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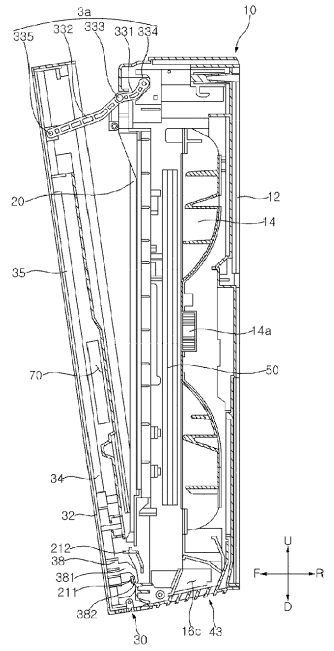
(54) **INDOOR UNIT OF AIR CONDITIONER**

(57) An indoor unit of an air conditioner according to the present disclosure includes: a cabinet provided with an inlet through which outside air is introduced and an outlet through which air is discharged; a heat exchanger disposed in the cabinet; a blower fan disposed in the cabinet; a display panel detachably attached to the cabinet; and a connecting link hingedly connected to each of the display panel and the cabinet, wherein the display panel comprises a hanger configured to be hung on a hanger support portion of the cabinet.

Fig. 7



EP 4 394 264 A1

Description

BACKGROUND

Field

[0001] The present disclosure relates to an indoor unit of an air conditioner. More particularly, the present disclosure relates to an indoor unit of an air conditioner that allows a user, even if not an expert, to simply clean the inside of the indoor unit without having to remove large components.

Description of the Related Art

[0002] In general, an air conditioner is an apparatus for cooling and heating an indoor space by using a refrigerant refrigeration cycle consisting of a compressor, a four-way valve, an outdoor heat exchanger (condenser or evaporator), an expansion mechanism, and an indoor heat exchanger (evaporator or condenser) to create a more comfortable indoor environment for users. Air conditioners may be classified into a separated-type air conditioner and an integrated-type air conditioner.

[0003] The separate-type air conditioner and the integrated-type air conditioner are functionally the same. In the case of the separate-type air conditioner, an indoor unit (in which a heat dissipation/cooling device, an indoor fan, and an indoor fan motor are installed) and an outdoor unit (in which a heat dissipation/cooling device, a compressor, an outdoor fan, and an outdoor fan motor are installed) are separated from each other and are connected by a refrigerant pipe. In the case of the integrated-type air conditioner, the functions of cooling and heat dissipation are integrated.

[0004] The separate-type air conditioner is usually installed by placing an indoor unit upright in an indoor space, hanging the indoor unit on a wall, or embedding the indoor unit in a ceiling, while the integrated-type air conditioner is installed by drilling a hole in a wall of a house, installing a device on a window, or being placed outdoors and connected to an indoor space by a duct.

[0005] In the case of an indoor unit of an air conditioner according to the related art (Patent Document 1), which is hereby incorporated by reference, the inside the indoor unit (particularly, cleaning of a blower fan) can be cleaned when a blower fan (210) is exposed after a user removes a front panel (202) from a cabinet (201) and then removes a heat exchanger and an orifice inside a cabinet.

[0006] As for the Patent Document 1, a front panel, the heat exchanger, and the orifice should be removed to clean the blower fan. In particular, since the heat exchanger is connected through a refrigerant pipe, there is a risk of refrigerant leaking during the removal. In addition, each component should be removed for cleaning, which makes cleaning difficult.

[0007] In the case of Patent Document 2, a front panel (4), a heat exchanger, and an orifice should be removed to clean a blower fan, which makes cleaning difficult.

Related Art

Patent Document

[0008]

Patent Document 1- Korean Laid-Open Patent Publication No. 20160085355
Patent Document 2- Korean Laid-Open Patent Publication No. 20060011656

SUMMARY

[0009] It is an objective of the present disclosure to provide an indoor unit of an air conditioner that can allow a user, even if not an expert (technician), to simply clean the inside of the indoor unit without having to remove large components.

[0010] It is another objective of the present disclosure to provide an indoor unit of an air conditioner that has a structure that allows a display panel to be hung on a cabinet in different positions when cleaning or removing components by a user and when the indoor unit is operated.

[0011] It is yet another objective of the present disclosure to provide an indoor unit of an air conditioner that can prevent a user from being injured by a rotating blower fan when removing a cover for covering an outlet and facilitate cleaning.

[0012] It is yet another objective of the present disclosure to provide an indoor unit of an air conditioner that can prevent the formation of dew on a rear part of a vane and a rear part of a front panel.

[0013] It is yet another objective of the present disclosure to provide an indoor unit of an air conditioner that can allow the flow of air to be uniform when air heat-exchanged in a heat exchanger is discharged through an outlet.

[0014] The objectives of the present disclosure are not limited to the objectives described above, and other objectives not stated herein will be clearly understood by those skilled in the art from the following description.

[0015] At least one of these objects is solved by the features of the independent claim. Preferred embodiments are given in the dependent claims.

[0016] An indoor unit of an air conditioner according to the present disclosure is characterized in that a display panel is placed on a cabinet in a service state in which the display panel opens a lower portion of the cabinet.

[0017] In detail, according to one aspect of the subject matter described in this application, an indoor unit of an air conditioner includes: a cabinet provided with an inlet through which outside air is introduced and an outlet through which air is discharged; a heat exchanger disposed in the cabinet; a blower fan disposed in the cabinet; a display panel detachably attached to the cabinet; and

a connecting link hingedly connected to each of the display panel and the cabinet, wherein the display panel includes a hanger configured to be hung on a hanger support portion of the cabinet.

[0018] The connecting link may be positioned above the hanger.

[0019] The connecting link may be disposed at the upper portion of the cabinet and the hanger may be provided at the lower portion of the display panel. The connecting link may be disposed at a front side of the upper portion of the cabinet and the hanger may be provided at a rear side the lower portion of the display panel. The hanger support portion may be at the front side of the lower portion of the cabinet.

[0020] The connecting link may be spaced apart from the hanger.

[0021] The hanger may be positioned below the inlet.

[0022] The hanger may protrude rearward from a rear surface of the display panel, and the hanger support portion may protrude forward from a front surface of the cabinet.

[0023] The hanger may include: a first member extending from the display panel in one direction; and a second member extending from one end of the first member in a direction intersecting the first member.

[0024] The display panel may include: a closed state in which the front surface of the cabinet is completely covered; and a service state in which a lower portion of the cabinet is exposed. Thus, the display panel may be positioned at least in a closed state or in a service state.

[0025] The hanger may be hung on the lower hanger support portion in the closed state and may be hung on the upper hanger support portion in the service state.

[0026] A lower end of the display panel may be hung on the lower hanger support portion in the service state.

[0027] The display panel may further include an open state in which the display panel is spaced apart from one end of the cabinet. The display panel may be rotatably opened based on a rotation center at the hanger and/or the hanger support portion.

[0028] The hanger, during a process of switching from the closed state to the open state, may become a center of rotation while being hung on the lower hanger support portion.

[0029] The present disclosure may further include: a cover detachably coupled to the cabinet to cover at least the outlet.

[0030] The present disclosure may further include a cover fastening member passing through the cabinet to fasten the cover to the cabinet.

[0031] The display panel may include: a closed state in which a front surface of the cabinet is completely covered; and a service state in which a lower portion of the cabinet is exposed. The cover fastening member may be exposed in the service state.

[0032] The connecting link may include: a first link having a first end hinged to the cabinet; and a second link having a first end hinged to the first link and a second end hinged to the display panel.

[0033] A length of the second link may be greater than a length of the first link.

[0034] The present disclosure may further include: a cover removal detection sensor configured to detect removal of the cover from the cabinet; and a controller configured to control the blower fan to stop based on the removal of the cover from the cabinet being detected.

[0035] In addition, the present disclosure may further include: a control vane configured to open and close the outlet; and a vane motor configured to rotate the control vane.

[0036] The controller may control the vane motor to open the outlet based on the removal of the cover from the cabinet being detected.

[0037] According to another aspect, an indoor unit of an air conditioner includes: a cabinet provided with an inlet through which outside air is introduced and an outlet through which air is discharged; a heat exchanger disposed in the cabinet; a blower fan disposed in the cabinet; a display panel hinged to an upper end of the cabinet; a cover detachably coupled to the cabinet to cover at least the outlet; and a cover fastening member passing through the cabinet to fasten the cover to the cabinet, wherein the display panel comprises a hanger configured to be hung on the cabinet while the cover fastening member is exposed.

[0038] The cabinet may further include a hanger support portion on which the hanger is hung. The hanger support portion may be positioned above the cover fastening member.

BRIEF DESCRIPTION OF THE DRAWINGS

[0039]

FIG. 1 is a perspective view showing an indoor unit of an air conditioner according to an embodiment of the present disclosure.

FIG. 2 is a perspective view showing an open state of a display panel of the indoor unit in FIG. 1.

FIG. 3 is an exploded perspective view of the indoor unit in FIG. 1.

FIG. 4 is a cross-sectional view taken along line 17-17' of FIG. 1.

FIG. 5 illustrates a display panel in FIG. 1, when viewed from the rear.

FIG. 6 is a cross-sectional view showing a closed state of the display panel.

FIG. 7 is a cross-sectional view showing an open state of the display panel.

FIG. 8 is a cross-sectional view showing a service state of the display panel.

FIG. 9 is a front view showing a service state of the display panel.

FIG. 10 is a cross-sectional view showing a portion at which a screw of FIG. 9 is positioned.

FIG. 11 illustrates a state in which a lower cover is

removed in a service state of the display panel.

FIG. 12 is a plan view of a lower cover according to an embodiment of the present disclosure.

FIG. 13 is a perspective view of a lower cover of an embodiment of the present disclosure.

FIG. 14 is a control block diagram according to an embodiment of the present disclosure.

FIG. 15 is a flowchart of a control method according to an embodiment of the present disclosure.

DETAILED DESCRIPTION

[0040] Advantages and features of the present disclosure and methods for achieving those of the present disclosure will become apparent upon referring to embodiments described later in detail with reference to the attached drawings. However, embodiments are not limited to the embodiments disclosed hereinafter and may be embodied in different ways. The embodiments are provided for perfection of disclosure and for informing persons skilled in this field of art of the scope of the present disclosure. The same reference numerals may refer to the same elements throughout the specification.

[0041] Spatially-relative terms such as "below", "beneath", "lower", "above", or "upper" may be used herein to describe one element's relationship to another element as illustrated in the Figures. It will be understood that spatially-relative terms are intended to encompass different orientations of the device in addition to the orientation depicted in the Figures. For example, if the device in one of the figures is turned over, elements described as "below" or "beneath" other elements would then be oriented "above" the other elements. The exemplary terms "below" or "beneath" can, therefore, encompass both an orientation of above and below. Since the device may be oriented in another direction, the spatially-relative terms may be interpreted in accordance with the orientation of the device.

[0042] The terminology used in the present disclosure is for the purpose of describing particular embodiments only and is not intended to limit the disclosure. As used in the disclosure and the appended claims, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0043] Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and the present disclosure, and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

[0044] In the drawings, the thickness or size of each layer is exaggerated, omitted, or schematically illustrated for convenience of description and clarity. Also, the size or area of each constituent element does not entirely reflect the actual size thereof.

[0045] Hereinafter, exemplary embodiments of the present disclosure will be described with reference to the accompanying drawings.

[0046] FIG. 1 is a perspective view showing an indoor unit of an air conditioner according to an embodiment of the present disclosure, FIG. 2 is a perspective view showing an open state of a display panel of the indoor unit in FIG. 1, and FIG. 3 is an exploded perspective view of the indoor unit in FIG. 1.

[0047] Referring to FIGS. 1 to 3, an indoor unit of an air conditioner according to an embodiment of the present disclosure includes a cabinet 10 and a display panel 30 coupled to a front surface of the cabinet 10. The cabinet 10 includes therein a base 12 having a space in which a blower fan 14, an orifice 13, and a heat exchanger 50 are accommodated and a front panel 20 configured to cover the base 12.

[0048] The display panel 30 is installed to the front panel 20 while being spaced apart from the front panel 20 by a predetermined distance.

[0049] The front panel 20 is provided at its center with an inlet 15 and is fixed or secured to the cabinet 10, and the cabinet 10 is provided with at least one outlet 16.

[0050] The outlet 16 may include a first outlet 16a, 16b and a second outlet 16c. The first outlet 16a, 16b may include a left outlet 16a that is disposed at a left side of the cabinet 10 and a right outlet 16b that is disposed at a right side of the cabinet 10. The second outlet 16c may be disposed at a bottom side of the cabinet 10.

[0051] Specifically, the first outlet 16a, 16b and the second outlet 16c may be formed in the base 12.

[0052] Here, a front-and-rear direction (FR) refers to a direction parallel to a rotation axis Ax of the blower fan 14. With respect to the blower fan 14, a direction to the display panel 30 is defined as a forward or front direction F, and a direction to the base 12 is defined as a rearward or rear direction R.

[0053] In addition, an up-and-down direction (UD) refers to a direction perpendicular to the rotation axis of the blower fan 14. With respect to the rotation axis Ax of the blower fan 14, a direction to the second outlet 16c is defined as a downward or down direction D, and a direction opposite to the downward direction is defined as an upward or up direction U.

[0054] Also, a left-and-right direction (LeRi) refers to a direction perpendicular to the up-and-down direction and the left-and-right direction.

[0055] The display panel 30 may be installed at the front of the front panel 20 while being spaced apart from the front panel 20 by a predetermined distance, thereby

forming a gap. Air flows to the inlet 15 through the gap formed between the front panel 20 and the display panel 30.

[0056] The base 12 may be provided with the blower fan 14 through which indoor air is drawn in/discharged, the orifice 13 disposed at the front of the blower fan 14 to guide air drawn in through the inlet 15 to the blower fan 14, and the heat exchanger 50 installed at the front of the orifice 13.

[0057] Here, the blower fan 14 is installed between the base 12 and the orifice 13 to guide all of the air drawn in through the inlet 15 to the outlet 16.

[0058] The blower fan 14 is a centrifugal fan configured to discharge air introduced from the orifice 13 in a circumferential direction. A fan motor 14a configured to rotate the blower fan 14 is connected to the blower fan 14.

[0059] The left outlet 16a and the right outlet 16b, which are configured to guide air discharged from the blower fan 14 to an outside of the cabinet 10, are formed on both sides of the blower fan 14, namely, both sides of the base 12.

[0060] In addition, the second outlet 16c configured to guide air discharged from the blower fan 14 to the outside of the cabinet 10 may be provided on a bottom side of the base 12. The second outlet 16c may be provided with a control vane 510 configured to open and close the second outlet 16c, and a vane motor 520 configured to rotate the control vane 510.

[0061] A side cover 41, 42 and a lower cover 43 to cover at least the outlet 16 may be coupled to both side surfaces and a lower surface of the base 12. The side cover 41, 42 may be provided with a discharge guide 412 configured to guide air discharged from the outlet 16. The side cover 41, 42 may include a left cover 41 and a right cover 42. The side cover 41, 42 and the lower cover 43 may be collectively referred to as a cover. This will be described in detail later with reference to FIG. 4 and FIG. 8.

[0062] The base 12 is fixed to a wall of an indoor space by a bracket 17 installed on a rear surface of the base 12.

[0063] Meanwhile, an electrical unit 2 constituting a controller 560 of the air conditioner is installed on an upper portion of the orifice 13.

[0064] The heat exchanger 50 is installed at the front of the orifice 13 to cool/heat introduced indoor air heat-exchanged with indoor air, and a drain pan 100 is disposed under the heat exchanger 50 to store (or collect) and discharge condensate generated in the heat exchanger 50.

[0065] Here, the heat exchanger 50 is fixed to the front panel 20 or the orifice 13, and is provided at its one side with a connecting pipe 52 so as to be connected to a refrigerant pipe (not shown) installed from the outside.

[0066] The front panel 20 is disposed at the front of the heat exchanger 50 to be coupled to the base 12.

[0067] The cabinet 10 is provided at its corner with a pipe cover 11, and the pipe cover 11 is installed at a corner of the base 12 to thereby define a portion of the outer appearance of the indoor unit.

[0068] Here, the pipe cover 11 is provided at a plurality of corners among four corners of the cabinet 10. In this embodiment, two pipe covers 11 are respectively installed at two lower corners of the cabinet 10, and an external refrigerant pipe passes through the pipe cover 11 to be guided inside the cabinet 10.

[0069] The front panel 20 is provided with the inlet 15 at its central portion and a front grille 21 by which the inlet 15 is divided into a plurality of regions.

[0070] The inlet 15 is provided with a filter 60 to filter indoor air flowing to the orifice 13.

[0071] Meanwhile, the filter 60 according to the present disclosure is detachably attached to the front panel 20, and in this embodiment, the filter 60 is supported by the front grille 21 of the front panel 20.

[0072] Here, the filter 60 and the front grille 21 that supports the filter 60 may be formed by gently protruding forward by a predetermined thickness with respect to the front panel 20. The filter 60 supported by being seated on the front grille 21 is prevented from contact with the heat exchanger 50.

[0073] Meanwhile, the display panel 30 may be hinged to the front panel 20 by a link assembly 3. The link assembly 3 may include a link 3a and a link motor 3b.

[0074] The display panel 30 may be provided with a display unit 35 configured to display an operation state of the indoor unit, etc. The display panel 30 includes a rear frame 34 and a front frame 32, and the display unit 35 is disposed between the front frame 32 and the rear frame 34.

[0075] The front frame 32 may have an opening through which the display unit 35 is exposed. A side frame 36 may be installed at a portion where the front frame 32 and the rear frame 34 are coupled.

[0076] Hereinafter, a structure that facilitates cleaning of the indoor unit will be described in detail.

[0077] FIG. 4A is a cross-sectional view taken along line 17-17' of FIG. 1, and FIG. 5 illustrates a display panel in FIG. 1, when viewed from the rear.

[0078] Referring to FIGS. 4 and 5, an embodiment of the present disclosure includes an air gap 70 formed between the display panel 30 and the cabinet 10.

[0079] The display panel 30 includes a rear frame 34 and a front frame 32, and a display unit 35 is accommodated between the front frame 32 and the rear frame 34. A front surface of the display unit 35 is exposed at the front through the front frame 32, and a rear surface of the display unit 35 is exposed at the rear through the rear frame 34. The display unit 35 may have a smaller area than the front frame 32 and the rear frame 34.

[0080] The display unit 35 may be provided with a control unit 37. The control unit 37 may control the display unit 35. The control unit 37 may include a controller configured to control the indoor unit. A vent hole 351 is formed in the rear surface of the display unit 35 to circulate air into the display unit 35.

[0081] The control unit 37 may be disposed on one

surface of the display unit 35. The control unit 37 may be coupled to the rear surface of the display unit 35. When viewed from the rear, the area of the control unit 37 may be less than the area of the display unit 35.

[0082] The display unit 35 may be positioned to overlap the inlet 15 in a rotation axis direction of the blower fan 14. The inlet 15 may be positioned behind the display unit 35.

[0083] The control unit 37 may be positioned to overlap the inlet 15 in the rotation axis direction of the blower fan 14. The inlet 15 may be positioned behind the control unit 37.

[0084] As the display unit 35 and the control unit 37 are positioned forward relative to the inlet 15, air introduced through the air gap 70 is discharged to the outlet 16 through inlet 15 when the blower fan 14 is operated in response to overheating of the control unit 37. Thus, as air in the air gap 70 is introduced through the inlet 15, the flow velocity and flow rate of the air introduced into the air gap 70 are increased, allowing the heat exchange efficiency to be improved.

[0085] The inlet 15 is positioned at a surface of the cabinet 10 that faces the display panel 30. The inlet 15 may be positioned at a front surface of the cabinet 10. In other words, as described above, the inlet 15 is formed in the front panel 20 that defines the front surface of the cabinet 10.

[0086] The air gap 70 may be defined as a gap between the display panel 30 and the cabinet 10. The air gap 70 provides a space that allows outside air to be introduced, be heat-exchanged with the display unit 35, and be discharged to the outside.

[0087] The air gap 70 has a structure in which air heated by the display unit 35 and/or the control unit 37 is moved by convection.

[0088] The display panel 30 and the cabinet 10 may be completely spaced apart from each other, but portions of the display panel 30 and the cabinet 10 may be in contact with each other. Accordingly, the air gap 70 between the display panel 30 and the cabinet 10 may define a flow path open at least at the top and the bottom.

[0089] Preferably, the air gap 70 between the display panel 30 and the cabinet 10 may define a flow path open at least at the top, the bottom, the left, and the right.

[0090] For example, the air gap 70 may include a first air gap 71 positioned below the display unit 35, a second air gap 72 positioned above the display unit 35, and a third air gap 73 in communication with the first air gap 71 and the second air gap 72.

[0091] The first air gap 71 may be positioned below the control unit 37, the second air gap 72 may be positioned above the control unit 37, and at least a portion of the third gap 73 may be positioned at a same height as the control unit 37.

[0092] The first air gap 71 is a space between a lower end of the display panel 30 and a lower end of the cabinet 10, the second air gap 72 is a space between an upper end of the display panel 30 and an upper end of the cabinet 10, and the third air gap 73 is a space between a middle (or central) portion of the display panel 30 and a middle (or central) portion of the cabinet 10.

[0093] Outside air may be introduced through the first air gap 71, may be heat-exchanged with the display unit 35 and/or the control unit 37 in the third air gap 73, and may be discharged to the outside through the second air gap 72.

[0094] The third air gap 73 may be positioned to horizontally overlap the display unit 35. The third air gap 73 may be positioned behind the display unit 35.

[0095] The inlet 15 may be in communication with the air gap 70. As the air gap 70 and the inlet 15 communicate with each other, outside air is naturally drawn into the inlet 15 through the air gap 70 during the cooling operation of the indoor unit, the flow velocity and flow rate of air flowing through the air gap 70 are increased to thereby improve the cooling capacity. Even when the blower fan 14 rotates at a low speed, the flow velocity and flow rate of the air flowing through the air gap 70 can be increased.

[0096] That is, as the inlet 15 is in communication with the air gap 70, the display unit 35 and the control unit 37 may be cooled simultaneously with the cooling operation.

[0097] Specifically, the inlet 15 may be positioned to overlap at least the third air gap 73 in the front-and-rear direction. The inlet 15 may be positioned behind the third air gap 73.

[0098] As the third air gap 73 is positioned forward relative to the inlet 15, when the blower fan 14 is operated in response to overheating of the control unit 37, or in the cooling mode of operation, air introduced through the air gap 70 is discharged to the outlet 16 through the inlet 15.

[0099] Accordingly, air heat-exchanged with the display unit 35 in the air gap 70 is introduced through the inlet 15, allowing the heat exchange efficiency to be increased.

[0100] A rear surface of the display panel 30 is exposed at the air gap 70. One surface of the display unit 35 may be exposed at the air gap 70. Specifically, the rear surface of the display unit 35 may be exposed at the air gap 70. The rear surface of the display unit 35 may be the largest surface among surfaces of the display unit 35.

[0101] One surface of the control unit 37 may be exposed at the air gap 70. Specifically, a rear surface of the control unit 37 may be exposed at the air gap 70. The rear surface of the control unit 37 may be the largest surface among surfaces of the control unit 37. As the largest surfaces of the display unit 35 and the control unit 37 are exposed at the air gap 70, the heat exchange efficiency can be maximized.

[0102] More heat is generated in the control unit 37 than in the display unit 35, and accordingly, heat is concentrated in the control unit 37. Therefore, the indoor unit of the air conditioner according to an embodiment of the present disclosure may further include an air guide 300 configured to guide or concentrate air flowing through the air gap 70 into the control unit 37.

[0103] For example, the air guide 300 may include a first air guide 310 and a second air guide 320 disposed to face the first air guide 310.

[0104] The control unit 37 may be positioned between the first air guide 310 and the second air guide 320. The first air guide 310 and the second air guide 320 may protrude from one surface of the display unit 35. Specifically, the first air guide 310 and the second air guide 320 may protrude rearward from the rear surface of the display unit 35.

[0105] An acceleration passage 74 may be defined between the first air guide 310 and the second air guide 320. The air guide 300 may have a shape such that top and bottom sides of the control unit 37 are open and left and right sides of the control unit 37 are closed.

[0106] The first air guide 310 may be positioned at the left side of the control unit 37 and may have a longer vertical length than the control unit 37. The second air guide 320 may be positioned at the right side of the control unit 37 and may have a longer vertical length than the control unit 37.

[0107] Portions of the first air guide 310 and the second air guide 320 are positioned to overlap the control unit 37 in the left-and-right direction, and the first air guide 310 and the second air guide 320 are disposed so as not to overlap the control unit 37 in the up-and-down direction.

[0108] Air flowing through the air gap 70 is introduced into a space between the first air guide 310 and the second air guide 320, so as to be guided to the control unit 37.

[0109] The air guide 300 may be divided into a lower section S1, a central section S2, and an upper section S3. The lower section S1 is a section located at a lower height than the control unit 37, the central section S2 is a section having at least a portion located at a same height as the control unit 37, and the upper section S3 is a section located at a higher height than the control unit 37.

[0110] A distance between the first air guide 310 and the second air guide 320 in the lower section S1 may be greater than a distance between the first air guide 310 and the second air guide 320 in the central section S2.

[0111] The first air guide 310 located in the lower section S1 may be referred to as a first lower portion 311; the second air guide 320 located in the lower section S1 may be referred to as a second lower portion 321; the first air guide 310 located in the central section S2 may be referred to as a first central portion 315; the second air guide 320 located in the central section S2 may be referred to as a second central portion 325; the first air guide 310 located in the upper section S3 may be referred to as a first upper portion 313; and the second air guide 320 located in the upper section S3 may be referred to as a second upper portion 323.

[0112] Specifically, a distance between the first lower portion 311 and the second lower portion 321 may be greater than a distance between the first central portion 315 and the second central portion 325.

[0113] The distance between the first air guide 310 and the second air guide 320 in the lower section S1 may decrease toward the central section S2. The distance between the first lower portion 311 and the second lower portion 321 may decrease from bottom to top. The first lower portion 311 may be inclined upward from left to right, and the second lower portion 321 may be inclined upward from right to left.

[0114] Due to the arrangement of the first lower portion 311 and the second portion 321, air introduced to an outside of the air guide 300 is accelerated to thereby increase the flow rate.

[0115] The distance between the first central portion 315 and the second central portion 325 may be constant in the up-and-down direction. A distance between the first air guide 310 and the second air guide 320 in the upper section S3 may be greater than the distance between the first air guide 310 and the second air guide 320 in the central section S2.

[0116] Specifically, a distance between the first upper portion 313 and the second upper portion 323 may be greater than the distance between the first central portion 315 and the second central portion 325.

[0117] The distance between the first air guide 310 and the second air guide 320 in the upper section S3 may decrease toward the central section S2. The distance between the first upper portion 313 and the second upper portion 323 may increase from bottom to top. The first upper portion 313 may be inclined upward from right to left, and the second upper portion 323 may be inclined upward from left to right.

[0118] Due to the arrangement of the first upper portion 313 and the second upper portion 323, the flow velocity of air heat-exchanged with the control unit 35 is slow, which results in an increase in contact time with the display unit 35 and an increase in contact area with the display unit 35.

[0119] The vent hole 351 may be positioned between an upper end (or top) of the first upper portion 313 and an upper end (or top) of the second upper portion 323. A space between the upper end of the first upper portion 313 and the upper end of the second upper portion 323 may vertically overlap a plurality of vent holes 351. The vent hole 351 may be positioned above the space between the upper end of the first upper portion 313 and the upper end of the second upper portion 323.

[0120] Air discharged from the upper section S3 of the air guide 300 is slowed down and spread out to thereby provide time for the air to be introduced into the display unit 35 through the vent hole 351, allowing the heat exchange efficiency to be increased.

[0121] The air guide 300 may serve as a reinforcing member for reinforcing the rigidity of the display unit 35. The air guide 300 prevents warping (or twisting) and vibration of the display unit 35 and reinforces the rigidity of the display unit 35.

[0122] The display panel 30 and the cabinet 10 may be moved relative to each other by a link. The link may

include a connecting link 3a and an auxiliary link 3c.

[0123] The connecting link 3a may be hingedly connected to each of the display panel 30 and the cabinet 10. The connecting link 3a may include a first link 331 having one end (or first end) hinged to the cabinet 10, and a second link 332 having one end (or first end) hinged to the first link 331 and the other end (or second end) hinged to the display panel 30. A length of the second link 332 may be greater than a length of the first link 331. A link motor 3b may be connected to the connecting link 3a.

[0124] The first link 331 is connected to the cabinet 10 by a first hinge 334, the first link 331 is connected to the second link 332 by a second hinge 333, and the second link 332 is connected to the display panel 30 by a third hinge 335.

[0125] The auxiliary link 3c is hingedly connected to each of the display panel 30 and the cabinet 10. A pair of auxiliary links 3c may be provided. The connecting link 3a may be disposed between the pair of auxiliary links 3c.

[0126] The connecting link 3a may be positioned above the auxiliary link 3c, and a total length of the connecting link 3a may be greater than a total length of the auxiliary link 3c.

[0127] The display panel 30 includes a hanger 38. The hanger 38 allows the display panel 30 to be placed on a hanger support portion 210 of the cabinet 10.

[0128] For example, the hanger 38 may protrude rearward from the rear surface of the display panel 30. Specifically, the hanger 38 may include a first member 381 that extends rearward of the display panel 30 from a front surface of the display panel 30 and a second member 382 that extends downward from a rear end of the first member 381. One end of the second member 382 may have a sphere shape to reduce friction.

[0129] The hanger 38 may be disposed to be spaced apart from the connecting link 3a. The hanger 38 may be positioned below the connecting link 3a.

[0130] The hanger 38 may be positioned below the inlet 15. Also, the hanger 38 may be positioned below the display unit 35.

[0131] The cabinet 10 includes the hanger support portion 210. The hanger support portion 210 may protrude forward from the front surface of the cabinet 10. The hanger support portion 210 may define a space on which the hanger 38 is hung.

[0132] For example, the hanger support portion 210 may include an upper hanger support portion 212 and a lower hanger support portion 211 located at a lower position than the upper hanger support portion 212.

[0133] The upper hanger support portion 212 may protrude forward from the front panel 20. Since the upper hanger support portion 212 does not provide the center of rotation during a rotation operation of the display panel 30 and the hanger 38 is only placed thereon in a service state, it is preferable that the upper hanger support portion 212 has a structure that allows the hanger 38 to be easily hung and extends in a horizontal direction to be separated.

[0134] The lower support portion 211 may include a first lower hanger support portion 211a that extends forward from the front panel 20 and a second lower hanger support portion 211b that extends upward from one end of the first lower hanger support portion 211a.

[0135] When the display panel 30 is switched from an open state to a closed state or vice versa, the lower hanger support portion 211 becomes the center of rotation of the display panel 30 as the hanger 38 is hung thereon, and thus, the lower hanger support portion 211 has a structure that protrudes rearward and is bent upward to prevent the separation of the hanger 38.

[0136] The upper hanger support portion 212 and the lower hanger support portion 211 may be disposed adjacent to a lower end of the front panel 20. Specifically, the upper hanger support portion 212 and the lower hanger support portion 211 may be positioned below the inlet 15.

[0137] The display panel 30 may include a closed state, an open state, and a service state.

[0138] Hereinafter, different states of the display panel 30 will be described.

[0139] FIG. 6 is a cross-sectional view showing a closed state of the display panel 30.

[0140] Referring to FIG. 6, the display panel 30 may include a closed state in which the front surface of the cabinet 10 is completely covered by the display panel 30. In the closed state, the display panel 30 may completely overlap the cabinet 10 in the front-and-rear direction, and at least one surface of the display panel 30 may be in contact with at least one surface of the cabinet 10. Also, in the closed state, the display panel 30 and the cabinet 10 are arranged in parallel. That is, in the closed state, the display panel 30 and the cabinet 10 extend in the horizontal direction.

[0141] In the closed state, the hanger 38 is hung on the lower hanger support portion 211, and the connecting link 3a is in a folded state.

[0142] In the closed state, natural convection is caused to dissipate heat from the display panel 30, or the blower fan 14 is operated at a low speed.

[0143] FIG. 7 is a cross-sectional view showing an open state of the display panel 30.

[0144] Referring to FIG. 7, the display panel 30 may include an open state in which the display panel 30 is spaced apart from one end of the cabinet 10. In the open state, an upper end of the display panel 30 may be spaced apart from an upper end of the cabinet 10, and a lower end of the display panel 30 may be in contact with a lower end of the cabinet 10.

[0145] In addition, when switched from the closed state to the open state, the display panel 30 rotates about the lower hanger support portion 211, and the connecting link 3a is unfolded. During the process of switching from the closed state to the open state, the hanger 38 becomes the center of rotation of the display panel 30 while being hung on the lower hanger support portion 211.

[0146] That is, in the open state, the display panel 30 has a slope with respect to the cabinet 10.

[0147] In the open state, the indoor unit performs the cooling or heating operation.

[0148] FIG. 8 is a cross-sectional view showing a service state of the display panel 30, FIG. 9 is a front view showing a service state of the display panel 30, and FIG. 10 is a cross-sectional view showing a portion at which a screw of FIG. 9 is positioned.

[0149] Referring to FIGS. 8 to 10, the display panel 30 may include a service state in which a lower portion of the cabinet 10 is exposed. In the service state, the upper end of the display panel 30 is spaced apart from the upper end of the cabinet 10, and the lower end of the display panel 30 is located at a higher position than the lower end of the cabinet 10.

[0150] Thus, in the service state, the lower end of the cabinet 10 may be exposed at the front, and a cover fastening member 810 may be exposed. The cover fastening member 810 will be described later.

[0151] In other words, the service state is a state in which the display panel 30 in the open state is moved upward. The hanger 38 is hung on the cabinet 19 while the cover fastening member 810 is exposed.

[0152] In the service state, the hanger 38 may be hung on the upper hanger support portion 212, and the lower end of the display panel 30 may be hung on the lower hanger support portion 211. Thus, in the service state, the display panel 30 is securely placed.

[0153] In the service state, since a user may be injured by the blower fan 14 while cleaning, the blower fan 14 is stopped.

[0154] The lower cover 43 is disposed at the second outlet 16c formed in a lower surface of the cabinet 10. The lower cover 43 may be coupled to the cabinet 10 by the cover fastening member 810.

[0155] The cover fastening member 810 may pass through the cabinet 10 to fasten the cover to the cabinet 10. For example, the cover fastening member 810 may include a screw.

[0156] The cover fastening member 810 may be disposed to be adjacent to the lower end of the cabinet 10. The cover fastening member 810 may be positioned below the hanger support portion 210. As the cover fastening member 810 is located below the hanger support portion 210, the cover fastening member 810 is exposed when the hanger 38 is hung on the hanger support portion 210. The cabinet 10 may include a screw hole 231 to which the cover fastening member 810 is fastened.

[0157] The lower cover 43 may include a fastening piece 449 having a through-hole through which the cover fastening member 810 passes.

[0158] FIG. 11 illustrates a state in which the lower cover 43 is removed in a service state of the display panel 30.

[0159] Referring to FIG. 11, in the service state of the display panel 30, the cover fastening member 810 is removed to detach the lower cover 43. When the lower cover 43 is removed in the service state of the display panel 30, the blower fan 14 is exposed through the second outlet 16c. Thus, at least a portion of the blower fan 14 may be positioned to vertically overlap the second outlet 16c.

[0160] The side frame 36 may be removed in the service state of the display panel 30 or before switching to the service state of the display panel 30.

[0161] Hereinafter, a structure of the lower cover 43 will be described.

[0162] FIG. 12 is a plan view of the lower cover 43 according to an embodiment of the present disclosure, and FIG. 13 is a perspective view of the lower cover 43 according to an embodiment of the present disclosure.

[0163] Referring to FIGS. 12 and 13, the lower cover 43 may have a structure that is detachably attached to the cabinet 10 and fastened to the cover fastening member 810.

[0164] For example, the lower cover 43 includes a cover plate 441 that is coupled to the cabinet 10, and a cover opening 443 that is formed through the cover plate 441 and positioned corresponding to the second outlet 16c to allow air discharged to the second outlet 16c is discharged therethrough.

[0165] The cover plate 441 may cover at least the second outlet 16c. Preferably, the cover plate 441 may have a shape and a size corresponding to each side or surface of the base 12, and may cover a lower side or surface of the base 12.

[0166] The cover plate 441 may be provided with a coupling element coupled to the base 12. The coupling element may include a cover hook. The cover hook is inserted into the cabinet 10. The cover hook may include a first cover hook 445 that is disposed at one end of the cover plate 441 and a second cover hook 446 that is disposed at another end of the cover plate 441.

[0167] The lower cover 43 may further include a fastening piece 449 having a through-hole through which the cover fastening member 810 passes. The fastening piece 449 extends from the cover plate 441 in a direction intersecting the cover plate 441.

[0168] FIG. 14 is a control block diagram according to an embodiment of the present disclosure.

[0169] Referring to FIG. 14, the present disclosure may further include a temperature sensor 525, a humidity sensor 530, a cover removal detection sensor 550, and a controller 560.

[0170] The temperature sensor 525 may be installed at the cabinet 10. Specifically, the temperature sensor 525 may be installed to be adjacent to the left inlet 16a or the right inlet 16b. The temperature sensor 525 may provide temperature information to the controller 560.

[0171] The cover removal detection sensor 550 may be installed at the cabinet 10. Specifically, the cover removal detection sensor 550 may be installed to be adjacent to the second outlet 16c of the cabinet 10. The cover removal detection sensor 550 detects whether or not the lower cover 42 is removed and provides relevant infor-

mation to the controller 560. The cover removal detection sensor 550 may be configured as an optical sensor or a switch sensor.

[0172] The humidity sensor 530 may be installed at the cabinet 10. Specifically, the humidity sensor 530 may be installed to be adjacent to the left outlet 16a or the right outlet 16b. The humidity sensor 530 may provide relative humidity information to the controller 560.

[0173] When the cover removal detection sensor 550 detects removal of the cover from the cabinet 10, the controller 560 may control the blower fan 14 to stop. Thus, when cleaning, a user can be prevented from inadvertently cleaning while the blower fan 14 is rotating.

[0174] In addition, when removal of the cover from the cabinet 10 is detected, the controller 560 may control the vane motor 520 to open the outlet 16. When the cover is removed from the cabinet 10, the controller 560 may control such that the control vane 510 opens the second 16c, allowing the blower fan 14 to be exposed through the second outlet 16c.

[0175] The controller 560 may determine a dew formation condition based on temperature and humidity around the cabinet 10 and a rotational speed of the fan motor 14a. When the dew formation condition is satisfied, the controller 560 may control the vane motor 520 such that the control vane 510 closes the second outlet 16c.

[0176] When the second outlet 16c is closed by the control vane 510 under the dew formation condition, the flow velocity of air discharged to the first outlet 16a, 16b increases, thereby preventing the formation of dew on the first outlet 16a, 16b and the second outlet 16c.

[0177] When the temperature around the cabinet 10 is in a predetermined temperature range, the humidity around the cabinet 10 is greater than or equal to predetermined reference humidity, and the rotational speed of the fan motor 14a is less than a reference speed, the controller 560 may determine that the dew formation condition is satisfied.

[0178] In addition, when the dew formation condition is satisfied, the controller 560 may increase the rotational speed of the fan motor 14a from a current rotational speed. When the rotational speed of the fan motor 14a is increased from the current rotational speed based on the dew formation condition being satisfied, the formation of dew on the outlet 16 can be prevented.

[0179] Further, when the temperature of the control unit 37 is higher than a critical temperature, the controller 560 may control the fan motor 14a to rotate the blower fan 14. When the temperature of the control unit 37 is higher than the critical temperature, the controller 560 may control the fan motor 14a to rotate the fan motor 14a at a rotational speed lower than a speed in the normal operation.

[0180] Hereinafter, a control method for preventing injury to a user when removing a cover of the present disclosure will be described in detail.

[0181] FIG. 15 is a flowchart of a control method according to an embodiment of the present disclosure.

[0182] Referring to FIG. 15, the cover removal detection sensor 550 detects removal of the cover and provides relevant information to the controller 560 (S 105).

[0183] Based on the information received from the cover removal detection sensor 550, the controller 560 determines whether or not the cover is removed (S 110).

[0184] Based on a determination that the cover is removed, the controller 560 controls the blower fan 14 to stop by powering off the fan motor 14a (S120).

[0185] Based on a determination that the cover is removed, the controller 560 controls the vane motor 520 such that the control vane 510 opens the second outlet 16c (S130).

[0186] The indoor unit of the present disclosure has one or more of the following effects.

[0187] First, as a lower portion of a cabinet is exposed when a display panel is in a service state, a cover that covers a bottom outlet is able to be removed by removing a screw coupled to the lower portion of the cabinet, and a blower fan is exposed through the bottom outlet, the blower fan can be easily cleaned, through the bottom outlet, with a cleaning brush. In addition, cleaning can be easily done by lifting a service panel, removing screws, and removing a lower cover.

[0188] Second, in a service state in which a lower portion of the cabinet is exposed by the display panel, a hanger provided at the display panel is hung on the cabinet, and thus, cleaning can be done without removing the display panel, which allows even the elderly people to be clean the indoor unit easily.

[0189] Third, as two support portions having a step are provided at the cabinet, and the hanger of the display panel is hung on the two support portions below the display panel, allowing the display panel to be securely placed in the service state.

[0190] Fourth, as the hanger of the display panel is hung on the cabinet in a closed state and an open state of the display panel, the display panel can be securely fixed, and the hanger serves as the center of rotation during the process of switching from the closed state to the open state of the display panel.

[0191] Fifth, as a rear side of an outlet has a shallower inclination angle than a discharge guide, a smooth change in direction can be achieved when air discharged from the outlet through the discharge guide, the air discharged through the outlet can be increased in flow velocity and have a uniform speed, thereby preventing the formation of dew around the outlet.

[0192] Sixth, as the discharge guide located on the same plane as the rear side of the outlet is configured to have a portion with the same inclination angle as the rear side of the outlet and a portion with a greater inclination angle than the rear side of the outlet, allowing air discharged from the outlet to the discharge guide to be more smoothly changed in direction of the air to thereby prevent the formation of dew on the rear side of the outlet. In addition, as the discharge guide has a large angle at the rear side of the outlet, the formation of dew on a wall

adjacent to the rear side of the outlet can be prevented.

[0193] The above-described features, configurations, effects, and the like are included in at least one of the embodiments of the present disclosure, and should not be limited to only one embodiment. In addition, the features, configurations, effects, and the like as illustrated in each embodiment may be implemented with regard to other embodiments as they are combined with one another or modified by those skilled in the art. Thus, content related to these combinations and modifications should be construed as including in the scope of the disclosure as disclosed in the accompanying claims.

Claims

1. An indoor unit (1) of an air conditioner comprising:

   a cabinet (10) provided with an inlet (15) for introducing air and an outlet (16) for discharging air;
   a heat exchanger (50) disposed in the cabinet (10);
   a blower fan (14) disposed in the cabinet (10);
   a display panel (30) detachably attached to the cabinet (10); and
   a connecting link (3a) hingedly connected to each of the display panel (30) and the cabinet (10),
   wherein the display panel (30) comprises a hanger (38) configured to be hung on a hanger support portion (210) of the cabinet (10).

2. The indoor unit of claim 1, wherein the connecting link (3a) is positioned above the hanger (38) and/or the connecting link (3a) is spaced apart from the hanger (38).

3. The indoor unit of any one of claims 1 or 2, wherein the hanger (38) is positioned below the inlet (15).

4. The indoor unit of any one of the preceding claims, wherein the hanger (38) protrudes rearward from a rear surface of the display panel (30), and/or the hanger support portion (210) protrudes forward from a front surface of the cabinet (10).

5. The indoor unit of any one of the preceding claims, wherein the hanger (38) comprises:

   a first member (381) extending from the display panel (30) in one direction; and
   a second member (382) extending from one end of the first member (381) in a direction intersecting the first member (381).

6. The indoor unit of any one of the preceding claims, wherein the display panel (30) includes:

   a closed state in which the front surface of the cabinet (10) is completely covered; and
   a service state in which a lower portion of the cabinet (10) is exposed.

7. The indoor unit of any one of the preceding claims, wherein the hanger (38) is hung on a lower hanger support portion (211) in the closed state and is hung on an upper hanger support portion (212) in the service state.

8. The indoor unit of claim 6 or 7, wherein a lower end of the display panel (30) is hung on the lower hanger support portion (211) in the service state.

9. The indoor unit of claim 6, 7 or 8, wherein the display panel (30) further includes an open state in which the display panel (30) is spaced apart from one end of the cabinet (10), and the hanger (38), during a process of switching from the closed state to the open state, becomes a center of rotation while being supported on the lower hanger support portion (211).

10. The indoor unit of any one of the preceding claims, further comprising:

    a cover (41, 42, 43) detachably coupled to the cabinet (10) to cover at least the outlet (16); and
    a cover fastening member (810) passing through the cabinet (10) to fasten the cover (41, 42, 43) to the cabinet (10).

11. The indoor unit of claim 10, wherein the display panel (30), wherein the cover fastening member (810) is exposed in the service state.

12. The indoor unit of any one of the preceding claims, wherein the connecting link (3a) comprises:

    a first link (331) having a first end hinged to the cabinet (10); and
    a second link (332) having a first end hinged to the first link (331) and a second end hinged to the display panel (30).

13. The indoor unit of claim 12, wherein a length of the second link (332) is greater than a length of the first link (331).

14. The indoor unit of any one of the preceding claims, further comprising:

    a cover removal detection sensor (550) configured to detect removal of the cover (41, 42, 43) from the cabinet (10);
    a controller (560) configured to control the blower fan (14) to stop based on a detection result of the cover removal detection sensor (550).

15. The indoor unit of any one of the preceding claims, further comprising:

a control vane (510) configured to open and close the outlet (16); and
a vane motor (520) configured to rotate the control vane (510),
wherein the controller (560) is configured to control the vane motor (520) to open the outlet (16) based on the removal of the cover (41, 42, 43) from the cabinet (10) being detected.

Fig. 1

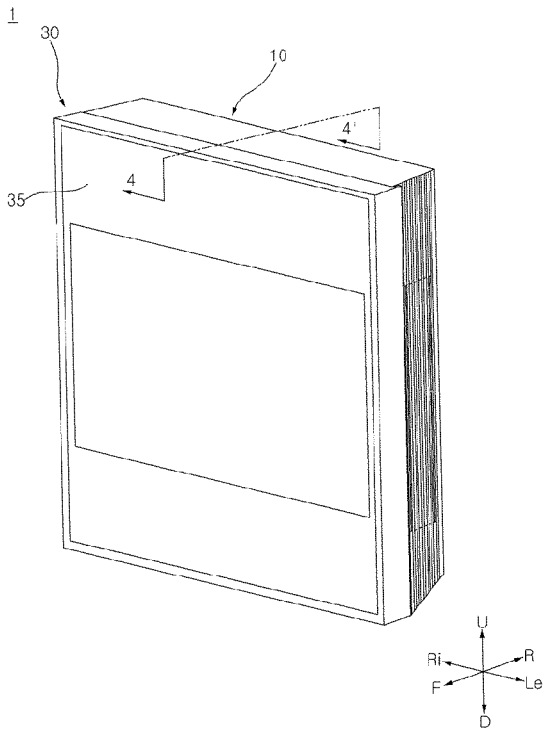


Fig. 2

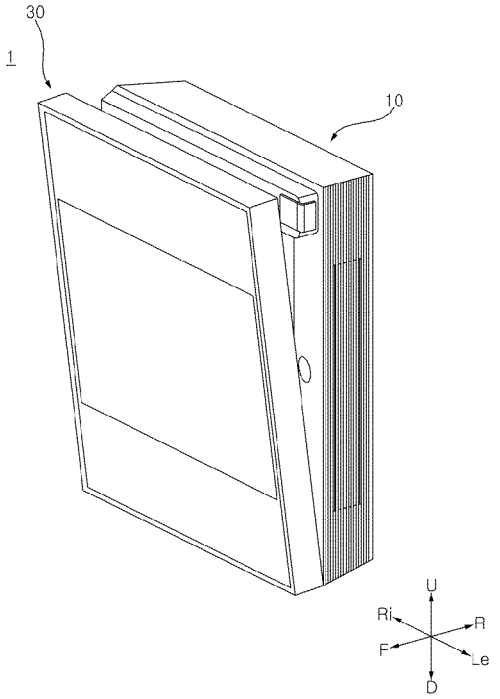


Fig. 3

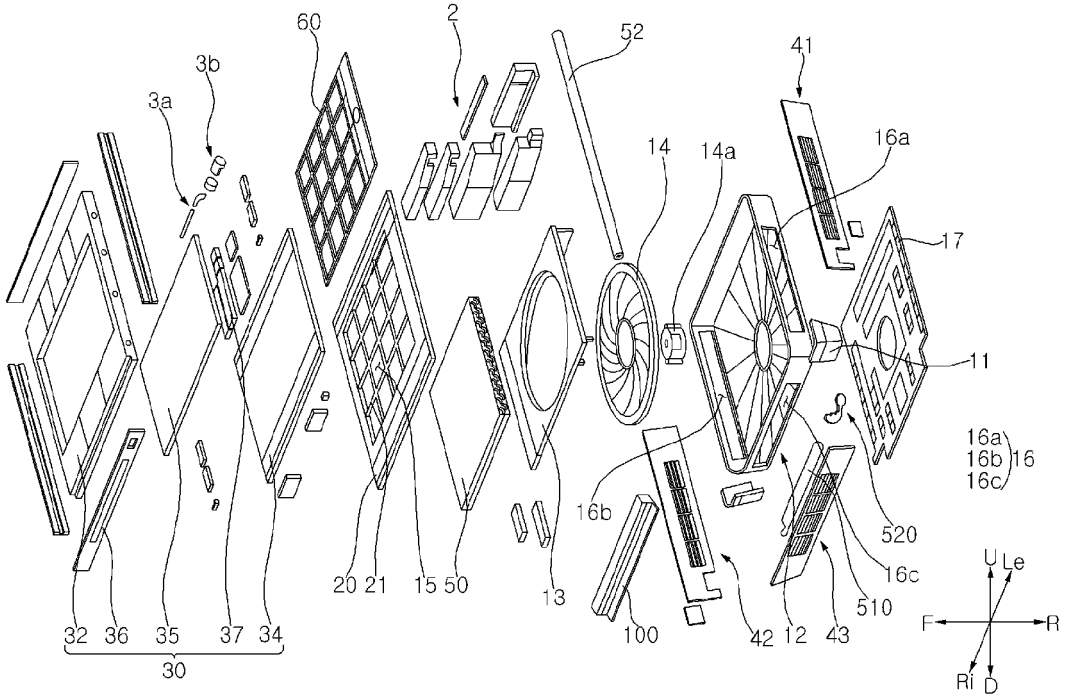


Fig. 4

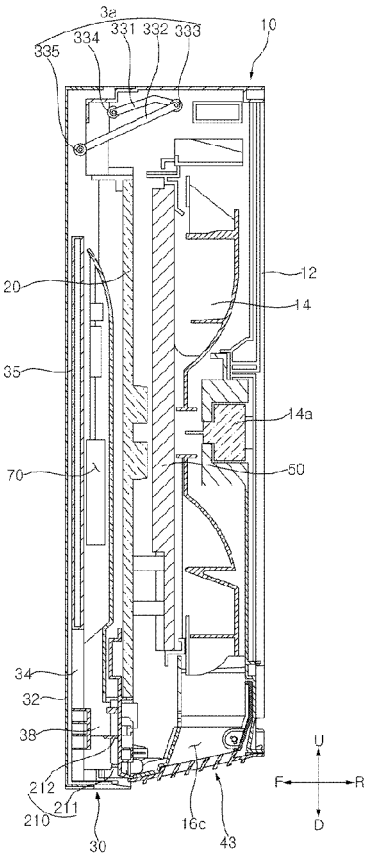

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Fig. 5

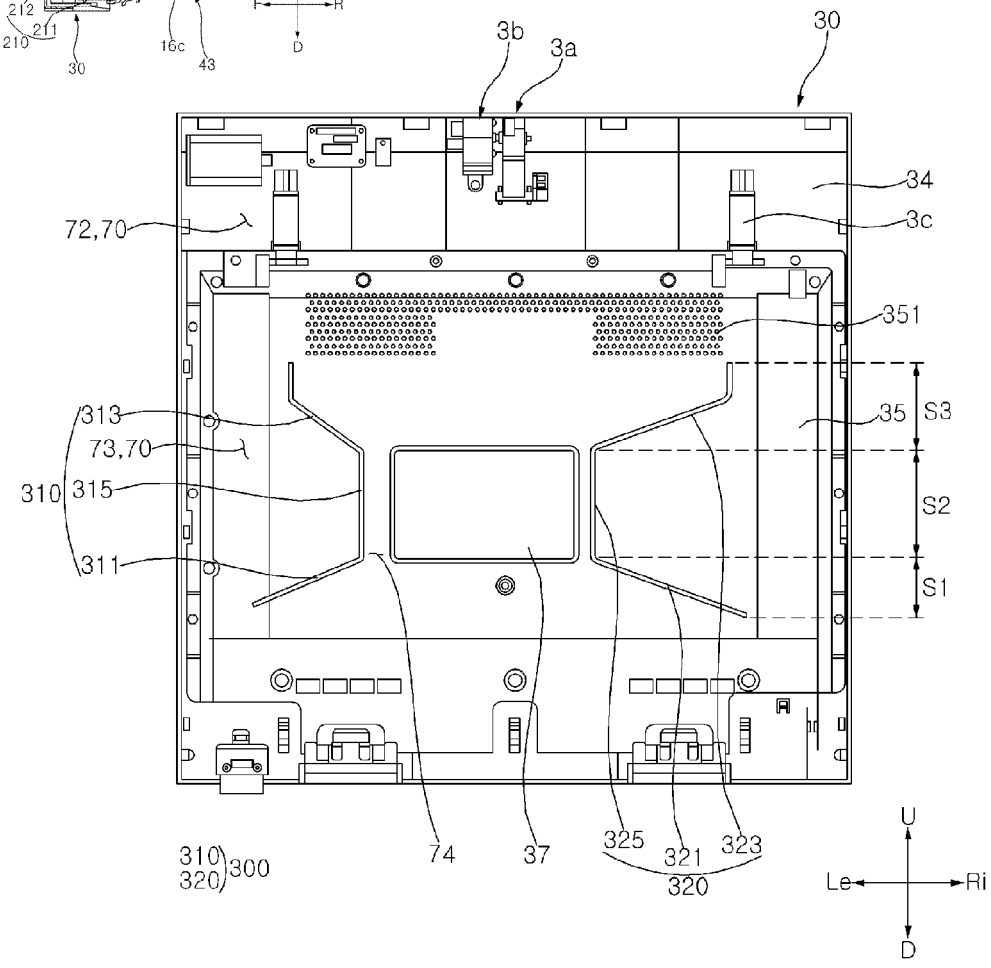
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Fig. 6

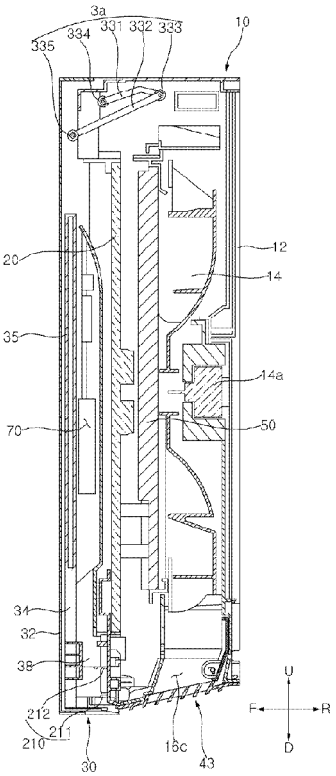


Fig. 7

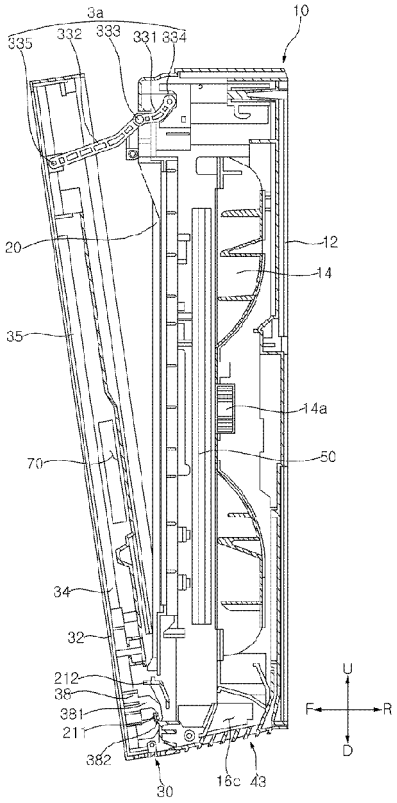


Fig. 8

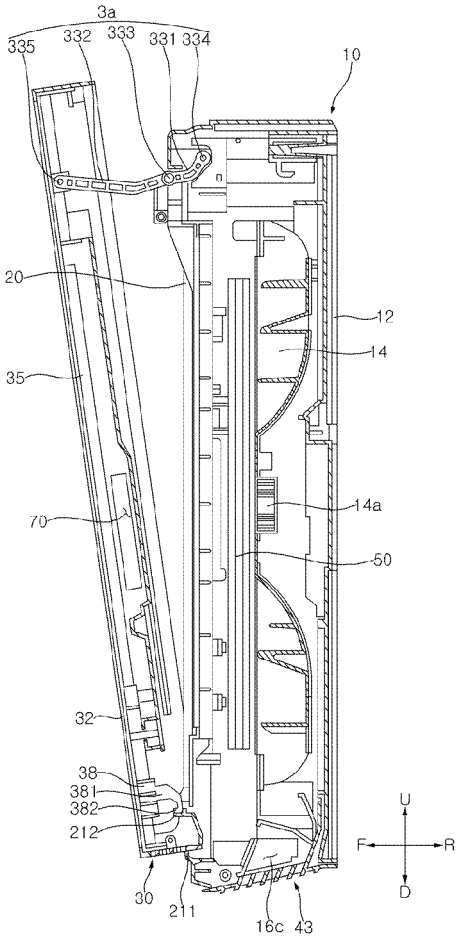


Fig. 9

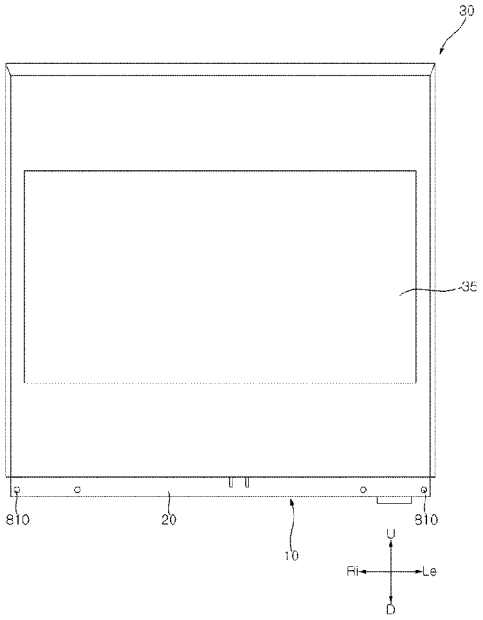


Fig. 10

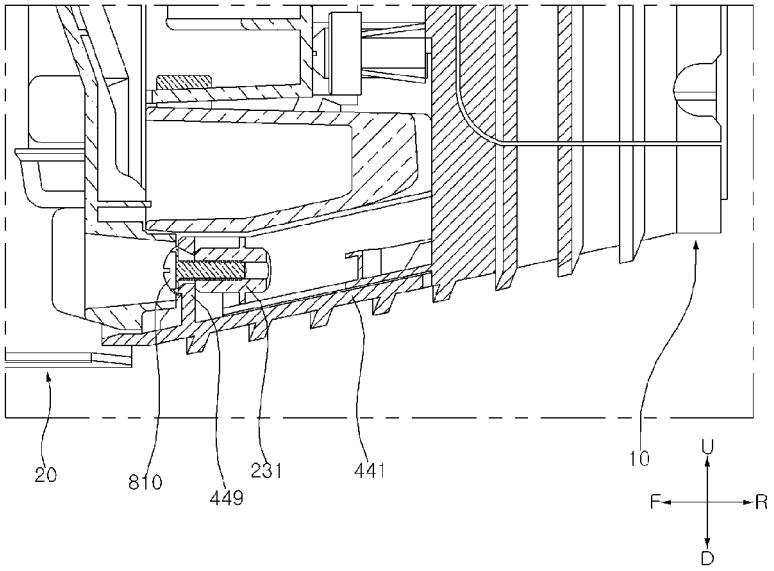


Fig. 11

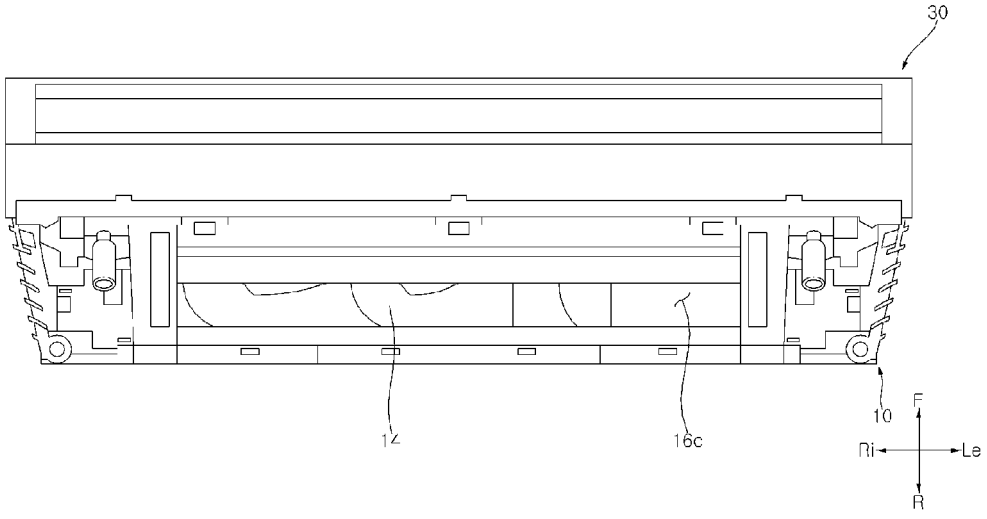


Fig. 12

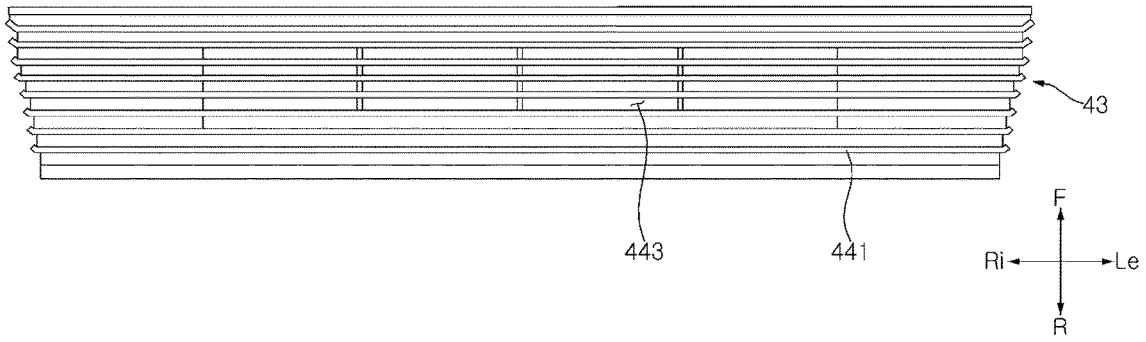


Fig. 13

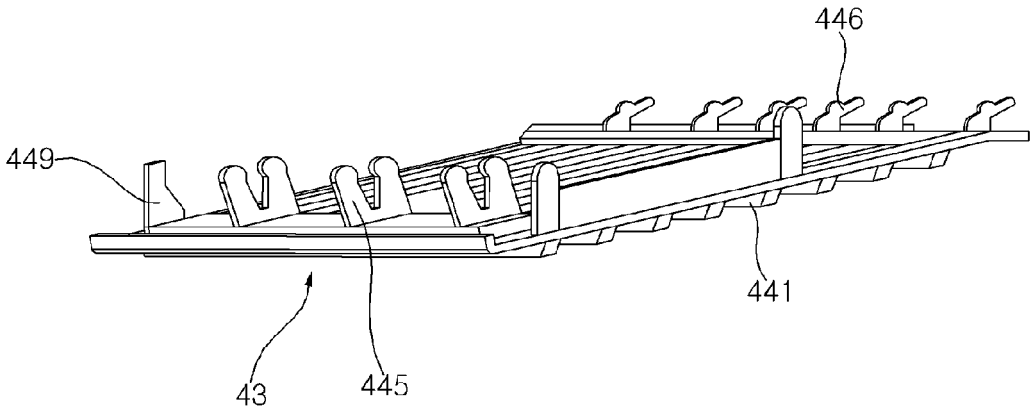


Fig. 14

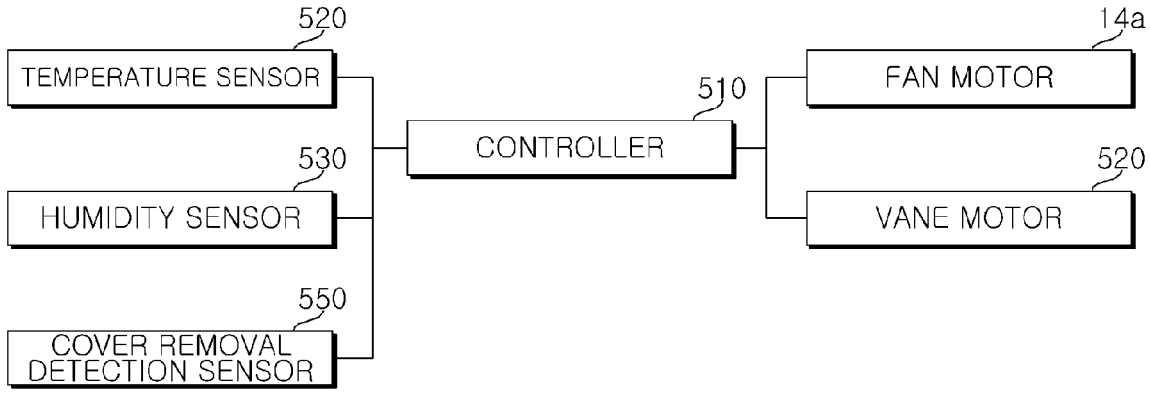
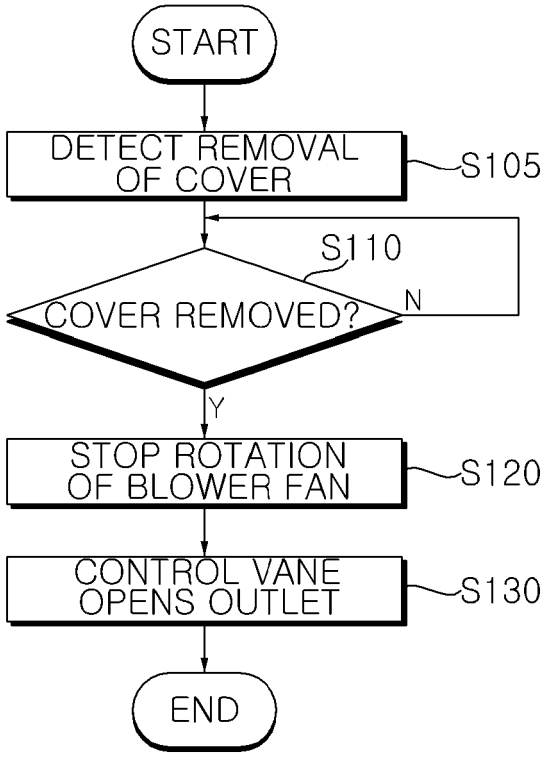


Fig. 15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Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 23 22 0257

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	CN 101 017 011 A (LG ELECTRONICS INC [KR]) 15 August 2007 (2007-08-15) * figures 1-15 *	1-15	INV. F24F1/0057 F24F13/20 F24F1/0063
A	US 2002/189274 A1 (LEE HAE RIM [KR] ET AL) 19 December 2002 (2002-12-19) * figures 1-12 *	1-15	
A	KR 2007 0077642 A (LG ELECTRONICS INC [KR]) 27 July 2007 (2007-07-27) * figures 1-11 *	1-15	

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	17 April 2024	Ismail, Youssef

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