(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 076 097 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
15.11.2017 Bulletin 2017/46

(21) Application number: **14866397.4**

(22) Date of filing: **26.11.2014**

(51) Int Cl.:
F24F 13/14 *(2006.01)* ***F24F 13/28*** *(2006.01)*
F24F 1/00 *(2011.01)* ***F24F 13/20*** *(2006.01)*

(86) International application number:
PCT/JP2014/081277

(87) International publication number:
WO 2015/080165 (04.06.2015 Gazette 2015/22)

(54) **INDOOR UNIT**

INNENRAUMEINHEIT

UNITÉ INTÉRIEURE

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **26.11.2013 JP 2013244417**
26.11.2013 JP 2013244418
26.11.2013 JP 2013244419
26.11.2013 JP 2013244420
27.12.2013 JP 2013271804

(43) Date of publication of application:
05.10.2016 Bulletin 2016/40

(73) Proprietor: **Daikin Industries, Ltd.**
Osaka-shi, Osaka 530-8323 (JP)

(72) Inventors:
- **OKAMOTO, Naoko**
  Osaka-shi
  Osaka 530-8323 (JP)
- **NAKANISHI, Junichi**
  Osaka-shi
  Osaka 530-8323 (JP)
- **YAMADA, Toshiaki**
  Osaka-shi
  Osaka 530-8323 (JP)
- **WAKIHARA, Katsuhiro**
  Osaka-shi
  Osaka 530-8323 (JP)
- **INOUE, Tetsuji**
  Osaka-shi
  Osaka 530-8323 (JP)

(74) Representative: **Hoffmann Eitle**
Patent- und Rechtsanwälte PartmbB
Arabellastraße 30
81925 München (DE)

(56) References cited:
JP-A- H0 763 368
JP-A- H0 763 368
JP-A- 2004 084 978
JP-A- 2004 163 077
JP-A- 2004 163 077
JP-U- S6 352 018
JP-U- S6 352 018

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 3 076 097 B1

Description

[Technical Field]

[0001] The present invention relates to an indoor unit used in, for example, an air conditioner.

[Background Art]

[0002] A known indoor unit includes a casing and a front panel provided forward of the casing. This indoor unit includes a heat exchanger and a cross flow fan which are provided in the casing. The air sucked through an inlet port of a top plate portion of the casing is supplied to the cross flow fan, and then the air from the cross flow fan is blown out through an outlet port. In this indoor unit, a filter for removing dust included in the air sucked through the inlet port is provided at a position forward of the heat exchanger. This filter is attached or detached in a state that the front panel is open with respect to the casing as the lower end of the front panel has been moved forward.

[Citation List]

[Patent Literatures]

[0003] [Patent Literature 1] Japanese Unexamined Patent Publication No. 2011-149620
JP S63-52018 U discloses features falling under the preamble of claim 1.

[Summary of Invention]

[Technical Problem]

[0004] The cross flow fan provided in the indoor unit is characterized in that the wind quantity is the largest at its central part in the longitudinal direction. In this regard, in a known indoor unit, because the width of the inlet port is constant in the longitudinal direction, the air sucked through the inlet port is not sufficiently supplied to the central part in the longitudinal direction of the cross flow fan. For example, if the top plate portion of the casing is enlarged in the known indoor unit, the inlet port is enlarged and hence the air amount supplied to the central part in the longitudinal direction of the cross flow fan is increased, but the casing is enlarged and hence the appearance of the indoor unit is significantly deteriorated.

[0005] Instead of enlarging the entire casing, the inventors of the present invention considered the possibility of the indoor unit in which a front surface of the casing is curved to bulge so that its central part is at the foremost, and found that, in such an indoor unit, the deterioration of the appearance of the indoor unit is restrained while an inlet port of a top plate portion is enlarged. In this regard, an effect that air volume supplied to a central part in the longitudinal direction of a cross flow fan is increased as compared to known indoor units is achieved.

[0006] However, in the indoor unit in which the front surface of the casing is curved to bulge so that its central part is at the foremost, on the front surface of the casing, a protruding wall surface protruding forward is formed at around the lower end portion of a filter provided inside the casing. This protruding wall surface has, in a manner similar to the top plate portion, a front end curved so that its central part protrudes forward, and hence the lower end portion of the filter is at a position away from the front end of the protruding wall surface toward the back surface side. On this account, when the filter is attached or detached in a state that the front panel is open with respect to the casing, the user cannot hold the lower end portion of the filter and therefore cannot easily detach the filter.

[0007] An object of the present invention is to provide an indoor unit in which a front surface of a casing is curved to bulge so that its central part is at the foremost and a filter is easily detached.

[Solution to Problem]

[0008] The invention is defined by claim 1, defining the first aspect of the invention.

[0009] In this indoor unit, because the protruding wall surface provided at around the lower end portion of the opening of the casing is inclined forward in the downward direction, when the front panel is open with respect to the casing, the user is able to easily take out the filter by stretching his/her hand along the protruding wall surface inclined forward in the downward direction. It is therefore possible to easily take out the filter from in which the front surface of the casing is curved to bulge so that its central part is at the foremost.

[0010] According to the second aspect of the invention, the indoor unit of the first aspect further includes a heat exchanger provided in the casing, a front end portion and its surroundings of the filter being in parallel to a front surface of the heat exchanger in a state that the filter is attached to the mounting position.

[0011] In this indoor unit, the front end portion and its surroundings of the filter are in parallel to the front surface of the heat exchanger at the attaching position. The gap between the front panel and the filter is therefore not narrow as in the cases where the front end portion of the filter and its surroundings are not in parallel to the front surface of the heat exchanger at the attaching position, and hence the air is easily sucked through the opening.

[0012] According to the third aspect of the invention, the indoor unit of the first or second aspect is arranged such that, at the lower end portion of the opening of the casing, restriction means is provided to restrict forward movement of the front end portion of the filter attached to the mounting position.

[0013] While in this indoor unit it is necessary to cancel the movement restriction of the front end portion of the filter when the filter is taken out, the user is able to easily cancel the movement restriction of the front end portion

of the filter.

[0014] According to the fourth aspect of the invention, the indoor unit of any one of the first to third aspects is arranged such that, at the front end portion of the filter, a handle portion is provided for taking out the filter.

[0015] In this indoor unit, because the handle portion is provided at the front end portion of the filter for taking out the filter, the user is able to easily take out the filter by gripping the front end portion of the filter.

[0016] According to the fifth aspect of the invention, the indoor unit of any one of the first to fourth aspects is arranged such that, in a state that the front panel is closed with respect to the casing, the lower end portion of the front panel is identical in height with the central part of the front end of the protruding wall surface.

[0017] In this indoor unit, because the lower end portion of the front panel is identical in height with the central part of the front end of the protruding wall surface in the state that the front panel is closed with respect to the casing, the user is able to easily take out the filter by gripping the front end portion of the filter in the state that the front panel is open with respect to the casing.

[Advantageous Effects of Invention]

[0018] As described hereinabove, the present invention brings about the following effects.

[0019] According to the first aspect of the invention, because the protruding wall surface provided at around the lower end portion of the opening of the casing is inclined forward in the downward direction, when the front panel is open with respect to the casing, the user is able to easily take out the filter by stretching his/her hand along the protruding wall surface inclined forward in the downward direction. It is therefore possible to easily take out the filter from the indoor unit in which the front surface of the casing is curved to bulge so that its central part is at the foremost.

[0020] According to the second aspect of the invention, the gap between the front panel and the filter is therefore not narrow as in the cases where the front end portion of the filter and its surroundings are not in parallel to the front surface of the heat exchanger at the attaching position, and hence the air is easily sucked through the opening.

[0021] According to the third aspect of the invention, while it is necessary to cancel the movement restriction of the front end portion of the filter when the filter is taken out, the user is able to easily cancel the movement restriction of the front end portion of the filter.

[0022] According to the fourth aspect of the invention, because the handle portion is provided at the front end portion of the filter for taking out the filter, the user is able to easily take out the filter by gripping the front end portion of the filter. According to the fifth aspect of the invention, because the lower end portion of the front panel is identical in height with the central part of the front end of the protruding wall surface in the state that the front panel is closed with respect to the casing, the user is able to easily take out the filter by gripping the front end portion of the filter in the state that the front panel is open with respect to the casing.

[Brief Description of Drawings]

[0023]

[FIG. 1] FIG. 1A is an oblique perspective of an indoor unit of an embodiment of the present invention during operation stop, FIG. 1B is an oblique perspective of the indoor unit during operation, and FIG. 1C is an oblique perspective of the indoor unit from which a front panel and an outlet panel have been detached.

[FIG. 2] FIG. 2A is a front elevation of the indoor unit during operation stop, whereas FIG. 2B is a front elevation of the indoor unit during operation.

[FIG. 3] FIG. 3A is a right side view of the indoor unit during operation stop, whereas FIG. 3B is a right side view of the indoor unit during operation.

[FIG. 4] FIG. 4 is a front elevation of the indoor unit from which the front panel and the outlet panel have been detached.

[FIG. 5] FIG. 5 schematically shows a vertical cross section of the indoor unit.

[FIG. 6] FIG. 6A is a front elevation showing a state that the front panel has been removed, whereas FIG. 6B is an oblique perspective showing the state that the front panel has been removed.

[FIG. 7] FIG. 7A is a front elevation during operation stop of the indoor unit, FIG. 7B is a front elevation showing a state that the filter is attached or detached, and FIG. 7C is an oblique perspective showing the state that the filter is attached or detached.

[FIG. 8] FIG. 8 is a block diagram of a controller of the indoor unit.

[FIG. 9] FIG. 9A is a top view of the indoor unit during operation stop, whereas FIG. 9B is a top view of the indoor unit during operation.

[FIG. 10] FIG. 10 is a bottom view of the indoor unit during operation stop.

[FIG. 11] FIG. 11A schematically shows a top plate portion, whereas FIG. 11B is a front elevation of only a wind direction changing plate.

[FIG. 12] FIG. 12 illustrates the positional relationship between the top plate portion, the cross flow fan, and the wind direction changing plate.

[FIG. 13] FIG. 13 is a right side view of the indoor unit from which the front panel and the outlet panel have been detached.

[FIG. 14] FIG. 14A is an enlarged view of a part A in FIG. 4, FIG. 14B shows a state in which a screw has been removed as compared to the state shown in FIG. 14A, and FIG. 14C is a cross section taken at the XIV(c)-XIV(c) line in FIG. 4.

[FIG. 15] FIG. 15A is a front elevation of the front panel and the outlet panel, FIG. 15B is a cross sec-

tion taken at the XV(b)-XV(b) line, FIG. 15C is a cross section taken at the XV (c) -XV (c) line, and FIG. 15D is a cross section taken at the XV(d)-XV(d) line.

[FIG. 16] FIG. 16 is a cross section taken at the XVI-XVI line in FIG. 2.

[FIG. 17] FIG. 17A shows the back surfaces of the front panel and the outlet panel, whereas FIG. 17B is an oblique perspective of the back surfaces of the front panel and the outlet panel.

[FIG. 18] FIG. 18 is a cross section taken at the XVIII-XVIII line in FIG. 2, and shows the structure of a drive mechanism.

[FIG. 19] FIGs. 19A to 19C illustrate how the front panel and the outlet panel move. FIG. 19A shows a state before the movement of the front panel, FIG. 19B shows a state after the movement of the front panel, and FIG. 19C shows a state after the movement of the front panel and the outlet panel.

[Description of Embodiments]

[0024] The following will describe an indoor unit of an air conditioner of an embodiment of the present invention.

[Overall Structure of Air Conditioner]

[0025] The air conditioner of the embodiment of the present invention is formed of an indoor unit 1 shown in FIG. 1 and an unillustrated outdoor unit. The indoor unit 1 is on the whole narrow in shape in one direction, and is attached to a wall surface of a room so that the length thereof is horizontal. Hereinafter, a direction of protrusion from the wall surface on which the indoor unit 1 is provided will be referred to as "forward", and a direction opposite to the forward will be referred to as "backward". Furthermore, a left-right direction shown in FIG. 1 will be simply referred to as "left-right direction", and an up-down direction shown in FIG. 1 will be simply referred to as "up-down direction".

[Structure of Indoor Unit]

[0026] As shown in FIG. 5, the indoor unit 1 is mainly provided with a main body 4, a front panel 7 , an outlet panel 8, a wind direction changing plate 50, and the like.

[Main Body]

[0027] As shown in FIG. 4 and FIG. 5, the main body 4 includes a casing 5 including a bottom frame 42 and a front grill 6, an indoor heat exchanger 20 housed in the casing 5, a cross flow fan 21 (hereinafter, this may be simply referred to as a fan 21), a fan motor 22 (see FIG. 8), and an electric component box 40. As shown in FIG. 5, the indoor heat exchanger 20 and the fan 21 are attached to the bottom frame 42. The indoor heat exchanger 20 and the fan 21 are arranged such that the fan 21 is provided at a substantial center of the indoor unit 1 in cross section and the indoor heat exchanger 20 which is inverse V-shaped is provided to surround an upper half of the fan 21.

[0028] As shown in FIG. 4, the electric component box 40 is provided to the right of the indoor heat exchanger 20 and the fan 21 in front elevation. The electric component box 40 houses a controller 60 therein (see FIG. 8) for controlling components of the indoor unit 1 required for operations such as cooling and warming. As shown in FIG. 8, this controller 60 is connected with the fan motor 22 driving the fan 21, a drive motor 43 driving a driver 41 of a later-described drive mechanism 9, a flap motor 51 driving the wind direction changing plate 50, and an auxiliary flap motor 53 driving a later-described auxiliary wind direction changing plate 52, to control the fan 21, the driver 41, the wind direction changing plate 50, and the auxiliary wind direction changing plate 52.

[0029] The bottom frame 42 is made of a resin material and is shaped to cover the bottom, back, and the sides of the fan 21. This bottom frame 42 includes: an unillustrated main casing which fixes the indoor heat exchanger 20 and the fan 21 and constitutes a back surface 1b of the indoor unit 1; and decorative plates 47 (see FIG. 3) constituting, together with the front grill 6, side surfaces of the indoor unit 1. On the back surface of the main casing, a mounting board is attached to fix the indoor unit 1 to the wall surface of the room. A lower part of the bottom frame 42 and the front grill 6 form an outlet port 27. This outlet port 27 is a port through which wind from the fan 21 is blown into the room. The outlet port 27 is provided in the vicinity of a lower part of the indoor unit 1 and is on the front surface side of the indoor unit 1. As shown in FIG. 2B, the outlet port 27 is shaped to be long in a horizontal direction in front elevation.

[Front Grill]

[0030] The front grill 6 is attached to the bottom frame 42 from the front side, and covers the front, sides, top, and bottom of the main body 4. The front grill 6 is formed by molding a resin material, is thin and rectangular parallelepiped in shape, and is entirely open at the back. As shown in FIG. 4, this front grill 6 includes a top plate portion 30, a front surface 31 (the front surface of the casing), and a bottom surface 32.

(Top Plate Portion)

[0031] As shown in FIG. 9A, the top plate portion 30 is curved so that a central part 30M of a front end 30F protrudes forward. To be more specific, the front end 30F of the top plate portion 30 is inclined to the back surface 1b side from the central part 30M of the front end 30F toward the both ends 30a and 30b of the front end 30F, and is curved so that the direction of a tangent to the front end 30F of the top plate portion 30 continuously changes in plan view. Side ends 30L and 30R of the top plate portion 30 are inclined (curved) to the center in the longitudinal

direction (left-right direction) of the indoor unit 1 from the ends 30a and 30b toward the back surface 1b.

[0032] The substantially entirety of the top plate portion 30 functions as a first inlet port 23 (inlet port) for sucking air inside the room. As shown in FIG. 9A, across the substantially entire first inlet port 23, blades 30c are provided to extend in the longitudinal direction and the front-back direction. Below this first inlet port 23 (i.e., on the inner side of the indoor unit 1), an opening 24 is formed at the central part in the longitudinal direction and non-openings 25 are formed outside in the longitudinal direction of the opening 24. In an area corresponding to the opening 24, a gap between the blades 30c is open. In each non-opening 25, a plate 30d is provided to close the gaps between the blades 30c. This plate 30d is provided below the outer edge of the top plate portion 30 (i.e. , provided on the inner side of the indoor unit 1 as compared to the first inlet port 23). With this arrangement, room air sucked through the first inlet port 23 is either directly taken into the fan 21 side through the opening 24 or horizontally flows on the plates 30d of the non-openings 25 and is then taken into the fan 21 side through the opening 24.

[0033] As shown in FIG. 11A, the first inlet port 23 is arranged such that the width W1 of an inlet central part 23M corresponding to the central part 30M of the front end 30F of the top plate portion 30 in the longitudinal direction is wider than the width of each of the both ends in the longitudinal direction of the first inlet port 23. In other words, in the present embodiment, the width W1 is arranged to be wider than each of the width around the left end 30a of the top plate portion 30 and the width around the right end 30b of the top plate portion 30. In the present embodiment, the width around the left end 30a of the top plate portion 30 and the width around the right end 30b of the top plate portion 30 are very narrow (almost zero) . The width of the first inlet port 23 is at its maximum at the inlet central part 23M. The width of the first inlet port 23 is narrowed from the inlet central part 23M toward the ends 30a and 30b in the longitudinal direction. For the sake of convenience, FIG. 11A does not show the blades 30c extending in the longitudinal direction and the front-back direction.

[0034] As shown in FIG. 11A, the front end 24F of the opening 24 extends along the front end 30F of the top plate portion 30. The opening 24 is arranged such that the width of an opening central part 24M corresponding to the central part 30M of the front end 30F of the top plate portion 30 in the longitudinal direction is wider than the width of each of the both ends of the opening 24 (i.e., wider than each of the width of the left end 24L of the opening 24 and the width of the right end 24R of the opening 24) . As shown in FIG. 12, the central part in the longitudinal direction of the opening 24 below the top plate portion 30 is slightly shifted leftward from the inlet central part 23M corresponding to the central part 30M of the front end 30F of the top plate portion 30 and corresponds to the central part in the longitudinal direction of the fan 21 and the central part in the longitudinal direction of the wind direction changing plate 50. Furthermore, the ends 24L and 24R of the opening 24 substantially correspond to the ends of the fan 21 and the ends 50L and 50R of the wind direction changing plate 50.

(Front Surface)

[0035] As shown in FIG. 4, the front surface 31 (the front surface of the casing) is shaped to be substantially rectangular and long in the left-right direction in front elevation. As easily understood from FIG. 1C, in the front surface 31, vicinity surfaces 33 of the front grill 6, which are provided in the vicinity of the respective ends in the longitudinal direction of the front surface 31 (i.e. , in the vicinity of the respective ends in the longitudinal direction of the front surface of the casing), are curved so that the size in the front-back direction (i.e., thickness) of the indoor unit 1 increases toward the central part in the longitudinal direction. These vicinity surfaces 33 are inclined (curved) to the back surface 1b side in the downward direction. This front surface 31 includes, apart from the vicinity surfaces 33 above, components such as the front end 30F of the top plate portion 30, openings 34 for taking in the room air, and an outlet port peripheral portion 35 provided around the outlet port 27.

[0036] As shown in FIG. 4, the openings 34 are formed from around the center in the up-down direction of the front surface 31 to an upper part of the front surface 31, so as to oppose the front surface side of the indoor heat exchanger 20. Each opening 34 is rectangular in shape and long in the left-right direction, and extends in the vertical direction as shown in FIG. 13. The openings 34 are therefore in the same plane. Through these openings 34, the room air taken in from the front end 24F side of the opening 24 and the room air taken in through a later-described second inlet port 26 are sent to the fan 21 side. In front of these openings 34, filters 36 (see FIG. 5) are attached to cover the substantially entirety of the openings 34. When each filter 36 is attached to a mounting position, the front end portion and its surroundings of the filter 36 are substantially in parallel to the front surface of the heat exchanger 20. As shown in FIG. 5, each filter 36 extends from the front side to the upper side of the indoor heat exchanger 20, in order to capture dust in the room air which is taken in through the first inlet port 23 and the second inlet port 26.

[0037] In the indoor unit 1, the filters 36 are provided, one of which covers the left opening 34 and the other which covers the right opening 34. Each of the filters 36 is arranged to be attachable to the mounting position to cover the corresponding opening 34, and filter mounting portions 34a are provided at the lower end portion of the opening 34. Each filter mounting portion 34a has a fitting groove in which the front end portion of the filter 36 is fitted. When each filter 36 is attached to the mounting position to cover the corresponding opening 34, the front end portion of the filter 36 is fitted in the fitting grooves.

On this account, the forward movement of the front end portion of the filter 36 attached to the mounting position is restricted, and hence the detachment of the filter 36 from the front surface 31 (i.e., the front surface of the casing) is prevented. At the front end portion of each filter 36, a handle portion 36a is provided for detaching the filter 36. With this arrangement, when detaching the filter 36, the user holds the handle portion 36a of the filter 36 and detaches the filter 36 so that the front end portion of the filter 36 is disengaged from the fitting grooves.

[0038] As shown in FIG. 1C, the outlet port peripheral portion 35 is curved so that its central part in the longitudinal direction protrudes forward. To be more specific, the outlet port peripheral portion 35 is curved so that the thickness in the front-back direction of the indoor unit 1 increases from the both ends toward the central part in the longitudinal direction. As shown in FIG. 13, the front surface 31 (the front surface of the casing) is provided with a protruding wall surface 37 which is provided around the lower end portion of the opening 34 to protrude forward. In the protruding wall surface 37, the front end is curved so that its central part protrudes forward and is inclined forward in a downward direction, as shown in

[0039] FIG. 5.

[0040] In the indoor unit 1, the front panel 7 is arranged to be rotatable with respect to the front grill 6 (the casing 5). During operation stop, as shown in FIG. 7A, the front panel 7 is closed with respect to the front grill 6 and the lower end portion of the front panel 7 is identical in height with the central part of the front end of the protruding wall surface 37. When the filters 36 are attached or detached, as shown in FIG. 7A and FIG. 7C, the front panel 7 is rotated so that the lower end portion thereof moves forward, with the result that the front panel 7 is opened with respect to the front grill 6. As such, the filters 36 are attached or detached in a state that the front panel 7 is open. However, when the indoor unit 1 is installed close to the ceiling, it is impossible to widely open the front panel 7. On this account, the user is required to attach or detach the filters 36 through a narrow gap between the lower end portion of the front panel 7 and the front surface 31 of the front grill 6. In this regard, because in the indoor unit 1 the protruding wall surface 37 is arranged to be inclined forward in the downward direction, the user is allowed to easily hold the handle portion 36a of the filter 36 by inserting his or her hand into the gap between the lower end portion of the front panel 7 and the front surface 31 of the front grill 6.

[0041] As understood from figures such as FIG. 1A, during operation stop of the indoor unit 1, the front panel 7 is in contact with or close to the front end 30F and a part of (upper side of) the vicinity surfaces 33 of the top plate portion 30. The upper part of the front surface 31 is therefore closed by the front panel 7. In addition to the above, the outlet panel 8 is in contact with or close to the outlet port peripheral portion 35 and a part of (lower side of) the vicinity surfaces 33. The lower part of the front surface 31 is therefore closed by the outlet panel 8. In the meanwhile, during operation of the indoor unit 1, as shown in FIG. 1B, a gap is formed between the front panel 7 and the front end 30F of the top plate portion 30 and the vicinity surfaces 33, as the front panel 7 moves substantially horizontally forward, with the result that the second inlet port 26 for sucking the room air is formed. Furthermore, as the outlet panel 8 is moved to a position between the front panel 7 and the front grill 6, the outlet port 27 is opened.

[0042] As shown in FIG. 4, on the upper end side of the vicinity surfaces 33 provided in the vicinity of the respective ends in the longitudinal direction of the front surface 31, two recesses 91 are formed to recess toward the back surface as compared to the vicinity surfaces 33 (i.e., the front surface 31 of the front grill 6). These recesses 91 are symmetrically formed in the left-right direction. As shown in FIG. 14, in each of these recesses 91, a screw fixing portion 92 (screw hole) is formed to receive a screw S for fixing the front grill 6 to the bottom frame 42. Furthermore, on each recess 91, a protrusion 93 is provided outside in the left-right direction of the screw fixing portion 92 to protrude forward as compared to the vicinity surface 33 (front surface of the front grill). With this arrangement, in this indoor unit 1, the screw S is less visible in a side view and an oblique front view of the indoor unit 1.

[0043] Below the front surface 31 and in front of the bottom surface 32, an opening is formed to form the outlet port 27 together with the bottom frame 42. The front surface of this outlet port 27 is closed by the outlet panel 8 during operation stop of the indoor unit 1. The bottom surface of this outlet port 27 is, as shown in FIG. 13, closed by the wind direction changing plate 50 attached to the bottom frame 42, during operation stop of the indoor unit 1.

[0044] As shown in FIG. 2B, in the outlet port 27, the wind direction changing plate 50 and the auxiliary wind direction changing plate 52 above the wind direction changing plate 50 are provided. Each of the wind direction changing plate 50 and the auxiliary wind direction changing plate 52 is a plate which is long in the left-right direction. The wind direction changing plate 50 and the auxiliary wind direction changing plate 52 are arranged to be rotatable about different rotational axes extending along the horizontal direction, respectively. With this arrangement, the wind direction changing plate 50 changes, in the up-down direction, the direction of the air blown out from the outlet port 27, together with the auxiliary wind direction changing plate 52. The wind direction changing plate 50 is connected with the flap motor 51, whereas the auxiliary wind direction changing plate 52 is connected with the auxiliary flap motor 53. The wind direction changing plate 50 and the auxiliary wind direction changing plate 52 are rotatable about different rotational axes extending along the horizontal direction, respectively, by the driving of the flap motor 51 and the auxiliary flap motor 53.

[0045] As shown in FIG. 11 and FIG. 12, in the wind

direction changing plate 50, the front end 50F is curved so that its center and surroundings protrude forward. To be more specific, the front end 50F of the wind direction changing plate 50 is inclined to the back surface 1b side from an outlet central part 50M (see also FIG. 1C and FIG. 2B) corresponding to the central part 30M of the front end 30F of the top plate portion 30 toward the both ends 50a and 50b, and is curved so that the direction of a tangent to the front end 50F of the top plate portion 50 continuously changes in plan view. Side ends 50L and 50R of the wind direction changing plate 50 extend in the front-back direction. This wind direction changing plate 50 is arranged such that the width W2 of the outlet central part 50M corresponding to the central part 30M of the front end 30F of the top plate portion 30 is wider than the width in the longitudinal direction of each of the both ends of the wind direction changing plate 50 (i.e., wider than each of the width of the left end 50L and the width of the right end 50R). The width of the wind direction changing plate 50 is at its maximum at the outlet central part 50M. The width of the wind direction changing plate 50 is narrowed from the outlet central part 50M toward the ends 50a and 50b in the longitudinal direction of the wind direction changing plate 50. As shown in FIG. 10, this wind direction changing plate 50 is shaped to extend along an opening defined by the outlet panel 8 and the bottom surface 32 of the front grill 6 during operation stop of the indoor unit 1. When an instruction to stop the operation is received, the wind direction changing plate 50 moves to be in parallel to the horizontal plane, so as to form the bottom surface of the indoor unit 1, which is in parallel to the horizontal plane, together with the bottom surface 32 of the front grill 6. As shown in FIG. 12, the central part in the longitudinal direction of the wind direction changing plate 50 is slightly shifted leftward from the outlet central part 50M corresponding to the central part 30M of the front end 30F of the top plate portion 30, and corresponds to the central part in the longitudinal direction of the fan 21 and the central part in the longitudinal direction of the opening 24. The width W3 of the central part in the longitudinal direction of the wind direction changing plate 50 is wider than the width of each of the ends in the longitudinal direction (i.e., the width of the left end 50L and the width of the right end 50R) of the wind direction changing plate 50.

[0046] In the meanwhile, as shown in FIG. 2B, the width of the auxiliary wind direction changing plate 52 is uniform in the longitudinal direction. As such, because the width of the auxiliary wind direction changing plate 52 is uniform in the longitudinal direction, the wind direction changing plate 50 and the auxiliary wind direction changing plate 52 do not interfere with each other when the wind direction changing plate 50 and the auxiliary wind direction changing plate 52 rotate about the different rotational axes extending along the horizontal direction.

[Front Panel and Outlet Panel]

[0047] As shown in FIG. 1A, the front panel 7 and the outlet panel 8 substantially cover the entirety of the front surface 31 of the front grill 6 during operation stop of the indoor unit 1.

[0048] The front panel 7 is formed by molding a resin material, and covers an upper part of the front surface 31 of the front grill 6. The front panel 7 is supported at around the left and right ends by a later-described opening mechanism 61 to be movable in the front-back direction. The second inlet port 26 is opened as the front panel 7 moves away from the front surface 31 of the front grill 6, and the second inlet port 26 is closed as the front panel 7 moves toward the front surface 31 of the front grill 6.

[0049] The outlet panel 8 is formed by molding a resin material and covers a lower part of the front surface 31 of the front grill 6. The outlet panel 8 is supported at around the left and right ends by the later-described opening mechanism 61 to be movable in the up-down direction. The outlet port 27 is opened as the outlet panel 8 moves to the gap between the front panel 7 and the front grill 6 (i.e. , moves upward) in a state that the front panel 7 has moved forward, and the outlet port 27 is closed as the outlet panel 8 moves downward.

(Panel Shape)

[0050] Each of the front panel 7 and the outlet panel 8 is a three-dimensional panel having a three-dimensional shape. In other words, each of these panels is curved in the longitudinal direction (left-right direction) and in the up-down direction. The thickness of the front panel 7 and the thickness of the outlet panel 8 are substantially constant in the longitudinal direction and the up-down direction, and are substantially identical with each other. From the substantially entire outer circumferences of the back surfaces of the front panel 7 and the outlet panel 8, reinforcing ribs 7a and 8a protrude backward (see FIG. 15D).

[0051] As shown in FIG. 15B, the front panel 7 is curved so that its central part 7M protrudes forward in plan view. To be more specific, the front surface 7F (front surface portion) of the front panel 7 is inclined to the back surface 1b side from the central part 7M of the front surface 7F of the front panel 7 toward the ends in the longitudinal direction, and the direction of a tangent to the front surface 7F of the front panel 7 continuously changes in plan view. In other words, the front panel 7 is entirely curved in the longitudinal direction.

[0052] As shown in FIG. 15D, this front panel 7 is arranged such that the upper end 7Fa of the front surface 7F of the front panel 7 is at the forefront, and the front surface 7F (front surface portion) of the front panel 7 is inclined to the back surface 1b side toward the lower end 1a. Furthermore, because the thickness of the front panel 7 is constant in the up-down direction, the entirety of the front panel 7 is inclined to the back surface 1b side toward

the lower end 1a. Furthermore, this front panel 7 is curved so that the front side thereof protrudes, i.e., the direction of a tangent to the front surface 7F of the front panel 7 continuously changes in cross section. In other words, the front panel 7 is entirely curved in the left-right direction.

[0053] In this front panel 7, a part opposing the front end 30F of the top plate portion 30 of the front grill 6 is curved along the front end 30F. Furthermore, in the front panel 7, parts opposing the vicinity surfaces 33 of the front grill 6 are curved along the vicinity surfaces 33 in the longitudinal direction and in the up-down direction. On this account, gaps are scarcely formed between the front panel 7 and the front end 30F and the vicinity surfaces 33 during operation stop of the indoor unit 1.

[0054] As shown in FIG. 15C, the outlet panel 8 is curved so that its central part 8M protrudes forward in plan view. To be more specific, the front surface 8F of the outlet panel 8 is inclined to the back surface 1b side from the central part 8M of the front surface 8F of the outlet panel 8 toward the ends in the longitudinal direction, and the direction of a tangent to the front surface 8F of the outlet panel 8 continuously changes in plan view. In other words, the outlet panel 8 is entirely curved in the longitudinal direction.

[0055] As shown in FIG. 15D, this outlet panel 8 is arranged such that the upper end 8Fa of the front surface 8F of the outlet panel 8 is at the forefront, and the front surface 8F of the outlet panel 8 is inclined to the back surface 1b side toward the lower end 1a. Furthermore, because the thickness of the outlet panel 8 is constant in the up-down direction, the entirety of the front panel 8 is inclined to the back surface 1b side toward the lower end 1a. Furthermore, this outlet panel 8 is curved so that the front side thereof protrudes, i.e., the direction of a tangent to the front surface 8F of the outlet panel 8 continuously changes in cross section. In other words, the outlet panel 8 is entirely curved in the up-down direction.

[0056] In this outlet panel 8, parts opposing the vicinity surfaces 33 of the front grill 6 and a part opposing the outlet port peripheral portion 35 of the front grill 6 are curved along the vicinity surfaces 33 and the outlet port peripheral portion 35 in the longitudinal direction and the up-down direction. On this account, gaps are scarcely formed between the outlet panel 8 and the vicinity surfaces 33 and the outlet port peripheral portion 35 during operation stop of the indoor unit 1.

(Extension Parts)

[0057] As shown in FIGs. 1A and 9A, the front panel 7 includes extension parts 71 which extend outward as compared to the ends 31L and 31R of the front surface 31 of the front grill 6 (see also FIG. 4). As shown in FIGs. 1A and 10, the outlet panel 8 includes extension parts 81 which extend outward as compared to the ends 31L and 31R of the front surface 31 of the front grill 6. As shown in FIG. 9A, the extension parts 71 are parts on the outside in the longitudinal direction of lines L1 which extend along the front-back direction and pass the ends 31L and 31R of the front surface 31 of the front grill 6. As shown in FIG. 10, the extension parts 81 are parts on the outside in the longitudinal direction of lines L2 which extend along the front-back direction and pass the ends 31L and 31R of the front surface 31 of the front grill 6. The extension parts 71 are symmetrical in the left-right direction, and the extension parts 81 are symmetrical in the left-right direction, too.

[0058] As shown in FIGs. 9A and 10, the extension parts 71 of the front panel 7 and the extension parts 81 of the outlet panel 8 extend toward the back surface 1b side from the ends 31L and 31R of the front surface 31 of the front grill 6. Leading end portions 72 of the extension parts 71 and leading end portions 82 of the extension parts 81 are bent forward. In this regard, it is noted that "bending" encompasses "curving" in the present invention.

[0059] Now, referring to FIG. 16, the definition of "the extension parts 71 extend toward the back surface 1b side from the ends 31L and 31R of the front surface 31 of the front grill 6" and the definition of "the leading end portions 72 of the extension parts 71 are bent forward" will be specifically described. It is noted that the definition of "the extension parts 81 extend toward the back surface 1b side from the ends 31L and 31R of the front surface 31 of the front grill 6" and the definition of "the leading end portions 82 of the extension parts 81 are bent forward" are not described because they are similar to the above.

[0060] The recitation "the extension parts 71 extend toward the back surface 1b side from the ends 31L and 31R of the front surface 31 of the front grill 6" indicates that, as shown in FIG. 17, the entirety of each extension part 71 is on the back surface 1b side relative to a horizontal line L3 (in the left-right direction) which passes an intersection 7Fb of the above-described line L1 and the front surface 7F of the front panel 7. The recitation "the leading end portions 72 of the extension parts 71 are bent forward" indicates that, in plan view, at least a part of the center line of each leading end portion 72 is on the front side of a virtual line L4 which is an outward extension in the left-right direction of the center line of the front panel 7 except the leading end portion 72 of the extension part 71.

[0061] During operation stop of the indoor unit 1, the front panel 7 and the outlet panel 8 below the front panel 7 are provided forward of the front grill 6 (casing 5) . From the substantially entire outer circumferences of the back surfaces of the front panel 7 and the outlet panel 8, reinforcing ribs 7a and 8a shown in FIGs. 5 and 15D protrude backward. The reinforcing rib 8a is bent upward at the end portion on the back surface side, and the bent part functions as a closing portion 8b (closing member) . The closing portion 8b is integrated with the outlet panel 8. During operation stop of the indoor unit 1, the gap between the front panel 7 and the outlet panel 8 is closed

by the closing portion 8b from the front grill 6 (casing 5) side. The closing portion 8b extends across the entire width of the front grill 6 (casing 5). With this arrangement, in the indoor unit 1, during operation stop of the indoor unit 1, as the end portion on the back surface side of the reinforcing rib 7a of the front panel 7 makes contact with the front surface of the closing portion 8b of the outlet panel 8, the gap between the front panel 7 and the outlet panel 8 is closed across the entire width of the front grill 6 (casing 5). At this stage, in the indoor unit 1, for example, as a drive motor 43 for moving the front panel 7 is further driven in the direction of moving the front panel 7 toward the back surface side, the end portion on the back surface side of the reinforcing rib 7a of the front panel 7 is pressed toward the side surface on the front surface side of the closing portion 8b of the outlet panel 8, from the front side. The front panel 7 and the outlet panel 8 include the extension parts 71 and 81 which extend outward as compared to the ends of the front surface 31 of the front grill 6 (casing 5). In this regard, the closing portion 8b does not extend outward as compared to the ends of the front surface 31 of the front grill 6 (casing 5), and hence each gap between the extension parts 71 and 81 is not closed. The indoor unit 1 has a part where the height of the closing portion 8b is partially low, but the height of this part is wider than the gap between the front panel 7 and the outlet panel 8, and hence the gap between the front panel 7 and the outlet panel 8 is closed across the entire width of the front grill 6 (casing 5).

[Drive Mechanism]

[0062] The drive mechanism 9 is a mechanism for moving the front panel 7 away from the front surface 31 of the front grill 6 in a substantially horizontal direction and moving the outlet panel 8 to the gap between the front panel 7 and the front grill 6 in a state that the front panel 7 has moved forward in the substantially horizontal direction. As shown in FIG. 4, the drive mechanism 9 is provided with a driver 41 and an opening mechanism 61.

[0063] As shown in FIG. 4, the driver 41 is to the right of the indoor heat exchanger 20 and the fan 21 in front elevation, and is configured to generate driving force for moving the front panel 7 and the outlet panel 8. This driver 41 includes the drive motor 43 (see FIG. 8) and unillustrated driver gears. The drive motor 43 is connected by a cable with the controller 60 housed in the electric component box 40, and functions as a drive source for moving the front panel 7 and the outlet panel 8. The driver gears are disposed to be engaged with an unillustrated power transmission gear of the opening mechanism 61. The driver gears transmit the rotation of the drive motor 43, i.e. , the driving force of the drive motor 43 to the power transmission gear of the opening mechanism 61.

[0064] The opening mechanism 61 is a mechanism for opening and closing the second inlet port 26 and the outlet port 27 by moving the front panel 7 and the outlet panel 8 by means of the driving force of the driver 41. The opening mechanism 61 is formed of components including gears, and functions as a speed reducer for transmitting the driving force of the driver 41 to the front panel 7 and the outlet panel 8. The opening mechanism 61 functions as a conversion mechanism of converting the rotational movement transmitted from the driver 41 to the opening/closing movement of the front panel 7 and the outlet panel 8. As shown in FIG. 4, the opening mechanism 61 includes a first opening mechanism 62 provided to the left of the front grill 6 and a second opening mechanism 63 provided to the right of the front grill 6. The first opening mechanism 62 and the second opening mechanism 63 are connected with each other by an unillustrated power transmission shaft.

[0065] The first opening mechanism 62 is attached to the back surfaces of the left side surfaces of the front panel 7 and the outlet panel 8, to support the left ends and their surroundings of the front panel 7 and the outlet panel 8. The first opening mechanism 62 transfers the driving force of the driver 41 to the left end and its surroundings of the front panel 7 and to the left end and its surroundings of the outlet panel 8, so as to move the left parts of the front panel 7 and the outlet panel 8, when the front panel 7 and the outlet panel 8 are opened or closed.

[0066] The second opening mechanism 63 is attached to the back surfaces of the right side surfaces of the front panel 7 and the outlet panel 8, to support the right ends and their surroundings of the front panel 7 and the outlet panel 8. The second opening mechanism 63 transfers the driving force of the driver 41 to the right end and its surroundings of the front panel 7 and to the right end and its surroundings of the outlet panel 8, so as to move the right parts of the front panel 7 and the outlet panel 8, when the front panel 7 and the outlet panel 8 are opened or closed.

[0067] The unillustrated power transmission shaft is a member which distributes and transfers the driving power of the driver 41 to the first opening mechanism 62 and the second opening mechanism 63, and is attached to the back surface of the front surface 31 of the front grill 6 to be rotatable about an axis which is in parallel to the longitudinal direction of the indoor unit 1. The ends of the power transmission shaft are connected with the first opening mechanism 62 and the second opening mechanism 63, respectively, and unillustrated power transmission gears are provided therebetween. The power transmission gear is disposed to be engaged with the driver gears of the driver 41. As such, the opening mechanism 61 is configured to distribute, by the power transmission shaft, the driving force from the driver 41 to the first opening mechanism 62 and the second opening mechanism 63.

[0068] The following will briefly describe the arrangement of the first opening mechanism 62. The description of the second opening mechanism 63 is omitted because it is symmetrical in structure with the first opening mechanism 62 in the left-right direction. The first opening

mechanism 62 includes, as shown in FIG. 18, front panel opening gears 64, an outlet panel opening gear 65, a front panel supporting member 66, an outlet panel supporting member 67, and a transmission gear 68.

[0069] The front panel opening gear 64 transmits, to the front panel supporting member 66, the driving force supplied from the driver 41 via the power transmission shaft. This front panel supporting member 66 is provided to be movable in the front-back direction (substantially horizontal direction), and is able to substantially horizontally move the front panel 7 in the front-back direction.

[0070] The transmission gear 68 transmits, to the outlet panel opening gear 65, the driving force supplied from the driver 41 via the power transmission shaft, and the outlet panel opening gear 65 transmits the driving force to the outlet panel supporting member 67. This outlet panel supporting member 67 is provided to be movable in the up-down direction, and is able to linearly move the outlet panel 8 in the up-down direction. The transmission gear 68 has a part where no tooth is formed. With this, until the driver 41 is driven and the forward movement of the front panel supporting member 66 is completed, the rotation of the transmission gear 68 is not transmitted to the outlet panel opening gear 65. After the completion of the forward movement of the front panel supporting member 66, the transmission gear 68 is engaged with the outlet panel opening gear 65, and hence the upward movement of the outlet panel supporting member 67 becomes possible.

[Movement of Front Panel and Outlet Panel at Driving Start]

[0071] Now, the movement of the front panel 7 and the outlet panel 8 at the start of the driving will be described with reference to FIG. 19.

[0072] As shown in FIG. 19A, when the indoor unit 1 is in a stopped state, the second inlet port 26 and the outlet port 27 are closed by the front panel 7 and the outlet panel 8. When the indoor unit 1 is in the stopped state, the front surface 7F of the front panel 7 and the front surface 8F of the outlet panel 8 are substantially flush with each other in the up-down direction in a side view. In this state, the front panel supporting member 66 of the opening mechanism 61 is at the most backward position within the movable range. The outlet panel supporting member 67 is at the lowermost position within the movable range.

[0073] As the indoor unit 1 starts the operation, the drive motor 43 of the driver 41 is controlled and starts the rotation. The driving force of the driver 41 is transmitted to the unillustrated power transmission shaft of the opening mechanism 61, and the driving force is distributed to the first opening mechanism 62 and the second opening mechanism 63 of the opening mechanism 61. Thereafter, by the first opening mechanism 62 and the second opening mechanism 63, the front panel 7 and the outlet panel 8 are moved, with the result that the second inlet port 26 and the outlet port 27 are opened.

[0074] To be more specific, by the opening mechanism 61, the driving force of the driver 41 is transmitted to the front panel supporting member 66 via the front panel opening gears 64. As a result, the front panel supporting member 66 linearly moves forward in the substantially horizontal direction. With this, as shown in FIG. 19B, the front panel 7 moves forward in the substantially horizontal direction so as to open the second inlet port 26.

[0075] As shown in FIG. 19B, when the front panel supporting member 66 is at the forefront position within the movable range, the driving force of the driver 41 is transmitted to the outlet panel supporting member 67 via the transmission gear 68 and the outlet panel opening gear 65. With this, as shown in FIG. 19C, the outlet panel 8 moves to the gap between the front panel 7 and the front grill 6, so as to open the outlet port 27. When the outlet panel supporting member 67 is at the uppermost position within the movable range, the outlet panel 8 is hidden behind the front panel 7. In other words, the substantially entirety of the outlet panel 8 overlaps the front panel 7, and hence the outlet panel 8 is not viewable in front elevation as shown in FIG. 2A.

[0076] As the fan 21 is driven, the room air is sucked into the indoor unit 1 through the first inlet port 23 and the second inlet port 26 and is subjected to heat exchange at the indoor heat exchanger 20, and the air after the heat exchange is blown out from the outlet port 27.

[0077] During operation stop of the indoor unit 1, the drive motor 43 of the driver 41 is controlled to drive backward, and the outlet panel supporting member 67 and the front panel supporting member 66 move in this order in the direction opposite to the above. As a result, the front panel 7 and the outlet panel 8 move inversely as compared to the above, and the front panel 7 and the outlet panel 8 return to the state at the stop of the indoor unit 1.

<Characteristics of Indoor Unit of Present Embodiment>

[0078] In the indoor unit 1 of the present embodiment, because the protruding wall surface 37 provided at around the lower end portion of the opening 34 of the casing 5 is inclined forward in the downward direction, when the front panel 7 is open with respect to the casing 5, the user is able to easily take out the filters 36 by stretching his/her hand along the protruding wall surface 37 inclined forward in the downward direction. It is therefore easy to take out the filters 36 in the indoor unit 1 in which the front surface 31 of the casing 5 is curved to bulge so that its central part is at the foremost.

[0079] In addition to the above, in the indoor unit 1 of the present embodiment, the front end portion and its surroundings of each filter 36 are in parallel to the front surface of the indoor heat exchanger 20, at its attaching position. The gap between the front panel 7 and the filter 36 is therefore not narrow as in the cases where the front end portion of the filter and its surroundings are not in

parallel to the front surface of the heat exchanger at the attaching position, and hence the air is easily sucked through the openings.

[0080] In addition to the above, while in the indoor unit 1 of the present embodiment it is necessary to cancel the movement restriction of the front end portion of each filter 36 when the filter 36 is taken out, the user is able to easily cancel the movement restriction of the front end portion of the filter 36.

[0081] In addition to the above, because in the indoor unit 1 of the present embodiment the handle portion 36a is provided at the front end portion of each filter 36 for taking out the filter, the user is able to easily take out the filter 36 by gripping the front end portion of the filter 36.

[0082] In addition to the above, because in the indoor unit 1 of the present embodiment the lower end portion of the front panel 5 is identical in height with the central part of the front end of the protruding wall surface 37 in the state that the front panel 7 is closed with respect to the casing 5, the user is able to easily take out each filter 36 by gripping the front end portion of the filter 36 in the state that the front panel 7 is open with respect to the casing 5.

[0083] Thus, the embodiment of the present invention is described hereinabove. However, the specific structure of the present invention shall not be interpreted as to be limited to the above described embodiments. The scope of the present invention is defined not by the above embodiment but by claims set forth below, and shall encompass the equivalents in the meaning of the claims and every modification within the scope of the claims.

[0084] While the embodiment above describes a case where the front end portion and its surroundings of each filter 36 are in parallel to the front surface of the indoor heat exchanger 20 in the state that the filter 38 is attached to the mounting position, the front end portion and its surroundings of each filter 36 may not be in parallel to the front surface of the indoor heat exchanger 20.

[0085] While in the embodiment above the filter mounting portions 34a (restriction means) are provided at the lower end portion of each opening 34 of the casing 5 to restrict the forward movement of the front end portion of the corresponding filter 36 attached to the mounting position, the restriction means for restricting the forward movement of the front end portion of the filter 36 attached to the mounting position may be differently structured.

[0086] While in the embodiment above the filter mounting portion 36a for taking out the filter is provided at the front end portion of each filter 36, such a handle portion 36a for taking out the filter may not be provided at the front end portion of the filter 36.

[0087] While in the embodiment above the lower end portion of the front panel 7 is identical in height with the central part of the front end of the protruding wall surface 37 in the state that the front panel 7 is closed with respect to the casing 5, the lower end portion of the front panel 7 may be different in height from the central part of the front end of the protruding wall surface 37.

[Industrial Applicability]

[0088] The present invention makes it possible to easily take out a filter from an indoor unit in which a front surface of a casing is curved to bulge so that its central part is at the foremost.

[Reference Signs List]

[0089]

1 INDOOR UNIT

5 CASING

6 FRONT GRILL

7 FRONT PANEL

20 INDOOR HEAT EXCHANGER (HEAT EXCHANGER)

21 CROSS FLOW FAN

23 FIRST INLET PORT (INLET PORT)

30 TOP PLATE PORTION

34 OPENING

34a FILTER MOUNTING PORTION (RESTRICTION MEANS)

36 FILTER

36a HANDLE PORTION

37 PROTRUDING WALL SURFACE

Claims

1. An indoor unit comprising:

a casing (5);
a front panel (7) provided at a position forward of the casing (5); and
a filter (36) arranged to be attachable to a mounting position to cover an opening (34) formed on a front surface of the casing,
wherein, on the front surface (31) of the casing (5), a protruding wall surface (37) is provided around a lower end portion of the opening to protrude forward, the protruding wall surface (37) being inclined forward in a downward direction, wherein the opening (34) is extending from around the center in a vertical direction of the front surface to an upper part of the front surface,

characterized by a front end of the protruding wall being curved so that a central part of the front end protrudes forward,
the front panel (7) is rotatable relative to the casing (5) so that a lower end portion of the front panel moves forward,
a filter mounting portion (34a) being provided at a lower end portion of the opening (34),
the filter mounting portion (34a) having a fitting groove, and a front end portion of the filter (36) being arranged to be fitted in the fitting groove.

2. The indoor unit according to claim 1, further comprising a heat exchanger (20) provided in the casing (5),
a front end portion and its surroundings of the filter (36) being in parallel to a front surface of the heat exchanger in a state that the filter is attached to the mounting position.

3. The indoor unit according to claim 1 or 2, wherein, at the lower end portion of the opening of the casing, restriction means is provided to restrict forward movement of the front end portion of the filter attached to the mounting position.

4. The indoor unit according to any one of claims 1 to 3, wherein, at the front end portion of the filter (36), a handle portion (36a) is provided for taking out the filter (36).

5. The indoor unit according to any one of claims 1 to 4, wherein, in a state that the front panel is closed with respect to the casing, the lower end portion of the front panel (7) is identical in height with the central part of the front end of the protruding wall surface (37).

Patentansprüche

1. Innenraumeinheit, umfassend:

ein Gehäuse (5);
eine Fronttafel (7), die an einer Position vor dem Gehäuse (5) bereitgestellt ist; und
einen Filter (36), der dazu eingerichtet ist, an einer Montageposition befestigbar zu sein, um eine Öffnung (34) zu bedecken, die an einer Vorderfläche des Gehäuses gebildet ist,
wobei an der Vorderfläche (31) des Gehäuses (5) eine vorstehende Wandfläche (37) um einen unteren Endbereich der Öffnung herum bereitgestellt ist, um nach vorn vorzustehen, wobei die vorstehende Wandfläche (37) nach vorn in einer Abwärtsrichtung geneigt ist, wobei die Öffnung (34) von um das Zentrum herum in einer vertikalen Richtung der Vorderfläche zu einem oberen Teil der Vorderfläche verläuft, **dadurch gekennzeichnet, dass**
ein vorderes Ende der vorstehenden Wand so gekrümmt ist, dass ein zentraler Teil des vorderen Endes nach vorn vorsteht,
die Fronttafel (7) relativ zum Gehäuse (5) rotierbar ist, so dass sich ein unterer Endbereich der Fronttafel nach vorn bewegt,
ein Filter-Montagebereich (34a) an einem unteren Endbereich der Öffnung (34) bereitgestellt ist,
der Filter-Montagebereich (34a) eine Passnut hat, und ein vorderer Endbereich des Filters (36) dazu eingerichtet ist, in die Passnut eingepasst zu werden.

2. Innenraumeinheit nach Anspruch 1, die weiter einen Wärmetauscher (20) umfasst, der im Gehäuse (5) bereitgestellt ist, wobei ein vorderer Endbereich und dessen Umgebung des Filters (36) parallel zu einer Vorderfläche des Wärmetauschers in einem Zustand sind, in welchem der Filter an der Montageposition befestigt ist.

3. Innenraumeinheit nach Anspruch 1 oder 2, wobei am unteren Endbereich der Öffnung des Gehäuses ein Beschränkungsmittel bereitgestellt ist, um eine Vorwärtsbewegung des vorderen Endbereichs des Filters zu beschränken, der an der Montageposition befestigt ist.

4. Innenraumeinheit nach einem der Ansprüche 1 bis 3, wobei am vorderen Endbereich des Filters (36) ein Griffbereich (36a) bereitgestellt ist, um den Filter (36) herauszunehmen.

5. Innenraumeinheit nach einem der Ansprüche 1 bis 4, wobei in einem Zustand, in welchem die Fronttafel hinsichtlich des Gehäuses geschlossen ist, der untere Endbereich der Fronttafel (7) in der Höhe identisch mit dem zentralen Teil des vorderen Endes der vorstehenden Wandfläche (37) ist.

Revendications

1. Unité intérieure comprenant :

un boîtier (5) ;
un panneau avant (7) prévu dans une position située à l'avant du boîtier (5) ; et
un filtre (36) conçu pour pouvoir être fixé dans une position de montage pour recouvrir une ouverture (34) formée sur une surface avant du boîtier;
dans laquelle, sur la surface avant (31) du boîtier (5), est prévue une surface de paroi saillante (37) autour d'une portion d'extrémité inférieure

de l'ouverture pour faire saillie vers l'avant, la surface de paroi saillante (37) étant inclinée vers l'avant dans une direction descendante, l'ouverture (34) s'étendant approximativement à partir du centre dans une direction verticale de la surface avant jusqu'à une partie supérieure de la surface avant;
caractérisée en ce qu'une extrémité avant de la paroi saillante est incurvée, d'une manière telle qu'une partie centrale de l'extrémité avant fait saillie vers l'avant;
le panneau avant (7) est rotatif par rapport au boîtier (5), d'une manière telle qu'une portion d'extrémité inférieure du panneau avant se déplace vers l'avant;
une portion de montage de filtre (34a) est prévue à une portion d'extrémité inférieure de l'ouverture (34) ;
la portion de montage de filtre (34a) possède une rainure d'insertion ; et
une portion d'extrémité avant du filtre (36) est conçue pour venir s'insérer dans la rainure d'insertion.

2. Unité intérieure selon la revendication 1, comprenant en outre un échangeur de chaleur (20) prévu dans le boîtier (5),
une portion d'extrémité avant et ses alentours du filtre (36) étant parallèles à une surface avant de l'échangeur de chaleur dans un état tel que le filtre est fixé dans la position de montage.

3. Unité intérieure selon la revendication 1 ou 2, dans laquelle, au niveau de la portion d'extrémité inférieure de l'ouverture du boîtier, est prévu un moyen de restriction pour restreindre un mouvement vers l'avant de la portion d'extrémité avant du filtre fixé dans la position de montage.

4. Unité intérieure selon l'une quelconque des revendications 1 à 3, dans laquelle, au niveau de la portion d'extrémité avant du filtre (36), est prévue une portion de poignée (36a) pour retirer le filtre (36).

5. Unité intérieure selon l'une quelconque des revendications 1 à 4, dans laquelle, dans un état tel que le panneau avant est fermé par rapport au boîtier, la portion d'extrémité inférieure du panneau avant (7) est identique en hauteur à la partie centrale de l'extrémité avant de la surface de paroi saillante (37).

FIG.1A

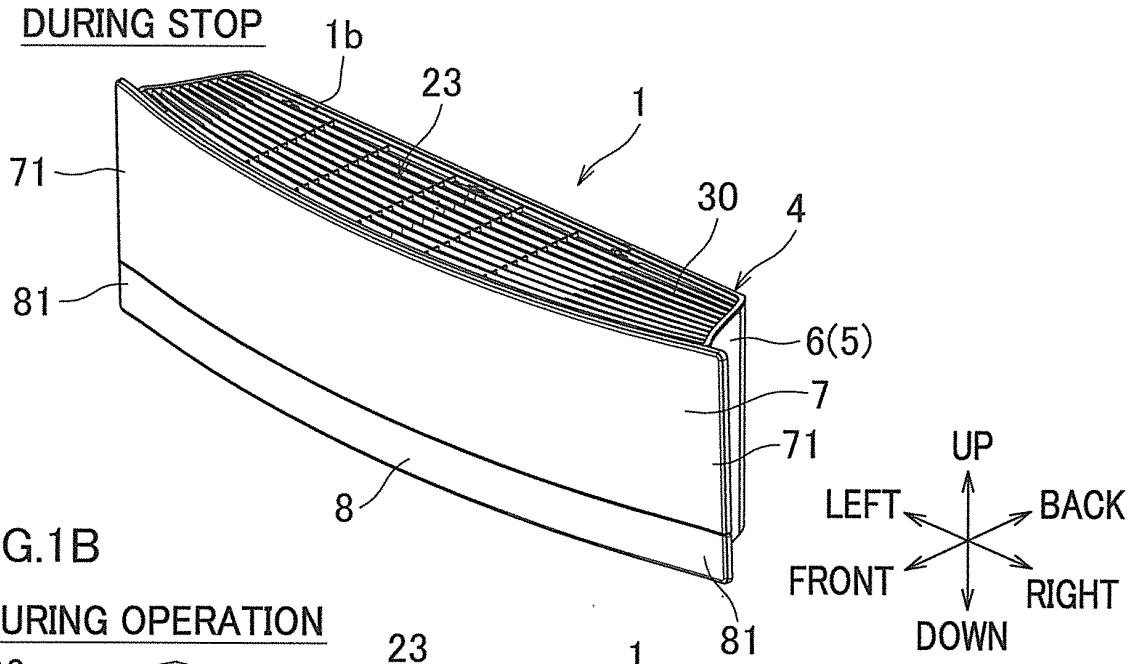


FIG.1B

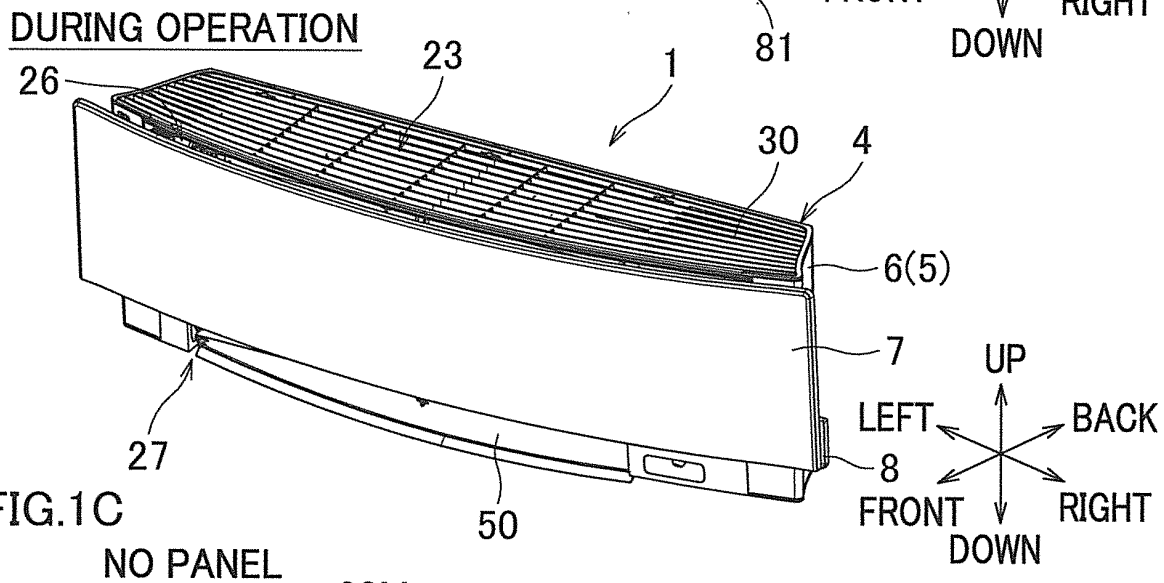


FIG.1C

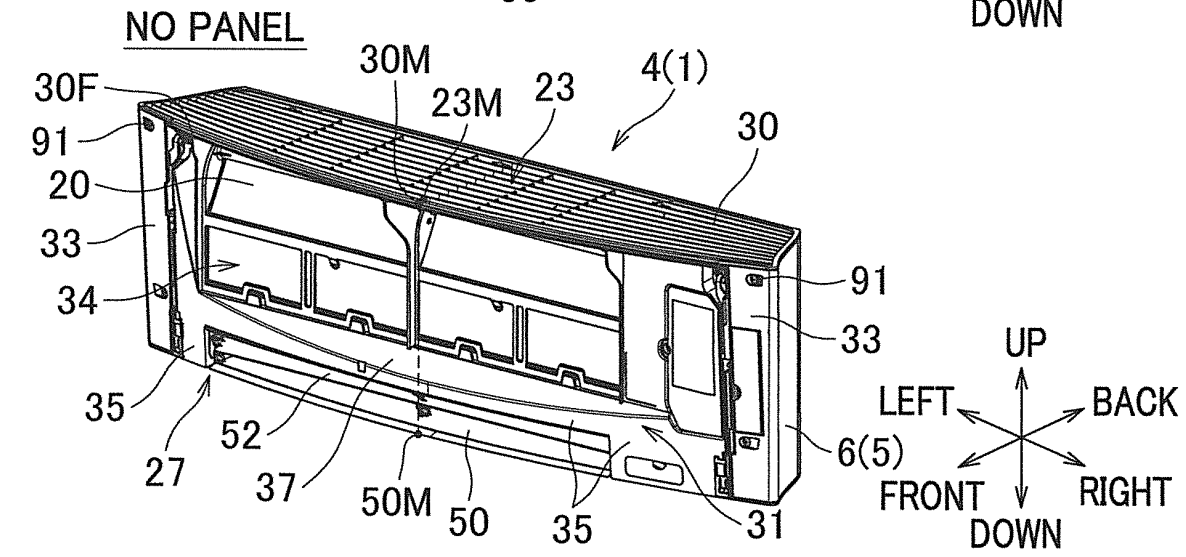


FIG.2A

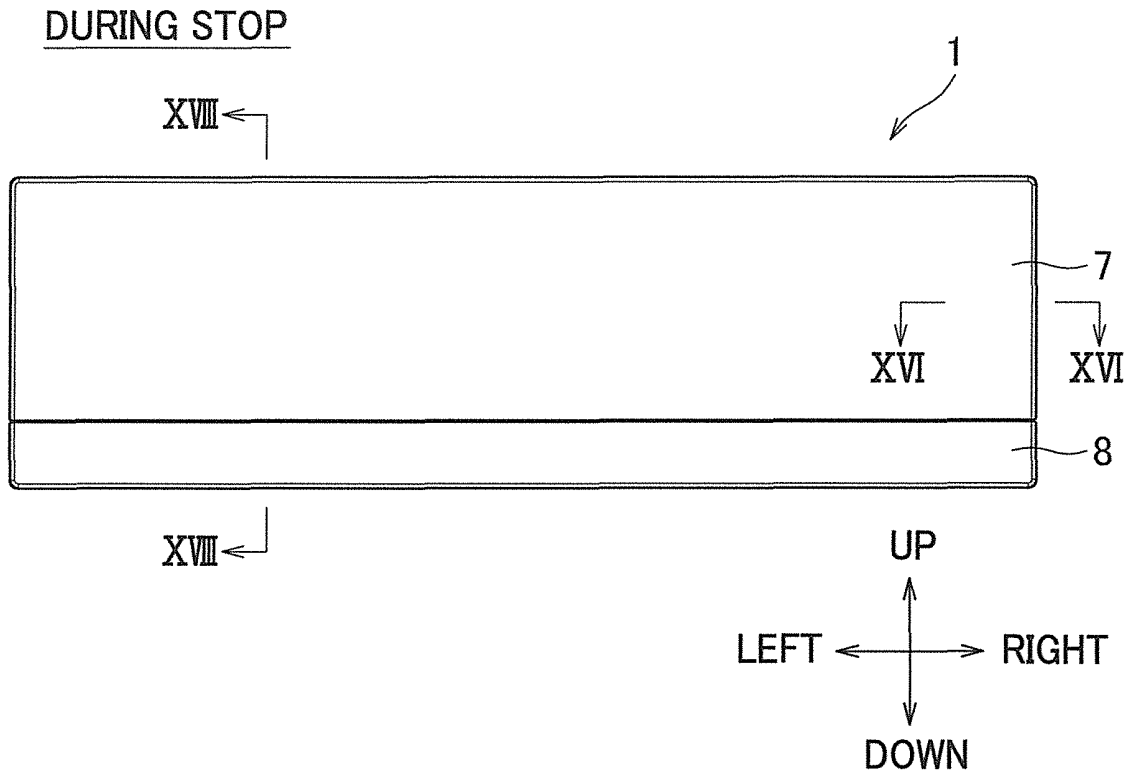

DURING STOP
1
XVIII
7
XVI
XVI
8
XVIII
UP
LEFT
RIGHT
DOWN

FIG.2B

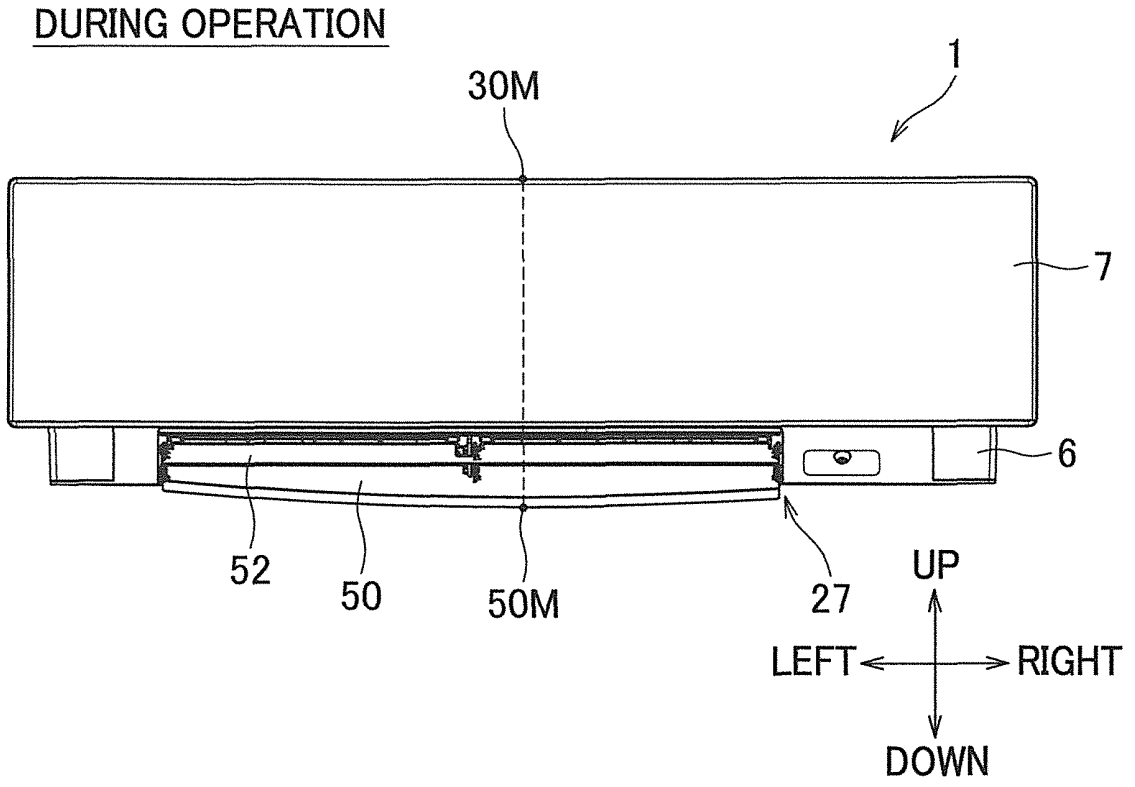

DURING OPERATION
1
30M
7
6
52
50
50M
27
UP
LEFT
RIGHT
DOWN

FIG.3A DURING STOP

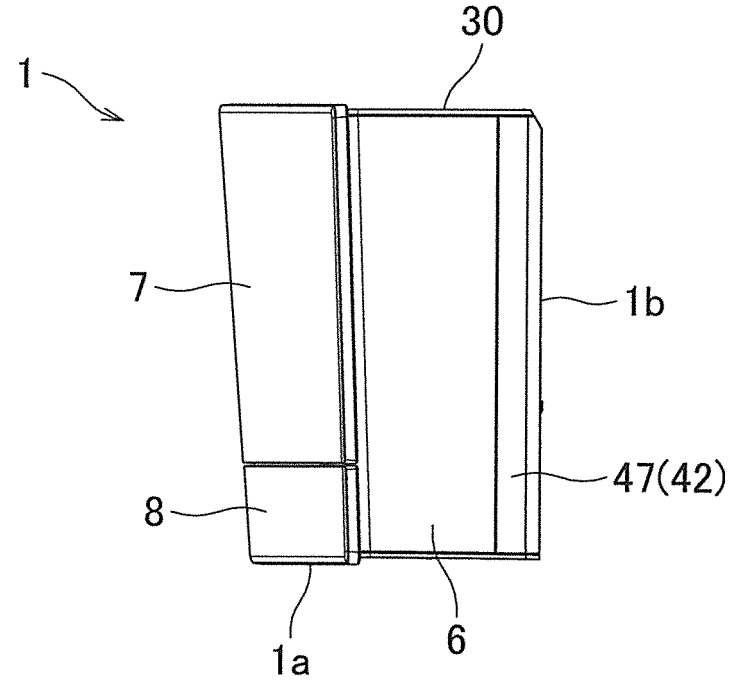


FIG.3B DURING OPERATION

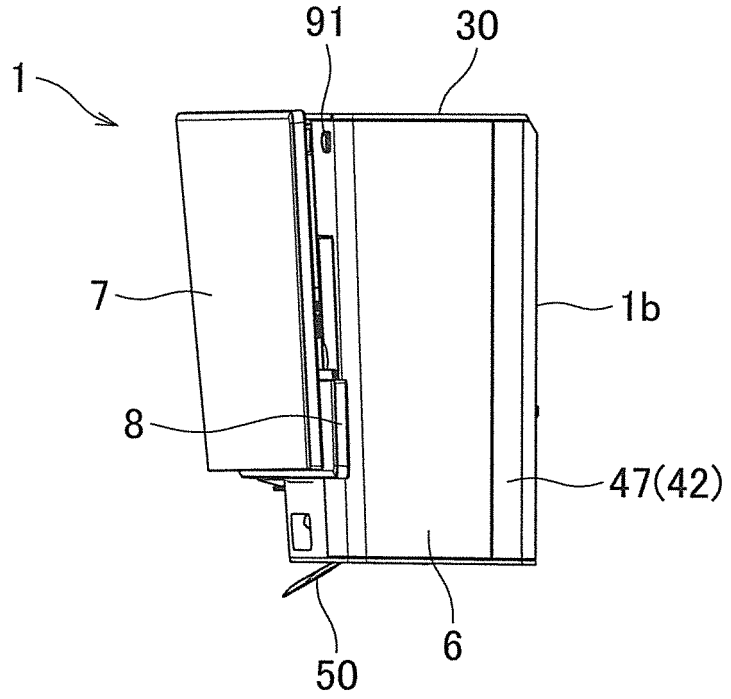


FIG.4

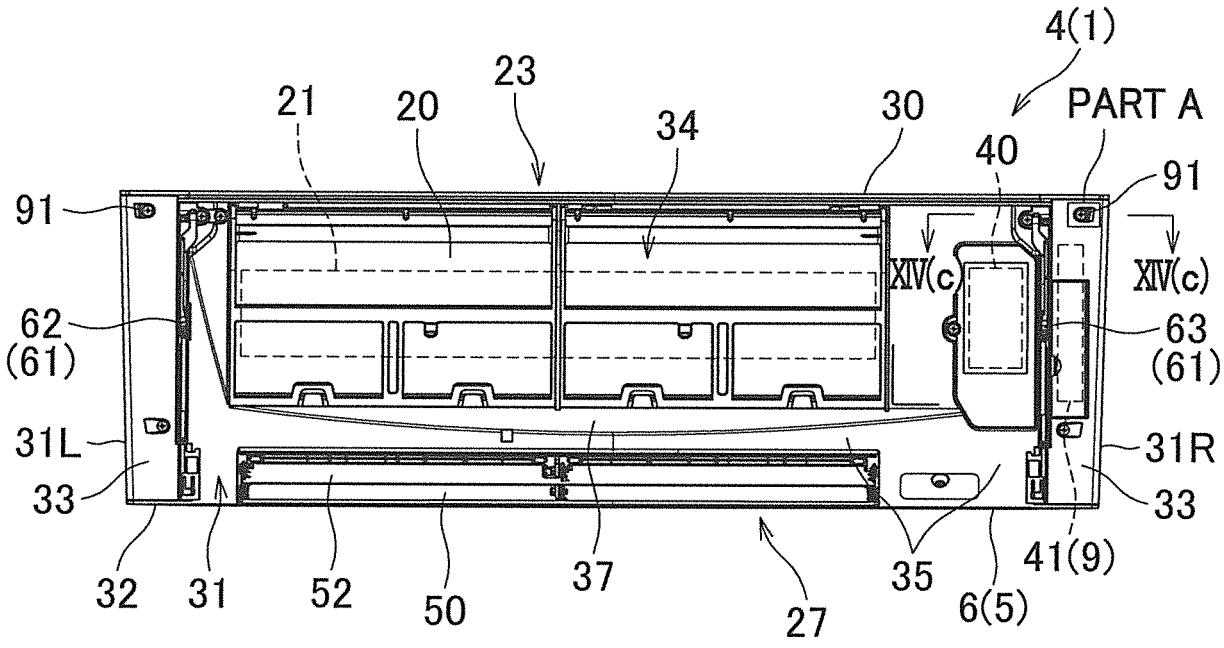

4(1)
PART A
23
21
20
34
30
40
91
91
XIV(c)
XIV(c)
62
(61)
63
(61)
31L
31R
33
33
32
31
52
50
37
27
35
6(5)
41(9)

FIG.5

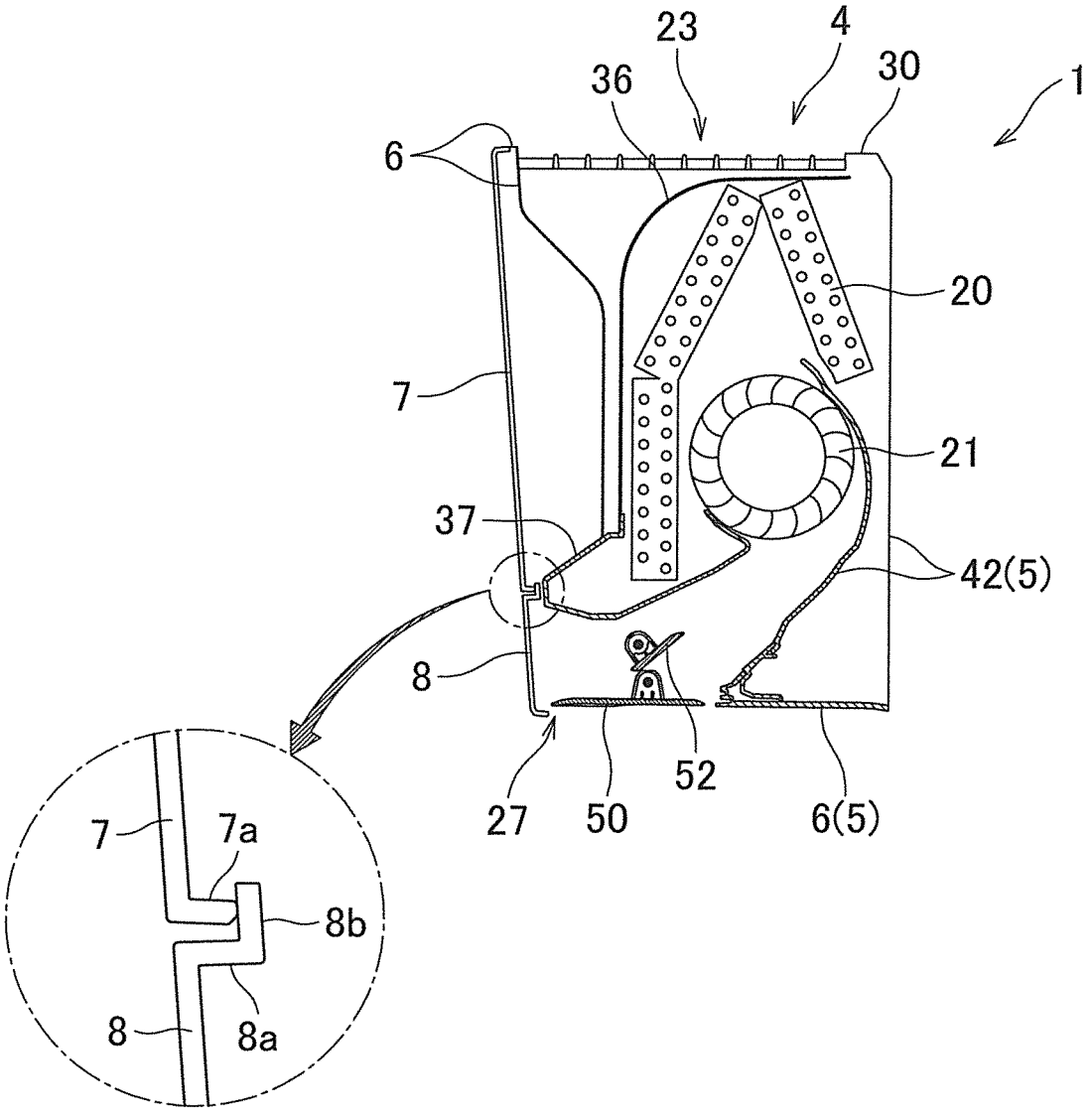


FIG.6A

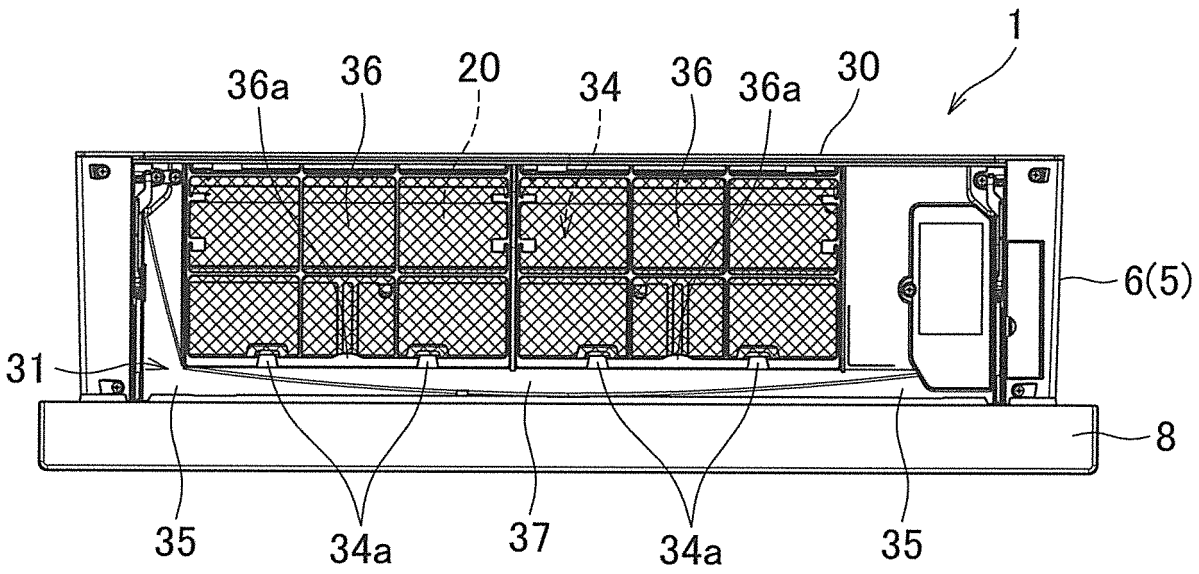

1
36a
36
20
34
36
36a
30
6(5)
31
8
35
34a
37
34a
35

FIG.6B

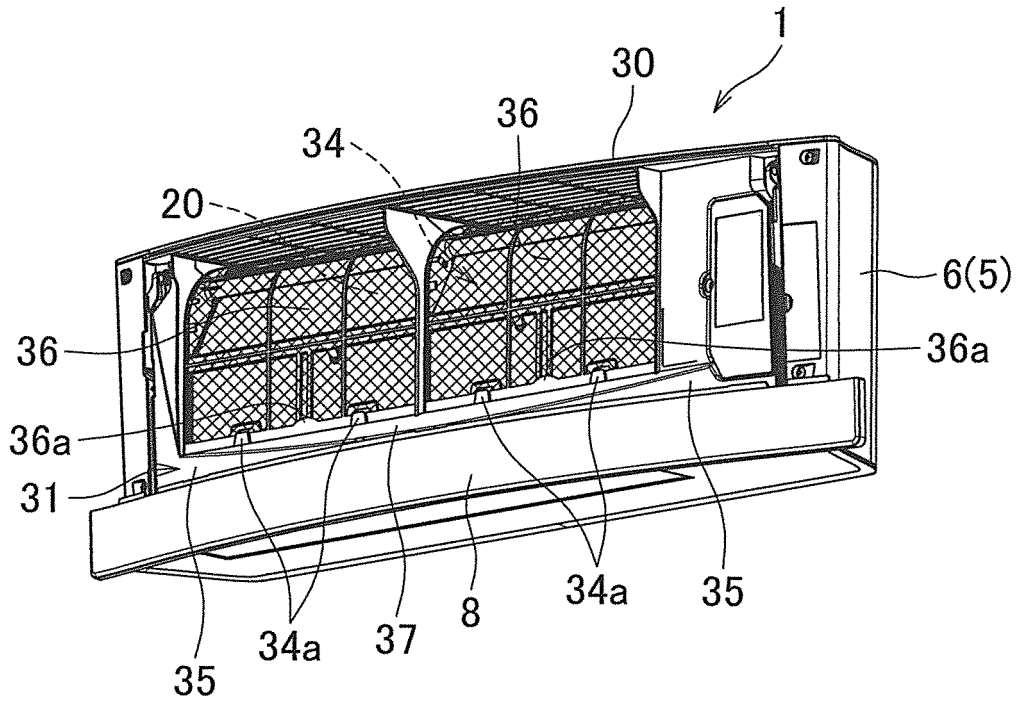

1
30
36
34
20
6(5)
36
36a
36a
31
35
34a
37
8
34a
35

FIG.7A

DURING STOP

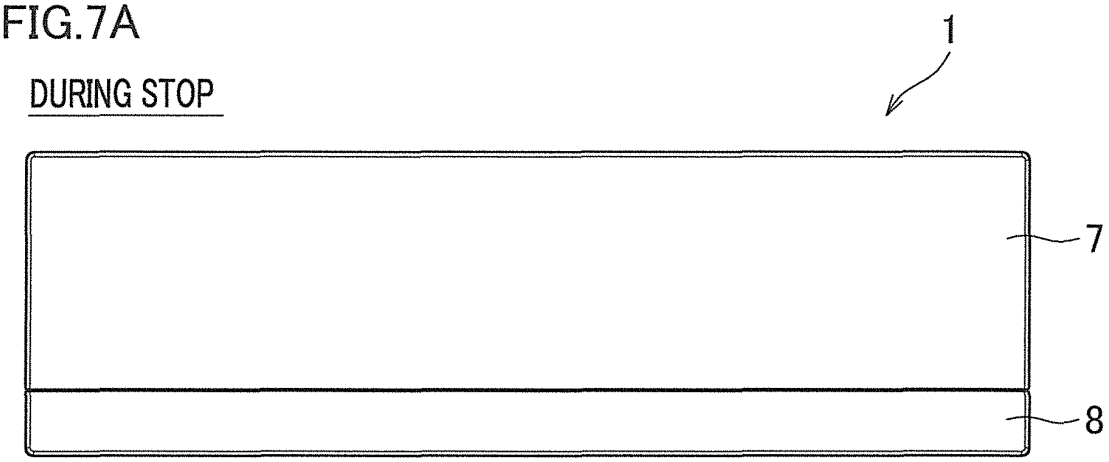


FIG.7B

WHEN FILTER IS ATTACHED OR DETACHED

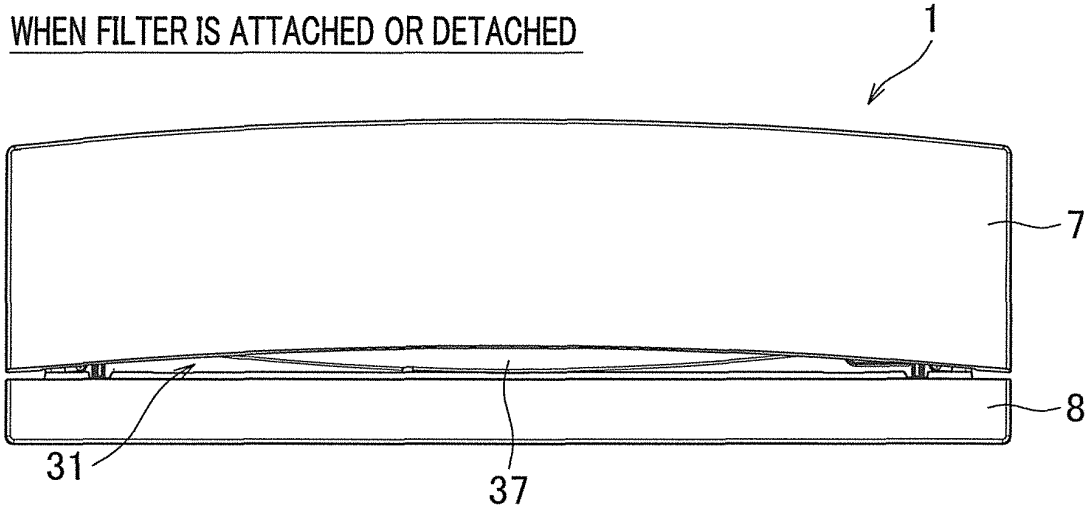


FIG.7C

WHEN FILTER IS ATTACHED OR DETACHED

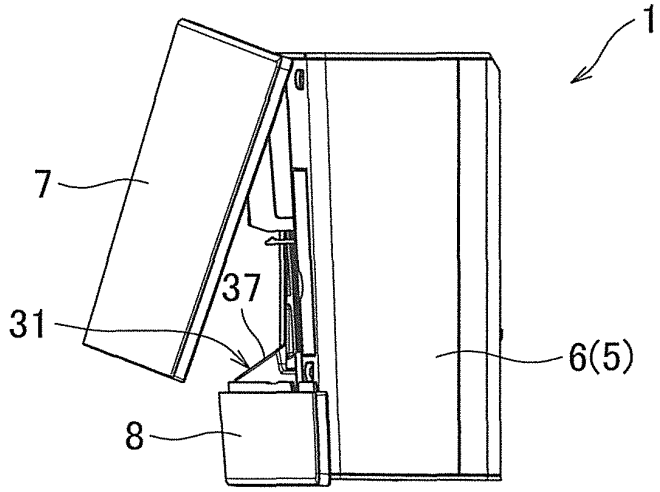


FIG.8

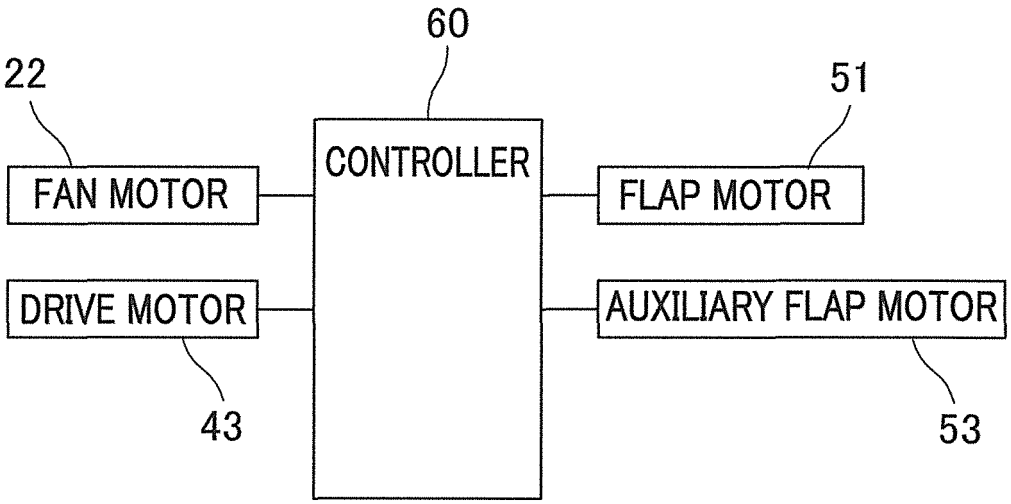

60
22
51
CONTROLLER
FAN MOTOR
FLAP MOTOR
DRIVE MOTOR
AUXILIARY FLAP MOTOR
43
53

FIG.9A DURING STOP

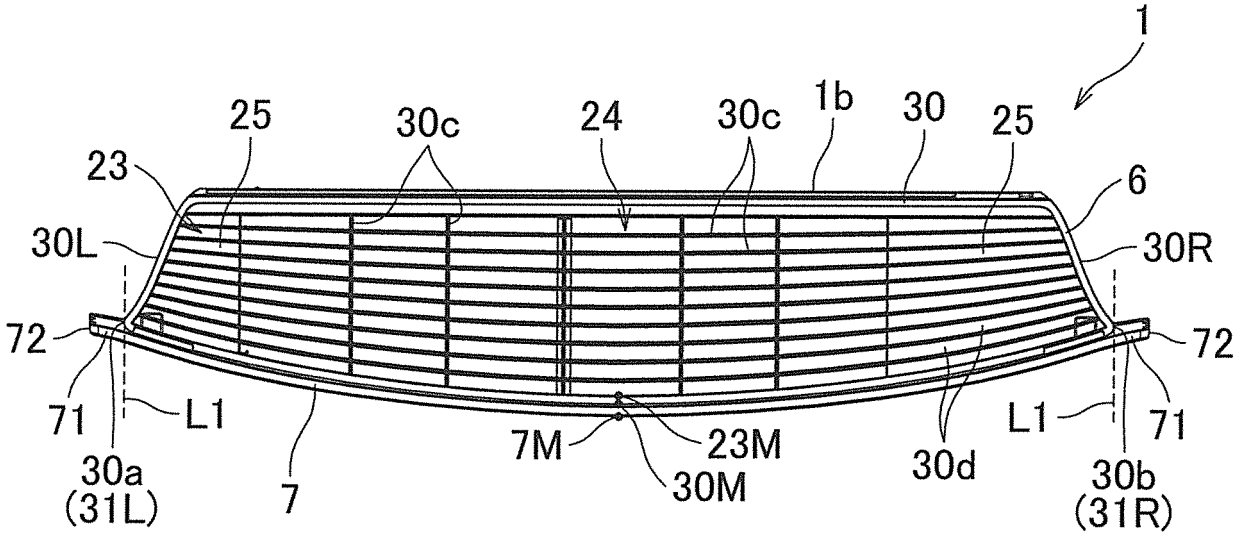


FIG.9B DURING OPERATION

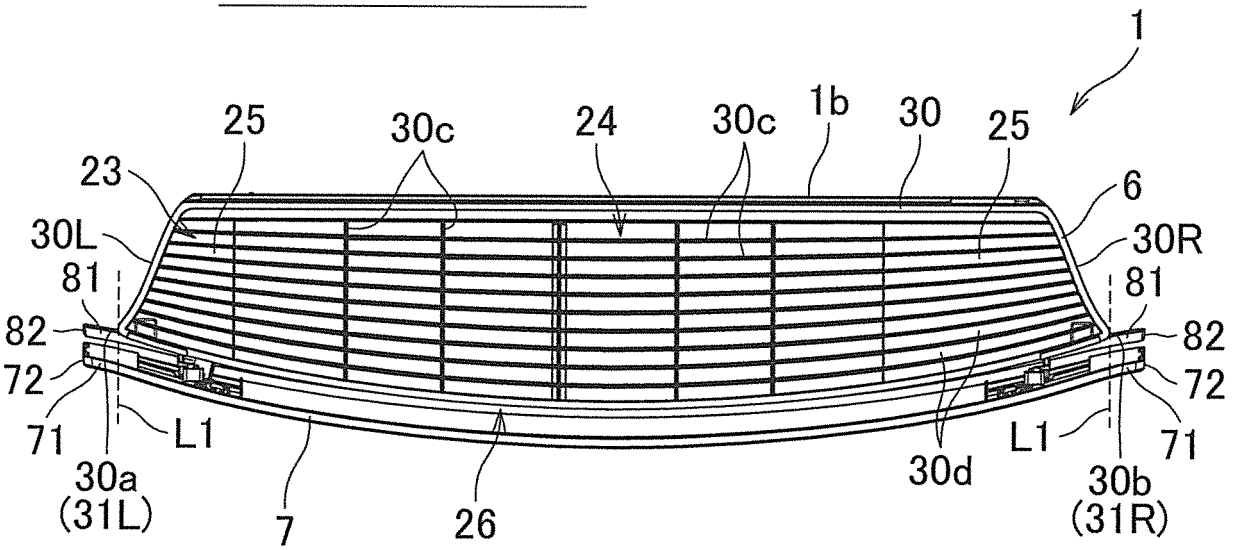


FIG.10

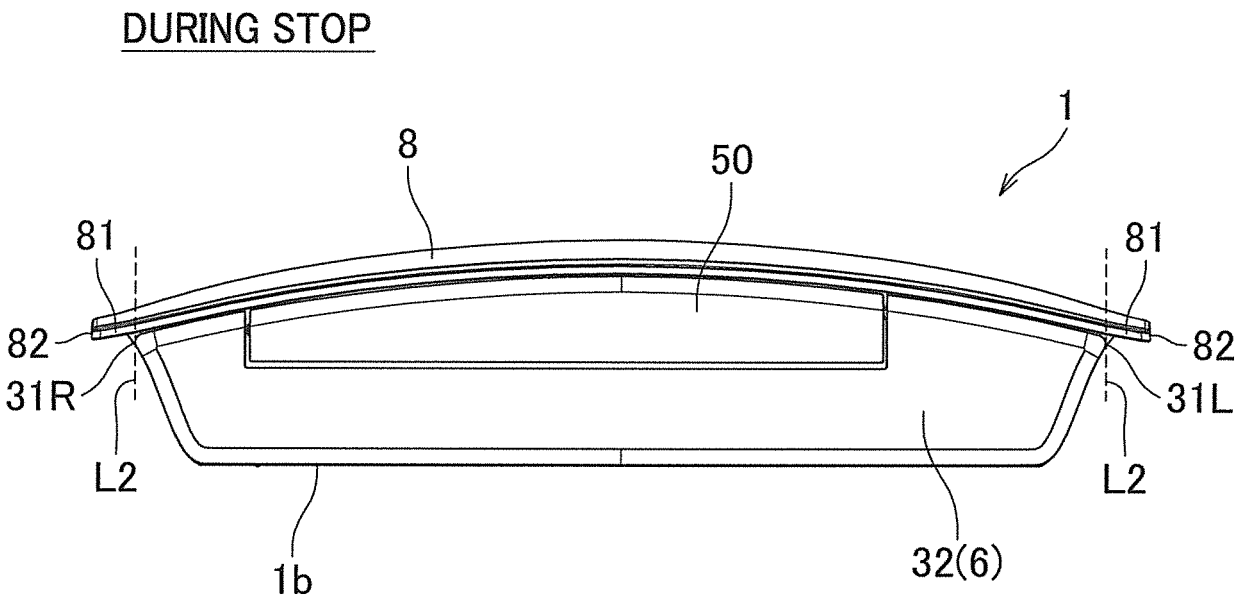


FIG.11A

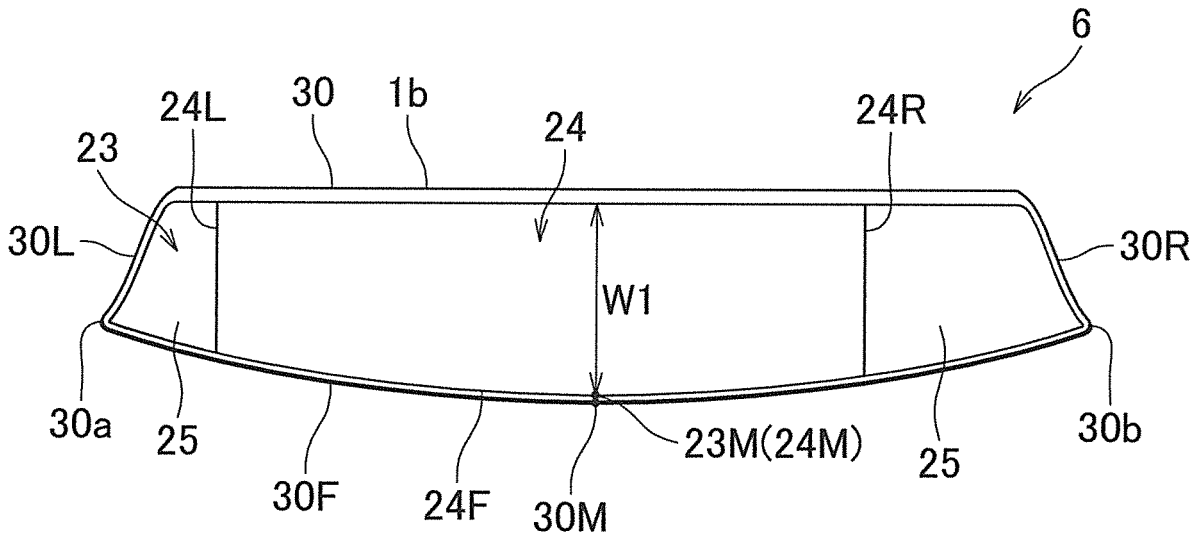


FIG.11B

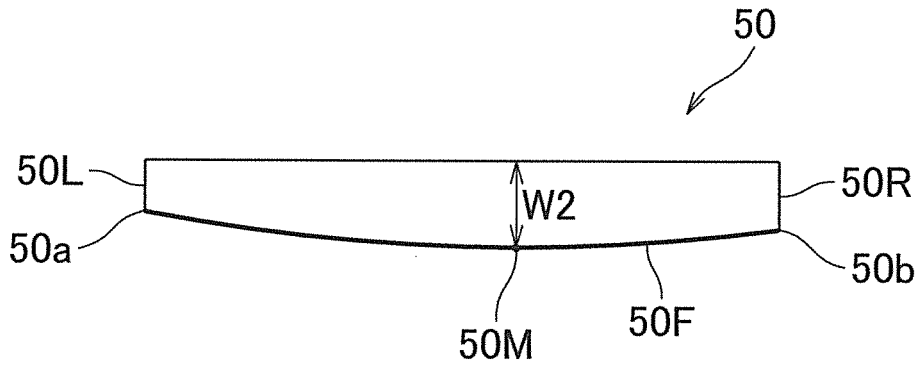


FIG.12

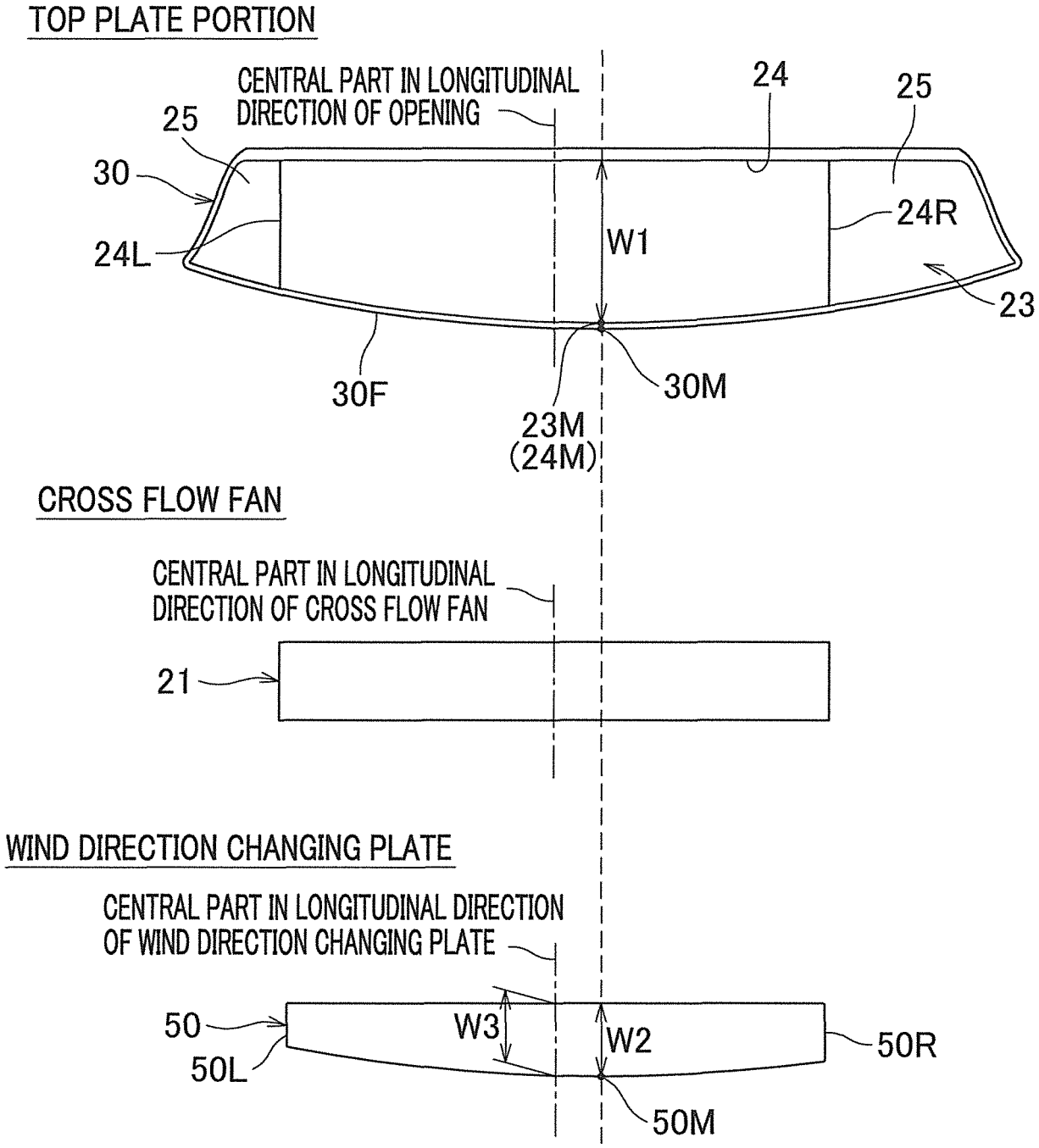

TOP PLATE PORTION
CENTRAL PART IN LONGITUDINAL DIRECTION OF OPENING
24
25
25
30
24L
W1
24R
23
30F
30M
23M
(24M)
CROSS FLOW FAN
CENTRAL PART IN LONGITUDINAL DIRECTION OF CROSS FLOW FAN
21
WIND DIRECTION CHANGING PLATE
CENTRAL PART IN LONGITUDINAL DIRECTION OF WIND DIRECTION CHANGING PLATE
50
50L
W3
W2
50R
50M

FIG.13

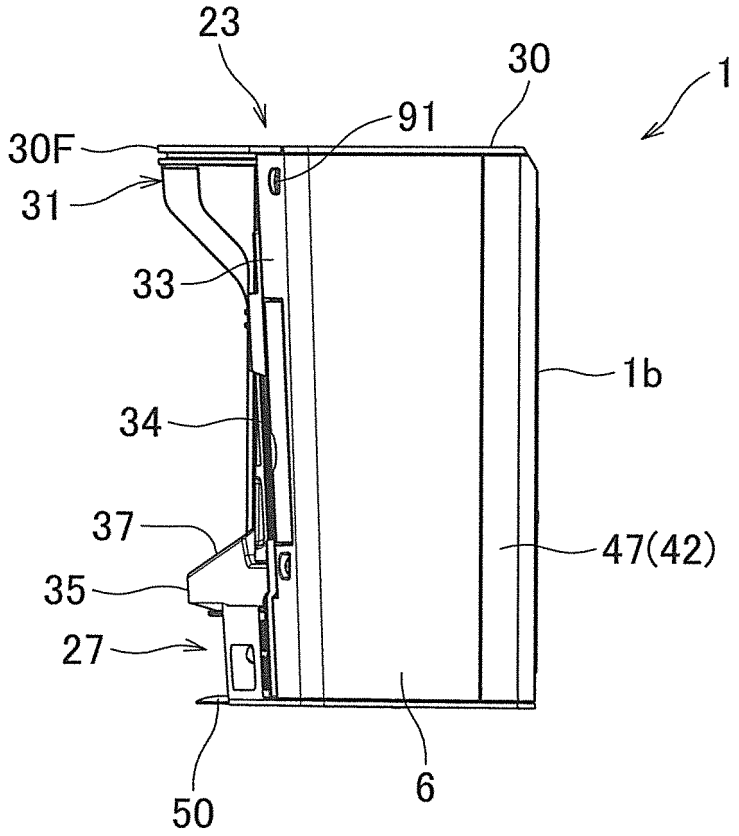


FIG.14A PART A

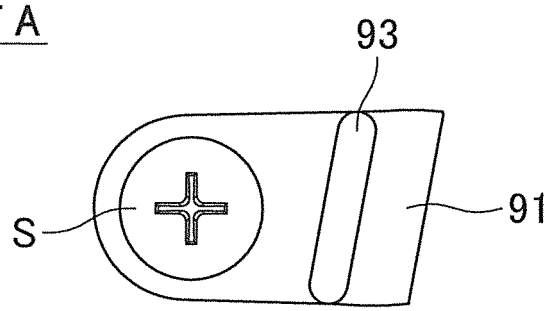


FIG.14B

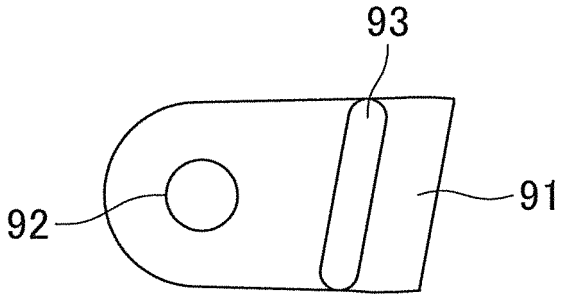


FIG.14C

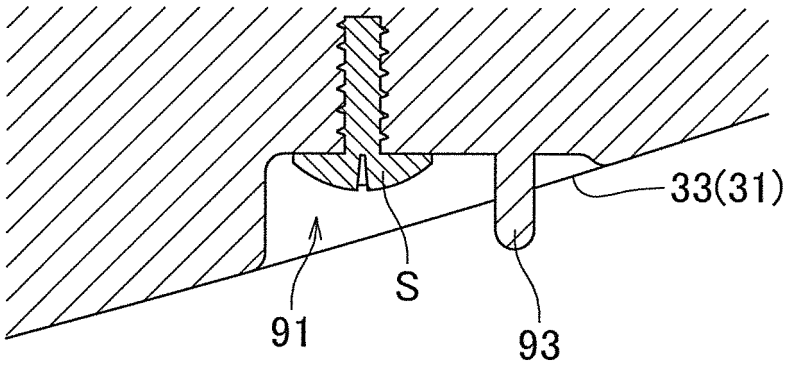


FIG.15A

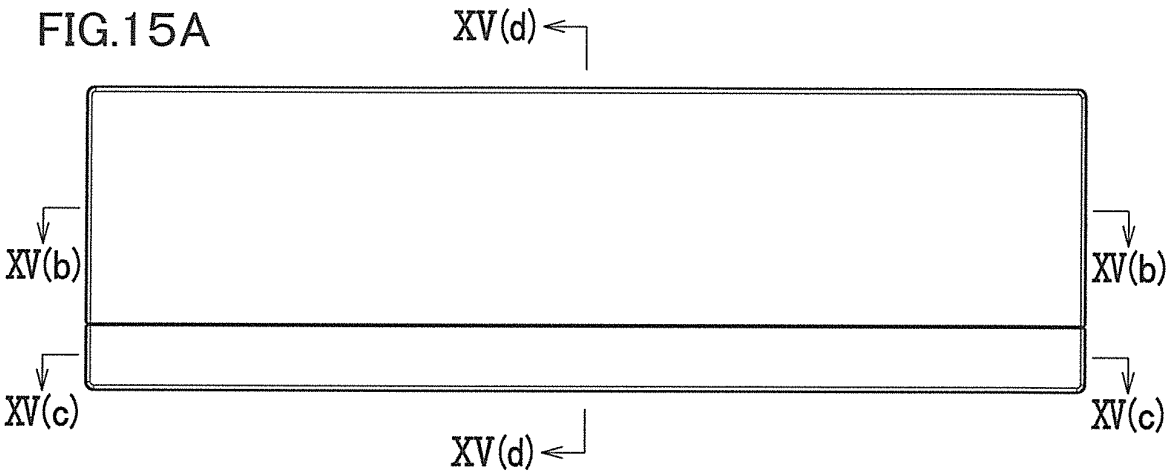


FIG.15B

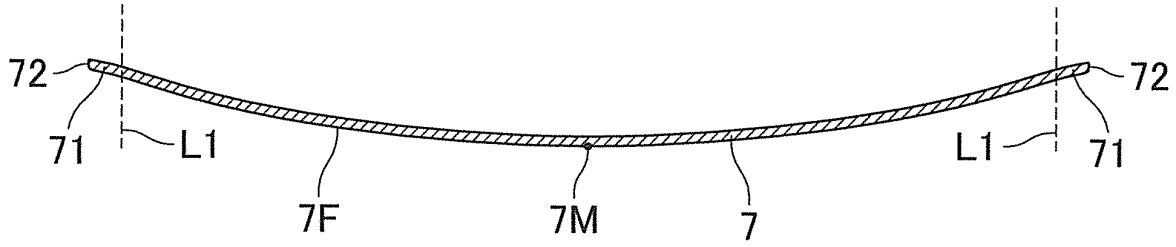


FIG.15C

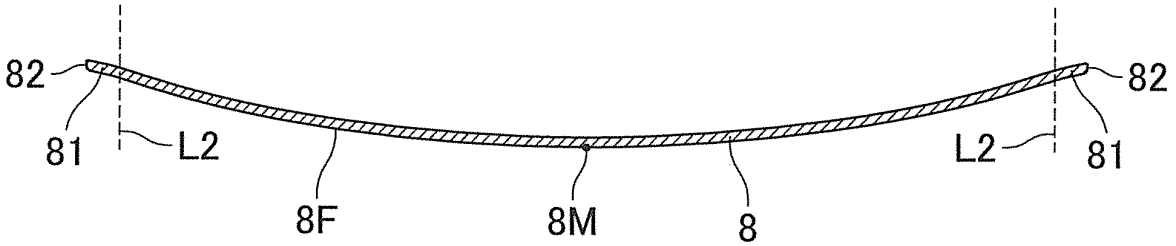


FIG.15D

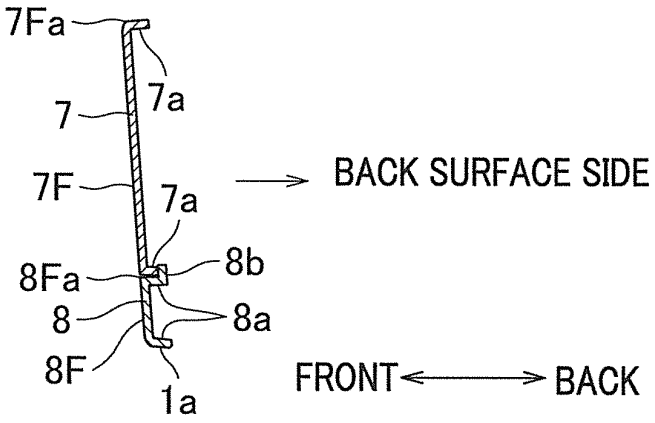


FIG.16

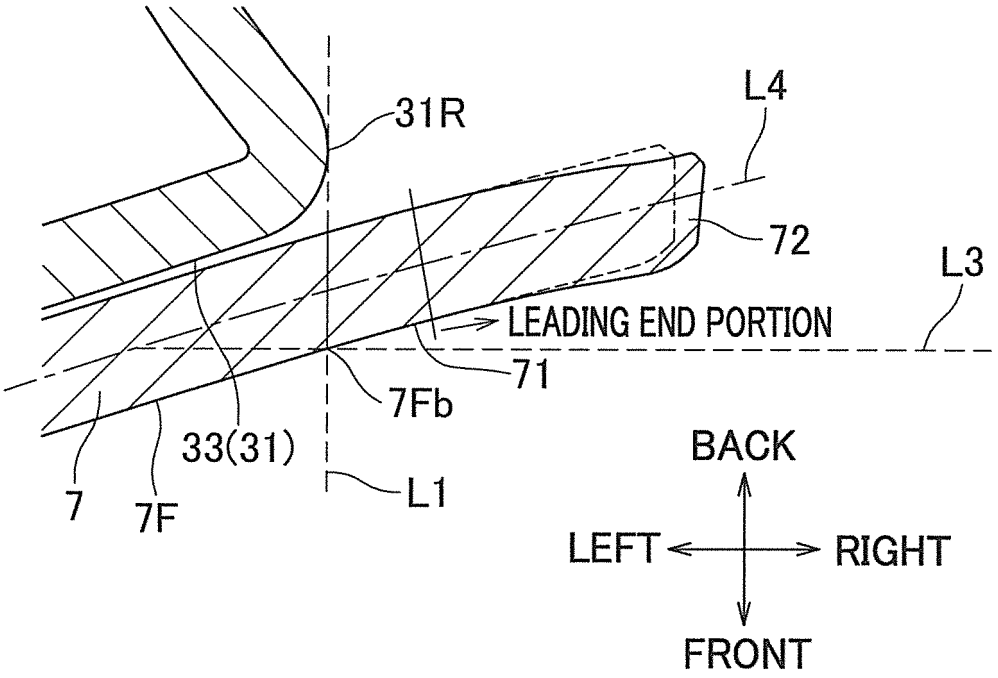

31R
L4
72
L3
LEADING END PORTION
71
7Fb
33(31)
7
7F
L1
BACK
LEFT
RIGHT
FRONT

FIG.17A

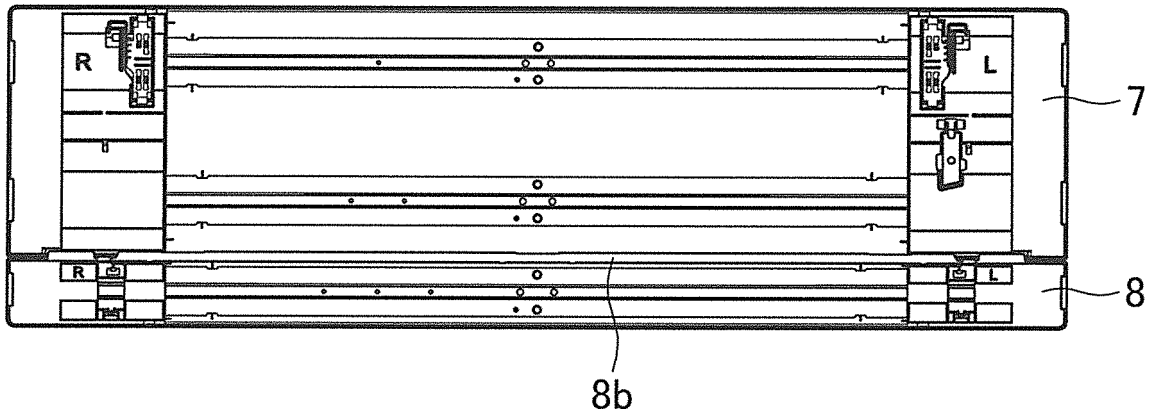


FIG.17B

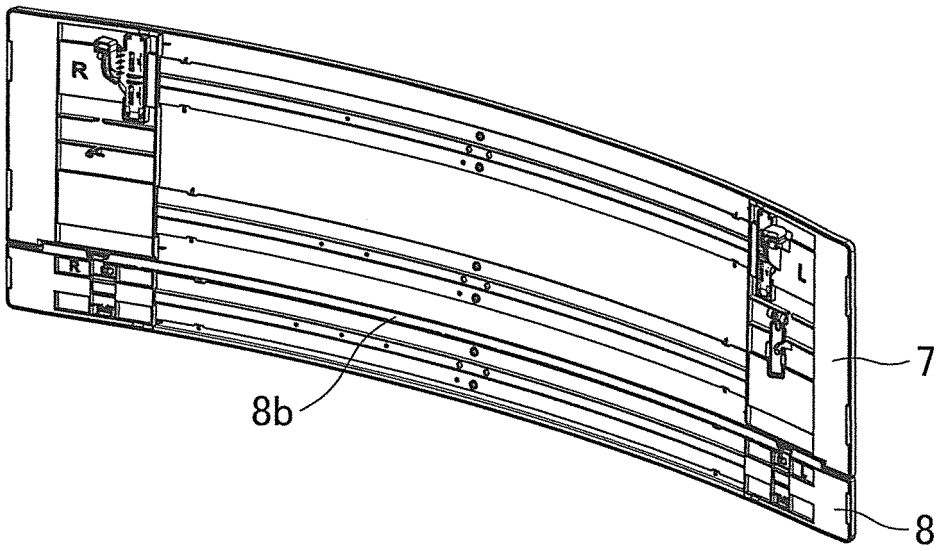


FIG.18

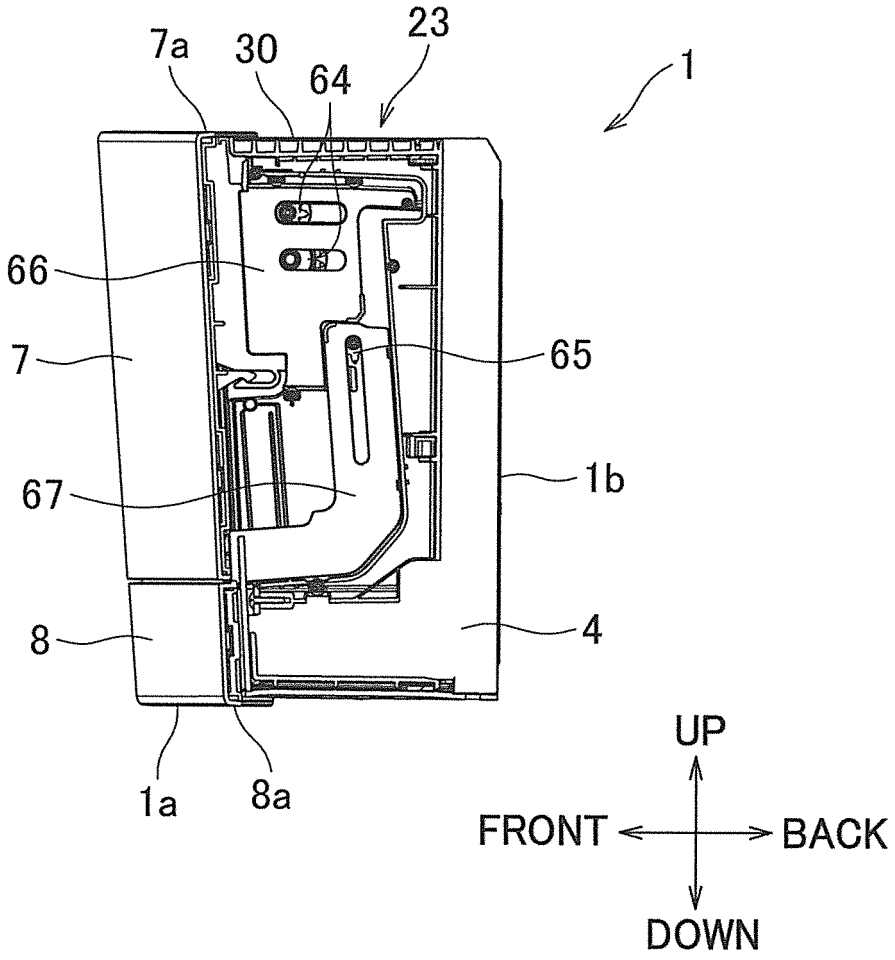


FIG.19A

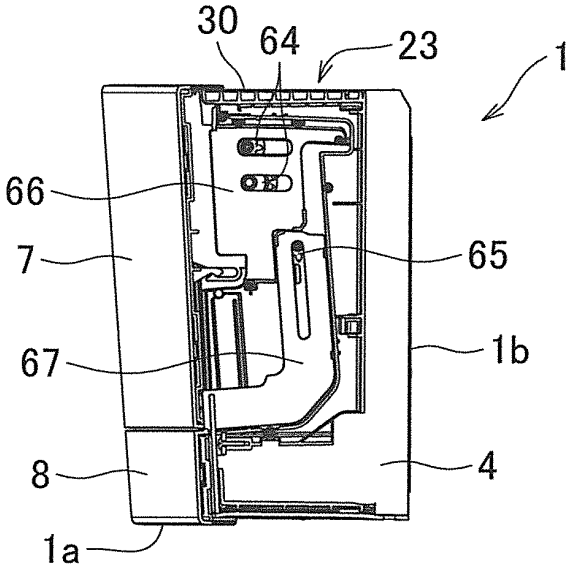


FIG.19B

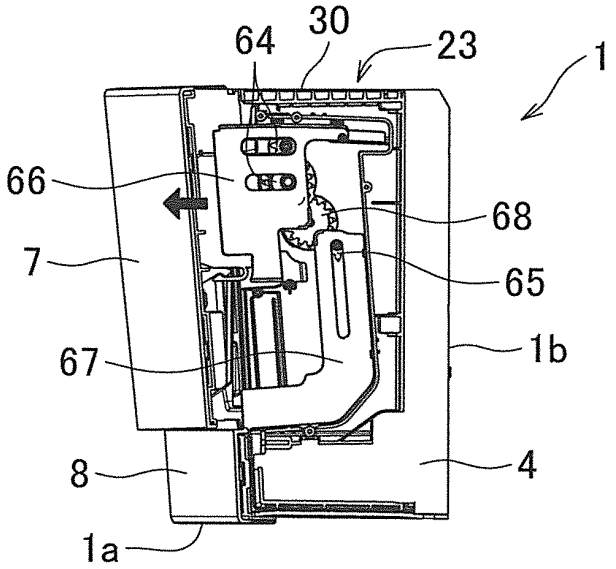
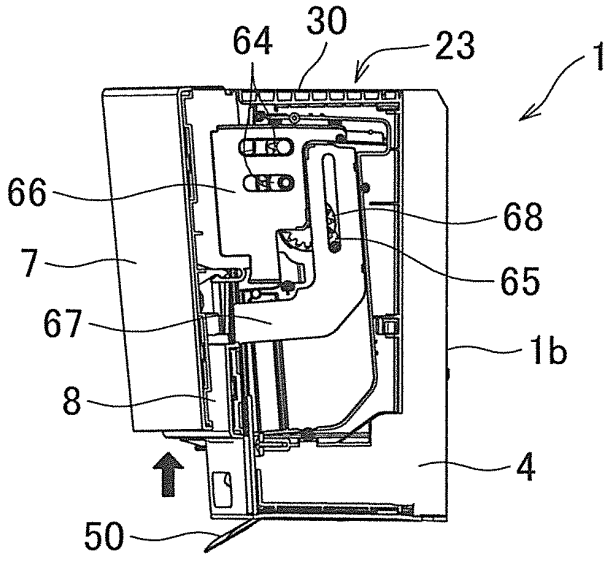


FIG.19C



REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2011149620 A **[0003]**
- JP S6352018 U **[0003]**