

TITLE OF INVENTION

AIR CONDITIONER

TECHNICAL FIELD

The present invention relates to an air conditioner.

5 BACKGROUND ART

Conventionally, air conditioners installed in an indoor space include those provided with a swing control mode that causes a flap to swing when air is blown out. For example, Patent Literature 1 (Japanese Patent Publication No. 5589538) discloses a swing control mode in which a flap repeatedly rotates up and down and two orientations are alternately repeated.

10 SUMMARY OF THE INVENTION

<Technical Problem>

One effect of swing control such as that described above is that air is directly blown onto a user, whereby the user is made to comfortably feel the temperature of the air. For example, when air is continuously blown onto the user with the flap fixed in place, the user can
15 sufficiently feel the temperature of the air, but may also feel a draft due to the air being continuously blown. In view of this, air is directly blown onto the user for a suitable interval due to swing control being provided, whereby the aforementioned draft sensation can be alleviated.

However, the inventors of the present invention discovered that although the draft sensation for the user is alleviated by performing swing control, it is inevitable that the effect of
20 lowering the temperature surrounding the user will be lessened. As a result, it was discovered that there is room for improvement in enhancing the comfort of the user onto whom air is directly blown by swing control.

An object of the present invention is to quickly bring the temperature of the user's surroundings close to the temperature of the air that has just been blown out when flap swing
25 control is performed, and to enhance the comfort of the user onto whom the air is directly blown.

<Solution to Problem>

An air conditioner according to a first aspect of the present invention comprises a casing that is installed in a space to be air-conditioned and that has a first blow-out port to blow out air, and a first flap that is provided to the first blow-out port and that vertically varies the direction of
30 air blown out from the first blow-out port by rotating from an upper limit to a lower limit of a first rotation range, the first flap in swing control performing, within a first range which is smaller than the first rotation range and either near to the upper limit of the first rotation range or equidistant from the upper limit and the lower limit, a first action of approaching the lower limit

of the first rotation range until reaching a lower end of the first range and a second action of approaching the upper limit of the first rotation range away from the lower end of the first range and rotating through the entire first range due at least one of the first action and the second action, and/or performing, within a second range which is smaller than the first rotation range and either near to the lower limit of the first rotation range or equidistant from the upper limit and the lower limit, a third action of approaching the upper limit of the first rotation range until reaching an upper end of the second range and a fourth action of approaching the lower limit of the first rotation range away from the upper end of the second range and rotating through the entire second range due to at least one of the third action and the fourth action.

In the air conditioner according to the first aspect of the present invention, the first flap in swing control performs a first action of approaching the lower limit of the first rotation range until reaching a lower end of the first range and a second action of approaching the upper limit of the first rotation range away from the lower end of the first range and rotates through the entire first range due at least to one of the first action and the second action; therefore, diffusion of blowing air in the first range is able to be made smaller in a case in which the first flap rotates through the an entire first range than in a case in which the first flap rotates in one direction and passes through the first range without turning back at the lower end of the first range. Additionally, the first flap in swing control performs a third action of approaching the upper limit of the first rotation range until reaching an upper end of the second range and a fourth action of approaching the lower limit of the first rotation range away from the upper end of the second range and rotates through the entire second range due to at least one of the third action and the fourth action; therefore, diffusion of blowing air in the second range is able to be made smaller in a case in which the first flap rotates through the an entire second range than in a case in which the first flap rotates in one direction and passes through the second range without turning back at the upper end of the second range. As a result, the temperature of the first range and the second range into which the airflow is directly blown can be changed to the temperature of air that has just been blown out, more quickly than a case in which the first flap does not perform any of the first through fourth actions.

An air conditioner according to a second aspect of the present invention is the air conditioner according to the first aspect, wherein a starting point of the first action and an ending point of the second action are the same, and a starting point of the third action and an ending point of the fourth action are the same.

In the air conditioner according to the second aspect of the present invention, when the first flap performs the first action and the second action, the first flap can be moved back and forth through the entire first range in both the first action and the second action. When the first flap performs the third action and the fourth action, the first flap can be moved back and forth through the entire second range in both the third action and the fourth action.

An air conditioner according to a third aspect of the present invention is the air conditioner according to the first or second aspect, wherein the lower limit of the first rotation range is included in the second range when the second range is near the lower limit of the first rotation range.

In the air conditioner according to the third aspect of the present invention, because the lower limit of the first rotation range is included in the second range, diffusion of blowing air can be lessened for the range that, of the ranges into which air blown out from the blow-out port is directly blown due to the swinging of the first flap, is closest to the blow-out port.

An air conditioner according to a fourth aspect of the present invention is the air conditioner according to any of the first through third aspects, wherein the upper limit of the first rotation range is included in the first range when the first range is near the upper limit of the first rotation range.

In the air conditioner according to the fourth aspect of the present invention, because the upper limit of the first rotation range is included in the first range, diffusion of blowing air can be lessened for the range that, of the ranges into which air blown out from the blow-out port is directly blown due to the swinging of the first flap, is farthest from the blow-out port.

An air conditioner according to a fifth aspect of the present invention is the air conditioner according to any of the first through fourth aspects, wherein the first range is a range from a median point between the upper limit and lower limit of the first rotation range to the upper limit of the first rotation range, and the second range is a range from the median point to the lower limit of the first rotation range.

In the air conditioner according to the fifth aspect of the present invention, because the range from the median point to the upper limit of the first rotation range is designated as the first range and the range from the median point to the lower limit of the first rotation range is designated as the second range, diffusion of blowing air can be lessened for the entire range into which air blown out from the blow-out port is directly blown due to the swinging of the first flap.

An air conditioner according to a sixth aspect of the present invention is the air conditioner according to any of the first through fifth aspects, wherein the first flap performs

a fifth action and a sixth action, the fifth action is to rotate from an upper end to a lower end of a third range that includes the median point between the upper limit and the lower limit of the first rotation range and does not include the upper limit and the lower limit, and the sixth action is to rotate from the lower end to the upper end of the third range.

5 In the air conditioner according to the sixth aspect of the present invention, it is possible to reduce diffusion of blowing air in the third range, which is a median portion of the entire range the air directly reaches.

 An air conditioner according to a seventh aspect of the present invention is the air conditioner according to any of the first through sixth aspects, further comprising a second flap, 10 wherein: the casing further has a second blow-out port to blow out air; the second flap is provided to the second blow-out port and vertically varies the direction of air blown out from the second blow-out port by rotating from an upper limit to a lower limit of a second rotation range; and the second flap in swing control performs, within a fourth range which is smaller than the second rotation range and near to the upper limit of the second rotation range, a seventh action of 15 approaching the lower limit of the second rotation range until reaching the lower end of the fourth range and an eighth action of approaching the upper limit of the second rotation range away from the lower end of the fourth range and rotates through the entire fourth range due to at least one of the seventh action and the eighth action, and/or performs, within a fifth range which is smaller than the second rotation range and near to the lower limit of the second rotation range, 20 a ninth action of approaching the upper limit of the second rotation range until reaching the upper end of the fifth range and a tenth action of approaching the lower limit of the second rotation range away from the upper end of the fifth range and rotates through the entire fifth range due to at least one of the ninth action and the tenth action.

 In the air conditioner according to the seventh aspect of the present invention, the 25 second flap, similar to the first flap, can change the temperature of the fourth range and the fifth range, into which the airflow is directly blown, to approach the temperature of air that has just been blown out, more quickly than in a case in which the second flap does not perform the seventh through tenth actions, and the comfort of the user onto whom air is directly blown is enhanced during swing control.

30 An air conditioner according to an eighth aspect of the present invention is the air conditioner according to any of the first through seventh aspects, wherein a first drive motor to drive the first flap is further provided, and the first drive motor has substantially the same speed per unit time when moving the first flap.

In the air conditioner according to the eighth aspect of the present invention, because the speed of the first drive motor per unit time when moving the first flap is substantially the same and the movement speed of the first flap is not changed in a complex manner, an inexpensive first drive motor can be used.

5 EFFECTS OF THE INVENTION

With the air conditioner according to the first aspect of the present invention, it is possible to enhance the comfort of the user onto whom air is directly blown in swing control.

With the air conditioner according to the second aspect of the present invention, it is possible to sufficiently enhance the comfort of the first range and/or the second range.

10 With the air conditioner according to the third aspect of the present invention, the temperature of the range that, of the ranges into which air blown out from the blow-out port is directly blown, is closest to the blow-out port can be quickly changed to approach the temperature of air that has just been blown out.

15 With the air conditioner according to the fourth aspect of the present invention, the temperature of the range that, of the ranges into which air blown out from the blow-out port is directly blown, is farthest from the blow-out port can be quickly changed to approach the temperature of air that has just been blown out.

20 With the air conditioner according to the fifth aspect of the present invention, the temperature of the entire range into which air blown out from the blow-out port is directly blown can be quickly changed to approach the temperature of air that has just been blown out.

25 With the air conditioner according to the sixth aspect of the present invention, the temperature of the median portion of the range into which air blown out from the blow-out port is directly blown can be quickly changed to approach the temperature of air that has just been blown out, more so than in a case in which the first flap does not perform the fifth action and the sixth action.

With the air conditioner according to the seventh aspect of the present invention, both the first flap and the second flap can enhance the comfort of the user onto whom air is directly blown during swing control.

30 With the air conditioner according to the eighth aspect of the present invention, it is possible to achieve at low cost an air conditioner in which the temperature of the range into which air is directly blown from a blow-out port can be quickly changed to approach the temperature of air that has just been blown out.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view showing a generalization of an external view of an air conditioner according to an embodiment of the present invention;

FIG. 2 is a cross-sectional view of the air conditioner of FIG.1;

FIG. 3 is a block diagram showing an example of the control system of the air conditioner;

FIG. 4 is a partial enlarged cross-sectional view of the air conditioner for illustrating the rotating action of the first flap;

FIG. 5 is a timing chart for illustrating simple swing control for the first flap;

FIG. 6 is a schematic drawing for illustrating simple swing control for the first flap;

FIG. 7 is a timing chart for illustrating special swing control for the first flap;

FIG. 8 is a schematic drawing for illustrating special swing control for the first flap;

FIG. 9 is a schematic drawing for illustrating the conditions of measuring indoor temperature in simple swing control and special swing control;

FIG. 10 is a graph showing the change over time in temperature at measurement point MP1 in FIG. 9;

FIG. 11 is a graph showing the change over time in temperature at measurement point MP2 in FIG. 9;

FIG. 12 is a timing chart for illustrating special swing control in modification 1F;

FIG. 13 is a timing chart for illustrating another special swing control in modification 1F;

FIG. 14 is a timing chart for illustrating special swing control in modification 1G;

FIG. 15 is a timing chart for illustrating another special swing control in modification 1G;

FIG. 16 is a timing chart for illustrating special swing control in modification 1H;

FIG. 17 is a timing chart for illustrating another special swing control in modification 1H;

FIG. 18 is a timing chart for illustrating special swing control in modification 1I;

FIG. 19 is a timing chart for illustrating another special swing control in modification 1L;

FIG. 20 is a timing chart for illustrating one example of special swing control in modification 1N; and

FIG. 21 is a timing chart for illustrating another example of special swing control in modification 1N.

DESCRIPTION OF EMBODIMENTS

<First Embodiment>

(1) Overall configuration of air conditioner

FIG. 1 shows an external view of an air conditioner according to an embodiment of the present invention. An air conditioner 10 is, for example, a ceiling-mounted air conditioner. The air conditioner 10 has a casing 12, which is octagonal as seen from above, and a decorative panel 13 disposed in the lower side of the casing 12. The decorative panel 13 is square as seen from below.

FIG. 2 shows the cross-sectional shape of the air conditioner 10 sectioned by a plane passing through the center of the casing 12 along line I-I in FIG. 1. With the air conditioner 10 embedded in a ceiling CE within a room, the decorative panel 13 is exposed in the room, which is a space to be air-conditioned.

An intake port 14 is formed in the central part of the decorative panel 13 in order to take indoor air into the casing 12. A grille 19 is attached to the intake port 14.

In order to blow air out of the air conditioner 10 into the room, a blow-out port 15 that has substantially square ring shape is formed so as to encircle the outer periphery of the intake port 14 of the decorative panel 13. The blow-out port 15 includes a main blow-out port 16 extending lengthwise to portions corresponding to the four sides of the square ring, and a sub-blow-out port 17 corresponding to the four corners of the square ring. The portions corresponding to the sides of the main blow-out port 16 are referred to as a first blow-out port 16a, a second blow-out port 16b, a third blow-out port 16c, and a fourth blow-out port 16d.

A first flap 51 is provided to the first blow-out port 16a, a second flap 52 is provided to the second blow-out port 16b, a third flap 53 is provided to the third blow-out port 16c, and a fourth flap 54 is provided to the fourth blow-out port 16d. The first flap 51 and the second flap 52 rotate about the centers of rotating shafts 61, 62, respectively, as shown in FIG. 2. The first flap 51 and the second flap 52 direct air comparatively upward at the positions shown in solid lines and filled in with hatching, and direct air comparatively downward at the positions shown in dashed lines. By rotating in this manner, the first flap 51 and the second flap 52 vertically vary the direction of air blown out from the first blow-out port 16a and the second blow-out port 16b, respectively. Though not illustrated, the third flap 53 and the fourth flap 54 also rotate about rotating shafts in the same manner as the first flap 51 and the second flap 52, and vertically vary the direction of air blown out from the third blow-out port 16c and the fourth blow-out port 16d, respectively.

(2) Internal configuration of air conditioner 10

The air conditioner 10 is provided with a filter 21 that removes dust from indoor air taken in from the intake port 14, the filter 21 being provided above the grille 19. The air conditioner 10 has a bell mouth 22 provided above the filter 21, and a centrifugal fan 23 provided above the bell mouth 22. When the centrifugal fan 23 is driven, indoor air that has passed through the filter 21 is guided by the bell mouth 22 to an impeller 23a of the centrifugal fan 23.

The impeller 23a rotates due to a fan motor 24, whereby indoor air is taken in from underneath the impeller 23a of the centrifugal fan 23 and the indoor air is blown out from the impeller 23a in an outer peripheral direction. The direction of blowing from the impeller 23a toward the outside is substantially parallel to the ceiling CE. An indoor heat exchanger 25 is disposed in the outer peripheral direction of the impeller 23a. The indoor heat exchanger 25 is disposed so as to encircle the centrifugal fan 23 and is disposed in the shape of the letter O as seen from above. A blow-out passage 27 that communicates with the blow-out port 15 is formed on the outer peripheral side of the indoor heat exchanger 25. Conditioned air that has undergone heat exchange in the indoor heat exchanger 25 is blown through the blow-out passage 27 and out from the blow-out port 15.

The indoor heat exchanger 25 of the air conditioner 10 is connected to a refrigerant circuit (not shown) that includes, for example, an outdoor heat exchanger and an expansion valve of an outdoor machine (a heat-source-side unit). Indoor air passing through the indoor heat exchanger 25 exchanges heat with refrigerant circulating through the refrigerant circuit, in which a vapor-compression refrigeration cycle is performed.

(3) Control system of air conditioner 10

FIG. 3 shows a control device 30 that controls the air conditioner 10, the main instruments controlled by the control device 30, etc. The control device 30 controls the fan motor 24, a first drive motor 31, a second drive motor 32, a third drive motor 33, and a fourth drive motor 34. The control device 30 is able to control not only the turning on and off of the fan motor 24, but also the speed of the fan motor 24. As the speed of the fan motor 24 increases, the wind speed at the blow-out port 15 increases. This air conditioner 10 has, for example, an L tap for creating a light airflow, an M tap for creating a moderate airflow having greater airflow speed than the light airflow, and an H tap for creating a heavy airflow faster than the moderate airflow, the airflow quantity increasing successively from L tap, to M tap, to H tap. In this air conditioner 10, a fan tap is set so that the airflow speed can be varied in stages by selecting the L tap, M tap,

and H tap airflow quantities. Additionally, the control device 30 is connected to an intake temperature sensor 42, an indoor heat exchanger temperature sensor 43, and various other sensors in order to obtain information for controlling the instruments.

Under the control of the control device 30, the first drive motor 31 causes the first flap 51 to rotate to vary the angle of the first flap 51, the second drive motor 32 causes the second flap 52 to rotate to vary the angle of the second flap 52, the third drive motor 33 causes the third flap 53 to rotate to vary the angle of the third flap 53, and the fourth drive motor 34 causes the fourth flap 54 to rotate to vary the angle of the fourth flap 54. FIG. 4 shows the positions the first flap 51 can take. When the position of the first flap 51 is varied, the vertical airflow direction changes. When the air conditioner 10 blows air out from the blow-out port 15, the first flap 51 takes a position among positions P0 to P4. Additionally, when the air conditioner 10 has stopped, the first flap 51 takes a position Pc of closing the first blow-out port 16a. The second flap 52, the third flap 53, and the fourth flap 54, in the same manner as the first flap 51, are also configured so as to allow the selection of positions P0 to P4 when air is blown out and a position Pc when the air conditioner 10 has stopped.

When the first flap 51 is in the position P0, the direction of air blown out from the first blow-out port 16a is directed the most upward. At this time, an outer peripheral side of end part of the first flap 51 is in the highest location among those of the states in which air is blown out from the first blow-out port 16a. The air flow blown out from the first blow-out port 16a is closest to a plane F1 (normally a horizontal plane) parallel to the ceiling CE. In other words, the position P0 is the upper end of a first rotation range RR1 of the first flap 51. Every time the first flap 51 moves from position P0 to position P1, position P2, position P3, and position P4, the first flap 51 rotates downward by a preset angle. When the first flap 51 is in position P4, the direction of air blown out from the first blow-out port 16a is directed the most downward. At this time, the outer peripheral side of end part of the first flap 51 is in the lowest location. In other words, position P4 is the lowest end of the first rotation range RR1 of the first flap 51. For example, the angle during rotation from position P0 to position P1 and the angle during rotation from position P1 to position P2 may be set the same or differently. The relationship between positions P0 to P4 and airflow directions for the second through fourth flaps 52 to 54 is the same as for the first flap 51 described above.

The control device 30 is configured so as to be able to send and receive signals to and from a remote controller 41 in order to set the conditions used when controlling the instruments described above. The user can use the remote controller 41 to set the fan taps described above.

Additionally, the user can use the remote controller 41 to issue a command to the control device 30, cause the first through fourth drive motors 31 to 34 to be driven, and vary the angles of the first through fourth flaps 51 to 54 to the desired angles. After the angles of the first through fourth flaps 51 to 54 have been varied through the remote controller 41, the angles are maintained. Additionally, the control device 30 is provided with an internal central computation processing device (CPU) and memory (not shown), and the control device 30 can automatically vary the angles of the first through fourth flaps 51 to 54. When a swing mode is selected by the remote controller 41, the control device 30 performs swing control, which continues the swinging of the first through fourth flaps 51 to 54. This air conditioner 10 is configured so that two types of swing modes can be selected: a simple swing mode and a special swing mode, described hereinafter, and the control device 30 is configured so as to be able to perform the simple swing mode and the special swing mode as swing control.

(4) Swing control

(4-1) Simple swing mode

FIGS. 5 and 6 show the action of the first flap 51 in the simple swing mode. In the air conditioner 10, the other second through fourth flaps 52 to 54 are configured so as to, for example, perform the same action as the first flap 51 or are configured so as to vary positions in the same sequence with merely different action timings from the first flap 51 in the simple swing mode. Therefore, the action of the first flap 51 shall now be described and descriptions of the actions of the other second through fourth flaps 52 to 54 shall be omitted.

Up to time T0 in FIG. 5, the air conditioner 10 is stopped. At time T0, for example, the remote controller 41 is used to start the operation of the air conditioner 10. When the operation of the air conditioner 10 is started, the control device 30 stores the state of the first flap in which the first flap was before the operation of the air conditioner 10 had stopped. When, for example, the first flap 51 was in the location of position P4 before operation had stopped, the first flap 51 is moved to position P4 after calibration has been performed beginning at time T0 as shown in FIG. 5. The calibration is performed by retightening of the first flap 51. In the calibration performed beginning at time T0, the control device 30 transmits to the first drive motor 31 a drive signal causing the first drive motor 31 to be driven in a direction of moving the first flap 51 higher than position Pc, at which the first blow-out port 16a is closed, in order to correct the location of the first flap 51 from time T0. When such a drive signal has been transmitted, if the first flap 51 is correctly closing the first blow-out port 16a, the first flap 51 does not move upward and therefore remains stopped. However, in cases in which the first flap 51 is not

correctly closing the first blow-out port 16a and has rotated downward, the first flap 51 moves upward due to the calibration and the first flap 51 can correctly close the first blow-out port 16a. Thus, due to performing calibration before the first flap 51 starts moving immediately after the air conditioner 10 starts operating, the first flap 51 can begin to move correctly from the closing position Pc.

After operation has been started, the first flap 51 maintains position P4 until time T1, at which the air conditioner 10 is caused to switch to the simple swing mode by the remote controller 41. When a command to switch to the simple swing mode is inputted to the control device 30 from the remote controller 41 at time T1, the control device 30 starts the simple swing mode. When the simple swing mode is started, the first flap 51 performs angle variation of moving from position P4 to position P0 by means of a rotating action M0. This rotating action M0 is a preparatory action for simple swing control, which moves the first flap 51 to position P0. For example, when a switch to the simple swing mode is made by the remote controller 41, a rotation action involving movement to position P0 is first performed even if the first flap 51 is in any of the positions P1 to P3 other than position P4. When the first flap 51 is in position P0 at the time that a switch to the simple swing mode is made by the remote controller 41, the above-described preparatory action is not performed.

Next, the first flap 51 maintains position P0 for a predetermined holding time (e.g., one second). After the holding time has elapsed, the first flap 51 performs angle variation of moving from position P0 to position P4 by means of a rotating action M1. Additionally, after maintaining position P4 for a predetermined holding time, the first flap 51 performs angle variation of moving from position P4 to position P0 by means of a rotating action M2. Additionally, after maintaining position P0 for a predetermined holding time, the first flap 51 performs angle variation of moving from position P0 to position P4 by means of a rotating action M3. Furthermore, by means of the rotating action M0, the first flap 51 returns from position P4 to position P0 and returns to the initial state of simple swing control. The holding time is not limited to one second and may be longer than one second or shorter than one second; for example, the holding time may be 0 seconds.

Thus, until the simple swing mode is canceled, the first flap 51 repeats a rotating action of swinging back and forth between position P0 and position P4. The simple swing mode is canceled, for example, when a location for the first flap 51 is designated by the remote controller 41, when switching to another mode, and when the air conditioner 10 has stopped.

(4-2) Special swing mode

FIGS. 7 and 8 show an example of the action of the first flap 51 in the special swing mode. In the air conditioner 10, the other second through fourth flaps 52 to 54 are configured so as to, for example, perform the same action as the first flap 51 or vary positions in the same sequence with merely different action timings from the first flap 51 in the special swing mode.

Therefore, the action of the first flap 51 shall be described here and descriptions of the actions of the other second through fourth flaps 52 to 54 shall be omitted.

Until time T0 in FIG. 7 and from time T0 until time T2, the action is the same as that of the simple swing mode shown in FIG. 5 and a description of this action is therefore omitted. When a command to switch to the special swing mode is inputted from the remote controller 41 to the control device 30 at time T2, the control device 30 starts special swing control. When special swing control is started, the first flap 51 performs angle variation of moving from position P4 to position P0 by means of a rotating action M10. This rotating action M10 is a preparatory action for special swing control, in which the first flap 51 is moved to position P0. For example, when a switch to the special swing mode is made by the remote controller 41, a rotating action involving movement to position P0 is first performed even if the first flap 51 is in any of the positions P1 to P3 other than position P4. When the first flap 51 is in position P0 at the time that a switch to the special swing mode is made by the remote controller 41, the above-described preparatory action is not performed.

Next, the first flap 51 maintains position P0 for a predetermined holding time (e.g., one second). After the holding time has elapsed, the first flap 51 performs angle variation of moving from position P0 to position P2 by means of a rotating action M11. Additionally, after maintaining position P2 for a predetermined holding time, the first flap 51 performs angle variation of moving from position P2 to position P0 by means of a rotating action M12. What is performed by these rotating actions M11 and M12 is a rotation of the first flap 51 within a first range r1, which is smaller than the first rotation range RR1 and near position P0 at the upper limit of the first rotation range RR1. Specifically, in the first range r1 during special swing control, the first flap 51 rotates through the entire first range r1 by performing the rotating action M11, which is a first action of approaching position P4 at the lower limit of the first rotation range RR1 until reaching position P2 at the lower end of the first range r1, and the rotating action M12, which is a second action of approaching position P0 at the upper limit of the first rotation range RR1 from position P2 at the lower end of the first range r1. After maintaining position P0 for a predetermined holding time, the first flap 51 then performs angle variation of moving from position P0 to position P4 by means of a rotating action M13.

Next, after maintaining position P4 for a predetermined holding time, the first flap 51 performs angle variation of moving from position P4 to position P2 by means of a rotating action M14. Additionally, after maintaining position P2 for a predetermined holding time, the first flap 51 performs angle variation of moving from position P2 to position P4 by means of a rotating action M15. What is performed by these rotating actions M14 and M15 is a rotation of the first flap 51 within a second range r2, which is smaller than the first rotation range RR1 and near position P4 at the lower limit of the first rotation range RR1. Specifically, in the second range r2 during special swing control, the first flap 51 rotates through the entire second range r2 by performing the rotating action M14, which is a third action of approaching position P4 at the lower limit of the first rotation range RR1 until reaching position P2 at the upper end of the second range r2, and the rotating action M15, which is a fourth action of approaching position P0 at the upper limit of the first rotation range RR1 from position P2 at the upper end of the second range r2. By means of a rotating action M16, the first flap 51 then returns from position P4 to position P0 and returns to the initial state of special swing control.

The first flap 51 repeats the rotating actions M11 to M16 until the special swing mode is canceled. The special swing mode is canceled, for example, when a location for the first flap 51 is designated by the remote controller 41, when switching to another mode, and when the air conditioner 10 has stopped.

(4-3) Comparison of the effects of simple swing mode and special swing mode

FIG. 9 shows air conditioners 10 arranged in the room shown in FIGS. 6 and 8, and measurement points where the temperature change in the room caused by air conditioning is measured. Additionally, FIGS. 10 and 11 show the temperature change in the room at the measurement points shown in FIG. 9. As shown in FIG. 6, the height H1 from the floor FL in the room to the ceiling CE is 2.6 m, the distances L1 to measurement points MP1, MP2 from a foot of a perpendicular extending down from the first blow-out port 16a to the floor FL are 1.2 m and 2.4 m respectively, and the height H3 of the measurement points MP1, MP2 is 0.8 m. Supposing the height H2 of a user sitting in a chair is 1.3 m, the measurement conditions described above are decided. Additionally, in this measurement, three out of four air conditioners 10 have been stopped, and only one is being operated. The changes in indoor temperature caused by the simple swing mode and the special swing mode are compared in a case in which the set temperature is set to 20°C, the airflow quantity is set to H tap, and a room interior of 30°C is cooled by an air conditioner 10.

In FIG. 10, the measurement result at the measurement point MP1 during the simple swing mode is represented by the curve C1, and the measurement result at the measurement point MP1 during the special swing mode is represented by the curve C2. In FIG. 11, the measurement result at the measurement point MP2 during the simple swing mode is represented by the curve C3, and the measurement result at the measurement point MP2 during the special swing mode is represented by the curve C4.

It can be seen that in either of the measurement conditions shown in FIGS. 10 and 11, the temperature decrease in the room at the 15 second mark is faster when the air conditioner 10 has been operated in the special swing mode than when the air conditioner 10 has been operated in the simple swing mode. The mark stands for a point in time when 15 seconds pass from a start. Users at the measurement points MP1, MP2 will feel coolness faster when the special swing mode than when the simple swing mode is used.

(5) Modifications

(5-1) Modification 1A

In the above embodiment, a case was described in which the air conditioner 10 has both the simple swing mode and the special swing mode, but the air conditioner 10 may be configured so as to not have the simple swing mode and only have the special swing mode.

(5-2) Modification 1B

In the above embodiment, a case was described in which the first flap 51, the second flap 52, the third flap 53, and the fourth flap 54 are respectively provided to the first blow-out port 16a, the second blow-out port 16b, the third blow-out port 16c, and the fourth blow-out port 16d. The first through fourth blow-out ports 16a to 16d are connected by the sub-blow-out port 17, configuring one blow-out port 15. However, it is not absolutely necessary for all four of the first through fourth blow-out ports 16a to 16d to be connected; for example, the sub-blow-out port 17 may be closed and the main blow-out port 16 may be divided into four portions.

(5-3) Modification 1C

In the above embodiment, a case was described in which the first flap 51, the second flap 52, the third flap 53, and the fourth flap 54 of the first through fourth blow-out ports 16a to 16d are provided. However, the air conditioner of the present invention may be configured as being provided with one blow-out port and one flap each. Additionally, the air conditioner of the present invention can have a configuration in which one flap is provided to each of two blow-out ports. Furthermore, the air conditioner of the present invention may be configured with one flap

provided to each of three or more blow-out ports. Additionally, the number of flaps provided to one blow-out port is not limited to one and may be a plurality.

(5-4) Modification 1D

5 The air conditioner 10 described above is a ceiling-mounted air conditioner. However, the air conditioner to which the present invention is applied is not limited to being installed in a ceiling; for example, the air conditioner may be a ceiling-suspended type that is installed as being suspended from a ceiling, or a wall-mounted type that is mounted to a wall in a room.

(5-5) Modification 1E

10 In special swing control described using FIG. 7 or the swing control described below, the positions that can be taken by the first through fourth flaps 51 to 54 when air is blown out are the five positions P0 to P4, but the number of positions that can be taken by the first through fourth flaps 51 to 54 may be three, four, six, or more.

(5-6) Modification 1F

15 In special swing control in the above embodiment, in the first range r1, the first flap 51 performs an action of turning back at the lower end of the first range r1, and in the second range r2, the first flap 51 performs an action of turning back at the upper end of the second range r2. However, a configuration may be adopted so as to omit the action of turning back at the upper end of the second range r2 and perform only the action of turning back at the lower end of the first range r1, as shown in, for example, FIG. 12. As long as special swing control continues after
20 a preparatory action M20, the rotating actions M21, M22, M23, and M24 shown in FIG. 12 are repeated. Another configuration may be adopted so as to omit the action of turning back at the upper end of the first range r1 and perform only the action of turning back at the lower end of the second range r2, as shown in, for example, FIG. 13. As long as special swing control continues after a preparatory action M30, the rotating actions M31, M32, M33, and M34 shown
25 in FIG. 13 are repeated. After the rotating actions M21, M22, M23, and M24 and the rotating actions M31, M32, M33, and M34, the positions are maintained for respective predetermined holding times.

The first flap 51 may be configured so as to repeat a back-and-forth action a plurality of times within the first range r1. Similarly, the first flap 51 may be configured so as to repeat
30 a back-and-forth action a plurality of times within the second range r2.

(5-7) Modification 1G

A case was described in which in special swing control described using FIG. 7, position P2 equivalent to the lower end of the first range r1 and position P2 equivalent to the upper range

of the second range r2 coincide. However, the air conditioner of the present invention may be configured so that the lower end of the first range and the upper end of the second range do not coincide in special swing control.

The air conditioner may be configured so that in special swing control, the first flap 51 performs the actions shown in, for example, FIG. 14. In a first range r11 shown in FIG. 14, after maintaining position P0 for a holding time, the first flap 51 moves by means of a rotating action M41, which is a first action, from position P0, which is equivalent to the upper end of the first range r11, to position P1, which is equivalent to the lower end of the first range r11. Additionally, after maintaining position P1 for a holding time, the first flap 51 moves from position P1 (the lower end of the first range r11) to position P0 (the upper end of the first range r11) by means of a rotating action M42, which is a second action. By means of a rotating action M43 after holding the position P0 for a predetermined holding time, the first flap 51 performs angle variation of moving from position P0 to position P4. In a second range r12, after maintaining position P4 for a holding time, the first flap 51 moves by means of a rotating action M44, which is a third action, from position P4, which is equivalent to the lower end of the second range r12, to position P3, which is equivalent to the upper end of the second range r12. Additionally, after maintaining position P3 for a holding time, the first flap 51 moves from position P3 (the upper end of the second range r12) to position P0 (the lower end of the second range r12) by means of a rotating action M45, which is a fourth action. A rotating action M40 is a preparatory action for moving to position P0. Additionally, the air conditioner may be configured so that the same special swing control as that of the first flap 51 or a similar special swing control, in which the positions are varied in the same sequence, is performed in the second through fourth flaps 52 to 54 as well.

The air conditioner may be configured so that in special swing control, the first flap 51 performs the actions shown in, for example, FIG. 15. In a first range r21 shown in FIG. 15, after maintaining position P0 for a holding time, the first flap 51 moves by means of a rotating action M51, which is a first action, from position P0, which is equivalent to the upper end of the first range r21, to position P3, which is equivalent to the lower end of the first range r21. Additionally, after maintaining position P3 for a holding time, the first flap 51 moves from position P3 (the lower end of the first range r21) to position P0 (the upper end of the first range r21) by means of a rotating action M52, which is a second action. By means of a rotating action M53 after holding the position P0 for a predetermined holding time, the first flap 51 performs angle variation of moving from position P0 to position P4. In a second range r22, after

maintaining position P4 for a holding time, the first flap 51 moves by means of a rotating action M54, which is a third action, from position P4, which is equivalent to the lower end of the second range r22, to position P1, which is equivalent to the upper end of the second range r22. Additionally, after maintaining position P1 for a holding time, the first flap 51 moves from position P1 (the upper end of the second range r22) to position P0 (the lower end of the second range r22) by means of a rotating action M55, which is a fourth action. A rotating action M50 is a preparatory action for moving to position P0. Additionally, the air conditioner may be configured so that the same special swing control as that of the first flap 51 or a similar special swing control, in which the positions are varied in the same sequence, is performed in the second through fourth flaps 52 to 54 as well.

(5-8) Modification 1H

During special swing control described using FIG. 7, the rotating action M11, which is a first action, and the rotating action M12, which is a second action, in the first range r1 are designed so that the starting point (position P0) of the rotating action M11 and the ending point (position P0) of the rotating action M12 coincide, and the ending point (position P2) of the rotating action M11 and the starting point (position P2) of the rotating action M12 coincide. In other words, the first action (rotating action M11) and the second action (rotating action M12) constitute a back-and-forth action of moving back and forth through the first range r1. Additionally, the rotating action M14, which is a third action, and the rotating action M15, which is a fourth action, in the second range r2 are designed so that the starting point (position P4) of the rotating action M14 and the ending point (position P4) of the rotating action M15 coincide, and the ending point (position P2) of the rotating action M14 and the starting point (position P2) of the rotating action M15 coincide. In other words, the third action (rotating action M14) and the fourth action (rotating action M15) constitute a back-and-forth action of moving back and forth through the second range r2.

However, in the air conditioner of the present invention, the first action and the second action need not constitute a back-and-forth action, and the third action and the fourth action need not constitute a back-and-forth action. The air conditioner may be configured so that in special swing control, the first flap 51 performs the action shown in, for example, FIG. 16. In a first range r31 shown in FIG. 16, after maintaining position P0 for a holding time, the first flap 51 moves by means of a rotating action M61, which is a first action, from position P0, which is equivalent to the upper end of the first range r31, to position P2, which is equivalent to the lower end of the first range r31. Additionally, after maintaining position P2 for a holding time, the first

flap 51 moves from position P2 (the lower end of the first range r31) to position P1 by means of a rotating action M62, which is a second action. By means of a rotating action M63 after maintaining position P1 for a predetermined holding time, the first flap 51 performs angle variation of moving from position P1 to position P4. Additionally, in a second range r32, after maintaining position P4 for a holding time, the first flap 51 moves by means of a rotating action M64, which is a third action, from position P4, which is equivalent to the lower end of the second range r32, to position P2, which is equivalent to the upper end of the second range r32. Additionally, after maintaining position P2 for a holding time, the first flap 51 moves from position P2 (the upper end of the second range r32) to position P3 by means of a rotating action M65, which is a fourth action. By means of a rotating action M66 after maintaining position P3 for a predetermined holding time, the first flap 51 performs angle variation of moving from position P3 to position P0. A rotating action M60 is a preparatory action for moving to position P0. Additionally, the air conditioner may be configured so that the same special swing control as that of the first flap 51 or a similar special swing control, in which the positions are varied in the same sequence, is performed in the second through fourth flaps 52 to 54 as well.

The air conditioner may be configured so that in special swing control, the first flap 51 performs the actions shown in, for example, FIG. 17. In a first range r41 shown in FIG. 17, after maintaining position P0 for a holding time, the first flap 51 moves by means of a rotating action M71 from position P0, which is equivalent to the upper end of the first range r41, to position P1. Furthermore, after maintaining position P1 for a holding time, the first flap 51 moves from position P1 to position P2, which is equivalent to the lower end of the first range r41, by means of a rotating action M72, which is a first action. Additionally, after maintaining position P2 for a holding time, the first flap 51 moves from position P2 (the lower end of the first range r41) to position P0 (the upper end of the first range r41) by means of a rotating action M73, which is a second action. By means of a rotating action M74 after holding the position P1 for a predetermined holding time, the first flap 51 performs angle variation of moving from position P1 to position P3. Additionally, in a second range r42, after maintaining position P3 for a holding time, the first flap 51 moves by means of a rotating action M75, which is a third action, from position P3 to position P2, which is equivalent to the upper end of the second range r42. Additionally, after maintaining position P2 for a holding time, the first flap 51 moves from position P2 (the upper end of the second range r42) to position P4 (the lower end of the second range r42) by means of a rotating action M76, which is a fourth action. By means of a rotating action M77 after maintaining position P4 for a predetermined holding time, the first flap 51

performs angle variation of moving from position P4 to position P1. A rotating action M70 is a preparatory action for moving to position P0. Additionally, the air conditioner may be configured so that the same special swing control as that of the first flap 51 or a similar special swing control, in which the positions are varied in the same sequence, is performed in the second through fourth flaps 52 to 54 as well.

(5-9) Modification 11

The air conditioner may be configured so that in special swing control, the first flap 51 performs the actions shown in, for example, FIG. 18. In special swing control shown in FIG. 18, a third range r53 (positions P1 to P3) is provided between a first range r51 (positions P0 to P1) and a second range r52 (positions P3 to P4).

In the first range r51 shown in FIG. 18, after maintaining position P0 for a holding time, the first flap 51 moves by means of a rotating action M81, which is a first action, from position P0, which is equivalent to the upper end of the first range r51, to position P1, which is equivalent to the lower end of the first range r51. Additionally, after maintaining position P1 for a holding time, the first flap 51 moves from position P1 (the lower end of the first range r51) to position P0 (the upper end of the first range r51) by means of a rotating action M82, which is a second action. By means of a rotating action M83 after maintaining position P0 for a predetermined holding time, the first flap 51 performs angle rotation of moving from position P0 to position P3. In the third range r53, after maintaining position P3 for a holding time, the first flap 51 moves by means of a rotating action M84, which is a sixth action, from position P3, which is equivalent to the lower end of the third range r53, to position P1, which is equivalent to the upper end of the third range r53. Additionally, after maintaining position P1 for a holding time, the first flap 51 moves by means of a rotating action M85, which is a fifth action, from position P1, which is equivalent to the upper end of the third range r53, to position P3, which is equivalent to the lower end of the third range r53. Furthermore, after maintaining position P3 for a holding time, the first flap 51 moves from position P3 (the lower end of the third range r53) to position P1 (the upper end of the third range r53) by means of a rotating action M86, which is a sixth action. By means of a rotating action M87 after maintaining position P1 for a predetermined holding time, the first flap 51 performs angle variation of moving from position P1 to position P4. In the second range r52, after maintaining position P4 for a holding time, the first flap 51 moves by means of a rotating action M88, which is a third action, from position P4, which is equivalent to the lower end of the second range r52, to position P3, which is equivalent to the upper end of the second range r52. Additionally, after maintaining position P3 for a holding

time, the first flap 51 moves from position P3 (the upper end of the second range r52) to position P4 (the lower end of the second range r52) by means of a rotating action M89, which is a fourth action. By means of a rotating action after maintaining position P3 for a predetermined holding time, the first flap 51 performs angle variation of moving from position P4 to position P0. The rotating action M80 is a preparatory action for moving to position P0. Additionally, the air conditioner may be configured so that the same special swing control as that of the first flap 51 or a similar special swing control, in which the positions are varied in the same sequence, is performed in the second through fourth flaps 52 to 54 as well.

(5-10) Modification 1J

The upper limit (position P0) of the first rotation range RR1 is included in the first ranges r1, r11, r21, r31, and r41 of the first flap 51 in special swing control of the above embodiment and modifications 1F to 1I. However, special swing control may be configured so that the upper limit (position P0) of the first rotation range RR1 is not included in the first range. For example, the upper end of the first range may be set to position P1. Additionally, the lower limit (position P4) of the first rotation range RR1 may be included in the second ranges r2, r12, r22, r32, and r42 of the first flap 51 in special swing control of the above embodiment and modifications 1F to 1H. However, special swing control may be configured so that the lower limit (position P4) of the first rotation range RR1 is not included in the second range. For example, the lower limit of the second range may be set to position P3.

(5-11) Modification 1K

In the above embodiment and modifications 1A to 1J, a case was described in which there is one back-and-forth action in the first range and the second range each, but a plurality of back-and-forth actions may be performed.

(5-12) Modification 1L

In the above embodiment and Modifications 1A to 1K, the actions of the first flap 51 were described, but the air conditioner may be configured so that the same special swing control as that of the first flap 51 or a similar special swing control, in which the positions are varied in the same sequence, is performed in the second through fourth flaps 52 to 54 as well. For example, when a command to switch to the special swing mode is inputted from the remote controller 41 to the control device 30 at time T2, the control device 30 starts special swing control, as shown in FIG. 19. When special swing control is started, the second flap 52 performs angle variation of moving from position P4 to position P0 by means of a rotating action M90. This rotating action M90 is a preparatory action for special swing control in which the second

flap 52 is moved to position P0. For example, when a switch to the special swing mode is made by the remote controller 41, even if the second flap 52 is in any of the positions P1 to P3 other than position P4, a rotating action of moving to position P0 is first performed. When the second flap 52 is in position P0 at the time that a switch to the simple swing mode is made by the remote controller 41, the preparatory action described above is omitted.

Next, the second flap 52 maintains position P0 for, for example, two seconds (one second longer than the first flap 51). After a holding time has elapsed, the second flap 52 performs angle variation of moving from position P0 to position P2 by means of a rotating action M91. Additionally, after maintaining position P2 for a predetermined holding time, the second flap 52 performs angle variation of moving from position P2 to position P0 by means of a rotating action M92. What is performed by these rotating actions M91 and M92 is a rotation of the second flap 52 within a fourth range r4, which is smaller than a second rotation range RR2 and near position P0 at the upper limit of the second rotation range RR2. Specifically, in the fourth range r4 during special swing control, the second flap 52 rotates through the entire fourth range r4 by performing the rotating action M91, which is a seventh action of approaching position P4 at the lower limit of the second rotation range RR2 until reaching position P2 at the lower end of the fourth range r4, and the rotating action M92, which is an eighth action of approaching position P0 at the upper limit of the second rotation range RR2 from position P2 at the lower end of the fourth range r4. After maintaining position P0 for a predetermined holding time, the second flap 52 then performs angle variation of moving from position P0 to position P4 by means of a rotating action M93.

Next, after maintaining position P4 for a predetermined holding time, the second flap 52 performs angle variation of moving from position P4 to position P2 by means of a rotating action M94. Additionally, after maintaining position P2 for a predetermined holding time, the second flap 52 performs angle variation of moving from position P2 to position P4 by means of a rotating action M95. What is performed by these rotating actions M94 and M95 is a rotation of the second flap 52 within a fifth range r5, which is smaller than a second rotation range RR2 and near position P4 at the lower limit of the second rotation range RR2. Specifically, in the fifth range r5 during special swing control, the second flap 52 rotates through the entire fifth range r5 by performing the rotating action M94, which is a ninth action of approaching position P4 at the lower limit of the second rotation range RR2 until reaching position P2 at the upper end of the fifth range r5, and the rotating action M95, which is a tenth action of approaching position P4 at the lower limit of the second rotation range RR2 from position P2 at the upper end of the fifth

range r5. By means of a rotating action M96, the second flap 52 then returns from position P4 to position P0 and returns to the initial state of special swing control.

The second flap 52 repeats the rotating actions M91 to M96 until the special swing mode is canceled. The special swing mode is canceled, for example, when a location for the second flap 52 is designated by the remote controller 41, when switching to another mode, and when the air conditioner 10 has stopped.

In the description of Modification 1L using FIG. 19, the first range r1 in which the first flap 51 acts and the fourth range r4 in which the second flap 52 acts are set to the same range of position P0 to position P2, but the first range r1 and the fourth range r4 may be different.

Additionally, the second range r2 in which the first flap 51 activates and the fifth range r5 in which the second flap 52 activates are set to the same range of position P4 to position P2, but the second range r2 and the fifth range r5 may be different. Additionally, the holding times of the first flap 51 and the second flap 52 may be set to different lengths. Additionally, the rotational speeds of the first flap 51 and the second flap 52 may have different settings.

Furthermore, in the description of Modification 1L using FIG. 19, a case was described in which the first rotation range RR1 of the first flap 51 and the second rotation range RR2 of the second flap 52 are the same, but the first rotation range RR1 and the second rotation range RR2 may be configured so as to be different.

(5-13) Modification 1M

In special swing control described in the above embodiment and modifications 1A to 1K, the airflow quantity is preferably set to H tap, which is the maximum airflow quantity, in order to quickly change the temperature. However, the airflow quantity during special swing control is not limited to the maximum airflow quantity. For example, in a case in which a configuration is adopted such that five airflow quantity levels including L tap, ML tap, M tap, MH tap, and H tap are provided so that the airflow quantity increases in sequence and a selection can be made from these five airflow quantity levels, a configuration may be adopted so as to be set to MH tap or H tap during special swing control. These selections may be configured to be performed by a user through the remote controller 41, or these selections may be configured so that the control device 30 automatically makes a selection on the basis of, for example, the temperature of the room interior and the set temperature. Additionally, the air conditioner may be configured so that the airflow quantity can vary due to any one of the first through fourth flaps 51 to 54 of the above embodiment being closed.

(5-14) Modification 1N

The first range may be set to as to be equidistant from the upper limit (position P0) and lower limit (position P4) of the first rotation range RR1, as is a first range r61 shown in FIG. 20. In the first range r61 shown in FIG. 20, after maintaining position P0 for a holding time, the first flap 51 moves from position P0 to position P1, which is equivalent to the upper end of the first range r61, by means of a rotating action M101. Furthermore, after maintaining position P1 for a holding time, the first flap 51 moves from position P1 to position P3, which is equivalent to the lower end of the first range r61, by means of a rotating action M102, which is a first action. Additionally, after maintaining position P3 for a holding time, the first flap 51 moves from position P3 (the lower end of the first range r61) to position P1 (the upper end of the first range r61) by means of a rotating action M103, which is a second action. By means of a rotating action M104 after maintaining position P1 for a predetermined holding time, the first flap 51 performs angle variation of moving from position P1 to position P4. In FIG. 20, the rotating action in the second range r2 is described in the above embodiment and a description shall therefore be omitted. A rotating action M100 is a preparatory action for moving to position P0. Additionally, a configuration may be adopted so as to omit the second range r2 and repeat the rotating action in the range of the first range r61. In such special swing control, it is acceptable to repeat only the rotation actions in the first range r61 and the second range r2, but in between these actions may be a rotating action in which the first flap 51 simply swings back and forth in the same first rotation range RR1 as that of simple swing control.

The second range may be set so as to be equidistant from the upper limit (position P0) and lower limit (position P4) of the first rotation range RR1, as is a second range r62 shown in FIG. 21. In FIG. 21, the rotating action in the first range r1 is described in the above embodiment and a description shall therefore be omitted. In the second range r62 shown in FIG. 21, after maintaining position P0 for a holding time, the first flap 51 moves from position P0 to position P3, which is equivalent to the lower end of the second range r62, by means of a rotating action M111. Furthermore, after maintaining position P3 for a holding time, the first flap 51 moves from position P3 to position P1, which is equivalent to the upper end of the second range r62, by means of a rotating action M112, which is a third action. Additionally, after maintaining position P1 for a holding time, the first flap 51 moves from position P1 (the upper end of the second range r62) to position P3 (the lower end of the second range r62) by means of a rotating action M113, which is a fourth action. By means of a rotating action M114 after maintaining position P3 for a predetermined holding time, the first flap 51 performs angle variation of moving from position P3 to position P0. In such special swing control, it is acceptable to repeat only the

rotation actions in the first range r1 and the second range r62, but in between these actions may be a rotating action in which the first flap 51 simply swings back and forth in the same first rotation range RR1 as that of simple swing control. Additionally, a rotating action of simply swinging back and forth in the first rotation range RR1 may be included in partway through special swing control in other embodiments and modifications as well.

(6) Characteristics

(6-1)

In the above embodiment and modifications 1A to 1N, the first flap 51 in special swing control performs a first action (rotating action M11, M21, M41, M51, M61, M72, M81, M102) of approaching the lower limit (position P4) of the first rotation range RR1 until reaching a lower end of the first range r1, r11, r21, r31, r41, r51, r61 and a second action (rotating action M12, M22, M42, M52, M62, M73, M82, M103) of approaching the upper limit (position P0) of the first rotation range RR1 away from the lower end of the first range r1, r11, r21, r31, r41 and rotates through the entire first range r1, r11, r21, r31, r41, r51, r61 due at least one of the first action and the second action; therefore, diffusion of blowing air is able to be made smaller in the first range r1, r11, r21, r31, r41, r51, r61 in a case in which the first flap 51 rotates through the an entire first range r1, r11, r21, r31, r41, r51, r61 than in a case in which the first flap 51 rotates in one direction and passes through the first range r1, r11, r21, r31, r41, r51, r61 without turning back at the lower end of the first range r1, r11, r21, r31, r41, r51, r61.

The first flap 51 in special swing control also performs a third action (rotating action M14, M32, M44, M54, M64, M75, M88, M112) of approaching the upper limit (position P0) of the first rotation range RR1 until reaching an upper end of the second range r2, r12, r22, r32, r42, r52, r62 and a fourth action (rotating action M15, M33, M45, M55, M65, M76, M89, M113) of approaching the lower limit (position P4) of the first rotation range away from the upper end of the second range r2, r12, r22, r32, r42 and rotates through the entire second range r2, r12, r22, r32, r42, r52, r62 due to at least one of the third action and the fourth action; therefore, diffusion of blowing air is able to be made smaller in the second range r2, r12, r22, r32, r42, r52, r62 in a case in which the first flap 51 rotates through the an entire second range r2, r12, r22, r32, r42, r52, r62 than in a case in which the first flap 51 rotates in one direction and passes through the second range r2, r12, r22, r32, r42, r52, r62 without turning back at the upper end of the second range r2, r12, r22, r32, r42, r52, r62. As a result, the temperature of the first range r1, r11, r21, r31, r41, r51, r61 and the second range r2, r12, r22, r32, r42, r52, r62 into which the airflow is directly blown can be changed to the temperature of air that has just been blown

out, more quickly than a case in which the first flap 51 does not perform any of the first through fourth actions (for example, simple swing control described above), and the comfort of the user in swing control is enhanced.

(6-2)

5 In the actions of the first flap 51 described in the above embodiment and modifications 1F 1G, 1I, and 1N, when the first flap 51 performs the first action (rotating action M11, M21, M41, M51, M81, M102) and the second action (rotating action M12, M22, M32, M42, M52, M82, M103), the first flap 51 can move back and forth through the entire first range r1, r11, r21, r51, r61 in both of two actions including the first action and the second action, and
10 the enhancement of the comfort of the first range r1, r11, r21, r51, r61 is therefore appreciable. When the first flap 51 performs the third action (rotating action M14, M32, M44, M54, M84, M112) and the fourth action (rotating action M15, M33, M45, M55, M85, M113), the first flap moves back and forth through the entire second range r2, r12, r22, r52, r62 in both of two actions including the third action and the fourth action, and the enhancement of the comfort of
15 the second range r2, r12, r22, r52, r62 is therefore appreciable.

(6-3)

In the actions of the first flap 51 described in the above embodiment and modifications 1F to 1H, because the lower limit (position P4) of the first rotation range RR1 is included in the second range r2, r12, r22, r32, r42, r52, diffusion of blowing air can be lessened for the range
20 that, of the ranges into which air blown out from the first blow-out port 16a is directly blown due to the swinging of the first flap 51, is closest to the blow-out port. As a result, the temperature of the range closest to the first blow-out port 16a can be quickly changed to the temperature of air that has just been blown out, as was described using FIG. 10.

(6-4)

25 In the actions of the first flap 51 described in the above embodiment and modifications 1F to 1H, because the lower limit (position P0) of the first rotation range RR1 is included in the first range r1, r11, r21, r31, r41, r51, diffusion of blowing air can be lessened for the range that, of the ranges into which air blown out from the first blow-out port 16a is directly blown due to the swinging of the first flap 51, is farthest from the blow-out port. As a result, the temperature
30 of the range farthest from the first blow-out port 16a can be quickly changed to the temperature of air that has just been blown out, as was described using FIG. 11.

(6-5)

In the actions of the first flap 51 described in the above embodiment and modification 1H, because from the median point (position P2) to the upper limit (position P0) of the first rotation range RR1 is designated as the first range r1, r31, r41 and from the median point to the lower limit (position P4) of the first rotation range RR1 is designated as the second range r2, r32, r42, diffusion of blowing air can be lessened for the entire range into which air blown out from the first blow-out port 16a is directly blown due to the swinging of the first flap 51, and the temperature of the entire range into which air is directly blown can be quickly changed to the temperature of air that has just been blown out.

(6-6)

In the actions of the first flap 51 described in modification 1I, the fifth action and the sixth action are performed. The fifth action is an action of rotating from the upper end (position P1) to the lower end (position P3) of the third range r53. The third range r53 includes a median point (position P2) between the upper limit (position P0) and lower limit (position P4) of the first rotation range RR1, but does not include the upper limit and lower limit of the first rotation range RR1. The sixth action is an action of rotating from the lower end to the upper end of the third range r53. It is possible to reduce diffusion of blowing air in the third range r53, which is a median portion of the entire range the air directly reaches, and the temperature of the third range r53 can therefore be changed to approach the temperature of air that has just been blown out, more quickly than in a case in which the first flap 51 does not perform the fifth action and the sixth action.

(6-7)

The second flap 52 described in modification 1L is provided to the second blow-out port 16b of the casing 12. The second flap 52 vertically varies the direction of air blown out from the second blow-out port by rotating from the upper limit (position P0) to the lower limit (position P4) of the second rotation range RR2. This second flap 52 in special swing control performs, within a fourth range r4 which is smaller than the second rotation range RR2 and near to the upper limit of the second rotation range RR2, a seventh action of approaching the lower limit of the second rotation range RR2 until reaching the lower end (position P2) of the fourth range r4 and an eighth action of approaching the upper limit of the second rotation range RR2 away from the lower end of the fourth range r4. In modification 1L, the second flap 52 rotates through the entire fourth range r4 in both the seventh action and the eighth action, but may be configured so

as to rotate through the entire fourth range r4 in only the seventh action or only the eighth action, as was described in modification 1H for the first flap 51.

In modification 1L, the second flap 52 performs, within a fifth range r5 which is smaller than the second rotation range RR2 and near to the lower limit (position P4) of the second rotation range RR2, a ninth action of approaching the upper limit of the second rotation range RR2 until reaching the upper end (position P2) of the fifth range r5 and a tenth action of approaching the lower limit of the second rotation range RR2 away from the upper end of the fifth range r5. In modification 1L, the second flap 52 rotates through the entire fifth range r5 in both the ninth action and the tenth action, but may be configured so as to rotate through the entire fifth range r5 in only the ninth action or only the tenth action, as was described in modification 1H for the first flap 51.

In modification 1L, the second flap 52 is configured so as to perform the seventh action and the eighth action as well as the ninth action and the tenth action, but may also be configured so as to perform only the seventh action and the eighth action or only the ninth action and the tenth action.

Thus, the second flap 52, similar to the first flap 51, can change the temperature of the fourth range r4 and the fifth range r5, into which the airflow is directly blown, to the temperature of air that has just been blown out, more quickly than in a case in which the second flap 52 does not perform the seventh through tenth actions, and the comfort of the user onto whom air is directly blown is enhanced during special swing control.

(6-8)

The first drive motor 31, which drives the first flap 51 shown in FIG. 3, has substantially the same speed per unit time when moving the first flap 51 and does not change the movement speed of the first flap 51 in a complex manner; therefore, an inexpensive first drive motor 31 can be used. With such a configuration, inexpensive drive motors can be used for the second drive motor 32, the third drive motor 33, and the fourth drive motor 34 in cases in which these drive motors similarly do not change the movement speed in a complex manner.

REFERENCE SIGNS LIST

10	Air conditioner
30 12	Casing
15	Blow-out port
16a	First blow-out port
16b	Second blow-out port

- 16c Third blow-out port
- 16d Fourth blow-out port
- 30 Control device
- 31 First drive motor
- 5 32 Second drive motor
- 33 Third drive motor
- 34 Fourth drive motor
- 51 First flap
- 52 Second flap
- 10 53 Third flap
- 54 Fourth flap

CITATION LIST

PATENT LITERATURE

[Patent Literature 1] Japanese Patent Publication No. 5589538

CLAIMS

1. An air conditioner including:

a casing that is installed in a space to be air-conditioned and that has a first blow-out port to blow out air; and

5 a first flap that is provided to the first blow-out port and that vertically varies the direction of air blown out from the first blow-out port by rotating from an upper limit to a lower limit of a first rotation range;

the first flap in swing control performing, within a first range which is smaller than the first rotation range and either near to the upper limit of the first rotation range or equidistant from the upper limit and the lower limit, a first action of approaching the lower limit of the first rotation range until reaching a lower end of the first range and a second action of approaching the upper limit of the first rotation range away from the lower end of the first range and rotating through the entire first range due to at least one of the first action and the second action, and/or performing, within a second range which is smaller than the first rotation range and either near to the lower limit of the first rotation range or equidistant from the upper limit and the lower limit, a third action of approaching the upper limit of the first rotation range until reaching an upper end of the second range and a fourth action of approaching the lower limit of the first rotation range away from the upper end of the second range and rotating through the entire second range due to at least one of the third action and the fourth action,

20 wherein the first flap performs a full rotating action that rotates without resting in the entire range of the first rotation range, and

wherein, in the swing control, the first flap repeats a set including the first action, the second action and the full rotating action and/or a set including the third action, the fourth action and the full rotating action.

25 2. The air conditioner according to claim 1, wherein, in the swing control, the full rotating action is at least one of a rotating action immediately before the first action, a rotating action immediately after the second action, a rotating action immediately before the third action, and a rotating action immediately after the fourth action.

3. The air conditioner according to claim 1 or claim 2, wherein

30 a starting point of the first action and an ending point of the second action are the same, and

a starting point of the third action and an ending point of the fourth action are the same.

4. The air conditioner according to claim 3, wherein

35 the lower limit of the first rotation range is included in the second range when the second range is near the lower limit of the first rotation range.

5. The air conditioner according to any one of claims 1 to 4, wherein

the upper limit of the first rotation range is included in the first range when the first range is near the upper limit of the first rotation range.

6. The air conditioner according to any one of claims 1 to 5, wherein

5 the first range is a range from a median point between the upper limit and lower limit of the first rotation range to the upper limit of the first rotation range, and the second range is a range from the median point to the lower limit of the first rotation range.

7. The air conditioner according to any one of claims 1 to 6, wherein

the first flap performs a fifth action and a sixth action,

10 the fifth action is to rotate from an upper end to a lower end of a third range that includes the median point between the upper limit and the lower limit of the first rotation range and does not include the upper limit and the lower limit, and

the sixth action is to rotate from the lower end to the upper end of the third range.

8. The air conditioner according to any one of claims 1 to 7, further including a second flap,
15 wherein:

the casing further has a second blow-out port to blow out air;

the second flap is provided to the second blow-out port and vertically varies the direction of air blown out from the second blow-out port by rotating from an upper limit to a lower limit of a second rotation range; and

20 the second flap in swing control performs, within a fourth range which is smaller than the second rotation range and near to the upper limit of the second rotation range, a seventh action of approaching the lower limit of the second rotation range until reaching the lower end of the fourth range and an eighth action of approaching the upper limit of the second rotation range away from the lower end of the fourth range and rotates through the entire fourth range
25 due to at least one of the seventh action and the eighth action, and/or performs, within a fifth range which is smaller than the second rotation range and near to the lower limit of the second rotation range, a ninth action of approaching the upper limit of the second rotation range until reaching the upper end of the fifth range and a tenth action of approaching the lower limit of the second rotation range away from the upper end of the fifth range and rotates through the
30 entire fifth range due to at least one of the ninth action and the tenth action.

9. The air conditioner according to any one of claims 1 to 7,

further including a first drive motor to drive the first flap,

the first drive motor having substantially the same speed per unit time when moving the first flap.