, 33a) des ersten Dreiwegeventils verbunden ist und ein Auslass 1 des ersten Dreiwegeventils mit einem Einlass (23a, 24a, 31a, 32a, 33a) der Gasnachheizungsvorrichtung (14) verbunden ist, ein Auslass 2 des ersten Dreiwegeventils mit einem Einlass (23a, 24a, 31a, 32a, 33a) des Vierwegeventils verbunden ist und das Vierwegeventil der Reihe nach einen ersten Auslass (33b), einen zweiten Auslass (33c) und einen dritten Auslass (33d) umfasst,
der erste Auslass (33b) des Vierwegeventils mit einem Außenluft-Wärmetauscher (20) verbunden ist, der zweite Auslass (33c) des Vierwegeventils mit einem Verdichter verbunden ist und der dritte Auslass (33d) des Vierwegeventils mit dem ersten Wärmetauscher (18) verbunden ist, der eine Wasser-Wärmetauschvorrichtung ist, die anderen Enden des Außenluft-Wärmetauschers (20), der Luftnachheizungsvorrichtung (14) beziehungsweise des zweiten Wärmetauschers (40) jeweils mit dem Flüssigkeitsspeichertank (19) verbunden sind,
der Flüssigkeitsspeichertank (19) mit einem Einlass (23a, 24a, 31a, 32a, 33a) des zweiten Dreiwegventils verbunden ist, ein Auslass 1 des zweiten Dreiwegeventils mit einem zweiten Expansionsventil (39) verbunden ist, das zweite Expansionsventil (39) mit einem Einlass (23a, 24a, 31a, 32a, 33a) der Luftkühlungs- und -entfeuchtungsvorrichtung (13) verbunden ist, ein Auslass der Luftkühlungs- und - entfeuchtungsvorrichtung (13) mit einer Verdichtereinheit verbunden ist oder die Luftkühlungs- und -entfeuchtungsvorrichtung (13) über ein Ventil mit der Luftnachheizungsvorrichtung (14) verbunden ist und ein Auslass 2 des zweiten Dreiwegeventils mit einem ersten Expansionsventil (38) verbunden ist und das erste Expansionsventil (38) mit einem Außenluft-Wärmetauscher (20) verbunden ist,
ein Wärmeabsorptionsmodus des Außenluft-Wärmetauschers (20) aktiviert wird, Kältemittel in dem Außenluft-Wärmetauscher (20) über den Außenluft-Wärmetauscher (20) dem Vierwegeventil, danach über das Vierwegeventil der Verdichtereinheit zugeführt und in der Verdichtereinheit zu einem Heizmedium umgewandelt wird und das Heizmedium einem Einlass (23a, 24a, 31a, 32a, 33a) des ersten Dreiwegeventils und der Luftnachheizungsvorrichtung (14) über das erste Dreiwegeventil und/oder dem zweiten Wärmetauscher (40), der mit dem Vierwegeventil verbunden ist, zugeführt wird, das Heizmedium nach dem Wärmeaustausch über die Luftnachheizungsvorrichtung (14) und/oder den zweiten Wärmetauscher (40) zurück zu dem Flüssigkeitsspeichertank (19) strömt und danach über das zweite Dreiwegeventil zu dem Außenluft-Wärmetauscher (20) strömt.

4. Steuerungssystem zum Anpassen von Lufttemperatur, Feuchtigkeit und Wassertemperatur durch einen Außenluft-Wärmetauscher (20) nach einem der Ansprüche 1 bis 3, wobei die Klimaanlage (10) dafür konfiguriert ist, mit einem Wasserkühlungssystem (13-1) vor oder nach der Luftbehandlung des Kältemittelsystems (100) versehen zu werden.

5. Steuerungssystem zum Anpassen von Lufttemperatur, Feuchtigkeit und Wassertemperatur durch einen Außenluft-Wärmetauscher (20) nach einem der Ansprüche 1 bis 3, wobei die Klimaanlage (10) dafür konfiguriert ist, mit einem Wasserheizungssystem (14-1) vor oder nach der Luftbehandlung des Kältemittelsystems (100) versehen zu werden.

6. Steuerungssystem zum Anpassen von Lufttemperatur, Feuchtigkeit und Wassertemperatur durch einen Außenluft-Wärmetauscher (20) nach einem der Ansprüche 1 bis 3, wobei die Klimaanlage (10) dafür konfiguriert ist, mit einem Wasserkühlungssystem (13-1) vor der Luftbehandlung des Kältemittelsystems (100) versehen zu werden, und dafür konfiguriert ist, mit einem Wasserheizungssystem (14-1) nach der Luftbehandlung des Kältemittelsystems (100) versehen zu werden.

7. Steuerungssystem zum Anpassen von Lufttemperatur, Feuchtigkeit und Wassertemperatur durch einen Außenluft-Wärmetauscher (20) nach einem der Ansprüche 1 bis 3, wobei der zweite Wärmetauscher (40) in Reihe mit einem dritten Wärmetauscher (60) verbunden ist und der dritte Wärmetauscher (60) mit gekühltem Wasser verbunden ist.

8. Steuerungssystem zum Anpassen von Lufttemperatur, Feuchtigkeit und Wassertemperatur durch einen Außenluft-Wärmetauscher (20) nach Anspruch 7, wobei die Klimaanlage (10) dafür konfiguriert ist, mit einem Wasserkühlungssystem (13-1) vor der Luftbehandlung des Kältemittelsystems (100) versehen zu werden, ein drittes Dreiwegeventil dafür konfiguriert ist, an einem Einlass (23a, 24a, 31a, 32a, 33a) des Wasserkühlungssystems (13-1) angeordnet zu werden, und ein Auslass 2 des dritten Dreiwegeventils dafür konfiguriert ist, mit einem Einlass (23a, 24a, 31a, 32a, 33a) eines dritten Wärmetauschers (60) verbunden zu werden, ein viertes Dreiwegeventil dafür konfiguriert ist, an dem Einlass (23a, 24a, 31a, 32a, 33a) des dritten Wärmetauschers (60) bereitgestellt zu werden, der Auslass 2 des dritten Dreiwegeventils dafür konfiguriert ist, mit einem Einlass (23a, 24a, 31a, 32a, 33a) des vierten Dreiwegeventils verbunden zu werden, und ein Auslass 2 des vierten Dreiwegeventils dafür konfiguriert ist, mit gekühltem Wasser verbunden zu werden.

Revendications

1. Système de commande pour le réglage de la température de l'air, de l'humidité et de la température de l'eau par un échangeur de chaleur d'air extérieur (20), ledit système comprenant un appareil de climatisation (10), un appareil d'échange de chaleur et ledit échangeur de chaleur d'air extérieur (20), dans lequel

   l'appareil de climatisation (10) comprend à son tour : un appareil de récupération d'air (11), un appareil de refroidissement d'air et de déshumidification (13), un appareil d'alimentation en air (15) et une unité de compresseur ;
   l'appareil de refroidissement d'air et de déshumidification (13) et l'unité de compresseur sont raccordés en série à l'appareil d'échange de chaleur pour former un système de réfrigérant (100) ;
   l'échangeur de chaleur d'air extérieur (20) est raccordé en parallèle au système de réfrigérant (100) ;
   le système de commande est configuré pour être activé lorsque l'humidité intérieure est inférieure à une valeur de consigne, c'est-à-dire :

      lorsque l'humidité intérieure est inférieure à une valeur de consigne et que la température de l'eau et/ou la température ambiante est/sont inférieure(s) à une valeur de consigne, un mode d'absorption de chaleur de l'échangeur de chaleur d'air extérieur (20) va être activé, un réfrigérant dans l'échangeur de chaleur d'air extérieur (20) va être introduit dans l'unité de compresseur par le biais de l'échangeur de chaleur d'air extérieur (20), le réfrigérant dans l'unité de compresseur peut être converti en un fluide chauffant, et le fluide chauffant peut être introduit dans l'appareil d'échange de chaleur et augmenter la température de l'eau et/ou la température ambiante à travers le premier appareil d'échange de chaleur ; et
      lorsque l'humidité intérieure est inférieure à une valeur de consigne et que la température de l'eau et/ou la température ambiante est/sont supérieure(s) à une valeur de consigne, un mode de dissipation de chaleur de l'échangeur de chaleur d'air extérieur (20) va être activé, un réfrigérant dans l'échangeur de chaleur d'air extérieur (20) va réaliser une dissipation de chaleur par un air extérieur, et le réfrigérant après dissipation de chaleur va être introduit dans l'appareil d'échange de chaleur pour réduire la température de l'eau et/ou la température ambiante par le biais de l'appareil d'échange de chaleur,

caractérisé en ce que
le système est configuré de sorte que lorsque l'humidité intérieure est supérieure à une valeur de consigne et que la température de l'eau et/ou la température ambiante est/sont inférieure(s) à une valeur de consigne, un mode de pompe à chaleur de déshumidification va être activé, de sorte que le réfrigérant va absorber de la chaleur par le biais de l'appareil de refroidissement d'air et de déshumidification (13) et être ensuite introduit dans une unité de compresseur et converti en un fluide chauffant dans l'unité de compresseur, et le fluide chauffant va être introduit dans un appareil d'échange de chaleur et augmenter la température de l'eau et/ou la température ambiante par le biais d'un premier appareil d'échange de chaleur ;
lorsque l'humidité intérieure est supérieure à une valeur de consigne et que la température de l'eau et/ou la température ambiante est/sont supérieure(s) à une valeur de consigne, un mode de pompe à chaleur de déshumidification va être activé, le réfrigérant va réduire la température de l'eau et/ou la température ambiante par le biais de l'appareil d'échange de chaleur qui est un premier échangeur de chaleur (18) et/ou l'appareil de refroidissement d'air et de déshumidification (13), le réfrigérant après absorption de chaleur va être introduit dans une unité de compresseur, le réfrigérant dans l'unité de compresseur va être converti en un fluide chauffant, et le fluide chauffant va être introduit dans l'échangeur de chaleur d'air extérieur (20) pour une dissipation de chaleur par un air extérieur.

2. Système de commande pour le réglage de la température de l'air, de l'humidité et de la température de l'eau par un échangeur de chaleur d'air extérieur (20) selon la revendication 1, dans lequel

le premier échangeur de chaleur (18) est l'appareil de réchauffage d'air (14) agencé à l'intérieur d'un appareil de climatisation (10) ; et
le système de réfrigérant (100) est raccordé en parallèle à un deuxième échangeur de chaleur (40), qui est raccordé à un système d'eau ou à une tour d'eau (50).

3. Système de commande de réglage de la température de l'air, de l'humidité et de la température de l'eau par un échangeur de chaleur d'air extérieur (20) selon la revendication 2, dans lequel

le système de commande comprend en outre une première soupape à trois voies, une deuxième soupape à trois voies, une soupape à quatre voies et un réservoir de stockage de liquide (19) ;
l'unité de compresseur est raccordée à une entrée (23a, 24a, 31a, 32a, 33a) de la première soupape à trois voies, et une sortie (1) de la première soupape à trois voies est raccordée à une entrée (23a, 24a, 31a, 32a, 33a) de l'appareil de réchauffage de gaz (14) ; une sortie (2) de la première soupape à trois voies est raccordée à une entrée (23a, 24a, 31a, 32a, 33a) de la soupape à quatre voies, et la soupape à quatre voies comprend à son tour une première sortie (33b), une deuxième sortie (33c) et une troisième sortie (33d) ;
la première sortie (33b) de la soupape à quatre voies est raccordée à un échangeur de chaleur d'air extérieur (20), la deuxième sortie (33c) de la soupape à quatre voies est raccordée à un compresseur, et la troisième sortie (33d) de la soupape à quatre voies est raccordée au premier échangeur de chaleur (18) qui est un appareil d'échange de chaleur d'eau ;
les autres extrémités de l'échangeur de chaleur d'air extérieur (20), l'appareil de réchauffage d'air (14) et le deuxième échangeur de chaleur (40) sont respectivement raccordés au réservoir de stockage de liquide (19) ; le réservoir de stockage de liquide (19) est raccordé à une entrée (23a, 24a, 31a, 32a, 33a) de la deuxième soupape à trois voies, une sortie (1) de la deuxième soupape à trois voies est raccordée à un second détendeur (39), le second détendeur (39) est raccordé à une entrée (23a, 24a, 31a, 32a, 33a) de l'appareil de refroidissement d'air et de déshumidification (13), une sortie de l'appareil de refroidissement d'air et de déshumidification (13) est raccordée à une unité de compresseur, ou l'appareil de refroidissement d'air et de déshumidification (13) est raccordé à l'appareil de réchauffage d'air (14) par le biais d'une soupape ; et une sortie (2) de la deuxième soupape à trois voies est raccordée à un premier détendeur (38), et le premier détendeur (38) est raccordé à un échangeur de chaleur d'air extérieur (20) ;
un mode d'absorption de chaleur de l'échangeur de chaleur d'air extérieur (20) est activé, un réfrigérant dans l'échangeur de chaleur d'air extérieur (20) est introduit dans la soupape à quatre voies par le biais de l'échangeur de chaleur d'air extérieur (20), puis dans l'unité de compresseur par le biais de la soupape à quatre voies, et converti en un fluide chauffant dans l'unité de compresseur, et le fluide chauffant est introduit dans une entrée (23a, 24a, 31a, 32a, 33a) de la première soupape à trois voies, et à l'appareil de réchauffage d'air (14) par le biais de la première soupape à trois voies et/ou le deuxième échangeur de chaleur (40) raccordé à la soupape à quatre voies ; le fluide chauffant après échange de chaleur s'écoule de nouveau vers le réservoir de stockage de liquide (19) par le biais de l'appareil de réchauffage d'air (14) et/ou du deuxième échangeur de chaleur (40), puis s'écoule vers l'échangeur de chaleur d'air extérieur (20) par le biais de la deuxième soupape à trois voies.

4. Système de commande de réglage de la température de l'air, de l'humidité et de la température de l'eau par un échangeur de chaleur d'air extérieur (20) selon l'une quelconque des revendications 1 à 3, dans lequel l'appareil de climatisation (10) est configuré pour être équipé d'un système de refroidissement par eau (13-1) avant ou après un traitement par air du système de réfrigérant (100).

5. Système de commande pour le réglage de la température de l'air, de l'humidité et de la température de l'eau par un échangeur de chaleur d'air extérieur (20) selon l'une quelconque des revendications 1 à 3, dans lequel l'appareil de climatisation (10) est configuré pour être doté d'un système de chauffage d'eau (14-1) avant ou après un traitement par air du système de réfrigérant (100).

6. Système de commande pour le réglage de la température de l'air, de l'humidité et de la température de l'eau par un échangeur de chaleur d'air extérieur (20) selon l'une quelconque des revendications 1 à 3, dans lequel l'appareil de climatisation (10) est configuré pour être doté d'un système de refroidissement par eau (13-1) avant le traitement par air du système de réfrigérant (100), et est configuré pour être doté d'un système de chauffage par eau (14-1) après le traitement par air du système de réfrigérant (100).

7. Système de commande pour le réglage de la température de l'air, de l'humidité et de la température de l'eau par un échangeur de chaleur d'air extérieur (20) selon l'une quelconque des revendications 1 à 3, dans lequel le deuxième échangeur de chaleur (40) est raccordé en série à un troisième échangeur de chaleur (60), et le troisième échangeur de chaleur (60) est raccordé à de l'eau refroidie.

8. Système de commande pour le réglage de la température de l'air, de l'humidité et de la température de l'eau par un échangeur de chaleur d'air extérieur (20) selon la revendication 7, dans lequel l'appareil de climatisation (10) est configuré pour être doté d'un système de refroidissement par eau (13-1) avant le traitement par air du système de réfrigérant (100), une troisième soupape à trois voies est configurée pour être agencée au niveau d'une entrée (23a, 24a, 31a, 32a, 33a) du système de refroidissement par eau (13-1), et une sortie (2) de la troisième soupape à trois voies est configurée pour être raccordée à une entrée (23a, 24a, 31a, 32a, 33a) d'un troisième échangeur de chaleur (60) ; une quatrième soupape à trois voies est configurée pour être agencée au niveau de l'entrée (23a, 24a, 31a, 32a, 33a) du troisième échangeur de chaleur (60), la sortie (2) de la troisième soupape à trois voies est configurée pour être raccordée à une entrée (23a, 24a, 31a, 32a, 33a) de la quatrième soupape à trois voies, et une sortie (2) de la quatrième soupape à trois voies est configurée pour être raccordée à de l'eau refroidie.

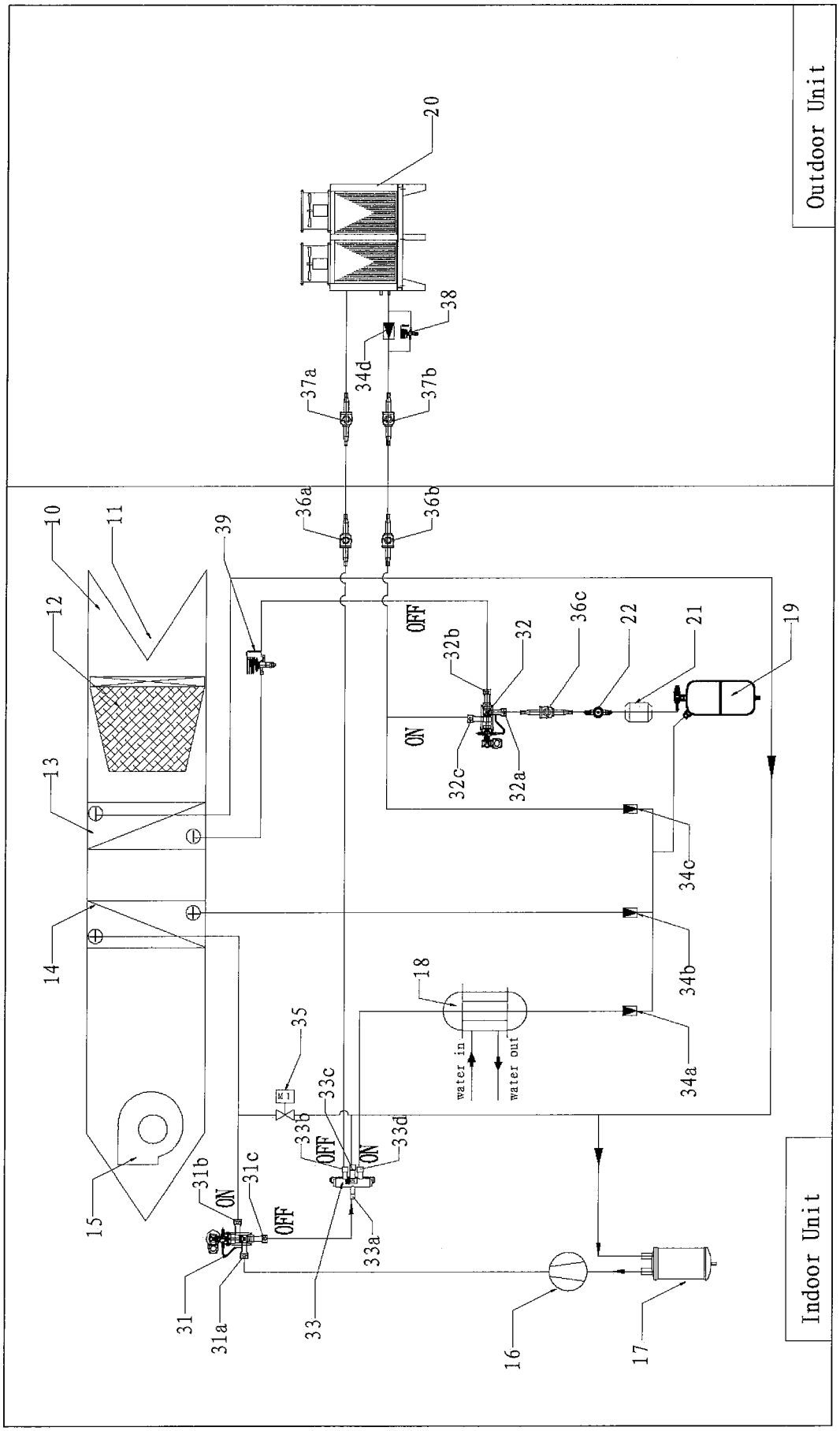
Outdoor Unit
Indoor Unit
20
38
37a
34d
37b
36a
36b
10
11
39
12
13
14
15
OFF
ON
32b
32
36c
22
21
19
32c
32a
34c
34b
34a
18
water in
water out
35
33c
33b
33d
OFF
ON
31b
31c
ON
OFF
31
31a
33
33a
16
17

Fig. 1

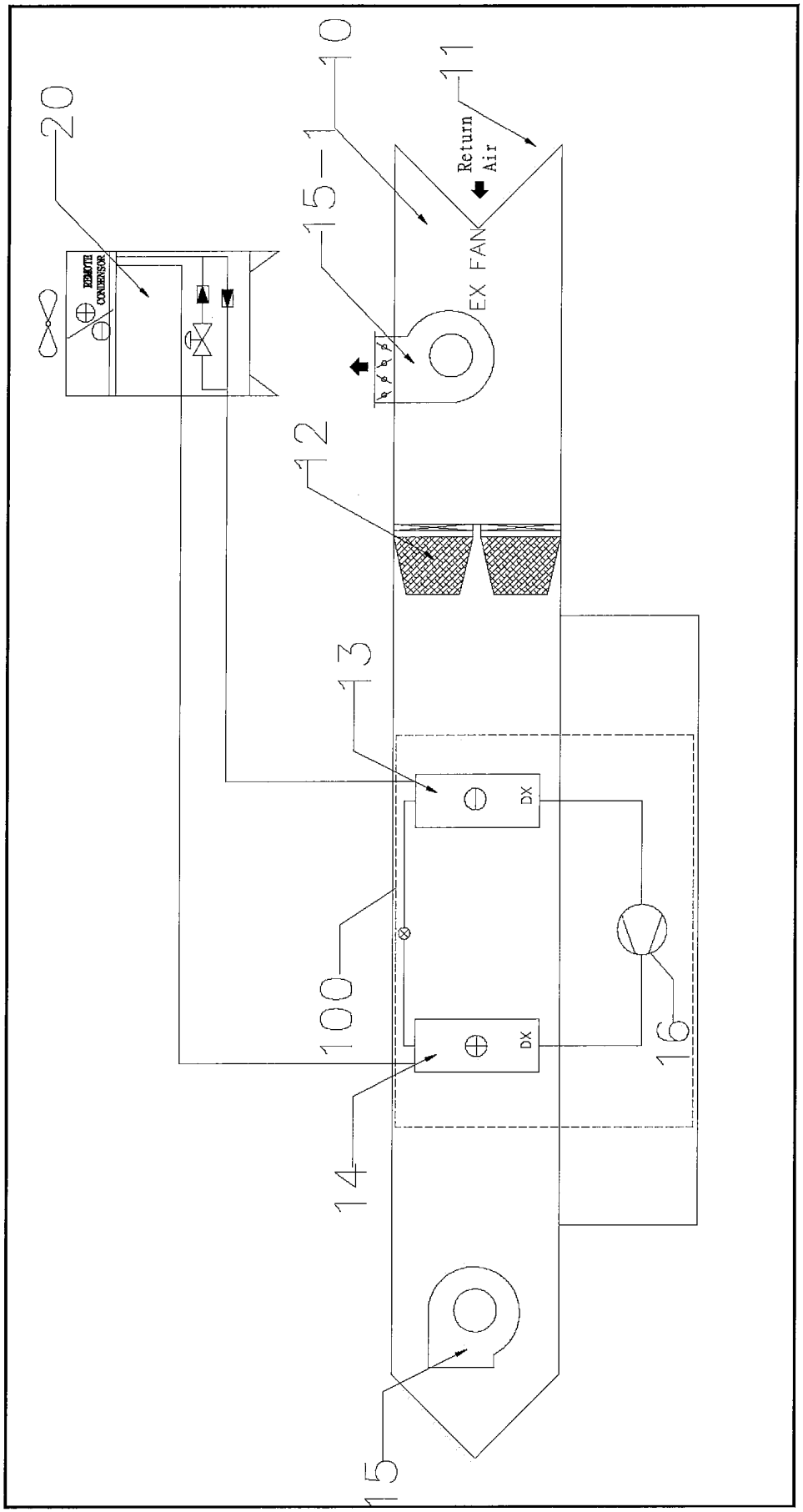

Fig. 2

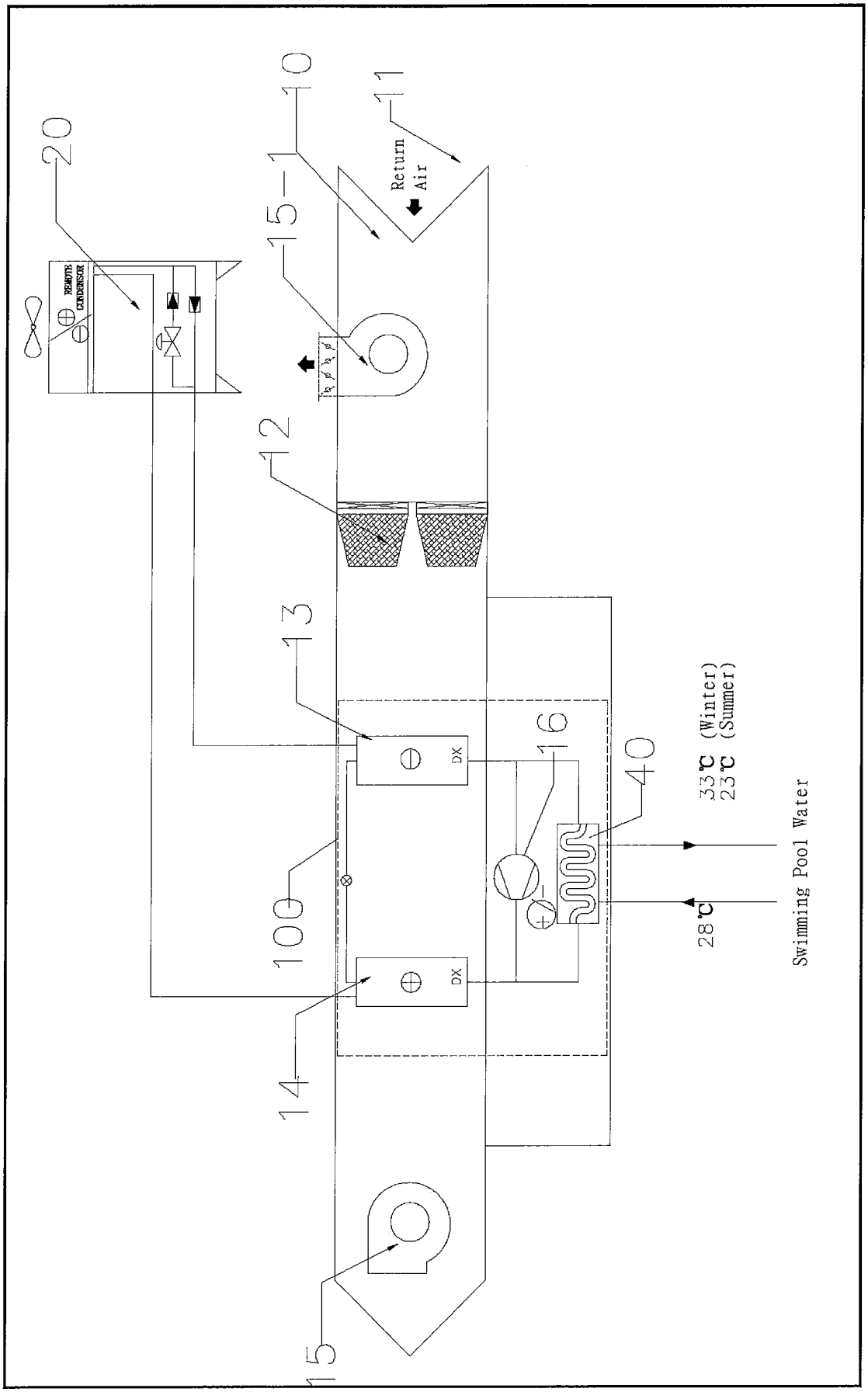
20
REMOTE CONDENSER
10
15-1
11
Return Air
12
13
DX
DX
16
40
100
14
15
33℃ (Winter)
23℃ (Summer)
28℃
Swimming Pool Water

Fig. 3

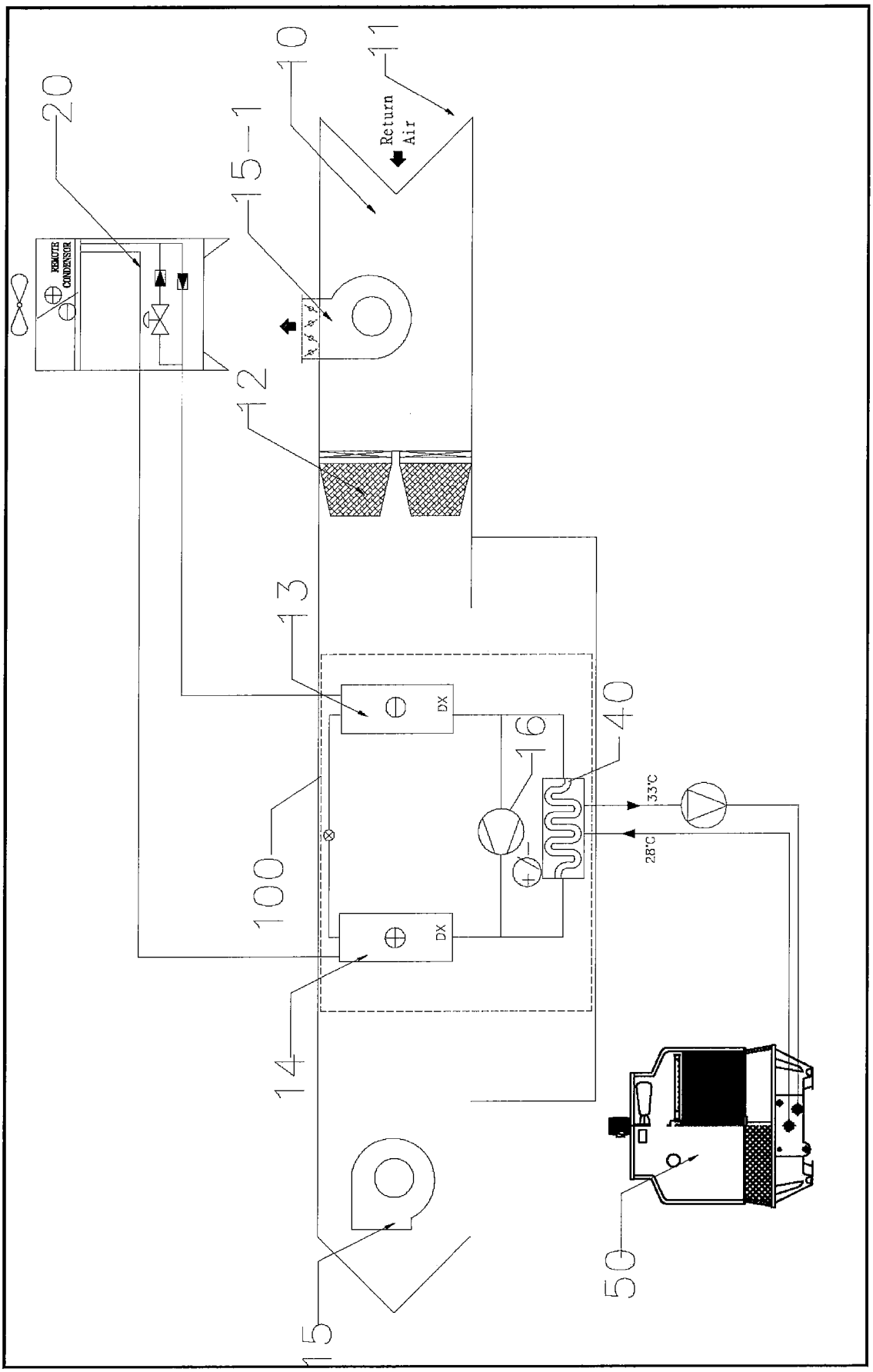
20
REMOTE CONDENSOR
15-1
10
11
Return Air
12
13
DX
16
40
33°C
28°C
100
DX
14
15
50

Fig. 4

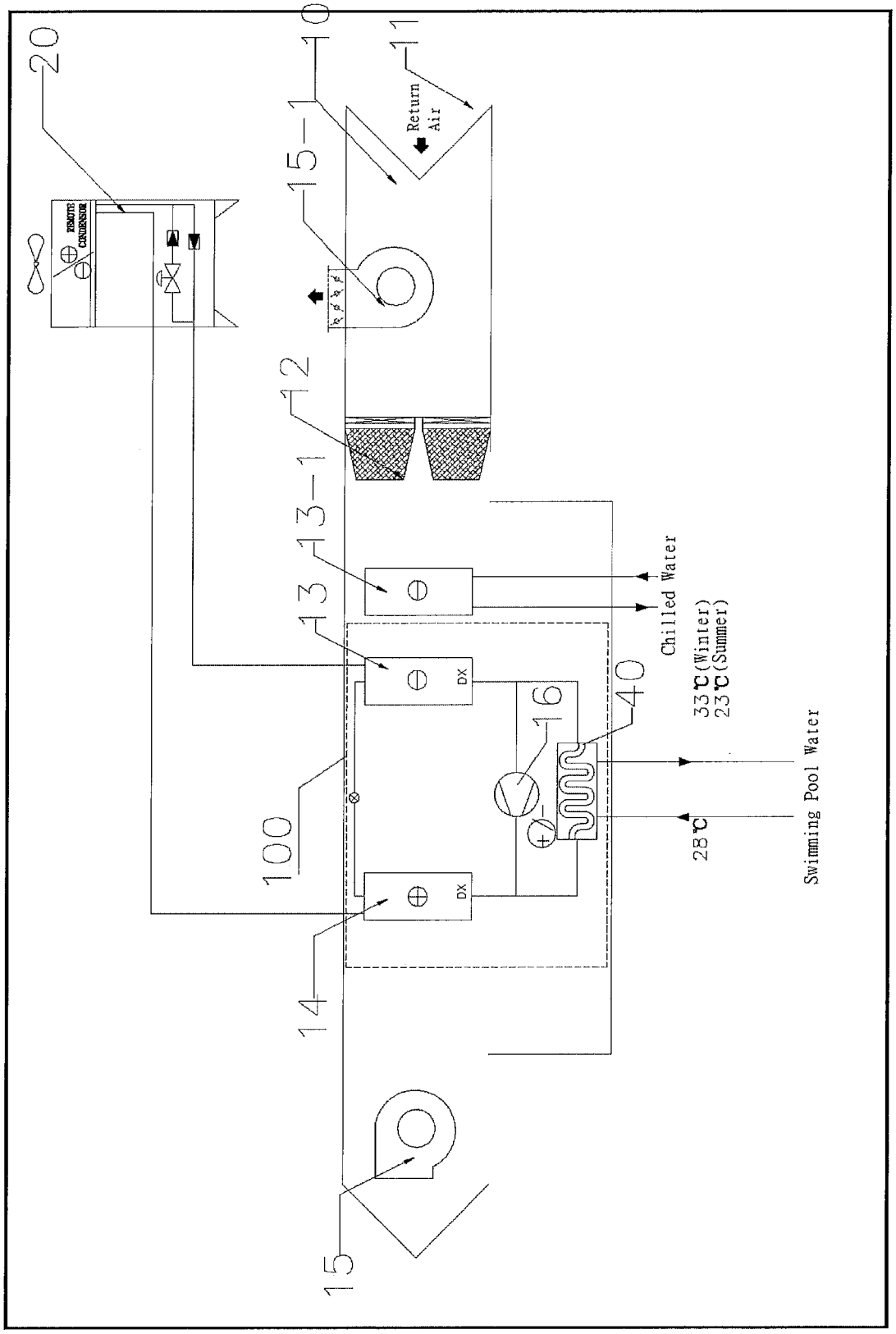
20
10
11
15-1
Return Air
REMOTE CONDENSER
12
13-1
13
DX
Chilled Water
33℃(Winter)
23℃(Summer)
40
16
100
28℃
Swimming Pool Water
14
15

Fig. 5

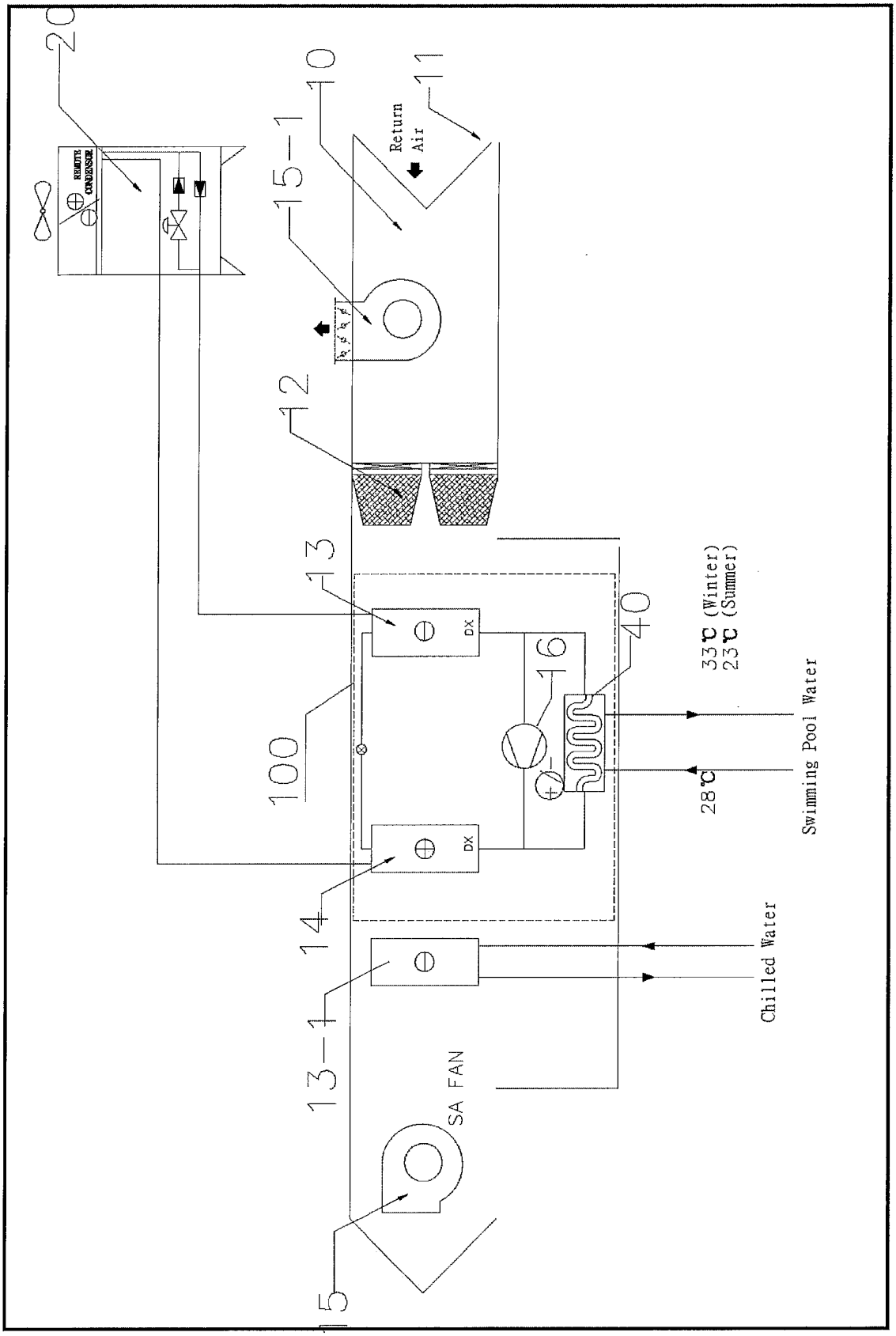
20
REMOTE CONDENSER
10
15-1
Return Air
11
12
13
DX
DX
16
40
100
33℃ (Winter)
23℃ (Summer)
28℃
Swimming Pool Water
14
13-1
Chilled Water
SA FAN
15

Fig. 6

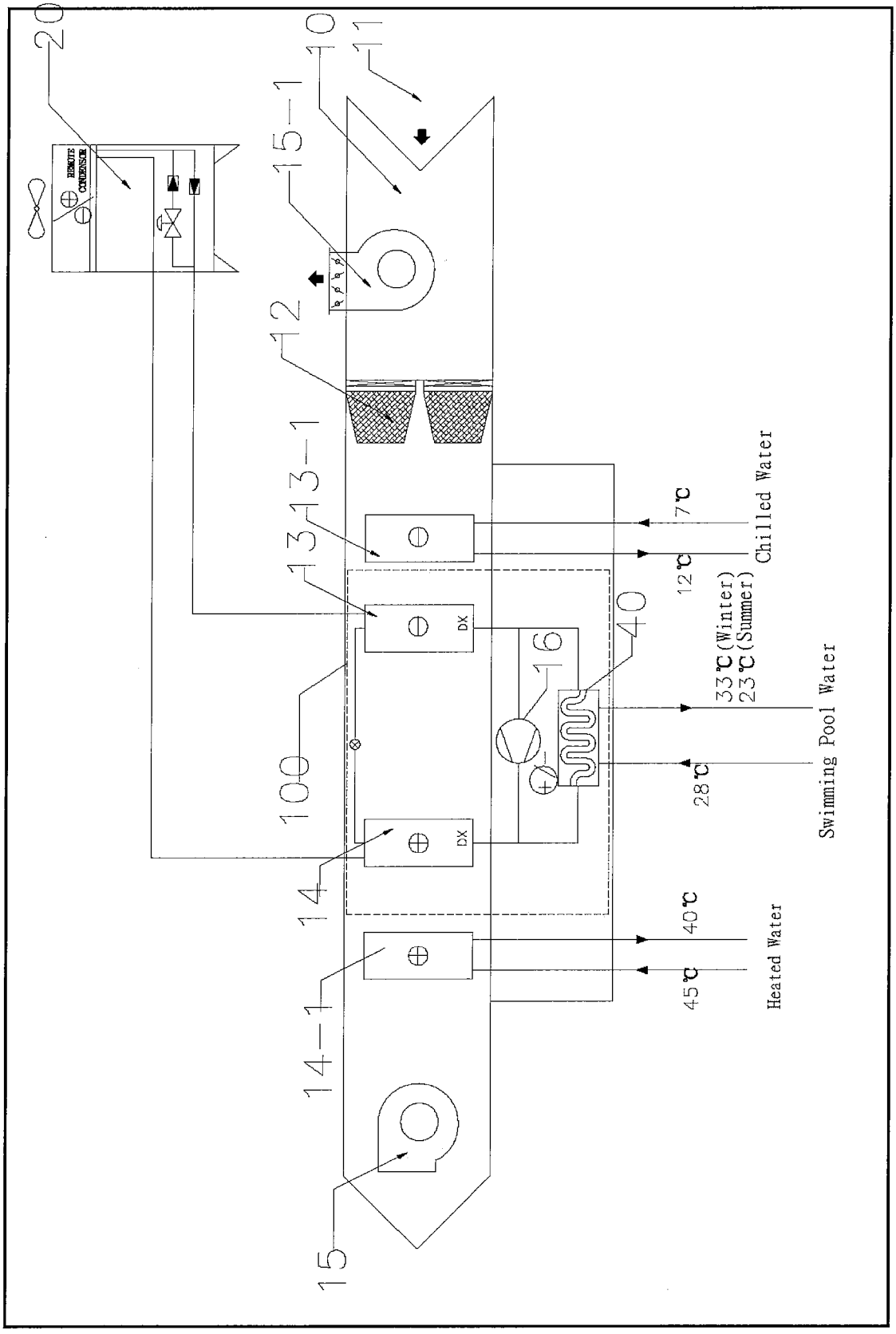
20
REMOTE CONDENSOR
10
11
15-1
12
13-1
13
DX
DX
100
14
14-1
15
16
40
7℃
12℃
Chilled Water
33℃(Winter)
23℃(Summer)
28℃
Swimming Pool Water
40℃
45℃
Heated Water

Fig. 7

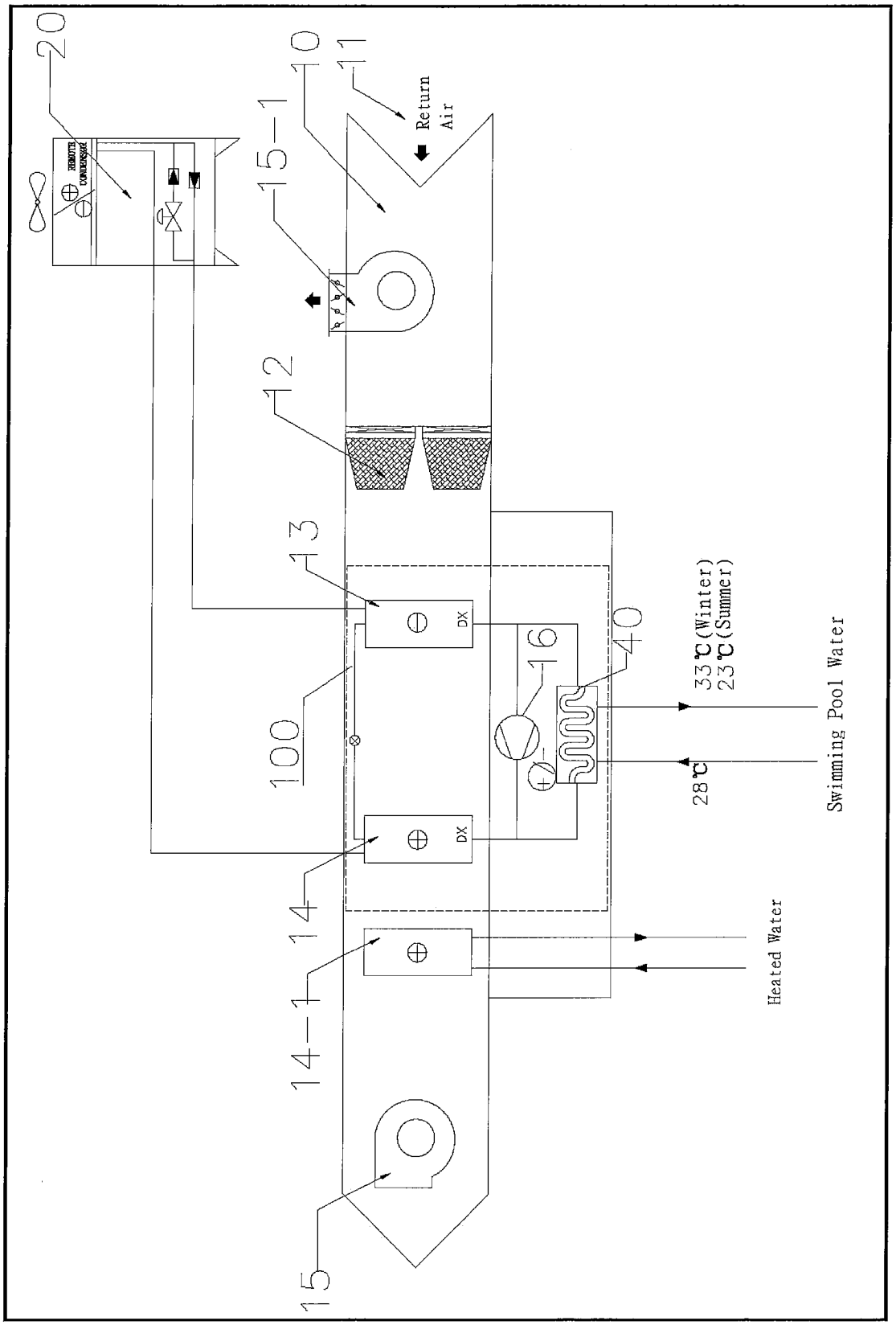
20
10
11
Return Air
15-1
12
13
DX
16
40
33℃(Winter)
23℃(Summer)
28℃
Swimming Pool Water
100
DX
14
14-1
Heated Water
15

Fig. 8

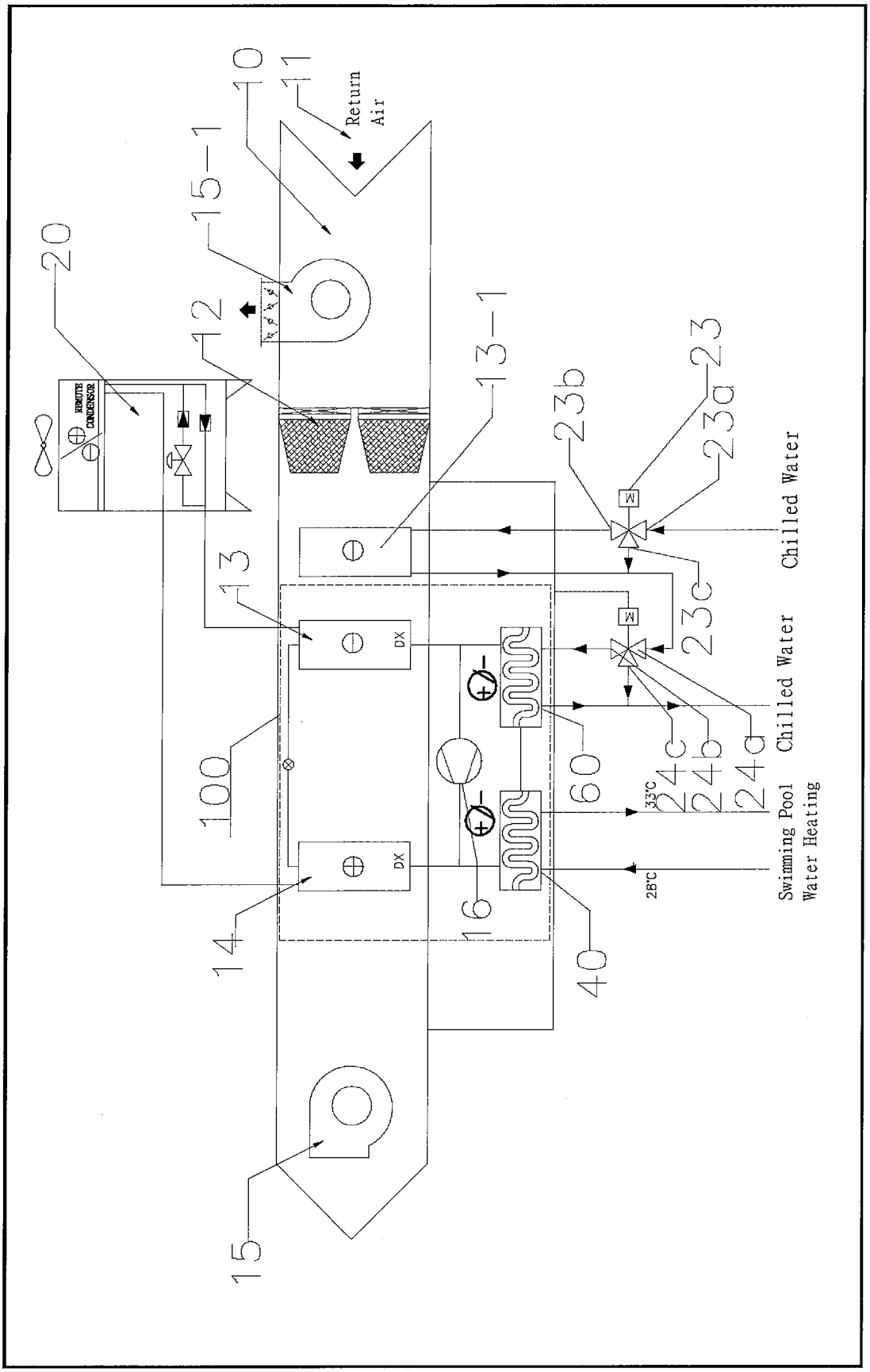
10
11
Return Air
15-1
20
12
13-1
23b
23
23a
13
23c
Chilled Water
DX
DX
100
60
24c
24b
24a
33°C
28°C
Swimming Pool Water Heating
Chilled Water
14
16
40
15

Fig. 9

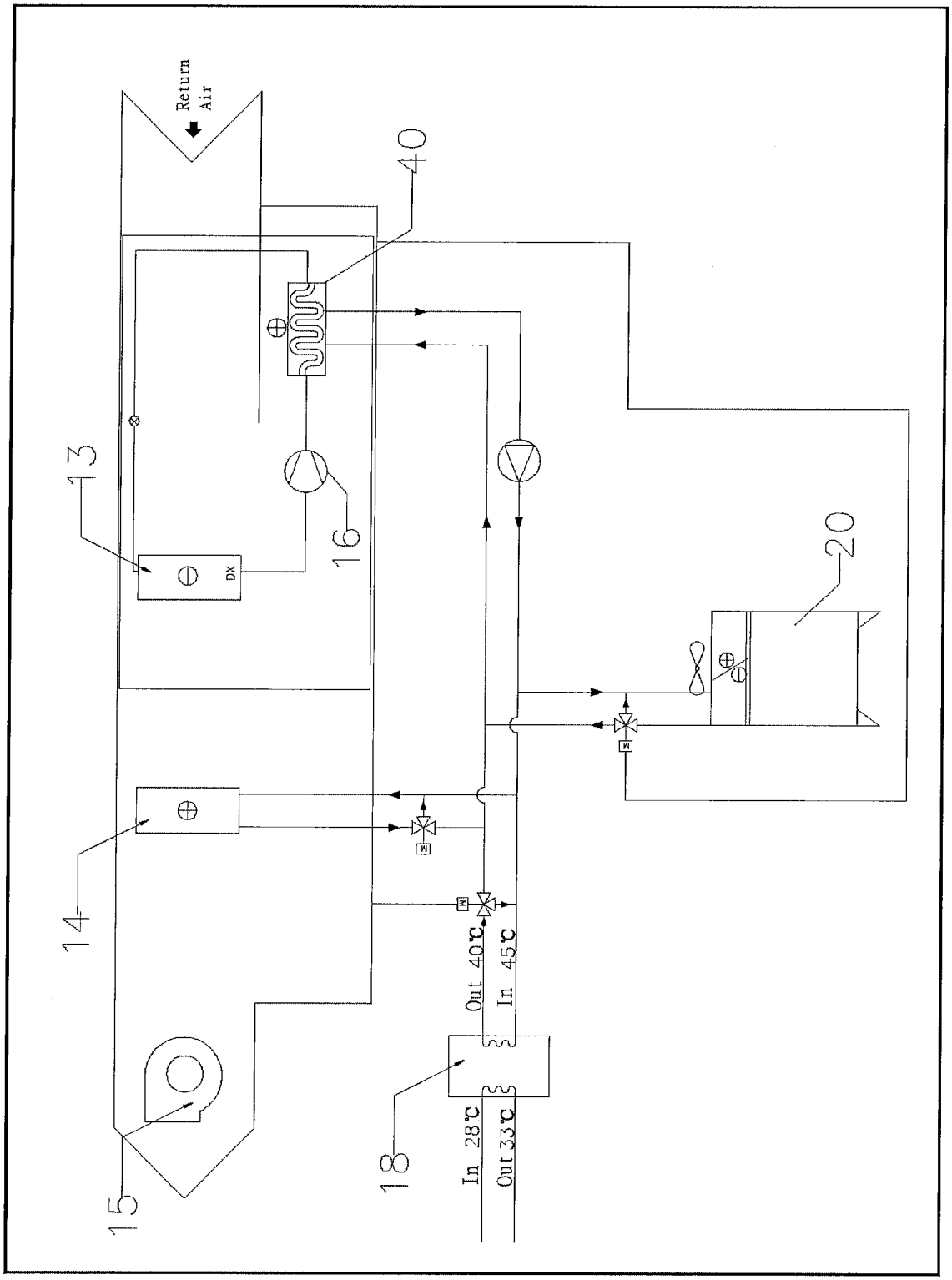

Fig. 10

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- EP 3299734 A1 **[0001]**
- EP 3205955 A1 **[0001]**