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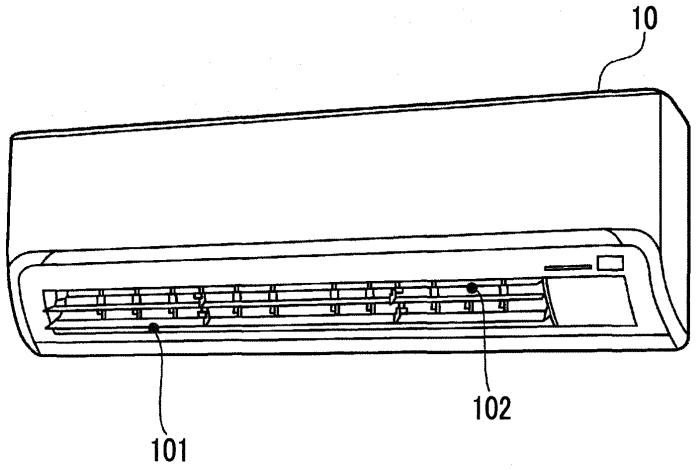
(54) CONTROL DEVICE, CONTROL METHOD USING CONTROL DEVICE, AND PROGRAM

(57) A control device for an air conditioner equipped with up/down flaps that are provided at a discharge opening and that change the breeze direction in the up/down direction, and left/right louvers that change the breeze direction in the left/right direction, said control device being equipped with a control unit that, on the basis of the operation mode of the air conditioner, a temperature difference between a set temperature and an indoor temperature, and an indoor humidity level detected by a humidity sensor, controls the up/down flaps and/or the left/right louvers so as to undergo a swinging movement and thereby diffuse the airflow.

FIG. 3



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Description

Technical Field

[0001] The present invention relates to a control device, a control method using the control device, and a program.

[0002] This application is based upon and claims the benefit of priority from Japanese Patent Application No. 2017-203721, filed October 20, 2017, the entire contents of which are incorporated herein by reference.

Background Art

[0003] In an air conditioner that adjusts a temperature of a space, various blowing controls are performed, such as a blowing control for allowing a person in a space to feel comfortability is performed.

[0004] PTL 1 discloses a technique related to blowing in consideration of a humidity level in a cooling operation of the air conditioner.

Citation List

Patent Literature

[0005] [PTL 1] Japanese Unexamined Patent Application Publication No. 2017-040407

Summary of Invention

Technical Problem

[0006] On the other hand, in a case where an air conditioner is operated for cooling in a space of an environment in which the humidity level is low (generally, lower than 60%), it is known that a sensible temperature of a person in the space is lowered. In addition, in a case where an air conditioner is operated for heating in a space of an environment in which the atmospheric temperature is approximately 10 degrees or higher and the humidity level is high (generally, higher than 60%), it is known that a sensible temperature of a person in the space rises.

[0007] On the other hand, in a general air conditioner, in a case where a difference between an actual temperature of a space and a temperature set in the air conditioner is large, a strong wind operation is performed such that the temperature of the space is quickly brought close to the temperature set in the air conditioner. For this reason, in particular, in a case where an air conditioner is operated for cooling in a space of an environment in which the humidity level is low, or in a case where an air conditioner is operated for heating in a space of an environment in which the atmospheric temperature is approximately 10 degrees or higher and the humidity level is high, a sensible temperature of a person in the space is greatly different from the temperature set in the air conditioner, and as a result, the person in the space may feel uncomfortable.

[0008] Thus, there is a need for a technique capable of realizing an operation of an air conditioner that allows a person in the space not to feel uncomfortable according to the humidity level and the temperature of the space in which the air conditioner is operated.

[0009] An object of the present invention is to provide a control device, a control method using the control device, and a program capable of solving the problem.

Solution to Problem

[0010] According to a first aspect of the present invention, there is provided a control device for an air conditioner including up/down flaps which are provided at a discharge opening and change a wind direction in an up/down direction and left/right louvers which change the wind direction in a left/right direction, the control device including: a control unit that performs a control for diffusing an airflow by swinging at least one of the up/down flaps and the left/right louvers based on an operation mode of the air conditioner, a temperature difference between a set temperature and an indoor temperature, and an indoor humidity level detected by a humidity sensor.

[0011] According to a second aspect of the present invention, the control device according to the first aspect may further include: a recognition unit that recognizes presence of a humidifier which operates in a space in which the air conditioner performs air conditioning. In the control device, the control unit may perform the control for diffusing the airflow in a case where the recognition unit recognizes an operation of the humidifier and the temperature difference for each of the operation modes satisfies a predetermined condition.

[0012] According to a third aspect of the present invention, in the control device according to the first aspect or the second aspect, in a case where the temperature difference is equal to or larger than a first temperature, the operation mode is a cooling mode, and the humidity level is lower than a first humidity level, the control unit may repeat, as the control for diffusing the airflow, a first control, a second control, and a third control in order, the first control being a control for widening a gap between the up/down flaps and swinging the left/right louvers by a first predetermined number of times, the second control being a control for fixing the left/right louvers in a direction in which the wind direction is directed to the front, narrowing the gap between the up/down flaps, and swinging the up/down flaps by a second predetermined number of times in up-blowing, the third control being a control for fixing the left/right louvers in a direction in which the wind direction is directed to the front, and operating the up/down flaps for a first predetermined time in horizontal-blowing.

[0013] According to a fourth aspect of the present invention, in the control device according to any one of the first aspect to the third aspect, in a case where the temperature difference is equal to or larger than a second

temperature, the operation mode is a heating mode, and the humidity level is equal to or higher than a second humidity level, the control unit may repeat, as the control for diffusing the airflow, a fourth control, a fifth control, and a sixth control in order, the fourth control being a control for widening the gap between the up/down flaps and swinging the left/right louvers by a first predetermined number of times, the fifth control being a control for fixing the left/right louvers in a direction in which the wind direction is directed to the front, narrowing the gap between the up/down flaps, and swinging the up/down flaps by a second predetermined number of times in down-blowing, the sixth control being a control for fixing the left/right louvers in a direction in which the wind direction is directed to the front, and operating the up/down flaps for a first predetermined time in down-blowing.

[0014] According to a fifth aspect of the present invention, there is provided a control method using a control device for an air conditioner including up/down flaps which are provided at a discharge opening and change a wind direction in an up/down direction and left/right louvers which change the wind direction in a left/right direction, the control method including: performing a control for diffusing an airflow by swinging at least one of the up/down flaps and the left/right louvers based on an operation mode of the air conditioner, a temperature difference between a set temperature and an indoor temperature, and an indoor humidity level detected by a humidity sensor.

[0015] According to a sixth aspect of the present invention, there is provided a program causing a computer of a control device for an air conditioner including up/down flaps which are provided at a discharge opening and change a wind direction in an up/down direction and left/right louvers which change the wind direction in a left/right direction, to execute: performing a control for diffusing an airflow by swinging at least one of the up/down flaps and the left/right louvers based on an operation mode of the air conditioner, a temperature difference between a set temperature and an indoor temperature, and an indoor humidity level detected by a humidity sensor.

Advantageous Effects of Invention

[0016] According to the control device of the embodiments of the present invention, it is possible to realize the operation of the air conditioner that allows a person in the space not to feel uncomfortable according to the humidity level and the temperature of the space in which the air conditioner is operated.

Brief Description of Drawings

[0017]

Fig. 1 is a diagram illustrating a configuration of an air conditioner system according to a first embodiment of the present invention.

Fig. 2 is a first diagram illustrating a configuration of an air conditioner according to the first embodiment of the present invention.

Fig. 3 is a second diagram illustrating a configuration of the air conditioner according to the first embodiment of the present invention.

Fig. 4 is a diagram illustrating a configuration of a control device according to the first embodiment of the present invention.

Fig. 5 is a diagram for explaining a wind direction control by the control device according to the first embodiment of the present invention.

Fig. 6 is a flowchart illustrating processing of the control device according to the first embodiment of the present invention.

Fig. 7 is a diagram illustrating a configuration of an air conditioner system according to a second embodiment of the present invention.

Fig. 8 is a diagram illustrating a configuration of a control device according to the second embodiment of the present invention.

Fig. 9 is a diagram illustrating a configuration of an air conditioner according to another embodiment of the present invention.

Fig. 10 is a schematic block diagram illustrating a configuration of a computer according to at least one embodiment.

Description of Embodiments

<First Embodiment>

[0018] Hereinafter, a configuration of an air conditioner system 1 according to a first embodiment of the present invention will be described.

[0019] The air conditioner system 1 is a system that performs an operation based on a control which does not cause a feeling of cold air in a case where, in a cooling operation, a humidity level is low (lower than 60%) and a temperature difference between an atmospheric temperature in a space and a set temperature of an air conditioner is equal to or larger than five degrees, and that performs an operation which allows a person in a space not to feel warm air in a case where, in a heating operation, the humidity level is high (equal to or higher than 60%) and a temperature difference between an atmospheric temperature in a space and a set temperature of an air conditioner is equal to or larger than five degrees. As illustrated in Fig. 1, the air conditioner system 1 includes an air conditioner 10 (air conditioner) and a control device 20.

[0020] As illustrated in Fig. 2, the air conditioner 10 includes a wind direction up/down changing mechanism 101 and a wind direction left/right changing mechanism 102. The air conditioner 10 is, for example, a wall-mounted air conditioner.

[0021] The wind direction up/down changing mecha-

nism 101 is a mechanism that changes a direction of airflow in an up/down direction. The wind direction up/down changing mechanism 101 corresponds to, for example, up/down flaps as illustrated in Fig. 3.

[0022] The wind direction left/right changing mechanism 102 is a mechanism that changes the direction of the airflow in a left/right direction. The wind direction left/right changing mechanism 102 corresponds to, for example, left/right louvers as illustrated in Fig. 3.

[0023] As illustrated in Fig. 4, the control device 20 includes a blowing control unit 201 and a wind direction control unit 202 (an example of a control unit).

[0024] The blowing control unit 201 specifies an operation mode and a temperature which are set for the air conditioner 10. The blowing control unit 201 controls a temperature and an amount of the airflow output from the air conditioner 10 based on the specified operation mode and the specified temperature. The operation mode which is set for the air conditioner 10 is a cooling operation or a heating operation. The temperature which is set for the air conditioner 10 is, for example, a temperature which is set via a remote controller of the air conditioner 10.

[0025] The wind direction control unit 202 controls the direction of the airflow of the wind direction up/down changing mechanism 101 in the up/down direction. Further, the wind direction control unit 202 controls the direction of the airflow of the wind direction left/right changing mechanism 102 in the left/right direction.

[0026] Specifically, the wind direction control unit 202 controls the direction of the airflow by the wind direction up/down changing mechanism 101 and the direction of the airflow by the wind direction left/right changing mechanism 102 according to a temperature difference between the temperature which is set for the air conditioner 10 and an atmospheric temperature in a space.

[0027] The wind direction control by the wind direction control unit 202 will be more specifically described. Here, an example of the wind direction control by the wind direction control unit 202 for each operation mode and for each condition will be described.

[0028] In a case where the operation mode is the cooling operation and the humidity level is equal to or higher than 60%, a sensible temperature of a person in the space does not greatly differ from the temperature which is set for the air conditioner 10. Therefore, according to the temperature difference between the temperature which is set for the air conditioner 10 and the atmospheric temperature in the space, a wind direction control under a following condition 1, a wind direction control under a following condition 2, and a wind direction control under a following condition 3 are performed.

(Wind Direction Control under Condition 1)

[0029] It is assumed that a case where, the operation mode is the cooling operation, the humidity level is equal to or higher than 60%, and the temperature difference is equal to or larger than five degrees is a condition 1. In a case where the condition 1 is satisfied, the wind direction control unit 202 fixes the left/right louvers as the wind direction left/right changing mechanism 102 in a direction in which the wind direction is directed to the front. Further, the wind direction control unit 202 narrows a gap between the up/down flaps as the wind direction up/down changing mechanism 101, and swings the up/down flaps in up-blowing.

(Wind Direction Control under Condition 2)

[0030] It is assumed that a case where, the operation mode is the cooling operation, the humidity level is equal to or higher than 60%, and the temperature difference is equal to or larger than two degrees (an example of a first temperature) and smaller than five degrees is a condition 2. In a case where the condition 2 is satisfied, the wind direction control unit 202 widens the gap between the up/down flaps as the wind direction up/down changing mechanism 101. As a first control, the wind direction control unit 202 swings the left/right louvers as the wind direction left/right changing mechanism 102, in the left/right direction, for three cycles (an example of a first predetermined number of times). As a second control, the wind direction control unit 202 fixes the left/right louvers to the front, narrows the gap between the up/down flaps, and swings the up/down flaps for five cycles (an example of a second predetermined number of times) in up-blowing. As a third control, the wind direction control unit 202 fixes the left/right louvers to the front, and operates the up/down flaps for a first predetermined time in horizontal-blowing. The wind direction control unit 202 repeats the first control, the second control, and the third control in order. Each time the first control, the second control, and the third control are repeated in order, the wind direction control unit 202 shortens the first predetermined time which is the operation time in the third control (for example, five minutes).

(Wind Direction Control under Condition 3)

[0031] It is assumed that a case where, the operation mode is the cooling operation, the humidity level is equal to or higher than 60%, and the temperature difference is smaller than two degrees is a condition 3. In a case where the condition 3 is satisfied, the wind direction control unit 202 fixes the left/right louvers to the front, and operates the up/down flaps for the first predetermined time in horizontal-blowing.

[0032] In a case where the operation mode is the cooling operation and the humidity level is lower than 60%, the sensible temperature of the person in the space greatly differs from the temperature which is set for the air conditioner 10. Therefore, according to the temperature difference between the temperature which is set for the air conditioner 10 and the atmospheric temperature in the space, a wind direction control under a following con-

dition 4, a wind direction control under a following condition 5, and a wind direction control under a following condition 6 are performed.

(Wind Direction Control under Condition 4)

[0033] It is assumed that a case where, the operation mode is the cooling operation, the humidity level is lower than 60%, and the temperature difference is equal to or larger than five degrees is a condition 4. In a case where the condition 4 is satisfied, the wind direction control unit 202 performs the same control as the wind direction control under the condition 2.

(Wind Direction Control under Condition 5)

[0034] It is assumed that a case where, the operation mode is the cooling operation, the humidity level is lower than 60%, and the temperature difference is equal to or larger than two degrees and smaller than five degrees is a condition 5. In a case where the condition 5 is satisfied, the wind direction control unit 202 performs the same control as the wind direction control under the condition 2.

(Wind Direction Control under Condition 6)

[0035] It is assumed that a case where, the operation mode is the cooling operation, the humidity level is lower than 60%, and the temperature difference is smaller than two degrees is a condition 6. In a case where the condition 6 is satisfied, the wind direction control unit 202 performs the same control as the wind direction control under the condition 3.

[0036] In a case where the operation mode is the heating operation and the humidity level is lower than 60%, the sensible temperature of the person in the space does not greatly differ from the temperature which is set for the air conditioner 10. Therefore, according to the temperature difference between the temperature which is set for the air conditioner 10 and the atmospheric temperature in the space, a wind direction control under a following condition 7, a wind direction control under a following condition 8, and a wind direction control under a following condition 9 are performed.

(Wind Direction Control under Condition 7)

[0037] It is assumed that a case where, the operation mode is the heating operation, the humidity level is lower than 60%, and the temperature difference is equal to or larger than five degrees is a condition 7. In a case where the condition 7 is satisfied, the wind direction control unit 202 fixes the left/right louvers as the wind direction left/right changing mechanism 102 in a direction in which the wind direction is directed to the front. Further, the wind direction control unit 202 narrows the gap between the up/down flaps as the wind direction up/down changing mechanism 101, and swings the up/down flaps in down-blowing.

(Wind Direction Control under Condition 8)

[0038] It is assumed that a case where, the operation mode is the heating operation, the humidity level is lower than 60%, and the temperature difference is equal to or larger than two degrees (an example of a second temperature) and smaller than five degrees is a condition 8. In a case where the condition 8 is satisfied, the wind direction control unit 202 widens the gap between the up/down flaps as the wind direction up/down changing mechanism 101. As a fourth control, the wind direction control unit 202 swings the left/right louvers as the wind direction left/right changing mechanism 102, in the left/right direction, for three cycles (an example of a third predetermined number of times). As a fifth control, the wind direction control unit 202 fixes the left/right louvers to the front, narrows the gap between the up/down flaps, and swings the up/down flaps for five cycles (an example of a fourth predetermined number of times) in down-blowing. As a sixth control, the wind direction control unit 202 fixes the left/right louvers to the front, and operates the up/down flaps for a second predetermined time in down-blowing. The wind direction control unit 202 repeats the fourth control, the fifth control, and the sixth control in order. Each time the fourth control, the fifth control, and the sixth control are repeated in order, the wind direction control unit 202 shortens the second predetermined time as an operation time in the sixth control (for example, five minutes).

(Wind Direction Control under Condition 9)

[0039] It is assumed that a case where, the operation mode is the heating operation, the humidity level is lower than 60%, and the temperature difference is smaller than two degrees is a condition 9. In a case where the condition 9 is satisfied, the wind direction control unit 202 fixes the left/right louvers to the front, and operates the up/down flaps for the second predetermined time in down-blowing.

[0040] In a case where the operation mode is the heating operation and the humidity level is equal to or higher than 60%, the sensible temperature of the person in the space greatly differs from the temperature which is set for the air conditioner 10. Therefore, according to the temperature difference between the temperature which is set for the air conditioner 10 and the atmospheric temperature in the space, a wind direction control under a following condition 10, a wind direction control under a following condition 11, and a wind direction control under a following condition 12 are performed.

(Wind Direction Control under Condition 10)

[0041] It is assumed that a case where, the operation mode is the heating operation, the humidity level is equal to or higher than 60%, and the temperature difference is

equal to or larger than five degrees is a condition 4. In a case where the condition 10 is satisfied, the wind direction control unit 202 performs the same control as the wind direction control under the condition 8.

(Wind Direction Control under Condition 11)

[0042] It is assumed that a case where, the operation mode is the heating operation, the humidity level is equal to or higher than 60%, and the temperature difference is equal to or larger than two degrees and smaller than five degrees is a condition 11. In a case where the condition 11 is satisfied, the wind direction control unit 202 performs the same control as the wind direction control under the condition 8.

(Wind Direction Control under Condition 12)

[0043] It is assumed that a case where, the operation mode is the heating operation, the humidity level is equal to or higher than 60%, and the temperature difference is smaller than two degrees is a condition 12. In a case where the condition 12 is satisfied, the wind direction control unit 202 performs the same control as the wind direction control under the condition 9.

[0044] Each of the wind direction controls under the conditions 1 to 12 can be summarized in a table as illustrated in Fig. 5.

[0045] Next, processing of the wind direction control by the control device 20 according to the first embodiment of the present invention will be described with reference to Fig. 6.

[0046] The blowing control unit 201 specifies an operation mode and a temperature which are set for the air conditioner 10 (step S1).

[0047] The wind direction control unit 202 determines whether or not the operation mode specified by the blowing control unit 201 is the cooling operation (step S2).

[0048] In a case where it is determined that the operation mode specified by the blowing control unit 201 is the cooling operation (YES in step S2), the wind direction control unit 202 determines whether or not the humidity level is equal to or higher than 60% (step S3).

[0049] In a case where it is determined that the humidity level is equal to or higher than 60% (YES in step S3), the wind direction control unit 202 determines whether or not the temperature difference between the temperature specified by the blowing control unit 201 and the actual temperature in the space is equal to or larger than five degrees (step S4).

[0050] In a case where it is determined that the temperature difference between the temperature specified by the blowing control unit 201 and the actual temperature in the space is equal to or larger than five degrees (YES in step S4), the wind direction control unit 202 determines that the condition 1 is satisfied, and performs the wind direction control under the condition 1 (step S5).

[0051] In a case where it is determined that the temperature difference between the temperature specified by the blowing control unit 201 and the actual temperature in the space is not equal to or larger than five degrees (NO in step S4), the wind direction control unit 202 determines whether or not the temperature difference between the temperature specified by the blowing control unit 201 and the actual temperature in the space is equal to or larger than two degrees (step S6).

[0052] In a case where it is determined that the temperature difference between the temperature specified by the blowing control unit 201 and the actual temperature in the space is equal to or larger than two degrees (YES in step S6), the wind direction control unit 202 determines that the condition 2 is satisfied, and performs the wind direction control under the condition 2 (step S7).

[0053] In a case where it is determined that the temperature difference between the temperature specified by the blowing control unit 201 and the actual temperature in the space is not equal to or larger than two degrees (NO in step S6), the wind direction control unit 202 determines that the condition 3 is satisfied, and performs the wind direction control under the condition 3 (step S8).

[0054] In a case where it is determined that the humidity level is not equal to or higher than 60% (NO in step S3), the wind direction control unit 202 determines whether or not the temperature difference between the temperature specified by the blowing control unit 201 and the actual temperature in the space is equal to or larger than five degrees (step S9).

[0055] In a case where it is determined that the temperature difference between the temperature specified by the blowing control unit 201 and the actual temperature in the space is equal to or larger than five degrees (YES in step S9), the wind direction control unit 202 determines that the condition 4 is satisfied, and performs the wind direction control under the condition 4 (step S10) .

[0056] In a case where it is determined that the temperature difference between the temperature specified by the blowing control unit 201 and the actual temperature in the space is not equal to or larger than five degrees (NO in step S9), the wind direction control unit 202 determines whether or not the temperature difference between the temperature specified by the blowing control unit 201 and the actual temperature in the space is equal to or larger than two degrees (step S11).

[0057] In a case where it is determined that the temperature difference between the temperature specified by the blowing control unit 201 and the actual temperature in the space is equal to or larger than two degrees (YES in step S11), the wind direction control unit 202 determines that the condition 5 is satisfied, and performs the wind direction control under the condition 5 (step S12) .

[0058] In a case where it is determined that the temperature difference between the temperature specified by the blowing control unit 201 and the actual temperature in the space is not equal to or larger than two degrees

(NO in step S11), the wind direction control unit 202 determines that the condition 6 is satisfied, and performs the wind direction control under the condition 6 (step S13) .

[0059] In a case where it is determined that the operation mode specified by the blowing control unit 201 is not the cooling operation (NO in step S2), the wind direction control unit 202 determines whether or not the humidity level is lower than 60% (step S14).

[0060] In a case where it is determined that the humidity level is lower than 60% (YES in step S14), the wind direction control unit 202 determines whether or not the temperature difference between the temperature specified by the blowing control unit 201 and the actual temperature in the space is equal to or larger than five degrees (step S15).

[0061] In a case where it is determined that the temperature difference between the temperature specified by the blowing control unit 201 and the actual temperature in the space is equal to or larger than five degrees (YES in step S15), the wind direction control unit 202 determines that the condition 7 is satisfied, and performs the wind direction control under the condition 7 (step S16) .

[0062] In a case where it is determined that the temperature difference between the temperature specified by the blowing control unit 201 and the actual temperature in the space is not equal to or larger than five degrees (NO in step S15), the wind direction control unit 202 determines whether or not the temperature difference between the temperature specified by the blowing control unit 201 and the actual temperature in the space is equal to or larger than two degrees (step S17).

[0063] In a case where it is determined that the temperature difference between the temperature specified by the blowing control unit 201 and the actual temperature in the space is equal to or larger than two degrees (YES in step S17), the wind direction control unit 202 determines that the condition 8 is satisfied, and performs the wind direction control under the condition 8 (step S18) .

[0064] In a case where it is determined that the temperature difference between the temperature specified by the blowing control unit 201 and the actual temperature in the space is not equal to or larger than two degrees (NO in step S17), the wind direction control unit 202 determines that the condition 9 is satisfied, and performs the wind direction control under the condition 9 (step S19) .

[0065] In a case where it is determined that the humidity level is not lower than 60% (NO in step S14), the wind direction control unit 202 determines whether or not the temperature difference between the temperature specified by the blowing control unit 201 and the actual temperature in the space is equal to or larger than five degrees (step S20) .

[0066] In a case where it is determined that the temperature difference between the temperature specified by the blowing control unit 201 and the actual temperature in the space is equal to or larger than five degrees (YES in step S20), the wind direction control unit 202 determines that the condition 10 is satisfied, and performs the wind direction control under the condition 10 (step S21) .

[0067] In a case where it is determined that the temperature difference between the temperature specified by the blowing control unit 201 and the actual temperature in the space is not equal to or larger than five degrees (NO in step S20), the wind direction control unit 202 determines whether or not the temperature difference between the temperature specified by the blowing control unit 201 and the actual temperature in the space is equal to or larger than two degrees (step S22).

[0068] In a case where it is determined that the temperature difference between the temperature specified by the blowing control unit 201 and the actual temperature in the space is equal to or larger than two degrees (YES in step S22), the wind direction control unit 202 determines that the condition 11 is satisfied, and performs the wind direction control under the condition 11 (step S23).

[0069] In a case where it is determined that the temperature difference between the temperature specified by the blowing control unit 201 and the actual temperature in the space is not equal to or larger than two degrees (NO in step S22), the wind direction control unit 202 determines that the condition 12 is satisfied, and performs the wind direction control under the condition 12 (step S24).

[0070] As above, the air conditioner system 1 according to the first embodiment of the present invention has been described.

[0071] In the air conditioner system 1 according to the first embodiment of the present invention, the wind direction control unit 202 controls the direction of the airflow of the wind direction up/down changing mechanism 101 in the up/down direction. Further, the wind direction control unit 202 controls the direction of the airflow of the wind direction left/right changing mechanism 102 in the left/right direction. Specifically, the wind direction control unit 202 controls the direction of the airflow by the wind direction up/down changing mechanism 101 and the direction of the airflow by the wind direction left/right changing mechanism 102 according to the temperature difference between the temperature which is set for the air conditioner 10 and the atmospheric temperature in the space.

[0072] In this way, the control device 20 can realize an operation of the air conditioner 10 that allows a person in the space not to feel cold air or warm air according to the humidity level and the temperature of the space in which the operation is performed. As a result, the control device 20 can realize the operation of the air conditioner 10 that allows a person in the space not to feel uncomfortable.

<Second Embodiment>

[0073] Hereinafter, a configuration of an air conditioner system 1 according to a second embodiment of the present invention will be described.

[0074] The air conditioner system 1 according to the second embodiment of the present invention has a function of a humidifier, and adjusts the humidity level of the space to a humidity level suitable for a person in the space. As illustrated in Fig. 7, the air conditioner system 1 includes an air conditioner 10, a control device 20, and a humidifier 30.

[0075] Similarly to the air conditioner 10 according to the first embodiment of the present invention, the air conditioner 10 includes a wind direction up/down changing mechanism 101 and a wind direction left/right changing mechanism 102.

[0076] As illustrated in Fig. 8, the control device 20 includes a blowing control unit 201, a wind direction control unit 202, a recognition unit 203, and a humidification control unit 204.

[0077] The recognition unit 203 recognizes the presence of the humidifier 30.

[0078] The humidification control unit 204 controls the humidification function of the humidifier 30, which is recognized by the recognition unit 203, to an ON state or an OFF state.

[0079] The humidifier 30 controls the humidification function to the ON state or the OFF state under the control of the control device 20. The humidifier 30 humidifies the space in a case of the ON state.

[0080] The wind direction control by the control device 20 according to the second embodiment of the present invention is the same as the wind direction control by the control device 20 according to the first embodiment of the present invention.

[0081] As above, the air conditioner system 1 according to the second embodiment of the present invention has been described.

[0082] In the air conditioner system 1 according to the second embodiment of the present invention, the humidifier 30 controls the humidification function to the ON state or the OFF state under the control of the control device 20. The humidifier 30 humidifies the space in a case of the ON state. The recognition unit 203 recognizes the presence of the humidifier 30. The humidification control unit 204 controls the humidification function of the humidifier 30, which is recognized by the recognition unit 203, to the ON state or the OFF state.

[0083] In this way, the control device 20 can set the humidity level of the space to a humidity level suitable for a person in the space.

[0084] The air conditioner system 1 according to the second embodiment of the present invention has been described as including the air conditioner 10, the control device 20, and the humidifier 30. On the other hand, in the air conditioner system 1 according to another embodiment of the present invention, as illustrated in Fig. 9, the air conditioner 10 may include the humidifier 30. Further, the humidification control unit 204 included in the control device 20 may control the humidifier 30.

[0085] In the air conditioner system 1 according to another embodiment of the present invention, in at least one of a case where the operation mode is the cooling operation and the humidity level is low (for example, lower than 60%) and a case where the operation mode is the heating operation and the humidity level is high (for example, higher than 60%), the wind direction control unit 202 may decrease a swing speed of at least one of the up/down flaps and the left/right louvers when transition to a control for diffusing the airflow. As described above, the wind direction control unit 202 can farther diffuse the airflow by decreasing the swing speed of at least one of the up/down flaps and the left/right louvers.

[0086] In the processing according to the embodiments of the present invention, the order of the processing may be changed within a range in which appropriate processing is performed.

[0087] Each of storage units and other storage devices according to the embodiments of the present invention may be provided in any place as long as appropriate information is transmitted and received. Further, each of a plurality of storage units and other storage devices may store data in a distribution manner in a range in which appropriate information is transmitted and received.

[0088] Although the embodiments of the present invention has been described, the air conditioner system 1, the air conditioner 10, the control device 20, and other control devices may include a computer system therein. Further, a procedure of the processing is stored in a computer-readable recording medium in a form of a program, and the processing is performed by causing a computer to read and execute the program. A specific example of a computer will be described below.

[0089] Fig. 10 is a schematic block diagram illustrating a configuration of a computer according to at least one embodiment.

[0090] As illustrated in Fig. 10, the computer 5 includes a CPU 6, a main memory 7, a storage 8, and an interface 9.

[0091] For example, each of the air conditioner system 1, the air conditioner 10, the control device 20, and other control devices is included in the computer 5. The operation of each processing unit described above is stored in the storage 8 in a form of a program. The CPU 6 reads the program from the storage 8, develops the program in the main memory 7, and executes the above-described processing according to the program. Further, the CPU 6 allocates a storage area corresponding to each storage unit in the main memory 7 according to the program.

[0092] Examples of the storage 8 include a hard disk drive (HDD), a solid state drive (SSD), a magnetic disk, a magneto-optical disk, a compact disc read only memory (CD-ROM), a digital versatile disc read only memory (DVD-ROM), a semiconductor memory, and the like. The storage 8 may be an internal medium directly connected

to a bus of the computer 5, or an external medium connected to the computer 5 via the interface 9 or a communication line. Further, in a case where the program is distributed to the computer 5 via a communication line, the computer 5 that receives the program may develop the program in the main memory 7 and execute the processing. In at least one embodiment, the storage 8 is a non-transitory tangible storage medium.

[0093] In addition, the program may realize a part of the above-described functions. Further, the program may be a file that can realize the above-described functions in combination with a program already recorded in the computer system, that is, a so-called differential file (differential program).

[0094] Although certain embodiments of the present invention have been described, these embodiments are examples and do not limit the scope of the inventions. In these embodiments, various additions, omissions, substitutions, and changes may be made without departing from the spirit of the inventions.

Industrial Applicability

[0095] According to the control device of the embodiments of the present invention, it is possible to realize the operation of the air conditioner that allows a person in the space not to feel uncomfortable according to the humidity level and the temperature of the space in which the air conditioner is operated.

Reference Signs List

[0096]

1:	Air Conditioner System
5:	Computer
6:	CPU
7:	Main Memory
8:	Storage
9:	Interface
10:	Air Conditioner
20:	Control Device
30:	Humidifier
101:	Wind Direction Up/Down Changing Mechanism
102:	Wind Direction Left/Right Changing Mechanism
201:	Blowing Control Unit
202:	Wind Direction Control Unit
203:	Recognition Unit
204:	Humidification Control Unit

Claims

1. A control device for an air conditioner including up/down flaps which are provided at a discharge opening and change a wind direction in an up/down direction and left/right louvers which change the wind direction in a left/right direction, the control device comprising:
   a control unit that performs a control for diffusing an airflow by swinging at least one of the up/down flaps and the left/right louvers based on an operation mode of the air conditioner, a temperature difference between a set temperature and an indoor temperature, and an indoor humidity level detected by a humidity sensor.

2. The control device according to claim 1, further comprising:
   a recognition unit that recognizes presence of a humidifier which operates in a space in which the air conditioner performs air conditioning,
   wherein the control unit performs the control for diffusing the airflow in a case where the recognition unit recognizes an operation of the humidifier and the temperature difference for each of the operation modes satisfies a predetermined condition.

3. The control device according to claim 1 or 2,
   wherein, in a case where the temperature difference is equal to or larger than a first temperature, the operation mode is a cooling mode, and the humidity level is lower than a first humidity level, the control unit repeats, as the control for diffusing the airflow, a first control, a second control, and a third control in order, the first control being a control for widening a gap between the up/down flaps and swinging the left/right louvers by a first predetermined number of times, the second control being a control for fixing the left/right louvers in a direction in which the wind direction is directed to the front, narrowing the gap between the up/down flaps, and swinging the up/down flaps by a second predetermined number of times in up-blowing, the third control being a control for fixing the left/right louvers in a direction in which the wind direction is directed to the front, and operating the up/down flaps for a first predetermined time in horizontal-blowing.

4. The control device according to any one of claims 1 to 3,
   wherein, in a case where the temperature difference is equal to or larger than a second temperature, the operation mode is a heating mode, and the humidity level is equal to or higher than a second humidity level, the control unit repeats, as the control for diffusing the airflow, a fourth control, a fifth control, and a sixth control in order, the fourth control being a control for widening the gap between the up/down flaps and swinging the left/right louvers by a first predetermined number of times, the fifth control being a control for fixing the left/right louvers in a direction in which the wind direction is directed to the front, narrowing the gap between the up/down flaps, and

swinging the up/down flaps by a second predetermined number of times in down-blowing, the sixth control being a control for fixing the left/right louvers in a direction in which the wind direction is directed to the front, and operating the up/down flaps for a first predetermined time in down-blowing.

5. A control method using a control device for an air conditioner including up/down flaps which are provided at a discharge opening and change a wind direction in an up/down direction and left/right louvers which change the wind direction in a left/right direction, the control method comprising:
performing a control for diffusing an airflow by swinging at least one of the up/down flaps and the left/right louvers based on an operation mode of the air conditioner, a temperature difference between a set temperature and an indoor temperature, and an indoor humidity level detected by a humidity sensor.

6. A program causing a computer of a control device for an air conditioner including up/down flaps which are provided at a discharge opening and change a wind direction in an up/down direction and left/right louvers which change the wind direction in a left/right direction, to execute:
performing a control for diffusing an airflow by swinging at least one of the up/down flaps and the left/right louvers based on an operation mode of the air conditioner, a temperature difference between a set temperature and an indoor temperature, and an indoor humidity level detected by a humidity sensor.

FIG. 1

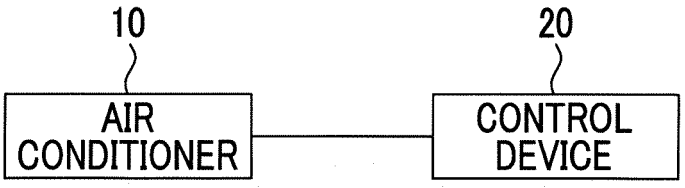
10
20
AIR CONDITIONER
CONTROL DEVICE

FIG. 2

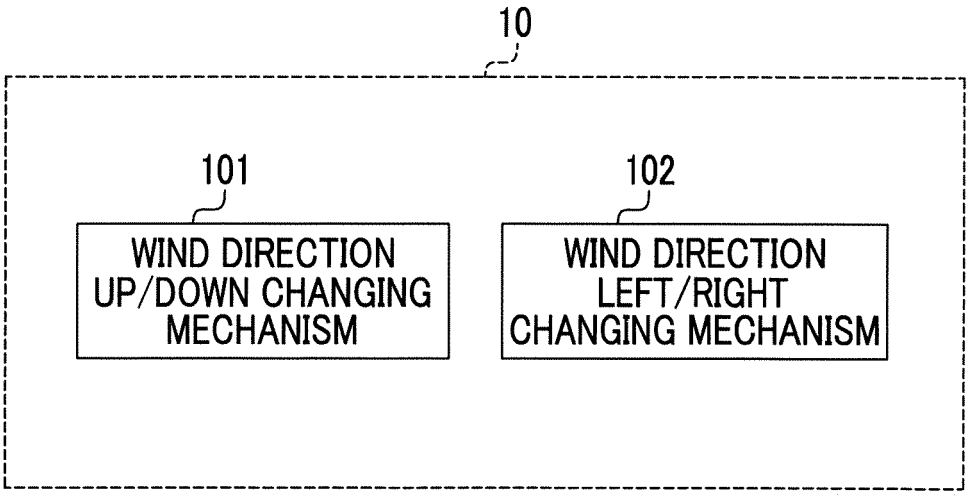
10
101
102
WIND DIRECTION UP/DOWN CHANGING MECHANISM
WIND DIRECTION LEFT/RIGHT CHANGING MECHANISM

FIG. 3

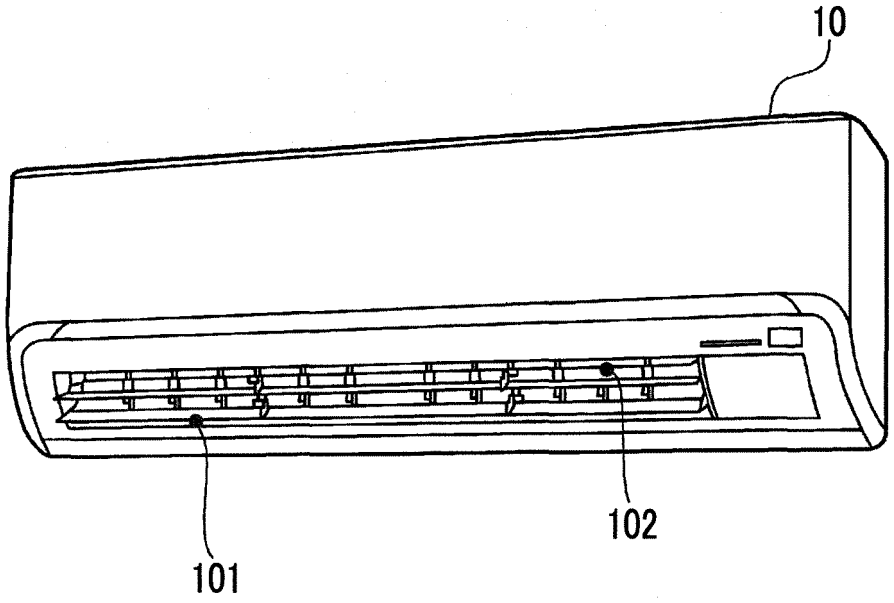
10
101
102

FIG. 4

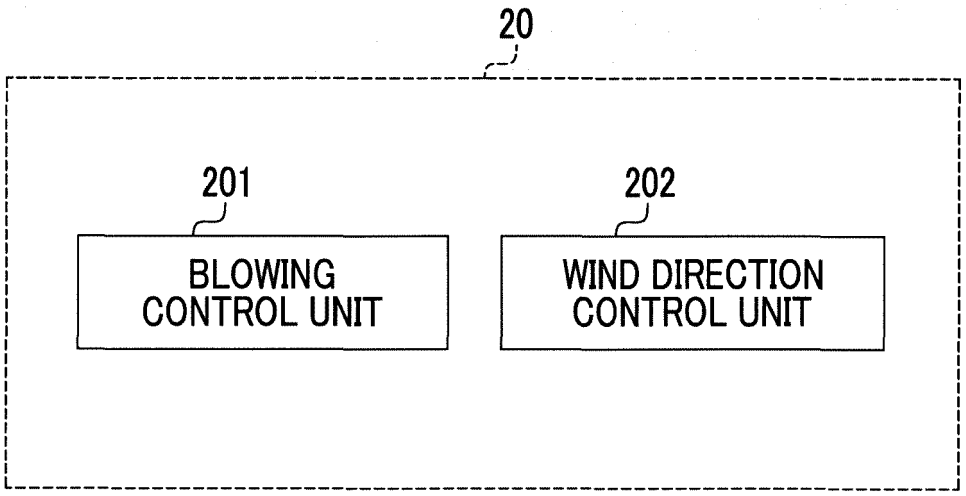
20
201
BLOWING CONTROL UNIT
202
WIND DIRECTION CONTROL UNIT

FIG. 5

TEMPERATURE DIFFERENCE BETWEEN INDOOR TEMPERATURE AND SET CORRECTION TEMPERATURE	WIND DIRECTION CONTROL			MAIN CHANGES FROM TS SERIES (IDEA IS SAME AS TS)
	WIND DIRECTION	COOLING	HEATING	
EQUAL TO OR LARGER THAN 5°C	UP/DOWN FLAPS LEFT/RIGHT LOUVERS	SPOT + SWING IN UP-BLOWING FRONT (FIXED)	SPOT + SWING IN DOWN-BLOWING FRONT (FIXED)	SPOT ALLOWS TEMPERATURE OF CENTER OF ROOM TO BE QUICKLY CLOSE SET TEMPERATURE
EQUAL TO OR LARGER THAN 2°C AND SMALLER THAN 5°C	UP/DOWN FLAPS LEFT/RIGHT LOUVERS	WIDEN GAP BETWEEN FLAPS (FIXED) LEFT/RIGHT SWING FOR THREE CYCLES ↓ SPOT + SWING IN UP-BLOWING FOR FIVE CYCLES FIX LEFT/RIGHT FLAPS TO FRONT (FIXED) ↓ OPERATE FLAPS IN HORIZONTAL-BLOWING (FIXED) FIX LEFT/RIGHT LOUVERS TO FRONT (FIXED FOR FIVE MINUTES)	WIDEN GAP BETWEEN FLAPS (FIXED) LEFT/RIGHT SWING FOR THREE CYCLES ↓ SPOT + SWING IN DOWN-BLOWING FOR FIVE CYCLES FIX LEFT/RIGHT FLAPS TO FRONT (FIXED) ↓ OPERATE FLAPS IN DOWN-BLOWING (FIXED) FIX LEFT/RIGHT LOUVERS TO FRONT (FIXED FOR FIVE MINUTES)	WIDENING OF GAP BETWEEN FLAPS ALLOWS COLD/WARM WIND TO REACH WIDE AREA (※) AIM TO AVOID FEELING OF COLD AIR WHEN SWING OF LOUVERS IN HEATING
EQUAL TO OR SMALLER THAN 2°C	UP/DOWN FLAPS LEFT/RIGHT LOUVERS	OPERATE FLAPS IN HORIZONTAL-BLOWING (FIXED) FIX LEFT/RIGHT LOUVERS TO FRONT (FIXED FOR FIVE MINUTES)	OPERATE FLAPS IN DOWN-BLOWING (FIXED) FIX LEFT/RIGHT LOUVERS TO FRONT (FIXED FOR FIVE MINUTES)	

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FIG. 6

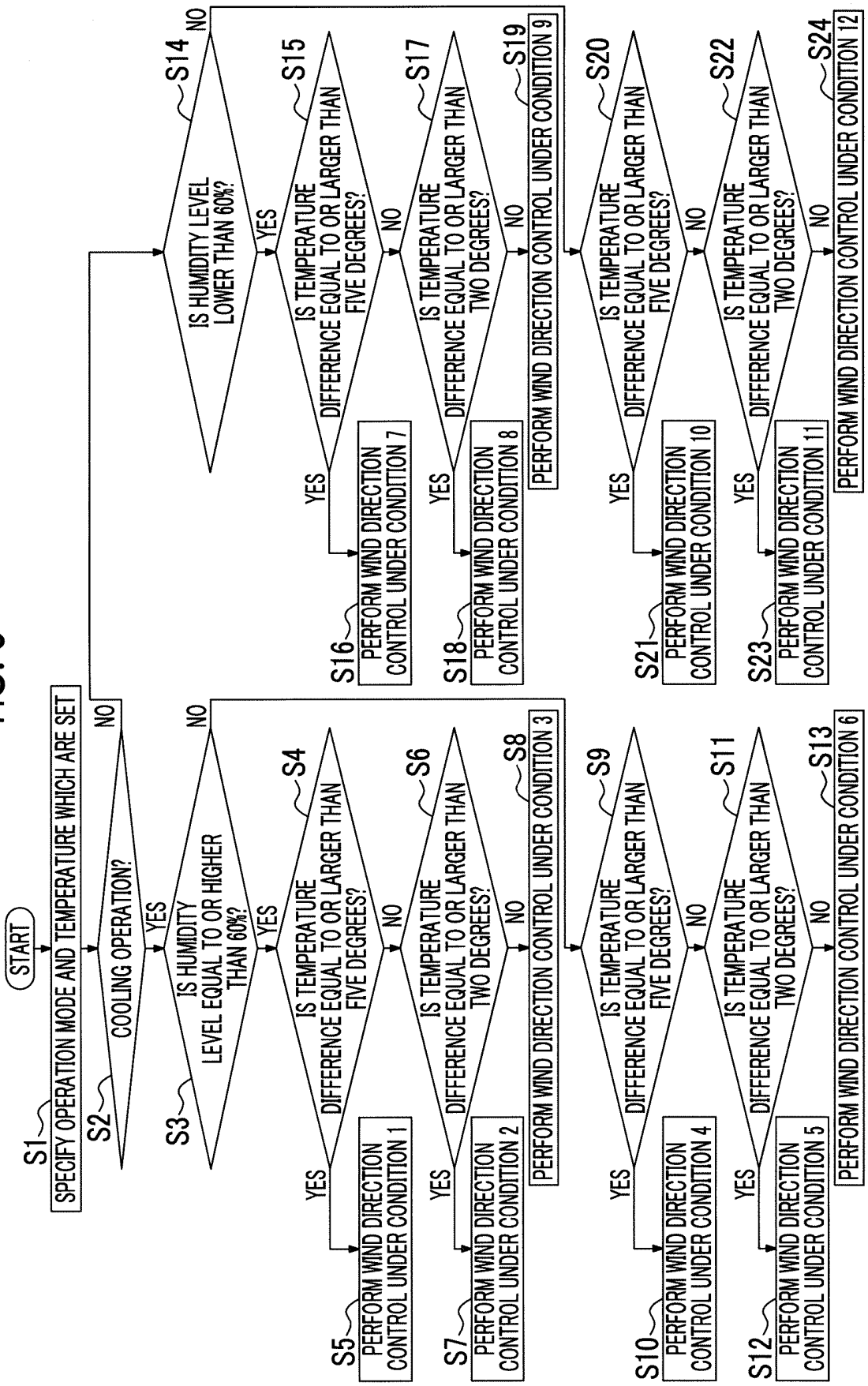

START
S1
SPECIFY OPERATION MODE AND TEMPERATURE WHICH ARE SET
S2
COOLING OPERATION?
YES
NO
S3
IS HUMIDITY LEVEL EQUAL TO OR HIGHER THAN 60%?
YES
NO
S4
IS TEMPERATURE DIFFERENCE EQUAL TO OR LARGER THAN FIVE DEGREES?
YES
NO
S5
PERFORM WIND DIRECTION CONTROL UNDER CONDITION 1
S6
IS TEMPERATURE DIFFERENCE EQUAL TO OR LARGER THAN TWO DEGREES?
YES
NO
S7
PERFORM WIND DIRECTION CONTROL UNDER CONDITION 2
S8
PERFORM WIND DIRECTION CONTROL UNDER CONDITION 3
S9
IS TEMPERATURE DIFFERENCE EQUAL TO OR LARGER THAN FIVE DEGREES?
YES
NO
S10
PERFORM WIND DIRECTION CONTROL UNDER CONDITION 4
S11
IS TEMPERATURE DIFFERENCE EQUAL TO OR LARGER THAN TWO DEGREES?
YES
NO
S12
PERFORM WIND DIRECTION CONTROL UNDER CONDITION 5
S13
PERFORM WIND DIRECTION CONTROL UNDER CONDITION 6
S14
IS HUMIDITY LEVEL LOWER THAN 60%?
YES
NO
S15
IS TEMPERATURE DIFFERENCE EQUAL TO OR LARGER THAN FIVE DEGREES?
YES
NO
S16
PERFORM WIND DIRECTION CONTROL UNDER CONDITION 7
S17
IS TEMPERATURE DIFFERENCE EQUAL TO OR LARGER THAN TWO DEGREES?
YES
NO
S18
PERFORM WIND DIRECTION CONTROL UNDER CONDITION 8
S19
PERFORM WIND DIRECTION CONTROL UNDER CONDITION 9
S20
IS TEMPERATURE DIFFERENCE EQUAL TO OR LARGER THAN FIVE DEGREES?
YES
NO
S21
PERFORM WIND DIRECTION CONTROL UNDER CONDITION 10
S22
IS TEMPERATURE DIFFERENCE EQUAL TO OR LARGER THAN TWO DEGREES?
YES
NO
S23
PERFORM WIND DIRECTION CONTROL UNDER CONDITION 11
S24
PERFORM WIND DIRECTION CONTROL UNDER CONDITION 12

FIG. 7

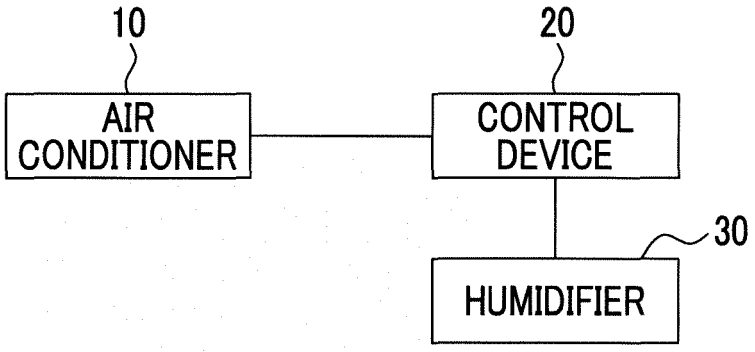

10
AIR CONDITIONER
20
CONTROL DEVICE
30
HUMIDIFIER

FIG. 8

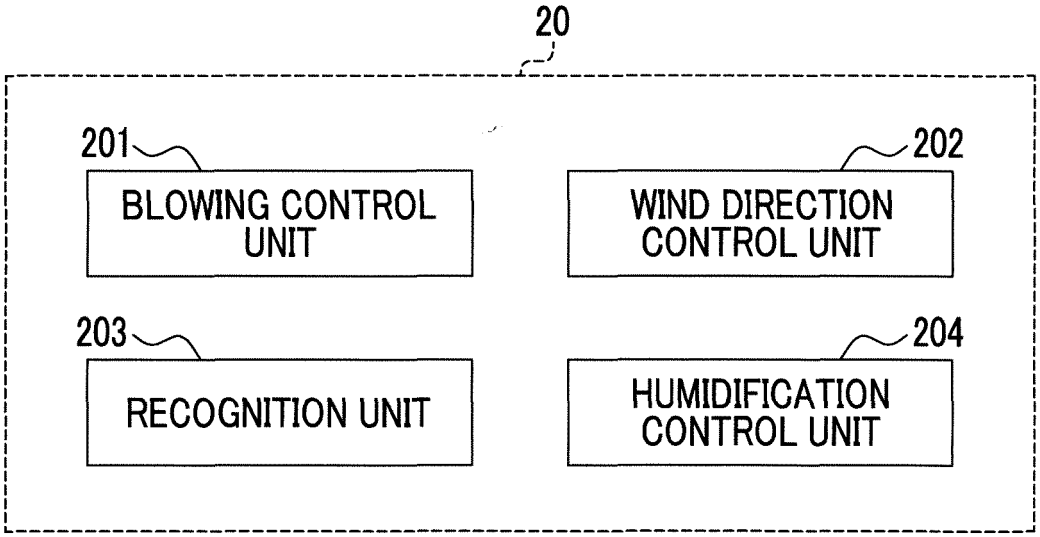

20
201
BLOWING CONTROL UNIT
202
WIND DIRECTION CONTROL UNIT
203
RECOGNITION UNIT
204
HUMIDIFICATION CONTROL UNIT

FIG. 9

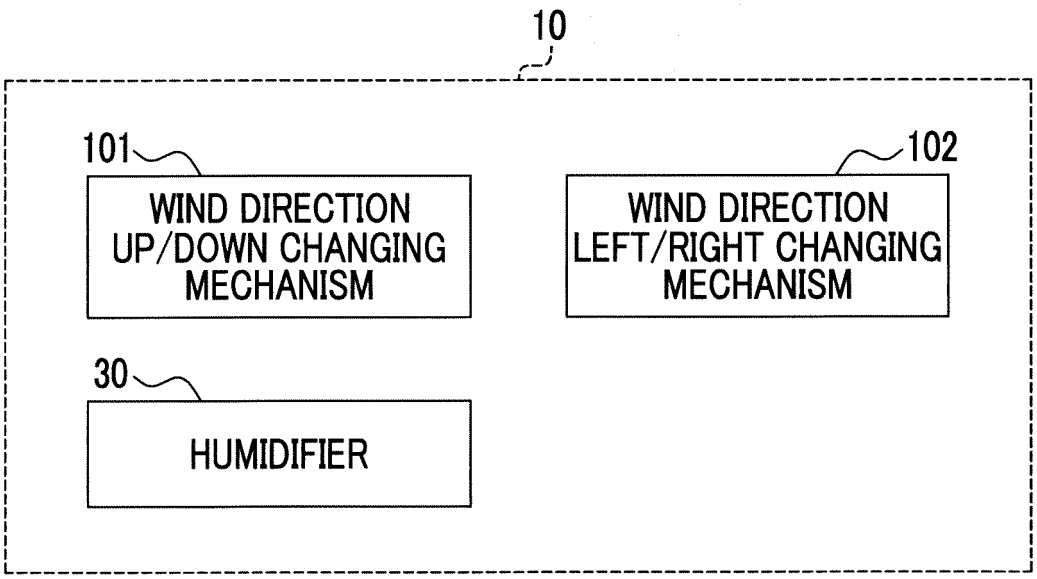
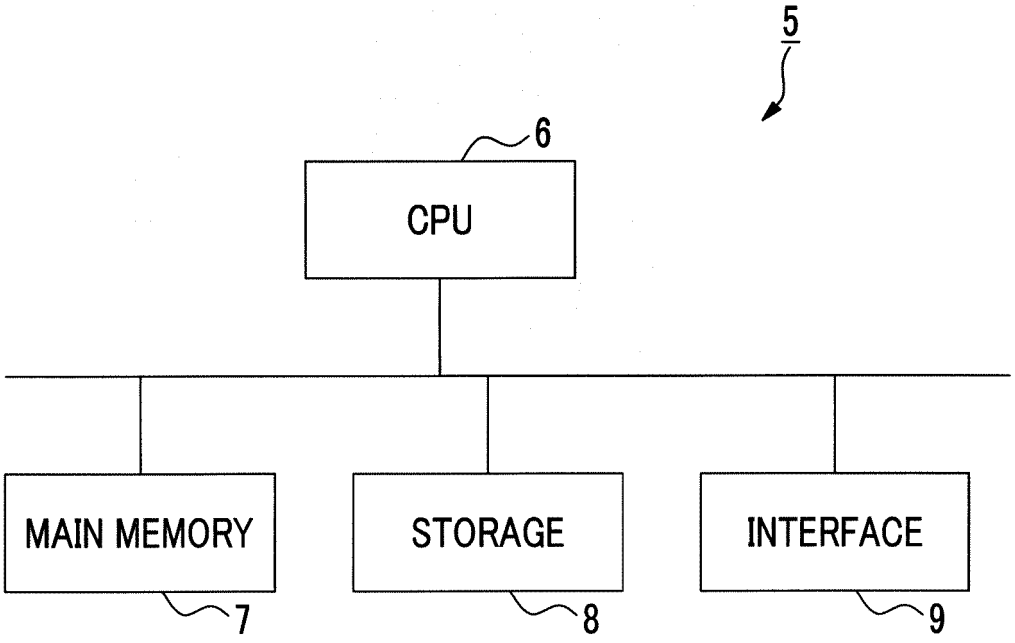

10
101
WIND DIRECTION UP/DOWN CHANGING MECHANISM
102
WIND DIRECTION LEFT/RIGHT CHANGING MECHANISM
30
HUMIDIFIER

FIG. 10


5
6
CPU
MAIN MEMORY
7
STORAGE
8
INTERFACE
9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2018/037760

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl. F24F11/79(2018.01)i, F24F11/65(2018.01)i, F24F11/89(2018.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl. F24F11/79, F24F11/65, F24F11/89

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan	1922-1996
Published unexamined utility model applications of Japan	1971-2018
Registered utility model specifications of Japan	1996-2018
Published registered utility model applications of Japan	1994-2018

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 2017-40412 A (JOHNSON CONTROLS HITACHI AIR CONDITIONING TECHNOLOGY (HONGKONG) LTD.) 23 February 2017, paragraphs [0014]-[0069], fig. 1-15 (Family: none)	1-2, 5-6 3-4
Y A	JP 62-276353 A (TOSHIBA CORP.) 01 December 1987, page 2, lower left column, line 10 to page 4, upper left column, line 19, fig. 1-12 (Family: none)	1-2, 5-6 3-4
Y A	JP 2001-235215 A (SANYO ELECTRIC CO., LTD.) 31 August 2001, paragraphs [0011]-[0029], fig. 1-2 (Family: none)	1-2, 5-6 3-4
Y	JP 2002-89937 A (SANYO ELECTRIC CO., LTD.) 27 March 2002, paragraphs [0010]-[0026], fig. 1-2 (Family: none)	2

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:
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"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
17 December 2018 (17.12.2018)	25 December 20108 (25.12.2018)

Name and mailing address of the ISA/	Authorized officer
Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2017203721 A **[0002]**
- JP 2017040407 A **[0005]**