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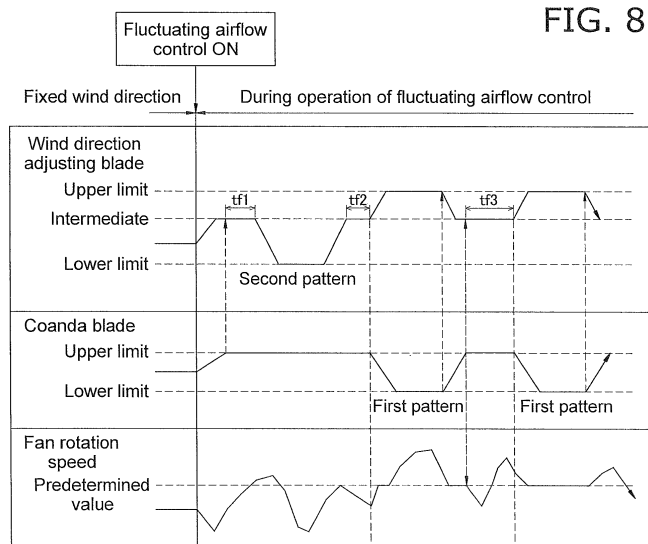
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(54) **AIR-CONDITIONING INDOOR UNIT**

(57) To provide an air conditioner indoor unit that through providing a variety of flows of wind is capable of realizing conditioned air closer to natural wind. In an air conditioner indoor unit (10), a control portion (40), during fluctuating airflow control, controls the operation of a Coanda blade implementing modes including a Coanda

generating condition that generates Coanda airflow, and a Coanda airflow not generated condition that does not generate Coanda airflow, thus during fluctuating airflow control, the flow of wind is varied by suddenly generating Coanda airflow, enabling conditioned air closer to natural wind to be provided to the occupant.



Description

TECHNICAL FIELD

[0001] The present invention relates to an air conditioner indoor unit, and more specifically an air conditioner indoor unit that uses the Coanda effect.

BACKGROUND ART

[0002] Recent years have seen efforts aimed at making living spaces more comfortable by making conditioned air blown out from an air conditioner indoor unit close to a natural airflow. For example in the air conditioner indoor unit disclosed in patent document 1 (Japanese Laid-open Patent Application No. 2001-41538), the wind direction of conditioned air is adjusted by three blades that swing up and down, at which time an airflow close to natural wind is attained by varying the phase of the three blades.

SUMMARY OF THE INVENTION

<Technical Problem>

[0003] In the above configuration however, the airflow simply gradually approaches a person then gradually recedes, without realizing varied wind.

[0004] A purpose of the present invention is to provide an air conditioner indoor unit that, through varying the flow of wind, realizes conditioned air more closely resembling natural wind.

<Solution to the Problem>

[0005] An air conditioner indoor unit according to a first aspect of the present invention causes the wind direction of conditioned air blown out from an outlet port to change upward and downward, generating fluctuating airflow, and is provided with a Coanda blade and a control portion. Through the Coanda effect, the Coanda blade, provided in the vicinity of the outlet port, forms the conditioned air into a Coanda airflow caused to follow the lower face of the blade itself, guided in a predetermined direction. The control portion controls the fluctuating airflow of conditioned air. Further, the control portion, during fluctuating airflow control, controls the operation of the Coanda blade, implementing a first mode that includes a Coanda generating condition that generates Coanda airflow, and a Coanda airflow not generated condition that does not generate Coanda airflow.

[0006] The Coanda blade, by the Coanda effect, changes the flow of conditioned air instantaneously to a Coanda airflow toward a predetermined direction. That is, if the Coanda effect is stopped, the Coanda airflow instantaneously switches to the original flow. In the case such as that in which conditioned air is flowing to an occupant, simultaneous with Coanda airflow occurring, the

conditioned air ceases flowing to the occupant, while simultaneous with Coanda airflow being stopped, the conditioned air flows to the occupant. This air conditioner indoor unit, during fluctuating airflow control, varies the flow of wind by instantaneously generating Coanda airflow, and is thus capable of providing to the occupant conditioned air closer to natural wind.

[0007] An air conditioner indoor unit according to a second aspect of the present invention causes the wind direction of conditioned air expelled from an outlet port to change upward and downward, generating fluctuating airflow, and is provided with Coanda blade and a control portion. Through the Coanda effect, the Coanda blade, provided in the vicinity of an outlet port, forms the conditioned air into a Coanda airflow caused to follow the lower face of the blade itself, guided in a predetermined direction. The control portion controls the fluctuating airflow by changing the wind change patterns. Further, the control portion is set in advance to be capable of implementing modes, being at least a first mode and a second mode. The first mode is a mode that, during fluctuating airflow control, controls the operation of the Coanda blade including a Coanda airflow generating condition that generates Coanda airflow and a Coanda airflow not generated condition that does not generate Coanda airflow. The second mode is a mode that, during fluctuating airflow control, continually does not generate Coanda airflow. Moreover, the control portion, during fluctuating airflow control, mixes the time periods for implementing the first mode and the time periods for implementing the second mode.

[0008] The Coanda blade, by the Coanda effect, changes the flow of conditioned air instantaneously to Coanda airflow toward a predetermined direction. That is, if the Coanda effect is stopped, the Coanda airflow instantaneously switches to the original flow. In the case such as that in which conditioned air flows onto an occupant, simultaneous with Coanda airflow occurring the conditioned air ceases flowing to the occupant, while simultaneous with Coanda airflow being stopped, the conditioned air flows to the occupant. This air conditioner indoor unit, during fluctuating airflow control, by mixing the time periods for implementing the first mode and the time periods for implementing the second mode, varies the flow of wind, and is thus capable of providing to the occupant conditioned air closer to natural wind.

[0009] An air conditioner indoor unit according to a third aspect of the present invention is the air conditioner indoor unit according to the first aspect or the second aspect, further provided with a wind direction adjusting blade for changing the blowout angle of conditioned air with respect to a horizontal plane. Further, the control portion, using either or both of the wind direction adjusting blade and the Coanda blade, controls the fluctuating airflow.

[0010] This air conditioning indoor unit is capable of realizing three kinds of fluctuating airflow, including fluctuating airflow through the wind direction adjusting blade

only, fluctuating airflow through the Coanda blade only, and fluctuating airflow through the wind direction adjusting blade and the Coanda blade, providing to the occupant fluctuating airflow replete with variation.

[0011] An air conditioner indoor unit according to a fourth aspect of the present invention is the air conditioner indoor unit according to the third aspect, in which the fluctuating airflow control includes an A mode and a B mode. The A mode causes the wind direction adjusting blade and the Coanda blade to swing, generating fluctuating airflow. The B mode causes only the wind direction adjusting blade to swing, generating fluctuating airflow.

[0012] With this air conditioner indoor unit, in the A mode, the fluctuating airflow gradually flowing toward and gradually receding from the occupant, repeats between a condition in which, due to the swing of the Coanda blade, the airflow instantaneously adheres to the lower face of the Coanda blade becoming Coanda airflow, not directed toward the occupant, and a condition in which the Coanda effect stops, the fluctuating airflow being directed again toward the occupant. Further, in the B mode, the conditioned air is swung up and down by the wind direction adjusting blade, creating fluctuating airflow gradually flowing toward and gradually receding from the occupant. That is, mixing the A mode and the B mode enables realization of fluctuating airflow with "unexpected breeze" and fluctuating airflow without "unexpected breeze".

[0013] An air conditioner indoor unit according to a fifth aspect of the present invention is the air conditioner indoor unit according to the fourth aspect, in which the fluctuating airflow control further includes a C mode for causing only the Coanda blade to swing, generating fluctuating airflow.

[0014] With this air conditioner indoor unit, in the C mode, when the direction of conditioned air is constant, the fluctuating airflow repeats between a condition in which, due to the swing of the Coanda blade, the airflow instantaneously adheres to the lower face of the Coanda blade becoming Coanda airflow, not directed toward the occupant, and a condition in which the Coanda effect stops, the fluctuating airflow being directed again toward the occupant. That is, "unexpected breeze" can be regularly generated.

[0015] An air conditioner indoor unit according to a sixth aspect of the present invention is the air conditioner indoor unit according to either of the first aspect or the second aspect, in which the control portion, during fluctuating airflow control, causes change in the air quantity of the conditioned air.

[0016] In this air conditioner indoor unit, by changing the air quantity in addition to wind direction, more comfortable air-conditioned space can be provided to the occupant as the conditioned air becomes airflow still closer to natural wind.

[0017] An air conditioner indoor unit according to a seventh aspect of the present invention is the air conditioner indoor unit according to the sixth aspect, in which the

control portion changes the air quantity of conditioned air in at least the time periods for generating Coanda airflow, to the predetermined air quantity.

[0018] In this air conditioner indoor unit, if the "unexpected breeze" does not reach the occupant there is no effect. That is, if the air quantity in the time periods for generating Coanda airflow decreases, conditioned air of the moments Coanda effect is stopped, due to the decrease in air quantity, does not reach the occupant and there is no "unexpected breeze".

[0019] In this air conditioner indoor unit, in at least the time periods for generating Coanda airflow, the air quantity of the conditioned air is changed to the predetermined air quantity, while conditioned air of the moments Coanda effect is stopped is maintained at the predetermined quantity, enabling "unexpected breeze" to be realized.

<Effects of the Invention>

[0020] With the air conditioner indoor unit according to the first aspect of the present invention, during fluctuating airflow control, by instantaneously generating Coanda airflow the flow of wind is varied, thus enabling conditioned air closer to natural wind to be provided to the occupant.

[0021] With the air conditioner indoor unit according to the second aspect of the present invention, during fluctuating airflow control, by mixing up the time periods for implementing the first mode and the time periods for implementing the second mode, the flow of wind is varied, thereby enabling conditioned air closer to natural wind to be provided to the occupant.

[0022] With the air conditioner indoor unit according to the third aspect of the present invention, three kinds of fluctuating airflow can be realized, including fluctuating airflow from the wind direction adjusting blade only, fluctuating airflow from the Coanda blade only, and fluctuating airflow from the wind direction adjusting blade and the Coanda blade, thus enabling fluctuating airflow replete with variation to be provided to the occupant.

[0023] With the air conditioner indoor unit according to the fourth aspect of the present invention, mixing the A mode and the B mode enables airflow with "unexpected breeze" and airflow without "unexpected breeze" to be provided.

[0024] With the air conditioner indoor unit according to the fifth aspect of the present invention, in the C mode, when the direction of the conditioned air is constant, there is repetition between a condition in which, due to the swing of the Coanda blade, the airflow instantaneously adheres to the lower face of the Coanda blade becoming Coanda airflow, not directed toward the occupant, and a condition in which the Coanda effect stops, the fluctuating airflow being directed again toward the occupant. That is, "unexpected breeze" can be regularly generated.

[0025] With the air conditioner indoor unit according to the sixth aspect of the present invention, by changing the air quantity in addition to wind direction, the conditioned

air becomes airflow closer to natural wind, enabling more comfortable air-conditioned space to be provided to the occupant.

[0026] With the air conditioner indoor unit according to the seventh aspect of the present invention, in at least the time periods for generating Coanda airflow, the air quantity of the conditioned air is changed to the predetermined air quantity, and conditioned air of the moments Coanda effect is stopped is maintained at the predetermined air quantity, enabling "unexpected breeze" to be realized.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027]

FIG. 1 is a cross-sectional view of an air conditioner indoor unit during the operation shutdown according to an embodiment of the present invention.

FIG. 2 is a cross-sectional view of the air conditioner indoor unit during operation.

FIG. 3A is a side view of the wind direction adjusting blade and the Coanda blade during normal forward blow of conditioned air.

FIG. 3B is a side view of the wind direction adjusting blade and the Coanda blade during normal forward-downward blow of conditioned air.

FIG. 3C is a side view of the wind direction adjusting blade and the Coanda blade during Coanda airflow forward blow.

FIG. 3D is a side view of the wind direction adjusting blade and the Coanda blade during Coanda airflow ceiling directed blow.

Fig. 4A is a conceptual diagram showing the direction of conditioned air and the direction of the Coanda airflow.

Fig. 4B is a conceptual diagram showing an example of the opening angles of the wind direction adjusting blade and the Coanda blade.

FIG. 5A is a comparative view showing, during Coanda airflow forward blow, the interior angle formed between the tangential line of scroll termination F and the Coanda blade, and the interior angle formed between the tangential line of scroll termination F and the wind direction adjusting blade.

FIG. 5B is a comparative view showing, during Coanda airflow ceiling blow, the interior angle formed between the tangential line of scroll termination F and the Coanda blade, and the interior angle formed between the tangential line of scroll termination F and the wind direction adjusting blade.

FIG. 6A is a side view of an air conditioner indoor unit installation space indicating the wind direction of conditioned air from the upward-downward swing of the wind direction adjusting blade.

FIG. 6B is a side view of the air conditioner indoor unit installation space showing the wind direction of conditioned air when the wind direction adjusting

blade is downwardly directed.

FIG. 6C is a side view of the air conditioner indoor unit installation space showing the wind direction of the Coanda airflow when the posture of the Coanda blade is the ceiling blow posture.

FIG. 7 is a flowchart showing, the operation of the wind direction adjusting blade and the Coanda blade during fluctuating airflow A control.

FIG. 8 is a flowchart showing the operation of the wind direction adjusting blade and the Coanda blade, and the fan rotation speed of the indoor fan, during fluctuating airflow B control.

FIG. 9 is a flowchart showing the operation of the wind direction adjusting blade and the Coanda blade during fluctuating airflow control, for a first modification.

FIG. 10 is a flowchart showing the operation of the wind direction adjusting blade and the Coanda blade during fluctuating airflow control, for a second modification.

DESCRIPTION OF THE EMBODIMENTS

[0028] An embodiment of the present invention will be described with reference to the drawings, it being understood that the embodiment described following is a basic example that is illustrative of the present invention and not intended to restrict the technical scope of the present invention.

(1) Overall configuration of the air conditioner indoor unit 10

[0029] FIG. 1 is a cross-sectional view of an air conditioner indoor unit 10 according to the first embodiment of the present invention during operation shutdown. FIG. 2 is a cross-sectional view of the air conditioner indoor unit 10 during operation. In FIG. 1 and FIG. 2 the air conditioner indoor unit 10 is a wall-mounted type, provided with a body casing 11, an indoor heat exchanger 13, an indoor fan 14, a bottom frame 16, and a control portion 40.

[0030] The body casing 11 has a top surface portion 11a, a front panel 11b, a back plate 11c and a lower horizontal plate 11d, while housed inside are the indoor heat exchanger 13, the indoor fan 14, the bottom frame 16 and the control portion 40.

[0031] The top surface portion 11a is located to the top of the body casing 11, a suction inlet (not shown in the drawing) being provided in the front portion thereof.

[0032] The front panel 11b constitutes the front surface portion of the indoor unit, having a flat form with no suction inlet. Further, the upper end of the front panel 11b is rotatably supported to the top surface portion 11a, and the front panel 11b is able to operate as a hinge.

[0033] The indoor heat exchanger 13 and the indoor fan 14 are attached to the bottom frame 16. The indoor heat exchanger 13 performs heat exchange by exchange

with through-passing air. Further, the indoor heat exchanger 13, in the side view, forms an inverted V-shape with both ends bent downward, the indoor fan 14 being located below. The indoor fan 14 is a cross flow fan, applying air taken in from inside the room to the indoor heat exchanger 13 and causing this to pass through the indoor heat exchanger 13 before being blown out inside the room.

[0034] An outlet 15 is provided in the lower portion of the body casing 11. A wind direction adjusting blade 31 that changes the direction of conditioned air blown out from the outlet 15 is installed to the outlet 15 so as to be able to rotate freely. The wind direction adjusting blade 31, driven by a motor (not shown in the drawing), changes the direction of the conditioned air, and can open and close the outlet 15. The wind direction adjusting blade 31 can take multiple postures of differing angles of inclination.

[0035] Further, a Coanda blade 32 is provided in the vicinity of the outlet 15. The Coanda blade 32, driven by a motor (not shown in the drawing), is able to take postures inclined along the forward-rearward direction, and during operation shutdown is housed in a housing portion 130 provided to the front panel 11b. The Coanda blade 32 can take multiple postures of differing angles of inclination.

[0036] The outlet 15 is linked to the inside of the body casing 11 by an outlet passage 18. The outlet passage 18 is formed following a scroll 17 of the bottom frame 16 from the outlet 15.

[0037] Indoor air is sucked in by the operation of the indoor fan 14 into the indoor fan 14, passing via the suction inlet and the indoor heat exchanger 13, and is blown from the indoor fan 14 out from the outlet 15, after passing via the outlet passage 18.

[0038] The control portion 40 is located to the right side of the indoor heat exchanger 13 and the indoor fan 14, viewing the body casing 11 from the front panel 11b, and controls the rotation speed of the indoor fan 14 and the operations of the wind direction adjusting blade 31 and the Coanda blade 32.

(2) Detailed configuration

(2-1) Front panel 11b

[0039] As shown in FIG. 1, the front panel 11b extends towards the front edge of the lower horizontal plate 11d while drawing a gently arcing curved surface from the front at the top of the body casing 11. A recessed region is toward the inner side of the body casing 11, at the lower portion of the front panel 11b. The depth of the recession is set so as to match the dimensions of the thickness of the Coanda blade 32, forming the housing portion 130 accommodating the Coanda blade 32. The surface of the housing portion 130 also is a gently arcing curved surface.

(2-2) Outlet 15

[0040] As shown in FIG. 1, the outlet 15 is formed in the lower portion of the body casing 11, and is a rectangular opening, the length to the lateral direction (the direction orthogonal to the page of FIG. 1). The lower end of the outlet 15 is in contact with the front edge of the lower horizontal plate 11d, a virtual surface connecting the lower end and the upper end of the outlet 15 inclining forward and upward.

(2-3) Scroll 17

[0041] The scroll 17 is a partition wall curved so as to oppose the indoor fan 14, and is a part of the bottom frame 16. The termination F of the scroll 17 reaches the vicinity of the periphery of the outlet 15. Air passing through the outlet passage 18 advances following the scroll 17, and is delivered in the tangential direction of the termination F of the scroll 17. Accordingly, if the wind direction adjusting blade 31 is not over the outlet 15, the wind direction of conditioned air blown out from the outlet 15 is substantially the direction along the tangential line L0 of the termination F of the scroll 17.

(2-4) Perpendicular wind direction adjusting blade 20

[0042] The perpendicular wind direction adjusting blade 20, as shown in FIG. 1 and FIG. 2, has a plurality of blade pieces 201 and a connecting rod 203 connecting the plurality of blade pieces 201. Further, the perpendicular wind direction adjusting blade 20 is arranged, in the outlet passage 18, closer to the indoor fan 14 than is the wind direction adjusting blade 31.

[0043] The plurality of blade pieces 201, due to the horizontal reciprocal movement of the connecting rod 203 following the longitudinal direction of the outlet 15, swing left-right centered on a vertical condition in relation to that longitudinal direction. Note that the connecting rod 203 is driven in the horizontal reciprocal movement by a motor (not shown in the drawing).

(2-5) Wind direction adjusting blade 31

[0044] The wind direction adjusting blade 31 has an area of an extent that enables blocking of the outlet 15. In the state in which the wind direction adjusting blade 31 has closed the outlet 15, the outside surface 31a finishes as a convex, gently arcing curved surface on the outside, as if extending along the curved surface of the front panel 11b. Further the inner surface 31b of the wind direction adjusting blade 31 (refer FIG. 2) also forms an arcing curved surface substantially parallel to the outside.

[0045] The wind direction adjusting blade 31 has a rotating shaft 311 to the lower end portion thereof. The rotating shaft 311 links to the rotating shaft of a stepping motor (not shown in the drawing) secured to the body casing 11 in the vicinity of the lower end of the outlet 15.

[0046] By turning of the rotating shaft 311 in the anti-clockwise direction in the front view of FIG. 1, the upper end of the wind direction adjusting blade 31 recedes from the upper end side of the outlet 15, opening the outlet 15, while by turning of the rotating shaft 311 in the clockwise direction in the front view of FIG. 1, the upper end of the wind direction adjusting blade 31 moves closer to the upper end side of the outlet 15, closing the outlet 15.

[0047] In the condition in which the wind direction adjusting blade 31 has opened the outlet 15, conditioned air blown out from the outlet 15 flows substantially along the inner surface 31b of the wind direction adjusting blade 31. That is, the wind direction of the conditioned air blown out substantially following the tangential direction of the termination F of the scroll 17, is changed to be somewhat upwardly directed by the wind direction adjusting blade 31.

(2-6) Coanda blade

[0048] The Coanda blade 32 is housed in the housing portion 130 during air conditioning operations shut down or during operation of normal blowout mode described subsequently. The Coanda blade 32 moves away from the housing portion 130 by turning. A rotating shaft 321 of the Coanda blade 32 is provided in the vicinity of the lower end of the housing portion 130, positioned to the inner side of the body casing 11 (a position above the upper wall of the outlet passage 18), the lower end portion of the Coanda blade 32 and the rotating shaft 321 being connected maintaining a predetermined distance. Thus to the extent that, as the rotating shaft 321 turns, the Coanda blade 32 moves away from the housing portion 130 of the indoor unit front surface portion, the height position of the lower end of the Coanda blade 32 turns so as to lower. Further, the inclination when the Coanda blade 32 turns and opens is more gradual than the inclination of the indoor unit front surface portion.

[0049] In this embodiment, the housing portion 130 is provided outside of the wind blast passage, and when housed, the entirety of the Coanda blade 32 is accommodated to the outside of the wind blast passage. Instead of this configuration, it is also suitable for only part of the Coanda blade 32 to be housed outside the wind blast passage, and for the remainder to be accommodated within the wind blast passage (for example the upper wall portion of the wind blast route).

[0050] Further, as the rotating shaft 321 turns in the anti-clockwise direction in the front view of FIG. 1, the upper end and the lower end of the Coanda blade 32 move away from the housing portion 130, drawing an arc, at which time, the minimum distance between the upper end and the housing portion 130 of the indoor unit front surface portion, above the outlet 15 is greater than the minimum distance between the lower end and the housing portion 130. That is, the Coanda blade 32 is controlled to a posture moving away from the indoor unit front surface portion in accordance with forward movement.

As the rotating shaft 321 turns in the clockwise direction in the front view of FIG. 1, the Coanda blade 32 approaches the housing portion 130 and finally is accommodated therein. The postures for the conditions of operation of the Coanda blade 32, are the state of the Coanda blade 32 being accommodated in the housing portion 130, rotated, inclining the posture forward and upward, further rotated, the posture becoming largely horizontal, and further rotated, inclining the posture forward and downward.

[0051] In the state in which the Coanda blade 32 is accommodated in the housing portion 130, the outside surface 32a of the Coanda blade 32 finishes as a convex, gently arcing curved surface on the outside, as if extending the gently arcing curved surface of the front panel 11b. Further, the inner surface 32b of the Coanda blade 32 finishes as an arc curved surface following the surface of the housing portion 130.

[0052] Further, the dimensions in the longitudinal direction of the Coanda blade 32 are set so as to be greater than the dimensions in the longitudinal direction of the wind direction adjusting blade 31. The reason is that all conditioned air having the wind direction adjusted by the wind direction adjusting blade 31 is received at the Coanda blade 32, the purpose being to prevent conditioned air short-circuiting from the side direction of the Coanda blade 32.

(3) Directional control of conditioned air

[0053] The air conditioner indoor unit according to this embodiment has, as a means for controlling the directionality of conditioned air, a normal blowout mode that causes rotation of only the wind direction adjusting blade 31, adjusting the direction of conditioned air, and Coanda airflow effect using mode, that causes rotation of the wind direction adjusting blade 31 and the Coanda blade 32, with conditioned air, due to the Coanda effect, becoming Coanda airflow following the outside surface 32a of the Coanda blade 32.

[0054] The wind direction adjusting blade 31 and the Coanda blade 32 change posture for each blowout direction of air in each of the above modes, and these postures will be described with reference to the drawings. Note that selection of the blowout direction is performed by a user via for example, a remote control. Further, it is possible to control the mode change or blowout direction so as to change automatically.

(3-1) Normal blowout mode

[0055] The normal blowout mode is a mode that causes rotation of the wind direction adjusting blade 31 only, for adjusting the direction of conditioned air, and includes "normal forward blow" and "normal forward-downward blow".

(3-1-1) Normal forward blow

[0056] FIG. 3A is a side view of the wind direction adjusting blade 31 and the Coanda blade 32 during normal forward blow of conditioned air. In FIG. 3A, when the user selects "normal forward blow", the control portion 40 causes rotation of the wind direction adjusting blade 31 until the inner surface 31b of the wind direction adjusting blade 31 reaches a position roughly horizontal. Note that in the case as in this embodiment, in which the inner surface 31b of the wind direction adjusting blade 31 forms an arcing curve, the wind direction adjusting blade 31 is caused to rotate such that the tangential line for the forward end E1 of the inner surface 31b becomes roughly horizontal. Resultantly, the conditioned air is in the forward blow condition.

(3-1-2) Normal forward-downward blow

[0057] FIG. 3B is a side view of the wind direction adjusting blade 31 and the Coanda blade 32 during normal forward-downward blow of conditioned air. In FIG. 3B, when the user wants the blowout direction facing further downward than "normal forward blow", the user selects "normal forward-downward blow".

[0058] Here, the control portion 40 causes rotation of the wind direction adjusting blade 31 until the tangential line for the forward end E1 of the inner surface 31b of the wind direction adjusting blade 31 becomes more forward falling than horizontal. Resultantly, the conditioned air is in the forward-downward blow condition.

(3-1-3) Automatic wind direction

[0059] FIG. 6A is a side view of a space for installation of the air conditioner indoor unit indicating the wind direction of conditioned air from the upward-downward swing of the wind direction adjusting blade 31. Wind direction adjustment as shown in FIG. 6A, also found in existing products, is what is known as wind direction adjustment through auto louver function, employing means for repeating an operation to apply wind and an operation to not apply wind to a human 400.

(3-2) Coanda effect using mode

[0060] Coanda (effect) is a phenomena in which if there is a wall near a flow of gas or liquid, even if the direction of the flow and the direction of the wall are different, the flow direction comes to follow the wall surface ("Hōsoku no Jiten (Legal Dictionary)", Asakura Publishing Co., Ltd.). The Coanda effect using mode includes "Coanda airflow forward blow" and "Coanda airflow ceiling blow", using the Coanda effect.

[0061] Further, in respect of the direction of the conditioned air and the direction of Coanda airflow, the method of definition differs according to how the reference position is taken, an example will now be provided. Fig. 4A

is a conceptual diagram showing the direction of conditioned air and the direction of the Coanda airflow. In FIG. 4A generating Coanda effect at the outside surface 32a side of the Coanda blade 32 requires that the inclination of the direction (D1) of conditioned air as changed by the wind direction adjusting blade 31 becomes close to the posture (inclination) of the Coanda blade 32, and if both those blades are too removed the Coanda effect does not arise. Thus, in the Coanda effect using mode it is necessary that the Coanda blade 32 and the wind direction adjusting blade 31 are at less than a predetermined angle of opening, that both blades (31, 32) are made within that range, such that the above described relationship is formed. Thus, as shown in FIG. 4A, after the wind direction of the conditioned air is changed to D1 by the wind direction adjusting blade 31, the wind direction is further changed by the Coanda effect to D2.

[0062] Further, with the Coanda effect using mode according to this embodiment, it is preferable that the Coanda blade 32 be located forward of (downstream side of blowout) and above the wind direction adjusting blade 31.

[0063] Again, in respect of the angle of opening of the wind direction adjusting blade 31 and the Coanda blade 32, the method of definition differs according to how the reference position is taken, an example will be provided below. Fig. 4B is a conceptual diagram showing an example of the opening angles of the wind direction adjusting blade 31 and the Coanda blade 32. In FIG. 4B, when the angle of the horizontal line and the straight line joining the front and rear ends of the inner surface 31b of the wind direction adjusting blade 31 is made the angle of inclination θ_1 of the wind direction adjusting blade 31, and the angle of the horizontal line and the straight line joining the front and rear ends of the outside surface 32a of the Coanda blade 32 is made the angle of inclination θ_2 of the Coanda blade 32, the opening angles of the wind direction adjusting blade 31 and the Coanda blade 32 are $\theta = \theta_2 - \theta_1$. Note that θ_1 and θ_2 are not absolute values, and in the case of being below the horizontal line in the front view of FIG. 4B, are negative values.

[0064] With both "Coanda airflow forward blow" and "Coanda airflow ceiling blow", it is preferable that the wind direction adjusting blade 31 and the Coanda blade 32 take a posture that fulfills the condition in which the interior angle formed by the tangential line of termination F of the scroll 17 and the Coanda blade 32, is greater than the interior angle formed by the tangential line of termination F of the scroll 17 and the wind direction adjusting blade 31.

[0065] Concerning these interior angles, referring to FIG. 5A and FIG. 5B, FIG. 5A comparing, during Coanda airflow forward blow, the interior angle R2 formed by the tangential line L0 of the termination F of the scroll 17 and the Coanda blade 32, and the interior angle R1 formed by the tangential line L0 of the termination F of the scroll 17 and the wind direction adjusting blade 31; and FIG. 5B comparing, during Coanda airflow ceiling blow, the interior angle R2 formed by the tangential line L0 of the

termination F of the scroll 17 and the Coanda blade 32, and the interior angle R1 formed by the tangential line L0 of the termination F of the scroll 17 and the wind direction adjusting blade 31.

[0066] Further, as shown in FIG. 5A and FIG. 5B, with the Coanda blade 32 in the Coanda effect usage mode, the tip end portion of the Coanda blade 32 being forward and above horizontal, is positioned further outside and above the outlet 15. Resultantly, the Coanda airflow reaches further, there is suppressed generation of strong airflow passing to the upper side of the Coanda blade 32, and upward guidance of Coanda airflow is less inhibited.

[0067] Again, as the height position of the rear end portion of the Coanda blade 32 becomes lower than during operation shutdown, Coanda airflow from the Coanda effect at the upstream side is generated easily.

(3-2-1) Coanda airflow forward blow

[0068] FIG. 3C is a side view of the wind direction adjusting blade 31 and the Coanda blade 32 during Coanda airflow forward blow. In FIG. 3C, when "Coanda airflow forward blow" is selected, the control portion 40 rotates the wind direction adjusting blade 31 until the tangential line L1 for the forward end E1 of the inner surface 31b of the wind direction adjusting blade 31 becomes more forward falling than horizontal.

[0069] Next, the control portion 40 rotates the Coanda blade 32 until the outside surface 32a of the Coanda blade 32 reaches a position roughly horizontal. Note that in the case as in this embodiment, in which the outside surface 32a of the Coanda blade 32 forms an arced curve, the Coanda blade 32 is caused to rotate such that the tangential line L2 for the forward end E2 of the outside surface 32a becomes roughly horizontal. That is, as shown in FIG. 5A, the interior angle R2 formed by the tangential line L0 and the tangential line L2 is greater than the interior angle R1 formed between the tangential line L0 and the tangential line L1.

[0070] The conditioned air adjusted to forward-downward blow at the wind direction adjusting blade 31, becomes, due to the Coanda effect, flow adhering to the outside surface 32a of the Coanda blade 32, changing to a Coanda airflow following the outside surface 32a.

[0071] Thus, though the direction of the tangential line L1 for the forward end E1 of the wind direction adjusting blade 31 is forward-downward blow, as the direction of the tangential line L2 for the forward end E2 of the Coanda blade 32 is horizontal, due to the Coanda effect, the conditioned air is blown out in the direction L2 for the forward end E2 of the outside surface 32a of the Coanda blade 32, that is to say the horizontal direction.

[0072] The Coanda blade 32 separates from the indoor unit front surface portion, the inclination becoming gradual, and the conditioned air becomes susceptible to Coanda effect further forward of the front panel 11b. Resultantly, though the conditioned air with wind direction

adjusted at the wind direction adjusting blade 31 is forward-downward blow, this becomes, due to the Coanda effect, horizontally blown air. Here, in comparison to the method in which air, immediately after passing through the outlet, approaches the front panel, and is upwardly directed by the Coanda effect of the front panel, pressure loss through ventilation resistance of the wind direction adjusting blade 31 is controlled while changing the wind direction.

(3-2-2) Coanda airflow ceiling blow

[0073] FIG. 3D is a side view of the wind direction adjusting blade 31 and the Coanda blade 32 during Coanda airflow ceiling blow. In FIG. 3D, when "Coanda airflow ceiling blow" is selected, the control portion 40 rotates the wind direction adjusting blade 31 until the tangential line L1 for the forward end E1 of the inner surface 31b of the wind direction adjusting blade 31 is horizontal.

[0074] Next, the control portion 40 rotates the Coanda blade 32 until the tangential line L2 for the forward end E2 of the outside surface 32a is directed forward and upward. That is, as shown in FIG. 5B, the interior angle R2 formed by the tangential line L0 and the tangential line L2 becomes greater than the interior angle R1 formed by the tangential line L0 and the tangential line L1. The conditioned air adjusted to horizontal blow at the wind direction adjusting blade 31, due to the Coanda effect, flows adhering to the outside surface 32a of the Coanda blade 32, changing to this Coanda airflow following the outside surface 32a.

[0075] Accordingly, though the direction of the tangential line L1 for the forward end E1 of the wind direction adjusting blade 31 is forward blow, as the direction of the tangential line L2 for the forward end E2 of the Coanda blade 32 is forward-upward blow, due to the Coanda effect, the conditioned air is blown out in the direction L2 for the forward end E2 of the outside surface 32a of the Coanda blade 32, that is to say the direction toward the ceiling. As the tip end portion of the Coanda blade 32 projects to the outside of the outlet 15, the Coanda airflow reaches further. Moreover, as the tip end portion of the Coanda blade 32 is positioned above the outlet 15, there is suppressed generation of strong airflow passing to the upper side of the Coanda blade 32, and upward guidance of Coanda airflow is less inhibited.

[0076] In this way, the Coanda blade 32 separates from the indoor unit front surface portion, the inclination becoming gradual, and the conditioned air becomes susceptible to Coanda effect further forward of the front panel 11b. Resultantly, though the conditioned air with wind direction adjusted at the wind direction adjusting blade 31 is forward blow, this becomes, due to the Coanda effect, upwardly directed air.

[0077] Note that the dimensions in the longitudinal direction of the Coanda blade 32 are greater than the dimensions in the longitudinal direction of the wind direction adjusting blade 31. Thus all conditioned air having

the wind direction adjusted by the wind direction adjusting blade 31 can be received at the Coanda blade 32, furnishing the effect of preventing conditioned air short-circuiting from the side direction of the Coanda blade 32.

(3-2-3) Unexpected breeze

[0078] FIG. 6B is a side view of the air conditioner indoor unit installation space showing the wind direction of conditioned air when the wind direction adjusting blade 31 is downwardly directed. Further, FIG. 6C is a side view of the air conditioner indoor unit installation space showing the wind direction of the Coanda airflow when the posture of the Coanda blade 32 is the ceiling blow posture.

[0079] In FIG. 6B and FIG. 6C, wind directed to the human 400 as in FIG. 6B, changes to an upwardly directed Coanda airflow as in FIG. 6C, through usage of the Coanda effect, thereafter, by performing the contrary operation, an unexpected breeze can be created and expelled, as if applied suddenly to the human 400.

[0080] For example, when the wind direction adjusting blade 31 directs conditioned air in the direction in which an occupant is, in the case of having the Coanda blade 32 in an irregular cycle, move so as to span the boundary area between the region in which Coanda effect is generated and the region in which Coanda effect is not generated, Coanda airflow is repeatedly generated and stopped, producing wind that is applied suddenly to the occupant.

(3-2-4) Fluctuating airflow A

[0081] Fluctuating airflow is airflow generated by irregularly fluctuating the wind direction of conditioned air, and differs to automatic wind direction as described in (3-1-3) on the point that wind direction is irregularly fluctuated.

[0082] FIG. 7 is a flowchart showing operations of the wind direction adjusting blade 31 and the Coanda blade 32 during fluctuating airflow A control. In FIG. 7, the wind direction adjusting blade 31 swings between an upper limit position and a lower limit position, interspersed by an operation of waiting in an intermediate position. The control portion 40 irregularly changes the times in which the wind direction adjusting blade 31 waits in the intermediate position (the intermediate position waiting time), so that by irregularly interchanging the combination of wind approaching the occupant and wind receding from the occupant, the occupant is provided with a variety of winds.

[0083] Moreover, the Coanda blade 32 swings between an upper limit position and a lower limit position. As shown in FIG. 7, fluctuating airflow control includes a first pattern in which, while the Coanda blade 32 swings between the upper limit position and the lower limit position, the wind direction adjusting blade 31 swings between the upper limit position and the intermediate position, and a second pattern in which, while the Coanda

blade 32 waits in the upper limit position, the wind direction adjusting blade 31 swings between the intermediate position and the lower limit position.

[0084] In the first pattern, the operation of the Coanda blade 32 swinging from the upper limit position toward the lower limit position synchronizes with the timing of the wind direction adjusting blade 31 swinging from the intermediate position toward the upper limit position. Further, the operation of the Coanda blade 32 swinging from the lower limit position toward the upper limit position synchronizes with the timing of the wind direction adjusting blade 31 swinging from the upper limit position toward the intermediate position.

[0085] When the wind direction adjusting blade 31 is in the intermediate position, the Coanda blade 32 is controlled so as to be in the upper limit position so Coanda airflow is not generated. Accordingly, by changing the intermediate position waiting time of the wind direction adjusting blade 31 irregularly, the times during which Coanda airflow is not generated change irregularly, interspersed irregularly with intervals of wind unexpectedly blowing, enabling the occupant to be provided with a variety of winds.

[0086] Note that in the intermediate position waiting time of the wind direction adjusting blade 31, as conditioned air is caused to flow stably, in one direction, in this embodiment, the time of the wind direction adjusting blade 31 being in the intermediate position, and the time of the Coanda blade 32 being in the upper limit position are counted as waiting time.

[0087] Further, the control portion 40 can cause the respective times for the wind direction adjusting blade 31 waiting in the upper limit position and waiting in the lower limit position to change irregularly, and cause the times at which the Coanda blade 32 waits in the lower limit position to change irregularly.

[0088] In this way, as the wind direction adjusting blade 31 and the Coanda blade 32 swing irregularly, the occupant is able to be provided with conditioned air closer to natural wind.

(3-2-5) Fluctuating airflow B

[0089] FIG. 8 is a flowchart showing the operation of the wind direction adjusting blade 31 and the Coanda blade 32, and the fan rotation speed of the indoor fan 14, during fluctuating airflow B control. In FIG. 8 the operations of the wind direction adjusting blade 31 and the Coanda blade 32 are the same as during fluctuating airflow A control, however the difference in relation to fluctuating airflow A control lies in the point that the rotation speed of the indoor fan 14 is caused to change in conformance with the operations of the wind direction adjusting blade 31 and the Coanda blade 32.

[0090] Particularly, with fluctuating airflow B control, at the point in time at which the Coanda blade 32 commences the transition from the upper limit position to the lower limit position the fan rotation speed of the indoor fan 14

risers to a predetermined value. Predetermined value here is the fan rotation speed for maintaining minimum air quantity by which wind peeling off from the Coanda blade 32 can reach the occupant.

[0091] Accordingly, at the point in time at which the Coanda blade 32 commences transition from the upper limit position to the lower limit position, if the fan rotation speed of the indoor fan 14 rises to the predetermined value, when the airflow peels off from the Coanda blade 32 and is directed toward the occupant, the airflow definitively reaches the occupant, producing an unexpected breeze.

(4) Operation

[0092] The operations of the wind direction adjusting blade 31 and the Coanda blade 32 during fluctuating airflow B control, will be described with reference to FIG. 8. In FIG. 8, when the wind direction mode switches from fixed wind direction control to fluctuating airflow B control, once, the wind direction adjusting blade 31 moves to the intermediate position and waits. Simultaneously, the Coanda blade 32 moves to the upper limit position and waits. The control portion 40, calculates the waiting time from the starting point of, the time when the wind direction adjusting blade 31 reaches the intermediate position and the time when the Coanda blade 32 reaches the upper limit position.

[0093] The wind direction adjusting blade 31, after a first waiting time tf_1 has elapsed, commences the transition to the lower limit position, then after reaching the lower limit position, remains still in the lower limit position for a predetermined time only, then commences transition to the intermediate position again. The wind direction adjusting blade 31 that has transitioned to the intermediate position, after waiting there for a second waiting time tf_2 only, commences the transition to the upper limit position. At this time, the Coanda blade 32, in synchronicity, commences transition to the lower limit position. The Coanda blade 32 having reached the lower limit position, after waiting there for a certain time only, commences rising toward the upper limit position.

[0094] Further, the wind direction adjusting blade 31 having reached the upper limit position, also waits there only a certain time, and in synchronicity with the Coanda blade 32 starting the transition to the upper limit position, commences transition toward the intermediate position. The wind direction adjusting blade 31 having reached the intermediate position, waits there, and during this time, the Coanda blade 32 reaches the upper limit position. The control portion 40 calculates the waiting time from the starting point of, the time when the wind direction adjusting blade 31 reaches the intermediate position and the time when the Coanda blade 32 reaches the upper limit position.

[0095] The wind direction adjusting blade 31, after waiting a second waiting time tf_3 only, commences the transition to the upper limit position. At this time the Coan-

da blade 32, in synchronicity, commences transition to the lower limit position. The Coanda blade 32 having reached the lower limit position, waits a certain time only, then commences rising toward the upper limit position.

[0096] Again, the wind direction adjusting blade 31 having already reached the upper limit position, waits there a certain time only, and in synchronicity with the Coanda blade 32 commencing transition to the upper limit position, commences transition toward the intermediate position. Thereafter operations conform with the wind direction patterns having differing waiting times as set in advance.

[0097] Further, the control portion 40 can cause the respective times for the wind direction adjusting blade 31 waiting in the upper limit position and waiting in the lower limit position to change irregularly, and cause the times at which the Coanda blade 32 waits in the lower limit position to change irregularly.

[0098] The fan rotation speed of the indoor fan 14 repeats irregularly rising or lowering, according to a pattern of varied fluctuations set in advance. When the Coanda blade 32 is in the lower limit position, a restriction is implemented causing the fan rotation speed to fluctuate irregularly in a range greater than a predetermined value. Then, the Coanda blade 32 commences transition from the lower limit position to the upper limit position, and at the point in time when the Coanda blade 32 reaches the upper limit position, the restriction is stopped and the fan rotation speed is caused to fluctuate irregularly.

[0099] Thus by causing the fan rotation speed of the indoor fan 14 to fluctuate in conformance with the operations of the wind direction adjusting blade 31 and the Coanda blade 32, low frequency fluctuations and undulations are produced, enabling conditioned air closer to natural wind to be provided to the occupant. Moreover during the periods in which the Coanda blade 32 transitions from the upper limit position to the lower limit position, waits, and then transitions again to the upper limit position, as the minimum air quantity is ensured that enables wind peeling off from the Coanda blade 32 to reach the occupant, the control implemented is such that the fan rotation speed is greater than the predetermined value.

(5) Characteristics

(5-1)

[0100] In the air conditioner indoor unit 10, during fluctuating airflow control, the control portion 40 controls the operation of the Coanda blade, implementing modes including a Coanda generating condition that generates Coanda airflow and a Coanda airflow not generated condition that does not generate Coanda airflow, thus during fluctuating airflow control, the flow of wind is varied as Coanda airflow is generated suddenly, enabling conditioned air closer to natural wind to be provided to the occupant.

(5-2)

[0101] Further, as the control portion 40 causes the air quantity of conditioned air to change during fluctuating airflow control, the change in air quantity in addition to wind direction produces conditioned air still closer to natural wind, enabling a more comfortable air-conditioned space to be provided to the occupant.

(5-3)

[0102] Moreover, in the time periods for generation of Coanda airflow, that is, during the time when the Coanda blade 32 moves from the upper limit position to the lower limit position, waits and then moves again to the upper limit position, the control portion 40 changes the air quantity of conditioned air to a predetermined value. Thus, conditioned air during the moment of the Coanda effect being stopped definitively reaches the occupant, providing an "unexpected breeze".

(6) Modifications

[0103] With the above described embodiment, in both fluctuating airflow A control and fluctuating airflow B control, causing the wind direction adjusting blade 31 and the Coanda blade 32 to swing irregularly realizes modes including a Coanda airflow generation condition in which Coanda airflow is generated and a Coanda airflow not generated condition in which Coanda airflow is not generated, however this is illustrative and not restrictive. Modifications of fluctuating airflow control will be described.

(6-1) First modification

[0104] FIG. 9 is a flowchart showing the operations of the wind direction adjusting blade 31 and the Coanda blade 32 during fluctuating airflow control for a first modification. In FIG. 9 the fluctuating airflow control in the first modification is characterized by mixing up time periods implementing A mode, in which the wind direction adjusting blade 31 and the Coanda blade 32 are caused to swing generating fluctuating airflow, with time periods implementing B mode in which only the wind direction adjusting blade 31 is caused to swing, generating fluctuating airflow.

[0105] A mode is the same as fluctuating airflow A control for the above described embodiment, in which the wind direction adjusting blade 31 swings between an upper limit position and a lower limit position, interspersed by an operation for waiting in an intermediate position. The control portion 40 irregularly changes the times in which the wind direction adjusting blade 31 waits in the intermediate position, so that by irregularly interchanging the combination of wind approaching the occupant and wind receding from the occupant, the occupant is provided with a variety of winds.

[0106] Moreover, the Coanda blade 32 swings between an upper limit position and a lower limit position. The control portion 40 irregularly changes the times in which the Coanda blade 32 waits in the upper limit position, such that the times of not generating Coanda airflow change irregularly, interchanged irregularly with intervals of wind unexpectedly blowing to the occupant, thus enabling the occupant to be provided with a variety of winds.

[0107] In B mode the Coanda blade 32 transitions to a fully closed position, such that, regardless of the wind direction adjusting blade 31 being in the upper or lower limit position, Coanda airflow is continually not generated. Nevertheless, the wind direction adjusting blade 31 swings between the upper limit position and the lower limit position interspersed with the operation for waiting in the intermediate position. During this time, the control portion 40 irregularly changes the periods during which the wind direction adjusting blade 31 waits in the intermediate position, so that by irregularly interchanging the combination of wind approaching the occupant and wind receding from the occupant, the occupant is provided with a variety of winds.

[0108] That is, mixing A mode and B mode creates mutual repetition between the fluctuating airflow with "unexpected breeze" and fluctuating airflow without "unexpected breeze", realizing a variety of winds.

(6-2) Second modification

[0109] FIG. 10 is a flowchart showing the operations of the wind direction adjusting blade 31 and the Coanda blade 32 during fluctuating airflow control for a second modification. In FIG. 10 fluctuating airflow control for the second modification is characterized by mixing in, in addition to the A mode and the B mode of fluctuating airflow control according to the first modification, a C mode that causes swing of the Coanda blade 32 only, generating fluctuating airflow.

[0110] In C mode for example, when there is constant direction of conditioned air as the wind direction adjusting blade 31 remains still in the intermediate position, there is repetition between the condition in which, due to the swing of the Coanda blade 32, airflow adheres momentarily to the lower face of the Coanda blade 32 becoming Coanda airflow, not being directed to the occupant, and the condition in which the Coanda effect is stopped, airflow again being directed to the occupant. That is, a constant "unexpected breeze" can be generated.

[0111] That is, by mixing up A mode, B mode and C mode, there is repetition between fluctuating airflow with "unexpected breeze", fluctuating airflow without "unexpected breeze", and fluctuating airflow with one directional "unexpected breeze", realizing a variety of winds.

INDUSTRIAL APPLICABILITY

[0112] The present invention is capable of providing conditioned air closer to natural wind to an occupant as

described above, and can not be applied only to a wall-mounted type air conditioner indoor unit, but also an air purifier.

REFERENCE SIGNS LIST

[0113]

- 10 Air conditioner indoor unit
- 15 Outlet
- 31 Wind direction adjusting blade
- 32 Coanda blade
- 40 Control portion

PATENT LITERATURE

Patent document 1

[0114] Japanese Laid-open Patent Application No. 2001-41538

Claims

1. An air conditioner indoor unit that causes the wind direction of conditioned air blown out from an outlet port (15) to change upward and downward, generating fluctuating airflow, the air conditioner indoor unit being provided with:

a Coanda blade (32), provided in the vicinity of the outlet port (15), that by the Coanda effect, forms the conditioned air into a Coanda airflow caused to follow the lower face of the Coanda blade itself, and guided in a predetermined direction; and

a control portion (40), for controlling the fluctuating airflow of the conditioned air; wherein the control portion (40), during the fluctuating airflow control, controls the operation of the Coanda blade (32), implementing a first mode that includes a Coanda generating condition that generates the Coanda airflow, and a Coanda airflow not generated condition that does not generate the Coanda airflow.

2. An air conditioner indoor unit that causes the wind direction of conditioned air blown out from an outlet port (15) to change upward and downward, generating fluctuating airflow, the air conditioner indoor unit being provided with:

a Coanda blade (32), provided in the vicinity of the outlet port (15), that by the Coanda effect, forms the conditioned air into a Coanda airflow caused to follow the lower face of the Coanda blade itself, and guided in a predetermined direction; and

a control portion (40), for changing the wind change patterns of the conditioned air, controlling the fluctuating airflow; wherein the control portion is set in advance to be capable of implementing modes, being at least a first mode that, during the fluctuating airflow control, controls the operation of the Coanda blade including a Coanda airflow generating condition that generates the Coanda airflow and a Coanda airflow not generated condition that does not generate the Coanda airflow, and a second mode that, during the fluctuating airflow control, continually does not generate the Coanda airflow, the control portion (40), during the fluctuating airflow control, mixing the time periods for implementing the first mode and the time periods for implementing the second mode.

3. The air conditioner indoor unit according to either of claim 1 or claim 2, further provided with a wind direction adjusting blade (31) for changing the blowout angle of the conditioned air in relation to a horizontal plane, wherein the control portion (40) controls the fluctuating airflow using either or both of the wind direction adjusting blade (31) and the Coanda blade (32).

4. The air conditioner indoor unit according to claim 3, wherein the fluctuating airflow control includes an A mode that causes the wind direction adjusting blade (31) and the Coanda blade (32) to swing, generating fluctuating airflow, and a B mode that causes only the wind direction adjusting blade (31) to swing, generating fluctuating airflow.

5. The air conditioner indoor unit according to claim 4, wherein the fluctuating airflow control further includes a C mode for causing only the Coanda blade (32) to swing, generating fluctuating airflow.

6. The air conditioner indoor unit according to either of claim 1 or claim 2, wherein the control portion (40), during the fluctuating airflow control, causes change in the air quantity of the conditioned air.

7. The air conditioner indoor unit according to claim 6, wherein the control portion (40) changes the air quantity of the conditioned air to the predetermined air quantity, in at least a time period for generating the Coanda airflow.

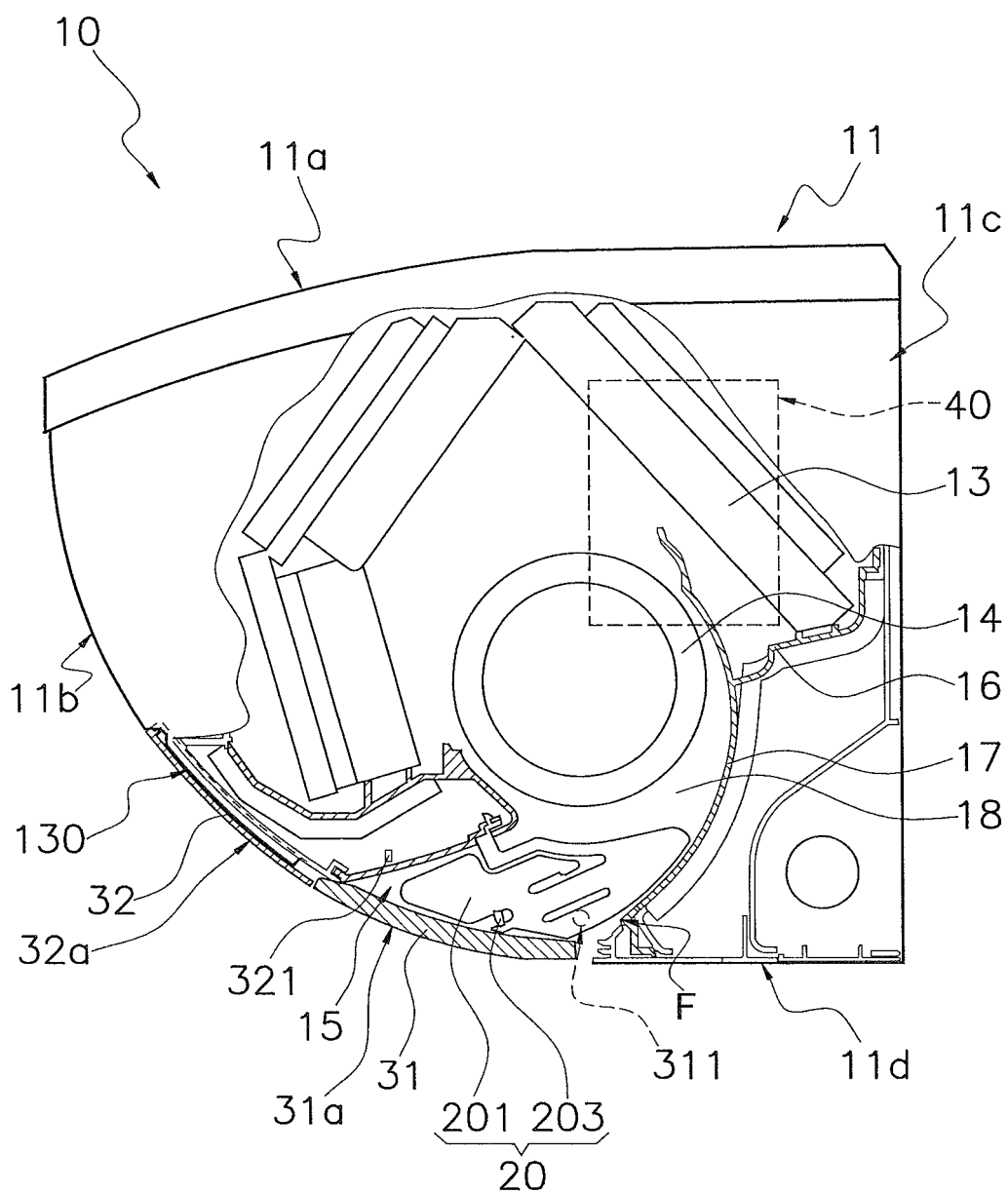


FIG. 1

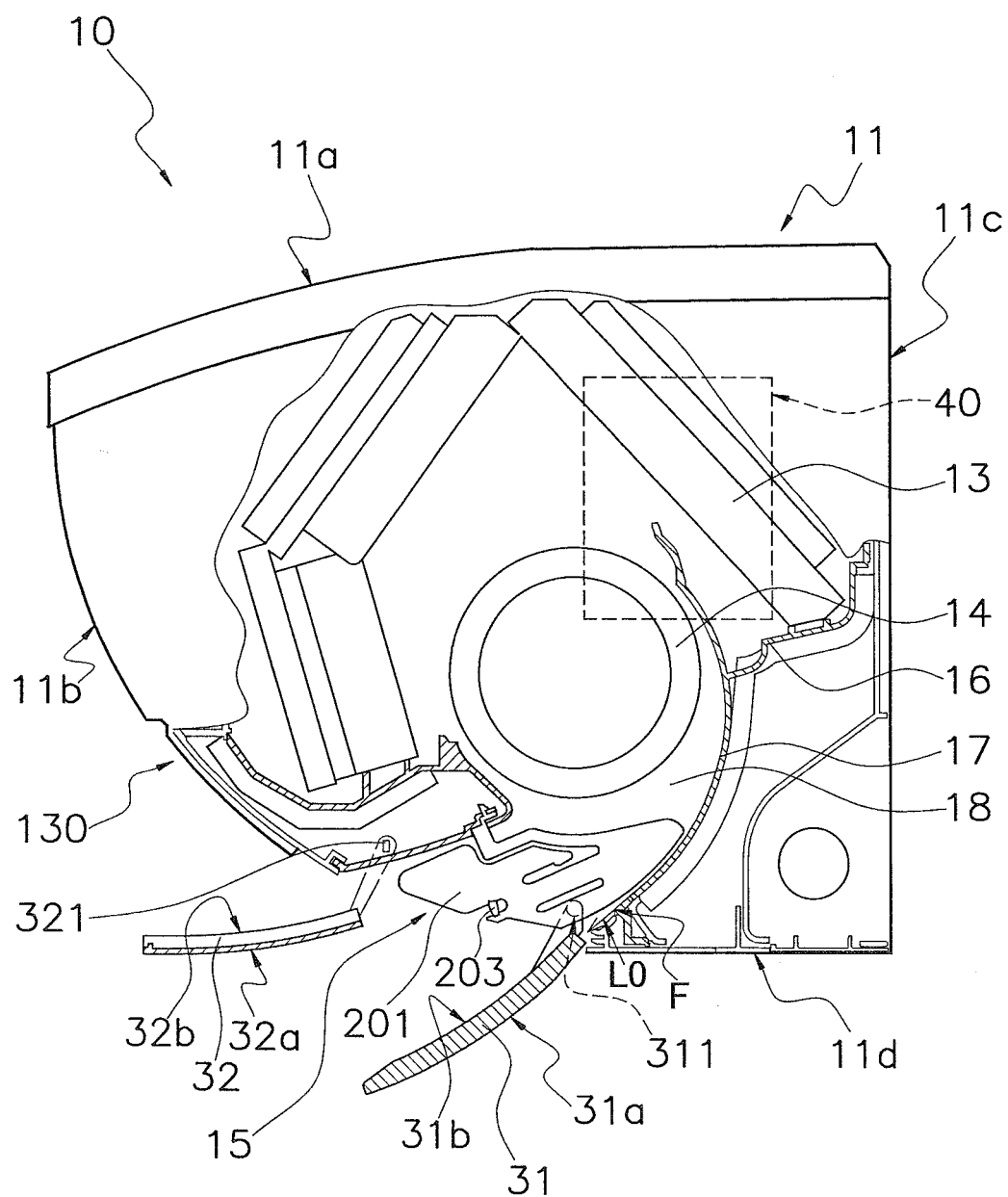


FIG. 2

FIG. 3A

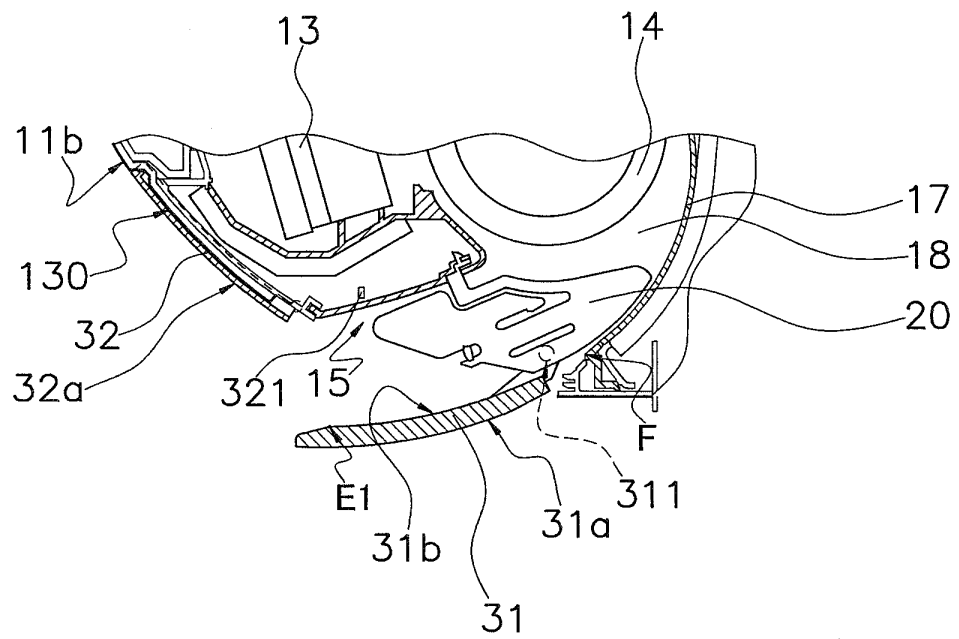


FIG. 3B

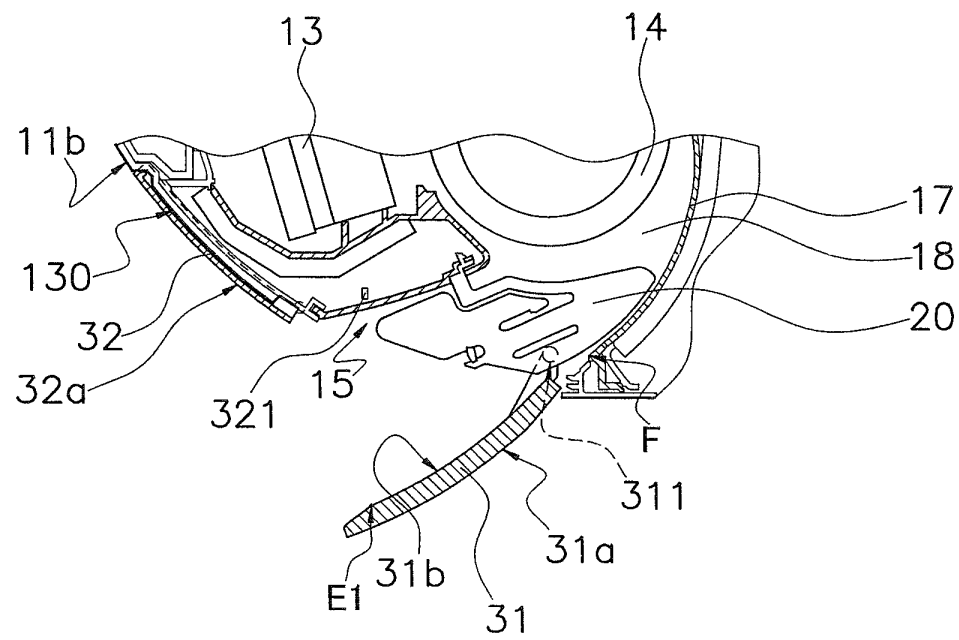


FIG. 3C

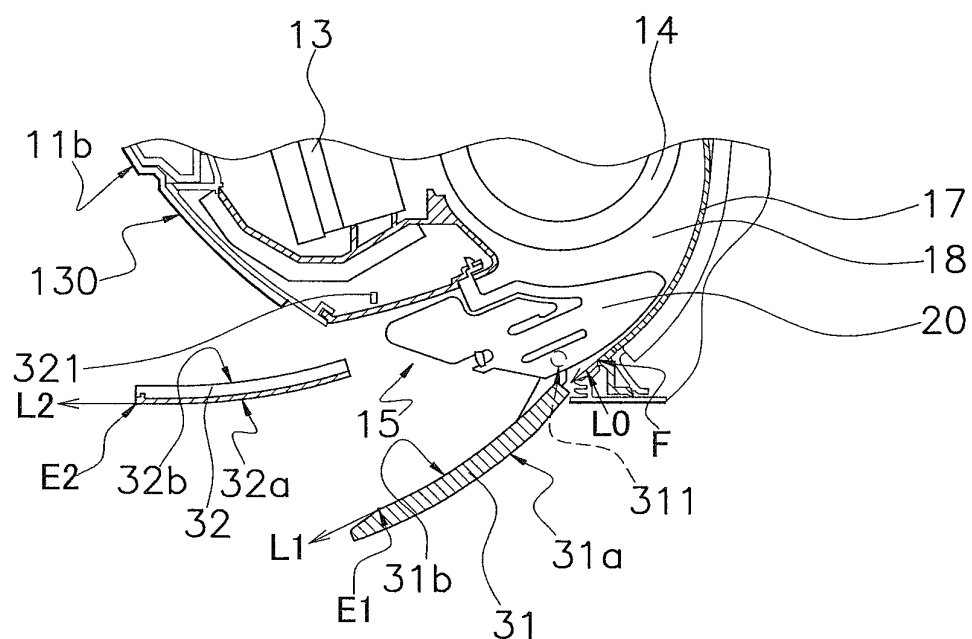


FIG. 3D

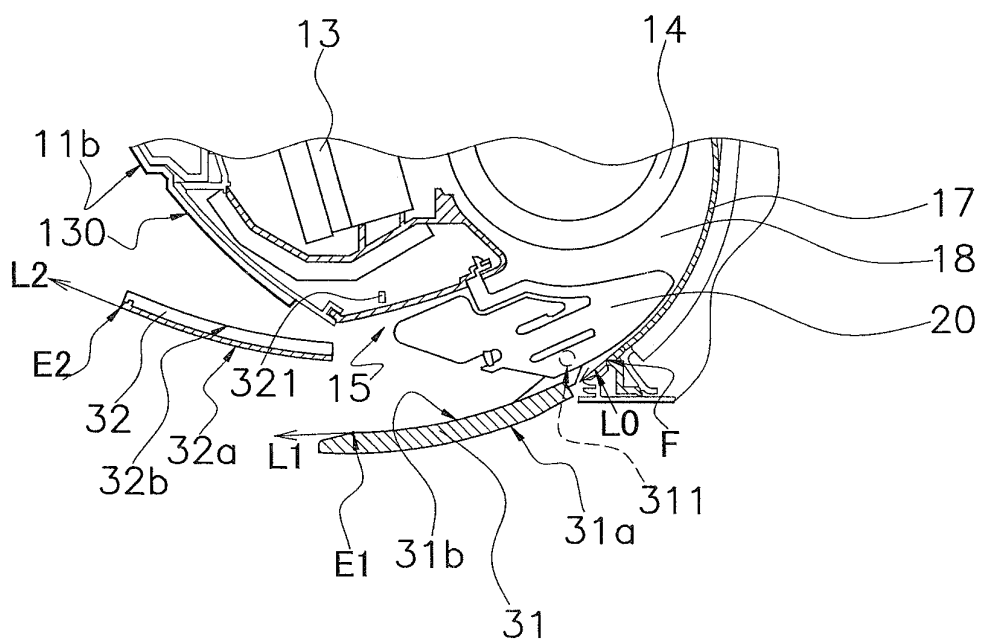


FIG. 4A

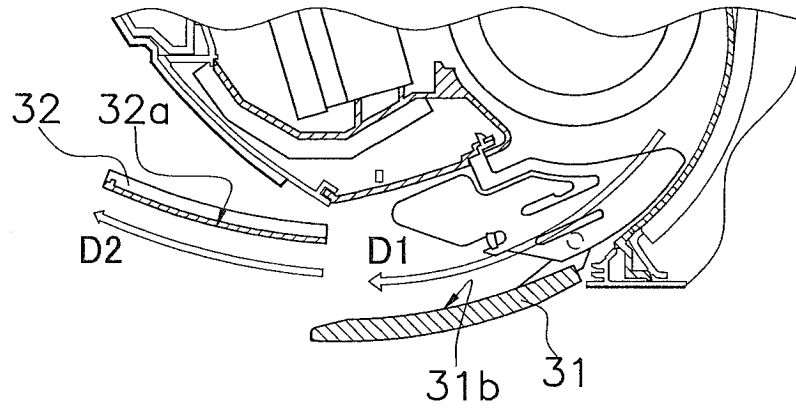


FIG. 4B

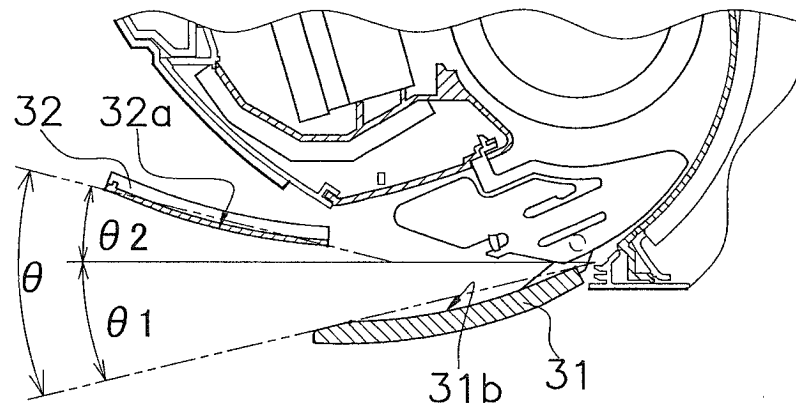


FIG. 5A

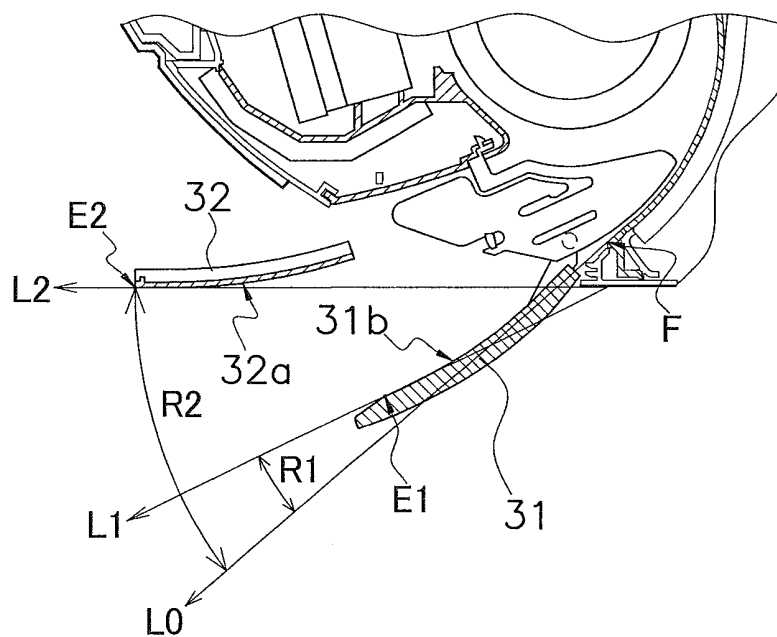


FIG. 5B

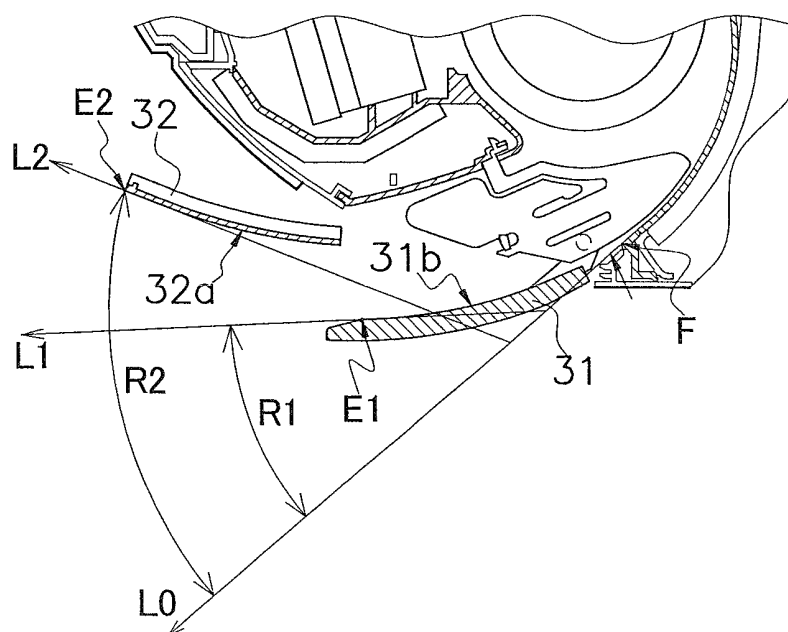


FIG. 6A

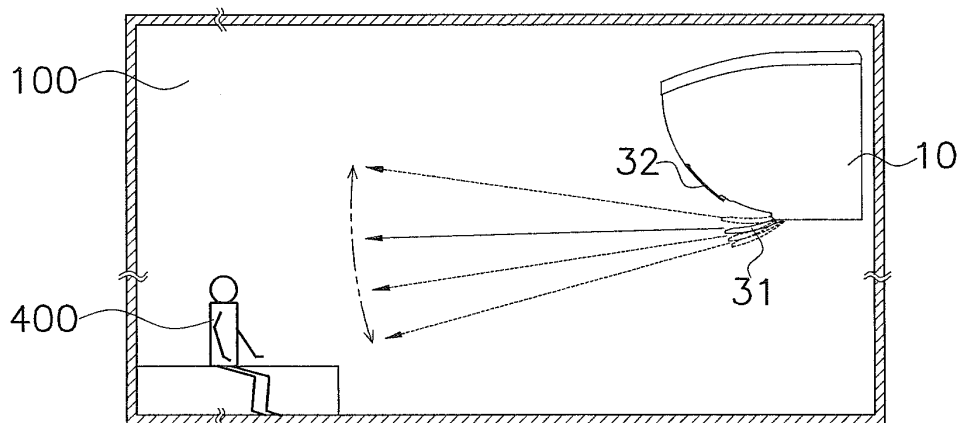


FIG. 6B

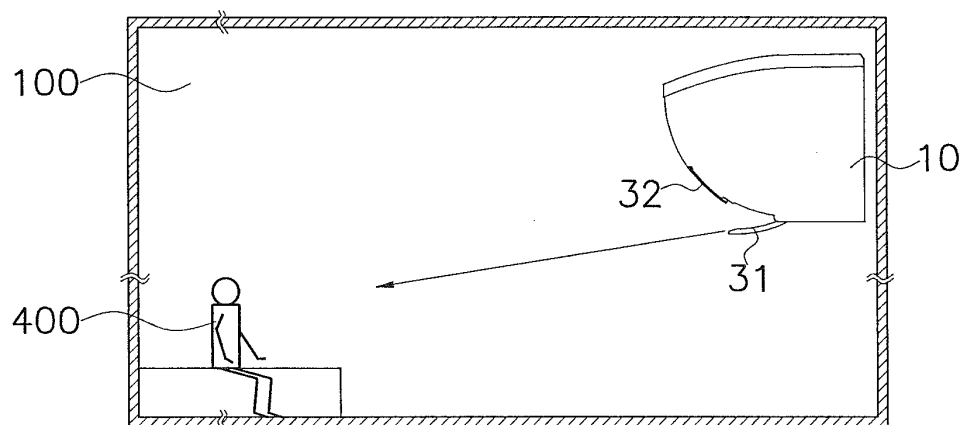


FIG. 6C

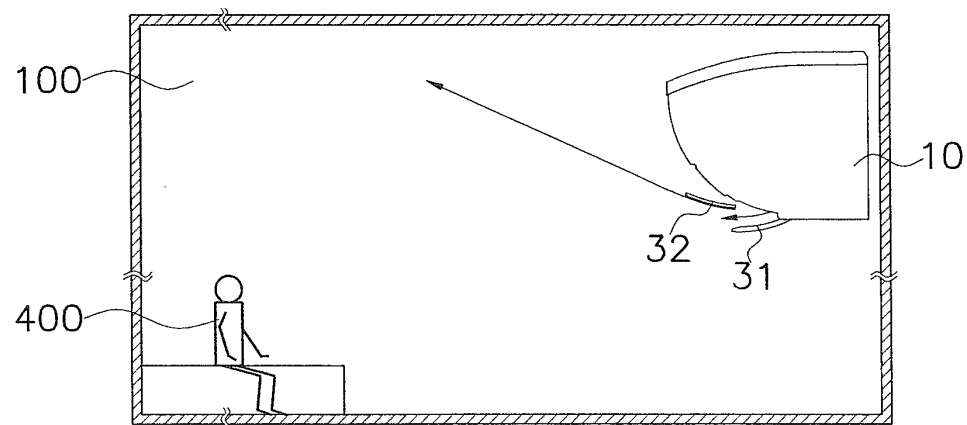


FIG. 7

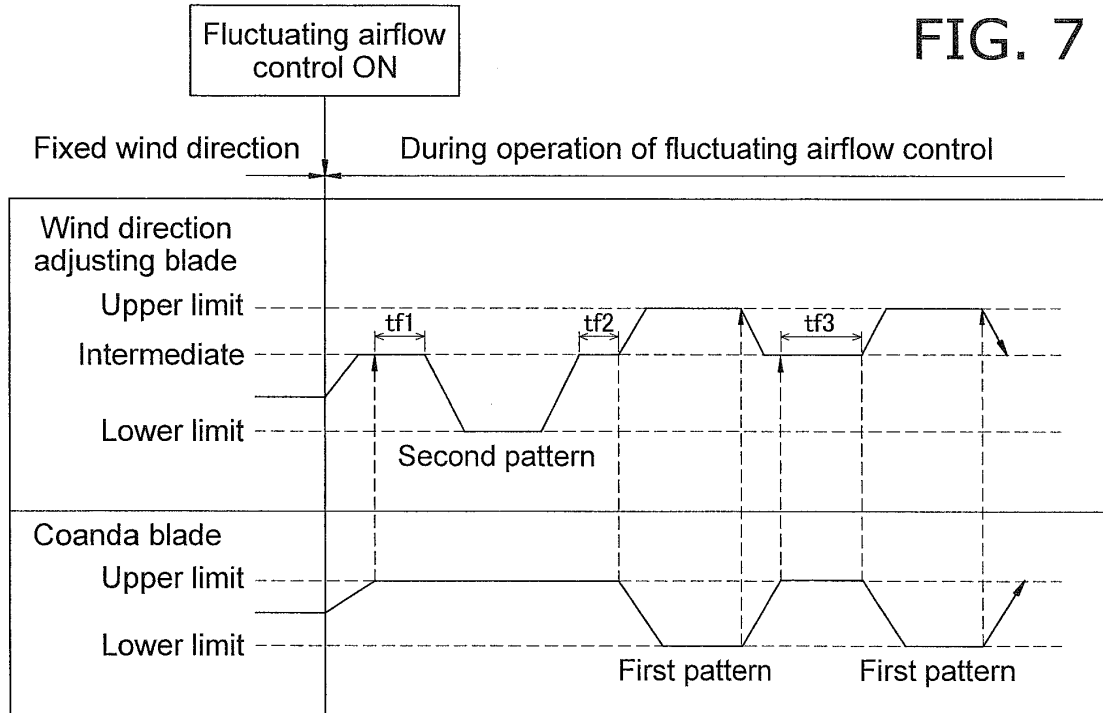
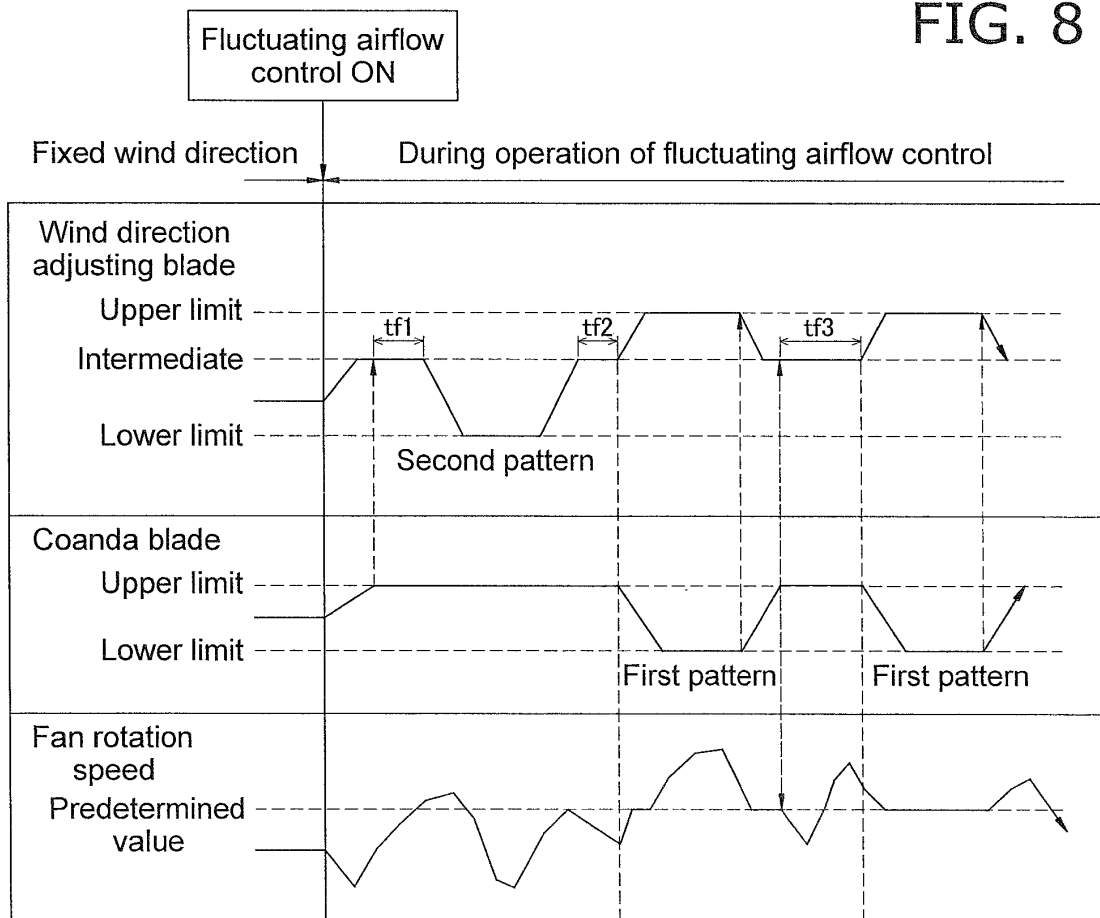


FIG. 8



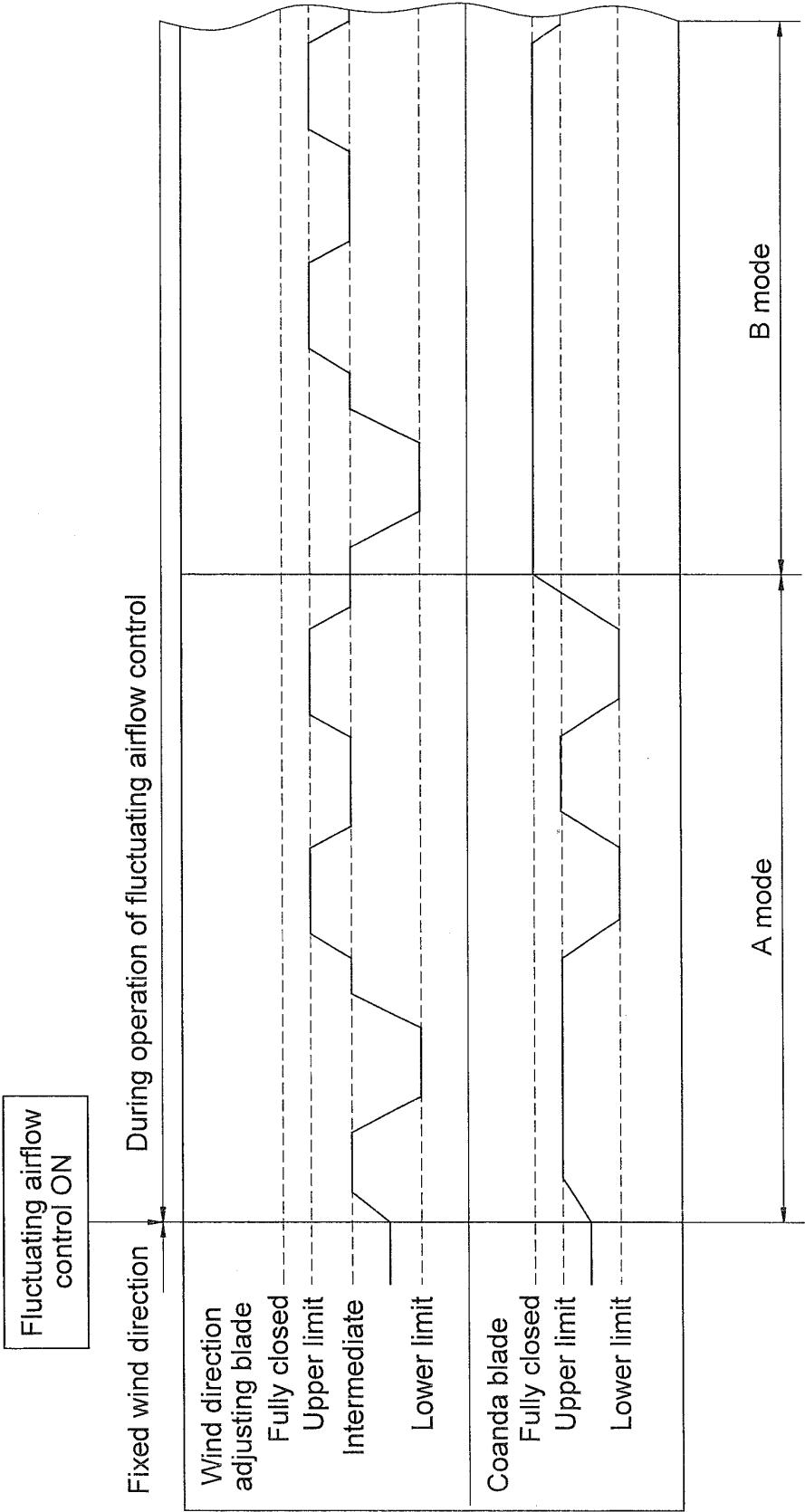


FIG. 9

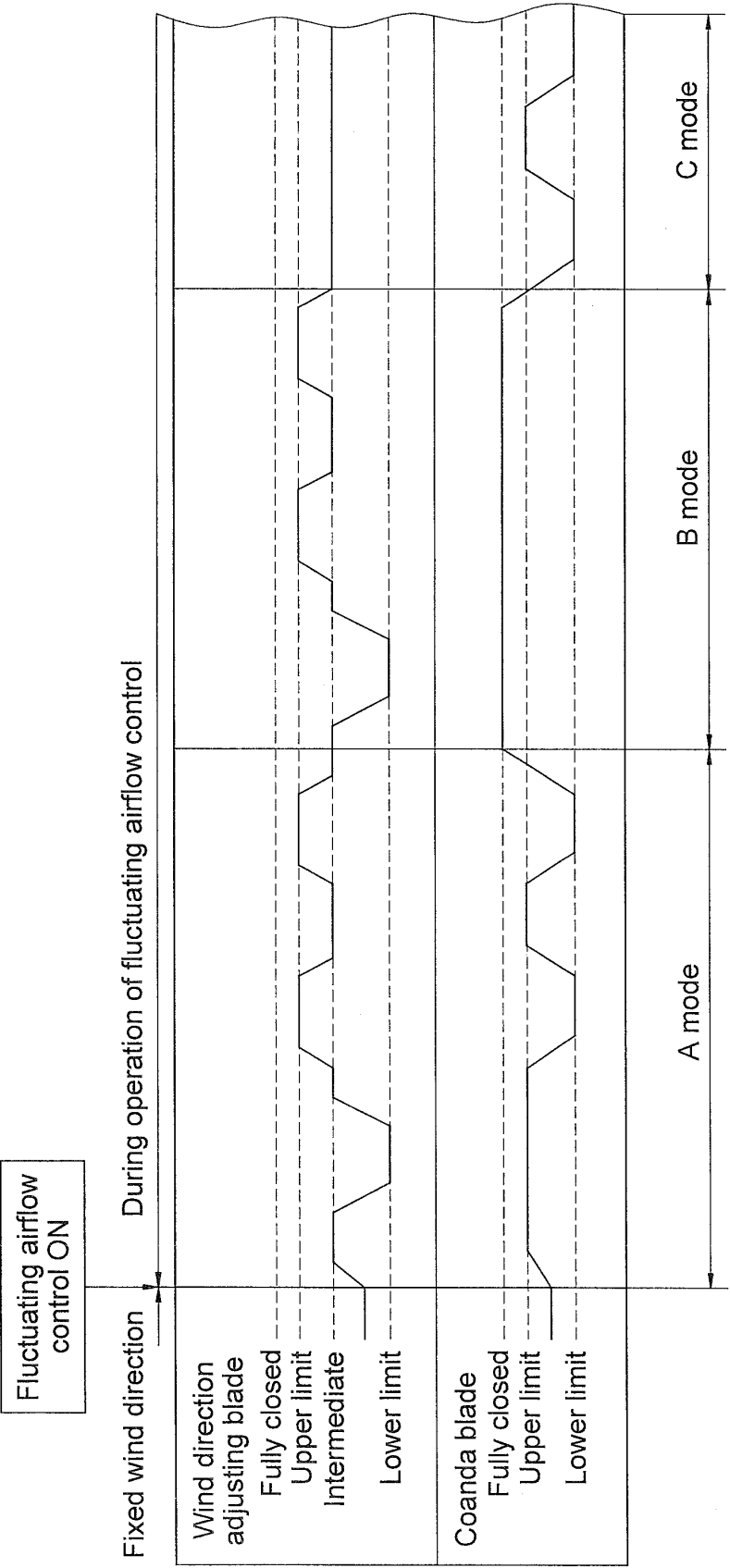


FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2013/073149

A. CLASSIFICATION OF SUBJECT MATTER

F24F11/02 (2006.01) i, F24F13/08 (2006.01) 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)

F24F11/02, F24F13/08

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

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2013
 Kokai Jitsuyo Shinan Koho 1971-2013 Toroku Jitsuyo Shinan Koho 1994-2013

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.
P, A	JP 2013-117368 A (Daikin Industries, Ltd.), 13 June 2013 (13.06.2013), entire text; all drawings & WO 2013/065395 A1	1-7
A	JP 2007-192480 A (Sharp Corp.), 02 August 2007 (02.08.2007), entire text; all drawings (Family: none)	1-7
A	JP 6-265168 A (Mitsubishi Heavy Industries, Ltd.), 20 September 1994 (20.09.1994), entire text; all drawings (Family: none)	1-7

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:

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"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
30 September, 2013 (30.09.13)Date of mailing of the international search report
08 October, 2013 (08.10.13)Name and mailing address of the ISA/
Japanese Patent Office

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Patent documents cited in the description

- JP 2001041538 A [0002] [0114]