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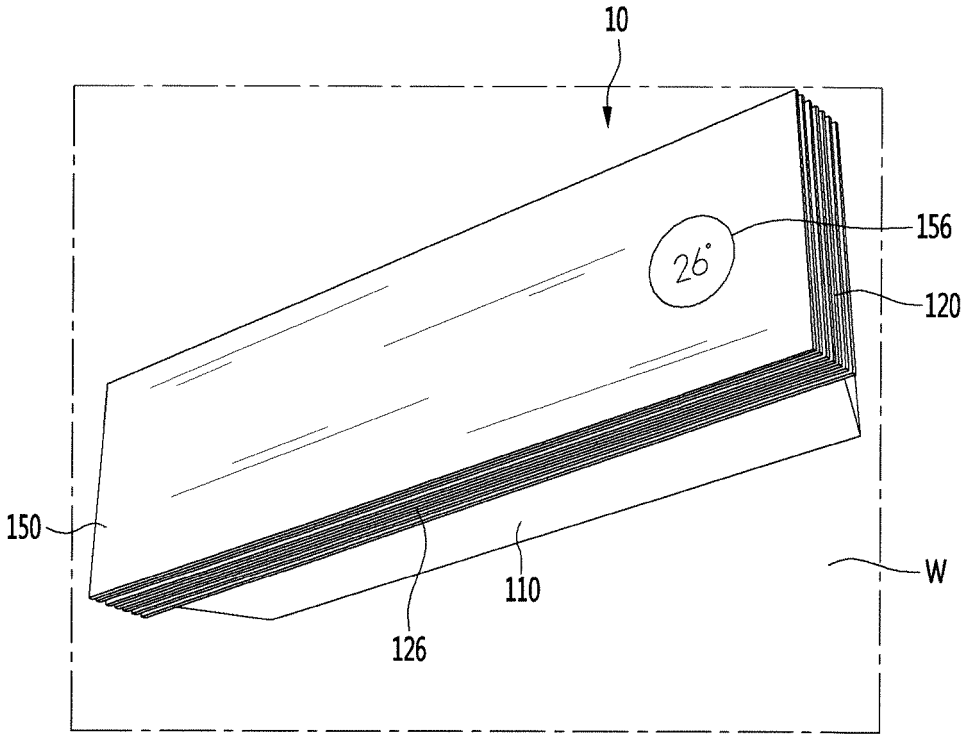
(54) INDOOR UNIT FOR AIR CONDITIONER

(57) Provided is an indoor unit for an air conditioner and a method for controlling the same. The indoor unit of the air conditioner according an embodiment may be provided with a front discharge part and a lower discharge part to diversify a flow direction of discharge air, thereby allowing a customized operation according to an operation mode of the air conditioner.

Fig. 1



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Description

BACKGROUND

[0001] The present disclosure relates to an indoor unit for an air conditioner and a method for controlling the same.

[0002] An indoor unit of an air conditioner may be classified into a stand type, a wall-mounted type, or a ceiling type according to its installation position. Among them, the wall-mounted type indoor unit is understood as an air conditioner that is attached to a vertical wall surface.

[0003] In general, the wall-mounted type indoor unit includes an air suction part and a discharge part. Air suctioned through the air suction part may be discharged into the room through the discharge part after passing through a heat exchanger and a blower fan.

[0004] The discharge part may be provided with a direction control device for controlling a direction of a flow of the discharged air. The direction control device may include a louver that guides the air flow in a vertical direction or horizontal directions.

[0005] The prior art document below discloses an air conditioner equipped with a louver that is capable of adjusting a flow direction of discharged air forward or downward. The information of the prior art document is as follows.

1. Registration Number (Registration Date): Korean Patent Registration No. 55309 (October 09, 1992)
2. Title of The Invention: Air Conditioning Device

[0006] Although the above prior art document conceptually discloses a louver set to an upper discharge position or a lower discharge position so as to control a discharge blowing direction, but specific ideas regarding the detailed configuration and operation of the louver are not disclosed.

[0007] In practice, it is not easy to open and close a plurality of discharge holes by using one louver so as to control the discharge blowing direction forward or downward. In particular, it is even more so if the plurality of discharge holes includes a front discharge hole and a lower discharge hole, which are disposed to be perpendicular to each other.

[0008] In addition, it is not preferable to provide a plurality of louvers for opening and closing a plurality of discharge holes, or to apply a louver having a complicated structure when considering an indoor unit having a limited size.

[0009] In addition, when an opening is defined in a lower portion of the front panel, and the louver is disposed inside the opening to define a front discharge port, foreign substances may be introduced into the indoor unit, or a user's hand may be caught to cause a safety accident.

SUMMARY

[0010] Embodiments provide an indoor unit for an air conditioner in which a front discharge part and a lower discharge part are provided to selectively open and close the front discharge part or the lower discharge part, thereby easily controlling a flow direction of discharged air.

[0011] Embodiments also provide an indoor unit for an air conditioner in which a front discharge part is opened by allowing a front panel to move, and a lower discharge part is opened by allowing a vertical vane to move.

[0012] Embodiments also provide an indoor unit for an air conditioner in which a vertical vane slidably or rotatably moves above a lower discharge part to adjust an opening area of the lower discharge part.

[0013] Embodiments also provide an indoor unit for an air conditioner in which a front panel and a vertical vane are interlocked with each other according to a cooling operation or heating operation of the air conditioner, thereby operating in a mode that is suitable for user's preference.

[0014] Embodiments also provide an indoor unit for an air conditioner in which a rail is coupled to both sides of a front panel to facilitate ascending or descending of the front panel.

[0015] Embodiments also provide an indoor unit for an air conditioner in which a horizontal vane is installed on a discharge part to easily control a flow of air discharged through a front discharge part and a lower discharge part in a horizontal direction.

[0016] Embodiments also provide an indoor unit for an air conditioner in which a horizontal vane is integrated with a lower portion of a drain pan to improve space utilization within the indoor unit.

[0017] Embodiments also provide an indoor unit for an air conditioner in which a curvature of a bottom surface of a drain pan is improved to guide a flow of air discharged through a front discharge part to a front upper side so that the air flows to a relatively far distance from the indoor unit.

[0018] Embodiments also provide an indoor unit for an air conditioner in which a groove or protrusion structure is applied to a bottom surface of a drain pan to guide stable discharge of air and reduce noise.

[0019] An indoor unit of an air conditioner according an embodiment may be provided with a front discharge part and a lower discharge part to diversify a flow direction of discharge air, thereby allowing a customized operation according to an operation mode of the air conditioner.

[0020] The front discharge part may be opened and closed by a front panel moving in a vertical direction, and the lower discharge part may be opened and closed by a vertical vane that is slidable or rotatable so that the selective opening and closing of the front discharge part or the lower discharge part is easily performed.

[0021] A vertical vane motor and a link may be provided at a side of the vertical vane to easily perform movement of the vertical vane.

[0022] The link may be eccentrically connected to the vertical vane to allow the vertical vane to rotatably or slidably move. Since the link is coupled to a rear side of the vertical vane, a rear end of the vertical vane may be lifted.

[0023] To open both the front discharge part and the lower discharge part, the front panel may move upward, and the vertical vane may be driven to be disposed at a first position.

[0024] In another operation, to open the front discharge part and close the lower discharge part, the front panel may move upward, and the vertical vane may be driven to be disposed at a second position.

[0025] In further another operation, to close the front discharge part and open the lower discharge part, the front panel may move downward, and the vertical vane may be driven to be disposed at a third position.

[0026] When a user desires direct wind during a cooling or heating operation of the air conditioner, since both the front discharge part and the lower discharge part are opened, a strong discharge air flow may be generated to directly supply the discharge air flow to the user.

[0027] When the user desires indirect wind during the cooling operation of the air conditioner, since the front discharge part is opened, and the lower discharge part is closed, air having a relatively low temperature may be discharged to a front side of the indoor unit to prevent cold air from being directly supplied to the user.

[0028] When the user desires the indirect wind during the heating operation of the air conditioner, the front discharge part may be closed, and the lower discharge part may be opened to discharge air having a relatively high temperature to a lower side of the indoor unit, thereby preventing warmth from being directly supplied to the user.

[0029] A horizontal vane may be provided at a position adjacent to the front discharge part and the lower discharge part to easily control a flow of air discharged through the front discharge part or the lower discharge part in the horizontal direction.

[0030] Since the horizontal vane is provided on the bottom surface of the drain pan supporting the lower part of the heat exchanger, the space utilization of the indoor unit may be improved.

[0031] Since a curved surface that guides the discharge airflow to the front upper side of the indoor unit is disposed on the bottom surface of the drain pan, the discharge air may reach a position that is far away from the indoor unit.

[0032] In addition, a pan groove or pan protrusion may be disposed on the bottom surface of the drain pan to realize stable flow of the discharge air and reduce the noise.

[0033] Since the front panel is provided to be movable upwards or downwards along rails disposed on both sides, the discharge air flow may be easily controlled, and the filter assembly disposed in an upper portion of the indoor unit may be easily detached.

[0034] Since the panel driving part for the movement of the front panel is provided on each of both sides of the front panel, the front panel may move vertically in a horizontal balance state.

[0035] A rack interlocked with the panel driving part may be provided at the rear surface of the support frame so as to be interlocked with the panel driving part.

[0036] In one embodiment, an indoor unit for an air conditioner includes: a body assembly provided with a front discharge part configured to discharge air passing through a blower fan; a vertical vane configured to open and close the lower discharge part, the vertical vane being provided to be movable; and a front panel configured to open and close the front discharge part, the front panel being provided to be movable.

[0037] The front panel may be provided to be movable in a vertical direction.

[0038] The front discharge part may be disposed in a lower portion of the body assembly, and when the front panel moves upward, the front discharge part may be opened.

[0039] The indoor unit may further include a rail provided on a side surface of the body assembly to guide a vertical movement of the front panel.

[0040] The front panel may be disposed in front of the body assembly, and the indoor unit may further include a rail coupling part extending backward from both sides of the front panel and coupled to the rail.

[0041] The body assembly may include a case body having a side part on which the rail is installed; and a grill frame coupled to a front side of the case body.

[0042] A frame insertion part through which the rail coupling part passes may be provided in the grill frame.

[0043] The rail may include a fixed rail which is fixed to the case body and in which a sliding groove is defined; and a movable rail which is movably coupled to the sliding groove of the fixed rail and to which the rail coupling part is fixed.

[0044] The vertical vane may rotatably or slidably move above the lower discharge part.

[0045] The body assembly may include: a case body coupled to a chassis provided at a wall; and a grill frame provided in front of the case body, the grill frame comprising a frame front part provided with the front discharge part and a frame lower part provided with the lower discharge part.

[0046] The vertical vane may be seated on a lower portion of the frame.

[0047] The indoor unit may further include: a vertical vane motor disposed at a side of the vertical vane; and a link configured to connect the vertical vane motor to the vertical vane.

[0048] The link may include: a link body having a bar shape; a motor connection part configured to define one side of the link body, the motor connection part being connected to the vertical vane motor; and a vane connection part configured to define the other side of the link body, the vane connection part being rotatably connected

to the vertical vane.

[0049] The indoor unit may further include a hinge protrusion disposed on a side surface of the vertical vane, wherein the hinge protrusion may be coupled to the vane connection part.

[0050] The vane connection part may be coupled to a rear portion of a side surface of the vertical vane.

[0051] The vertical vane may include a front end and a rear end, and the vane connection part may be disposed to be spaced backward from a horizontal extension line (f1) with respect to the horizontal extension line (ℓ1) that equally divides a distance from the front end to the rear end.

[0052] The vertical vane may have a plate shape extending in the horizontal direction, and the vertical vane motor may be provided on each of both sides of the vertical vane.

[0053] The indoor unit may further include: a heat exchanger disposed at a suction-side of the blower fan; and a drain pan configured to support the heat exchanger, the drain pan being configured to store condensed water generated in the heat exchanger.

[0054] The indoor unit may further include: a horizontal vane disposed on a bottom surface of the drain pan, the vertical vane being configured to adjust a horizontal flow direction of air discharged from the front discharge part or the lower discharge part; and a stabilizer configured to protrude from a bottom surface of the drain pan and face an outer circumferential surface of the blower fan.

[0055] A bottom surface part of the drain pan may be provided with: a first bottom part extending to be inclined upward to a stabilizer with respect to the lowest point (P1); and a second bottom part extending to be inclined upward in an opposite direction of the stabilizer with respect to the lowest point (P1).

[0056] The bottom surface part of the drain pan may be provided with: a pan protrusion disposed on the first bottom part; and a pan groove that is recessed downstream of the pan protrusion.

[0057] In another embodiment, an air conditioner may include: a body assembly including a front discharge part and a lower discharge part; a vertical vane configured to open and close the lower discharge part; and a front panel configured to open and close the front discharge part, wherein when an indoor of the air conditioner is turned on, the front panel may ascend to open the front discharge part, and the vertical vane may move to open the lower discharge part.

[0058] When a cooling operation or an indirect wind mode is selected through an input part, the vertical vane may close the lower discharge part, and the front panel may maintain a state of opening the front discharge part.

[0059] When a heating operation or the indirect wind mode is selected through the input part, the vertical vane may maintain a state of opening the lower discharge part, and the front panel may move downward to close the front discharge part.

[0060] The details of one or more embodiments are set forth in the accompanying drawings and the description below. Other features will be apparent from the description and drawings, and from the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0061]

FIG. 1 is a view illustrating a state in which an indoor unit of an air conditioner is installed on a wall according to an embodiment.

FIG. 2 is a perspective view illustrating a configuration of the indoor unit.

FIG. 3 is a front view of the indoor unit that is in a state in which a front panel moves upward according to an embodiment.

FIG. 4 is an exploded perspective view illustrating a configuration of the indoor unit.

FIG. 5 is an exploded perspective view illustrating a configuration of a case according to an embodiment.

FIG. 6 is a perspective view illustrating a state in which a component of the indoor unit is installed in the case.

FIG. 7 is a cross-sectional view taken along line VII-VII' of FIG. 2.

FIG. 8 is an exploded perspective view illustrating a configuration of an assembly (hereinafter, referred to as a panel assembly) of a front panel and a support frame according to an embodiment.

FIG. 9 is a cross-sectional view taken along line IX-IX' of FIG. 4.

FIG. 10 is a perspective view illustrating a configuration of an assembly (hereinafter, referred to as a body assembly) of a case body and a grill frame according to an embodiment.

FIG. 11 is a front view illustrating a configuration of a front surface of the indoor unit in a state in which the panel assembly is removed according to an embodiment.

FIG. 12 is an exploded plan view illustrating a configuration of the panel assembly and the case body according to an embodiment.

FIG. 13 is a view illustrating a state in which the panel assembly is coupled to a rail.

FIG. 14 is a cross-sectional view taken along line 14-14' of FIG. 2.

FIG. 15 is an exploded perspective view of the panel assembly and the case body, which shows a panel driving part for movement of the panel assembly according to an embodiment.

FIG. 16 is an exploded perspective view of the panel assembly and the case body, which shows a configuration of a holder and a holder bracket according to an embodiment.

FIG. 17 is a view illustrating a configuration of the panel driving part and peripheral components of the panel driving part according to an embodiment.

FIG. 18 is an exploded perspective view illustrating

a configuration of the panel driving part.

FIG. 19 is a cross-sectional view illustrating a configuration of a gear assembly according to an embodiment.

FIG. 20 is a cross-sectional view illustrating a state in which the holder and the holder bracket are coupled to each other.

FIG. 21 is a cross-sectional view taken along line 21-21' of FIG. 20.

FIG. 22 is an enlarged view illustrating a portion A of FIG. 15.

FIG. 23 is a cross-sectional view taken along line 23-23' of FIG. 22.

FIG. 24 is a schematic view illustrating a state in which a vertical vane and a link are connected to each other according to an embodiment.

FIG. 25 is an enlarged view illustrating a portion "B" of FIG. 15.

FIG. 26 is a top perspective view illustrating a configuration of a drain pan according to an embodiment.

FIG. 27 is a bottom perspective view illustrating a configuration of the drain pan according to an embodiment.

FIG. 28 is a view illustrating a state in which the drain pan is installed in the indoor unit according to an embodiment.

FIG. 29 is a view illustrating a state in which a horizontal vane motor and a horizontal vane are coupled to each other according to an embodiment.

FIGS. 30A to 30C are views illustrating a configuration and operation of the indoor unit when air is discharged forward and downward from the indoor unit.

FIGS. 31A to 31C are views illustrating a configuration and operation of the indoor unit when air is discharged forward from the indoor unit.

FIGS. 32A to 32C are views illustrating a configuration and operation of the indoor unit when air is discharged downward from the indoor unit.

FIG. 33 is a view illustrating a state in which the filter assembly is withdrawn forward when the front panel moves downward.

FIG. 34 is a view illustrating a portion of constitutions of the drain pan according to another embodiment.

FIG. 35 is a perspective view illustrating a configuration of a bottom surface of the drain pan according to another embodiment.

FIGS. 36A and 36B are experimental graphs illustrating a state in which a discharge air flow ascends forward in an indoor unit according to another embodiment when compared to the related art.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0062] Hereinafter, exemplary embodiments will be described with reference to the accompanying drawings. The invention may, however, be embodied in many different forms and should not be construed as being limited to the embodiments set forth herein; rather, that alternate embodiments included in other retrogressive inventions or falling within the scope of the present disclosure will fully convey the concept of the invention to those skilled in the art.

[0063] FIG. 1 is a view illustrating a state in which an indoor unit of an air conditioner is installed on a wall according to an embodiment, FIG. 2 is a perspective view illustrating a configuration of the indoor unit, FIG. 3 is a front view of the indoor unit that is in a state in which a front panel moves upward according to an embodiment, and FIG. 4 is an exploded perspective view illustrating a configuration of the indoor unit.

[0064] Referring to FIGS. 1 to 4, an indoor unit 10 of an air conditioner according to an embodiment may be installed on a wall W.

[0065] The indoor unit 10 includes an installation plate 20 fixed to the wall W, a chassis 30 coupled to a front portion of the installation plate 20, and a case 100 coupled to a front portion of the chassis 30.

[0066] The installation plate 20 may be a component for fixing the indoor unit 10 to the wall W and be coupled to the wall W so that the chassis 30 is mounted. The installation plate 20 has a thin plate shape and includes a central portion coupled to a rear surface of the chassis 30 and both side portions extending downward from both sides of the central portion to support a lower portion of the chassis 30.

[0067] A plurality of components may be installed in the chassis 30 and the case 100. The plurality of components may include a blower fan 40 and a heat exchanger 60.

[0068] The chassis 30 includes a plate coupling part 31 coupled to the installation plate 20 and a rear guide 33 extending downward to be rounded from the plate coupling part 31 so as to surround a portion of an outer circumferential surface of the blower fan 40.

[0069] The plate coupling part 31 has a thin plate shape. The rear guide 33 functions as a flow guide for guiding a flow of air discharged from the blower fan 40 toward discharge parts 126 and 129.

[0070] The blower fan 40 includes a cross flow fan. The cross flow fan may suction air suctioned from an upper portion of the indoor unit 10 in a circumferential direction to discharge the air in the circumferential direction. An axial direction of the blower fan 40 may be a horizontal direction of the indoor unit 10.

[0071] The blower fan 40 may be rotatably supported at both sides of the chassis 30. In detail, the chassis 30 further includes two fan support parts 35 protruding forward from both sides of the rear guide 33 and supporting both ends of the blower fan 40. A fan motor 45 driving the blower fan 40 may be installed outside one of the two fan support parts 35. A shaft of the fan motor 45 may be coupled to the blower fan 40 by passing through the fan support parts 35.

[0072] A motor cover 47 may be coupled to the fan motor 45. The fan motor 45 may be disposed in an inner

space defined by the fan support part 35 and the motor cover 47.

[0073] A control box 50 in which control components for operating the indoor unit 10 may be installed at a side of the chassis 30. The control box 50 is disposed at a side of the fan motor 45 and supported by a case body 100 that will be described later.

[0074] A heat exchanger 60 may be installed in an inner space defined by the chassis 30 and the case 100. The heat exchanger 60 may be disposed at a suction-side of the blower fan 40 to support the chassis 30 with respect to the air flow.

[0075] The heat exchanger 60 may have a bent shape. In detail, the heat exchanger 60 includes a first heat exchange part 61 extending vertically in a direction corresponding to the front surface of the indoor unit 10, a second heat exchange part 63 extending to be inclined upward from the first heat exchange part 61, and a third heat exchange part 65 extending to be inclined downward from the second heat exchange part 63. The first to third heat exchange parts 61, 63, and 65 may be disposed outside the blower fan 40 and be understood as being disposed at a suction region of air suctioned into the blower fan 40.

[0076] A heat exchanger holder 67 is coupled to the heat exchanger 60. The heat exchanger holder 67 may be coupled to a side of the heat exchanger 60 and may be supported on an inner surface of the case 100.

[0077] A refrigerant tube 70 is coupled to the heat exchanger 60. The refrigerant tube 70 may introduce a refrigerant into the heat exchanger 60 or guide a flow of the refrigerant discharged from the heat exchanger 60. The refrigerant tube 70 is coupled to the side of the heat exchanger 60 so that a tube cover 75 surrounds the outside of the refrigerant tube 70.

[0078] A lower plate 55 defining an outer appearance of a lower portion of the indoor unit 10 is disposed below the chassis 30.

[0079] A case 100 is provided at the front of the chassis 30. The assembly of the chassis 30 and the case 100 is understood to constitute the "body of the indoor unit". The body of the indoor unit may have a substantially hexahedral shape.

[0080] An air passage is provided in the case 100. In detail, an air suction part 115a is provided in an upper portion of the case 100, and a filter assembly 300 is installed on the air suction part 115a. The air suction part 115a may be opened to a top surface 115 of the case body 110.

[0081] A discharge hole is defined in a lower portion of the case 100. The discharge part is provided with a lower discharge part 126 and a front discharge part 129. The lower discharge part 126 may be provided in an opened lower end of the grill frame 120, and the front discharge part 129 may be provided by opening at least a portion of a front surface of the grill frame 120. Thus, the opened directions of the lower discharge part 126 and the front discharge part 129 may be perpendicular to each other.

[0082] A drain pan 80 disposed below the heat exchanger 60 may be provided in the discharge part. The drain pan 80 may include horizontal vane 83 that controls a flow of discharged air in a left-right direction. The horizontal vane 83 may rotate in the left-right direction based on a vertical line to control the discharge air flow in the left-right direction. The horizontal vane 83 may be provided in plurality and connected to one link bar. The plurality of horizontal vanes 83 may rotate together as the link bar moves.

[0083] A vertical vane 160 controlling an air discharge direction may be provided in the lower discharge part 126. The vertical vane 160 may be rotatably or slidably provided to control the discharge air flow in the vertical direction.

[0084] A front panel 150 defining an outer appearance of the front surface of the indoor unit 10 is disposed on a front portion of the case 100. A display part 156 for confirming operation information of the indoor unit 10 may be provided on the front panel 150.

[0085] The front panel 150 may be provided to be movable upward or downward. For example, when the indoor unit 10 is turned on, the front panel 150 may move upward as an initial operation.

[0086] When the front panel 150 moves upward, a human body sensor 165 for sensing a human body of a user that is placed in an indoor space may be exposed to a right side of the lower portion of the indoor unit 10. For example, the human body sensor 165 may include a camera module provided with a lens 166. The lens 166 may form a viewing angle toward the front side. In addition, the human body sensor 165 may be supported on a top surface of a lower grill 125a of the grill body 120 and may be disposed at a side of the lower discharge part 126.

[0087] A voice recognition device 190 that is capable of recognizing user's voice may be disposed at a side of the human body sensor 165. The voice recognition device 190 may be disposed at a side of the front discharge part 129. That is, the voice recognition device 190 may be disposed between the front discharge part 129 and the human body sensor 165.

[0088] The case 100 includes a grill frame 120 defining an outer appearance of a front edge of the indoor unit 10. The grill frame 120 may include a grill part provided with a lower grill 125a and a side grill 125b. The lower discharge part 126 is provided at an approximately central portion of the lower grill 125a.

[0089] The voice recognition device 190 includes a microphone hole 195 for collecting the user's voice. The microphone hole 195 may be defined in the grill frame 120.

[0090] A horizontal vane motor 83a for driving the horizontal vane 83 is provided at a side of the front discharge part 129.

[0091] The indoor unit 10 further includes a horizontal bar 128a extending in a horizontal direction at an approx-

imately central portion of the front discharge part 129 with respect to the vertical direction. The horizontal bar 128a may function as a safety device to prevent a user's hand from being inputted.

[0092] Hereinafter, the configuration of the case 100 will be described in more detail with reference to the drawings.

[0093] FIG. 5 is an exploded perspective view illustrating a configuration of the case according to an embodiment, FIG. 6 is a perspective view illustrating a state in which a component of the indoor unit is installed in the case, and FIG. 7 is a cross-sectional view taken along line VII-VII' of FIG. 2.

[0094] Referring to FIGS. 5 to 7, the case 100 according to an embodiment includes the front panel 150.

[0095] The front panel 150 includes a thin plate-shaped panel body 151 and a display hole 152 which is opened in the panel body 151 and in which a display 156 is disposed. The panel body 151 may have, for example, a quadrilateral plate shape.

[0096] The front panel 150 may be made of a metal material. In addition, other components of the case 100 except for the front panel 150 may be made of a plastic resin. When the blower fan 40 is driven, vibration occurs. As a result, the vibration may generate noise by inducing the vibration of the indoor unit.

[0097] In this embodiment, since the front panel 150 is made of a relatively heavy metal material, there is an advantage that the vibration of the metal material is reduced even if the vibration occurs. In addition, the metal material has lower possibility of contamination than that of the plastic resin and be easily cleaned even if the contamination occurs.

[0098] The front panel 150 may be surface-processed to feel a predetermined texture, thereby realizing an elegant outer appearance.

[0099] The case 100 further includes a support frame 140 coupled to a rear portion of the front panel 150 to support the front panel 150. The support frame 140 may be in surface contact with a rear surface of the front panel 150. An assembly of the front panel 150 and the support frame 140 may be referred to as a "panel assembly".

[0100] In detail, the support frame 140 is provided with a frame body 141 having a quadrilateral plate shape and a display opening 143 defined by opening at least a portion of the frame body 141. The display opening 143 may be aligned behind the display hole 152 of the front panel 150.

[0101] The display assembly 155 is installed in the display opening 143. The display assembly 155 includes a circuit board and a display part 156. The display part 156 defines a front portion of the display assembly 155 and be exposed to the outside through the display hole 152 of the front panel 150.

[0102] The support frame 140 is provided with rail coupling parts 145 protruding backward from both sides of the frame body 141. The support frame 140 may have a "⊏" shape as a whole by the frame body 141 and both the rail coupling parts 145.

[0103] The case 100 further includes a grill frame 120 provided behind the support frame 140 and providing the discharge parts 126 and 129. A front surface of the grill frame 120 is configured to face a rear surface of the support frame 140. The grill frame 120 is made of a plastic material, for example, may be made of acrylonitrile-butadiene-styrene resin (ABS resin) having relatively high strength.

[0104] The grill frame 120 further includes a frame lower part 121a extending backward from a lower portion of the frame front part 121 and a frame side part 121b extending backward from each of both sides of the frame front part 121.

[0105] The grill part 125 having a plurality of grills is provided on each of the frame lower part 121a and the frame side part 121b. The plurality of grills may be spaced forward and backward from each other to extend in parallel to each other and may be provided to be bent so as to define a lower portion and both side portions of the grill frame 120. For example, the grill part 125 may have a "U" shape.

[0106] In detail, the grill part 125 includes a lower grill 125a constituting the frame lower part 121a. At least a portion of the lower grill 125a may be provided to be penetrated, and the penetrated portion of the lower grill 125a may define the lower discharge part 126 to guide the discharge of air.

[0107] The lower discharge part 126 may be provided at an approximately central portion of the lower grill 125a, and both sides of the lower grill 125a may be blocked. Therefore, the air may not be discharged in an area of the lower grill 125a other than an area on which the lower discharge part 126 is disposed.

[0108] In detail, the lower grill 125a is configured to extend further downward from the lower discharge part 126, and the lower discharge part 126 is not well visible to the outside. Therefore, the elegant outer appearance of the indoor unit may be realized. In addition, air discharged from the lower discharge part 126 may be guided by the lower grill 125a to increase in straightness downward.

[0109] The grill part 125 further includes side grills 125b extending upward from each of both sides of the lower grill 125a. Since the shape of the side grill 125b is the same as that of the lower grill 125a, the lower grill 125a and the side grill 125b may have a sense of unity in terms of design.

[0110] Most of the side grills 125b may be blocked so as not to communicate with the outside. However, the sensor hole may be defined in a portion at which the temperature and humidity sensor 194 is disposed to communicate with the outside.

[0111] Frame insertion parts 127a and 127b into which the rail coupling parts 145 are inserted are provided in both sides of the grill frame 120. Each of the rail coupling parts 145 passes through each of the frame insertion parts 127a and 127b to extend backward and may be

coupled to the rail 130. The rail 130 may be provided at each of both sides of the indoor unit 10.

[0112] The case body 110 is provided at the rear side of the grill frame 120. The case body 110 may have a rectangular parallelepiped shape as a whole and may be configured to open a front portion, a lower portion, and an upper portion. The grill frame 120 and the case body 110 may be coupled to each other, and an assembly of the grill frame 120 and the case body 110 may be referred to as a "body assembly".

[0113] In detail, the case body 110 includes a body front part 111, a body side part 112, a body rear part 114, and a body top part 115. A front opening 111a of which at least a portion is covered by the grill gram 120 is defined in the body front part 111.

[0114] A lower portion of the front opening 111a may be aligned with the front discharge part 129 of the grill frame 120 in the front and rear direction. Therefore, air within the indoor unit may be discharged to the outside via the lower portion of the front opening 111a and the front discharge part 129. The panel assemblies 140 and 150 may move in the vertical direction to selectively open and close the front discharge part 129.

[0115] A control box 50 may be disposed inside the body side part 112. In addition, an outer surface of the body side part 112 includes a rail seating part 113 on which the rail 30 is placed. The grill part 125 is disposed to cover the rail seating part 113, and a space part in which the rail 130 is installed is defined between the grill part 125 and the rail seating part 113.

[0116] The rail coupling part 145 may be coupled to a side surface of the rail 130. In the process of allow the panel assemblies 140 and 150 to move in the vertical direction, the rail coupling part 145 may move in the vertical direction along the rail 130.

[0117] A rear opening 114a is defined in the body rear part 114. The chassis 30 may be coupled to the rear opening 114a. That is, the body assemblies 110 and 120 and the chassis 30 may be coupled to each other to define an overall outer appearance of the indoor unit 10, and the panel assemblies 140 and 150 may constitute the front surface of the indoor unit 10.

[0118] A top opening 115a on which the filter assembly 300 is mounted is defined in the body top part 115. The top opening 115a may function as an air suction part. A filter support part 115b extending forward and backward to support the filter assembly 300 is provided in the top opening 115a. The filter support part 115b may be provided in plurality and may be arranged to be spaced apart from each other in the left and right direction.

[0119] The vertical vane 160 for controlling the discharge air flow in the vertical direction is provided in a lower portion of the case 100. A vane motor 62 for driving each of the vertical vane 160 and a vane motor cover 163 surrounding the vane motor 62 are disposed at a side of the vertical vane 160.

[0120] A panel driving part 170 providing driving force for upward and downward movement of the panel assemblies 140 and 150 is further provided in the case 100. The panel driving part 170 is disposed on the rear surface of the grill frame 120, and the gears provided in the panel driving part 170 contact the panel assemblies 140 and 150 through the grill frame 120. The panel driving part 170 may be provided at each of both sides of the case 100 to provide stable driving force to the panel assembly 170.

[0121] The case 100 further includes a temperature and humidity sensor 194 that senses a temperature and humidity of the indoor space in which the indoor unit 10 is installed. The temperature and humidity sensor 194 may include a temperature sensor and a humidity sensor and may be installed on the body side part 112 of the case body 110.

[0122] In detail, a sensor mounting part 113a on which the temperature and humidity sensor 192 is installed is provided on a lower portion of the body side part 112. The sensor mounting part 113a may be disposed below the rail seating part 113, and a partition rib 113b may protrude between the sensor mounting part 113a and the rail seating part 113. The side grill 125b of the grill part 125 may cover side surfaces of the rail seating part 113 and the sensor mounting part 113a. In the side grill 125b, a sensor hole may be defined in a point corresponding to the position of the temperature and humidity sensor 192 to communicate with the outside of the indoor unit 10.

[0123] The case 100 further includes a dust sensor 192 that senses air quality information around the indoor unit 10. The dust sensor 192 may be installed on the body side part 112 of the case body 110. In detail, a dust sensor opening 112a may be defined in the case body 110, and a dust sensor cover 192a (see FIG. 10) may be detachably provided on the dust sensor opening 112a.

[0124] The dust sensor cover 192a may be separated to clean the dust sensor 192, and the user may clean the dust sensor 192 by using a cleaning mechanism, for example, a cotton swab.

[0125] A filter cleaning device 400 for separating dust accumulated in the filter assembly 300 and a dust container 430 for storing the separated dust may be provided in the upper portion of the case 100. The dust container 430 may be disposed at a side of the filter assembly 300.

[0126] A brush 420 may be provided between the filter assembly 300 and the dust container 430. The brush 420 may be in contact with the prefilter provided in the filter assembly 300 to separate foreign matters accumulated in the prefilter.

[0127] The prefilter is rotatably provided by a filter rotation motor 350, and the foreign matters may be separated from a prefilter by the contact between the prefilter and the brush 420 during the rotation of the prefilter. The filter rotation motor 350 may be surrounded by a motor cover 355 and may be supported inside the case body 110.

[0128] The brush 420 may include a brush body 421 having a cylindrical shape and a brush bristle 425 provided on an outer circumferential surface of the brush

body 421 to contact the prefilter.

[0129] The filter cleaning device 400 may be disposed below the dust container 430 and may be disposed above the control box 50. When the filter cleaning device 400 is driven, suction force of the filter cleaning device 400 may act on the filter assembly 300 via the dust container 430, and the foreign matters separated from the filter assembly 300 may be stored in the dust container 430.

[0130] FIG. 8 is an exploded perspective view illustrating a configuration of the assembly (hereinafter, referred to as the panel assembly) of the front panel and the support frame according to an embodiment, and FIG. 9 is a cross-sectional view taken along line IX-IX' of FIG. 4.

[0131] Referring to FIGS. 8 and 9, the front panel 150 according to an embodiment may be coupled to a front side of the support frame 140. In other words, the support frame 140 may be coupled to a rear surface of the front panel 150.

[0132] The front panel 150 and the support frame 140 may be made of different materials. In detail, the front panel 150 may be made of a metal material, and the support frame 140 may be made of a plastic resin. For example, the front panel 150 may be made of aluminum.

[0133] Therefore, the front panel 150 may be configured to be heavier than the support frame 140. However, to relatively reduce a weight of the front panel 150, a recess part 151c may be defined in a rear side of the front panel 150. The recess part 151c may be understood as a result of performing a weight loss process so as to reduce the weight of the front panel 150 in a processing process of the front panel 150.

[0134] The recess part 151c may be defined in an area of 80% or more of the rear area of the front panel 150 and may have an approximately quadrilateral shape.

[0135] To support relatively heavy components, a firm coupling structure of the front panel 150 is required. In this embodiment, to prevent deformation due to the weight of the front panel 150, the front panel 150 may be coupled to the support frame 140 by using a panel bracket 153.

[0136] In detail, the panel bracket 153 is coupled to the rear surface of the panel body 151. The panel bracket 153 may be provided in plurality, which are spaced apart from an edge of the panel body 151. For example, eight panel brackets 153 may be provided.

[0137] Four panel brackets 153 are horizontally spaced apart from an upper portion of the rear surface of the panel body 151, and the remaining four panel brackets 153 are spaced apart from a rear portion of the front panel 150 in the horizontal direction.

[0138] A plurality of bracket grooves 151a are recessed in the rear surface of the panel body 151, and the panel brackets 153 are coupled to the bracket grooves 151a.

[0139] In detail, each of the panel brackets 153 includes a bracket body 153a extending in the vertical direction. A front portion of the bracket body 153a may be inserted into each of the bracket grooves 151a, and a rear surface of the bracket body 153a may be supported by the frame body 141.

[0140] An inner insertion part 153b inserted into the bracket groove 151a and hooked with the panel body 151 and a hook part 153c bent from the inner insertion part 153b to extend and supported on the rear surface of the panel body 151 are disposed on an upper portion of the bracket body 153a.

[0141] The panel body 151 includes a support protrusion 151b disposed between the inner insertion part 153a and the hook part 153b. A front portion of the support protrusion 151b supports the inner insertion part 153a, and a rear surface of the support protrusion 151b may be supported by the hook part 153.

[0142] A rear support part 153e supporting the rear surface of the panel body 151 is disposed on a lower portion of the bracket body 153a. The hook part 153c may be disposed above the bracket groove 151a, and the rear support part 153e may be disposed below the bracket groove 151a.

[0143] The frame body 141 of the support frame 140 may be in contact with the rear surface of the panel bracket 153 and may be coupled to the front panel 150 through a panel coupling member 154.

[0144] A frame coupling hole 141b through which the panel coupling member 154 passes is defined in the frame body 141. The panel coupling member 154 may be inserted into the frame coupling hole 141b and coupled to the coupling hole 153d of the panel bracket 153. The coupling hole 153d may be defined in an approximately central portion of the bracket body 153a with respect to the vertical direction and may be defined between the hook part 153c and the rear support part 153e.

[0145] For convenience of description, the coupling hole 153c may be referred to as a "first coupling hole" and the frame coupling hole 141b may be referred to as a "second coupling hole".

[0146] As described above, since the relatively heavy front panel 150 may be coupled to the support frame 140 through the panel bracket 153, the front panel may be prevented from being separated or from being deformed at the coupled portion.

[0147] A display assembly 155 may be provided on the support frame 140. The display assembly 155 may be coupled to the rear surface of the support frame 140, and a front portion of the display assembly 155 may protrude forward from the support frame 140 through the display opening 143.

[0148] That is, the display assembly 155 may be coupled to the rear surface of the support frame 140 to extend forward through the display opening 143. The display part 156 may be disposed in front of the display opening 143.

[0149] FIG. 10 is a perspective view illustrating a configuration of the assembly (hereinafter, referred to as the body assembly) of a case body and a grill frame according to an embodiment, and FIG. 11 is a front view illustrating a configuration of a front surface of the indoor unit

in a state in which the panel assembly is removed according to an embodiment.

[0150] Referring to FIGS. 10 and 11, the indoor unit 10 according to an embodiment includes the grill frame 120 including a frame front part 121. The frame front part 121 may face the rear surface of the support frame 140, and a front discharge part 129 may be disposed below the frame front part 121. The front discharge part 129 may be provided by being cut in the horizontal direction.

[0151] The frame front part 121 includes frame openings 121f and 121g defined in both sides of the frame front part 121. When viewed from the front side, the frame openings 121f and 121g may be defined to pass through right and left portions of the frame front part 121, respectively. Each of the frame openings 121f and 121g may have a substantially rectangular shape.

[0152] In detail, the frame openings 121f and 121g include a first opening 121f and a second opening 121g. The first opening 121f may be larger than the second opening 121g. This is done for allowing the display assembly 155 protruding backward from the support frame 140 to be inserted into the first opening 121f.

[0153] At least a portion of the case body 110 behind the grill frame 120 may be exposed through the first and second openings 121f and 121g. In detail, the body front part 111 and the first rail 130a, which is disposed at a side of the body front part 111, may be exposed to the front side through the first opening 121f. In addition, the second rail 130b may be exposed to the front side through the second opening 121g.

[0154] The frame insertion parts 127a and 127b into which the rail coupling parts 145 of the support frame 140 are inserted are provided in the first and second openings 121f and 121g, respectively.

[0155] In detail, the frame insertion parts 127a and 127b include a first frame insertion part 127a which defines at least a portion of the first opening 121f and into which one of the two rail coupling parts 145 is inserted. In addition, the frame insertion parts 127a and 127b include a second frame insertion part 127b which defines at least a portion of the second opening 121g and into which the other one of the two rail coupling parts 145 is inserted.

[0156] In another aspect, the first frame insertion part 127a may be understood as a space between the first rail 130a provided on the case body 110 and an end of the first opening 121f. In addition, the second frame insertion part 127b may be understood as a space between the second rail 130b provided on the case body 110 and an end of the second opening 121g.

[0157] The two rail coupling parts 145 extend backward through the first and second frame insertion parts 127a and 127b and may be coupled to the first and second rails 130a and 130b, respectively.

[0158] FIG. 12 is an exploded plan view illustrating a configuration of the panel assembly and the case body according to an embodiment, FIG. 13 is a view illustrating a state in which the panel assembly is coupled to the rail, and FIG. 14 is a cross-sectional view taken along line 14-14' of FIG. 2.

[0159] Referring to FIGS. 12 to 14, the panel assemblies 140 and 150 according to an embodiment may be provided to be movable in the vertical direction in the front of the grill frame 120.

[0160] Two rail coupling parts 145 are provided at both rear sides of the panel assemblies 140 and 150, respectively. The rail coupling part 145 may be inserted into each of the frame insertion parts 127a and 127b of the grill frame 120 so as to be coupled to the rail 130 provided in the case body 110. In this case, each of the panel assemblies 140 and 150 may have a rear surface that is disposed opposite and adjacent to the frame front part 121 of the grill frame 120.

[0161] In detail, the two rail coupling parts 145 may be coupled to the first and second rails 130a and 130b, respectively. The first rail coupling part 145 provided at the right side of each of the panel assembly 140 and 150 may be coupled to the first rail 130a, and the second rail coupling part 145 provided at the left side of each of the panel assembly 140 and 150 may be coupled to the second rail 130b.

[0162] The rail 130 includes a fixed rail 131 coupled to the body side part 112 of the case body 110 and a movable rail 132 moving upward or downward along the fixed rail 131.

[0163] A rail seating part 113 having a seating surface facing a side and a rail accommodation part 117 protruding laterally from an edge of the rail seating part 113 are disposed on the body side part 112. In another aspect, the rail accommodation part 117 may be recessed backward from a front end of the body side part 112.

[0164] The front end of the body side part 112 is coupled to the frame front part 121 of the grill frame 120, and the frame front part 121 faces the rear surfaces of the panel assemblies 140 and 150.

[0165] The fixed rail 131 has a quadrangular plate shape, and a recessed sliding groove 131a is defined in each of both sides of the fixed rail 131. The sliding groove 131a may be lengthily defined in the vertical direction.

[0166] Each of both sides of the movable rail 132 may be accommodated in the sliding groove 131a, and the movable rail 132 may move along the sliding groove 131a. Therefore, the movable rail 132 may be prevented from shaken in the front and rear direction.

[0167] The rail coupling part 145 may be coupled to a side surface of the movable rail 132 to move upward or downward. In detail, the rail coupling part 145 includes first and second coupling parts 145a and 145b arranged in the vertical direction. The second coupling part 145b is disposed above the first coupling part 145a. As the two coupling parts 145a and 145b are coupled to the movable rail 132, coupling force between the rail coupling part 145 and the rail 130 may increase.

[0168] A frame recess part 145c is defined in the front of the rail coupling part 145. The frame recess part 145c is recessed backward from the frame body 141, and the

first and second coupling parts 145a and 145b extend from a rear side of the frame recess part 145c. A stress dispersion effect caused by the coupling between the first and second coupling parts 145a and 145b and the rail 130 may occur due to the configuration of the frame recess 145.

[0169] The rail coupling part 145 is provided with a coupling pin 147 and a pin coupling part 146 into which the coupling pin 147 is inserted. The pin coupling part 146 extends backward from the frame recess part 145c, and the coupling pin 147 may be disposed at an end of the pin coupling part 146. Since the pin coupling part 146 extends backward from the frame recess part 145c, the stress dispersion effect transmitted from the coupling pin 147 may be expected.

[0170] FIG. 15 is an exploded perspective view of the panel assembly and the case body, which shows a panel driving part for movement of the panel assembly according to an embodiment, FIG. 16 is an exploded perspective view of the panel assembly and the case body, which shows a configuration of a holder and a holder bracket according to an embodiment, FIG. 17 is a view illustrating a configuration of the panel driving part and peripheral components of the panel driving part according to an embodiment, FIG. 18 is an exploded perspective view illustrating a configuration of the panel driving part, and FIG. 19 is a cross-sectional view illustrating a configuration of a gear assembly according to an embodiment.

[0171] Referring to FIGS. 15 to 19, the panel assembly 140 or 150 according to an embodiment may be provided to move in the vertical direction in the front of the grill frame 120.

[0172] The panel assemblies 140 and 150 include a front panel 150 and a support frame 140, which are coupled to the rear surface of the front panel 150. The indoor unit 10 further includes a driving mechanism for vertical movement of the front panel 150.

[0173] The drive mechanism includes a panel driving part 170 that provides driving force for the movement of the panel assemblies 140 and 150. The panel driving part 170 may be disposed on a rear surface of the grill frame 120. In detail, a motor bracket 124 is coupled to the rear surface of the grill frame 120, and the panel driving part 170 may be supported on a rear side of the motor bracket 124. The motor bracket 124 includes a bracket coupling part 124a coupled to the grill frame 120.

[0174] The panel driving parts 170a and 170b are provided in plurality, and the panel driving parts 170a and 170b include a first panel driving part 170a and a second panel driving part 170b, which are spaced apart from each other in the left and right direction.

[0175] In detail, the panel driving parts 170a and 170b include a driving motor 171 which generates driving force and has a motor shaft 171a and a gear assembly which transmits the power generated by the driving motor 171.

[0176] The gear assembly includes a first gear 171b coupled to the motor shaft 171a, a second gear 173a and a third gear 173b, which are interlocked with the first gear 171b, and a fourth gear 173c interlocked with the third gear 173b.

[0177] A first gear shaft 174a is centrally coupled to the second gear 173a and the third gear 173b. The first gear shaft 174a is rotatably supported by gear cases 172a and 172b, and the second and third gears 173a and 173b and the first gear shaft 174a may rotate together. For example, the third gear 173b is coupled to a side of the second gear 173a, and an outer diameter of the third gear 173b is larger than that of the second gear 173a and has more gear teeth.

[0178] The second gear 173a is disposed at an upper side of the first gear 171b and gear-coupled, and the second and third gears 173a and 173b are concentrically arranged.

[0179] The gear assembly further includes a fourth gear 173c that cooperates with the third gear 173b. The fourth gear 173c may be disposed below the third gear 173b and may be centrally coupled to the second gear shaft 174b. The second gear shaft 174b may be rotatably supported by the gear cases 172a and 172b.

[0180] The gear cases 172a and 172b include a case body 172a and a case cover 172b coupled to the case body 172a. The case body 172a and the case cover 172b may be coupled to each other in the left and right direction and may be coupled to each other by, for example, the case coupling member 172d. A coupling hole 172c into which the case coupling member 172d is inserted may be defined in each of the case body 172a and the case cover 172b.

[0181] When the driving motor 171 is driven, the fourth gear 173c finally rotates by the interlocking of the first to fourth gears. The fourth gear 173c may be gear-coupled to a rack 148 of the support frame 140 so as to be interlocked with each other.

[0182] The gear cases 172a and 172b include a case opening 172e that is opened so that the fourth gear 173c is exposed to the outside of the gear cases 172a and 172b. The case opening 172e may be defined in the front of the gear cases 172a and 172b and may face a rear surface of the support frame 140.

[0183] A rack 148 interlocked with the panel driving part 170 is disposed on the rear surface of the support frame 140. The rack 148 extends in the vertical direction and includes a plurality of gear teeth.

[0184] The rack 148 is provided with a plurality, the plurality of racks 148 may be spaced apart from each other in the left and right direction. In detail, the rack 148 includes a first rack 148a and a second rack 148b. The first and second racks 148b may be disposed at both rear sides of each of the panel assemblies 140 and 150, respectively.

[0185] The rack 148 may be gear-coupled with the fourth gear 173c of the panel driving part 170 so as to be interlocked with each other. In detail, the first and second racks 148a and 148c may be interlocked with the fourth gear 173c provided in the first and second panel driving parts 170a and 170b, respectively.

[0186] A holder bracket 185 into which a holder 178 coupled to the grill frame 120 is inserted is provided on the rear surface of the support frame 140. The holder bracket 185 may be disposed at each of sides of the first and second racks 148a and 148b to extend in the vertical direction.

[0187] In detail, the plurality of holder brackets 185 may be provided, and the plurality of holder brackets 185 may be spaced apart from each other in the left and right direction. In detail, the holder bracket 185 includes a first holder bracket 185a disposed at a side of the first rack 148a and a second holder bracket 185b disposed at a side of the second rack 148b.

[0188] A bracket hole 185d (see FIG. 21) into which a portion of the holder 178 is inserted may be defined in the holder bracket 185. When the panel assemblies 140 and 150 move in the vertical direction, the holder 178 may move in the vertical direction along the holder bracket 185.

[0189] A connection link 180 is mounted on the rear surface of the support frame 140. The connection link 180 may have a shape that is bent several times. The connection link 180 may have one end coupled to the rear surface of the support frame 140 and the other end coupled to the case body 110.

[0190] The connection link 180 is configured to protect a wire, for example, a power line connecting the display assembly 155 to the control box 50. In detail, an accommodation space of the wire is defined in the connection link 180, and an outer side of the wire is surrounded by the connection link 180.

[0191] When the panel assemblies 140 and 150 move in the vertical direction, a distance between the case body 110, in which the control box 50 is installed, and the display assembly 155, installed in each of the panel assemblies 140 and 150, is changed. Here, since the wire moves, there is possibility that the wire interferes with the peripheral components if the wire is not protected by the connection link 180.

[0192] Therefore, in this embodiment, the connection link 180 surrounding the wire is configured to connect the panel assemblies 140 and 150 to the case body 110, thereby preventing the interference between the wire and the peripheral components.

[0193] A gear hole 122 through which the fourth gear 173c of the panel driving part 170 passes is defined in the grill frame 120. The gear hole 122 may be defined in plurality in both sides of the grill frame 120 to correspond to the positions of the first and second panel driving parts 170a and 170b.

[0194] In addition, a holder through-hole 122a through which the holder 178 passes is defined in the grill frame 120. The holder through-hole 122a may be disposed adjacent to the side of the gear hole 122. The holder through-hole 122a may be provided in plurality corresponding to the number of holders 178 and the number of holder brackets 185.

[0195] The holder 178 is coupled to the rear surface of the grill frame 120 to extend forward through the holder through-hole 122a. In addition, the holder 178 may be movably coupled to the holder bracket 185.

[0196] FIG. 20 is a cross-sectional view illustrating a state in which the holder and the holder bracket are coupled to each other, and FIG. 21 is a cross-sectional view taken along line 21-21' of FIG. 20.

[0197] Referring to FIGS. 20 and 21, the indoor unit 10 according to an embodiment includes a holder 178 mounted on the grill frame 120 to allow the panel assemblies 140 and 150 to stably move in the vertical direction.

[0198] The holder 178 is installed on the rear surface of the grill frame 120. A seating rib 122c on which the holder 178 is seated is provided on the rear surface of the grill frame 120. The seating rib 122c may have a rectangular shape which protrudes backward from the rear surface of the frame body 141 and has an empty inside.

[0199] A holder coupling boss 122b coupled to the holder 178 is provided inside the seating rib 122c. The holder coupling boss 122b may protrude backward from the rear surface of the frame body 141, and a screw S may be coupled to the holder coupling boss 122b. The holder coupling boss 122b may be provided in plurality on both sides of the seating rib 122c.

[0200] The holder 178 includes a grill support part 179a disposed on the seating rib 122c and an insertion part 179b extending forward from the grill support part 179d and inserted into the holder bracket 185 via the holder through-hole 122a and the bracket hole 185d.

[0201] The grill support part 179a has a substantially quadrangular plate shape, and a holder coupling hole 179c may be defined in each of both sides of the grill support part 179a to which the screw S is coupled.

[0202] The holder 178 further includes a slider 179d extending from an end of the insertion part 179b in a horizontal direction to move vertically within the holder bracket 185. Since a horizontal length of the slider 179d is greater than a horizontal diameter of the bracket hole 185d, the slider 179d may be prevented from being separated from the holder bracket 185.

[0203] When the panel assemblies 140 and 150 move in the vertical direction, the holder bracket 185 may move in the vertical direction, and a protrusion rib 186c provided on the rear surface of the holder bracket 185 may be provided to contact the grill frame 120.

[0204] The slider 179d moves relatively inside the holder bracket 185. The rear surface of the slider 179d protrudes a protrusion 179e that contacts the inner surface of the holder bracket 185.

[0205] In detail, the holder bracket 185 includes a first part 186b coupled to the rear surface of the frame body 141 and a second part 186b bent backward from the first part 186b to extend. The first protrusion rib 186c may protrude backward from a rear surface of the second part 186b.

[0206] The first and second parts 186a and 186b are respectively provided at both sides of the holder bracket

185, and a bracket hole 185d is defined between the two first and second parts 186a and 186b. The holder 178 may be stably supported by the holder bracket 185 due to the above-described configuration.

[0207] FIG. 22 is an enlarged view illustrating a portion A of FIG. 15, FIG. 23 is a cross-sectional view taken along line 23-23' of FIG. 22, FIG. 24 is a schematic view illustrating a state in which a vertical vane and a link are connected to each other according to an embodiment, and FIG. 25 is an enlarged view illustrating a portion "B" of FIG. 15.

[0208] Referring to FIGS. 22 to 25, a vertical vane 160 that opens or closes the lower discharge part 126 is disposed on a lower portion of the indoor unit 10 according to an embodiment.

[0209] In detail, the vertical vane 160 may be provided on a top surface of the frame lower part 121a of the grill frame 120. The lower discharge part 126 penetrated in the vertical direction may be provided in the frame lower part 121a to discharge the air downward.

[0210] The vertical vane 160 may have a size that is sufficient to cover the entire lower discharge part 126. In detail, the vertical vane 160 may have a quadrilateral plate shape and have a left-right width greater than a front-rear width.

[0211] When the vertical vane 160 closes the lower discharge part 126, the vertical vane 160 may be disposed in a horizontal direction and thus may be perpendicular to the front panel 150 disposed in the vertical direction.

[0212] The indoor unit 10 further includes vertical vane motors 162a and 162b that provide driving force for the movement of the vertical vane 160. The vertical vane motors 162a and 162b may be supported on an upper side of the frame lower part 121a. The vane motor cover 163 is covered outside the vertical vane motors 162a and 162b.

[0213] The vertical vane motors 162a and 162b include a first vane motor 162a disposed on one side portion (e.g., a right side portion) of the vertical vane 160 and a second vane motor 162b disposed at the other side portion (e.g., a left side portion) of the vertical vane 160.

[0214] Since the vertical vane 160 are disposed to be relatively long in the left-right direction to correspond to the left-right width of the lower discharge part 126, when the vertical vane is driven by one vane motor, the vertical vane may not easily move. In particular, the movement of a portion that is away from the vane motor of the vertical vane may cause low responsibility and warpage.

[0215] Therefore, in this embodiment, the two vane motors may be provided on both sides of the vertical vane 160 to provide the driving force, thereby improving reliability in movement of the vertical vane 160. The driving of the first and second vane motors 162a and 162b may be synchronized.

[0216] The indoor unit 10 further includes links 167a and 167b that transmit the driving force of the first and second vane motors 162a and 162b to the vertical vane 160.

[0217] In detail, the links 167a and 167b include a first link 167a connecting the first vane motor 162a to the vertical vane 160 and a second link 167b connecting the second vane motor 162b to the vertical vane 160.

[0218] The first link 167a may extend from the first vane motor 162a to a right side of the vertical vane 160. That is, one side of the first link 167a may be connected to a motor shaft of the first vane motor 162a, and the other side may be coupled to a right end of the vertical vane 160.

[0219] The second link 167b may extend from the second vane motor 162b to a left side of the vertical vane 160. That is, one side of the second link 167b may be connected to a motor shaft of the second vane motor 162b, and the other side may be coupled to a left end of the vertical vane 160.

[0220] A configuration of the first link 167a and a configuration of the second link 167b are the same. Therefore, in relation to the configuration of the link, the following description will be mainly focused on the configuration of the first link 167a, and the description of the second link 167b will be derived from the first link 167a.

[0221] The first link 167a includes a bar-shaped link body 168a, a motor connection part 168b defining one side of the link body 168a and connected to the first vane motor 162a, and a vane connection part 168c defining the other side of the link body 168a and rotating with respect to the motor connection part 168b.

[0222] The link body 168a, the motor connection part 168b, and the vane connection part 168c may be integrated with each other.

[0223] The motor connection part 168b may be connected to the motor shaft of the first vane motor 162a to extend through the vane motor cover 163. The motor connection part 168b may extend laterally. Also, the vane motor cover 163 is provided with a cover through-part 163a through which the motor connection part 168b passes.

[0224] When the first vane motor 162a is driven, the motor connection part 168b may rotate in place.

[0225] The link body 168a may extend from the motor connection part 168b in the front-rear direction. When the first vane motor 162a is driven, the link body 168a may rotate with respect to the motor connection part 168b. For example, the link body 168a may rotate in the front-rear direction with respect to a central axis in the left-right direction.

[0226] The vane connection part 168c protrudes from the link body 168a in the left-right direction so as to be rotatably coupled to the vertical vane 160. The vane connection part 168c may rotate together with the link body 168a.

[0227] In detail, a hinge protrusion 161 is provided on a side surface of the vertical vane 160. The vane connection part 168c may be coupled to the hinge protrusion 161 to rotate. That is, the hinge protrusion 161 may be inserted into the vane connection part 168c to perform a

"rotation center" function of the vane connection part 168c.

[0228] On the contrary, the hinge protrusion may be provided at the vane connection part 168c, and the vertical vane 160 may be rotatably coupled to the hinge protrusion of the vane connection part 168c.

[0229] The vane connection part 168c may be coupled to a rear portion of the vertical vane 160 with respect to a center line $\ell 1$ passing through a center C in the front-rear direction of the vertical vane 160.

[0230] In detail, when defining a distance from a front end 160a of the vertical vane 160 to a rear end 160b, i.e., the front and rear width (w1 + w2) of the vertical vane 160, a distance w1 from the vane connection part 168c to the front end of the vertical vane 160 may be greater than a distance w2 from the vane connection part 168c to the rear end of the vertical vane 160.

[0231] In addition, the vane connection part 168c may be disposed to be spaced apart from the center line t1 by a predetermined distance ΔS.

[0232] Due this configuration, the vertical vane 160 may not merely perform an operation of simply rotating around the vane connection part 168c, but a rear portion of the vertical vane 160 may ascend or descend according to the movement of the vane connection part 168c.

[0233] As a result, when the vane connection part 168c rotates, the vertical vane 160 may rotate or be slid. In particular, an angle between the vane connection part 168c and the vertical vane 160 may be changed while the vane connection part 168c rotates.

[0234] FIG. 26 is a top perspective view illustrating a configuration of a drain pan according to an embodiment, FIG. 27 is a bottom perspective view illustrating a configuration of the drain pan according to an embodiment, FIG. 28 is a view illustrating a state in which the drain pan is installed in the indoor unit according to an embodiment, and FIG. 29 is a view illustrating a state in which a horizontal vane motor and a horizontal vane are coupled to each other according to an embodiment.

[0235] Referring to FIGS. 26 to 29, the indoor unit 10 according to an embodiment further includes a drain pan 80 supporting the heat exchanger 60 and storing condensed water generated in the heat exchanger 60. The drain pan 80 may be disposed below the heat exchanger 60, for example, below the first heat exchanger 61. The drain pan 80 may be disposed behind the front discharge part 129 of the grill frame 120.

[0236] In detail, the drain pan 80 includes a pan body 81 including a heat exchanger support rib 82. The pan body 81 may constitute a bottom surface of the drain pan 80, and the heat exchanger support ribs 82 may protrude upward from the pan body 81 to support the bottom surface of the heat exchanger 60. have.

[0237] The pan body 81 includes a body bottom part 81c, a body side part 81b extending upward from both sides of the body bottom part 81c, and a body front part 61c extending upward from a front portion of the body bottom part 81c.

[0238] Due to the configuration of the body bottom part 81a, the body side part 81b, and the body front portion 61c, a condensed water storage space 82a in which the condensed water generated in the heat exchanger 60 is stored may be defined in the pan body 81.

[0239] The drain pan 80 further includes a stabilizer 85 that protrudes upward from a rear portion of the pan body 81 to face an outer circumferential surface of the blower fan 40.

[0240] The stabilizer 85 may be disposed adjacent to a front lower side of the blower fan 40. In detail, the stabilizer 85 is installed to be spaced apart from the outer circumferential surface of the blower fan 40 at a discharge side of the blower fan 40 to prevent air discharged from the blower fan 40 from flowing backward to the heat exchanger 60. A relatively small space may be defined between the stabilizer 85 and the outer circumferential surface of the blower fan 40. The stabilizer 85 may lengthily extend in the axial direction of the blower fan 40.

[0241] The drain pan 80 is provided with the horizontal vane 83 that controls the flow of the discharge air in the left-right direction. The horizontal vane 83 are provided on the body bottom part 81a. Also, the horizontal vane 83 may be provided in plurality and may be arranged to be spaced apart from each other in the left-right direction. The plurality of horizontal vanes 83 may be disposed above the vertical vane 160.

[0242] The horizontal vane motor 85 for providing driving force to the horizontal vane 83 is disposed at a side of the horizontal vane 83.

[0243] The drain pan 80 further includes a link bar 84 connected to the plurality of horizontal vanes 83. The link bar 84 extends in the left-right direction and may be coupled to rear portions of the plurality of horizontal vanes 83.

[0244] A first vane pin 86a is coupled to the rear portion of the horizontal vane 83. The first vane pin 86a may be coupled to the horizontal vane 83 through the link bar 84. The first vane pin 86a may be provided in plurality, and each of the first vane pins 86a may be coupled to each of the horizontal vanes 83.

[0245] A second vane pin 86b is coupled to a front portion of the horizontal vane 83. The second vane pin 86b may be coupled to a body bottom part 81a of the pan body 81 by passing through the horizontal vane 83. The second vane pin 86b may be provided in plurality, and each of the second vane pins 86b may be coupled to each of the horizontal vanes 83.

[0246] The first vane pin 86a is disposed behind the second vane pin 86b. The rear portion of the horizontal vane 83, to which the first vane pin 86a is coupled, may rotate with respect to the front portion to which the second vane pin 86b is coupled.

[0247] That is, the rear portions of the plurality of horizontal vanes 83 are connected to the link bar 84 by the first vane pin 86a, and the plurality of horizontal vanes 83 may rotate in the left-right direction with respect to the second van pins 86b according to movement of the link bar 84.

[0248] The drain pan 80 further includes a vane link 87 connecting the horizontal vane motor 85 to the link bar 84. The vane link 87 is coupled to the motor shaft of the horizontal vane motor 85 to extend laterally so as to be coupled to the link bar 84.

[0249] A link hole 87a penetrated in the left-right direction may be defined in the vane link 87. Also, a guide pin 88 may be inserted into the link hole 87a. The guide pin 88 may pass through the link hole 87a and be coupled to the body bottom part 81a of the pan body 81.

[0250] When the horizontal vane motor 85 is driven, the vane link 87 may move in the left-right direction. In this process, the guide pin 88 may guide the vane link 87 so that the vane link 87 linearly moves in the let-right direction without being shaken in other directions.

[0251] FIGS. 30A to 30C are views illustrating a configuration and operation of the indoor unit when air is discharged forward and downward from the indoor unit.

[0252] Referring to FIGS. 30A to 30C, in the indoor unit 10 according to an embodiment, a "simultaneous mode" for discharging air through the lower discharge part 126 and the front discharge part 129 may operate. For example, in the cooling operation and the heating operation of the air conditioner, the operation in the simultaneous mode is possible.

[0253] The indoor unit 10 or a separate remote controller may be provided with an input part. The input part may include a "cooling and heating selection part" for selecting a cooling operation or a heating operation.

[0254] The input part may further include a "simultaneous mode selection part" that is capable of commanding an operation of the "simultaneous mode". The user may input the cooling or heating operation through the air conditioning selection part to select the cooling or heating operation, and then input the simultaneous mode operation through the simultaneous mode selection part to perform the simultaneous mode operation.

[0255] As another example, when the user selects the heating/cooling selection part, the simultaneous mode operation may be set as a basic operation mode without the input of the simultaneous mode selection part.

[0256] In detail, when the blower fan 40 is driven, the air suctioned from the upper portion of the indoor unit 10 is purified while passing through the filter assembly 300 and then flows to the lower portion of the indoor unit 10 while passing through the blower fan 40. Here, the front panel 150 moves upward to be disposed at an upper position.

[0257] The front panel 150 may be located at a position higher than the front discharge part 129 at the upper position. That is, a lower end of the front panel 150 may be located at a position higher by a predetermined height Δh than an upper end of the front discharge part 129. In this case, the flow of air discharged from the front discharge part 129 may be prevented from contacting the front panel 150 of the metal material. Thus, the air may be prevented from being condensed on the front panel 150 to generate condensed water.

[0258] When the vertical vane motors 162a and 162b are driven, the vertical vane 160 may move by an action of the links 167a and 167b.

[0259] In detail, the vertical vane 160 is disposed to be inclined upward at a predetermined angle with respect to the top surface of the lower grill 125a of the grill frame 120. Here, the first set angle $\theta 1$ is set in a range of about 10° to about 30°. Also, a rear end 160b of the vertical vane 160 is located at a position higher than a front end 160a of the vertical vane 160, and thus, the rear end of the vertical vane 160 is lifted upward.

[0260] Also, the vane connection part 168c is located at a position higher than the motor connection part 168b and also is disposed behind the motor connection part 168b. The link body 168a may be disposed to be substantially parallel to the vertical vane 160.

[0261] Air passing through the blower fan 40 may be guided by the vertical vane 160 and discharged forward through the opened lower and front discharge parts 126 and 129.

[0262] FIGS. 31A to 31C are views illustrating a configuration and operation of the indoor unit when air is discharged forward from the indoor unit.

[0263] Referring to FIGS. 31A to 31C, in the indoor unit 10 according to an embodiment, air may be discharged through only the front discharge part 129. For example, an indirect wind mode may operate to perform downward discharge so that the cold air is not directly supplied to the user during the cooling operation of the air conditioner.

[0264] The input part may include an "indirect wind mode selection part" for selecting an indirect wind mode. A user may input the cooling operation through the cooling/heating selection part to select the cooling operation and then input the indirect wind mode through the indirect wind mode selection part to perform the indirect wind mode during the cooling operation.

[0265] In detail, when the blower fan 40 is driven, the air suctioned from the upper portion of the indoor unit 10 is purified while passing through the filter assembly 300 and then flows to the lower portion of the indoor unit 10 while passing through the blower fan 40.

[0266] Here, the front panel 150 moves upward in the same position as in the simultaneous mode operation.

[0267] Also, the vertical vane 160 is in parallel with the top surface of the lower grill 125a of the grill frame 120. That is, the vertical vane 160 has a state of laying so that a front end and a rear end thereof have the same height, and the vertical vane 160 closes the lower discharge part 126.

[0268] Also, the vane connection part 168c is located at a position lower than the motor connection part 168b and also is disposed in front of the motor connection part 168b.

[0269] A process of switching the position of the link 167b disposed in FIG. 30C to the position of the link 167b disposed in FIG. 31C will be described. At the position of FIG. 30C, the vane connection part 168c rotates in a

counterclockwise direction with respect to the motor connection part 168b, and thus, the rear end 160b of the vertical vane 160 is lifted upward.

[0270] Also, when the vane connection part 168c further moves forward than the motor connection part 168b, the front end of the vertical vane 160 moves forward, and thus, the inclined angle of the vertical vane 160 with respect to the lower grill 125a is reduced. As a result, the vertical vane 160 may be disposed as illustrated in FIG. 31C.

[0271] Air passing through the blower fan 40 may be guided by the vertical vane 160 and discharged forward through the opened front discharge part 129. Here, since the lower discharge part 126 is covered by the vertical vane 160, the downward flow of the discharge air is limited.

[0272] FIGS. 32A and 32B are views illustrating a configuration and operation of the indoor unit when air is discharged downward from the indoor unit.

[0273] Referring to FIGS. 32A to 32C, in the indoor unit 10 according to an embodiment, air may be discharged through only the lower discharge part 126. For example, an indirect wind mode may operate to perform downward discharge so that the hot air is not directly supplied to the user during the heating operation of the air conditioner.

[0274] The user may input the heating operation through the cooling/heating selection part to select the heating operation and then input the indirect wind mode through the indirect wind mode selection part to perform the indirect wind mode during the cooling operation.

[0275] That is, even if one indirect wind mode selection part is input, an operation state of the indoor unit may vary depending on whether the indoor unit operates in the cooling operation or the heating operation. As described with reference to FIGS. 31A to 31C, when the indirect wind mode selection part is input after the cooling operation is selected, only the front discharge unit 129 may be opened to perform the front discharge of the discharge air. On the other hand, as illustrated in FIGS. 32A to 32C, when the indirect wind mode selection part is input after the heating operation is selected, only the lower discharge unit 129 may be opened to discharge the discharge air forward.

[0276] Referring again to FIG. 32B, when the blower fan 40 is driven, the air suctioned from the upper portion of the indoor unit 10 is purified while passing through the filter assembly 300 and then flows to the lower portion of the indoor unit 10 while passing through the blower fan 40.

[0277] Here, the front panel 150 does not move upward or downward, but is disposed at a central position. Here, the "central position" is understood as a position at which the front panel 150 covers the front discharge part 129 of the grill frame 120 and does not further descend than the lower end of the grill frame 120.

[0278] The vertical vane 160 is disposed to be inclined upward at a second set angle $\theta 2$ with respect to the top surface of the lower grill 125a of the grill frame 120. Here, the second set angle $\theta 2$ is set in a range of about 30° to about 60°.

[0279] In detail, the rear end 160b of the vertical vane 160 is located at a position higher than a front end 160a of the vertical vane 160, and thus, the rear end 160b of the vertical vane 160 is lifted upward. Also, the vane connection part 168c is located at a position higher than the motor connection part 168b and is located in front of the motor connection part 168b.

[0280] A process of switching the position of the link 167b disposed in FIG. 31C to the position of the link 167b disposed in FIG. 32C will be described. At the position of FIG. 30C, the vane connection part 168c rotates in a clockwise direction with respect to the motor connection part 168b, and thus, the rear end 160b of the vertical vane 160 is lifted upward. As a result, the vertical vane 160 may be arranged as illustrated in FIG. 32C.

[0281] Air passing through the blower fan 40 may be guided by the vertical vane 160 and discharged downward through the opened lower discharge part 126. Here, since the front discharge part 129 is covered by the panel assemblies 140 and 150, the discharge air flow forward is limited.

[0282] As described above, when the indoor unit 10 is driven, the front panel 150 may be disposed at a "first position (central position)" or "second position (upper position)" and may perform the indirect wind mode or simultaneous mode according to the position of the vertical vane 160.

[0283] FIG. 33 is a view illustrating a state in which the filter assembly is withdrawn forward when the front panel moves downward.

[0284] Referring to FIG. 33, the filter assembly 300 according to an embodiment may be detachably provided to the indoor unit 10. The front panel 150 may move downward to separate the filter assembly 300.

[0285] When the front panel 150 is disposed at the "central position", since the front part of the filter assembly 300 interferes with the panel assemblies 140 and 150, the filter assembly 300 is limited to the forward separation. That is, the front portion of the filter assembly 300 may face the rear portions of the panel assemblies 140 and 150 and may be covered by the rear portions of the panel assemblies 140 and 150.

[0286] However, when the front panel 150 is disposed at the third position (lower position), the front of the filter assembly 300 may be opened. Therefore, the filter assembly 300 may move forward and be in a state that is detachable from the indoor unit 10.

[0287] To allow the filter assembly 300 to move forward, the filter driving part (motor and gear) may be provided at the rear side of the filter assembly 300. As described above, the front panel 150 may move downward so that the filter assembly 300 is easily separated forward.

[0288] Hereinafter, descriptions will be made according to the second embodiment of the present invention. Since this embodiment is the same as the foregoing em-

bodiment except for a configuration of a drain pan, different points between the embodiments will be described principally, and description of the same parts will be denoted by the same reference numerals and descriptions of the foregoing embodiment.

[0289] FIG. 34 is a view illustrating a portion of constitutions of the drain pan according to another embodiment, FIG. 35 is a perspective view illustrating a configuration of a bottom surface of the drain pan according to another embodiment, and FIGS. 36A and 36B are experimental graphs illustrating a state in which a discharge air flow ascends forward in an indoor unit according to another embodiment when compared to the related art.

[0290] Referring to FIGS. 34 and 35, an indoor unit 10 according to this embodiment includes a drain pan 80a that supporting the heat exchanger 60 and storing condensed water generated in a heat exchanger 60.

[0291] The drain pan 80a includes a pan body 81 including a body bottom part 81a, a body side part 81b, and a body front part 61c. A condensed water storage space 82a is defined in the pan body 81, and a stabilizer 85 protruding upward is further provided in a rear portion of the pan body 81. The description with respect to the above-described constituents will be derived from those according to the foregoing embodiment.

[0292] Air discharged from a blower fan 40 is guided toward a front discharge part 129 via the body bottom part 81a of the pan body 81. To allow the air discharged through the front discharge part 129 to reach a relatively far place, it may be advantageous that a discharge direction of the air flow is directed toward a front upper side of the front discharge part 129.

[0293] For this, this embodiment is characterized in that a configuration of a bottom surface of the pan body 81 is improved.

[0294] The body bottom part 81a of the pan body 81 may extend forward and rearward to be inclined upward with respect to the lowest point P1. In detail, the body bottom part 81a includes a first bottom part 81d extending to the stabilizer 85 with respect to the lowest point P1 and a second bottom part 81e extending in an opposite direction of the stabilizer 85 with respect to the lowest point P2, i.e., extending to the body front part 81c.

[0295] The upward angle defined by the first bottom part 81d with respect to a horizontal extension line $\ell 2$ is defined as a first upward angle $\theta 3$, and the upward angle defined by the second bottom part 81e is defined as a second upward angle $\theta 4$. For example, the first upward angle $\theta 3$ or the second upward angle $\theta 4$ may be defined in a range of about 5° to about 25°. Due to this configuration, the body bottom part 81a may provide a gentle inclination forward and backward with respect to the lowest point P1.

[0296] A surface connecting the first bottom part 81d, the lowest point P1, and the second bottom part 81e may have an inclined straight surface or may have a curved surface having a gentle curvature.

[0297] Air discharged from the blower fan 40 which rotates in a clockwise direction with reference to FIG. 31B may be prevented from flowing into a suction side of the blower fan 40 by the stabilizer 85, and most of the air may flow toward a bottom side of the pan body 81.

[0298] The flow of the discharge air, which is directed toward the bottom side of the pan body 81, flows adjacent to the first and second bottom parts 81d and 81e by the Coanda effect. In detail, the discharge air is discharged to the front discharge part 129 via the first bottom part 81d, the lowest point P1, and the second bottom part 81e.

[0299] In particular, the air may flow upward from the lowest point P1 while passing through the second bottom part 81e. In detail, referring to FIG. 36A, in the case of an indoor unit having a typical general drain pan structure, the air discharged from the front discharge part flows toward a front lower side.

[0300] On the other hand, referring to FIG. 36B, in the case of the drain pan 80a according to this embodiment, the air discharged from the front discharge part 129 by the configuration of the bottom surface of the drain pan 80a, which has the inclined straight surface or the curved surface, may flow to the front upper side. Thus, there is an advantage that the air flow reaches a relatively far away from the indoor unit 10.

[0301] The drain pan 80a further includes a guide structure that suppresses an occurrence of turbulence to stabilize the air flow and reduce noise.

[0302] In detail, referring to FIG. 35, a pan protrusion 89a and a pan groove 89b are provided on/in the bottom surface of the drain pan 80a. The pan protrusion 89a may be disposed at a rear end of the first bottom part 81d, i.e., at a portion connected to the stabilizer 85.

[0303] The pan protrusion 89a may be provided in plurality in an axial direction of the blower fan 40. A low pressure is generated at the rear end of the first bottom part 81d by the plurality of pan protrusions 86. Thus, the air may flow to the bottom surface of the first bottom part 81d, but a phenomenon in which the air is introduced between the stabilizer 85 and the blower fan 40 may be prevented.

[0304] The pan groove 89b may be disposed at a downstream side of the pan protrusion 89a with respect to the air flow direction and may have a shape in which a portion of the bottom surface of the first bottom part 81d is recessed. The direction in which the pan groove is recessed may be a front-rear direction of the first bottom part 81d. The pan groove 89b may be provided in plurality, and the plurality of pan grooves 89b may be spaced apart from each other in the axial direction.

[0305] Due to the Coanda effect, the air may flow adjacent to the bottom surface of the pan body 81 but may be reduced in flow rate. Therefore, in this embodiment, the plurality of pan protrusions 89a and the pan grooves 89b may be provided to generate a low pressure condition on the bottom surface side of the pan body 81 to prevent the air from being reduced in flow rate. The air may be guided along the pan protrusion 89a and the pan groove 89b to prevent the turbulence from occurring,

thereby reducing noise.

[0306] According to the embodiment, the front discharge part and the lower discharge part may be provided to selectively open and close the front discharge part or the lower discharge part, thereby easily controlling the flow direction of the discharged air.

[0307] Also, the front discharge part may be opened by allowing the front panel to move, and the lower discharge part may be opened by allowing the vertical vane to move.

[0308] Particularly, the vertical vane may slidably or rotatably move above the lower discharge part to adjust the opening area of the lower discharge part.

[0309] Also, the front panel and the vertical vane may be interlocked with each other according to the cooling operation or heating operation of the air conditioner, thereby operating in the mode that is suitable for the user's preference.

[0310] Also, the rail may be coupled to both the sides of the front panel to facilitate the ascending or descending of the front panel.

[0311] Also, the horizontal vane may be installed on the discharge part to easily control the flow of the air discharged through the front discharge part and the lower discharge part in the horizontal direction.

[0312] The horizontal vane may be integrated with the lower portion of the drain pan to improve the space utilization within the indoor unit.

[0313] The curvature of the bottom surface of the drain pan may be improved to guide the flow of the air discharged through the front discharge part to the front upper side so that the air flows to a relatively far distance from the indoor unit.

[0314] The groove or protrusion structure may be applied to the bottom surface of the drain pan to guide the stable discharge of the air and reduce the noise.

[0315] Although embodiments have been described with reference to a number of illustrative embodiments thereof, it should be understood that numerous other modifications and embodiments can be devised by those skilled in the art that will fall within the scope of the principles of this disclosure. More particularly, various variations and modifications are possible in the component parts and/or arrangements of the subject combination arrangement within the scope of the disclosure, the drawings and the appended claims. In addition to variations and modifications in the component parts and/or arrangements, alternative uses will also be apparent to those skilled in the art.

Claims

1. An indoor unit (10) for an air conditioner, comprising:

a blower fan (40);
a body assembly (110, 120) provided with a front discharge part (129) configured to discharge air passing through the blower fan (40); and
a front panel (150) configured to cover a front portion of the body assembly (110, 120), the front panel (150) being made of a metal material,
wherein an entire portion of the front panel (150) is provided to be movable upward or downward, and
wherein when the front panel (150) moves upward, the front discharge part (129) is switched from a closed state to an opened state to discharge air.

2. The indoor unit (10) according to claim 1, wherein the front discharge part (129) is disposed in a lower portion of the body assembly (110, 120),
wherein when the front panel (150) moves upward, an upper end of the front panel (150) is located at a position that is higher than the body assembly (110, 120), and the front discharge part (129) is opened.

3. The indoor unit (10) according to claim 1 or 2, further comprising a rail (130) disposed on a side surface of the body assembly (110, 120) to guide a vertical movement of the front panel (150).

4. The indoor unit (10) according to claim 3, wherein the front panel (150) is disposed in front of the body assembly (110, 120),
wherein the indoor unit (10) further comprises a rail coupling part (145) extending backward from both sides of the front panel (150) and coupled to the rail (130).

5. The indoor unit (10) according to claim 4, wherein the body assembly (110, 120) comprises:

a case body (110) having a side surface on which the rail (130) is installed; and
a grill frame (120) coupled to a front side of the case body (110),

wherein a frame insertion part (127a, 127b) through which the rail coupling part (145) passes is defined in the grill frame (120).

6. The indoor unit (10) according to claim 5, wherein the rail (130) comprises:

a fixed rail (131) which is fixed to the case body (110) and in which a sliding groove (131a) is defined; and
a movable rail (132) which is movably coupled to the sliding groove (131a) of the fixed rail (131) and to which the rail coupling part (145) is fixed.

7. The indoor unit (10) according to any one of claims 1 to 6, wherein a lower discharge part (126) is provided in the body assembly (110, 120), and

the indoor unit (10) further comprises a vertical vane (160) configured to open and close the lower discharge part (126) and provided to be movable.

8. The indoor unit (10) according to claim 7, wherein the vertical vane (160) rotatably or slidably moves above the lower discharge part (126).

9. The indoor unit (10) according to any one of claims 5 to 8, wherein:

the case body (110) is coupled to a chassis (30) provided at a wall (W); and
the grill frame (120) is provided in front of the case body (110) and comprises a frame front part (121) provided with the front discharge part (129) and a frame lower part (121a) provided with the lower discharge part (126).

10. The indoor unit (10) according to any one of claim 1 to 9, further comprising:

a vertical vane motor (162a, 162b) disposed at one side of the vertical vane (160); and
a link (167a, 167b) configured to connect the vertical vane motor (162a, 162b) to the vertical vane (160).

11. The indoor unit (10) according to claim 10, wherein the link (167a, 167b) comprises:

a link body (168a) having a bar shape;
a motor connection part (168b) configured to define one side of the link body (168a), the motor connection part (168b) being connected to the vertical vane motor (162a, 162b); and
a vane connection part (168c) configured to define the other side of the link body (168a), the vane connection part (168c) being rotatably connected to the vertical vane (160).

12. The indoor unit (10) according to claim 11, further comprising a hinge protrusion (161) disposed on a side surface of the vertical vane (160),
wherein the hinge protrusion (161) is coupled to the vane connection part (168c).

13. The indoor unit (10) according to claim 11 or 12, wherein the vertical vane (160) comprises a front end (160a) and a rear end (160b), and
the vane connection part (168c) is disposed to be spaced backward from a horizontal extension line ($\ell 1$) with respect to the horizontal extension line ($\ell 1$) that equally divides a distance from the front end (160a) to the rear end (160b).

14. The indoor unit (10) according to any one of claim 1 to 13, further comprising:

a heat exchanger (60) disposed at a suction-side of the blower fan (40); and
a drain pan (80) configured to support the heat exchanger (60), the drain pan (80) being configured to store condensed water generated in the heat exchanger (60).

15. The indoor unit (10) according to claim 14, further comprising:

a horizontal vane (83) disposed on a bottom surface of the drain pan (80), the vertical vane (160) being configured to adjust a horizontal flow direction of air discharged from the front discharge part (129) or the lower discharge part (126); and
a stabilizer (85) configured to protrude from a bottom surface of the drain pan (80) and face an outer circumferential surface of the blower fan (40).

Fig. 1

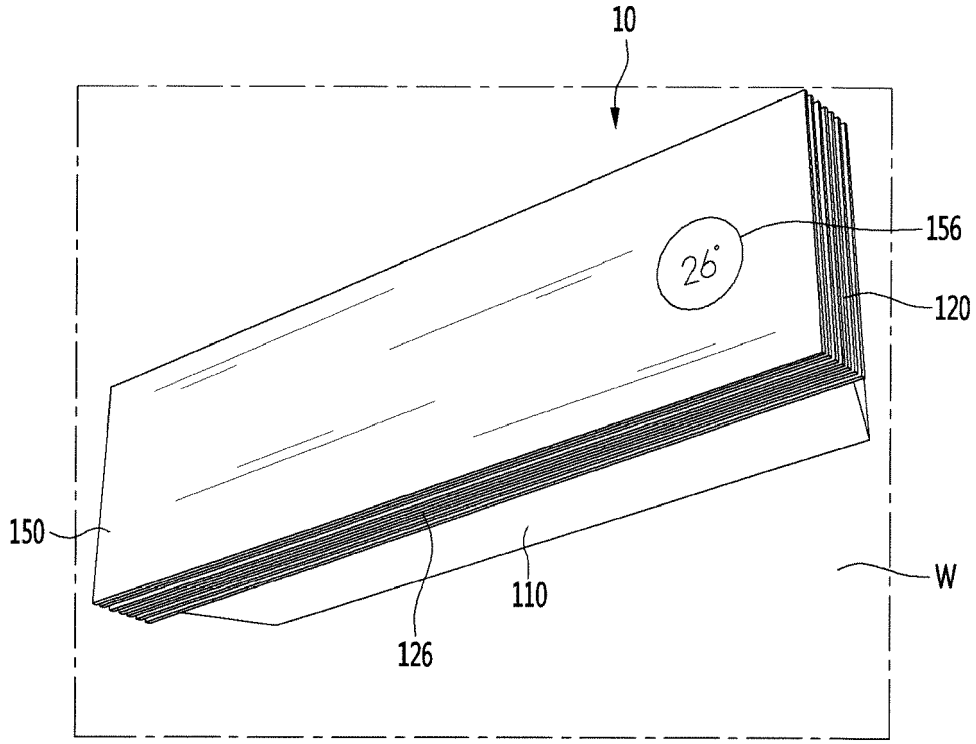

Fig. 2

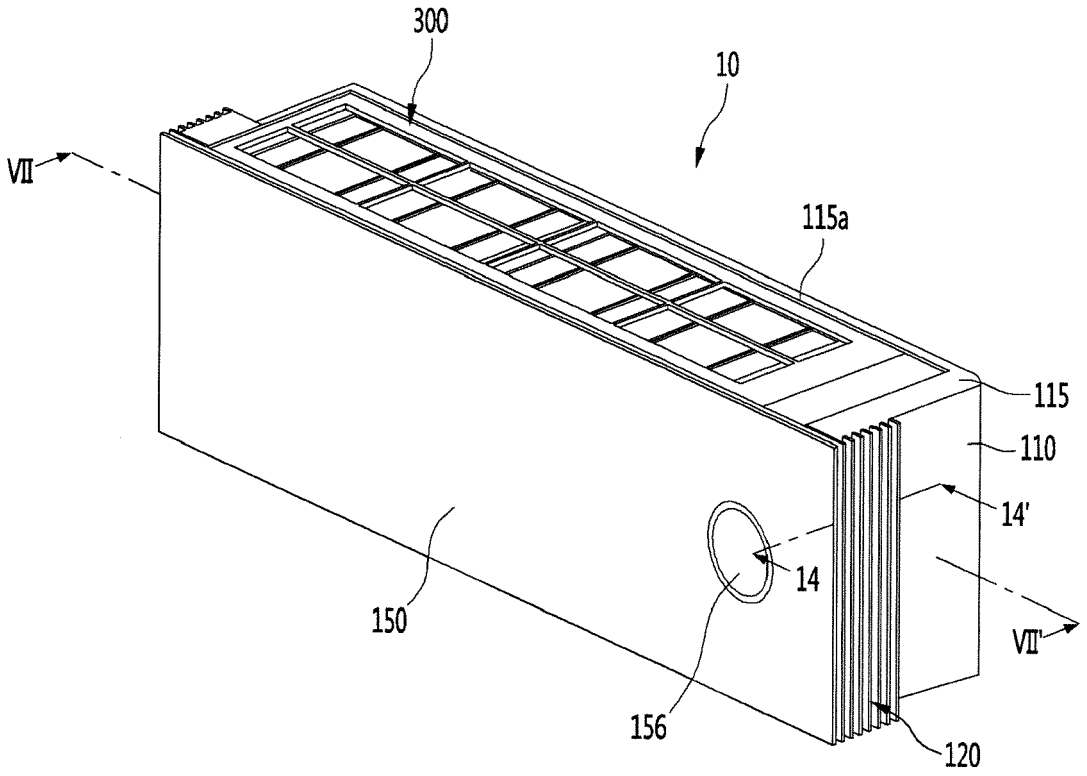

Fig. 3

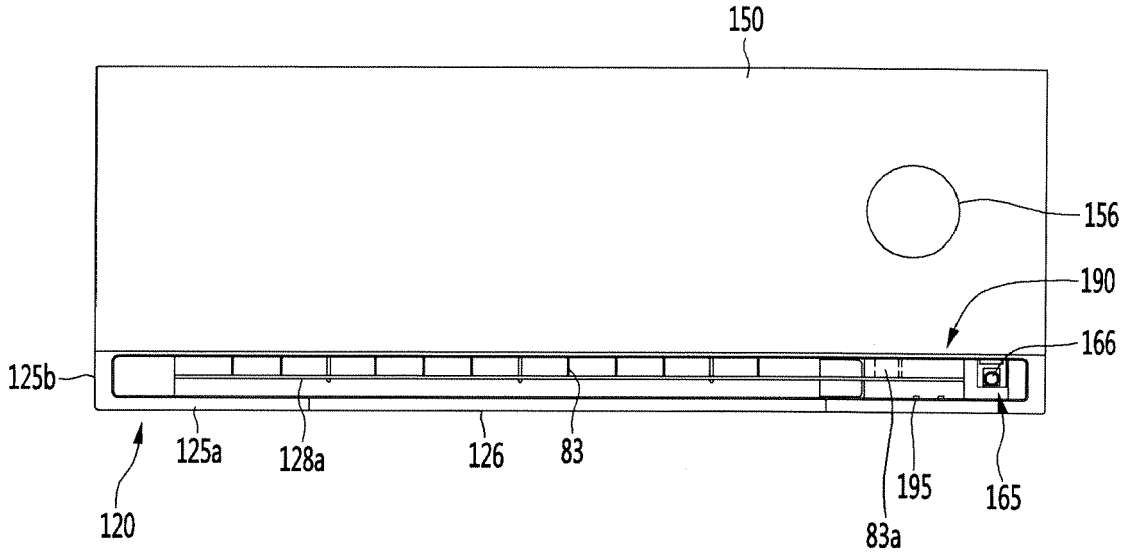

Fig. 4

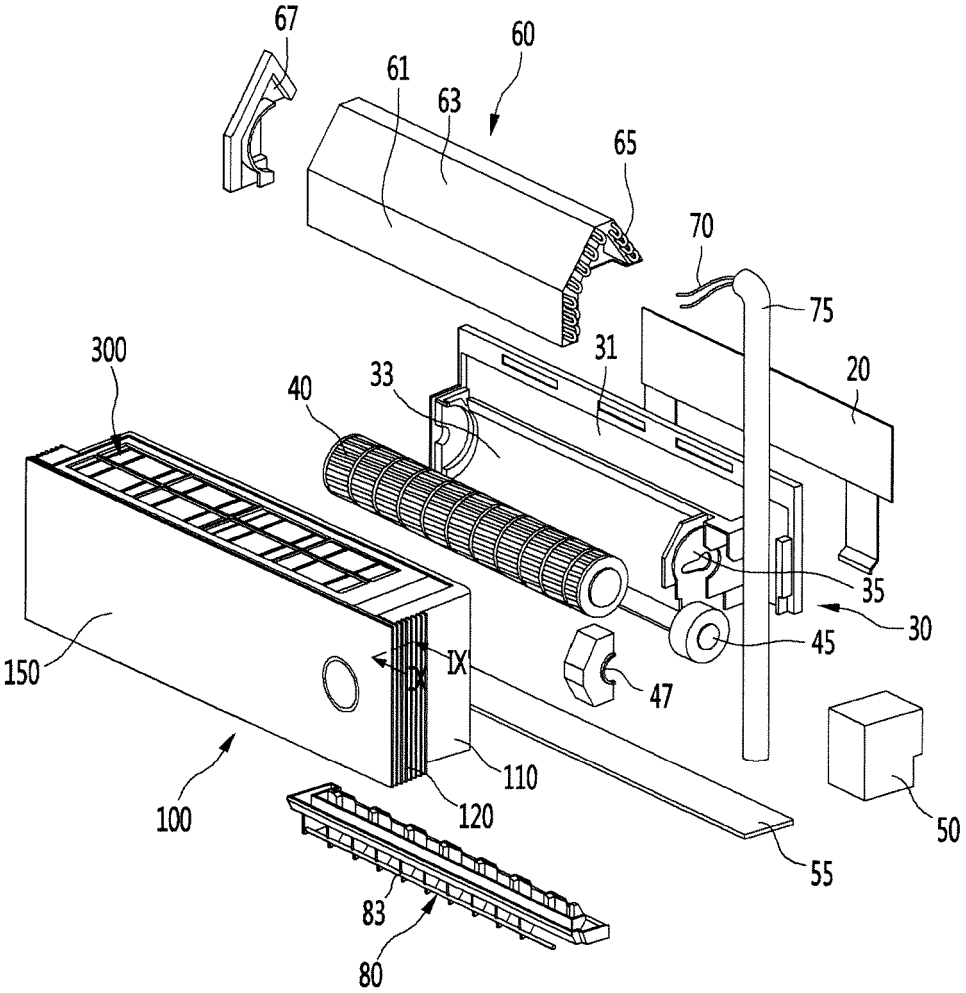
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Fig. 5

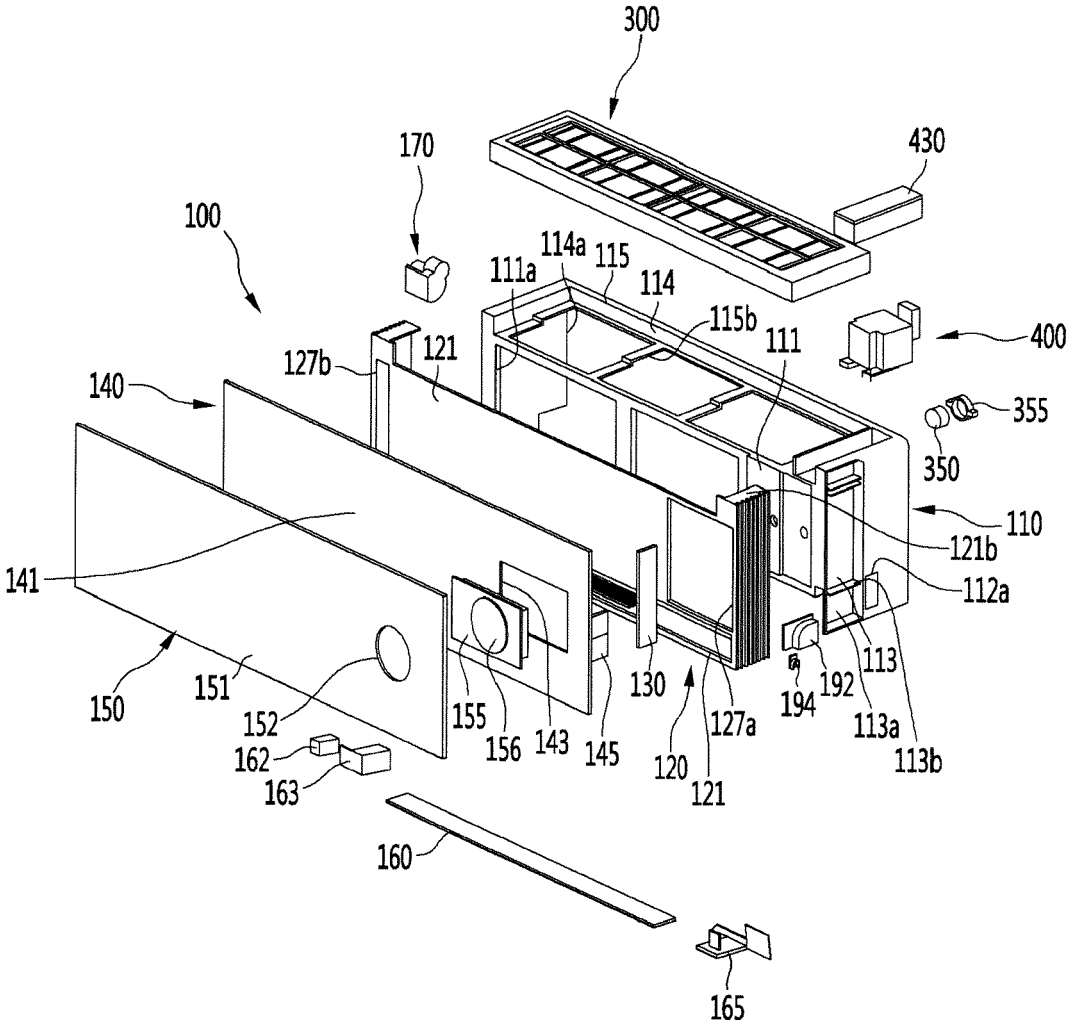
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Fig. 6

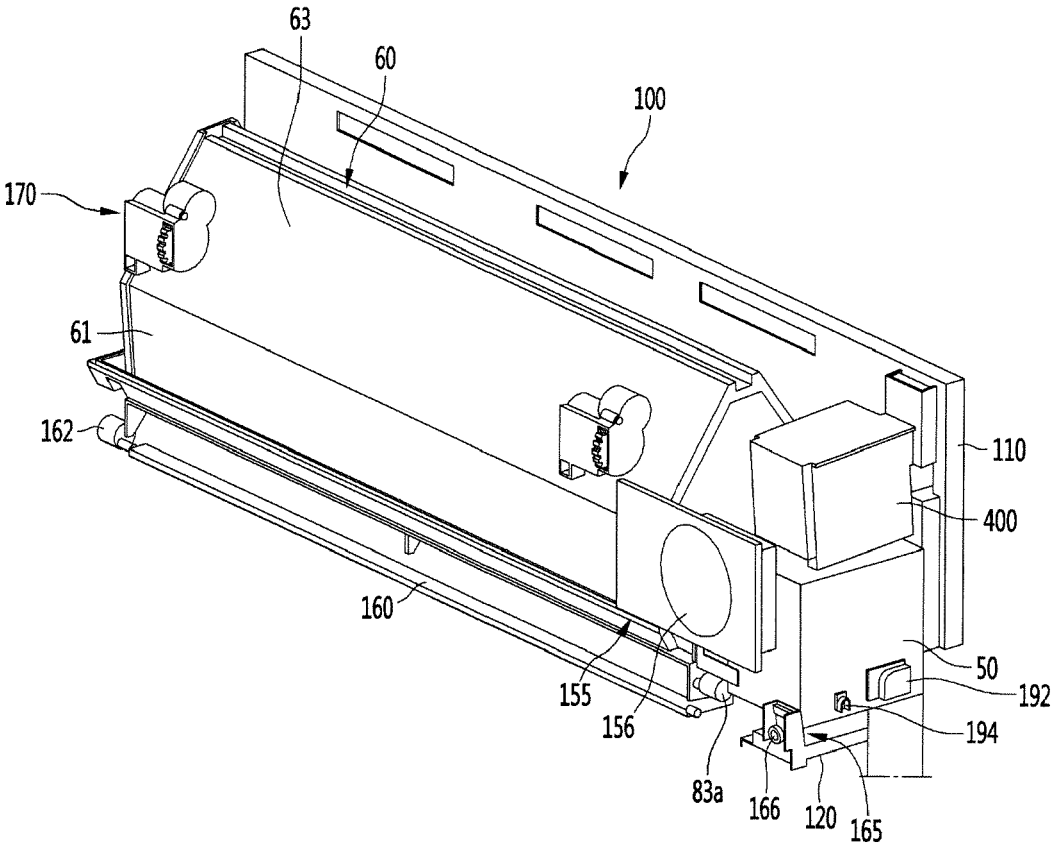
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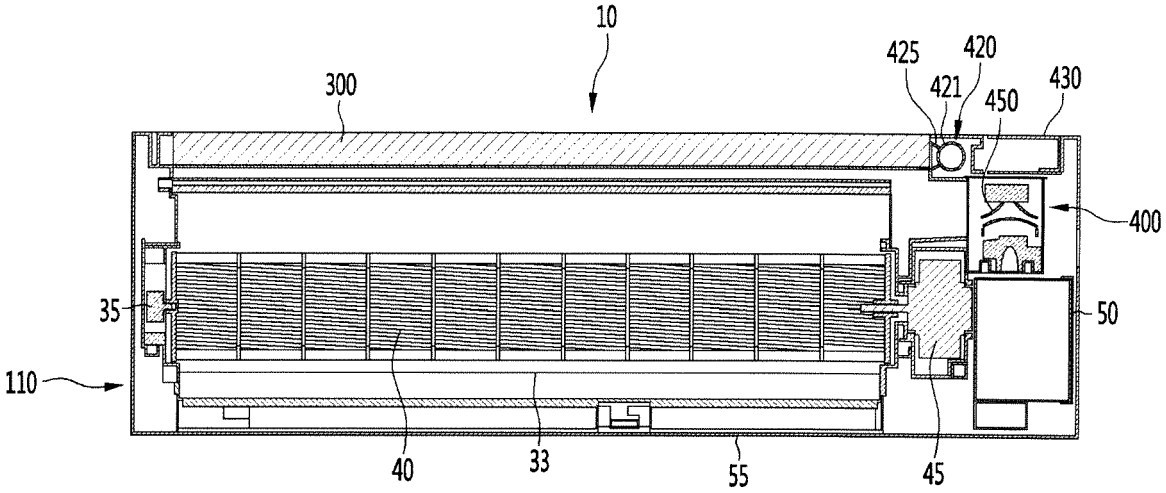
Fig. 7



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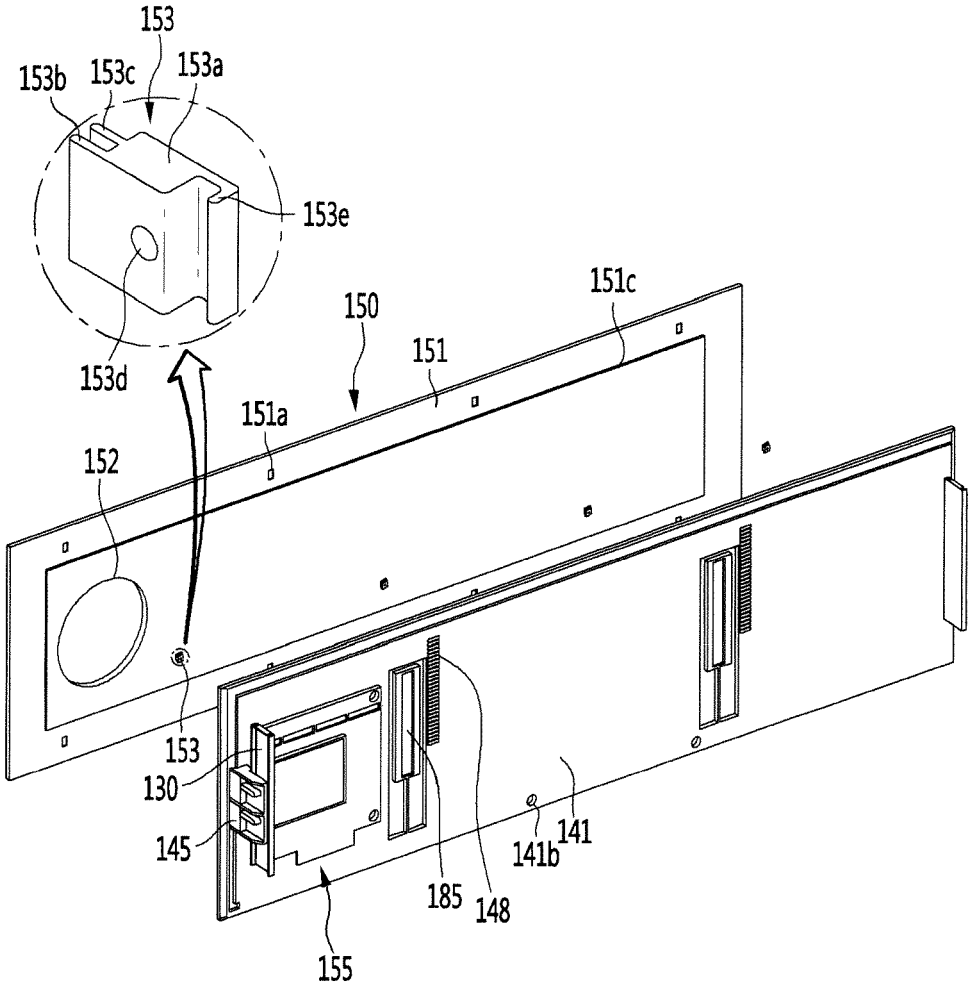
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151c
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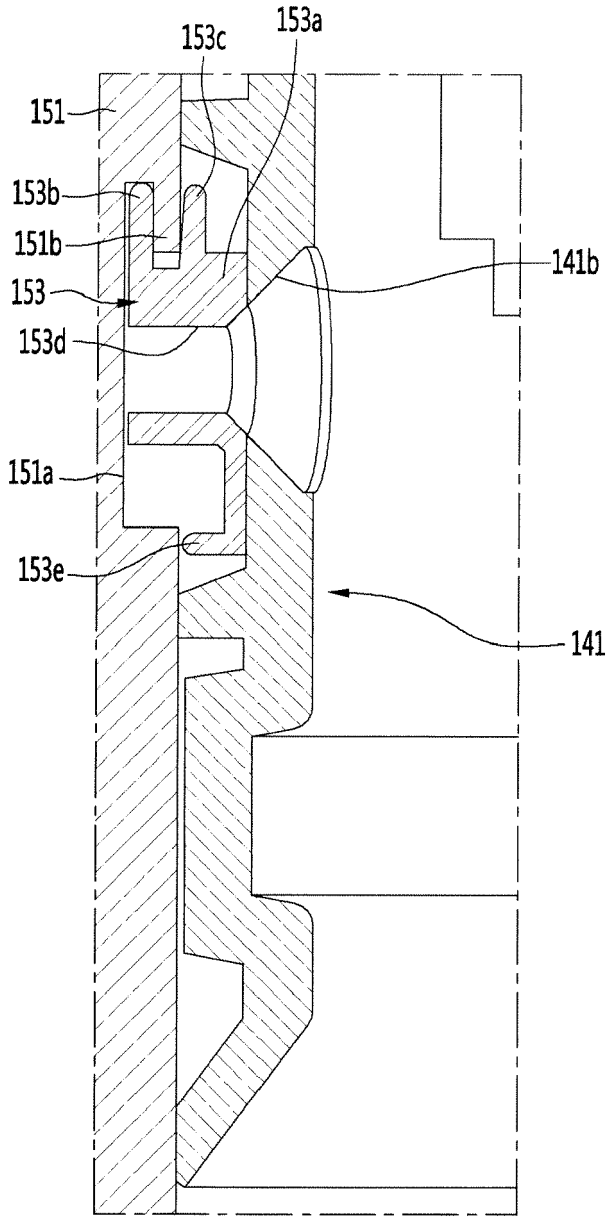
141

Fig. 9



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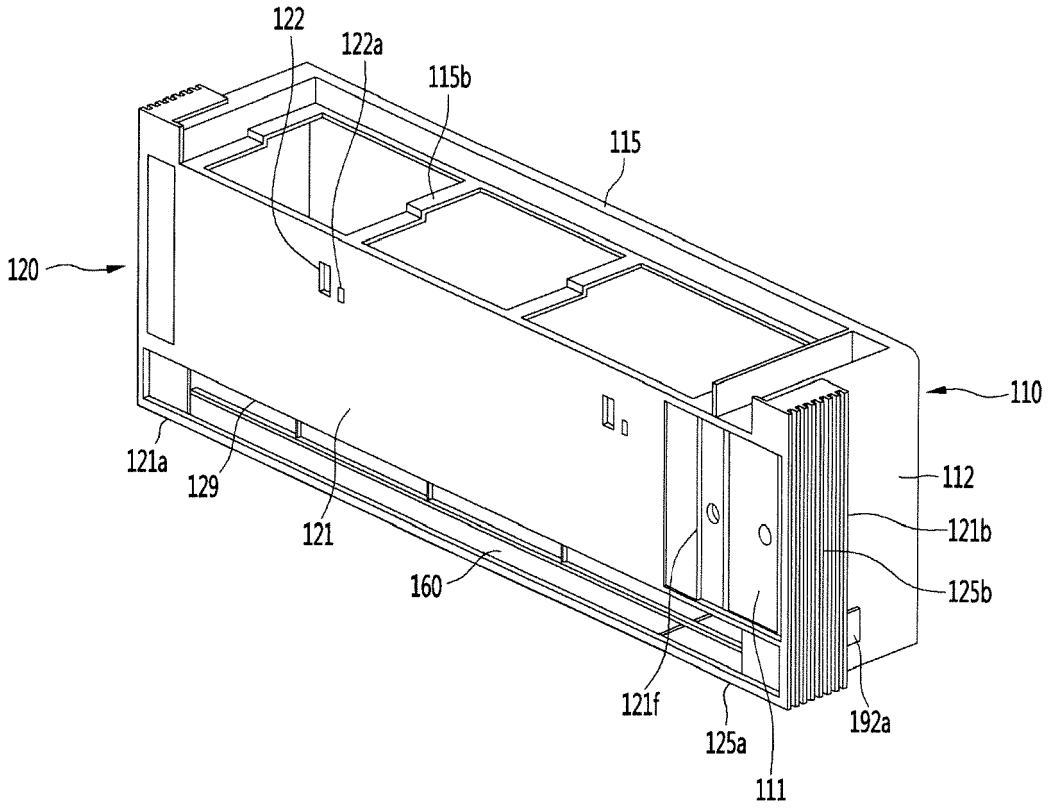
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121b
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121f
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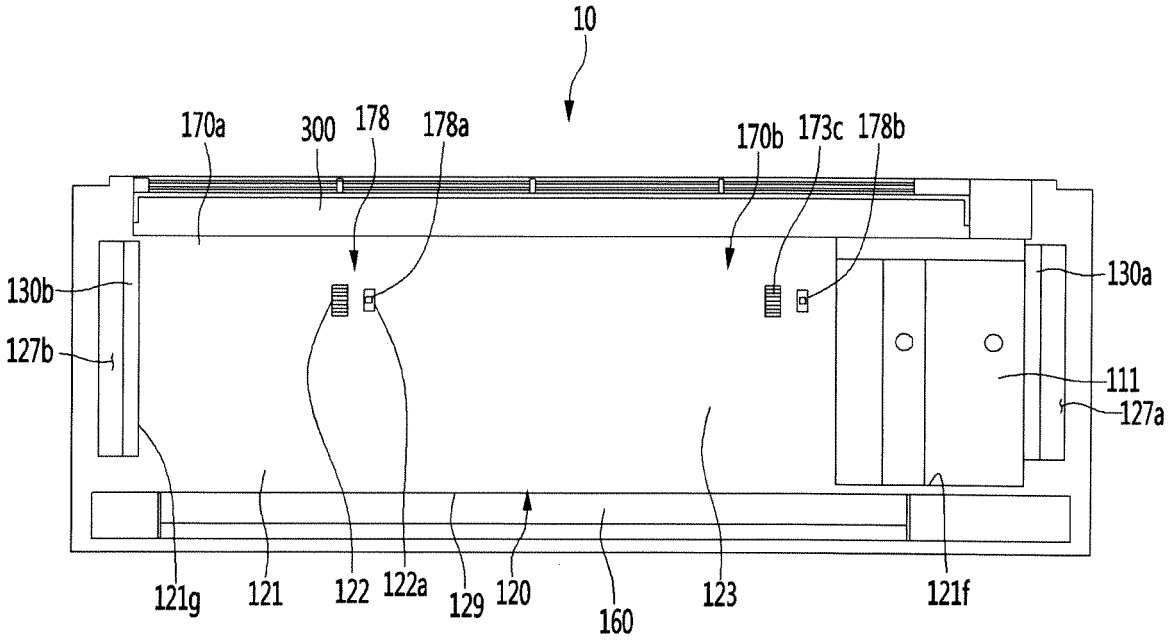
111
192a

Fig. 11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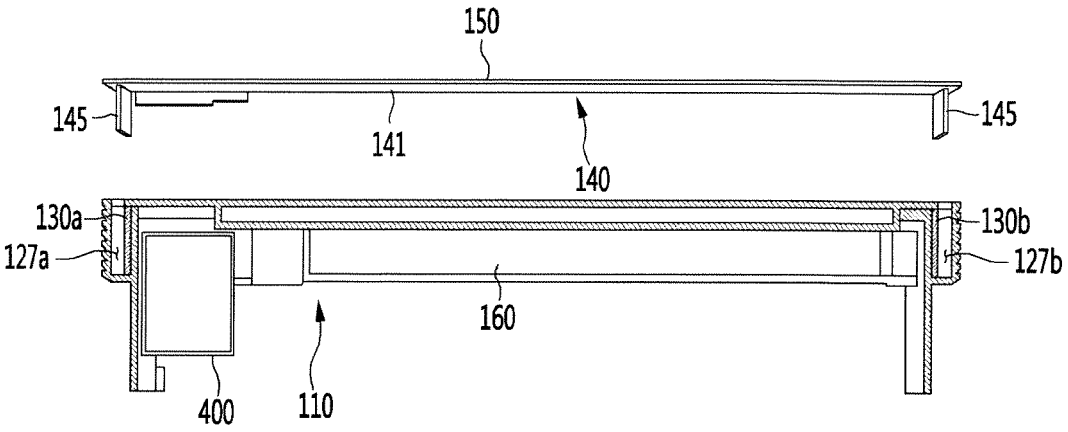
123
121f

Fig. 12



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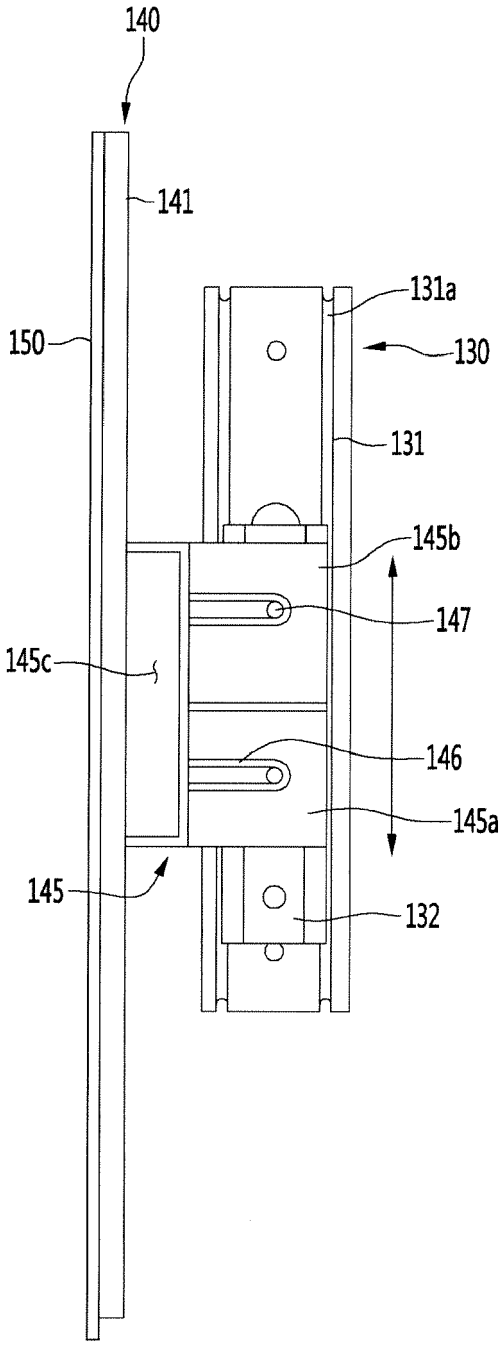

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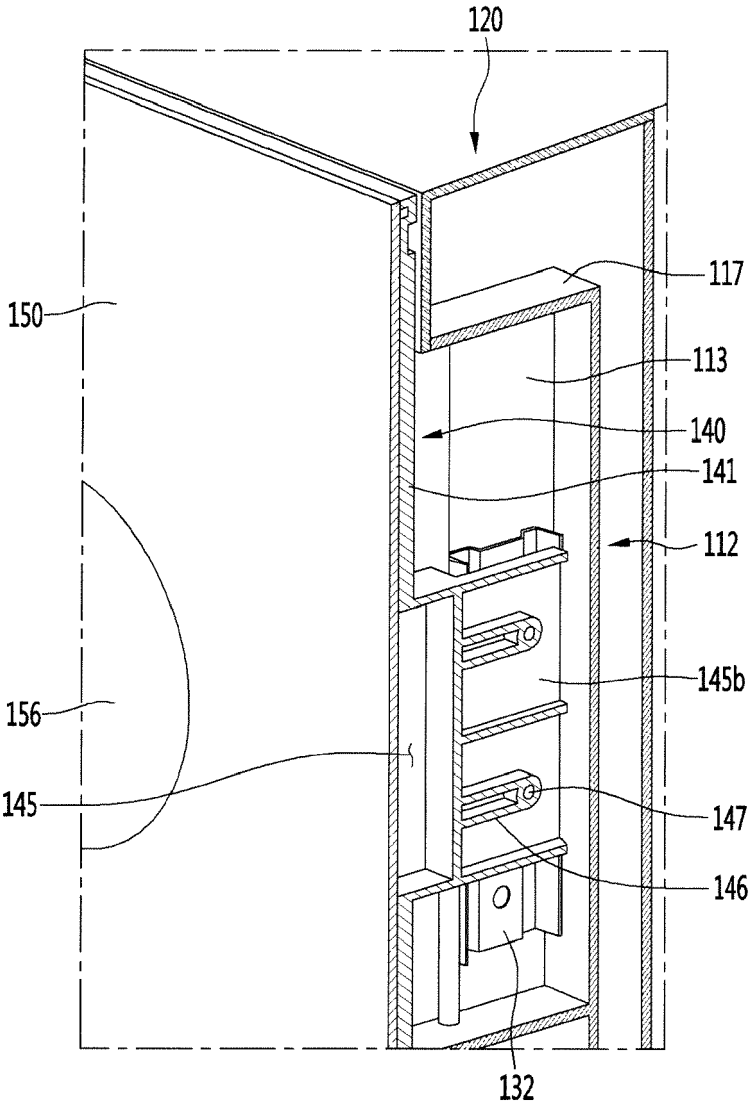

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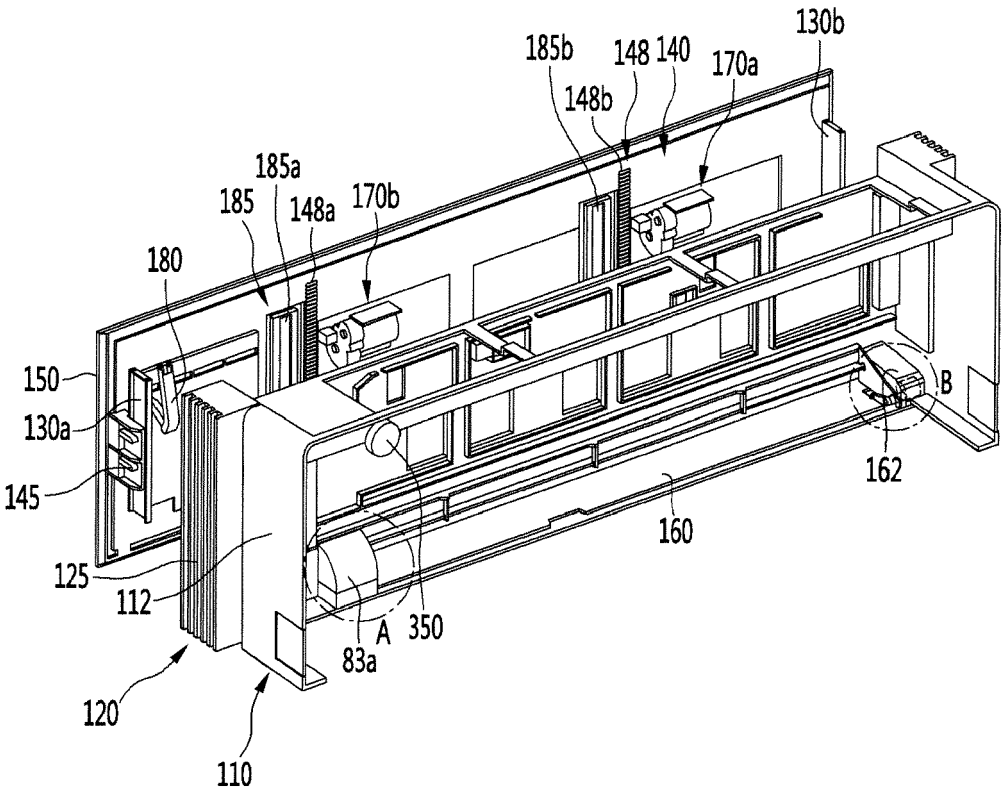
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83a
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162
B

Fig. 16

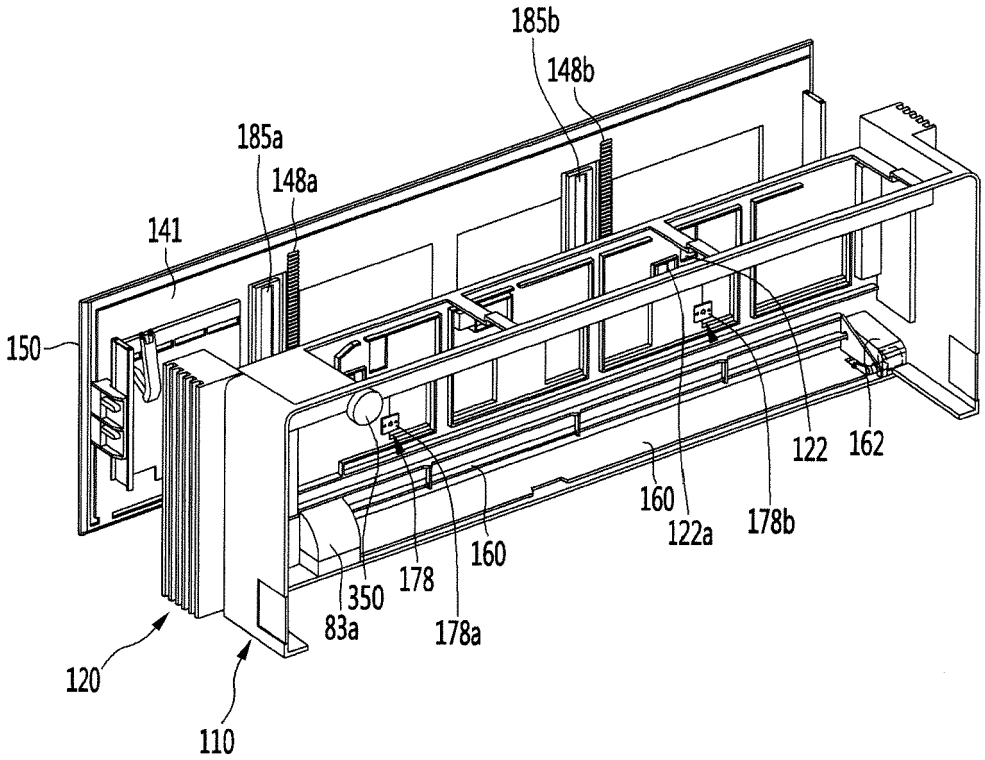
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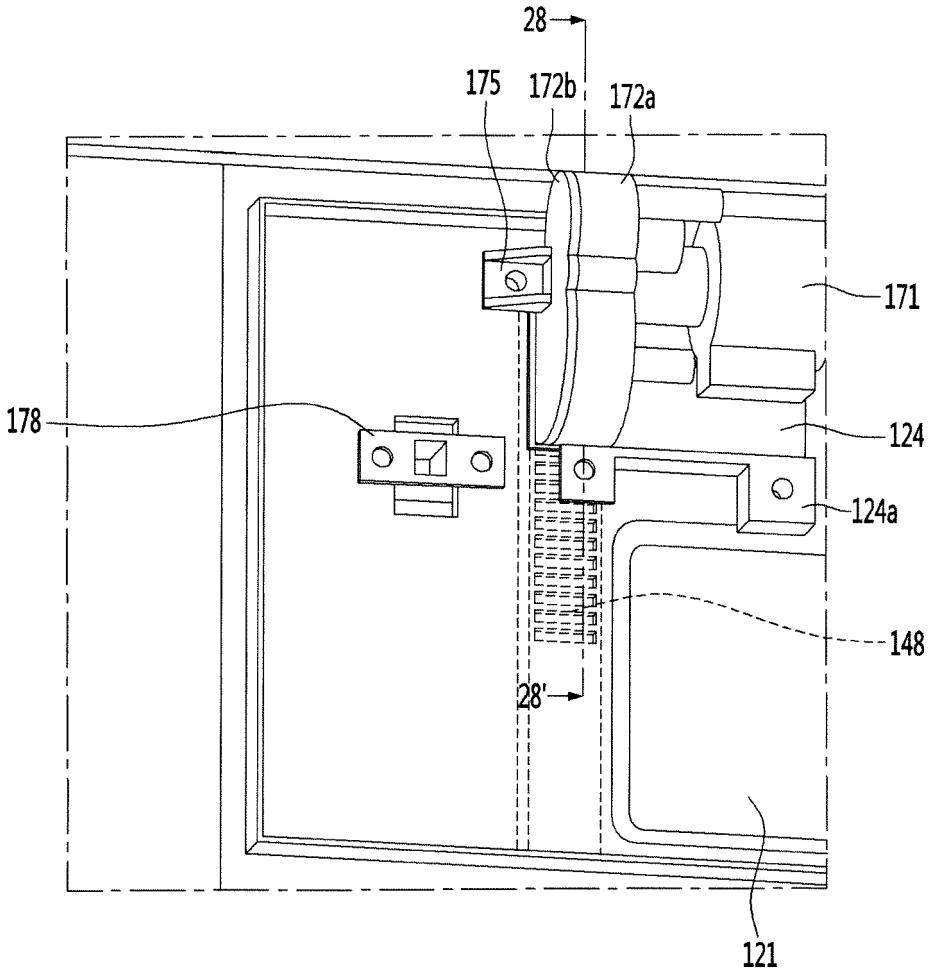
Fig. 17



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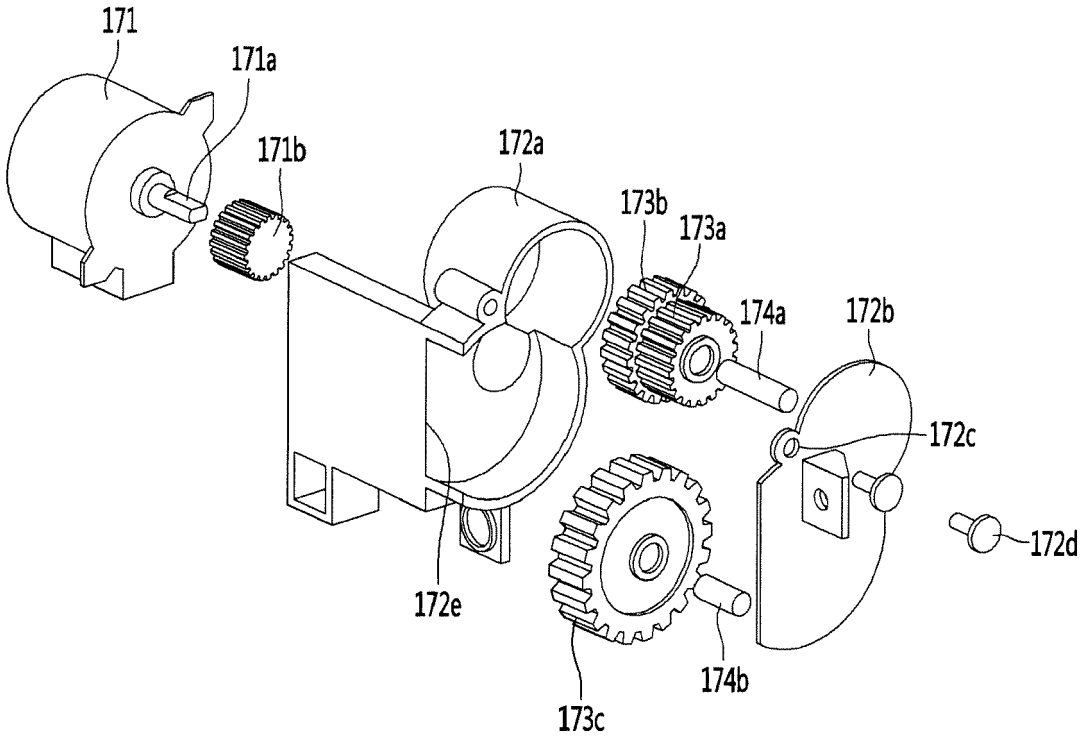
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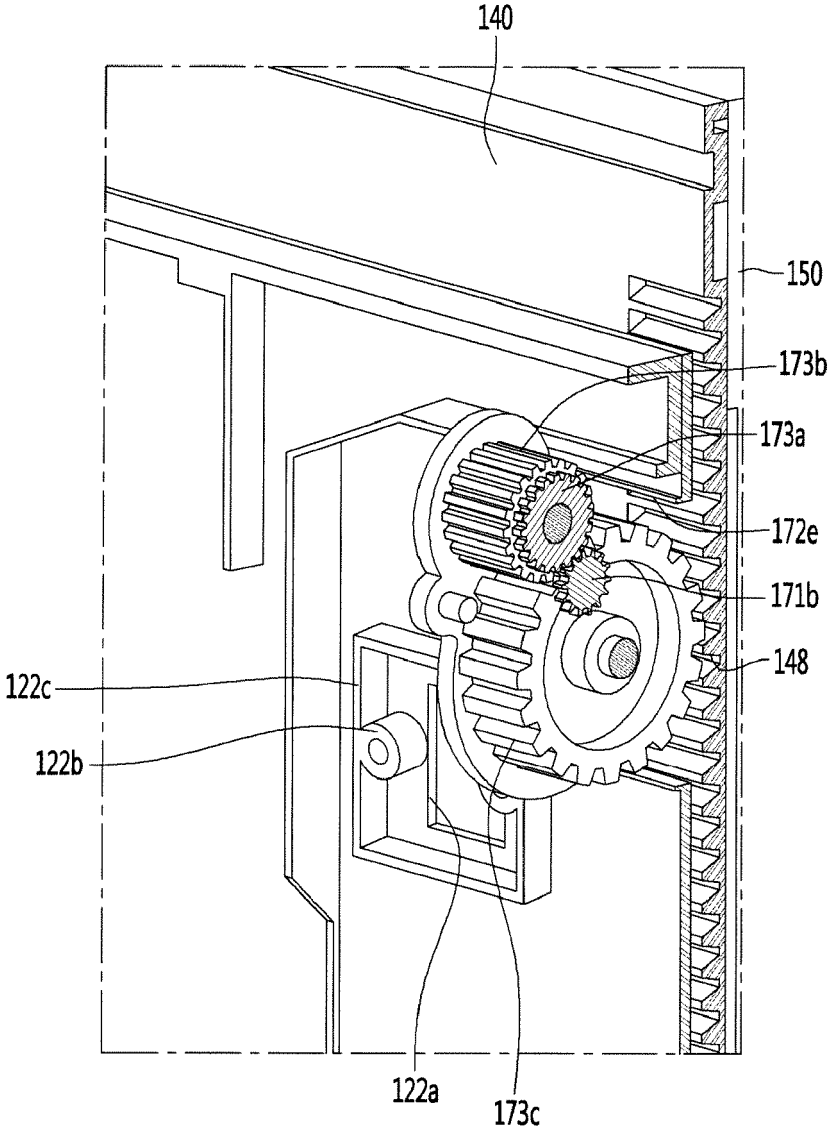
Fig. 19



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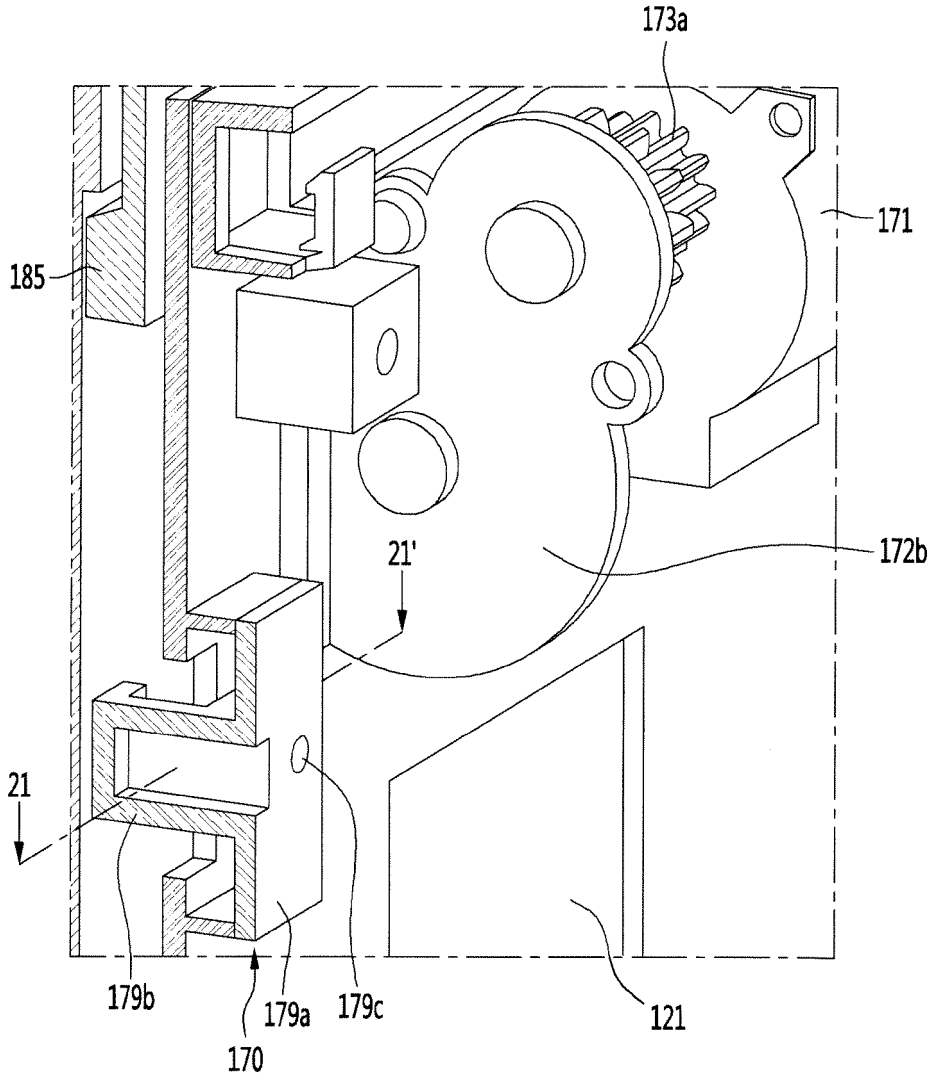

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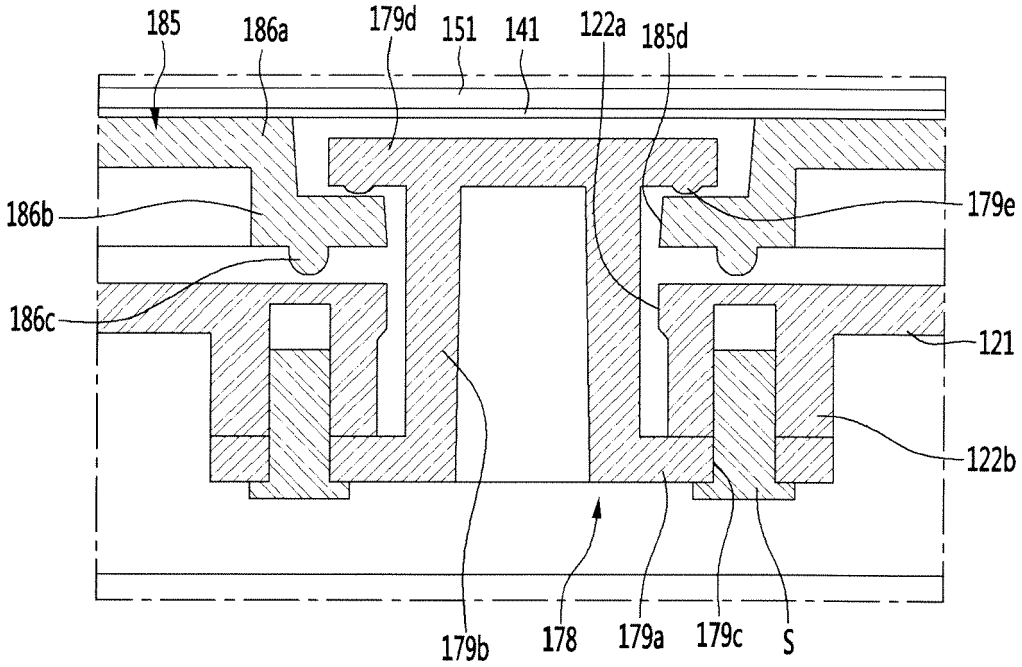
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Fig. 22

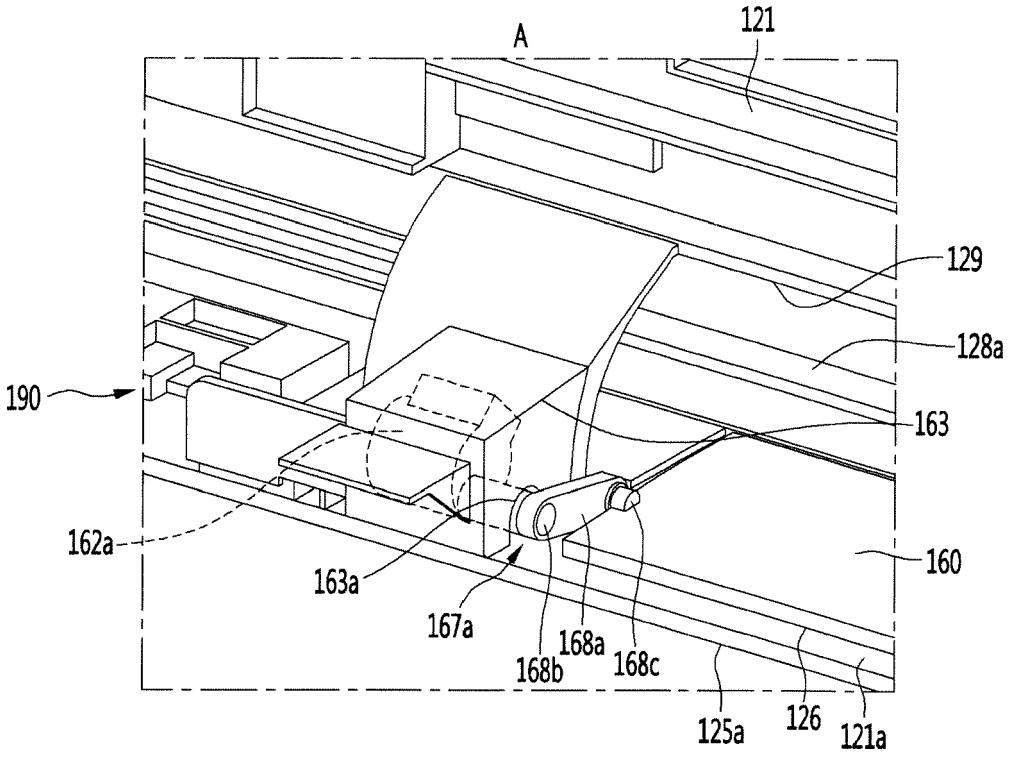
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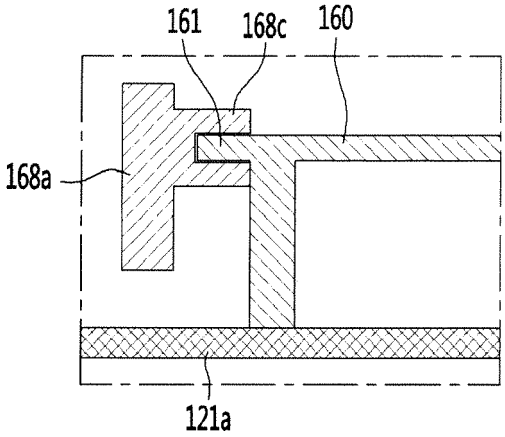
Fig. 23



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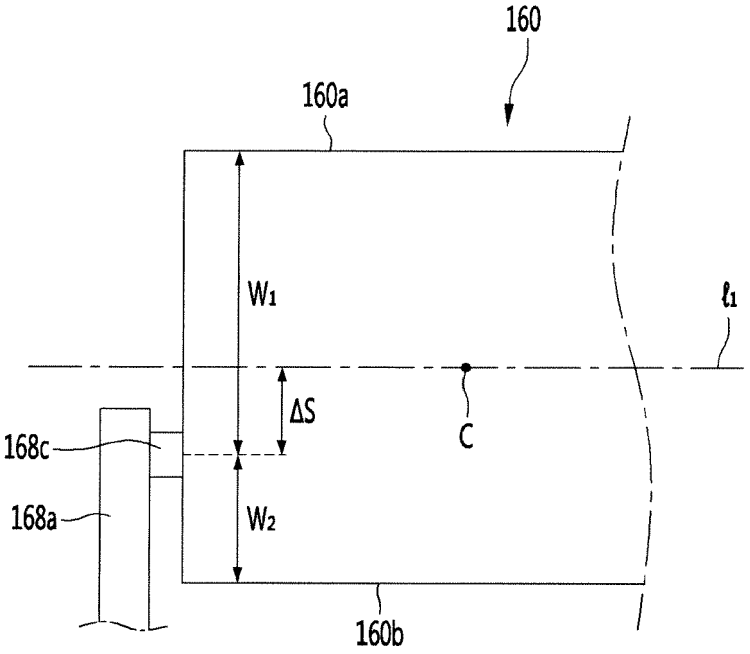


Fig. 25

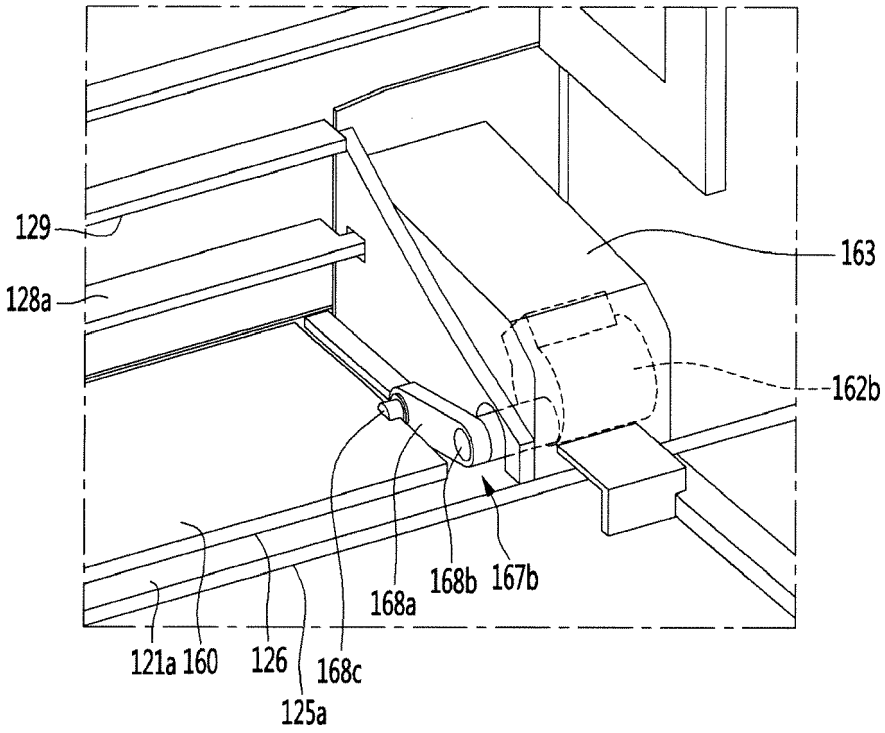
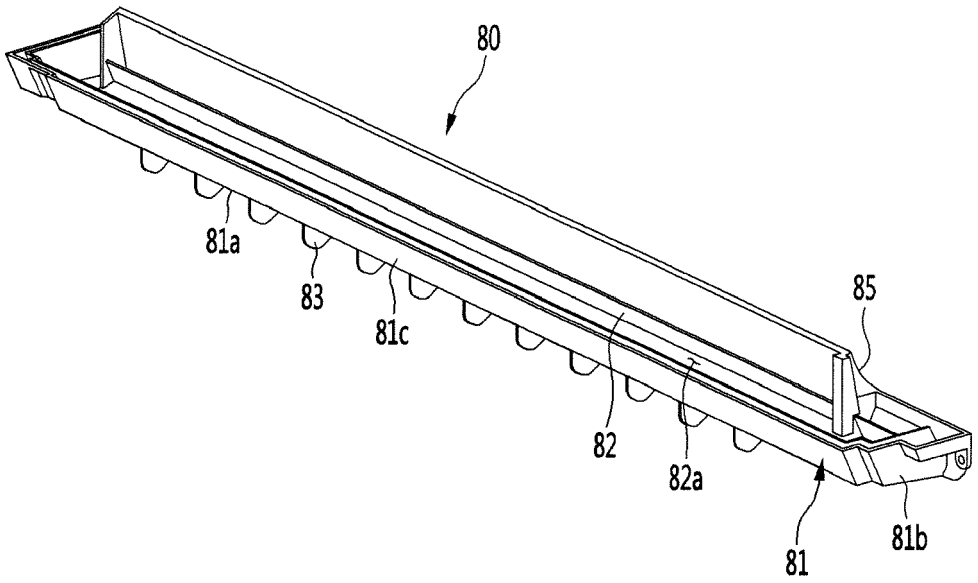


Fig. 26



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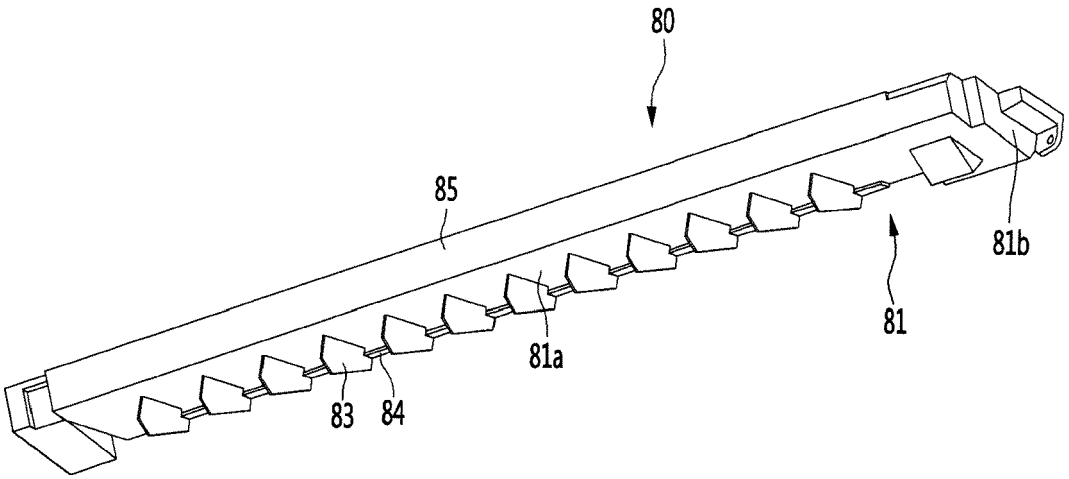
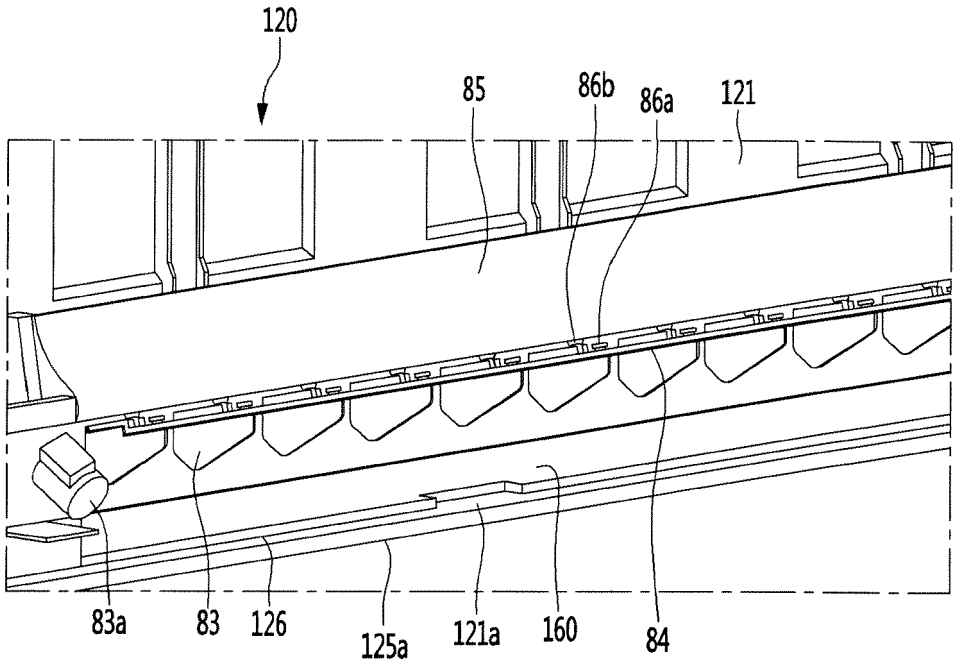


Fig. 28



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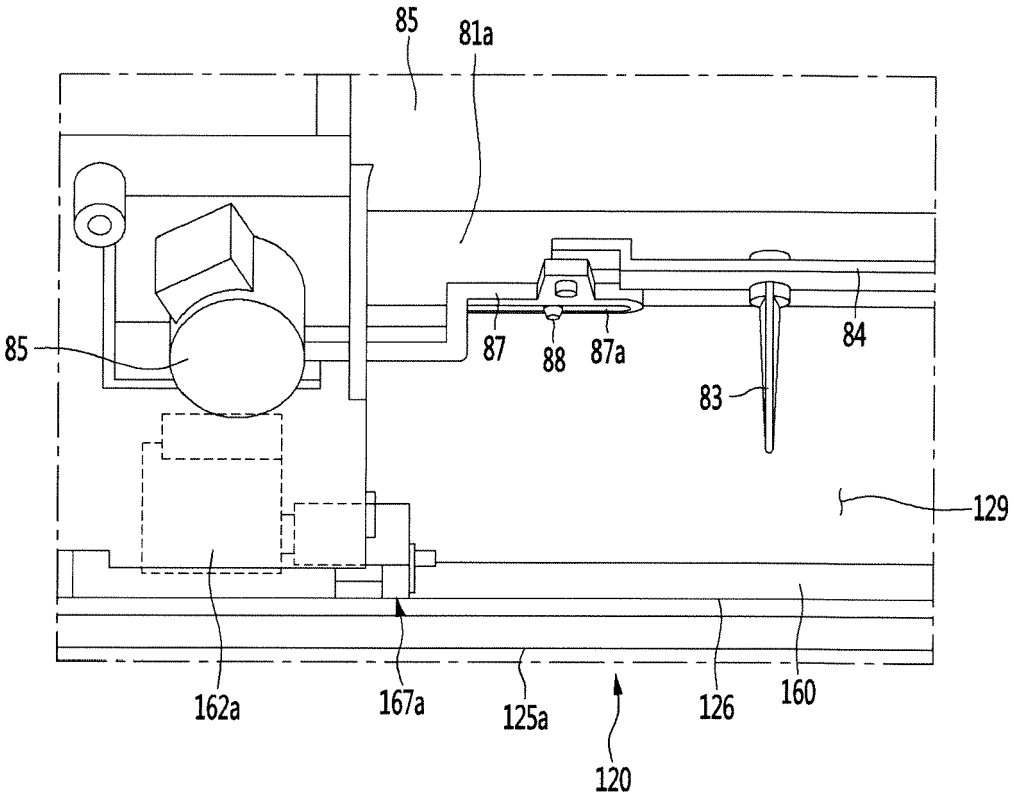


Fig. 30a

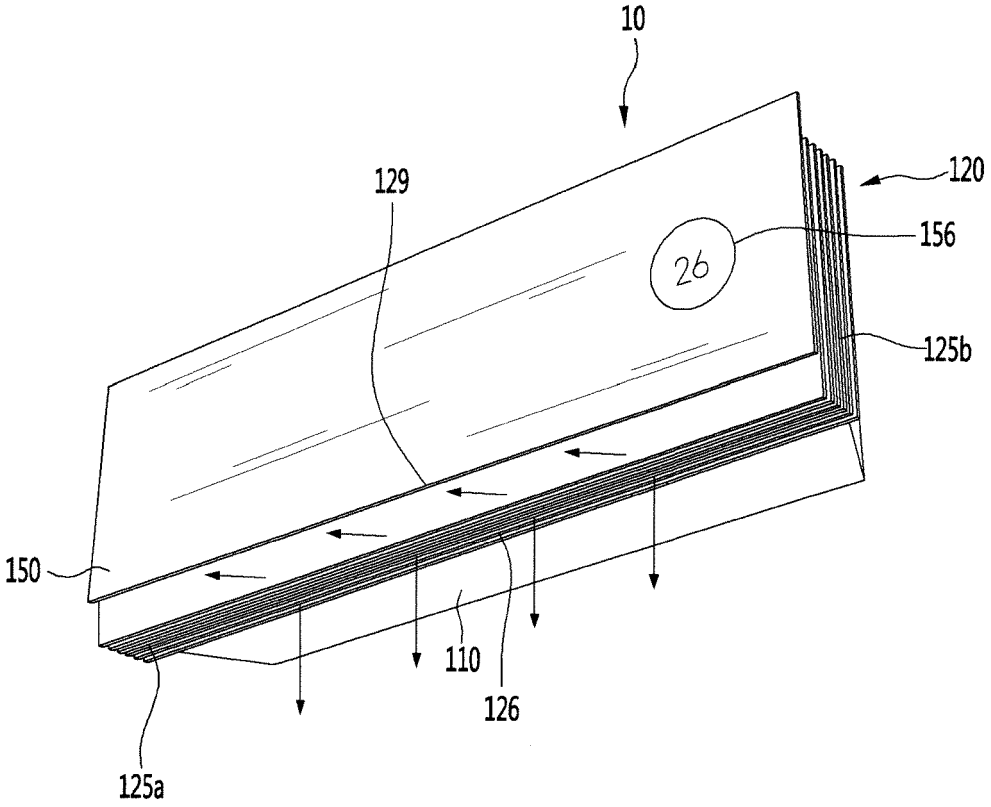


Fig. 30b

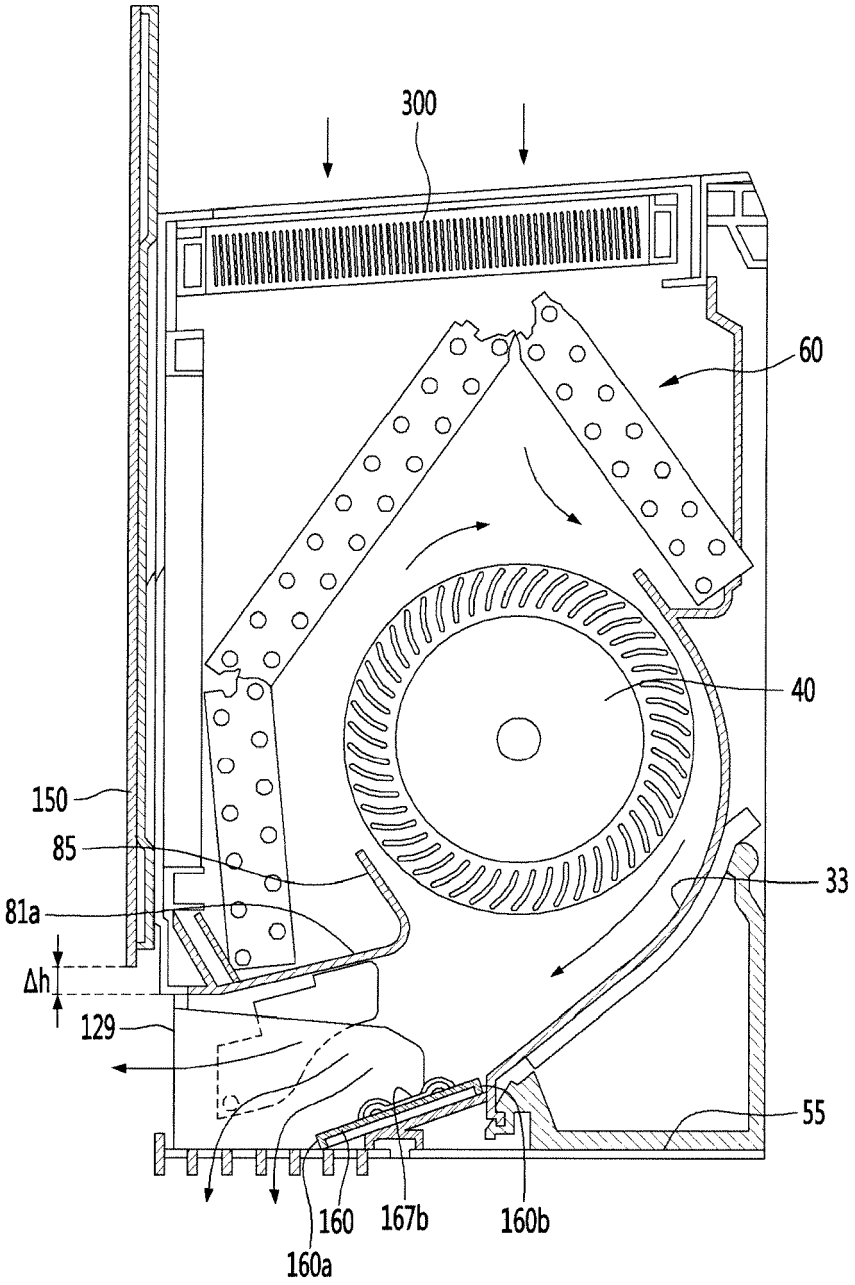


Fig. 30c

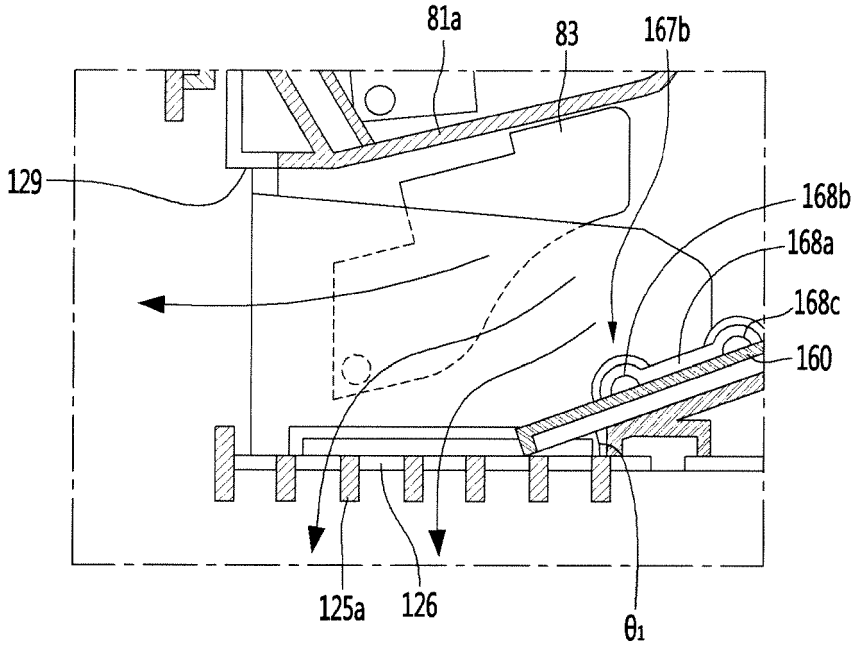
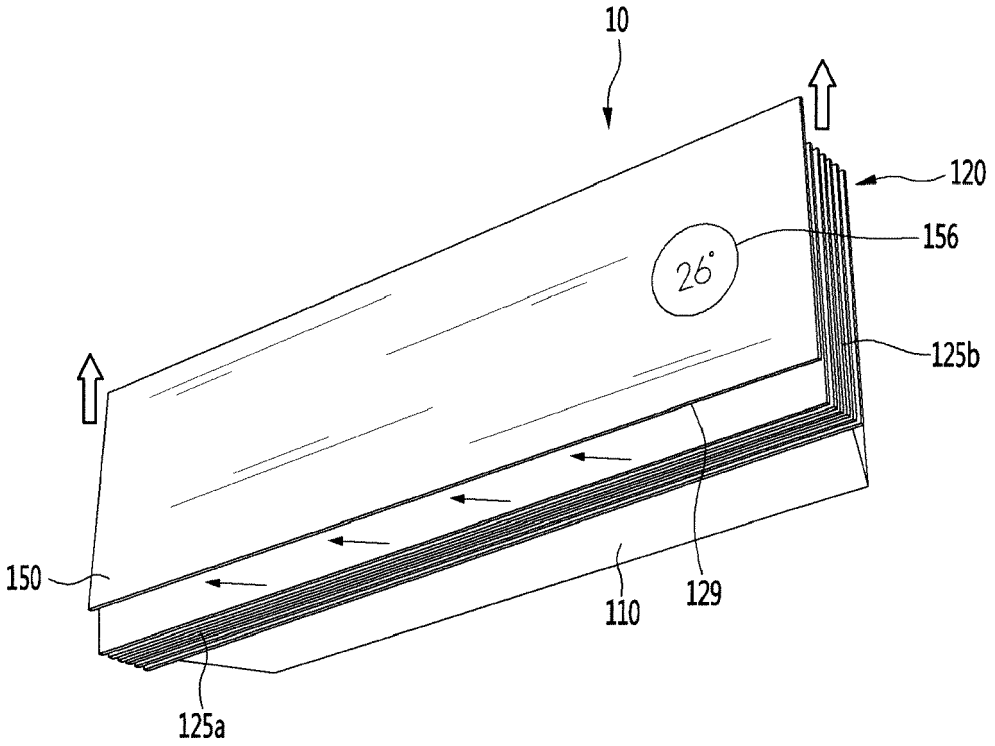


Fig. 31a



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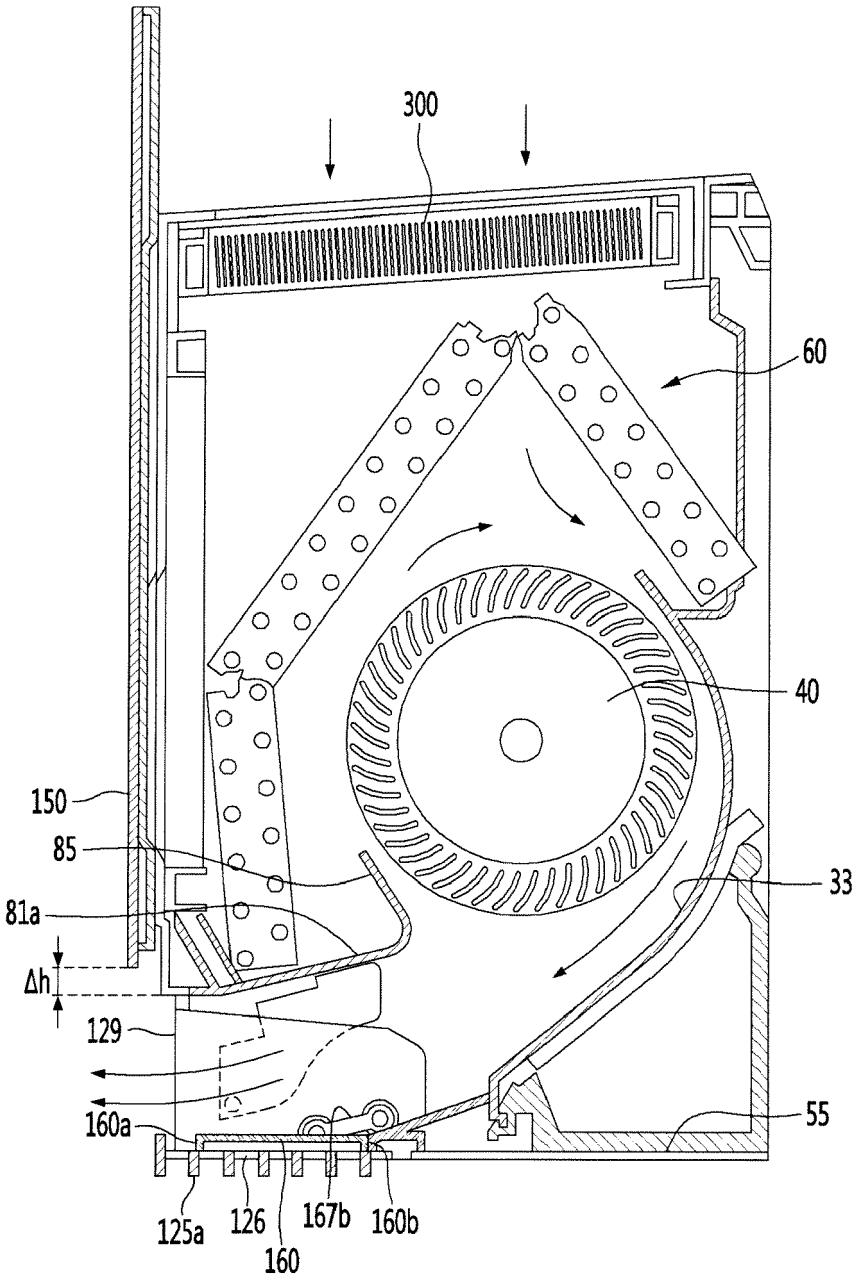

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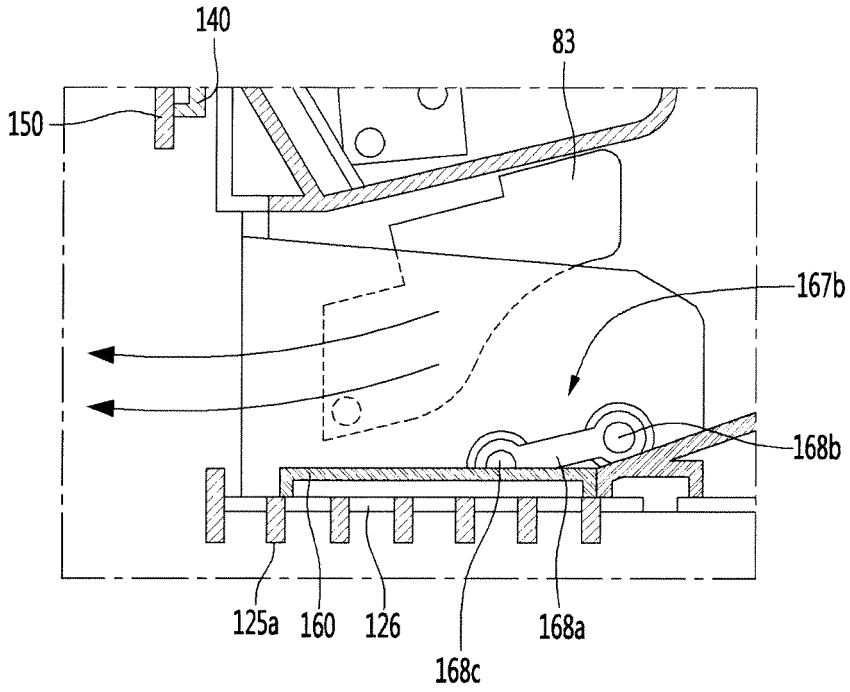
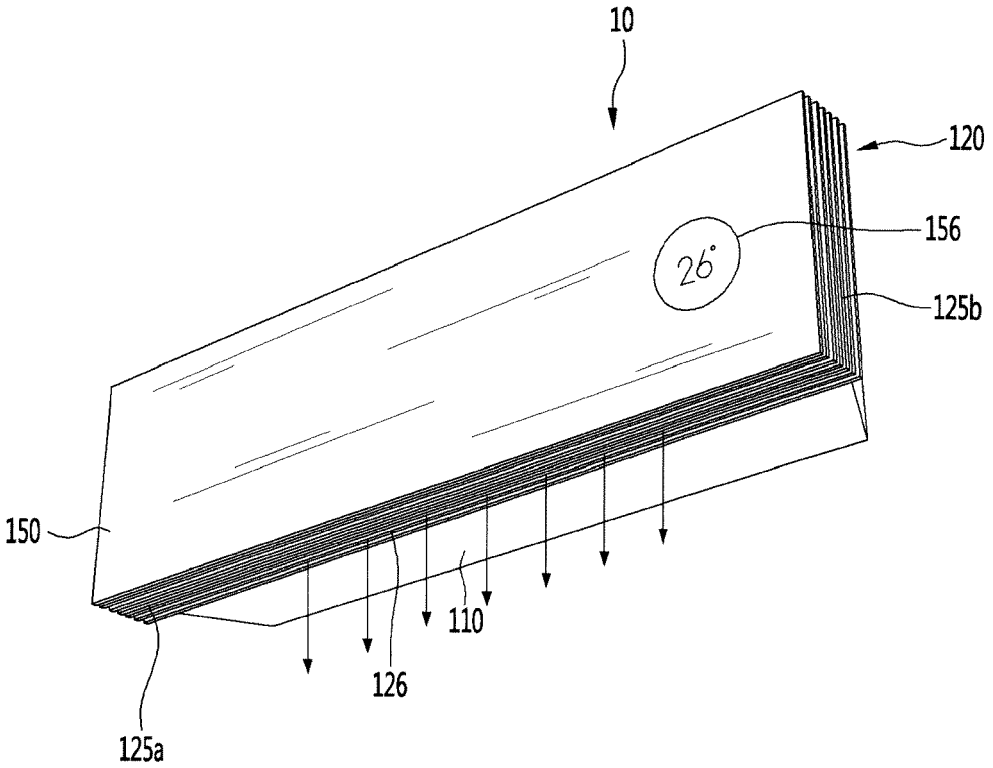


Fig. 32a



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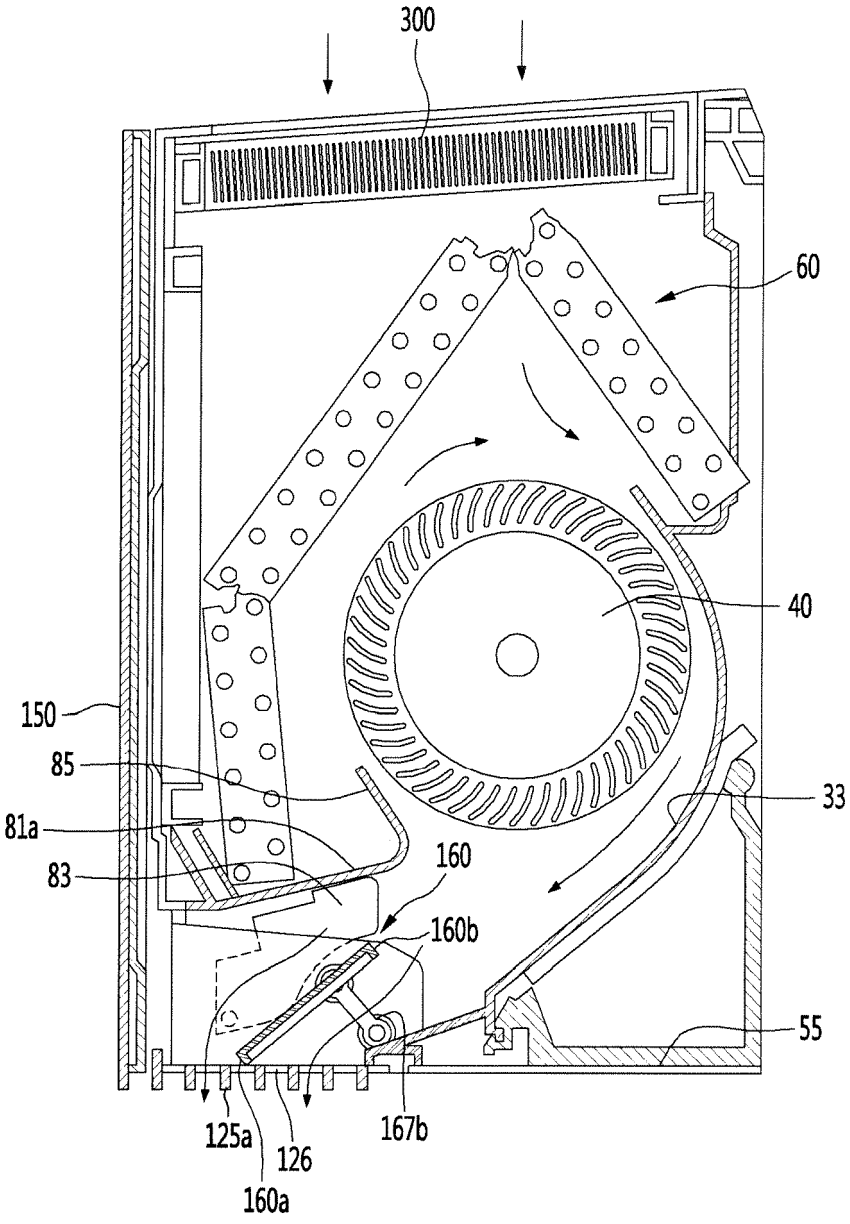


Fig. 32c

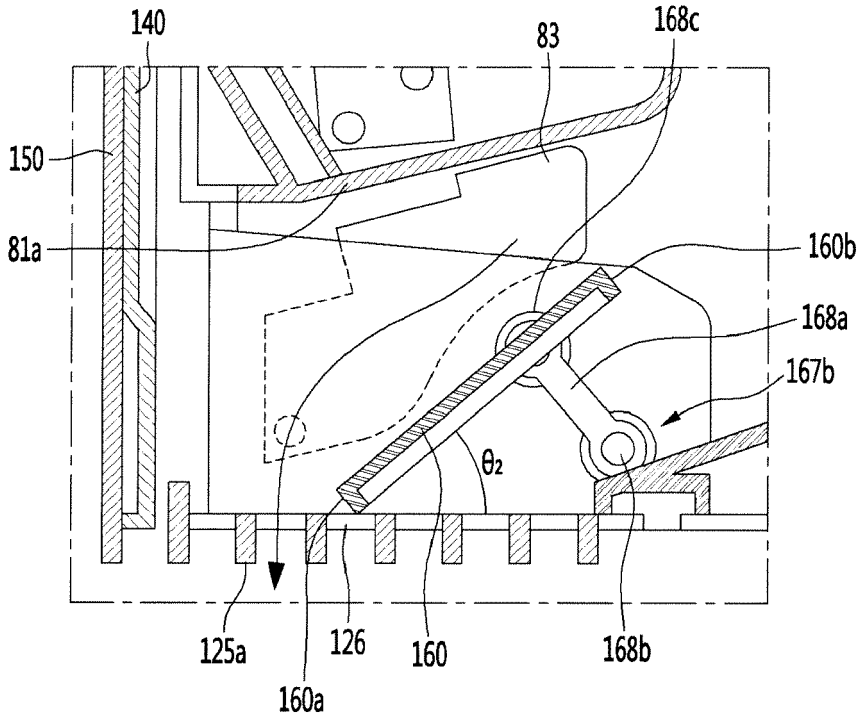


Fig. 33

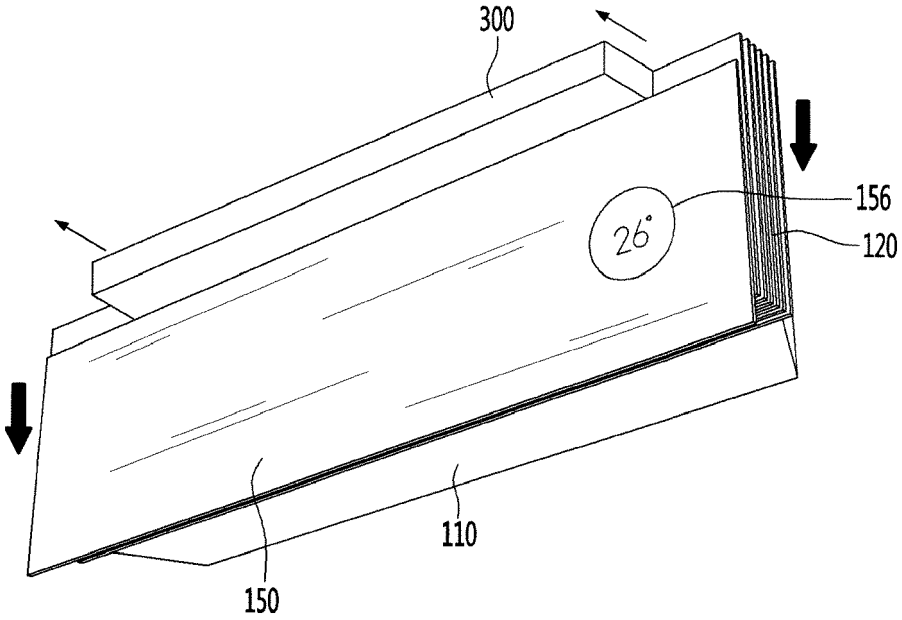
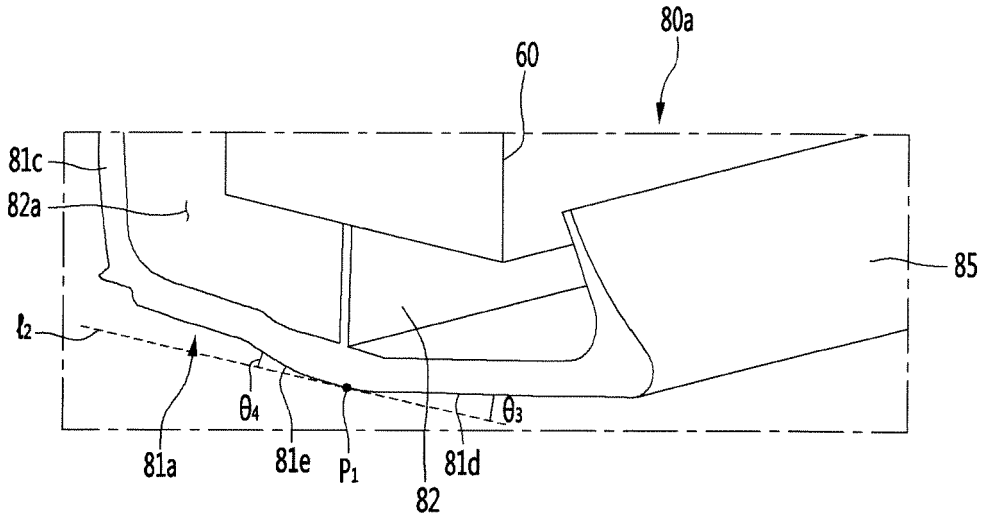


Fig. 34



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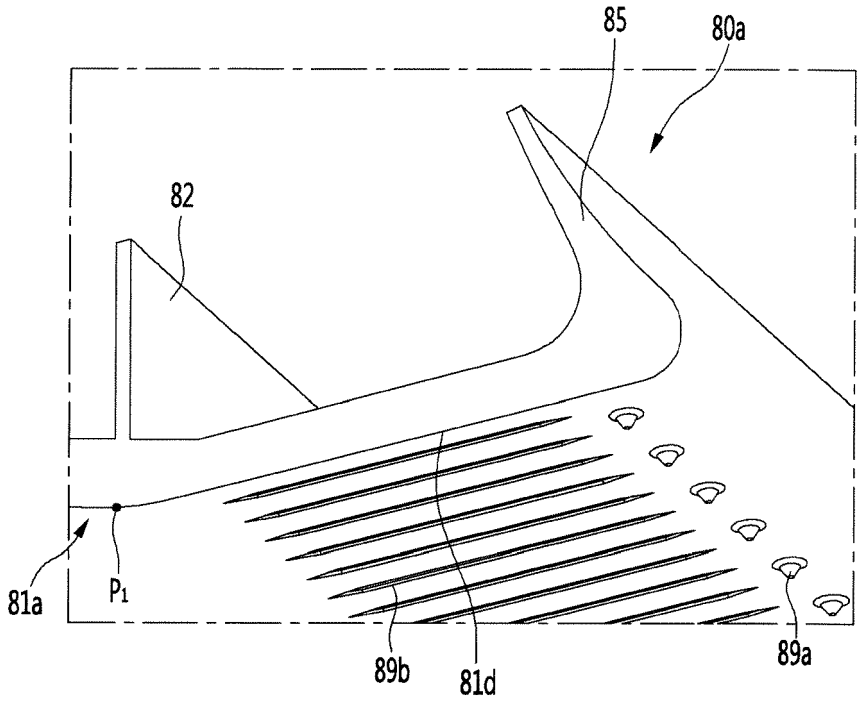


Fig. 36a

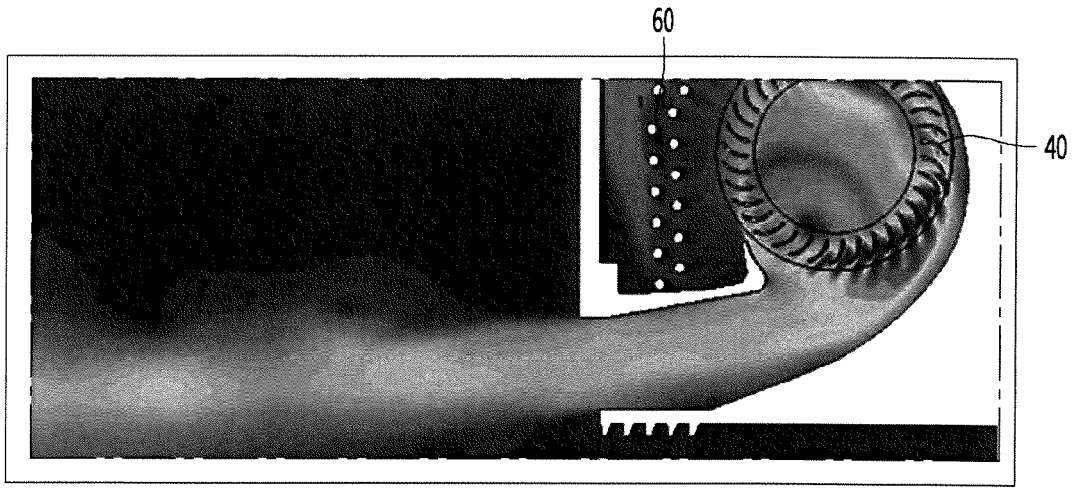
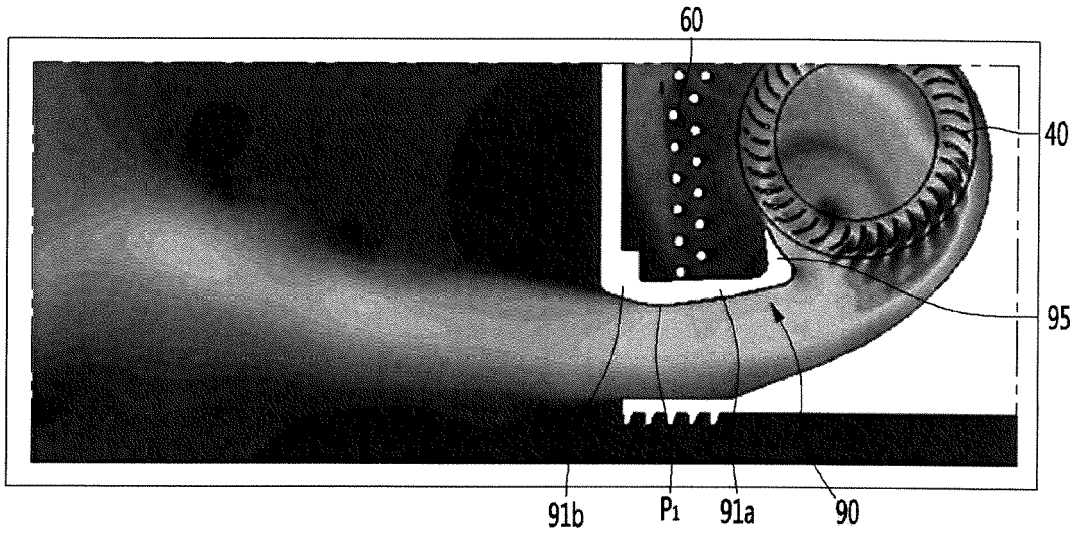


Fig. 36b



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EUROPEAN SEARCH REPORT

Application Number
EP 20 15 3819

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	KR 2009 0042523 A (LG ELECTRONICS INC [KR]) 30 April 2009 (2009-04-30) * the whole document * -----	1-14 15	INV. F24F1/0007 F24F11/52 F24F13/20
Y	KR 2006 0082458 A (LG ELECTRONICS INC [KR]) 18 July 2006 (2006-07-18) * figures 4,5 * -----	15	F24F13/24
X Y	EP 1 808 645 A2 (LG ELECTRONICS INC [KR]) 18 July 2007 (2007-07-18) * the whole document * -----	1-14 15	
X	EP 2 184 553 A1 (LG ELECTRONICS INC [KR]) 12 May 2010 (2010-05-12) * figures 1,2 * -----	1	

TECHNICAL FIELDS SEARCHED (IPC)

F24F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	28 May 2020	Blot, Pierre-Edouard

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28-05-2020

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