

DESCRIPTION

AIR CONDITIONING SYSTEM

TECHNICAL FIELD

5 [0001]

The present invention relates to an air conditioning system.

BACKGROUND ART

[0002]

10 A conventionally known air conditioning system conditions indoor air. Examples of such an air conditioning system include one that dehumidifies a room in addition to cooling the room.

[0003]

15 For example, the air conditioning system described in Patent Literature 1 includes a refrigerant circuit to which a compressor, an outdoor heat exchanger, an expansion valve, and an indoor heat exchanger are connected, and is configured to perform a refrigeration cycle in the refrigerant circuit. In the air conditioning system, an evaporation temperature of the indoor heat exchanger is lowered during operation of dehumidifying a room. Thus in the indoor heat exchanger, air is cooled to a temperature lower than a dew point temperature, and
20 moisture in the air is condensed. As a result, the room is dehumidified.

CITATION LIST

PATENT LITERATURE

[0004]

25 [Patent Literature 1] JP H9-14724 A

SUMMARY OF THE INVENTION

<Technical Problem>

[0005]

30 If the air is excessively cooled to dehumidify the air with the air conditioning system as described above, the indoor temperature is lowered and comfort is impaired, or energy conservation is impaired due to an excessive decrease in the temperature.

[0006]

The present invention has been made in view of such problems, and an object of the

present invention is to provide an air conditioning system that is excellent in energy conservation and capable of maintaining the indoor temperature and humidity within a target range.

<Solution to Problem>

5 [0007]

A first invention relates to an air conditioning system including:

a plurality of air conditioners (20, 40) each including an indoor unit (30, 50) and an outdoor unit (21, 41), each of the air conditioners being configured to perform a refrigeration cycle individually and air-condition a same indoor space; and

10 a control device (60) that controls the plurality of air conditioners (20, 40),

wherein the control device (60) is configured to perform a simultaneous operation of controlling at least one of the air conditioners (20) as a latent heat machine such that the indoor unit (30) of the air conditioner (20) cools air to a dew point temperature or lower, and simultaneously controlling another air conditioner (40) as a sensible heat machine such that
15 the indoor unit (50) of the other air conditioner (40) cools the air at a temperature higher than the dew point temperature, and

the control device (60) performs a control operation of adjusting a cooling capacity of the indoor unit (30) of the air conditioner (20) operating as the latent heat machine and a cooling capacity of the indoor unit (50) of the air conditioner (40) operating as the sensible
20 heat machine, such that a current indoor temperature and a current indoor humidity are brought close to target values of indoor temperature and humidity.

[0008]

In the first invention, during the simultaneous operation, the indoor unit (30) of a part of the air conditioners (20) operates as the latent heat machine and cools the air to the
25 dew point temperature or lower. At the same time, the indoor unit (50) of the other air conditioner (40) operates as the sensible heat machine and cools the air at a temperature higher than the dew point temperature. As a result, latent heat and sensible heat of an indoor space (11) to be air-conditioned by the air conditioners (20, 40) are treated substantially separately, and energy conservation is improved.

30 [0009]

During the simultaneous operation, the control device (60) adjusts the cooling capacities of the indoor units (30, 50) of the air conditioners (20, 40) such that the current indoor temperature and the current indoor humidity are brought close to the target values of indoor temperature and humidity. As a result, the indoor temperature and humidity

converge to the target values, and thus comfort of the room is also satisfied.

[0010]

A second invention relates to the air conditioning system according to the first invention, wherein, during the control operation, the control device (60) determines the cooling capacities of the indoor units (30, 50) of the air conditioners (20, 40) based at least on the target values, the current indoor temperature, and the current indoor humidity.

[0011]

In the second invention, the control device (60) determines the cooling capacities of the indoor units (30, 50) of the latent heat machine and the sensible heat machine based at least on the target values, the current indoor temperature, and the current indoor humidity. That is, as long as the target values, the current indoor temperature, and the current indoor humidity are determined, it can be determined how to change the cooling capacity of the indoor unit (30, 50) of any of the latent heat machine and the sensible heat machine in order for the indoor temperature and humidity to converge to the target values. Therefore, the control device (60) determines the cooling capacities of the indoor units (30, 50) based on such determination.

[0012]

A third invention relates to the air conditioning system according to the second invention, wherein, during the control operation, the control device (60) determines the cooling capacities of the indoor units (30, 50) of the air conditioners (20, 40) based on the target values, the current indoor temperature and the current indoor humidity, and indoor temperature and humidity at a predetermined time before a current time.

[0013]

In the third invention, the control device (60) determines the cooling capacities of the indoor units (30, 50) of the latent heat machine and the sensible heat machine based on the target values, the current indoor temperature and the current indoor humidity, and the indoor temperature and humidity at a predetermined time before the current time. That is, these indices make it possible to understand how the indoor temperature and humidity have changed and a resultant relationship between the current temperature and humidity and the target values. Therefore, it can be determined, based on these indices, how to change the cooling capacity of the indoor unit (30, 50) of any of the latent heat machine and the sensible heat machine. Therefore, the control device (60) determines the cooling capacities of the indoor units (30, 50) based on such determination.

[0014]

A fourth invention relates to the air conditioning system according to any one of the first to third inventions, wherein the control device (60) performs the simultaneous operation when the indoor temperature and humidity are within a predetermined temperature and humidity range including the target values, while the control device (60) performs a dehumidifying operation of controlling all the air conditioners (20) such that the indoor units (30) of the air conditioners (20) cool the air to the dew point temperature or lower when the indoor humidity exceeds a predetermined humidity equal to or higher than the temperature and humidity range.

[0015]

In the fourth invention, the simultaneous operation is performed when the indoor temperature and humidity are within the predetermined temperature and humidity range including the target values. During the simultaneous operation, therefore, the indoor temperature and humidity can be brought close to the target values with energy conservation secured. Meanwhile, when the indoor humidity exceeds the predetermined humidity due to, for example, an increase in latent heat load in the room, the dehumidifying operation is performed in which the indoor units (30, 50) of all the air conditioners (20, 40) cool the air to the dew point temperature or lower. As a result, the indoor humidity can be treated promptly, and the comfort in the room can be quickly secured.

[0016]

A fifth invention relates to the air conditioning system according to any one of the first to fourth inventions, wherein, during the control operation, the control device (60) controls the cooling capacity of the indoor unit (30) of the air conditioner (20) operating as the latent heat machine and the cooling capacity of the indoor unit (50) of the air conditioner (40) operating as the sensible heat machine at a same timing.

[0017]

In the fifth invention, during the simultaneous operation, the cooling capacities of the latent heat machine and the sensible heat machine are controlled at the same timing. For example, if the cooling capacities of both machines are changed at different times, the indoor temperature and humidity may be subjected to hunting and may not converge easily. To address this issue, the cooling capacities of the latent heat machine and the sensible heat machine are controlled at the same timing, in which case the indoor temperature and humidity are more likely to converge.

<Advantageous Effects of Invention>

[0018]

According to the present invention, the simultaneous operation is performed in which the latent heat machine cools the air to the dew point temperature or lower and simultaneously the sensible heat machine cools the air at a temperature higher than the dew point temperature. This makes it possible to prevent excessive cooling of the indoor air and to improve energy conservation. In addition, during the simultaneous operation, the cooling capacities of the latent heat machine and the sensible heat machine are adjusted such that the indoor temperature and humidity are brought close to the target values. Therefore, the indoor temperature and humidity can be maintained within the target range, and the comfort of the room can be secured.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

FIG. 1 is a schematic overall configuration diagram of an air conditioning system according to an embodiment.

FIG. 2 is a schematic piping diagram of a first air conditioner and a second air conditioner of the air conditioning system according to the embodiment.

FIG. 3 is a block diagram of the air conditioning system according to the embodiment.

FIG. 4 is a flowchart for describing a flow of transition to a temperature and humidity control mode of the air conditioning system according to the embodiment.

FIG. 5 is a flowchart for describing a flow of determination during each operation under the temperature and humidity control mode of the air conditioning system according to the embodiment.

FIG. 6 is a psychrometric chart for describing a relationship between each operation and thresholds or areas used in a first determination at the beginning of the temperature and humidity control mode.

FIG. 7 is a psychrometric chart for describing a relationship between each operation and thresholds or areas used in a determination during a dehumidifying operation and an unseparated operation.

FIG. 8 is a psychrometric chart for describing a relationship between each operation and thresholds or areas used in a determination during a latent- and sensible-heat separation operation.

FIG. 9 is a psychrometric chart for describing a relationship between each operation and thresholds or areas used in a determination during a sensible-heat operation.

FIG. 10 is a psychrometric chart for describing a relationship between each operation and thresholds or areas used in a determination during a latent-heat operation.

FIG. 11 is a psychrometric chart for describing an evaporation temperature determination during the dehumidifying operation and the latent-heat operation.

5 FIG. 12 is a psychrometric chart for describing a plurality of divided areas in the latent- and sensible-heat separation operation.

FIG. 13 is a schematic flowchart of step control during the latent- and sensible-heat separation operation.

10 FIG. 14 is a table illustrating examples of how to change steps of target evaporation temperatures of a latent heat machine and a sensible heat machine in accordance with a current area and a previous area of an air state point.

FIG. 15 is a diagram for describing the target evaporation temperature of the sensible heat machine of the latent heat machine, and change widths of the target evaporation temperature.

15

DESCRIPTION OF EMBODIMENTS

[0020]

20 An embodiment of the present invention will be described in detail below with reference to the drawings. The following embodiment is an essentially preferred example, and is not intended to limit the scope of the present invention, matters to which the present invention is applicable, or the usage of the present invention.

[0021]

<Overall configuration of air conditioning system>

25 An air conditioning system (10) of the present embodiment includes a plurality of air conditioners (20, 40). The plurality of air conditioners (20, 40) air-conditions the same indoor space (11). The air conditioning system (10) of the present embodiment is provided with two air conditioners (a first air conditioner (20) and a second air conditioner (40)). Alternatively, the air conditioning system (10) may include three or more air conditioners. The first air conditioner (20) and the second air conditioner (40) have basically the same
30 configuration. The air conditioning system (10) also includes a control device (60) that controls the air conditioners (20, 40).

[0022]

<First air conditioner>

As illustrated in FIGS. 1 and 2, the first air conditioner (20) includes a first outdoor

unit (21) installed outdoors and a plurality of first indoor units (30) installed indoors. The plurality of first indoor units (30) is connected in parallel to the first outdoor unit (21) via two connection pipes. The number of first indoor units (30) may be one, two, or three or more.

[0023]

5 The first air conditioner (20) includes a first refrigerant circuit (22) filled with refrigerant. In the first refrigerant circuit (22), a refrigeration cycle is performed based on circulation of the refrigerant. A first compressor (23), a first outdoor heat exchanger (24), a first outdoor expansion valve (25), a first four-way switching valve (26), and a plurality of first indoor heat exchangers (32) are connected to the first refrigerant circuit (22).

10 [0024]

The first compressor (23), the first outdoor heat exchanger (24), the first outdoor expansion valve (25), and the first four-way switching valve (26) are provided in the first outdoor unit (21). The first compressor (23) is an inverter-type compressor having a variable capacity. An operating frequency (the number of rotations of a motor) of the first
15 compressor (23) is adjustable through control of the output of an inverter device. The first outdoor heat exchanger (24) is, for example, a fin-and-tube heat exchanger. A first outdoor fan (27) is provided near the first outdoor heat exchanger (24). The first outdoor heat exchanger (24) exchanges heat between the refrigerant and outdoor air blown by the first outdoor fan (27). The first outdoor expansion valve (25) is an electronic expansion valve
20 having a variable opening degree. The first four-way switching valve (26) has first to fourth ports. The first port communicates with a discharge side of the first compressor (23), while the second port communicates with a suction side of the first compressor (23). The third port communicates with a gas-side end of the first outdoor heat exchanger (24), while the fourth port communicates with gas-side ends of the first indoor heat exchangers (32). The
25 first four-way switching valve (26) is switched between a first state (illustrated by the solid lines in FIG. 2) and a second state (illustrated by the broken lines in FIG. 2). In the first state, the first port and the third port communicate with each other while the second port and the fourth port communicate with each other. In the second state, the first port and the fourth port communicate with each other while the second port and the third port
30 communicate with each other.

[0025]

Each of the first indoor units (30) includes one first indoor heat exchanger (32). The first indoor heat exchanger (32) is disposed in an air passage in the first indoor unit (30). A first indoor fan (33) is provided near (on the downstream side of) the first indoor heat

exchanger (32). The first indoor heat exchanger (32) exchanges heat between the refrigerant and indoor air (suction air) sucked from the indoor space (11). The air subjected to the heat exchange by the first indoor heat exchanger (32) is supplied to the indoor space (11) as blown air.

5 [0026]

The first indoor fan (33) is, for example, a centrifugal fan, and the air volume of the fan is adjustable. The air volume of the first indoor fan (33) of the present embodiment can be switched in three stages, i.e., an L tap (low air volume), an M tap (medium air volume), and an H tap (high air volume).

10 [0027]

Each of the first indoor units (30) is provided with one first suction temperature sensor (34) and one first suction humidity sensor (35). The first suction temperature sensor (34) detects the temperature of the suction air. The first suction humidity sensor (35) detects the humidity (absolute humidity) of the suction air.

15 [0028]

The refrigeration cycle performed in the first refrigerant circuit (22) is switched between a first refrigeration cycle (cooling cycle) and a second refrigeration cycle (heating cycle). In the first refrigeration cycle, the first four-way switching valve (26) is in the first state, where the first compressor (23), the first outdoor fan (27), and the first indoor fan (33) are operated. Thus, in the first refrigeration cycle, the refrigerant dissipates heat (condenses) in the first outdoor heat exchanger (24), is decompressed in the first outdoor expansion valve (25), and evaporates in the first indoor heat exchanger (32). In the second refrigeration cycle, the first four-way switching valve (26) is in the second state, where the first compressor (23), the first outdoor fan (27), and the first indoor fan (33) are operated. Thus, in the second refrigeration cycle, the refrigerant dissipates heat (condenses) in the first indoor heat exchanger (32), is decompressed in the first outdoor expansion valve (25), and evaporates in the first outdoor heat exchanger (24).

[0029]

The first indoor heat exchanger (32) of the first refrigerant circuit (22) is provided with a refrigerant temperature sensor (not illustrated) that detects an evaporation temperature (T_e).

[0030]

<Second air conditioner>

As illustrated in FIG. 2, the second air conditioner (40) includes similar components

to those of the first air conditioner (20). That is, the second air conditioner (40) includes a second refrigerant circuit (42) through which refrigerant circulates and to which a second outdoor unit (41) and a plurality of second indoor units (50) are connected.

[0031]

5 The second outdoor unit (41) is provided with a second compressor (43), a second outdoor heat exchanger (44), a second outdoor expansion valve (45), a second four-way switching valve (46), and a second outdoor fan (47). Each of the second indoor units (50) is provided with a second indoor heat exchanger (52), a second indoor fan (53), a second suction temperature sensor (54), and a second suction humidity sensor (55). The
10 refrigeration cycle in the second refrigerant circuit (42) is switched between the first refrigeration cycle (cooling cycle) and the second refrigeration cycle (heating cycle), in a similar manner to the first refrigerant circuit (22). The configuration of each device of the second air conditioner (40) is similar to that of the first air conditioner (20), and thus the detailed description thereof will be omitted.

15 [0032]

<Remote controller>

As illustrated in FIG. 1, the first air conditioner (20) is provided with a first remote controller (36). The second air conditioner (40) is provided with a second remote controller (56). Each remote controller (36, 56) is installed, for example, on a wall in a room and
20 configured to be operable by a user. Each remote controller (36, 56) includes an operation unit with which to turn the power on and off, switch the operating mode, and switch the direction of blown air, for example, for the corresponding air conditioner (20, 40). Each remote controller (36, 56) also includes a display unit on which to display the current operating mode, the set temperature, and the set humidity, for example, of the corresponding
25 air conditioner (20, 40).

[0033]

<Control device>

As illustrated in FIGS. 1 and 3, the air conditioning system (10) includes the control device (60) (control system) that controls the air conditioners (20, 40). The control device
30 (60) of the present embodiment includes a first local controller (61), a second local controller (71), a communication terminal (80), a router (85), and a cloud server (90).

[0034]

The first local controller (61) is provided corresponding to the first air conditioner (20). The first local controller (61) is configured to control, for example, each component of

the first refrigerant circuit (22), and the first indoor fan (33). The first local controller (61) includes a microcomputer and a memory device (specifically, a semiconductor memory) that stores software for operating the microcomputer.

[0035]

5 The first local controller (61) includes a first capability determination unit (62), a first capability control unit (63), and a first communication unit (64). The first capability determination unit (62) is a calculation unit that determines the capability of the first air conditioner (20). The first capability control unit (63) controls the capability of the first air conditioner (20).

10 [0036]

 The first communication unit (64) is connected to the Internet (86) via the router (85) and configured to communicate with the cloud server (90) via the Internet (86). The first communication unit (64) may communicate with the router (85) wirelessly or in a wired manner. Such a configuration enables bidirectional exchange of signals, such as operation
15 commands and control parameters, between the first local controller (61) and the cloud server (90).

[0037]

 The second local controller (71) is provided corresponding to the second air conditioner (40). The second local controller (71) is configured to control, for example,
20 each component of the second refrigerant circuit (42), and the second indoor fan (53). The second local controller (71) includes a microcomputer and a memory device (specifically, a semiconductor memory) that stores software for operating the microcomputer.

[0038]

 The second local controller (71) includes a second capability determination unit (72),
25 a second capability control unit (73), and a second communication unit (74). The second capability determination unit (72) is a calculation unit that determines the capability of the second air conditioner (40). The second capability control unit (73) controls the capability of the second air conditioner (40).

[0039]

30 The second communication unit (74) is connected to the Internet (86) via the router (85) and configured to communicate with the cloud server (90) via the Internet (86). The second communication unit (74) may communicate with the router (85) wirelessly or in a wired manner.

[0040]

The communication terminal (80) is a communication device for the user to activate the operation under the temperature and humidity control mode, which will be described in detail later. The communication terminal (80) includes, for example, a smartphone or a tablet PC. The communication terminal (80) includes a microcomputer and a memory device (specifically, a semiconductor memory) that stores software for operating the microcomputer. The communication terminal (80) further includes a touch panel (81) that serves also as a display unit and an operation unit, and a communication unit (82) connected to the cloud server (90) via the Internet (86).

[0041]

The communication terminal (80) stores a program (control application) for executing the temperature and humidity control mode. By operating the touch panel (81) of the communication terminal (80), the user can activate or deactivate the temperature and humidity control mode, set an indoor target temperature (T_s) under the temperature and humidity control mode, and set an indoor target humidity (R_s) under the temperature and humidity control mode.

[0042]

The cloud server (90) is configured to bidirectionally communicate with the first local controller (61), the second local controller (71), and the communication terminal (80) via the Internet (86). The cloud server (90) includes a microcomputer and a memory device (specifically, a semiconductor memory) that stores software for operating the microcomputer.

[0043]

The cloud server (90) includes an operation determination unit (91) and a capability determination unit (92). The operation determination unit (91) makes a determination for switching various operations (details will be described later) under the temperature and humidity control mode. The capability determination unit (92) determines a target evaporation temperature of each air conditioner (20, 40) and the speed of the indoor fan (fan tap) in each operation under the temperature and humidity control mode. The cloud server (90) transmits the operation parameters thus determined to each local controller (61, 71) via the Internet (86) at predetermined time intervals (for example, every 20 seconds).

[0044]

-Operation-

The operation of the air conditioning system (10) will be described in detail.

[0045]

With the air conditioning system (10), a temperature control mode or the

temperature and humidity control mode can be selected. The temperature control mode is an operating mode for only adjusting the temperature of indoor air in the indoor space (11), and includes a cooling operation and a heating operation. Control is exercised under the temperature control mode such that the temperature of the indoor air is brought close to a target temperature. The temperature and humidity control mode is an operating mode for adjusting the temperature and humidity of the indoor air in the indoor space (11). The temperature and humidity control mode includes 1) a dehumidifying operation, 2) an unseparated operation, 3) a latent- and sensible-heat separation operation, 4) a sensible-heat operation, and 5) a latent-heat operation. Under the temperature and humidity control mode, the operations 1) to 5) are automatically switched and performed in accordance with the indoor air state (temperature and humidity). The details of these operations will be described later.

[0046]

-Cooling operation under temperature control mode-

The cooling operation under the temperature control mode will be described. During the cooling operation, the first refrigeration cycle described above is performed in each air conditioner (20, 40). That is, the refrigerant compressed by the compressors (23, 43) is condensed in the outdoor heat exchangers (24, 44) and dissipates heat to the outdoor air. The condensed refrigerant is decompressed by the outdoor expansion valves (25, 45), and then flows through the indoor heat exchangers (32, 52). In the indoor heat exchangers (32, 52), the refrigerant absorbs heat from the indoor air and evaporates. As a result, the suction air is cooled in the indoor units (30, 50). The evaporated refrigerant is sucked into the compressors (23, 43) and compressed again. The air cooled by the indoor heat exchangers (32, 52) is supplied to the indoor space (11) as blown air.

[0047]

During the cooling operation, the capability of each air conditioner (20, 40) is controlled in accordance with a difference ΔT between the temperature of the suction air of each indoor unit (30, 50) and the set temperature. As this ΔT increases, the target evaporation temperature of each air conditioner (20, 40) decreases, and the operating frequency of each compressor (23, 43) increases. Conversely, as ΔT decreases, the target evaporation temperature of each air conditioner (20, 40) increases, and the operating frequency of each compressor (23, 43) decreases.

[0048]

-Temperature and humidity control mode-

During the operation under the temperature and humidity control mode, the indoor temperature is brought close to the target temperature (T_s) and the indoor humidity is brought close to the target humidity (R_s). Under the temperature and humidity control mode, various operations are switched in accordance with a current air state point (C), such that the
5 current indoor temperature and the current indoor humidity are each brought close to a target point (S) (see FIG. 6). The temperature and humidity control mode is achieved by mutual signal exchange among the local controllers (61, 71), the cloud server (90), and the communication terminal (80). Transmission and reception of signals between these terminals are performed at predetermined time intervals (for example, every 20 seconds).

10 [0049]

<Control exercised until transition to temperature and humidity control mode>

Control exercised until transition to the temperature and humidity control mode will be described with reference to FIG. 4. When the user activates the application of the communication terminal (80) and selects "ON" of the "temperature and humidity control
15 mode" on the touch panel (81), a signal indicating this selection is output to the cloud server (90). At the same time, the target temperature (T_s) and the target humidity (R_s) set in the communication terminal (80) are input to the cloud server (90). As described above, upon the instruction to start the temperature and humidity control mode, the processing proceeds from step St1 to step St2.

20 [0050]

Next, the cloud server (90) transmits the received target temperature (T_s) and target humidity (R_s) to the local controllers (61, 71) or the remote controllers (36, 56) of the air conditioners (20, 40). The local controllers (61, 71) determine whether to activate (thermo-
on) the air conditioners (20, 40) based on the suction air temperature and the target
25 temperature (T_s) detected by the air conditioners (20, 40). Alternatively, the local controllers (61, 71) may determine whether to activate the air conditioners (20, 40) based on the suction air humidity and the target humidity (R_s) detected by the air conditioners (20, 40).

[0051]

As described above, when the thermo-on condition is satisfied, the processing
30 proceeds from step St2 to step St3, that is, proceeds to the temperature and humidity control mode.

[0052]

<First determination>

As illustrated in FIG. 5, a first determination is made (step St51) after the transition

to the temperature and humidity control mode. In the first determination, the operation determination unit (91) determines which of 1) dehumidifying operation, 3) sensible-heat operation, 4) sensible-heat operation, and 5) latent-heat operation is to be performed. That is, 2) unseparated operation is not selected in the first determination. The target temperature (Ts) set in the communication terminal (80), the target humidity (Rs) set in the communication terminal (80), and the current air state in the indoor space (11) are used for the determination. Here, a current air temperature (T) in the indoor space (11), a current air humidity (R) in the indoor space (11), and a current discomfort index (DI) in the indoor space (11) are used as indices indicating the current air state.

10 [0053]

The air temperature (T) to be used is the highest air temperature (Tmax) among the detected temperatures of the plurality of first suction temperature sensors (34) and the detected temperatures of the plurality of second suction temperature sensors (54). The air humidity (R) is a detected humidity corresponding to the highest air temperature (Tmax), among the detected humidities of the plurality of first suction humidity sensors (35) and the detected humidities of the plurality of second suction humidity sensors (55). In other words, the air temperature (T) and the air humidity (R) respectively correspond to the suction temperature sensor (34, 54) and the suction humidity sensor (35, 55), which constitute a pair in the corresponding indoor unit (30, 50).

20 [0054]

The discomfort index (DI) is determined based on the air temperature (T) and the air humidity (R). Here, the discomfort index is one of the thermal indices representing the thermal sensation of a human body, and can be calculated by a relational expression including a temperature and a humidity.

25 [0055]

In the determination, a plurality of thresholds for determining the transition to one of the operations is used. These thresholds are determined based on the target values of the indoor air state (i.e., the target temperature (Ts) and the target humidity (Rs)).

[0056]

30 Specifically, as will be conceptually described with reference to the psychrometric chart of FIG. 6, the operation determination unit (91) calculates a first temperature threshold (Ts1), a second temperature threshold (Ts2), a third temperature threshold (Ts3), a fourth temperature threshold (Ts4), and a thermo-off determination temperature (Toff) based on the target temperature (Ts). The first temperature threshold (Ts1) is a value obtained by adding

a predetermined temperature $\Delta t1$ (for example, 0.5°C) to the target temperature (T_s). The second temperature threshold (T_{s2}) is a value obtained by adding a predetermined temperature $\Delta t2$ (for example, 1.5°C) to the target temperature (T_s). The third temperature threshold (T_{s3}) is a value obtained by adding a predetermined temperature $\Delta t3$ (for example, 2.0°C) to the target temperature (T_s). The fourth temperature threshold (T_{s4}) is a value obtained by subtracting a predetermined temperature $\Delta t4$ (for example, 0.5°C) from the target temperature (T_s). The thermo-off determination temperature (T_{off}) is a value obtained by subtracting a predetermined temperature (for example, 2°C) from the target temperature. In the present embodiment, $\Delta t1$ and $\Delta t4$ are equal.

10 [0057]

The operation determination unit (91) calculates a first humidity threshold (R_{s1}), a second humidity threshold (R_{s2}), a third humidity threshold (R_{s3}), and a fourth humidity threshold (R_{s4}) based on the target humidity (R_s). Here, the first humidity threshold (R_{s1}) is a value obtained by adding a predetermined humidity $\Delta r1$ (for example, 1.0 g/kg (dry-air)) to the target humidity (R_s). The second humidity threshold (R_{s2}) is a value obtained by adding a predetermined humidity $\Delta r2$ (for example, 2.0 g/kg (dry-air)) to the target humidity (R_s). The third humidity threshold (R_{s3}) is a value obtained by subtracting a predetermined humidity $\Delta r3$ (for example, 1.0 g/kg (dry-air)) from the target humidity (R_s). The fourth humidity threshold (R_{s4}) is a value obtained by subtracting a predetermined humidity $\Delta r4$ (for example, 2.0 g/kg (dry-air)) from the target humidity (R_s). In the present embodiment, $\Delta r1$ and $\Delta r3$ are equal, and $\Delta r2$ and $\Delta r4$ are equal.

[0058]

The operation determination unit (91) calculates a target discomfort index (DI_{s1}) of the indoor space (11) based on the target temperature (T_s) and the target humidity (R_s). In the psychrometric chart of FIG. 6, the discomfort index increases toward the upper right section of the chart (as the temperature and humidity increase), and the discomfort index decreases toward the lower left section of the chart (as the temperature and humidity decrease). Therefore, in the psychrometric chart, the target discomfort index (DI_{s1}) is represented by a line extending toward the upper left section of the chart, and the target discomfort index (DI_{s1}) is defined as a first discomfort index threshold. Furthermore, the operation determination unit (91) determines a value, obtained by adding a predetermined value (for example, 0.5) to the target discomfort index (DI_{s1}), as a second discomfort index threshold (DI_{s2}).

[0059]

The operation determination unit (91) compares each threshold described above with the current air state point (C) (i.e., the air temperature (T) and the air humidity (R)), and determines one of the operations to which the air conditioning system is to transition.

[0060]

Specifically, in a case where the current air state point (C) is in an area E1 surrounded by a thick line, the operation determination unit (91) determines the transition to the latent- and sensible-heat separation operation. That is, the transition to the latent- and sensible-heat separation operation is determined in a case where the air temperature (T) is lower than the second temperature threshold (Ts2), and the air humidity (R) is equal to or higher than the third humidity threshold (Rs3) but lower than the first humidity threshold (Rs1). The operation determination unit (91) determines the transition to the latent- and sensible-heat separation operation also in a case where the current discomfort index (DI) of air is lower than the target discomfort index (DI_{s1}) and the air humidity (R) is equal to or higher than the third humidity threshold (Rs3).

[0061]

In a case where the current air state point (C) is in an area E2 surrounded by a thick line, the operation determination unit (91) determines the transition to the sensible-heat operation. That is, the transition to the sensible-heat operation is determined in a case where the air temperature (T) is equal to or higher than the second temperature threshold (Ts2) and the air humidity (R) is lower than the first humidity threshold (Rs1). The operation determination unit (91) determines the transition to the sensible-heat operation also in a case where the air temperature (T) is lower than the second temperature threshold (Ts2) and the air humidity (R) is lower than the third humidity threshold (Rs3).

[0062]

In a case where the current air state point (C) is in an area E3 surrounded by a thick line, the operation determination unit (91) determines the transition to the latent-heat operation. That is, the transition to the latent-heat operation is determined in a case where the air temperature (T) is lower than the first temperature threshold (Ts1), the air humidity (R) is equal to or higher than the first humidity threshold (Rs1), and the discomfort index (DI) is equal to or higher than the target discomfort index (DI_{s1}).

[0063]

In a case where the current air state point (C) is in an area E4, the operation determination unit (91) determines the transition to the dehumidifying operation. That is, the transition to the dehumidifying operation is determined in a case where the air

temperature (T) is equal to or higher than the first temperature threshold (Ts1) and the air humidity (R) is equal to or higher than the first humidity threshold (Rs1).

[0064]

As illustrated in FIG. 5, in the present embodiment, when a predetermined time (for example, 120 seconds) elapses in step St56 after the dehumidifying operation is started, the processing proceeds to step St57 where the dehumidifying operation is switched to the unseparated operation.

[0065]

<Outline of second and subsequent determinations>

In the second and subsequent determinations after the transition to the temperature and humidity control mode (step St58), the operation determination unit (91) determines which of the operations other than the dehumidifying operation (i.e., 2) unseparated operation, 3) sensible-heat operation, 4) sensible-heat operation, and 5) latent-heat operation) is to be performed. That is, under the temperature and humidity control mode, the dehumidifying operation is performed only in the case where the current air is in the area E4 in the first determination immediately after the temperature and humidity control mode has started.

[0066]

The second and subsequent determinations are made at predetermined time intervals (for example, every 20 seconds) during each operation. The basic determination criteria for the second and subsequent determinations are the same as those for the first determination described above. In the second and subsequent determinations, however, the thresholds for determining the next operation are different from those used in the first determination, depending on the current operation being performed.

[0067]

<Determination during dehumidifying operation and unseparated operation>

The thresholds used for the determination during the dehumidifying operation and the unseparated operation are those illustrated in FIG. 7. In these operations, the humidity range of the area E1 corresponding to the latent- and sensible-heat separation operation is expanded toward the lower side (low humidity side) as compared to the other determinations, although the detailed description is omitted. Moreover, in these operations, the threshold of the discomfort index in the range equal to or higher than the first humidity threshold (Rs1) does not exist in the area E1 corresponding to the latent- and sensible-heat separation operation.

[0068]

<Determination during latent- and sensible-heat separation operation>

The thresholds used for the determination during the latent- and sensible-heat separation operation are those illustrated in FIG. 8. During the latent- and sensible-heat separation operation, the area E2 corresponding to the sensible-heat operation and the area E3 corresponding to the latent-heat operation are smaller than those in the first determination, although the detailed description is omitted. In a case where the current air state point (C) is in an area E5 during the latent- and sensible-heat separation operation, the transition to the unseparated operation is determined. The range of the area E5 during the latent- and sensible-heat separation operation is smaller than that of the area E4 in the first determination (the range for determining the transition to the dehumidifying operation). As described above, in the determination during the latent- and sensible-heat separation operation, the area E1 for continuing the latent- and sensible-heat separation operation is larger than the area E1 in the first determination. This makes it possible to prevent another operation from starting again (so-called hunting), which would otherwise be caused by a slight increase in the air temperature (T) and the air humidity (R) after the transition to the latent- and sensible-heat separation operation.

[0069]

<Determination during sensible-heat operation>

The thresholds used for the determination during the sensible-heat operation are those illustrated in FIG. 9. During the sensible-heat operation, there is an area E6 (hatched area) that is not included in the other determinations, although the detailed description is omitted. The area E6 is, like the area E5, an area for determining the transition to the unseparated operation. Note that, in a case where the air state point (C) is in the area E5 in the determination during the sensible-heat operation, the operation immediately transitions to the unseparated operation. Meanwhile, in a case where the air state point (C) is in the area E6 in the determination during the sensible-heat operation, this state continues for a predetermined time (for example, 180 seconds), after which the operation transitions to the unseparated operation. With such time constraints provided in the area near the boundary between the sensible-heat operation and the unseparated operation, the hunting between the sensible-heat operation and the unseparated operation can be avoided.

[0070]

<Determination during latent-heat operation>

The thresholds used for the determination during the latent-heat operation are those illustrated in FIG. 10. During the latent-heat operation, the humidity range of the area E1

corresponding to the latent- and sensible-heat separation operation is expanded toward the lower side (low humidity side) as compared to the first determination, although the detailed description is omitted.

[0071]

5 <Outline of each operation>

Next, each operation performed under the temperature and humidity control mode will be described. The operation under the temperature and humidity control mode is roughly classified into the following first to third operations. In the first operation, all of the plurality of air conditioners (20, 40) operate as latent heat machines. In the second
10 operation, a part of the plurality of air conditioners (in this example, the first air conditioner (20)) operates as a latent heat machine, and the other air conditioners (in this example, the second air conditioner (40)) operate as a sensible heat machine. In the third operation, all of the plurality of air conditioners (20, 40) (in this example, the first air conditioner (20) and the second air conditioner (40)) operate as sensible heat machines. The first operation includes
15 the dehumidifying operation, the unseparated operation, and the latent-heat operation. The latent- and sensible-heat separation operation corresponds to the second operation, and the sensible-heat operation corresponds to the third operation.

[0072]

The “latent heat machine” refers to an air conditioner controlled such that the indoor
20 heat exchanger (32, 52) of the indoor unit (30, 50) cools the air to the dew point temperature or lower. Therefore, when the air is cooled by the indoor unit (30, 50) of the latent heat machine, the moisture in the air condenses, and the condensed water is collected in a drain pan or the like. As a result, both the temperature and the humidity of the air decrease in the indoor unit (30, 50) of the latent heat machine.

25 [0073]

The “sensible heat machine” refers to an air conditioner controlled such that the indoor heat exchanger (32, 52) of the indoor unit (30, 50) cools the air at a temperature higher than the dew point temperature. Therefore, when the air is cooled by the indoor unit (30, 50) of the sensible heat machine, the moisture in the air does not condense, and only the
30 temperature of the air decreases.

[0074]

<Dehumidifying operation>

The dehumidifying operation is for rapidly lowering the absolute humidity in the room under the conditions where the indoor humidity and temperature are high. During the

dehumidifying operation, both the first air conditioner (20) and the second air conditioner (40) operate as latent heat machines.

[0075]

Upon transition to the dehumidifying operation, the cloud server (90) transmits, to
5 each local controller (61, 71), a signal for controlling the air volume of the indoor fan (33, 53) of the corresponding air conditioner (20, 40). During the dehumidifying operation, a signal for controlling the air volume of the indoor fan (33, 53) to the L tap is transmitted. As a result, during the dehumidifying operation, the air volumes of all the indoor fans (33, 53) become low, and the dehumidifying performance of each indoor unit (30, 50) is improved.

10 [0076]

The cloud server (90) appropriately determines a target evaporation temperature (TeS) of each air conditioner (20, 40), and transmits the determined target evaporation temperature (TeS) to each local controller (61, 71). Here, during the dehumidifying operation, the target evaporation temperature (TeS) is calculated based on the current air state
15 through the following processing (target evaporation temperature determination processing). Specifically, the capability determination unit (92) calculates the target evaporation temperature (TeS) using a function expression stored in the memory. Here, this function expression includes a saturation curve, the current air temperature (T), and the current air humidity (R) illustrated on the psychrometric chart of FIG. 11. Specifically, as illustrated in
20 FIG. 11, this function expression is for calculating a temperature (Tp) corresponding to a contact point (P) between the saturation curve on the psychrometric chart and a straight line M passing through the current air state point. Here, the current air state point (C) corresponds to the current air temperature (T) and the current air humidity (R). The temperature (Tp) corresponding to the contact point (P) is calculated by this function
25 expression, and this temperature (Tp) is set as the target evaporation temperature (TeS). During the dehumidifying operation, such target evaporation temperature determination processing is performed, in principle, at predetermined time intervals (every 20 seconds).

[0077]

The target evaporation temperature (TeS) determined in this manner is appropriately
30 transmitted to each local controller (61, 71) via the Internet (86). As a result, each air conditioner (20, 40) controls the operating frequency of the corresponding compressor (23, 43) such that the current evaporation temperature (Te) is brought close to the target evaporation temperature (TeS) received at predetermined time intervals.

[0078]

The target evaporation temperature (T) is determined in this manner during the dehumidifying operation, making it possible to prevent an excessive increase or decrease in the target evaporation temperature (TeS). If the target evaporation temperature (TeS) is too high, the temperature at which the air can be cooled becomes high, and the amount of moisture that can be condensed from the air decreases. This makes it difficult to dehumidify the indoor air quickly, and to bring the indoor temperature and humidity close to the target point (S) quickly. As a result, the comfort of the indoor space (11) is impaired.

[0079]

If the target evaporation temperature (TeS) is too low, on the other hand, the air is to be dehumidified in an area where a sensible heat ratio of the air is large (area where the inclination of the arrow a in FIG. 11 is small). In this area, the proportion of latent heat to be treated to the total amount of heat to be treated is small, which is disadvantageous for dehumidification. When the air is cooled in this area, therefore, the dehumidification efficiency is lowered, and thus energy conservation is degraded.

[0080]

To address this issue, as illustrated in FIG. 11, the temperature (Tp) corresponding to the contact point (P) is set as the target evaporation temperature (TeS), whereby an excessive increase or decrease in the target evaporation temperature (TeS) is prevented. As a result, it is possible to achieve both indoor comfort and energy conservation of the air conditioning system (10).

[0081]

An upper limit value is set to the target evaporation temperature (TeS) determined during the dehumidifying operation, such that each latent heat machine can reliably cool the air to the dew point temperature or lower. Therefore, during the dehumidifying operation, the temperature of the air cooled by each latent heat machine does not rise above the dew point temperature.

[0082]

During the dehumidifying operation, as described above, the target evaporation temperature determination processing is performed, in principle, at predetermined time intervals (every 20 seconds). Note that, in order to protect the compressor (23, 43) and prevent hunting of the evaporation temperature (Te), the following update determination is performed before each target evaporation temperature determination processing.

[0083]

In the update determination, it is determined whether the target evaporation

temperature processing is to be performed again. In the update determination, in a case where one or both of Condition 1-A and Condition 1-B are satisfied, the target evaporation temperature determination processing is performed and the target evaporation temperature (TeS) is updated.

5 [0084]

1-A: Current $|Te - TeS| \leq E1$

1-B: $|(Current |Te - TeS| - Previous |Te - TeS|)| \leq E2$

[0085]

10 Here, Current $|Te - TeS|$ represents an absolute value of the difference between the current evaporation temperature (Te) and the current target evaporation temperature (TeS). Previous $|Te - TeS|$ corresponds to the value of $|Te - TeS|$ calculated in the previous update determination, the one just before the current update determination. E1 and E2 represent determination thresholds set in advance.

[0086]

15 In the case where Condition 1-A is satisfied, it can be determined that the actual evaporation temperature (Te) has converged to the target evaporation temperature (TeS). In the case where Condition 1-A is satisfied, therefore, the target evaporation temperature determination processing is performed again to recalculate the target evaporation temperature (TeS).

20 [0087]

In the case where Condition 1-B is satisfied, it can be determined that a decreasing change amount of the difference between the evaporation temperature (Te) and the target evaporation temperature (TeS) is small, and the evaporation temperature (Te) tends to converge to the target evaporation temperature (TeS). Also in the case where Condition 1-B is satisfied, therefore, the target evaporation temperature determination processing is performed again to recalculate the target evaporation temperature (TeS).

[0088]

30 In a case where neither Condition 1-A nor Condition 1-B is satisfied, it can be determined that the evaporation temperature (Te) has not converged to the target evaporation temperature (TeS), and the evaporation temperature (Te) has largely changed. In the case where these conditions are not satisfied, therefore, the target evaporation temperature determination processing is prohibited, and the target evaporation temperature (TeS) is not recalculated. This makes it possible to restrict the target evaporation temperature (TeS) from being changed again when the evaporation temperature (Te) has changed relatively

largely. Therefore, it is possible to avoid a significant change in the operating frequency of the compressor (23, 43), and the hunting of the evaporation temperature (T_e).

[0089]

<Unseparated operation>

5 Like the dehumidifying operation, the unseparated operation is for lowering the absolute humidity in the room under the conditions where the indoor humidity and temperature are high. During the unseparated operation, both the first air conditioner (20) and the second air conditioner (40) operate as latent heat machines. However, as described above, the unseparated operation is not performed in the first determination (see FIG. 5).
10 During the unseparated operation, both the first air conditioner (20) and the second air conditioner (40) operate as latent heat machines.

[0090]

 Upon transition to the unseparated operation, the cloud server (90) transmits, to each local controller (61, 71), a signal for controlling the air volume of the indoor fan (33, 53) of
15 the corresponding air conditioner (20, 40). During the unseparated operation, a signal for controlling the air volume of the indoor fan (33, 53) to the M tap is transmitted. Thus, during the unseparated operation, all the indoor fans (33, 53) have a medium air volume.

[0091]

 The cloud server (90) appropriately determines a target evaporation temperature
20 (T_{eS}) of each air conditioner (20, 40), and transmits the determined target evaporation temperature (T_{eS}) to each local controller (61, 71). Here, the target evaporation temperature (T_{eS}) during the unseparated operation is determined by a method similar to that used during the cooling operation of the temperature control mode.

[0092]

25 That is, in the evaporation temperature determination processing during the unseparated operation, the target evaporation temperature (T_{eS}) is calculated in accordance with a difference ΔT_{rs} between the current air temperature (T) and the target temperature (T_s) set in the communication terminal (80). As ΔT_{rs} increases, the target evaporation temperature (T_{eS}) decreases in order to increase the capability of each air conditioner (20, 40).
30 Conversely, as ΔT_{rs} decreases, the target evaporation temperature (T_{eS}) increases in order to decrease the capability of each air conditioner (20, 40).

[0093]

 An upper limit value is set to the target evaporation temperature (T_{eS}) determined during the unseparated operation, such that each latent heat machine can reliably cool the air

to the dew point temperature or lower. Therefore, during the unseparated operation, the temperature of the air cooled by each latent heat machine does not rise above the dew point temperature.

[0094]

5 During the unseparated operation, as in the dehumidifying operation, the update determination is made as to whether the target evaporation temperature (TeS) is to be updated. This can protect the compressor (23, 43) and avoid the hunting of the evaporation temperature (Te).

[0095]

10 <Latent-heat operation>

The latent-heat operation is for lowering the absolute humidity in the room under the conditions where the indoor humidity is particularly high. During the latent-heat operation, both the first air conditioner (20) and the second air conditioner (40) operate as latent heat machines. The latent-heat operation is basically subject to the same control as the dehumidifying operation.

[0096]

During the latent-heat operation, a signal for controlling the air volume of the indoor fan (33, 53) to the M tap is transmitted. Thus, during the latent-heat operation, all the indoor fans (33, 53) have a medium air volume.

20 [0097]

In the evaporation temperature determination processing during the latent-heat operation, the target evaporation temperature (TeS) is determined based on the temperature (Tp) corresponding to the contact point (P), as in the dehumidifying operation. Unlike the dehumidifying operation, however, the update determination of the target evaporation temperature (TeS) is not made during the latent-heat operation. During the latent-heat operation, therefore, the target evaporation temperature (TeS) is constantly recalculated at predetermined time intervals (for example, every 20 seconds).

[0098]

30 The latent-heat operation is performed in the case where the air state point (C) is in the area E3 as described above, and the area E3 is near the thermo-off area. If, during the latent-heat operation, recalculation of the target evaporation temperature (TeS) is prohibited as in the dehumidifying operation, the air may be excessively cooled during the operation, and the air temperature (T) may fall far below the target evaporation temperature (TeS). In this case, the air temperature (T) may reach the thermo-off area.

[0099]

In the present embodiment, in contrast, the target evaporation temperature (TeS) is constantly updated during the latent-heat operation. Therefore, the target evaporation temperature (TeS) can be adjusted before the air temperature (T) is excessively lowered.

5 This makes it possible to prevent the air temperature (T) from reaching the thermo-off area. During the latent-heat operation, the evaporation temperature (Te) is more likely to converge to the target evaporation temperature (TeS) than in the dehumidifying operation; therefore, the operating frequency of the compressor (23, 43) and the evaporation temperature (Te) do not significantly change even without the restrictions imposed by the update determination.

10 [0100]

<Outline of latent- and sensible-heat separation operation>

During the latent- and sensible-heat separation operation (simultaneous operation), when the indoor temperature and humidity are in a range close to the target point (S), latent heat and sensible heat in the room are treated separately in each air conditioner (20, 40).

15 During the latent- and sensible-heat separation operation of the present embodiment, the first air conditioner (20) operates as a latent heat machine, and the second air conditioner (40) operates as a sensible heat machine. Therefore, during the latent- and sensible-heat separation operation, the indoor unit (30, 50) of the first air conditioner (20) cools and dehumidifies the air and, at the same time, the indoor unit (30, 50) of the second air
20 conditioner (40) only cools the air. As described above, through simultaneous operation of the latent heat machine and the sensible heat machine, it is possible to bring the indoor temperature and humidity close to the target range while avoiding an excessive decrease in the indoor temperature.

[0101]

25 During the latent- and sensible-heat separation operation, it is necessary for the cloud server (90) to send different control signals to a local controller corresponding to the latent heat machine (in this example, the first local controller (61)) and to a local controller corresponding to the sensible heat machine (in this example, the second local controller (71)). This is because different control is performed between the sensible heat machine and the
30 latent heat machine. Therefore, device information is registered in the cloud server (90), the device information indicating which air conditioner (20, 40) operates as the latent heat machine and which air conditioner (20, 40) operates as the sensible heat machine during the latent- and sensible-heat separation operation. In this example, device information indicating that the first air conditioner (20) operates as the latent heat machine during the

latent- and sensible-heat separation operation, and device information indicating that the second air conditioner (40) operates as the sensible heat machine during the latent- and sensible-heat separation operation are registered in the cloud server (90). For example, such information is transmitted from the communication terminal (80) or each local controller (61, 71) to the cloud server (90) via the Internet (86).

[0102]

<Control of latent heat machine during latent- and sensible-heat separation operation>

During the latent- and sensible-heat separation operation, the cloud server (90) transmits a signal for controlling the air volume of the first indoor fan (33), to the first local controller (61) corresponding to the first air conditioner (20) that operates as the latent heat machine. During the latent- and sensible-heat separation operation, the air volume of the first indoor fan (33) in the first air conditioner (20) is switched between two levels (for example, between the L tap and the M tap). For example, the first indoor fan (33) may be switched between two levels of the M tap and the H tap.

[0103]

The cloud server (90) transmits, to the first local controller (61), the target evaporation temperature (first target evaporation temperature (TeS1) for controlling the evaporation temperature (Te) of the first air conditioner (20).

[0104]

The evaporation temperature determination processing of the latent heat machine during the latent- and sensible-heat separation operation is performed by a method similar to that used during the dehumidifying operation. Specifically, the capability determination unit (92) sets, as the first target evaporation temperature (TeS1), a temperature corresponding to the contact point between the saturation curve on the psychrometric chart and the straight line passing through the target point (S). In other words, the dehumidifying operation and the latent- and sensible-heat separation operation are different in the following: during the dehumidifying operation, the current air state point (C) (i.e., the air temperature (T) and the air humidity (R)) is used to determine the contact point with the saturation curve, whereas during the latent- and sensible-heat separation operation, the target point (S) (i.e., the target temperature (Ts) and the target humidity (Rs)) is used for that purpose. The target point (S) is determined based on the setting value of the communication terminal (80), and thus basically does not change, unlike the state point (C). Therefore, when the contact point is determined based on the target point (S), the first target evaporation temperature (TeS1) does not significantly change. This makes it possible to avoid a situation where the current air

state point (C) deviates from the area E1 in FIG. 8 due to such change in the first target evaporation temperature (TeS1), and to suppress the switching from the latent- and sensible-heat separation operation to another operation.

[0105]

5 In the evaporation temperature determination processing of the latent heat machine during the latent- and sensible-heat separation operation, the update determination is performed in a similar manner to the dehumidifying operation. This can protect the compressor (23, 43) and prevent the hunting of the evaporation temperature (Te).

[0106]

10 During the latent- and sensible-heat separation operation, the first target evaporation temperature (TeS1) of the latent heat machine is adjusted stepwise based on the current air state point (C), the target point (S), and the immediately preceding change in the air state point (C) (air temperature (T) and air humidity (R)), although the detailed description is omitted.

15 [0107]

<Control of sensible heat machine during latent- and sensible-heat separation operation>

During the latent- and sensible-heat separation operation, the cloud server (90) transmits a signal for controlling the air volume of the second indoor fan (53), to the second local controller (71) corresponding to the second air conditioner (40) that operates as the
20 sensible heat machine. During the latent- and sensible-heat separation operation, the air volume of the second indoor fan (53) in the second air conditioner (40) is controlled to, for example, the M tap or the H tap.

[0108]

The cloud server (90) transmits, to the second local controller (71), the target
25 evaporation temperature (TeS) (second target evaporation temperature (TeS2)) for controlling the evaporation temperature (Te) of the second air conditioner (40).

[0109]

In the evaporation temperature determination processing of the sensible heat machine during the latent- and sensible-heat separation operation, the second target
30 evaporation temperature (TeS2) is determined such that the temperature of the air to be treated by the sensible heat machine becomes higher than the dew point temperature. Specifically, a dew point temperature (Tdew-s) corresponding to the air is calculated based on the air state point (target temperature (Ts) and target humidity (Rs)) corresponding to the current target point (S). That is, the dew point temperature (Tdew-s) is a temperature at

which dew condensation occurs from the air at the target point (S) in a case where the air is cooled. Then, in the evaporation temperature determination processing, the dew point temperature ($T_{\text{dew-s}}$) is set as the second target evaporation temperature ($TeS2$).

[0110]

5 The latent- and sensible-heat separation operation is performed when the current air state point (C) is in the area E1 including the target point (S). Therefore, a large difference in the temperature and humidity of the air does not occur between the current air state point (C) and the target point (S). It is substantially impossible that the air cooled by the second indoor heat exchanger (52) of the sensible heat machine is cooled to a temperature equal to or
10 lower than the evaporation temperature. For this reason, with the dew point temperature ($T_{\text{dew-s}}$) corresponding to the target point (S) set as the second target evaporation temperature ($TeS2$), the sensible heat machine substantially cools the air at a temperature higher than the actual dew point temperature.

[0111]

15 The target point (S) is determined based on the setting value of the communication terminal (80), and thus basically does not change, unlike the state point (C). Therefore, when the dew point temperature is determined based on the target point (S), the second target evaporation temperature ($TeS2$) does not significantly change. This makes it possible to avoid a situation where the current air state point (C) deviates from the area E1 in FIG. 8 due
20 to such change in the second target evaporation temperature ($TeS2$), and to suppress the switching from the latent- and sensible-heat separation operation to another operation.

[0112]

<Sensible-heat operation>

25 The sensible-heat operation is for lowering the indoor temperature under the conditions where the indoor temperature is particularly high. During the sensible-heat operation, both the first air conditioner (20) and the second air conditioner (40) operate as sensible heat machines.

[0113]

30 Upon transition to the sensible-heat operation, the cloud server (90) transmits, to each local controller (61, 71), a signal for controlling the air volume of the indoor fan (33, 53) of the corresponding air conditioner (20, 40). During the sensible-heat operation, a signal for controlling the air volume of the indoor fan (33, 53) to the M tap is transmitted. Thus, during the sensible-heat operation, all the indoor fans (33, 53) have a medium air volume.

[0114]

The cloud server (90) transmits, to each local controller (61, 71), the target evaporation temperature (TeS) for controlling the evaporation temperature (Te) of the corresponding air conditioner (20, 40).

[0115]

5 In the evaporation temperature determination processing during the sensible-heat operation, the target evaporation temperature (TeS) is determined such that the temperature of the air to be treated by the sensible heat machine becomes higher than the dew point temperature. Specifically, a dew point temperature (Tdew-c) corresponding to the current air is calculated based on the current air state point (C) (air temperature (T) and air humidity (R))). That is, the dew point temperature (Tdew-c) is a temperature at which dew
10 condensation occurs from the air at the current state point in a case where the air is cooled. Then, in the evaporation temperature determination processing, the dew point temperature (Tdew-c) is set as the second target evaporation temperature (TeS2).

[0116]

15 The sensible-heat operation is performed when the current air state point (C) is in the area E2 apart from the target point (S). Therefore, the current air state point (C) is at a relatively higher temperature than the target point (S). For this reason, during the sensible-heat operation, unlike the control of the latent heat machine during the latent- and sensible-heat separation operation, the dew point temperature (Tdew-c) corresponding to the current
20 air state point (C), not the target point (S), is set as the target evaporation temperature (TeS). That is, if the dew point temperature (Tdew-s) corresponding to the target point (S) is set as the target evaporation temperature during the sensible-heat operation, the target evaporation temperature (TeS) becomes excessively low, and the air may be cooled to the actual dew point temperature or lower. During the sensible-heat operation, in contrast, the dew point
25 temperature (Tdew-c) corresponding to the current air state point (C) is set as the target evaporation temperature (TeS), making it possible to reliably prevent dehumidification of the air during the sensible-heat operation.

[0117]

<Thermo-off operation>

30 During each operation described above, in principle, when each suction temperature sensor (34, 54) of the air conditioners (20, 40) detects a temperature equal to or lower than the thermo-off determination temperature (Toff), the corresponding indoor unit (30, 50) enters thermo-off.

[0118]

During the latent- and sensible-heat separation operation, however, all the indoor units (30, 50) are prohibited from entering thermo-off until at least all the suction temperature sensors (34, 54) of the plurality of indoor units (30, 50) in operation detect a temperature equal to or lower than the thermo-off determination temperature (Toff). Therefore, during the latent- and sensible-heat separation operation, the indoor units (30, 50) do not enter thermo-off even when the suction temperature sensor (34, 54) of only a part of the indoor units (30, 50) detects a temperature equal to or lower than the thermo-off determination temperature (Toff).

[0119]

During the latent- and sensible-heat separation operation, the temperature of the blown air is different between the sensible heat machine and the latent heat machine. For this reason, the temperature tends to become uneven in the indoor space (11). Due to this phenomenon, the temperature detected by the suction temperature sensor (34, 54) of a part of the indoor units (30, 50) may become extremely low, making it difficult to continue the latent- and sensible-heat separation operation. To address this issue, the above-mentioned thermo-off determination is made, whereby the latent- and sensible-heat separation operation can be continued until the temperature of the entire indoor space (11) becomes equal to or lower than the thermo-off determination temperature.

[0120]

-Details of step control during latent- and sensible-heat separation operation-

During the latent- and sensible-heat separation operation, as described above, the first target evaporation temperature (TeS1) of the first air conditioner (20) operating as the latent heat machine, and the second target evaporation temperature (TeS2) of the second air conditioner (40) operating as the sensible heat machine are determined. Furthermore, during the latent- and sensible-heat separation operation, control is exercised such that these target evaporation temperatures (TeS) are increased or decreased stepwise based on the target evaporation temperatures (TeS) thus determined. This control operation (step control) will be described with reference to FIGS. 12 to 14.

[0121]

After the first target evaporation temperature (TeS1) and the second target evaporation temperature (TeS2) are calculated by the above-described method in step St21 of FIG. 13, the processing proceeds to steps St22 to St24. In steps St22 to St24, it is determined which range the current temperature and humidity of the air (state point (C)) are in.

[0122]

Specifically, the cloud server (90) stores data such as a function and a map for determining a plurality of areas (divided areas) as illustrated in FIG. 12. Here, in the example of FIG. 12, a plurality of divided areas arranged in a lattice is formed. In the present embodiment, an area E including a target point (S) and a plurality of (eight in this example) areas A, B, C, D, F, G, H, and I surrounding the area E are formed. These areas are determined based on the target temperature and humidity (target point (S)) set in the communication terminal (80). Therefore, when the position of the target point (S) changes, the position of each area on the psychrometric chart also changes.

[0123]

More specifically, the area A covers a range from the first temperature threshold (Ts1) to the third temperature threshold (Ts3) and from the first humidity threshold (Rs1) to the second humidity threshold (Rs2). The area B covers a range from the first temperature threshold (Ts1) to the third temperature threshold (Ts3) and from the third humidity threshold (Rs3) to the first humidity threshold (Rs1). The area C covers a range from the first temperature threshold (Ts1) to the third temperature threshold (Ts3) and from the fourth humidity threshold (Rs4) to the third humidity threshold (Rs3). The area D covers a range from the fourth temperature threshold (Ts4) to the first temperature threshold (Ts1) and from the first humidity threshold (Rs1) to the second humidity threshold (Rs2). The area E covers a range from the fourth temperature threshold (Ts4) to the first temperature threshold (Ts1) and from the third humidity threshold (Rs3) to the first humidity threshold (Rs1). The area F covers a range from the fourth temperature threshold (Ts4) to the first temperature threshold (Ts1) and from the fourth humidity threshold (Rs4) to the third humidity threshold (Rs3). The area G covers a range from the thermo-off determination temperature (Toff) to the fourth temperature threshold (Ts4) and from the first humidity threshold (Rs1) to the second humidity threshold (Rs2). The area H covers a range from the thermo-off determination temperature (Toff) to the fourth temperature threshold (Ts4) and from the third humidity threshold (Rs3) to the first humidity threshold (Rs1). The area I covers a range from the thermo-off determination temperature (Toff) to the fourth temperature threshold (Ts4) and from the fourth humidity threshold (Rs4) to the third humidity threshold (Rs3).

[0124]

In steps St22 to St24, step control is exercised to adjust the target evaporation temperature (TeS) of each air conditioner (20, 40) based on the data indicating such a plurality of areas. In the step control, based on the current air state point (C) and the target

point (S), the target evaporation temperature (TeS) of the first air conditioner (20) operating as the latent heat machine and the target evaporation temperature (TeS) of the second air conditioner (40) operating as the sensible heat machine are changed. Furthermore, in the step control, the past location (c) of the current air state point (C) is also taken into consideration.

[0125]

Specifically, in step St22, the capability determination unit (92) of the control device (60) determines which of the plurality of divided areas the current air state point (C) belongs to. Next, in step St23, the capability determination unit (92) of the control device (60) determines which of the plurality of divided areas the previous air state point (C) belonged to. Here, in this step control, the previous air state point (C) means the point belonging to the area determined in the previous step, i.e., step St22.

[0126]

Next, it is determined in step St24 how to change the target evaporation temperatures (TeS) of the first air conditioner (20) and the second air conditioner (40) based on the current area determined in step St22 and the previous area determined in step St23. Specifically, it is determined in step St24 whether to increase by one step, maintain, or decrease by one step the first target evaporation temperature (TeS1) of the first air conditioner (20) based on the current air state point (C) and the previous air state point (C). At the same time, it is determined in step St24 whether to increase by one step, maintain, or decrease by one step the second target evaporation temperature (TeS2) of the second air conditioner (40) based on the current air state point (C) and the previous air state point (C).

[0127]

Here, in the air conditioning system (10) of the present embodiment, a change width $\Delta Te1$ (first change width) per step of the first target evaporation temperature (TeS1) of the latent heat machine is set to, for example, 1.0°C. A change width $\Delta Te2$ (second change width) per step of the second target evaporation temperature (TeS2) of the sensible heat machine is set to, for example, 0.5°C. That is, during the latent- and sensible-heat separation operation, the change width $\Delta Te1$ of the first target evaporation temperature (TeS1) of the first air conditioner (20) operating as the latent heat machine is larger than the change width $\Delta Te2$ of the second target evaporation temperature (TeS2) of the second air conditioner (40) operating as the sensible heat machine. In other words, during the latent- and sensible-heat separation operation, a change width $\Delta W1$ of the cooling capacity of the first air conditioner (20) operating as the latent heat machine is larger than a change width

ΔW_2 of the cooling capacity of the second air conditioner (40) operating as the sensible heat machine.

[0128]

In step St24, the capability of each air conditioner (20, 40) is determined in accordance with, for example, the conditions illustrated in FIG. 14. Note that FIG. 14 only illustrates a part of the conditions. For example, it is assumed that the current air state point (C) is in the area E and the previous air state point (C) is in the area A, as indicated by a condition e1 in FIG. 14. This means that the air of the state point (C) in the area A has transitioned to the area E through the operation up to this point. When this condition is satisfied, the capability determination unit (92) increases the first target evaporation temperature (TeS1) of the latent heat machine by one step, while maintaining the second target evaporation temperature (TeS2) of the sensible heat machine as it is. As a result, ΔTe_1 is added to the current first target evaporation temperature (TeS1), and the cooling capacity of the first air conditioner (20) decreases. Meanwhile, the current second target evaporation temperature (TeS2) is maintained as it is, and the cooling capacity of the second air conditioner (40) does not change. The above operation can suppress the temperature and humidity of the air that has transitioned to the area E becoming lower than the target point (S).

[0129]

For example, it is assumed that the current air state point (C) is in the area E and the previous air state point (C) is in the area D, as indicated by a condition e2 in FIG. 14. This means that the air of the state point (C) in the area D has transitioned to the area E through the operation up to this point. When this condition is satisfied, the capability determination unit (92) increases the first target evaporation temperature (TeS1) and the second target evaporation temperature (TeS2) by one step each. As a result, ΔTe_1 is added to the current first target evaporation temperature (TeS1), and the cooling capacity of the first air conditioner (20) decreases. At the same time, ΔTe_2 is added to the current second target evaporation temperature (TeS2), and the cooling capacity of the second air conditioner (40) decreases. The above operation can suppress the temperature and humidity of the air that has transitioned to the area E becoming lower than the target point (S).

[0130]

Similarly, in a case where the current air state point (C) is in the area E and the previous air state point (C) is in the area F as indicated by a condition e3 in FIG. 14, the first target evaporation temperature (TeS1) is decreased by one step and the second target evaporation temperature (TeS2) is maintained as it is. This increases the cooling capacity of

the first air conditioner (20) but does not change the cooling capacity of the second air conditioner (40).

[0131]

In a case where the current air state point (C) is in the area E and the previous air state point is in the area I as indicated by a condition e4 in FIG. 14, the first target evaporation temperature (TeS1) and the second target evaporation temperature (TeS2) are decreased by one step each. This increases the cooling capacity of each of the first air conditioner (20) and the second air conditioner (40).

[0132]

In a case where the current air state point (C) is in the area A or the area D as indicated by a condition a1 or a condition d1 in FIG. 14, respectively, it can be determined that the cooling capacity of each air conditioner (20, 40) seems to be insufficient. In this case, therefore, the first target evaporation temperature (TeS1) and the second target evaporation temperature (TeS2) are changed to minimum values (lowest step among multiple steps) regardless of the area of the previous air state point (C). As a result of the first target evaporation temperature (TeS1) and the second target evaporation temperature (TeS2) becoming the minimum values, the cooling capacities of the first air conditioner (20) and the second air conditioner (40) increase. Therefore, the air state point (C) can be quickly brought close to the area E.

[0133]

In a case where the current air state point (C) is in the area I as indicated by a condition i1) in FIG. 14, it can be determined that the cooling capacity of each air conditioner (20, 40) seems to be excessive. In this case, therefore, the first target evaporation temperature (TeS1) is increased by one step regardless of the area of the previous air state point (C). As a result, the cooling capacity of the first air conditioner (20) increases, and the air state point (C) can be brought close to the area E quickly.

[0134]

Description of the determination about the other conditions is omitted.

[0135]

In step St24, as described above, the target evaporation temperatures (TeS) of the air conditioners (20, 40) are finely adjusted in accordance with the area of the current air state point (C) and the area of the previous air state point (C). That is, in step St24, the cooling capacities of the air conditioners (20, 40) are adjusted such that, preferably, the current air state point (C) converges to the area E, based on the relationship between the current air state

point (C) and the target point (S) and the relationship (behavior) between the current air state point (C) and the previous air state point (C). As a result, during the latent- and sensible-heat separation operation, the air state point (C) can be brought close to the target point (S), and the indoor temperature and humidity can be maintained within the target range.

5 [0136]

When the target evaporation temperatures (TeS) of the air conditioners (20, 40) are determined in step St24, the target evaporation temperatures (TeS) are transmitted to the local controllers (61, 71). Therefore, the local controllers (61, 71) adjust the operating frequencies of the compressors (23, 43) such that the evaporation temperatures (Te1, Te2) of the air conditioners (20, 40) converge to the target evaporation temperatures (TeS).

[0137]

Next, in a case where the target temperature (Ts) and the target humidity (Rs) set in the communication terminal (80) are changed in step St25, the processing proceeds to step St21. In this case, the first target evaporation temperature (Te1) and the second target evaporation temperature (Te2) are recalculated based on the newly set target point (S). Then, the determination processing of steps St22 to St24 is performed again. In a case where the target temperature (Ts) and the target humidity (Rs) are not changed in step St25, on the other hand, step S21 is skipped and the processing of steps St22 to St24 is repeated.

[0138]

20 <Change width in step control>

The change width of the target evaporation temperature (TeS) in the above-described step control will be described in further detail. As illustrated in FIG. 15, during the latent- and sensible-heat separation operation, the first target evaporation temperature (TeS1) of the first air conditioner (20) operating as the latent heat machine is equal to or lower than the dew point temperature, while the second target evaporation temperature (TeS2) of the second air conditioner (40) operating as the sensible heat machine is higher than the dew point temperature. Therefore, the temperature difference between the suction air temperature of the first indoor unit (30) and the first target evaporation temperature (TeS1) is larger than the temperature difference between the suction air temperature of the second indoor unit (50) and the second target evaporation temperature (TeS2). That is, during the latent- and sensible-heat separation operation, the air cooling capacity of the first indoor unit (30) is higher than that of the second indoor unit (50).

[0139]

Meanwhile, during the latent- and sensible-heat separation operation, the first air

conditioner (20) and the second air conditioner (40) finely adjust the target evaporation temperatures (TeS) stepwise, as described above. Here, if the change width $\Delta Te1$ of the first target evaporation temperature (TeS1) of the first air conditioner (20) is too small, the change width $\Delta W1$ of the cooling capacity per step with respect to the cooling capacity required by the latent heat machine also becomes too small. As a result, the responsiveness of the cooling capacity of the latent heat machine is degraded. If the change width $\Delta Te2$ of the second target evaporation temperature (TeS2) of the second air conditioner (40) is too large, the change width $\Delta W2$ of the cooling capacity per step with respect to the cooling capacity required by the sensible heat machine also becomes too large. As a result, the cooling capacity of the sensible heat machine cannot be adjusted with high accuracy.

[0140]

Accordingly, in the present embodiment, the change width $\Delta Te1$ of the first target evaporation temperature (TeS1) of the latent heat machine is made larger than the change width $\Delta Te2$ of the second target evaporation temperature (TeS2) of the sensible heat machine. In other words, the change width $\Delta W1$ (first change width) of the cooling capacity of the latent heat machine is made larger than the change width $\Delta W2$ (second change width) of the cooling capacity of the sensible heat machine.

[0141]

Specifically, in the present embodiment, the change width $\Delta Te1$ of the first target evaporation temperature (TeS1) of the latent heat machine is set to 1.0°C. Here, this change width of 1.0°C corresponds to the amount of change in evaporation temperature required to change the absolute humidity of air by 1.0/kg (DA) under a rated operating condition of the first indoor unit (30). The change width $\Delta Te2$ of the second target evaporation temperature (TeS2) of the sensible heat machine is set to 0.5°C. Here, this change width of 0.5°C corresponds to the amount of change in evaporation temperature required to change the temperature of air by 1.0°C under a rated operating condition of the second indoor unit (50).

[0142]

As illustrated in FIG. 15, the change width $\Delta Te1$ of the first target evaporation temperature (TeS1) is relatively large in the first indoor unit (30); therefore, the change width $\Delta W1$ of the cooling capacity per step also becomes large. Therefore, the proportion of the change width $\Delta W1$ to the cooling capacity is large in the latent heat machine. As a result, the responsiveness of the cooling capacity of the latent heat machine can be improved. Meanwhile, the change width $\Delta Te2$ of the second target evaporation temperature (TeS2) is relatively small in the second indoor unit (50); therefore, the proportion of the change width

ΔW_2 of the cooling capacity per step becomes small. As a result, the cooling capacity of the sensible heat machine can be adjusted with high accuracy.

[0143]

-Effect of embodiment-

5 In the above embodiment, the control device (60) performs the control operation (step control) for adjusting the cooling capacity of the indoor unit (30, 50) of the air conditioner (20, 40) operating as the latent heat machine, and the cooling capacity of the indoor unit (30, 50) of the air conditioner (20, 40) operating as the sensible heat machine, such that the current indoor temperature and the current indoor humidity are brought close to
10 the target indoor temperature and humidity. More specifically, the control device (60) determines the cooling capacities of the indoor units (30, 50) of the air conditioners (20, 40) based on the target point (S), the current air state point (C), and the previous air state point (C).

[0144]

15 This makes it possible to determine how to change the cooling capacity of any of the sensible heat machine and the latent heat machine in consideration of the relationship between the target point (S) and the current air state point (C) and the change of the air state point (C). Therefore, the air state point (C) can be brought close to the target point (S) promptly. Therefore, the latent- and sensible-heat separation operation excellent in energy
20 conservation and capable of maintaining the indoor temperature and humidity within a desired range can be achieved.

[0145]

 In the above embodiment, when the target evaporation temperatures (T_{eS}) of the latent heat machine and the sensible heat machine are determined in step St24, the cooling
25 capacities of the air conditioners (20, 40) are changed at the same timing. For example, if the cooling capacities of both machines are changed at different times, the indoor temperature and humidity may be subjected to hunting and may not converge easily. To address this issue, the cooling capacities of the latent heat machine and the sensible heat machine are controlled at the same timing, in which case the indoor temperature and humidity are more
30 likely to converge.

[0146]

<<Other embodiments>>

 In the step control of the above embodiment, the cooling capacities of the air conditioners (20, 40) are determined in consideration of the target point (S), the current air

state point (C), and the previous air state point (C). Alternatively, however, the cooling capacities of the air conditioners (20, 40) may be determined only in consideration of the target point (S) and the current air state point (C), without considering the previous air state point (C).

5 [0147]

In the step control of the above embodiment, the cooling capacities are changed through adjustment of the evaporation temperatures of the air conditioners (20, 40). Alternatively, the cooling capacities may be changed through adjustment of the operating frequencies of the compressors (23, 43) or the number of rotations of the indoor fans (33, 53).

10 [0148]

The control device (60) of the above embodiment includes the cloud server (90), the communication terminal (80) and the like, and achieves the temperature and humidity control mode via the Internet (86). Alternatively, the control device (60) may control the air conditioners (20, 40) only with the local controllers, not via the Internet.

15 [0149]

Although the air conditioning system (10) of the above embodiment includes the two air conditioners (20, 40) used for air-conditioning the same indoor space (11), the number of air conditioners (20, 40) may be three or more. Also in this case, which air conditioner operates as the latent heat machine and which air conditioner operates as the sensible heat machine during the latent- and sensible-heat separation operation, is registered in advance. For the latent- and sensible-heat separation operation, a ratio between the number of latent heat machines and the number of sensible heat machines is determined based on the registered information.

[0150]

25 In the air conditioning system (10) of the above embodiment, for example, the air conditioner may be of a so-called multi-type for a building, having three or more indoor units and in which a refrigerant circuit in each indoor unit is provided with an indoor expansion valve.

30 **INDUSTRIAL APPLICABILITY**

[0151]

As described above, the present invention is useful for an air conditioning system.

REFERENCE SIGNS LIST

[0152]

10 Air conditioning system

20 First air conditioner

21 First outdoor unit

5 30 First indoor unit

40 Second air conditioner

41 Second outdoor unit

50 Second indoor unit

60 Control device

10

CLAIMS

1. An air conditioning system comprising:

a plurality of air conditioners (20, 40) each including an indoor unit (30, 50) and an outdoor unit (21, 41), each of the air conditioners being configured to perform a refrigeration cycle individually and air-condition a same indoor space; and

a control device (60) that controls the plurality of air conditioners (20, 40),

wherein the control device (60) is configured to perform a simultaneous operation of controlling at least one of the air conditioners (20) as a latent heat machine such that the indoor unit (30) of the air conditioner (20) cools air to a dew point temperature or lower, and simultaneously controlling another air conditioner (40) as a sensible heat machine such that the indoor unit (50) of the other air conditioner (40) cools the air at a temperature higher than the dew point temperature, and

the control device (60) performs a control operation of adjusting a cooling capacity of the indoor unit (30) of the air conditioner (20) operating as the latent heat machine and a cooling capacity of the indoor unit (50) of the air conditioner (40) operating as the sensible heat machine, such that a current indoor temperature and a current indoor humidity are brought close to target values of indoor temperature and humidity.

2. The air conditioning system according to claim 1,

wherein, during the control operation, the control device (60) determines the cooling capacities of the indoor units (30, 50) of the air conditioners (20, 40) based at least on the target values, the current indoor temperature, and the current indoor humidity.

3. The air conditioning system according to claim 2,

wherein, during the control operation, the control device (60) determines the cooling capacities of the indoor units (30, 50) of the air conditioners (20, 40) based on the target values, the current indoor temperature and the current indoor humidity, and indoor temperature and humidity at a predetermined time before a current time.

4. The air conditioning system according to any one of claims 1 to 3,

wherein the control device (60) performs the simultaneous operation when the indoor temperature and humidity are within a predetermined temperature and humidity range including the target values, while the control device (60) performs a dehumidifying operation of controlling all the air conditioners (20) such that the indoor units (30) of the air conditioners (20) cool the air to the dew point temperature or lower when the indoor humidity exceeds a predetermined humidity equal to or higher than the temperature and humidity range.

5. The air conditioning system according to any one of claims 1 to 4,

wherein, during the control operation, the control device (60) controls the cooling capacity of the indoor unit (30) of the air conditioner (20) operating as the latent heat machine and the cooling capacity of the indoor unit (50) of the air conditioner (40) operating as the sensible heat machine at a same timing.