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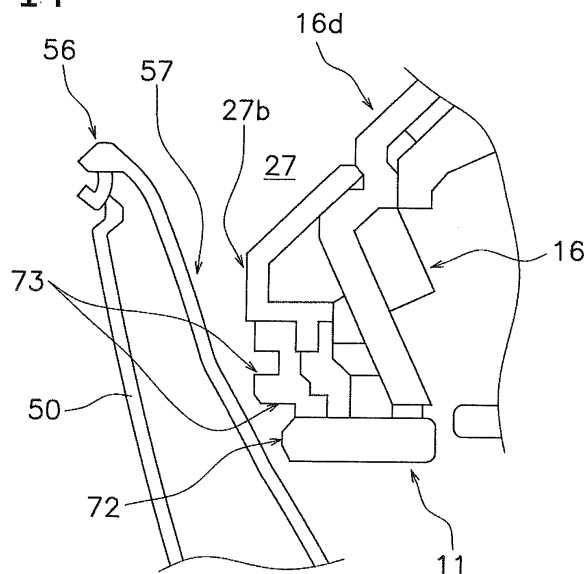
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(54) **WALL MOUNTING AIR-CONDITIONING INDOOR UNIT**

(57) To ease restrictions on airflow control without compromising design attractiveness in a wall-mounted air conditioning indoor unit. A recessed portion (57) that is upwardly recessed is formed in a rear end portion of an air direction adjustment member lower surface (52) of an air direction adjustment member (50). The air direction adjustment member (50), when generating a first airflow heading in the direction of an installation side wall

from an air outlet (27), adopts a first posture in which its upper surface rotates rearward relative to a vertical plane so that its front end is positioned more rearward than its rear end (56). The air direction adjustment member (50) is attached in such a way that a lower edge (27b) of the air outlet (27) enters the recessed portion (57) when the air direction adjustment member (50) adopts the first posture.

FIG. 14



Description

TECHNICAL FIELD

[0001] The present invention relates to a wall-mounted air conditioning indoor unit.

BACKGROUND ART

[0002] Conventionally, wall-mounted air conditioning indoor units equipped with an air direction adjustment member for carrying out up and down air direction adjustment have been proposed. For example, as disclosed in patent document 1 (JP-A No. 2007-93092) and elsewhere, there is an air conditioning indoor unit that is capable of changing downward, with an air direction adjustment member, the blow-out direction of conditioned air traveling through an air passage and blown out from an air outlet.

SUMMARY OF INVENTION

<Technical Problem>

[0003] The air conditioning indoor unit disclosed in patent document 1 can change downward the air blown out from the air outlet, but airflow control using the air direction adjustment member ends up being restricted because the rotational range of the air direction adjustment member is small, and the function of providing a comfortable environment is not sufficient.

[0004] It is a problem of the present invention to ease restrictions on airflow control in a wall-mounted air conditioning indoor unit.

<Solution to Problem>

[0005] A wall-mounted air conditioning indoor unit pertaining to a first aspect of the invention comprises: a casing having rear surface portion is secured to an installation side wall and having an air outlet, through which conditioned air is blown out, located in front of the rear surface portion; and an air direction adjustment member that has a rear end near, a front end arranged at position farther from a rotational center set at a lower edge (27) than the rear end, an upper surface that adjusts the air direction of outlet air blown out from the air outlet, and a lower surface located on the opposite side of the upper surface, the air direction adjustment member having a recessed portion that is upwardly recessed being disposed in a rear end portion of the lower surface, wherein the air direction adjustment member is configured to be capable of being located in a first posture, in which the front end is positioned more rearward than the rear end by rearward rotation beyond a vertical plane of the upper surface so that when generating a first airflow toward the installation side wall from the air outlet, and a second posture, in which the front end is positioned more forward than

the rear end by forward rotation beyond the vertical plane of the upper surface when generating a second airflow forward from the air outlet, and the air direction adjustment member is attached in such a way that the lower edge of the air outlet enters the recessed portion when the air direction adjustment member becomes the first posture.

[0006] In this wall-mounted air conditioning indoor unit, the lower edge of the air outlet enters the recessed part of the recessed portion of the air direction adjustment member when the air direction adjustment member becomes the first posture, so the range of rotational motion can be increased.

[0007] A wall-mounted air conditioning indoor unit pertaining to a second aspect of the invention is the air conditioning indoor unit pertaining to the first aspect, wherein the casing has a depression portion corresponding to the shape of the lower surface of the air direction adjustment member disposed in the lower edge of the air outlet and in a position opposing the rear end portion of the lower surface of the air direction adjustment member that has become the first posture.

[0008] In this wall-mounted air conditioning indoor unit, the depression portion provided on the lower edge of the air outlet of the casing is provided in correspondence to the shape of the lower surface of the air direction adjustment member, so the range of rearward rotation of the air direction adjustment member can be increased compared to a case where the depression portion is not provided.

[0009] A wall-mounted air conditioning indoor unit pertaining to a third aspect of the invention is the air conditioning indoor unit pertaining to the first aspect or the second aspect, wherein the casing has groove portions disposed in the lower edge of the air outlet and in a position opposing the rear end portion of the lower surface of the air direction adjustment member that has become the first posture.

[0010] In this wall-mounted air conditioning indoor unit, the groove portions provided in the lower edge of the air outlet of the casing are disposed opposing a gap between the air direction adjustment member and the casing, so air flowing through the gap between the air direction adjustment member and the casing can be agitated.

[0011] A wall-mounted air conditioning indoor unit pertaining to a fourth aspect of the invention is the air conditioning indoor unit pertaining to the first aspect, wherein sloping end surfaces are formed in the air direction adjustment member and in the casing in places thereof that oppose each other when the air direction adjustment member adopts the first posture.

[0012] In this wall-mounted air conditioning indoor unit, the sloping end surface of the air direction adjustment member and the sloping end surface of the casing oppose each other when the air direction adjustment member adopts the first posture, so the range of rearward rotation of the air direction adjustment member can be increased.

[0013] A wall-mounted air conditioning indoor unit pertaining to a fifth aspect of the invention is the air conditioning indoor unit pertaining to any of the first aspect to the fourth aspect, wherein the air direction adjustment member has flanges on side portions of the recessed portion, and the casing pivotally supports the flanges in such a way that the air direction adjustment member is rotatable in the up and down direction.

[0014] In this wall-mounted air conditioning indoor unit, the strength of the rear end portion of the air direction adjustment member drops because of the recessed portion in the rear end portion of the air direction adjustment member, but by providing the flanges, the air direction adjustment member is reinforced and deformation of the air direction adjustment member can be reduced even when the recessed portion is provided in the rear end portion of the air direction adjustment member.

<Advantageous Effects of Invention>

[0015] In the wall-mounted air conditioning indoor unit pertaining to the first aspect of the invention, restrictions on airflow control for ensuring comfort can be eased because the range of rotational motion increases. Furthermore, design attractiveness can be well maintained because it is easy to form the recessed portion in such a way that it is hardly noticeable in the lower surface of the air direction adjustment member.

[0016] In the wall-mounted air conditioning indoor unit pertaining to the second aspect of the invention, restrictions on airflow control can be eased by how much the rotational range is increased by the step in the air direction adjustment member.

[0017] In the wall-mounted air conditioning indoor unit pertaining to the third aspect of the invention, the groove portions can keep condensation from forming in the gap between the air direction adjustment member and the casing.

[0018] In the wall-mounted air conditioning indoor unit pertaining to the fourth aspect of the invention, restrictions on airflow control can be eased by how much the rotational range is increased by the sloping end surfaces of the air direction adjustment member and the casing.

[0019] In the wall-mounted air conditioning indoor unit pertaining to the fifth aspect of the invention, by reducing deformation of the air direction adjustment member, a drop in air direction adjustment function can be prevented and design attractiveness can be prevented from being reduced.

BRIEF DESCRIPTION OF DRAWINGS

[0020]

FIG. 1 is a perspective view showing the outer appearance of an air conditioning indoor unit pertaining to an embodiment of the invention.

FIG. 2 is a sectional view showing an overview of

the configuration of the air conditioning indoor unit of FIG. 1.

FIG. 3 is a perspective view of an air direction adjustment member.

FIG. 4 is a partial enlarged sectional view for describing a scroll air outflow passage.

FIG. 5 is a partial enlarged sectional view for describing the relationship between the air direction adjustment member and a lower edge of an air outlet.

FIG. 6 is a sectional view for describing the posture of the air direction adjustment member in a second air direction.

FIG. 7 is a perspective view showing the left side part of the air conditioning indoor unit cut by a plane perpendicular to the right and left direction.

FIG. 8(a) is a partial sectional view for describing another example of the postures of a first auxiliary flap and a second auxiliary flap in the second air direction, and FIG. 8(b) is a partial sectional view for describing another example of the postures of the first auxiliary flap and the second auxiliary flap in the second air direction.

FIG. 9(a) is a partial sectional view for describing the posture of the air direction adjustment member in a third air direction, FIG. 9(b) is a partial sectional view for describing the posture of the air direction adjustment member in a fourth air direction, and FIG. 9(c) is a partial sectional view for describing the posture of the air direction adjustment member in a fifth air direction.

FIG. 10(a) is a sectional view of the air direction adjustment member, and FIG. 10(b) is a side view of the air direction adjustment member.

FIG. 11 is a partial enlarged perspective view in which part of the air direction adjustment member is broken out.

FIG. 12 is a partial enlarged perspective view showing the area around a central rear end portion of the air direction adjustment member.

FIG. 13(a) is a side view for describing a first airflow of the air conditioning indoor unit installed in a room, and FIG. 13(b) is a side view for describing a second airflow of the air conditioning indoor unit installed in the room.

FIG. 14 is a partial enlarged sectional view for describing the relationship between the air direction adjustment member and the lower edge of the air outlet. FIG. 15 is a partial sectional view for describing the relationship between the air direction adjustment member and the lower edge of the air outlet pertaining to an example modification.

FIG. 16 is a partial enlarged sectional view in which a part of the air direction adjustment member and the lower edge of the air outlet in FIG. 15 is enlarged.

DESCRIPTION OF EMBODIMENT

(1) Configuration of Air Conditioning Indoor Unit

[0021] FIG. 1 shows the outer appearance of an air conditioning indoor unit 10 as seen from the front and obliquely from the right and below. The up and down, front and rear, and right and left directions of the air conditioning indoor unit 10 in the following description are as indicated by the Cartesian coordinates in FIG. 1. FIG. 2 shows the main shape of the cross section of the air conditioning indoor unit 10 cut by a plane perpendicular to the right and left direction of the air conditioning indoor unit 10 in the substantial center of the air conditioning indoor unit 10 in the right and left direction. The air conditioning indoor unit 10 is a wall-mounted type, and its rear portion is attached to an installation side wall WL in a room. The air conditioning indoor unit 10 can perform a cooling operation in which it performs cooling of a room space RS and a heating operation in which it performs heating of the room space RS.

(2) Detailed Configuration

[0022] As shown in FIG. 1 and FIG. 2, the air conditioning indoor unit 10 is equipped with a casing 11, an air filter 12, an indoor heat exchanger 13, an indoor fan 14, plural vertical flaps 15, a second auxiliary flap 30, a first auxiliary flap 40, and an air direction adjustment member 50. It will be noted that illustration of the vertical flaps 15 is omitted in FIG. 2.

(2-1) Casing 11

[0023] The casing 11 is shaped like a box that is long and narrow in the transverse direction (the right and left direction of the air conditioning indoor unit 10 (refer to the Cartesian coordinates in FIG. 1)) and has plural openings. The casing 11, as shown in FIG. 1 and FIG. 2, has inside a three-dimensional space surrounded by a top surface portion 11a, a front surface portion 11b, a rear surface portion 11c, a right side surface portion 11d, a left side surface portion 11e, and a bottom surface portion 11f. The top surface portion 11a, the front surface portion 11b, the right side surface portion 11d, the left side surface portion 11e, and the bottom surface portion 11f of the casing 11 are covered by a decorative plate 20. The casing 11 is attached to the installation side wall WL by means of a back surface plate 28 located on the rear surface portion 11c. The air filter 12, the indoor heat exchanger 13, the indoor fan 14, and a bottom frame 16 are housed in the three-dimensional space in the casing 11. In order to house these in the three-dimensional space, the decorative plate 20 is configured to be overlaid from the front to the rear.

[0024] The top surface portion 11a is positioned on the upper end portion of the casing 11. The front surface portion 11b of the decorative plate 20 is configured by a

front surface plate 21 whose upper end is supported on the top surface portion 11a by hinge (not shown in the drawings) in such a way that the front surface plate 21 may freely rotate. The front surface plate 21 is separated from a right side plate 22, which configures the right side surface portion 11d of the decorative plate 20, and a left side plate 23, which configures the left side surface portion 11e of the decorative plate 20.

[0025] The back surface plate 28 configures the rear surface portion 11c of the casing 11. The air conditioning indoor unit 10 is installed on the installation side wall WL by mounting, with screws or the like, the back surface plate 28 to a mounting plate (not shown in the drawings) installed on the installation side wall WL in the room.

[0026] A top surface air inlet 25 is provided in the top surface portion 11a of the casing 11. When the indoor fan 14 is driven, room air in the neighborhood of the top surface air inlet 25 is taken inside the casing 11 from the top surface air inlet 25. The room air that has been taken in from the top surface air inlet 25 travels through the indoor heat exchanger 13 and is sent to the indoor fan 14.

[0027] A bottom surface air inlet 26 is formed in the bottom surface portion 11f of the casing 11. Furthermore, an air outlet 27 is formed in the bottom surface portion 11f. The bottom surface air inlet 26 is provided more rearward than the air outlet 27. The bottom surface air inlet 26 and the space located above the air filter 12 in the casing 11 are interconnected by an inflow passage 16a of the bottom frame 16. Consequently, because of the driving of the indoor fan 14, room air in the neighborhood of the bottom surface air inlet 26 is sent from the bottom surface air inlet 26 through the inflow passage 16a to the indoor heat exchanger 13. The inflow passage 16a is formed along a flow passage upper surface 16c and a flow passage lower surface 16d of the bottom frame 16 from the bottom surface air inlet 26. The inflow passage 16a and a later-described scroll air outflow passage 16b are adjacent to each other across the flow passage lower surface 16d. An opening and closing plate 17 for opening and closing the bottom surface air inlet 26 is provided in the bottom surface air inlet 26.

[0028] In the air conditioning indoor unit 10, the air outlet 27 provided more forward than the bottom surface air inlet 26 is connected to the inside of the casing 11 by the scroll air outflow passage 16b. Room air sucked in from the top surface air inlet 25 and the bottom surface air inlet 26 undergoes heat exchange in the indoor heat exchanger 13, thereafter travels through the scroll air outflow passage 16b, and is blown out into the room from the air outlet 27.

(2-2) Configurations for Air Direction Adjustment

[0029] The air outlet 27 has an upper edge 27a and a lower edge 27b that extend long right and left. The flat plate-like second auxiliary flap 30 that extends long right and left and the first auxiliary flap 40 that extends long right and left are provided on the side of the upper edge

27a of the air outlet 27. Furthermore, the air direction adjustment member 50 that extends long right and left is provided on the side of the lower edge 27b of the air outlet 27. The second auxiliary flap 30, the first auxiliary flap 40, and the air direction adjustment member 50 respectively have a second auxiliary flap upper surface 31 and a second auxiliary flap lower surface 32, a first auxiliary flap upper surface 41 and a first auxiliary flap lower surface 42, and an air direction adjustment member upper surface 51 and an air direction adjustment member lower surface 52. The first auxiliary flap 40 and the air direction adjustment member 50 are hollow structures, whereby the weight of the first auxiliary flap 40 and the air direction adjustment member 50 is reduced.

[0030] The second auxiliary flap 30, the first auxiliary flap 40, and the air direction adjustment member 50 are each rotatably attached to the casing 11. The second auxiliary flap 30, the first auxiliary flap 40, and the air direction adjustment member 50 are configured in such a way that they can be independently rotated, by flap drive motors (not shown in the drawings) provided with respect to each, about rotational centers 35, 45, and 58 (see FIG. 6) extending right and left. FIG. 3 shows a view of the air direction adjustment member 50 as seen obliquely from the right and above. A straight line joining supported portions 53 of the air direction adjustment member 50 becomes the rotational center 58 of the air direction adjustment member 50. Furthermore, the flap drive motors are controlled by a control device (not shown in the drawings) provided inside the air conditioning indoor unit 10. Additionally, the second auxiliary flap 30, the first auxiliary flap 40, and the air direction adjustment member 50 adjust up and down, by themselves or in cooperation with each other, the air direction of the air blown out from the air outlet 27. Furthermore, the air direction adjustment member 50 has the function of opening the air outlet 27 when blowing out air from the air outlet 27 and closing the air outlet 27 when operation is stopped. Moreover, the first auxiliary flap 40 is configured in such a way that, when operation is stopped, it can adopt a posture in which it moves closer to the casing 11 and becomes like part of the casing 11. When operation is stopped, the first auxiliary flap lower surface 42 and the air direction adjustment member lower surface 52 become assimilated with the decorative plate 20 of the casing 11 and configure the design of the air conditioning indoor unit 10.

[0031] The plural vertical flaps 15, which have flat surfaces intersecting the right and left direction, are provided on the far side of the second auxiliary flap 30 in the air outlet 27. The vertical flaps 15 are configured in such a way that they can be rotated right and left, by a flap drive motor (not shown in the drawings), about rotational centers extending up and down. The flap drive motor that drives the vertical flaps 15 is also controlled by the aforementioned control device provided inside the air conditioning indoor unit 10. Additionally, the plural vertical flaps 15 adjust right and left the air direction of the air blown

out from the air outlet 27.

(2-3) Indoor Heat Exchanger 13

[0032] The indoor heat exchanger 13 is configured by plural fins and plural heat transfer tubes that run through the plural fins. The indoor heat exchanger 13 is attached to the bottom frame 16 inside the casing 11. The indoor heat exchanger 13 functions as an evaporator or a condenser in accordance with the operating state of the air conditioning indoor unit 10, and causes heat exchange to be carried out between refrigerant flowing through the heat transfer tubes and the air traveling through the indoor heat exchanger 13.

[0033] The indoor heat exchanger 13, as shown in FIG. 2, has a substantially inverted V-shape in which both ends bend downward as seen in a side view. Additionally, the indoor heat exchanger 13 is disposed so as to surround the indoor fan 14 from above.

(2-4) Indoor Fan 14

[0034] The indoor fan 14, as shown in FIG. 2, is positioned in the substantially central part of the inside of the casing 11. The indoor fan 14 is a cross-flow fan having a substantially cylindrical shape that is long and narrow in the longitudinal direction of the air conditioning indoor unit 10 (the right and left direction). When the indoor fan 14 is driven to rotate, conditioned air that has been generated as a result of the room air being sucked in from the top surface air inlet 25 and the bottom surface air inlet 26, traveling through the air filter 12, and then traveling through the indoor heat exchanger 13 is blown out into the room from the air outlet 27.

(2-5) Bottom Frame 16

[0035] The bottom frame 16 fulfills the role of supporting the aforementioned air filter 12, the indoor heat exchanger 13, and the indoor fan 14. Furthermore, the inflow passage 16a and the scroll air outflow passage 16b are formed by the bottom frame 16. The scroll air outflow passage 16b extends obliquely forward and downward from directly under the indoor fan 14. The scroll air outflow passage 16b is a space sandwiched between the flow passage upper surface 16c and the flow passage lower surface 16d.

[0036] FIG. 4 shows a state in which the second auxiliary flap 30, the first auxiliary flap 40, and the air direction adjustment member 50 have been removed from FIG. 2. The shape of the scroll air outflow passage 16b will be described using FIG. 4. The flow passage lower surface 16d extends upward from the lower edge 27b of the air outlet 27 and covers the rear portion of the indoor fan 14 up to its diagonal upper part. The flow passage lower surface 16d smoothly curves in such a way as to bulge rearward. The cross-sectional shape of the flow passage lower surface 16d when the flow passage lower surface

16d is cut by a plane perpendicular to the right and left direction is a spiral shape. In other words, the cross-sectional shape of the flow passage lower surface 16d is a curved line that moves further and further away from the rotational center of the indoor fan 14 as it spirals.

[0037] A recess 16g that extends long right and left is formed between the upper edge 27a of the air outlet 27 and an upper surface front end 16f of the flow passage upper surface 16c. Because this recess 16g is formed, a step is formed in front of the upper surface front end 16f of the flow passage upper surface 16c. The second auxiliary flap 30 can be stowed in the recess 16g. The recess 16g is configured in such a way that, in a state in which the second auxiliary flap 30 is stowed in the recess 16g, the rear end portion of the second auxiliary flap lower surface 32 becomes even with the flow passage upper surface 16c. The flow passage upper surface 16c extends substantially straightly obliquely rearward and upward from the upper surface front end 16f heading toward the lower part of the indoor fan 14.

(2-6) Air Filter 12

[0038] The air filter 12 is for trapping dirt and dust in the room air that has been sucked in from the top surface air inlet 25 and the bottom surface air inlet 26. In a state in which the air filter 12 is loaded in the casing 11, the air filter 12 is positioned between the top surface portion 11a of the casing 11 and the indoor heat exchanger 13. The air filter 12 prevents dirt and dust in the room air from sticking to the surface of the indoor heat exchanger 13. The air filter 12 is configured in such a way that it can be put into the casing 11 and removed from the casing 11 for maintenance.

(3) Air Direction Adjustment in Up and Down Direction

(3-1) First Air Direction

[0039] The postures of the second auxiliary flap 30, the first auxiliary flap 40 and the air direction adjustment member 50 shown in FIG. 1 and FIG. 2 are adopted when blowing out air in a first air direction. The first air direction is an air direction when causing the airflow to circulate as far as the far side of the room space RS. In order to cause the airflow to circulate as far as the far side of the room space RS, it is preferred to create a laminar flow having a fast air speed without allowing the airflow to diffuse at the air outlet 27. To create such a laminar flow, it is preferred to extend the scroll air outflow passage 16b. However, it is difficult to extend and shorten the scroll air outflow passage 16b, so the state shown in FIG. 1 and FIG. 2 is a state in which the postures of the second auxiliary flap 30 and the air direction adjustment member 50 pseudo-create a situation that is the same as if the scroll air outflow passage 16b were extended.

[0040] In the first air direction, the second auxiliary flap 30 adopts a posture in which the second auxiliary flap

lower surface 32 extends forward the flow passage upper surface 16c of the scroll air outflow passage 16b. Furthermore, in the first air direction, the air direction adjustment member 50 adopts a posture in which the air direction adjustment member upper surface 51 extends forward the flow passage lower surface 16d of the scroll air outflow passage 16b.

[0041] As shown in FIG. 4, when the flow passage upper surface 16c is extended forward, a first virtual plane PL1 that starts at the upper surface front end 16f is formed substantially parallel to the flow passage upper surface 16c. In this case, it is preferred that a first virtual line formed as a result of the first virtual plane PL1 being cut by a sectional plane parallel to the rear direction and the up and down direction coincide with a tangent to the distal end portion of the flow passage upper surface 16c of the scroll air outflow passage 16b. Furthermore, when the flow passage lower surface 16d is extended forward, a second virtual plane PL2 that starts at a lower surface front end 16h of the flow passage lower surface 16d is formed substantially parallel to the lower surface front end 16h. In this case, it is preferred that a second virtual line formed as a result of the second virtual plane PL2 being cut by a sectional plane parallel to the front and rear direction and the up and down direction coincide with a tangent to the distal end portion of the flow passage lower surface 16d of the scroll air outflow passage 16b.

[0042] It will be noted that there are also cases where the second auxiliary flap lower surface 32 curves a little, and in those cases the second auxiliary flap lower surface 32 is regarded as coinciding with the first virtual plane PL1 when the rear end portion of the main surface of the second auxiliary flap lower surface 32 coincides with the first virtual plane PL1. Furthermore, there are also cases where the second auxiliary flap lower surface 32 curves a little, and in those cases the air direction adjustment member upper surface 51 is regarded as coinciding with the second virtual plane PL2 when the rear end portion of the main surface of the air direction adjustment member upper surface 51 coincides with the second virtual plane PL2. It will be noted that "main surface" here refers to the surface used exclusively for air direction adjustment, excluding parts that do not contribute to air direction adjustment. For example, a recess portion 54 is provided in correspondence to a projection located in the casing 11. This part with the recess portion 54 is a structure for ensuring that the projection of the casing 11 does not get in the way when the air direction adjustment member 50 closes the air outlet 27, and is not included in the main surface because it does not contribute much to air direction adjustment.

[0043] The second auxiliary flap 30 is, for the purpose of rotating, attached away from the upper surface front end 16f of the flow passage upper surface 16c. For the same reason, the air direction adjustment member 50 is also attached away from the lower surface front end 16h of the flow passage lower surface 16d. However, if the second auxiliary flap 30 is too far away from the flow

passage upper surface 16c and the air direction adjustment member 50 is too far away from the flow passage lower surface 16d, a sufficient effect of extending the scroll air outflow passage 16b by means of the second auxiliary flap lower surface 32 and the air direction adjustment member 50 is not obtained. Therefore, in a state in which the second auxiliary flap 30 and the air direction adjustment member 50 are set to the first air direction, in the range in which the second auxiliary flap 30 is rotatable the distance from a rear end 34 (see FIG. 2) of the second auxiliary flap 30 to the upper surface front end 16f of the flow passage upper surface 16c is configured to be equal to or less than 5 mm, and a distance L1 from a rear end 56 of the air direction adjustment member 50 to the lower surface front end 16h of the flow passage lower surface 16d is configured to be equal to or less than 5 mm (see FIG. 5).

[0044] The first auxiliary flap 40, because it is provided downstream of the second auxiliary flap 30, finely adjusts up and down the air direction of the air blown out from that part surrounded by a front end 33 of the second auxiliary flap 30 and a front end 55 of the air direction adjustment member 50, which are the air outlet of the extended scroll air outflow passage 16b. In the state shown in FIG. 2, the first auxiliary flap 40, while adopting a posture in which resistance becomes as low as possible with respect to the air that is blown out, adopts a posture in which it raises a little upward the air direction of the air blown out from the scroll air outflow passage 16b pointing a little downward from the horizontal.

(3-2) Second Air Direction

[0045] A second air direction shown in FIG. 6 is an air direction when creating an airflow along the wall to which the rear surface portion 11c of the air conditioning indoor unit 10 is attached. The second auxiliary flap 30, the first auxiliary flap 40, and the air direction adjustment member 50 that have been set to blow out the air in the second air direction generate an airflow heading in the direction of the rear surface portion 11c from the air outlet 27. At this time, the air direction adjustment member upper surface 51 of the air direction adjustment member 50 rotates rearward beyond a vertical plane perpendicular to the front and rear direction, so that the front end 55 of the air direction adjustment member 50 is positioned more rearward than the rear end 56 of the air direction adjustment member 50. Similarly, the first auxiliary flap upper surface 41 of the first auxiliary flap 40 also rotates rearward beyond a vertical plane perpendicular to the front and rear direction, so that a front end 43 of the first auxiliary flap 40 is positioned more rearward than a rear end 44 (see FIG. 2) of the first auxiliary flap 40. Similarly, the second auxiliary flap upper surface 31 of the second auxiliary flap 30 also rotates rearward beyond a vertical plane perpendicular to the front and rear direction, so that the front end 33 of the secondary auxiliary flap 30 is positioned more rearward than the rear end 34 (see FIG. 2) of the

second auxiliary flap 31.

[0046] The second auxiliary flap 30 and the first auxiliary flap 40 at the time of the second air direction adopt postures in which they overlap each other as seen in a frontal view, whereby the second auxiliary flap 30 and the first auxiliary flap 40 prevent the air from flowing forward through a gap between the second auxiliary flap 30 and the first auxiliary flap 40.

[0047] As the second air direction, the second auxiliary flap 30 and the first auxiliary flap 40 can also adopt the postures shown in FIG. 8(a) and FIG. 8(b). The second auxiliary flap 30 and the first auxiliary flap 40 shown in FIG. 8(a) adopt postures in which the second auxiliary flap upper surface 31 contacts the first auxiliary flap lower surface 42. Furthermore, the second auxiliary flap 30 and the first auxiliary flap 40 shown in FIG. 8(b) adopt postures in which the front end 33 of the second auxiliary flap 30 is contiguous with the first auxiliary flap 40 and in which the second auxiliary flap lower surface 32 and the first auxiliary flap lower surface 42 are side by side in a row and continuous with each other.

(3-3) Third Air Direction

[0048] A third air direction shown in FIG. 9(a) is an air direction when blowing out air at a maximum air volume. When the air conditioning indoor unit 10 has been set to blow out the air in the third air direction, the second auxiliary flap 30 is stowed in the recess 16g located in front of the flow passage upper surface 16c. In the third air direction, the front end 43 of the first auxiliary flap 40 moves upward a little from where it is in the first air direction, and the first auxiliary flap 40 adopts a posture in which it widens upward the airflow blown out from the air outlet 27. In the third air direction, the front end 55 of the air direction adjustment member 50 moves downward a little from where it is in the first air direction, and the air direction adjustment member 50 adopts a posture in which it widens downward the airflow blown out from the air outlet 27. That is to say, the first auxiliary flap 40 and the air direction adjustment member 50 adopt postures in which they become farther apart heading forward and in which it is easy for them to deliver to the room space RS the air that has been blown out at the maximum air volume.

(3-4) Fourth Air Direction

[0049] A fourth air direction shown in FIG. 9(b) is an air direction when blowing out air forward and downward. When the air conditioning indoor unit 10 has been set to blow out the air in the fourth air direction, the second auxiliary flap 30 is stowed in the recess 16g located in front of the flow passage upper surface 16c. In the fourth air direction, the front end 43 of the first auxiliary flap 40 moves downward a little from where it is in the first air direction, and the first auxiliary flap 40 adopts a posture in which it pushes downward the airflow blown out from

the air outlet 27. That is to say, the rate at which the first auxiliary flap lower surface 42 at this time declines downward heading forward is larger than that of the first virtual plane PL1, so that the first auxiliary flap lower surface 42 is more down in front than the first virtual plane PL1. In the fourth air direction, the front end 55 of the air direction adjustment member 50 moves downward a little from where it is in the first air direction, and the air direction adjustment member 50 adopts a posture in which it guides downward the airflow blown out from the air outlet 27. That is to say, the rate at which the air direction adjustment member upper surface 51 at this time descends downward heading forward is larger than that of the second virtual plane PL2, so that the air direction adjustment member upper surface 51 is more down in front than the second virtual plane PL2.

(3-5) Fifth Air Direction

[0050] A fifth air direction shown in FIG. 9(c) is an example of an air direction when blowing out air forward and downward using the second auxiliary flap 30. When the air conditioning indoor unit 10 has been set to blow out the air in the fifth air direction, the second auxiliary flap 30 rotates in such a way that the front end 33 moves downward, and the second auxiliary flap 30 sticks out from the recess 16g and adopts a down-in-front posture. At this time, the second auxiliary flap lower surface 32 is in a position near a plane joining the flow passage upper surface 16c and the first auxiliary flap lower surface 42 and relays the blown-out air in such a way that the airflow heading from the flow passage upper surface 16c toward the first auxiliary flap lower surface 42 becomes smooth.

[0051] In the fifth air direction, the front end 43 of the first auxiliary flap 40 is moved downward a little from where it is in the first air direction but is moved upward a little from where it is in the fourth air direction, and the first auxiliary flap 40 adopts a posture in which it pushes a little downward the airflow blown out from the air outlet 27. Furthermore, in the fifth air direction, the posture of the air direction adjustment member 50 is the same as it is in the fourth air direction. Because the second auxiliary flap 30, the first auxiliary flap 40, and the air direction adjustment member 50 adopt such postures, the air that has been blown out can be carried to a place farther away in front than in the fourth air direction.

(3-6) Movement of First Auxiliary Flap 40, Second Auxiliary Flap 30, and Air Direction Adjustment Member 50

[0052] The position of the front end 33 of the second auxiliary flap 30 shown in FIG. 6, FIG. 7, FIG. 8(a), and FIG. 8(b) is lower than the rotational center 45 of the first auxiliary flap 40. In contrast, the position of the second auxiliary flap 30 when it is stowed in the recess 16g is higher than the rotational center 45 of the first auxiliary flap 40. The first auxiliary flap 40 in the position shown in FIG. 6 to FIG. 8(b) on the path on which the second

auxiliary flap 30 rotates gets in the way as the second auxiliary flap 30 rotates to the position of the second auxiliary flap 30 shown in FIG. 6 to FIG. 8(b). That is to say, if the first auxiliary flap 40 were in the position shown in FIG. 6 to FIG. 8(b) when the second auxiliary flap 30 is stowed in the recess 16g, the second auxiliary flap 30 would end up hitting the first auxiliary flap 40 and not be able to rotate to the position shown in FIG. 6 to FIG. 8(b). Therefore, for example, in a state in which the first auxiliary flap 40 has rotated forward so that it is closest to the casing 11, or in other words in a state in which the first auxiliary flap 40 is along the casing 11, first the second auxiliary flap 30 stowed in the recess 16g is moved rearward to the position shown in FIG. 6 to FIG. 8(b). Next, the first auxiliary flap 40 is rotated rearward to the position shown in FIG. 6 to FIG. 8(b). In this way, by performing a rotational motion in which the second auxiliary flap 30 and the first auxiliary flap 40 avoid interfering with each other, the front end 33 of the second auxiliary flap 30 can switch between a state in which it is higher than the rotational center 45 of the first auxiliary flap 40 and a state in which it is lower than the rotational center 45 of the first auxiliary flap 40.

(4) Structure of Air Direction Adjustment Member

[0053] FIG. 10(a) shows an end surface of the air direction adjustment member 50 cut by line I-I of FIG. 3. FIG. 10(b) shows a side surface of the air direction adjustment member 50 as seen from the right side. FIG. 11 shows a state in which the air direction adjustment member 50 is broken out at its central part and seen from the right and above. The air direction adjustment member 50 has a hollow structure where a plate-like member configuring the air direction adjustment member upper surface 51 and a plate-like member configuring the air direction adjustment member lower surface 52 are fused together. Because the air direction adjustment member 50 has a hollow structure, this leads to deformation of the air direction adjustment member 50 if a concentration of stress occurs in the air direction adjustment member upper surface 51 and the air direction adjustment member lower surface 52. If the air direction adjustment member 50 deforms, a large gap forms between the air direction adjustment member 50 and the casing 11 when operation is stopped, for example, and the visual attractiveness is reduced.

[0054] In order to prevent such a concentration of stress, a supported portion 53 is provided in a recess portion 60 in a central pivotally supported part of the air direction adjustment member 50. As shown in FIG. 12, the supported portion 53 in the central pivotally supported part is rotatably supported by a support portion 71 that bridges the upper edge 27a and the lower edge 27b of the air outlet 27 of the casing 11. Furthermore, flanges 59 greater in width than the thickness of the air direction adjustment member 50 are attached to a right end portion 61 and a left end portion 62 of the air direction adjustment

member 50 (see FIG. 3). Additionally, supported portions 53 are provided on the flanges 59. The supported portions 53 on the flanges 59 are rotatably fitted into support portions (not shown in the drawings) provided in the casing 11.

[0055] Next, before describing a recessed portion 57 provided in the air direction adjustment member 50, the relationship between the posture of the air direction adjustment member 50 and the airflow will be described. As shown in FIG. 13(a), at the time of the second air direction, for example, the air conditioning indoor unit 10 generates an airflow that flows along the installation side wall WL, and this airflow will be called a first airflow CL1. When generating the first airflow CL1, the air direction adjustment member 50 adopts a posture in which the air direction adjustment member upper surface 51 rotates rearward relative to a vertical plane so that the front end 55 of the air direction adjustment member 50 is positioned more rearward than the rear end 56, and this posture will be called a first posture.

[0056] Furthermore, as shown in FIG. 13(b), at the time of the first air direction, the third air direction, or the fifth air direction, for example, the air conditioning indoor unit 10 generates an airflow that heads forward from the air outlet 27, and this airflow will be called a second airflow CL2. When generating the second airflow CL2, the air direction adjustment member 50 adopts a posture in which the air direction adjustment member upper surface 51 rotates forward relative to a vertical plane so that the front end 55 of the air direction adjustment member 50 is positioned more forward than the rear end 56, and this posture will be called a second posture.

[0057] FIG. 14 shows an enlarged view of the area around the lower edge 27b of the air outlet 27 in a state in which the air direction adjustment member 50 is adopting the first posture. A recessed portion 57 is formed by a step in the air direction adjustment member lower surface 52. In the cross-sectional shape in which the air direction adjustment member 50 is cut by a plane perpendicular to the right and left direction, the front side of the air direction adjustment member lower surface 52 describes a curved line that is convex downward, while the rear side describes a curved line that is convex upward. Because of this structure of the air direction adjustment member lower surface 52, the rear side of the air direction adjustment member lower surface 52 that describes a curved line that is convex upward is recessed upward to form a step, and this upwardly recessed step part is the recessed portion 57.

[0058] The air direction adjustment member 50 is attached in such a way that, at the time of the second air direction in which the air direction adjustment member 50 adopts the first posture, the lower edge 27b of the air outlet 27 enters the recessed portion 57 formed in the air direction adjustment member lower surface 52. Consequently, compared to a case where there is no recessed portion 57 in the air direction adjustment member lower surface 52, the front end 55 of the air direction adjustment

member 50 can be moved further rearward by how much the lower edge 27b enters the recessed portion 57. As a result, compared to a case where there is no recessed portion 57, the airflow can be made to flow along the installation side wall WL from a higher position because there is the recessed portion 57.

(5) Structure of Lower Edge 27b of Air Outlet 27

[0059] As shown in FIG. 14, in the lower edge 27b, a depression portion 72 that is set rearward is formed and groove portions 73 that are recessed rearward are formed. Compared to cases where the lower edge 27b is given a shape in which it is vertically cut out straight or where the shape of the lower edge 27b is formed in such a way that it projects forward heading downward, the front end 55 of the air direction adjustment member 50 can be moved further rearward because the depression portion 72 is formed. In other words, this means that the air direction adjustment member 50 can adopt a posture in which the air direction adjustment member upper surface 51 is rotated rearward relative to a vertical plane. As a result, in the second air direction, the air direction adjustment member 50 can adopt the first posture in which it allows the airflow to flow along the installation side wall WL from a higher position compared to a case where the depression portion 72 is not formed.

[0060] When the air direction adjustment member 50 has adopted the first posture, a gap forms between the lower edge 27b and the air direction adjustment member lower surface 52. When cool air flows through this gap, depending on environmental conditions sometimes dew condensation forms on the lower edge 27b and the air direction adjustment member 50. The groove portions 73 fulfill the role of disrupting the airflow that arises in this gap. The airflow that arises in the gap is disrupted and the air is agitated, whereby it becomes difficult for condensation to form.

(6) Example Modifications

(6-1) Example Modification A

[0061] In the embodiment, a case was described where the recessed portion 57 is formed by a step in the air direction adjustment member lower surface 52, but as with a sloping end surface 57A of an air direction adjustment member 50A shown in FIG. 15 and FIG. 16, a recessed portion can also be formed by the sloping end surface 57A. In a cross-sectional shape in which the air direction adjustment member 50A is cut by a plane perpendicular to the right and left direction, the front side of an air direction adjustment member lower surface 52A describes a gentle curved line that is convex downward, while the rear side describes a straight line with a large inclination. Because of the structure of this air direction adjustment member lower surface 52A, a recessed portion is formed by the sloping end surface 57A on the rear

side of the air direction adjustment member lower surface 52A.

[0062] A sloping end surface 74 is also formed in the lower edge 27b of the air outlet 27, which opposes the sloping end surface 57A serving as a recessed portion when the air direction adjustment member 50A adopts the first posture. It is preferred that the sloping end surface 57A serving as a recessed portion and the sloping end surface 74 of the lower edge 27b be configured to become parallel to each other when the air direction adjustment member 50A has rotated rearward so that the front end 55 has moved rearward its maximum extent. It will be noted that the groove portions 73 described in the embodiment may also be formed in the sloping end surface of the lower edge 27b.

(7) Characteristics

(7-1)

[0063] According to the wall-mounted air conditioning indoor unit 10 of the present embodiment, the lower edge 27b of the air outlet 27 enters the recessed part of the recessed portion 57 or the sloping end surface 57A serving as a recessed portion of the air direction adjustment member 50 or 50A when the air direction adjustment member 50 or 50A adopts the first posture. For example, the spaces surrounded by the long dashed double-short dashed lines and the air direction adjustment member lower surfaces 52 and 52A shown in FIG. 10 and FIG. 16 are the recessed part of the recessed portion 57 and the sloping end surface 57A serving as a recessed portion. Because the lower edge 27b enters the recessed part of the recessed portion 57 or the sloping end surface 57A serving as a recessed portion, the range of rotational motion can be increased, so restrictions on airflow control for ensuring comfort can be eased. Furthermore, in the air conditioning indoor unit 10, design attractiveness can be well maintained because the recessed portion 57 and the sloping end surface 57A serving as a recessed portion are formed in such a way that they are hardly noticeable in the air direction adjustment member lower surfaces 52 and 52A. It will be noted that the planes indicated by the long dashed double-short dashed lines are formed by extending the front/rear planes of the recessed portion 57 or the sloping end surface 57A serving as a recessed portion, for example.

(7-2)

[0064] As shown in FIG. 14, in the casing 11 of the air conditioning indoor unit 10, the depression portion 72 corresponding to the shape of the air direction adjustment member lower surface 52 is formed in the lower edge 27b of the air outlet 27 and in a position opposing the rear end portion of the air direction adjustment member lower surface 52 of the air direction adjustment member 50 that has adopted the first posture. Because the de-

pression portion 72 is provided in correspondence to the shape of the air direction adjustment member lower surface 52, the range of rearward rotation of the air direction adjustment member 50 can be increased compared to a case where the depression portion 72 is not provided. As a result, restrictions on the airflow control of the air conditioning indoor unit 10 can be eased by how much the rotational range is increased.

10 (7-3)

[0065] As shown in FIG. 14, the groove portions 73 provided in the lower edge 27b of the air outlet 27 of the casing 11 are formed opposing the gap between the air direction adjustment member 50 and the casing 11. As a result, the air that flows through the gap between the air direction adjustment member 50 and the casing 11 can be agitated, and the groove portions 73 can keep condensation from forming in the gap between the air direction adjustment member 50A and the casing 11.

(7-4)

[0066] As shown in FIG. 15 and FIG. 16, the sloping end surface 57A serving as a recessed portion of the air direction adjustment member 50A and the sloping end surface 74 of the casing 11 oppose each other when the air direction adjustment member 50A adopts the first posture, so the range of rearward rotation of the air direction adjustment member 50A can be increased. Restrictions on the airflow control of the air conditioning indoor unit 10 can be eased by how much the rotational range is increased by the sloping end surfaces of the air direction adjustment member 50 and the casing 11.

(7-5)

[0067] Compared to a case where the recessed portion 57 is not provided in the air direction adjustment member 50, the strength of the rear end portion of the air direction adjustment member 50 drops because of the recessed portion 57 in the rear end portion of the air direction adjustment member 50. By providing the flanges 59 on the side portions of the recessed portion 57, the air direction adjustment member 50 is reinforced by the flanges 59 and deformation of the air direction adjustment member 50 can be reduced even when the recessed portion 57 is provided in the rear end portion of the air direction adjustment member 50. Because the air direction adjustment member 50 is reinforced by the flanges 59, a drop in the air direction adjustment function caused by deformation of the air direction adjustment member 50 can be prevented and design attractiveness can be prevented from being reduced by deformation of the air direction adjustment member 50.

REFERENCE SIGNS LIST

[0068]

10 Air Conditioning Indoor Unit	5
11 Casing	
16 Bottom Frame	
16b Scroll Air Outflow Passage	
16c Flow Passage Upper Surface	
16d Flow Passage Lower Surface	10
27 Air Outlet	
27a Upper Edge	
27b Lower Edge	
30 Second Auxiliary Flap	
40 First Auxiliary Flap	15
50, 50A Air Direction Adjustment Members	
51 Air Direction Adjustment Member Upper Surface	
52 Air Direction Adjustment Member Lower Surface	
55 Front End	
56 Rear End	20
57 Recessed Portion	
57A Sloping End Surface (Example of Recessed Portion)	
59 Flanges	
72 Depression Portion	25
73 Groove Portions	

CITATION LIST

<Patent Literature> 30

[0069] Patent Document 1: JP-ANo. 2007-93092

Claims

1. A wall-mounted air conditioning indoor unit comprising: 35
- a casing (11) having rear surface portion secured to an installation side wall and having an air outlet (27), through which conditioned air is blown out, located in front of the rear surface portion; and 40
- an air direction adjustment member (50, 50A) that has a rear end (56), a front end (55) arranged at position farther from a rotational center set at a lower edge (27) than the rear end, an upper surface (51) that adjusts the air direction of outlet air blown out from the air outlet, and a lower surface (52) located on the opposite side of the upper surface, the air direction adjustment member having a recessed portion (57, 57A) that is upwardly recessed being disposed in a rear end portion of the lower surface, 50
- wherein 55
- the air direction adjustment member is configured to be capable of being located in a first posture,

in which the front end is positioned more rearward than the rear end by rearward rotation beyond a vertical plane of the upper surface when generating a first airflow toward the installation side wall from the air outlet, and a second posture, in which the front end is positioned more forward than the rear end by forward rotation beyond the vertical plane of the upper surface when generating a second airflow forward from the air outlet, and the air direction adjustment member is attached in such a way that the lower edge of the air outlet enters the recessed portion when the air direction adjustment member becomes the first posture.

2. The wall-mounted air conditioning indoor unit according to claim 1, wherein the casing has a depression portion (72) corresponding to the shape of the lower surface of the air direction adjustment member disposed in the lower edge of the air outlet and in a position opposing the rear end portion of the lower surface of the air direction adjustment member that has become the first posture.
3. The wall-mounted air conditioning indoor unit according to claim 1 or claim 2, wherein the casing has groove portions (73) disposed in the lower edge of the air outlet and in a position opposing the rear end portion of the lower surface of the air direction adjustment member that has become the first posture.
4. The wall-mounted air conditioning indoor unit according to claim 1, wherein the air direction adjustment member and the casing have sloping end surfaces disposed a place of the air direction adjustment member and a place of the casing that oppose each other when the air direction adjustment member becomes the first posture.
5. The wall-mounted air conditioning indoor unit according to any one of claims 1 to 4, wherein the air direction adjustment member has flanges (59) on side portions of the recessed portion, and the casing pivotally supports the flanges in such a way that the air direction adjustment member is rotatable in the up and down direction.

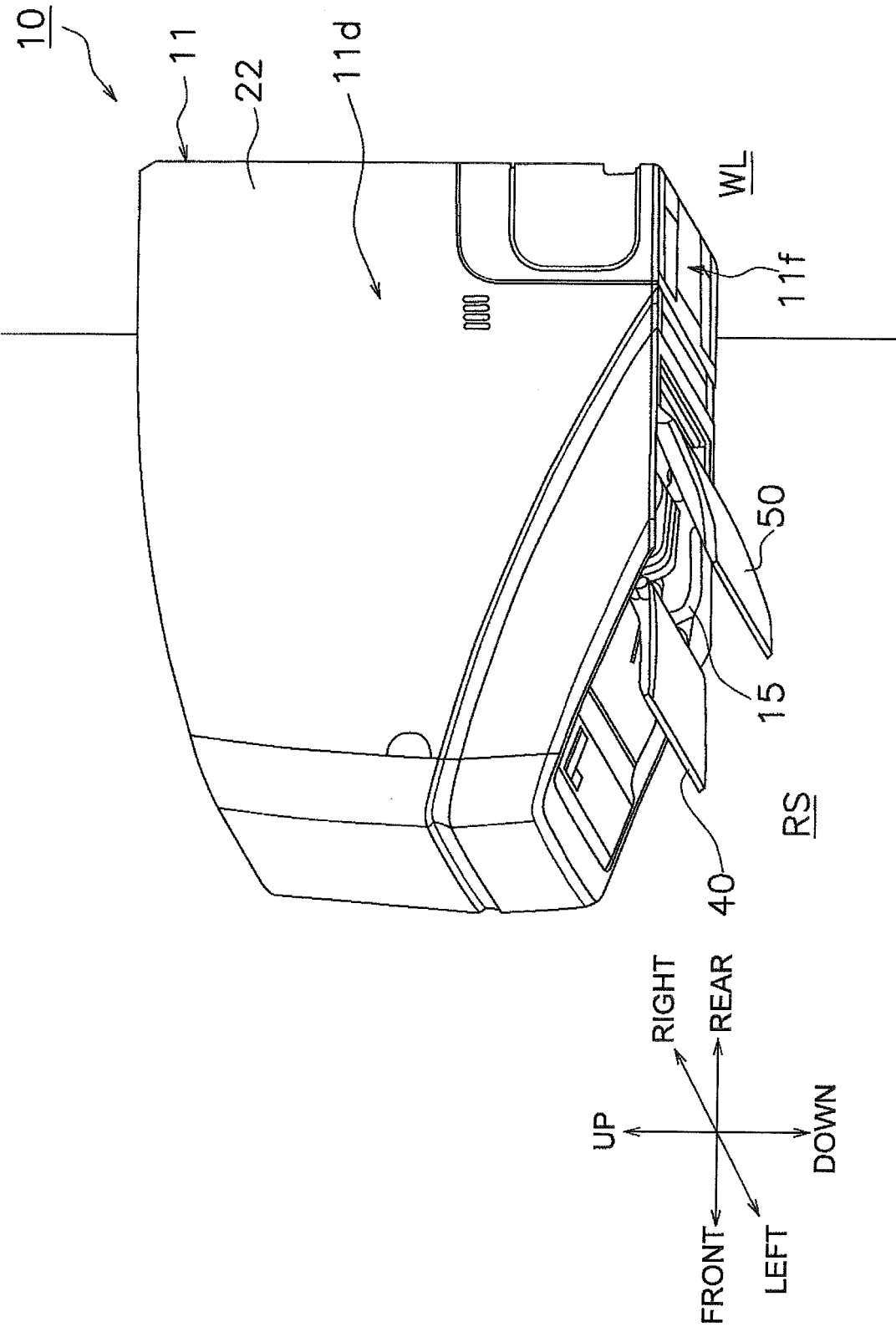


FIG. 1

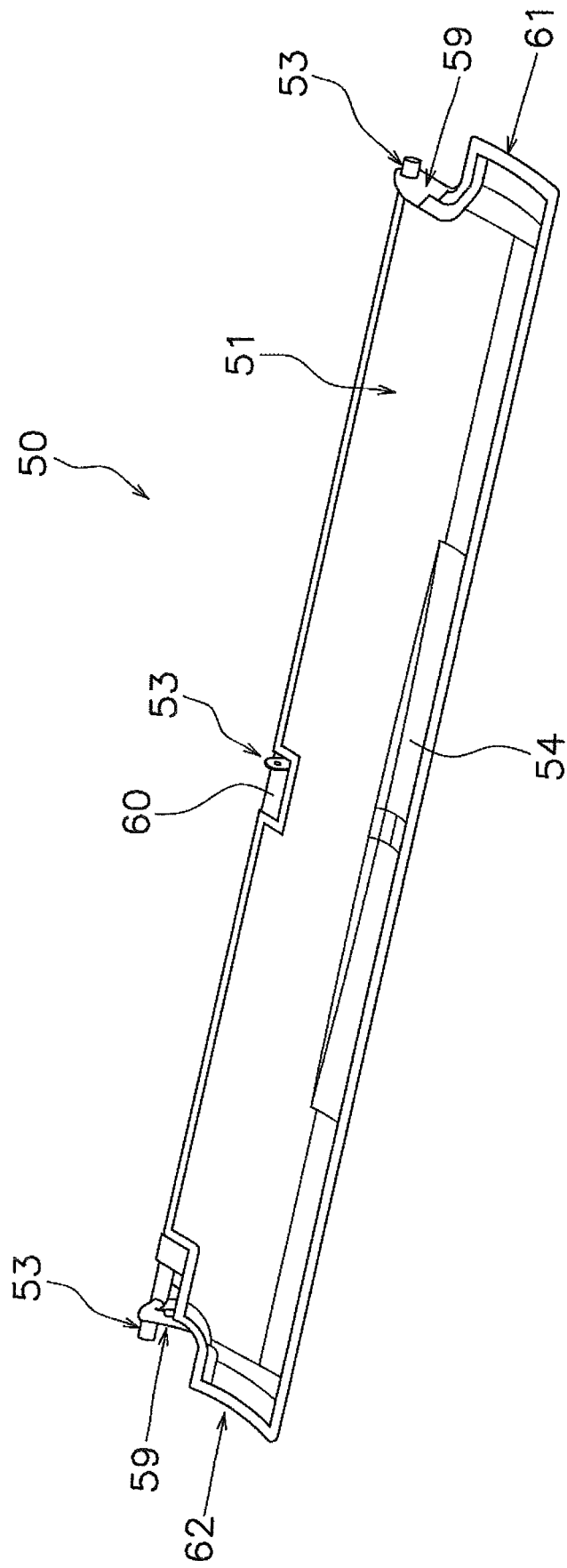


FIG. 3

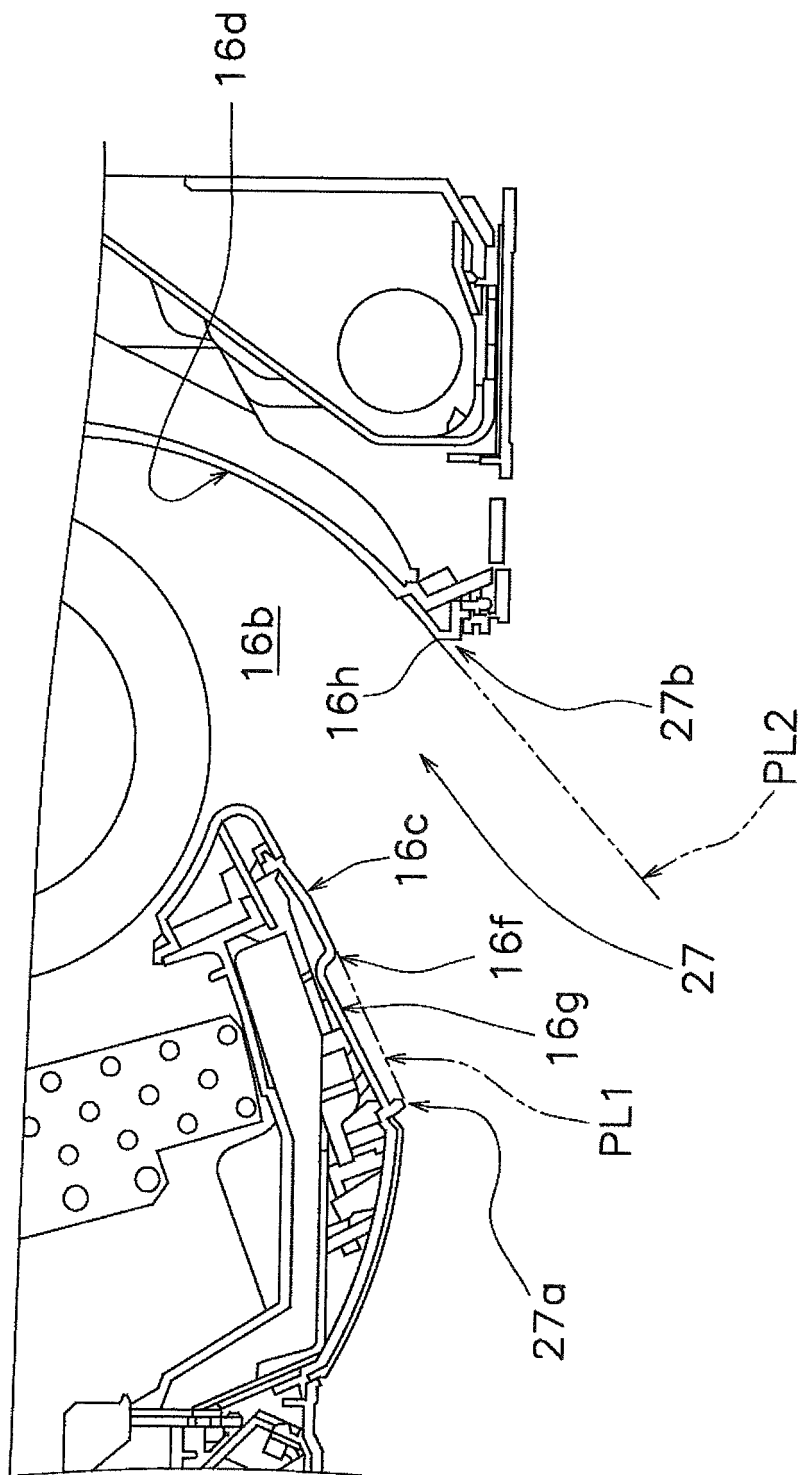


FIG. 4

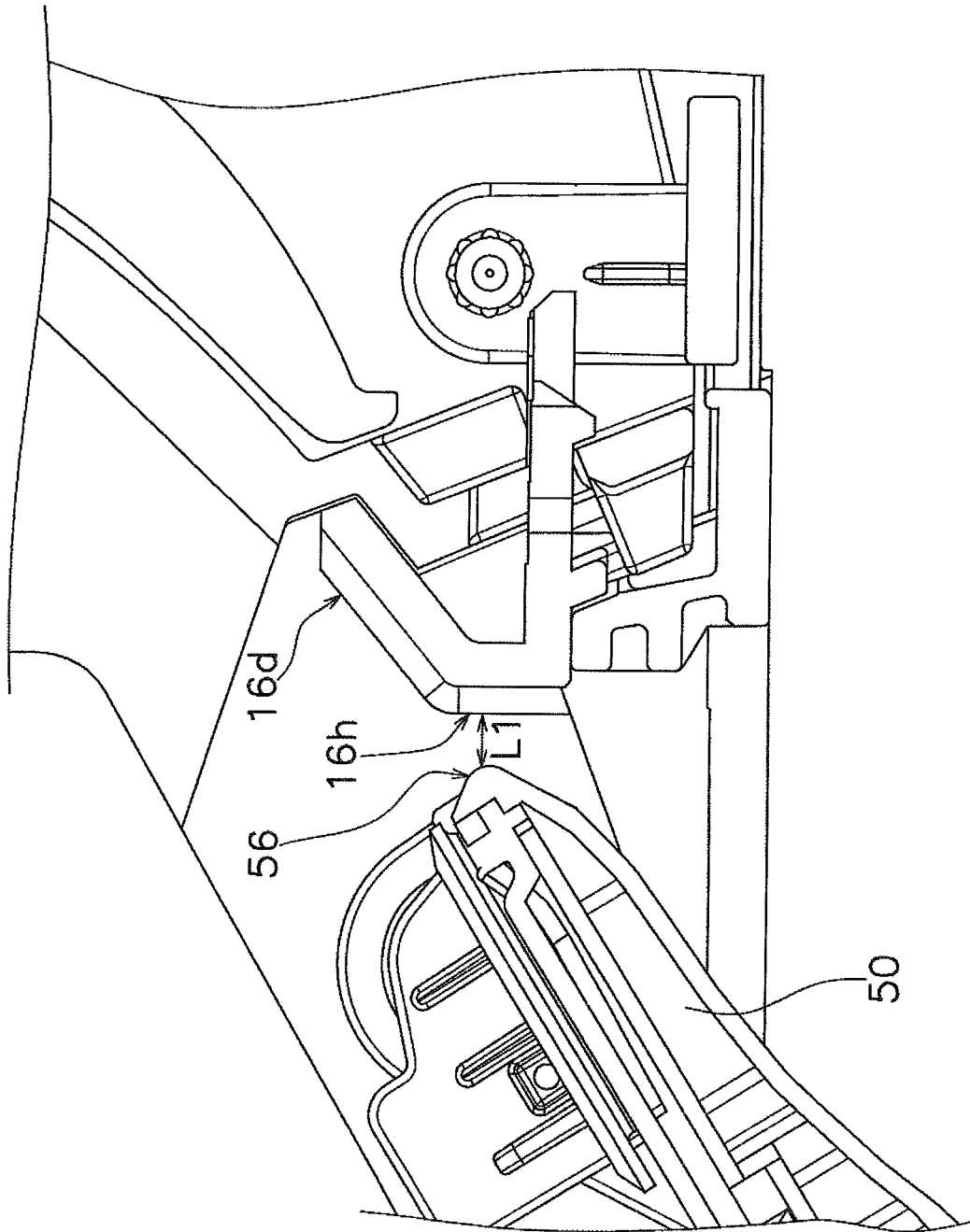


FIG. 5

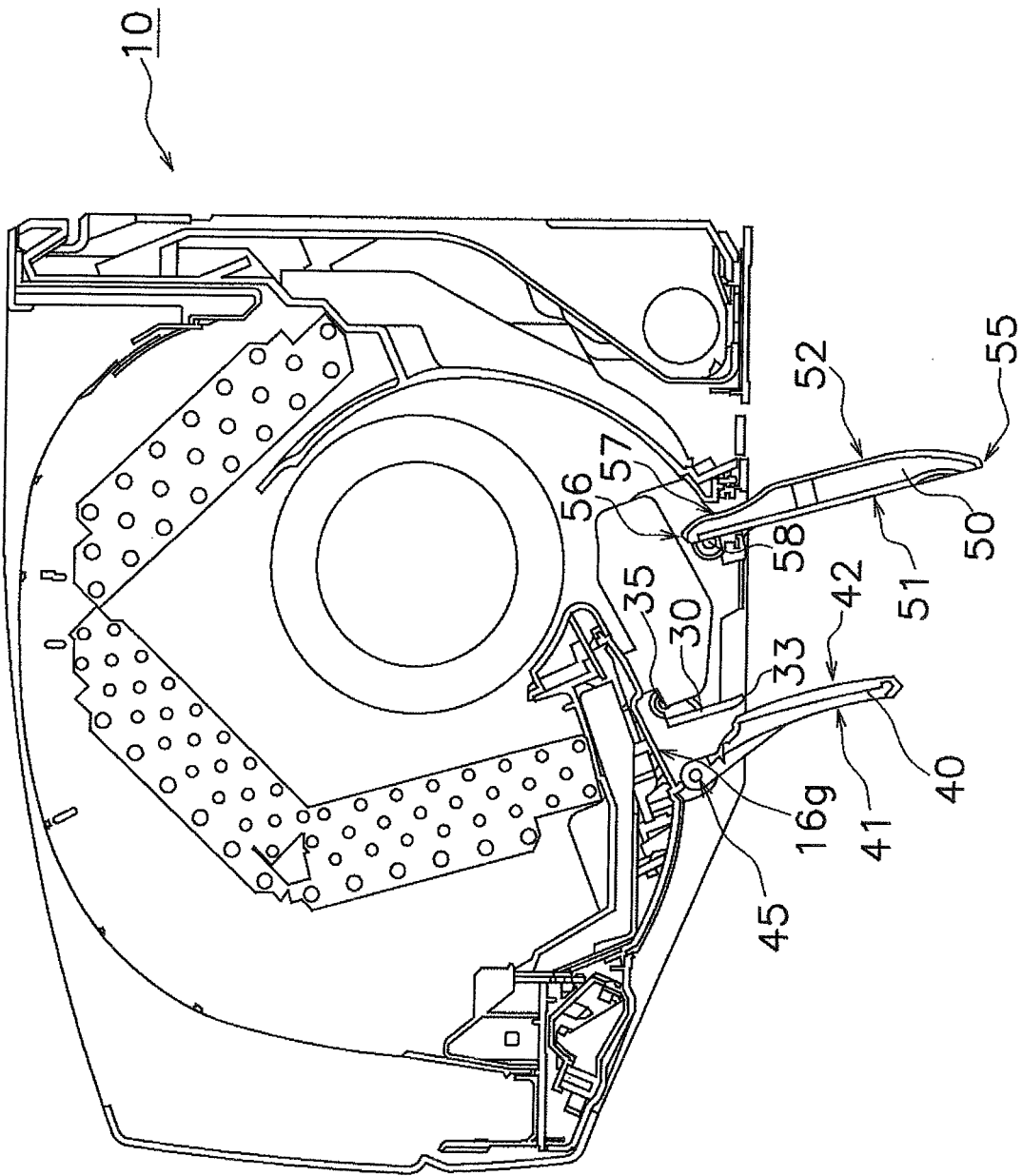


FIG. 6

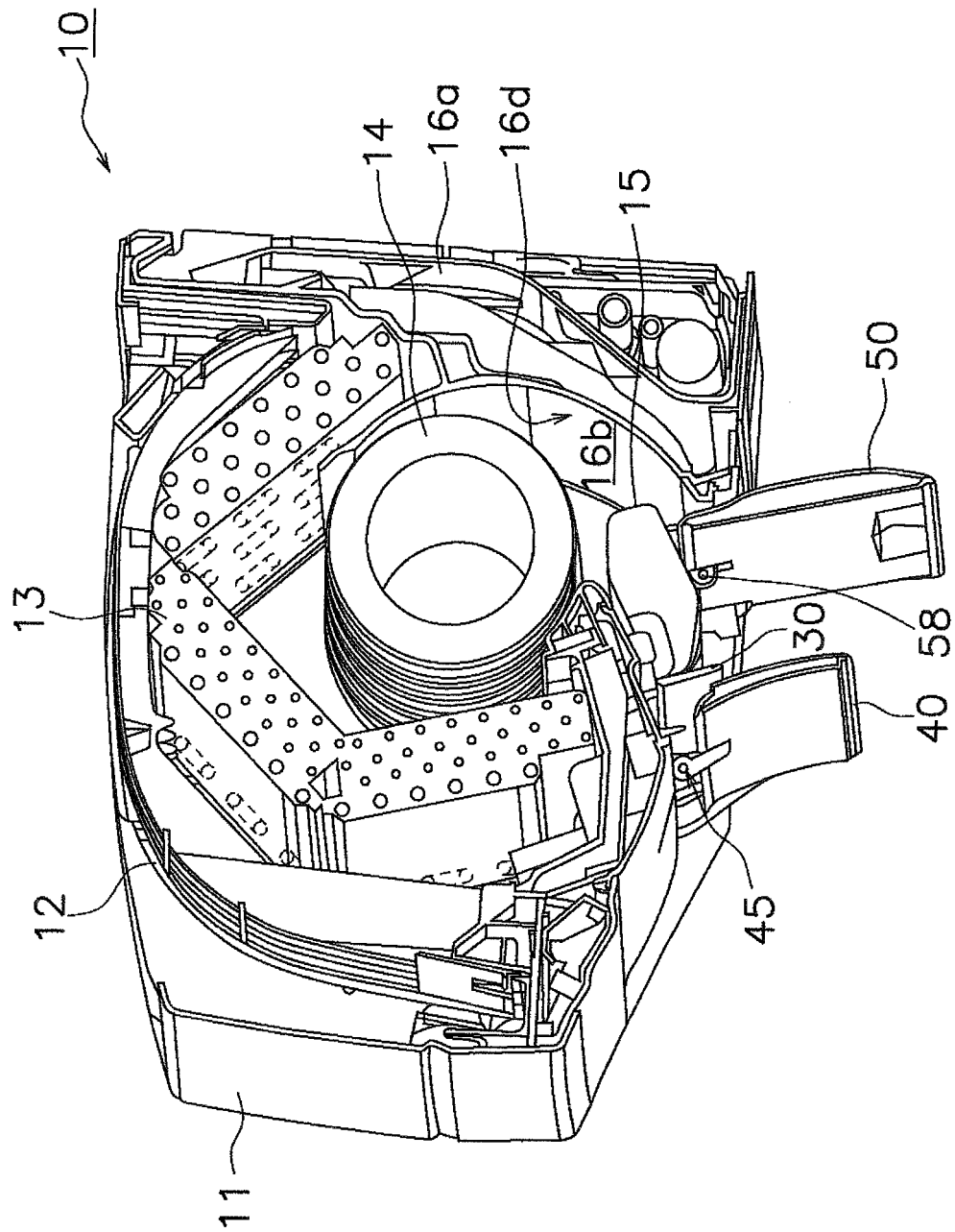
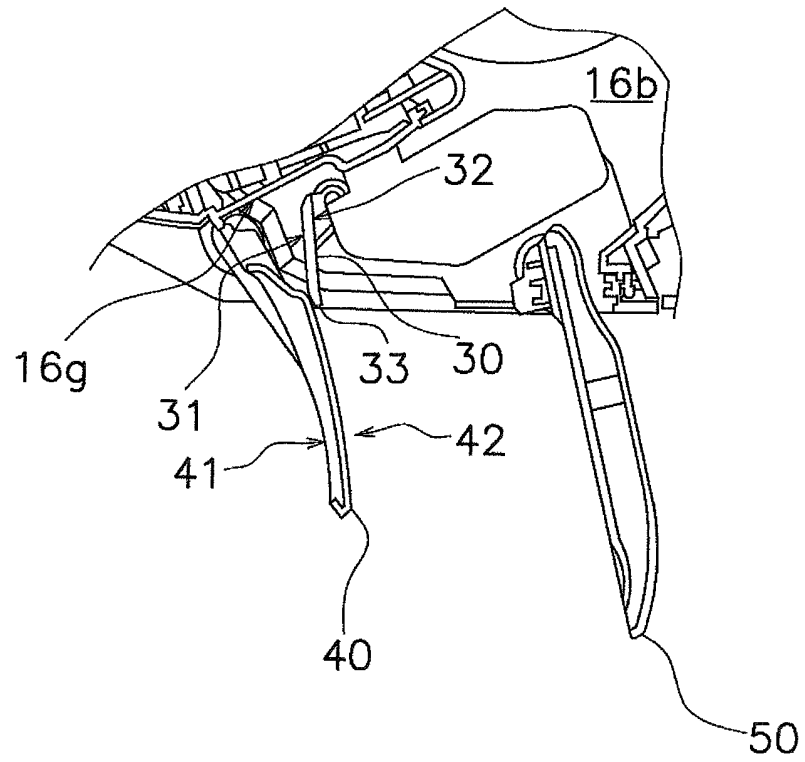


FIG. 7

(a)



(b)

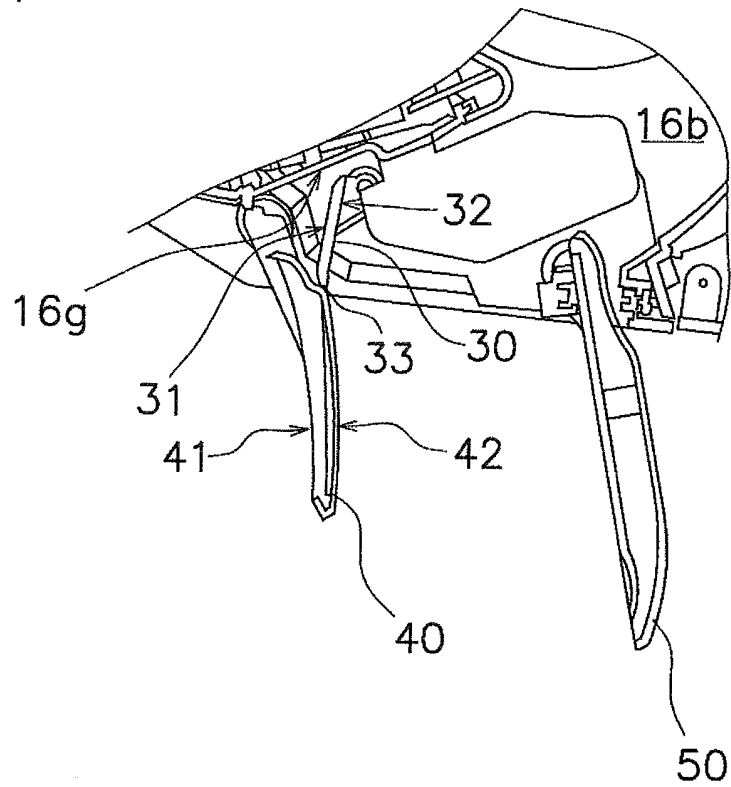


FIG. 8

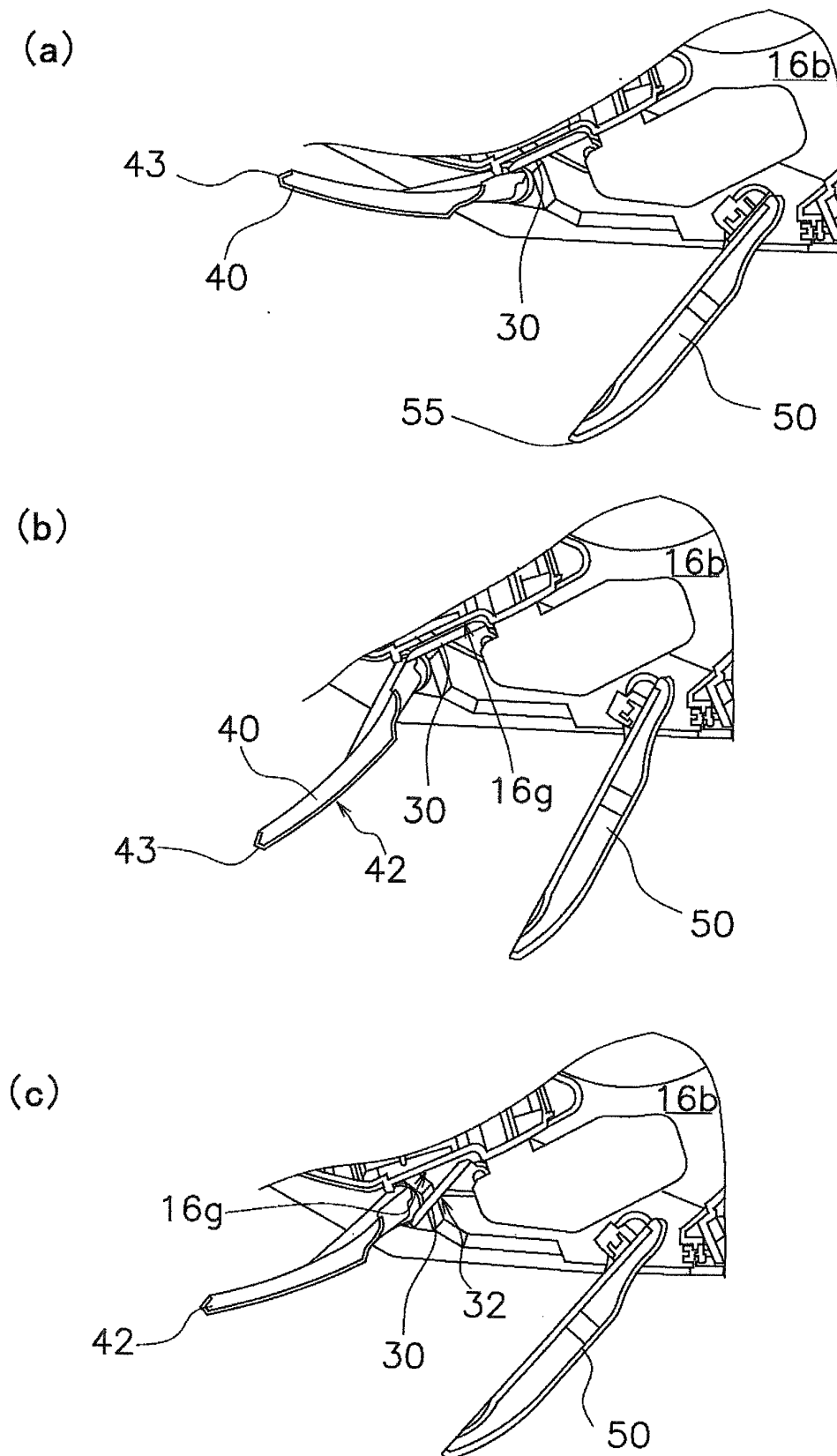


FIG. 9

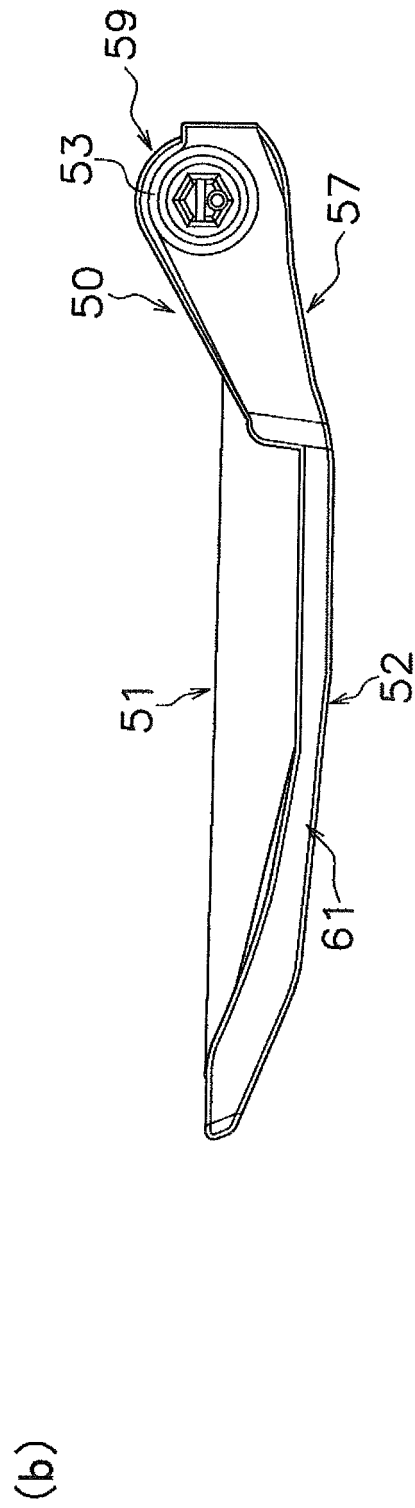
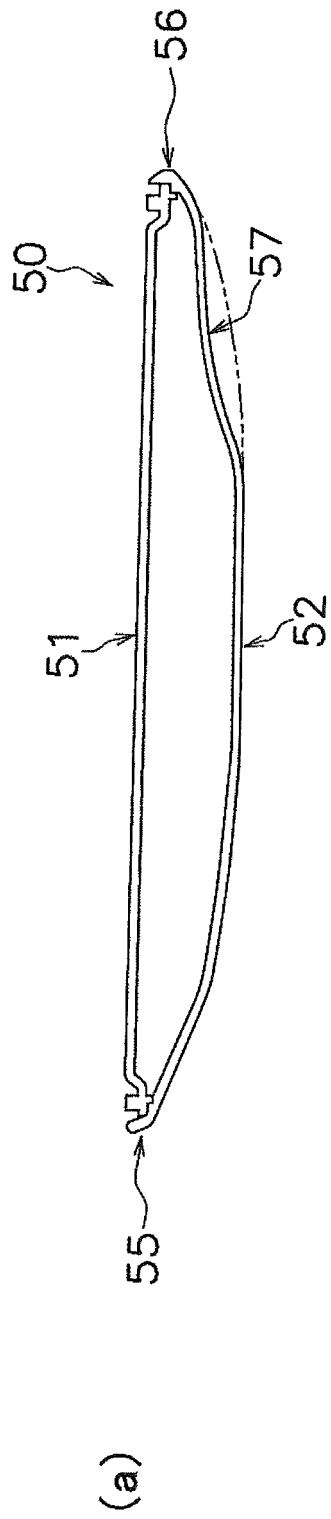


FIG. 10

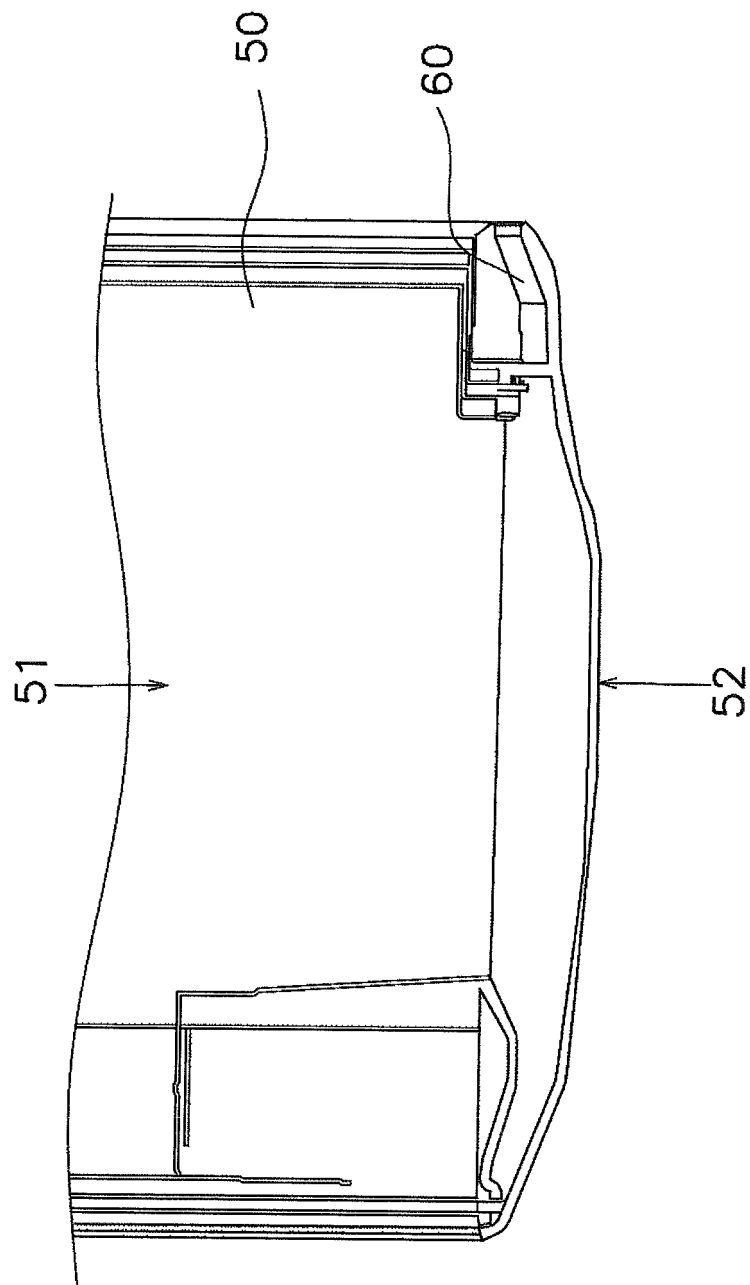


FIG. 11

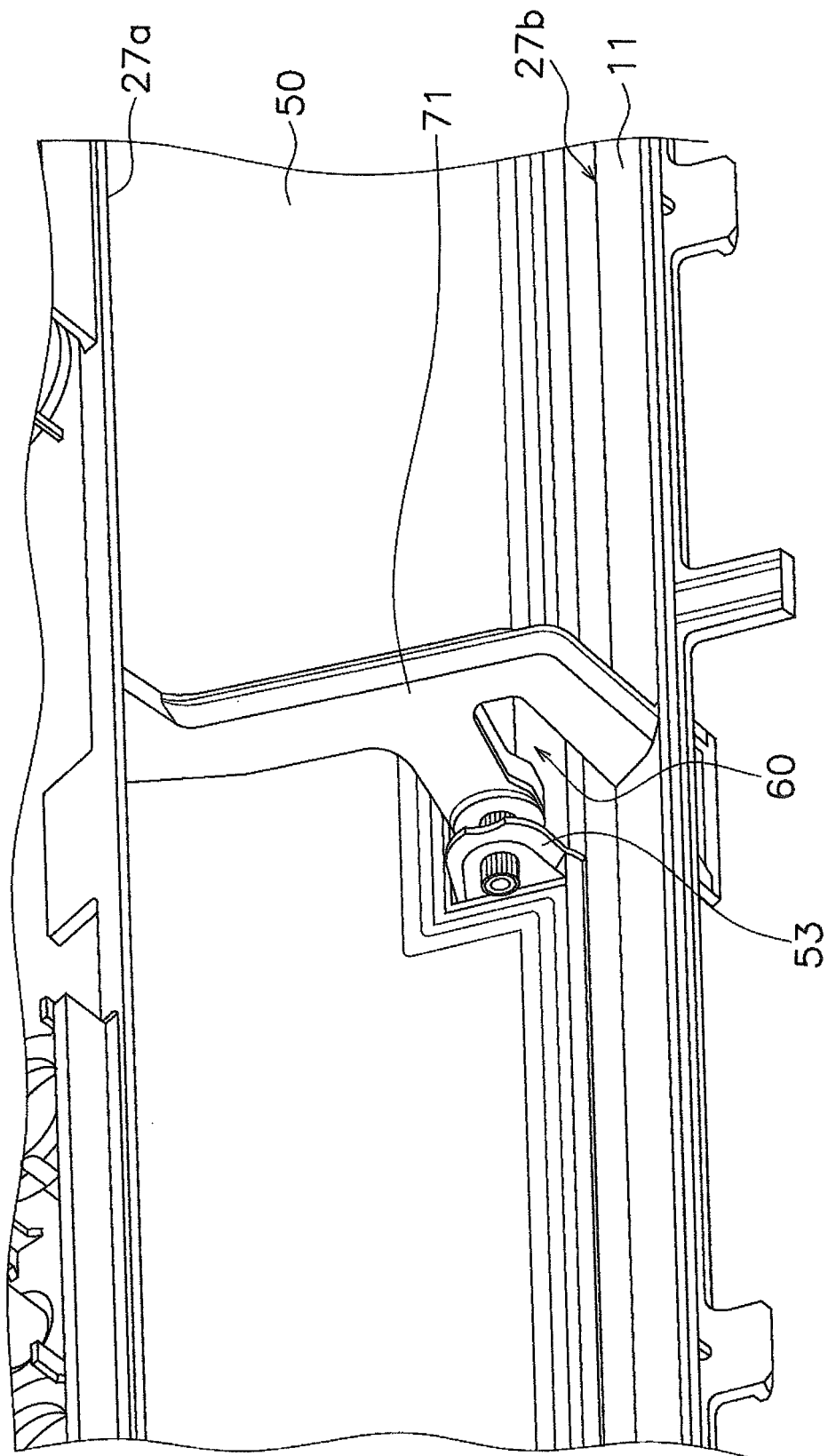


FIG. 12

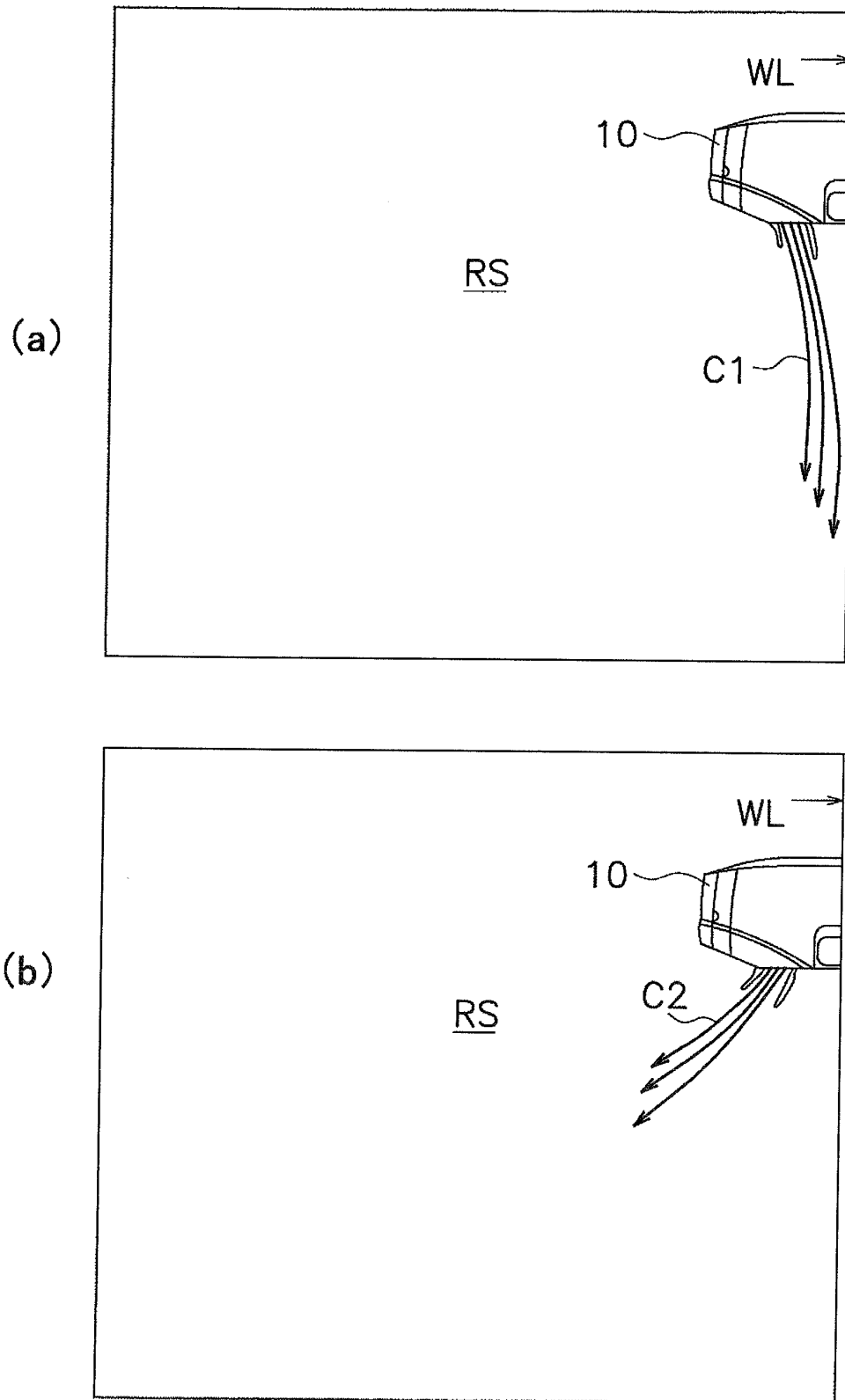


FIG. 13

FIG. 14

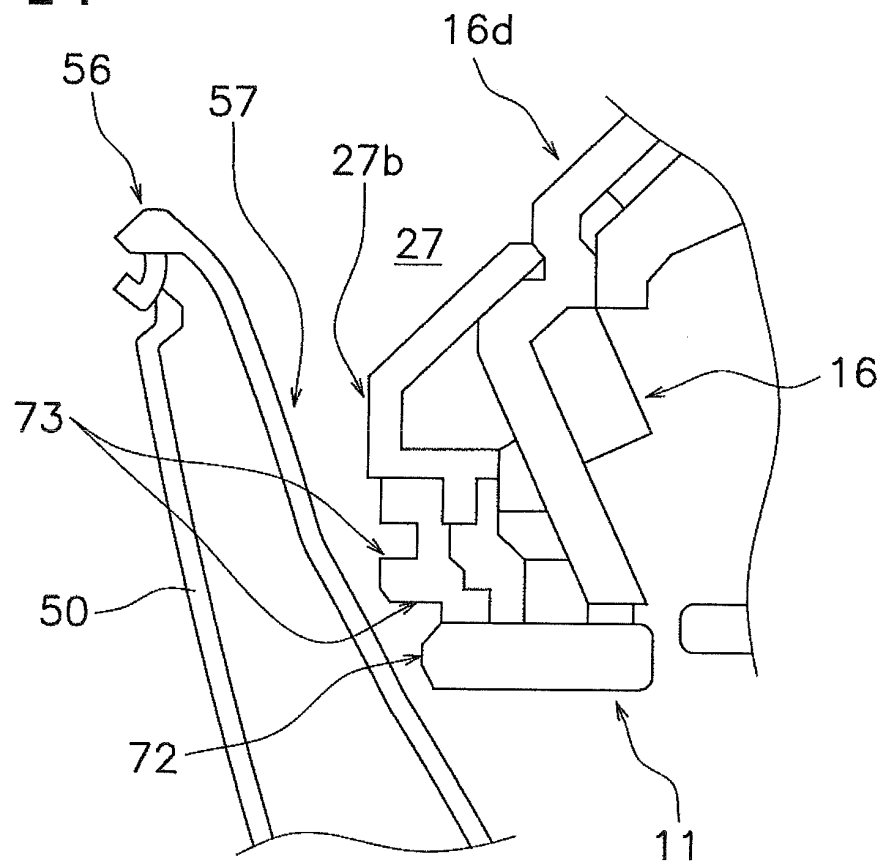
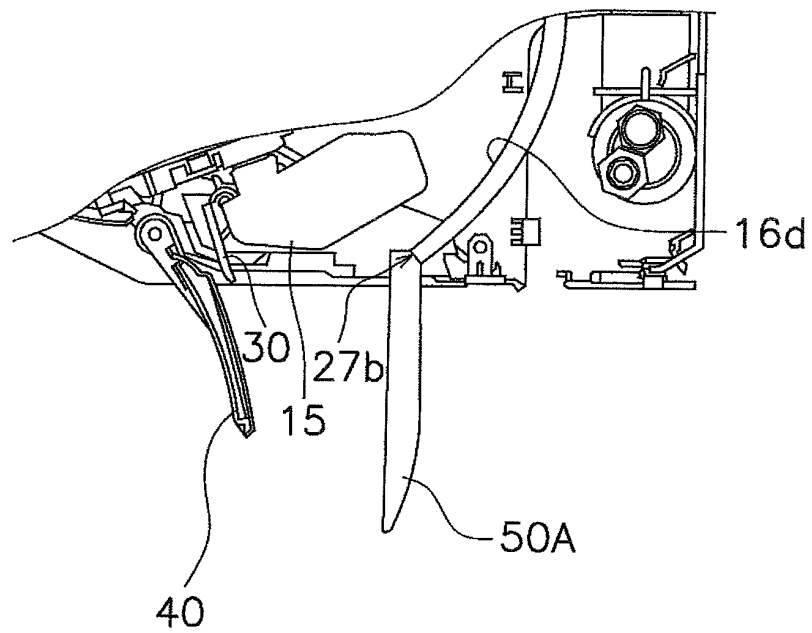


FIG. 15



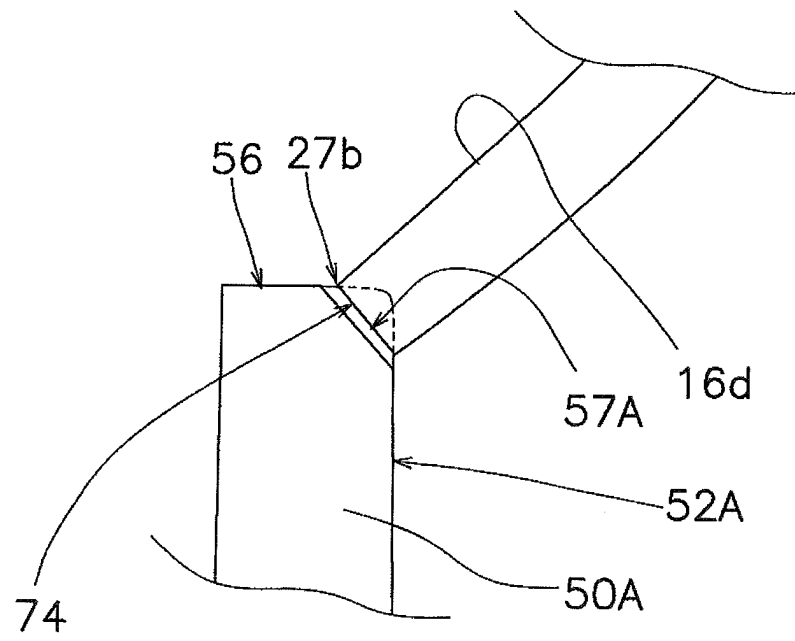


FIG. 16

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2016/076197

A. CLASSIFICATION OF SUBJECT MATTER

F24F13/20(2006.01)i, F24F13/14(2006.01)i, F24F13/32(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)

F24F13/20, F24F13/14, F24F13/32

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 1996-2016

Kokai Jitsuyo Shinan Koho 1971-2016 Toroku Jitsuyo Shinan Koho 1994-2016

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.
A	JP 9-310882 A (Fujitsu General Ltd.), 02 December 1997 (02.12.1997), entire text; all drawings & US 5873780 A & EP 809080 A2 & CN 1169523 A	1-5
A	JP 2003-232297 A (Sharp Corp.), 22 August 2003 (22.08.2003), entire text; all drawings & CN 1436981 A	1-5
A	JP 2014-55746 A (Daikin Industries, Ltd.), 27 March 2014 (27.03.2014), entire text; all drawings & WO 2014/042012 A & EP 2918930 A1 & CN 104620058 A	1-5

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

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"&" document member of the same patent family

Date of the actual completion of the international search
18 November 2016 (18.11.16)Date of mailing of the international search report
29 November 2016 (29.11.16)Name and mailing address of the ISA/
Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2016/076197

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 9-112950 A (Matsushita Electric Industrial Co., Ltd.), 02 May 1997 (02.05.1997), fig. 5 & EP 769661 A2 fig. 5 & CN 1150637 A	1-5

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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