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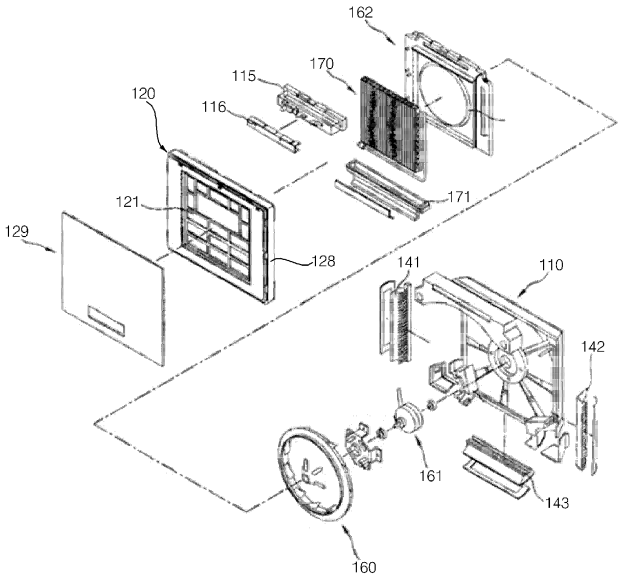
(54) AIR CONDITIONER

(57) The present disclosure relates to an air conditioner. An air conditioner according to one aspect of the present disclosure may comprise a case having a space therein; a front panel coupled to a front portion of the case and forming a suction port; a fan disposed in the case and rotating with respect to a rotational axis that extends in a front-rear direction; a discharge grille that is disposed at a position that a rotational direction of the fan is directed upward, the discharge grille through which air blown by the fan is discharged; and a guide disposed at the discharge grille and curved downward along a direction toward an outside of the case, thereby directing the discharged air to flow downward.

FIG. 4



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Description

[0001] This application claims priority from Korean Patent Application No. 10-2022-0104833, filed on August 22, 2022, in the Korean Intellectual Property Office.

[Technical Field]

[0002] The present disclosure is related to an air conditioner, more specifically, to an indoor unit of the air conditioner.

[Background Art]

[0003] An air conditioner is a device that exchanges heat with sucked air and supplies the heat-exchanged air to the indoors.

[0004] The indoor unit of an air conditioner is equipped with a fan and a heat exchanger, which exchange heat by sucking indoor air and supply it to the indoors.

[0005] Some of these indoor units are equipped with a flat front panel, which enhances the aesthetic sensibility by using the front panel as a picture frame.

[0006] However, in the case of the frame-type indoor unit, since the front surface thereof is used as the pirture frame, the sucked air should be discharged through lateral sides of the indoor unit, resulting in air flowing upward along the fan's rotation direction can not reach to the user by friction with the wall surface.

[0007] In addition, in case of the frame-type indoor unit, there was a problem with the non-uniform dispersion of the discharged air throughout the indoor space due to a significant difference in angles of the flow direction of air discharged through the two lateral sides.

[Prior Arts]

[0008] Korean Registered Patent Gazette 10-0714591, Korean Registered Patent Gazette 10-0714592

[Disclosure of Invention]

[Technical Problem]

[0009] The present disclosure aims to solve the above problem and other problems.

[0010] Another objective of the present disclosure is to provide an indoor unit that a front surface thereof is flat.

[0011] Another objective of the present disclosure is to discharge air laterally from the indoor unit.

[0012] Another objective of the present disclosure is to control an angle that an air flow is discharged.

[0013] Another objective of the present disclosure is to reduce friction between the discharged air flow and a wall surface.

[0014] Another objective of the present disclosure is to promote diffusion of the discharged air.

[0015] Another objective of the present disclosure is to simplify a structure of an air guide.

[0016] Another objective of the present disclosure is to reduce a flow resistance of the indoor unit.

[0017] The objectives of the present invention are not limited to the objectives mentioned above, and other objectives not mentioned would be clearly understood from the following description by those who skilled in the art.

[Technical Solution]

[0018] The objects of the present invention are solved by the features of the independent claims. Preferred embodiments are given in the dependent claims.

[0019] To solve above technical problems, an air conditioner of one aspect of the present disclosure comprises a case having an inner space.

[0020] The air conditioner comprises a front panel coupled to a front portion of the case and forming a suction port.

[0021] The air conditioner comprises a fan disposed inside the case and rotating with respect to a rotational axis which extends in a front-rear direction.

[0022] The air conditioner comprises a discharge grille that is disposed at a location where a rotational direction of the fan directs upward, and that air blown by the fan is discharged therethrough.

[0023] The air conditioner may comprise a guide disposed at the discharge grille and extending curvedly downward when it goes outward of the case, thereby converting flow direction of air discharged to direct downward.

[0024] The fan may comprise a plurality of blades spaced apart in a rotational direction of the fan.

[0025] The guide may extend curvedly toward the blade.

[0026] The guide may extend curvedly upward at a position adjacent to the fan and may extend curvedly in a horizontal direction when it goes away from the fan.

[0027] The guide may comprise an outer end portion that faces an outside of the case.

[0028] The guide may comprise an inner guide that faces the fan and that is curved along an up-down direction.

[0029] The guide may compise an outer guide that faces an outside of the case and that extends along a horizontal direction.

[0030] The guide may comprise an inner end portion tilted at an angle of 38 to 42 degrees from the horizontal direction.

[0031] The guide may comprise an outer end portion that is parallel to the horizontal direction.

[0032] The guide may comprise a first guide spaced apart from the fan.

[0033] The guide may comprise a second guide spaced downward from the first guide.

[0034] The first guide may be positioned to be higher than a rotation center of the fan.

[0035] The second guide may be positioned to be lower than a rotation center of the fan.

[0036] The first guide and the second guide may be positioned on a circle extending along a rotational direction of the fan.

[0037] A length of the first guide may be shorter than a length of the second guide.

[0038] The first guide may comprise a first inner guide that faces the fan.

[0039] The first guide may comprise a first outer guide that extends from the first inner guide toward an outside of the case.

[0040] The second guide may comprise a second inner guide that faces the fan.

[0041] The second guide may comprise a second outer guide that extends from the second inner guide toward an outside of the case.

[0042] A length of the first inner guide may be shorter than a length of the second inner guide.

[0043] The first guide may curvedly extend with a first radius of curvature.

[0044] The second guide may curvedly extend with a second radius of curvature which is equal to the first radius of curvature.

[0045] The air conditioner may comprise a first inner guide and a second inner guide which are disposed at a side of the fan and are spaced apart in an up-down direction.

[0046] The discharge grille, the first guide and the second guide may be disposed between the first inner guide and the second inner guide.

[0047] A vertical distance between the first inner guide and the second inner guide may be smaller than a vertical distance between the first guide and the second guide.

[0048] The air conditioner may comprise an inner guide that is disposed below the discharge grille and that faces the guide in an up-down direction.

[0049] The inner guide may comprise a first surface disposed below the guide.

[0050] The inner guide may comprise a second surface that is bent downward from the first surface.

[0051] The inner guide may be curved along an extending direction of the guide and may have a radius of curvature which is greater than a radius of curvature of the guide.

[0052] The inner guide may have an end portion which is inclined with respect to the horizontal direction.

[0053] An inclination angle of the inner guide may be smaller than an inclination angle of an end portion of the guide.

[0054] The air conditioner may comprise an auxiliary guide disposed at a position which is symmetric to the guide with respect to the fan.

[0055] The auxiliary guide may comprise a first auxiliart guide and a second auciliary guide which is spaced downward from the first auxiliart guide.

[0056] The auxiliary guide may comprise a third auxiliary guide spaced downward from the second auxiliary guide.

[0057] A length of the second auxiliary guide may be greater than legnths of the first auxiliary guide and the third auxiliary guide.

[0058] Details of the embodiments and the like are included in the detailed description and drawings.

[Advantageous Effects of Invention]

[0059] According to at least one embodiment of the disclosure, it is possible to discharge air laterally by a guide disposed at an outlet.

[0060] According to at least one embodiment of the disclosure, it is possible to control an angle of a flow direction of the discharged air by regulating an angle of the guide.

[0061] According to at least one embodiment, it is possible to reduce frinction between a wall surface and the discharged flow by controlling the angle of the flow direction of the discharged air.

[0062] According to at least one embodiment of the disclosure, it is possible to easily diffuse the discharged air indoors by controlling the angle of the flow direction of the discharged air.

[0063] Further, it is possible to save manufacturing cost by simplifying a shape of the guide.

[0064] According to at least one embodiment of the present disclosure, it is possible to minimize vortex formed in the outlet by installing the guide at the outlet.

[0065] The effects of the present invention are not limited to the effects mentioned above, and other effects not mentioned would be clearly understood from the claims by those who skilled in the art.

[Brief Description of Drawings]

[0066]

FIG. 1 shows a concept of the air conditioner of an embodiment of the present disclosure.

FIG. 2 shows a perspective view of an indoor unit of an embodiment of the present disclosure.

FIG. 3 shows a perspective view of an indoor unit of an embodiment of the present disclosure.

FIG. 4 shows an exploded view of an indoor unit of an embodiment of the present disclosure.

FIG. 5 shows an inner structure of an indoor unit of an embodiment of the present disclosure.

FIG. 6 shows a part of an indoor unit of an embodiment of the present disclosure.

FIG. 7 a contour for describing an effect of an air conditioner of an embodiment of the disclosure.

FIG. 8 shows an inner structure of an indoor unit of an embodiment of the present disclosure.

[Mode for the Invention]

[0067] Below, a detailed explanation of the exemplary

embodiment described in this specification is provided with reference to the attached drawings. Regardless of reference signs, elements that are identical or similar are assigned the same reference numbers, and same descriptions regarding these elements are omitted.

[0068] The suffixes "module" and "part, portion" used for the components in the following explanation are assigned or used interchangeably solely for the convenience of specification drafting and do not inherently indicate distinct meanings or roles.

[0069] Furthermore, if a detailed explanation of related known techniques, which may obscure the essence of the exemplary embodiment described in this specification, is deemed unnecessary, such explanation will be omitted. Additionally, the attached drawings are provided solely to facilitate understanding of the exemplary embodiment described in this specification and should not restrict the technical ideas disclosed herein. It should be understood that the attached drawings encompass all modifications, equivalents, and substitutions, including uniform materials or alternative substances, that fall within the scope of the present disclosure.

[0070] Terms containing ordinal numbers such as "first," "second," etc., can be used to describe various elements, but the aforementioned terms are not limiting the elements. The aforementioned terms are used solely for the purpose of distinguishing one element from another.

[0071] When an element is mentioned to be "connected" or "joined" to another element, it should be understood that the element may be directly connected or j oined to the other element, but there may also be other elements therebetween. On the other hand, when an element is mentioned to be "directly connected" or "directly joined" to another element, it should be understood that there are no other components therebetween.

[0072] The singular form includes the plural form unless explicitly stated otherwise in the context.

[0073] Referring to FIG. 1, an air conditioner 1 is described.

[0074] FIG. 1 conceptually shows a connection between an outdoor unit 2 and an indoor unit 100 of the air conditioner 1.

[0075] The air conditioner 1 may comprise the outdoor unit 2. The outdoor unit 2 may be installed at an outdoor space. The outdoor unit 2 may comprise an outdoor heat exchanger (not shown), an outdoor fan (not shown), a compressor (not shown), and an expansion device (not shown). The description of the general outdoor unit of air conditioner may be applied to the description of the outdoor unit 2.

[0076] The air conditioner 1 may comprise the indoor unit 100. The indoor unit 100 may be installed at an indoor space.

[0077] The indoor unit 100 may comprise a front panel 120. A front surface of the front panel 120 may be flat. The front panel 120 may be used as a picture frame. For example, a picture may be drawn on the front surface of the front panel 120. For example, another picture frame may be installed at the front surface of the front panel 120.

[0078] The air conditioner 1 may comprise a refrigerant pipe 3. The refrigerant pipe 3 may connect the outdoor unit 2 and the indoor unit 100. The refrigerant compressed by the compressor (not shown) inside the outdoor unit 2 may circulate between the outdoor unit 2 and the indoor unit 100 through the refrigerant pipe 3.

[0079] Referring to FIGS. 2 and 3, the indoor unit 100 is described.

[0080] FIG. 2 show a perspective view of the indoor unit 100. FIG. 3 shows a perspective view of the indoor unit 100 that the front panel 120 is moved forward.

[0081] The indoor unit 100 may comprise a case 110. The case 110 may have a space therein. The case 110 may be installed on a wall of the indoor space. A cross section of the case 110 may have a rectangular shape.

[0082] The indoor unit 100 may comprise the front panel 120. The front panel 120 may be coupled to the case 110. A cross section of the front panel 120 may have a rectangular shape. The front surface of the front panel 120 may be flat. A user may install a picture frame at the front surface of the front panel 120. In addition, a picture may be made on the front surface of the front panel 120. The user may install a picture frame on a front plate 129. A picture may be drawn on a front surface of the front plate 129.

[0083] The indoor unit 100 may comprise a discharge grille 140. The discharge grille 140 may be disposed at a lateral side of the case 110. The discharge grille 140 may be disposed at a lower portion of the case 110. Air sucked into the case 110 may be supplied to the indoor space through the discharge grille 140.

[0084] The front panel 120 may move against the case 110 in forward and backward directions. The front panel 120 may be coupled to the case 110 to be movable in the forward and backward directions. The front plate 129 of the front panel 120 may be moved in the forward and backward directions.

[0085] The indoor unit 100 may comprise a connector 150. The connector 150 may connect the case 110 and the front panel 120. A length of the connector 150 may be variable. The connector 150 may connect the front plate 129 and a main body 128 of the front panel 120.

[0086] The connector 150 may comprise a first connector 151 coupled to the front plate 129. The connector 150 may comprise a second connector 152 coupled to the main body 128 of the front panel 120. The connector 150 may comprise a joint 153 connecting the first connector 151 and the second connector 152. The joint 153 may be rotatable. When the front plate 129 moves forward and backward, the first and second connectors 151, 152 can move forward and backward, and the joint 153 can rotate.

[0087] The indoor unit 100 may comprise a filter 121. The filter 121 may be disposed between the front plate 129 and the body 128 of the front panel 120. The filter 121 may remove foreign substances contained in air in-

troduced into the case 110.

[0088] The indoor unit 100 may comprise a suction port 130. The suction port 130 may be between the front plate 129 and the main body 128 of the front panel 120. The filter 121 may be disposed at the suction port 130. An indoor air may be introduced into the case 110 through the suction port 130.

[0089] The front plate 129 may move forward, thereby opening the suction port 130. The front plate 129 may move backward, thereby closing the suction port 130. When the air conditioner 1 operates, the front plate 129 may move forward to open the suction port 130. When the air conditioner 1 is stopped, the front plate 129 may move backward to close the suction port 130. The suction port 130 may mean a space between the main body 128 of the front panel 120 and the front plate 129.

[0090] Referring to FIG. 4, the indoor unit 100 is described.

[0091] FIG. 4 shows an exploded view of the indoor unit 100.

[0092] The indoor unit 100 may copmrise the front panel 120. The front panel 120 may be coupled to a front of the case 110.

[0093] The indoor unit 100 may comprise the filter 121. The filter 121 may be disposed at the front panel 120.

[0094] The indoor unit 100 may copmrise the front plate 129. The front plate 129 may be a part of the front panel 120. The front plate 129 may move against the case 110 in forward and backward directions. The front plate 129 may be disposed at the front panel 120 to be movable in the forward and backward directions. The connector 150 (refer to FIG. 3) may connect the front plate 129 and the body 128 of the front panel 120. The front plate 129 may be a flat plate.

[0095] The indoor unit 100 may comprise a control box 115. The control box 115 may control driving of a fan 160. A PCB(Printed Circuit Board) may be disposed inside the control box 115. The control box 115 may be disposed inside the case 110.

[0096] The indoor unit 100 may comprise a control panel 116. The control panel 116 may be connected to the control box 115. A user may control driving of the fan 160 by controlling the control panel 116.

[0097] The indoor unit 100 may comprise a heat exchanger 170. The heat exchanger 170 may be connected to the refrigerant pipe 3 (see FIG. 1). Air sucked into the case 110 may exchange heat with the heat exchanger 170. The heat exchanger 170 may be disposed inside the case 110.

[0098] The indoor unit 100 may comprise a drain pan 171. The drain pan 171 may be disposed under the heat exchanger 170. Condensed water generated at the heat exchanger 170 may fall to the drain pan 171.

[0099] The indoor unit 100 may comprise the fan 160. The fan 160 may be disposed inside the case 110. The fan 160 may suck air outside the case 110. The fan 160 may be a turbo fan.

[0100] The indoor unit 100 may comprise a fan motor 161. The fan motor 161 may rotate the fan 160. The fan motor 161 may be fixed to the case 110.

[0101] The indoor unit 100 may copmrise a fan housing 162. The fan housing 162 may be coupled to the case 110. The fan 160 may be disposed inside the fan housing 162. The fan housing 162 may be named as an "orifice".

[0102] The indoor unit 100 may comprise discharge grilles 141, 142, and 143. A plurality of discharge grilles 141, 142, and 143 may be disposed.

[0103] The indoor unit 100 may copmrise a first discharge grille 141. The first discharge grille 141 may be disposed on one side of the indoor unit 100.

[0104] The indoor unit 100 may comprise a second discharge grille 142. The second discharge grille 142 may be disposed on the other side of the indoor unit 100.

[0105] The indoor unit 100 may comprise a third discharge grille 143. The third discharge grille 143 may be disposed below the indoor unit 100.

[0106] Air sucked into the indoor unit 100 by the fan 160 may be discharged to an outside of the indoor unit 100 through the first to third discharge grills 141, 142, and 143. The air sucked in by the fan 160 may be discharged to both lateral sides and to a bottom side of the indoor unit 100.

[0107] Referring to FIG. 5, the indoor unit is described.

[0108] FIG. 5 shows an inside of the indoor unit 100 while the front panel 120 is removed.

[0109] The first discharge grille 141 may open toward a left side of the indoor unit 100 as shown in FIG. 5.

[0110] The second discharge grille 142 may open toward a right side of the indoor unit 100 as shown in FIG. 5.

[0111] The third discharge grille 143 may open toward a bottom side of the indoor unit 100 as shown in FIG. 5.

[0112] Air blown by the fan 160 may flow to the outside of the indoor unit 100 through the first to third discharge grills 141, 142, and 143.

[0113] The fan 160 may rotate counterclockwise as shown in FIG. 5. The fan 160 may rotate counterclockwise with respect to a rotation center O.

[0114] The fan 160 may rotate downwardly A in an area adjacent to the first discharge grille 141. Accordingly, air discharged through the first discharge grille 141 may be blown in a downwardly inclined direction.

[0115] The fan 160 may rotate upwardly B in an area adjacent to the second discharge grille 142. Accordingly, air discharged through the second discharge grille 142 may be blown in an upwardly inclined direction.

[0116] In thie case, the indoor unit 100 may be installed at a wall surface adjacent to the ceiling. Since the indoor unit 100 is installed to be adjacent to the ceiling, the air blown in the upwardly inclined direction through the second discharge grille 142 may collide with the ceiling and not diffuse into the indoor space. Accordingly, it is necessary to adjust flow angle of the air discharged through the second discharge grille 142.

[0117] The indoor unit 100 may comprise a guide 180. The guide 180 may be disposed at the discharge grille 142. The guide 180 may extend towards fan 160. A plu-

rality of guides 180 may be disposed to be spaced apart in a top-bottom direction. The plurality of guides 180 may be spaced apart from each other along a rotational direction of the fan 160.

[0118] The guide 180 may comprise a first guide 181. The first guide 181 may extend from the discharge grille 142 toward the fan 160. The first guide 181 may extend in a downwardly curved shape. The first guide 181 may be inclined at an inclination angle $\theta 1$ with respect to a horizontal direction.

[0119] The guide 180 may comprise a second guide 182. The second guide 182 may extend from the discharge grille 142 toward the fan 160. The second guide 182 may extend in a downwardly curved shape. The second guide 182 may be inclined at an inclination angle $\theta 2$ with respect to the horizontal direction. The second guide 182 may be spaced downward from the first guide 181.

[0120] The first guide 181 and the second guide 182 may be located on a virtual line C. The virtual line C may be circular. The virtual line C may be circular with a predetermined diameter with respect to the rotation center O of the fan 160. End portions of the first guide 181 and the second guide 182 may be spaced apart from each other on the virtual line C. The virtual line C may be spaced apart outward from the fan 160. The first guide 181 and the second guide 182 may be spaced outward from the fan 160.

[0121] The fan 160 may copmrise a rotational center portion 162. The rotational center portion 162 may form the rotation center O. The fan motor 161 (see FIG. 4) may be coupled to the rotational center portion 162.

[0122] The fan 160 may comprise a hub 163. The hub 163 may extend from the rotational central portion 162 in a radially outward direction.

[0123] The fan 160 may comprise a shroud 164. The shroud 164 may extend from the hub 163 in the radially outward direction.

[0124] The fan 160 may comprise blades 165. The blades 165 may extend from the rotational central portion 162 in the radially outward direction. The blade 165 may have air foil shape. The blades may be spaced apart from each other and may be arranged along a rotational direction of the fan 160.

[0125] The blade 165 may comprise a positive pressure surface 165a. The positive pressure surface 165a may form one surface of the blade 165. The positive pressure surface 165a may extend in a radially outward direction of the fan 160.

[0126] The blade 165 may comprise a negative pressure surface 165b. The negative pressure surface 165b may form the other surface of the blade 165 which is opposite to the positive pressure surface 165a. The negative pressure surface 165b may extend in the radially outward direction of the fan 160.

[0127] The blade 165 may comprise a leading edge 165c. The leading edge 165c may connect the positive pressure surface 165a and the negative pressure surface 165b. The leading edge 165c may be connected to the hub 163.

[0128] The blade 165 may comprise a tip 165d. The tip 165d may connect the positive pressure surface 165a and the negative pressure surface 165b. The tip 165d may be connected to the shroud 164.

[0129] The blade 165 may extend from the leading edge 165c to the tip 165d. The leading edges 165c of the plurality of blades 165 may be located on a same circular line. The tips 165d of the plurality of blades 165 may be located on a same circular line.

[0130] A circular line formed by the tips 165d of the plurality of blades 165 may have a first diameter D1. The plurality of tips 165d may be spaced apart from the rotation center O by half of the first diameter D1.

[0131] An end portion of the shroud 164 may have a second diameter D2. The end portion of the shroud 164 may be spaced apart from the rotation center O by half of the second diameter D2.

[0132] The virtural line C on which the guides 180 are positioned may have a third diameter D3. The first guide 181 and the second guide 182 may be spaced apart from the rotation center O by half of the third diameter D3.

[0133] The guide 180 may be located farther from the rotation center O than the shroud 164 and the blade 165. The third diameter D3 may be larger than the first diameter D1. The third diameter D3 may be larger than the second diameter D2.

[0134] The second diameter D2 may be within a range of 475 mm to 485 mm. The third diameter D3 may be within a range of 540 mm to 550 mm.

[0135] The indoor unit 100 may comprise a first inner guide 191. The first inner guide 191 may be disposed inside the case 110. The first inner guide 191 may be disposed below the first discharge grille 141. The first inner guide 191 may be disposed at a lateral side of the third discharge grille 143. The first inner guide 191 may be disposed outside the fan 160. The first inner guide 191 may guide air blown by the fan 160 toward the first and third discharge grilles 141, 143.

[0136] The indoor unit 100 may comprise a second inner guide 192. The second inner guide 192 may be disposed inside the case 110. The second inner guide 192 may be disposed below the second discharge grille 142. The second inner guide 192 may be disposed at a lateral side of the third discharge grille 143. The second inner guide 192 may be disposed outside the fan 160. The second inner guide 192 may guide the air blown by the fan 160 to the second and third discharge grilles 142, 143. The second inner guide 192 may be spaced apart from the first inner guide 191 in a horizontal direction. The first inner guide 191, the second inner guide 192, and a third inner guide 193 may be named as "inner guide".

[0137] The indoor unit 100 may comprise the third inner guide 193. The third inner guide 193 may be disposed inside the case 110. The third inner guide 193 may be disposed above the first and second discharge grilles 141, 142. The third inner guide 193 may be disposed

above the fan 160. The third inner guide 193 may guide the air blown by the fan 160 toward the first and second discharge grilles 141, 142. The third inner guide 193 may extend in a curved shape along the horizontal direction.

[0138] Each of the first, second, and third inner guides 191, 192, 193 may be named one of a first inner guide, a second inner guide, and a third inner guide. For example, the second inner guide 192 may be named as first inner guide or third inner guide.

[0139] The third inner guide 193 may be spaced upward from the second inner guide 192. The second discharge grille 142 may be disposed between the second inner guide 192 and the third inner guide 193.

[0140] The guide 180 may be disposed between the second inner guide 192 and the third inner guide 193.

[0141] The first guide 181 may be positioned closer to the third inner guide 193 than to the second inner guide 192. The first guide 181 may be vertically spaced apart from the third inner guide 193 by a distance H1.

[0142] The second guide 182 may be positioned closer to the second inner guide 192 than to the third inner guide 193. The second guide 182 may be vertically spaced apart from the second inner guide 192 by a distance H3.

[0143] The first guide 181 and the second guide 182 may be vertically spaced apart. A distance H2 may be formed between the first guide 181 and the second guide 182.

[0144] The distance H2 between the first guide 181 and the second guide 182 may be greater than the distance H1 between the first guide 181 and the third inner guide 193.

[0145] The distance H2 between the first guide 181 and the second guide 182 may be greater than the distance H3 between the second guide 182 and the second inner guide 192.

[0146] By the structure described above, the air blown by the fan 160 can be evenly distributed to the second discharge grille 142 and the third discharge grille 143.

[0147] An upper surface of the second inner guide 193 may be curved along the horizontal direction. The upper surface of the second inner guide 193 may face the guide 180 in a vertical direction.

[0148] The second inner guide 193 may comprise a first surface 192a. The first surface 192a may extend along a horizontal direction. The first surface 192a may face the guide 180 in the vertical direction.

[0149] The second inner guide 193 may comprise a second surface 192b. The second surface 192b may be curved downward. The second surface 192b may face an end portion of the guide 180 in the vertical direction. The second surface 192b may be curved downward from the first surface 192a.

[0150] The second inner guide 193 may comprise a third surface 192c. The third surface 192c may extend to be curved in a horizontal direction. The third surface 192c may face the end of the guide 180. The third surface 192c may extend from the second surface 192b to be curved in the horizontal direction.

[0151] Referring to FIG. 6, the indoor unit 100 is described. FIG. 6 shows an enlarged view of a portion of FIG. 5.

[0152] The first guide 181 may comprise a first outer guide 181a. The first outer guide 181a may be connected to the discharge grille 142. The first outer guide 181a may extend along the horizontal direction.

[0153] The first guide 181 may comprise a first inner guide 181b. The first inner guide 181b may extend toward the fan 160 from the first outer guide 181a. The first inner guide 181b may extend to be curved extended downwardly.

[0154] The first guide 181 may comprise a first inner end portion 181c. The first inner end portion 181c may face the fan 160. The first inner end portion 181c may be a part of the first inner guide 181b.

[0155] The first guide 181 may comprise a first outer end portion 181d. The first outer end portion 181d may face the outside of the indoor unit 100. The first outer end portion 181d may be a part of the first outer guide 181a.

[0156] The second guide 182 may comprise a second outer guide 182a. The second outer guide 182a may be connected to the discharge grille 142. The second outer guide 182a may extend along the horizontal direction.

[0157] The second guide 182 may comprise a second inner guide 182b. The second inner guide 182b may extend toward the fan 160 from the second outer guide 182a. The second inner guide 182b may be curvedly extended downward in a curved manner.

[0158] The second guide 182 may comprise a second inner end portion 182c. The second inner end portion 182c may face the fan 160. The second inner end portion 182c may be a part of the second inner guide 182b.

[0159] The second guide 182 may copmrise a second outer end portion 182d. The second outer end portion 182d may face the outside of the indoor unit 100. The second outer end portion 182d may be a part of the second outer guide 182a.

[0160] A length L1 of the first outer guide 181a may be greater than a length L2 of the first inner guide 181b.

[0161] A radius of curvature R1 at a boundary portion between the first outer guide 181a and the first inner guide 181b may be 38 mm to 42 mm.

[0162] The first inner guide 181b may extend to be inclined downward. The first inner end 181c may have an inclination angle $\theta 1$ with respect to the horizontal direction. The inclination angle $\theta 1$ of the first inner end 181c may be in a range of 38 degrees to 42 degrees.

[0163] The first outer guide 181 a may extend along the horizontal direction. The first outer end portion 181d may be parallel to the horizontal direction.

[0164] A length L3 of the second outer guide 182a may be smaller than a length L4 of the second inner guide 182b.

[0165] A radius of curvature R2 at a boundary portion between the second outer guide 182a and the second inner guide 182b may be 38 mm to 42 mm.

[0166] The second inner guide 182b may extend to be

inclined downward. The second inner end portion 182c may have an inclination angle θ2 with respect to the horizontal direction. The inclination angle θ2 of the second inner end 182c may be in a range of 38 degrees to 42 degrees.

[0167] The second outer guide 182a may extend along the horizontal direction. The second outer end portion 182d may be parallel to the horizontal direction.

[0168] By length and angle of the guide 180, it is possible to minimize resistance acting on the air blown by the fan 160 and to effectively reduce the discharging angle of the air flow with respect to the horizontal direction.

[0169] A length of the first guide 181 may be smaller than a length of the second guide 182. The length L1 of the first outer guide 181a may be smaller than the length L3 of the second outer guide 182a. The length L2 of the first inner guide 181b may be smaller than the length L4 of the second inner guide 182b.

[0170] The first outer end portion 181d and the second outer end portion 182d may be disposed in up-down direction to face each other. The first and second outer end portions 181d and 182d may be positioned on a same vertical line.

[0171] The first inner end portion 181c and the second inner guide 182b may be disposed in the up-down direction to face each other.

[0172] A length L5 of the first surface 192a may be greater than a length of the guide 180 in the horizontal direction. That is, a horizontal distance from the outside of the indoor unit 100 to an end of the first surface 192a may be greater than a length of guide 180 in the horizontal direction.

[0173] The second surface 192b may be a boundary between the first surface 192a and the third surface 192c. A radius of curvature R3 of the second surface 192b may be greater than the radii of curvature R1, R2 of the guide 180. The second inner guide 192 may be more gently curved along the horizontal direction than the guide 180.

[0174] A length L6 of the second surface 192b may be greater than the lengths L2, L4 of the first, second inner guides 181b, 182b.

[0175] The third surface 192c may have an inclination angle θ3 which is inclined with respect to the horizontal direction. The inclination angle θ3 of the third surface 192c with respect to the horizontal direction may be smaller than the inclination angles θ1, θ2 of the guides 180 with respect to the horizontal direction.

[0176] The second inner end portion 182c may extend toward an end of the second inner guide 192. The air blown by the fan 160 may flow along a surface of the second inner guide 192 and may flow toward the second guide 182.

[0177] Referring to FIG. 7, the indoor unit 100 is described. FIG. 7 (a) is a contour showing flows of an indoor unit 100' of the conventional art. FIG. 7 (b) is a contour showing flow of the indoor unit 100 of the present disclosure.

[0178] Referring to (a) of FIG. 7, in case of the indoor unit 100' of the conventional art, air blown by a fan 160' flows upward with an angle of about 49 degrees in a region P'. In addition, the air blown by the fan 160' flows upward at an angle of about 21 degrees in a region Q'. Accordingly, there was a problem that the air discharged from the indoor unit 100' is excessively directed upward, and the discharged air is not diffused to the user due to friction with the ceiling.

[0179] Referring to (b) of FIG. 7, in case of the indoor unit 100 of the present disclosure, the flow direction of air blown from the fan 160 is guided by guides 181, 182. Accordingly, the air blown by the fan 160 flows with an angle of about 13 degrees in a region P. In addition, the air blown by the fan 160 flows with an angle of about 15 degrees in a region Q.

[0180] Referring to FIG. 8, an indoor unit 1000 of another embodiment of the present disclosure is described. FIG. 8 shows a structure inside the indoor unit 1000 of another embodiment of the disclosure.

[0181] In describing the indoor unit 1000 of another embodiment of the disclosure, except for description about guides 1810, 1820, 1830, 1840, 1850, and 1860, the description about the indoor unit 100 which are described with reference to FIGS. 1 to 7 can be equally applied.

[0182] The indoor unit 1000 may comprise a fan 1600, a first discharge grille 1410, a second discharge grille 1420, a first inner guide 1910, a second inner guide 1920, and a third inner guide 1930.

[0183] The description about the elements 160, 141, 142, 191, 192, 193 which are described with reference to FIGS. 1 to 7 can be equally applied to description for the elements 1600, 1410, 1420, 1910, 1920, and 1930.

[0184] The indoor unit 1000 may comprise a first guide 1810. The indoor unit 1000 may comprise a second guide 1820. The description about the first and second guides 181 and 182 described with reference to FIGS. 1 to 7 can be applied to description about the first guide 1810 and the second guide 1820.

[0185] The indoor unit 1000 may comprise a third guide 1860. The third guide 1860 may be disposed between the first guide 1810 and the second guide 1820. The third guide 1860 may face the first and second guides 1810 and 1820 in the vertical direction.

[0186] A length of the third guide 1860 may be smaller than lengths of the first, second guides 1810, 1820.

[0187] The third guide 1860 may be disposed at a position corresponding to a cener portion of the fan 1600 which is spaced apart in the horizontal direction.

[0188] The indoor unit 1000 may comprise a first auxiliary guide 1830. The first auxiliary guide 1830 may be disposed on the first discharge grille 1410. The first auxiliary guide 1830 may extend toward the fan 1600 from the first discharge grille 1410. The first auxiliary guide 1830 may be disposed at a position corresponding to the first guide 1810 in a horizontal direction.

[0189] The indoor unit 1000 may comprise a second auxiliary guide 1840. The second auxiliary guide 1840

may be disposed on the first discharge grille 1410. The second auxiliary guide 1840 may extend from the first discharge grille 1410 toward the fan 1600. The second auxiliary guide 1840 may be disposed at a position corresponding to the third guide 1860 in the horizontal direction.

[0190] The indoor unit 1000 may comprise a third auxiliary guide 1850. The third auxiliary guide 1850 may be disposed on the first discharge grille 1410. The third auxiliary guide 1850 may extend from the first discharge grille 1410 toward the fan 1600. The third auxiliary guide 1850 may be disposed at a position corresponding to the second guide 1820 in the horizontal direction.

[0191] The second auxiliary guide 1840 may be disposed between the first auxiliary guide 1830 and the third auxiliary guide 1850. The second auxiliary guide 1840 and the third auxiliary guide 1850 may be arranged in the up-down direction.

[0192] A length of the second auxiliary guide 1840 may be grater than lengths of the first auxiliary guide 1830 and the third auxiliary guide 1850.

[0193] The second auxiliary guide 1840 may extend curvedly upward toward the fan 1600. The second auxiliary guide 1840 may extend curvedly downward toward an outside of the indoor unit 1000.

[0194] The second auxiliary guide 1840 may comprise a first guide body 1841. The first guide body 1841 may extend in the horizontal direction from the first discharge grille 1410 toward the fan 1600.

[0195] The second auxiliary guide 1840 may comprise a second guide body 1842. The second guide body 1842 may extend curvedly upward from the first guide body 1841 toward the fan 1600.

[0196] The guides 1810, 1820, 1860 and the auxiliary guides 1830, 1840, 1850 may be disposed at symmetric positions with the fan 1600 interposed therebetween.

[0197] Desirable embodiments of the invention are described and illustrated above, but the invention is not limited to the specific embodiments disclosed above and can be variously modified within the scope of the claims without departing from the essence of the invention as understood by those skilled in the art to which the invention pertains. These modifications should not be understood beyond the technical scope or concepts of the invention as described or anticipated and should not be understood individually from the technical concepts and perspective of the invention.

[0198] The present disclosure should not be limited to the described embodiments, as it can be implemented in various modified forms. Therefore, if the modified embodiment includes the elements of the claims in this disclosure, it should be considered as it is within the scope of this disclosure.

[0199] Certain embodiments or other embodiments of the disclosure described above are not mutually exclusive or distinct from each other. Any or all elements of the embodiments of the disclosure described above may be combined with another or combined with each other in configuration or function.

[0200] For example, a configuration "A" described in one embodiment of the disclosure and the drawings and a configuration "B" described in another embodiment of the disclosure and the drawings may be combined with each other. Namely, although the combination between the configurations is not directly described, the combination is possible except in the case where it is described that the combination is impossible.

[0201] 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 air conditioner comprising:

   a case (110) having a space therein;
   a front panel (120) coupled to a front portion of the case (110) and forming a suction port (130);
   a fan (160) disposed in the case (110) and rotating with respect to a rotational axis that extends in a front-rear direction;
   a discharge grille (140) that is disposed at a location where a rotational direction of the fan (160) is directed upward, wherein air blown by the fan (160) is discharged through the discharge grille (140); and
   a guide (180) disposed at the discharge grille (140) and curved along a direction toward an outside of the case (110).

2. The air conditioner of claim 1, wherein the fan (160) comprises a plurality of blades spaced apart from each other in the rotational direction of the fan (160), preferably the guide (180) extends curvedly toward the blade.

3. The air conditioner of any one of claims 1 or 2, wherein the guide (180) extends curvedly upward at a position adjacent to the fan (160) and extends curvedly to a horizontal direction along a direction away from the fan (160).

4. The air conditioner of any one of the preceding claims, wherein the guide (180) comprises an outer end portion (182d) that faces the outside of the case

(110).

5. The air conditioner of any one of the preceding claims, wherein the guide (180) comprises:

an inner guide (181b) facing the fan (160) and curved along up-down direction; and
an outer guide (182a) facing the outside of the case (110) and extending along a horizontal direction.

6. The air conditioner of any one of the preceding claims, wherein the guide (180) comprises an inner end portion (181c) inclined in 38 to 42 degrees with respect to a horizontal direction; and/or an outer end portion (182d) that is parallel to the horizontal direction.

7. The air conditioner of any one of the preceding claims, wherein the guide (180) comprises:

a first guide (181) paced apart from the fan (160); and
a second guide (182) spaced downward from the first guide (181).

8. The air conditioner of claim 7, wherein the first guide (181) is positioned higher than a center of rotation of the fan (160), and/or the second guide (182) is positioned lower than the center of rotation of the fan (160).

9. The air conditioner of claim 7 or 8, wherein the first guide (181) comprises:

a first inner guide (181b) facing the fan (160); and
a first outer guide (181a) extending from the first inner guide (181b) outward of the case (110),
wherein the second guide (182) comprises:

a second inner guide (182b) facing the fan (160); and
a second outer guide (182a) extending from the second inner guide (182b) outward of the case (110),
preferably a length of the first inner guide (181b) is smaller than a length of the second inner guide (182b).

10. The air conditioner of any one of the preceding claims 7-9, wherein the first guide (181) extends curvedly with a first radius of curvature, and/or the second guide (182) extends curvedly with a second radius of curvature identical to the first radius of curvature.

11. The air conditioner of any one of the preceding claims 7-10, further comprising a first inner guide (181b) and a second inner guide (182b) that are positioned at a side of the fan (160) and that are spaced apart in up-down direction,
wherein the discharge grille (140), the first guide (181) and the second guide (182) are disposed between the first inner guide (181b) and the second inner guide (182b), wherein a vertical gap between the first inner guide (181b) and the second guide (182) is smaller than a vertical gap between the first guide (181) and the second guide (182).

12. The air conditioner of any one of the preceding claims, further comprising an inner guide (181b) disposed below the discharge grille (140) and facing the guide (180) in up-down direction.

13. The air conditioner of claim 12, wherein the inner guide (181) comprises:

a first surface (192a) disposed below the guide; and
a second surface (192b) bent downward from the first surface (192a).

14. The air conditioner of claim 12 or 13, wherein the inner guide (181) is curved a extending direction of the guide (180) and/or has a radius of curvature greater than a radius of curvature of the guide (180).

15. The air conditioner of any one of the preceding claims, further comprising an auxiliary guide (1830, 1840, 1850) disposed at a position symmetric to the guide (180) with respect to the fan (160), preferably the auxiliary guide (1830, 1840, 1850) comprises:

a first auxiliary guide (1830);
a second auxiliary guide (1840) spaced downward from the first auxiliary guide (1830); and
a third auxiliary guide (1850) spaced downward from the second auxiliary guide (1840),
more preferably a length of the second auxiliary guide (1840) is greater than lengths of the first auxiliary guide (1830) and the third auxiliary guide (1850).

FIG. 1

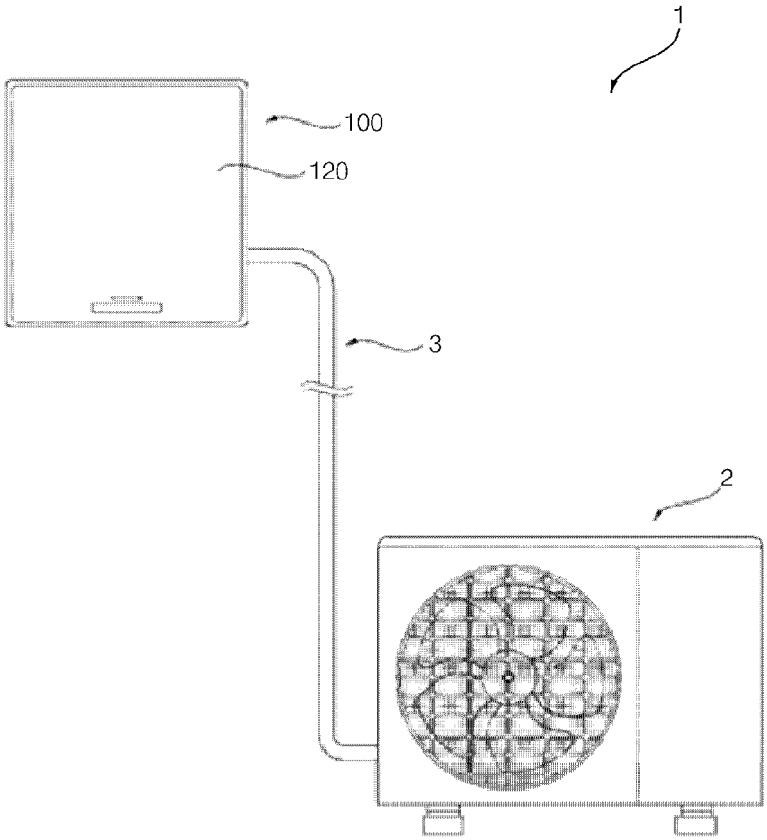


FIG. 2

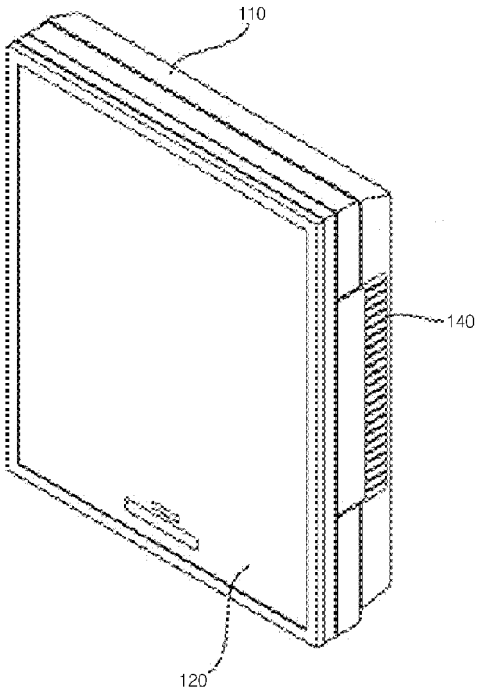


FIG. 3

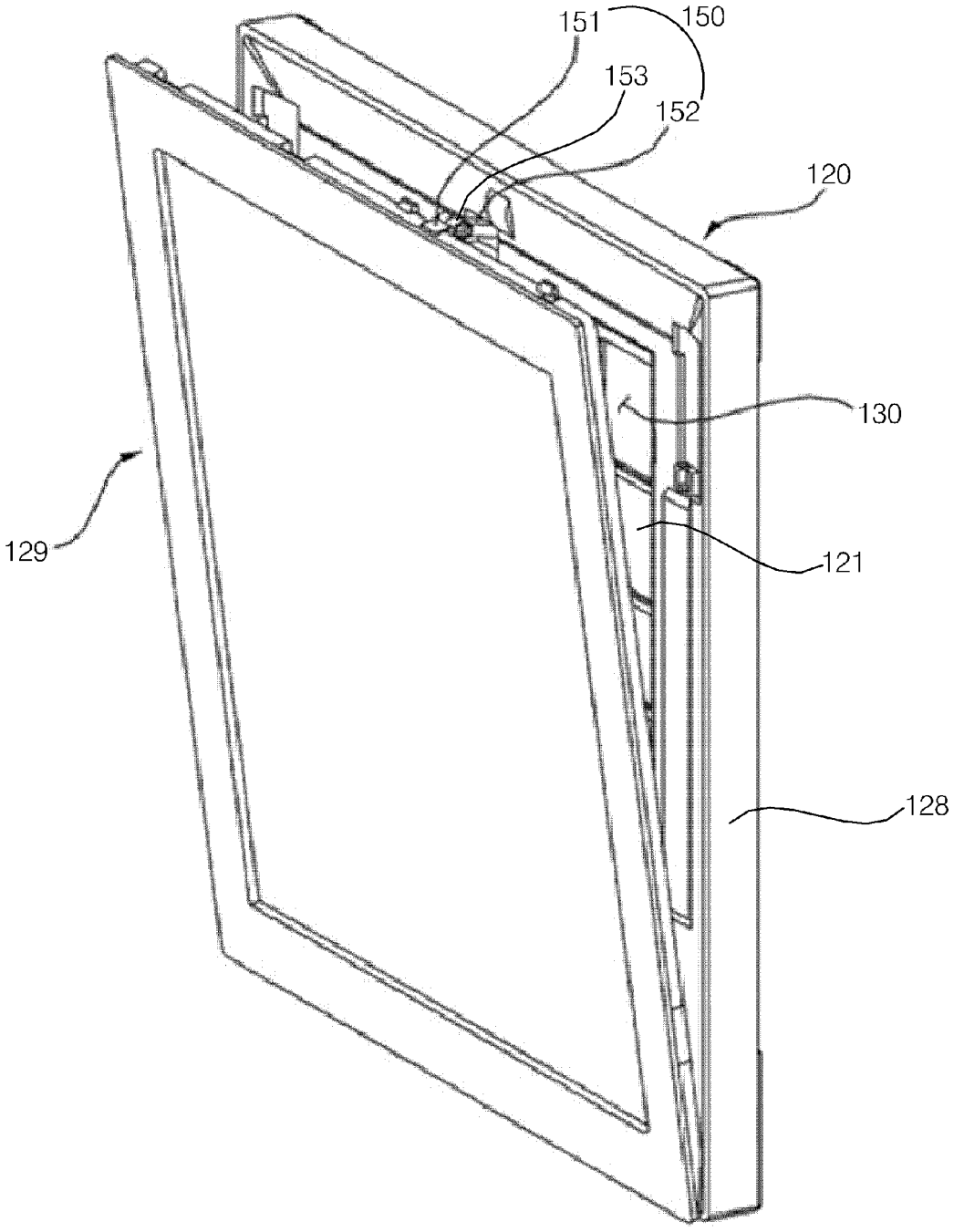
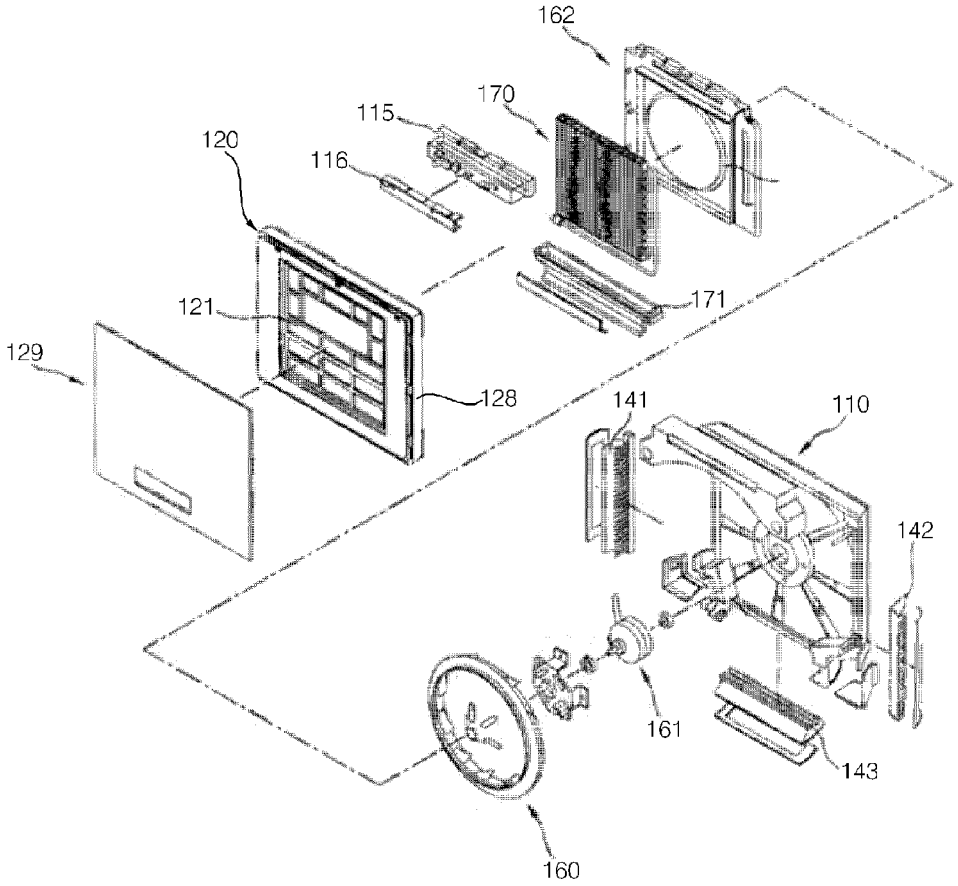


FIG. 4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170
115
120
116
121
171
129
128
141
110
142
161
143
160

FIG. 5

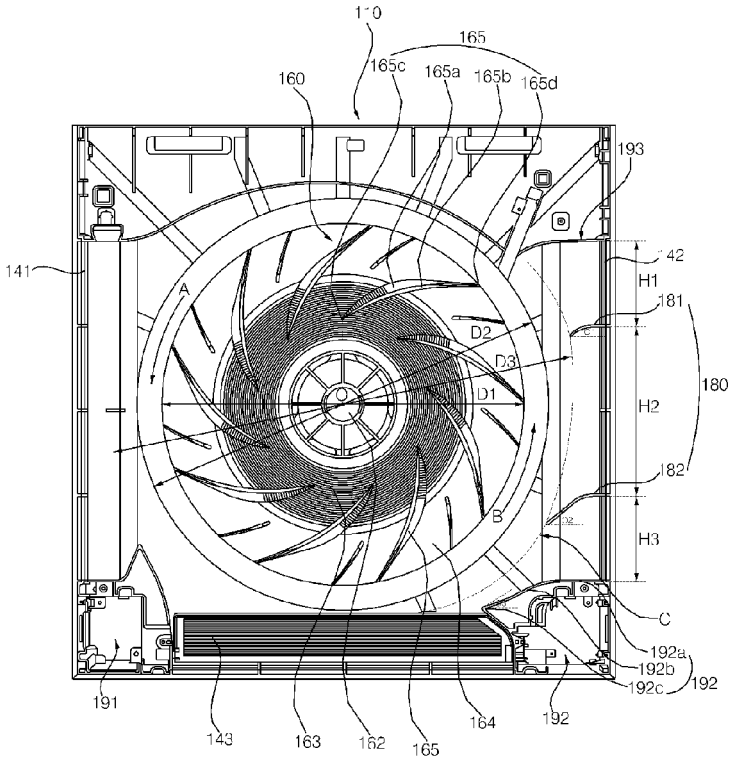

110
165
165c
165a
165b
165d
160
193
141
42
H1
181
A
D2
D3
D1
180
H2
182
B
H3
C
192a
192b
192c
192
191
143
163
162
165
164
192

FIG. 6

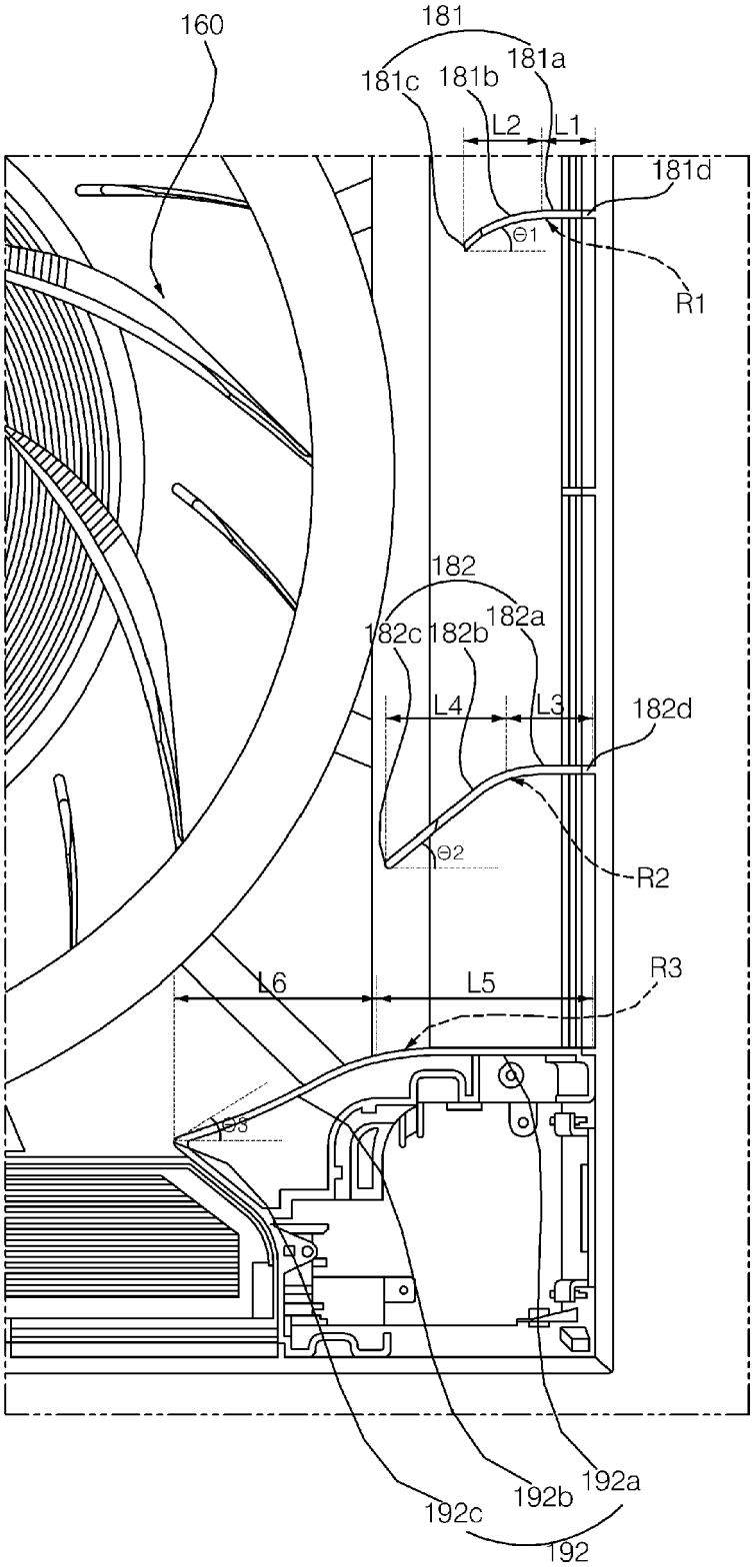

160
181
181a
181b
181c
L2
L1
181d
Θ1
R1
182
182a
182b
182c
L4
L3
182d
Θ2
R2
L6
L5
R3
Θ3
192a
192b
192c
192

FIG. 7

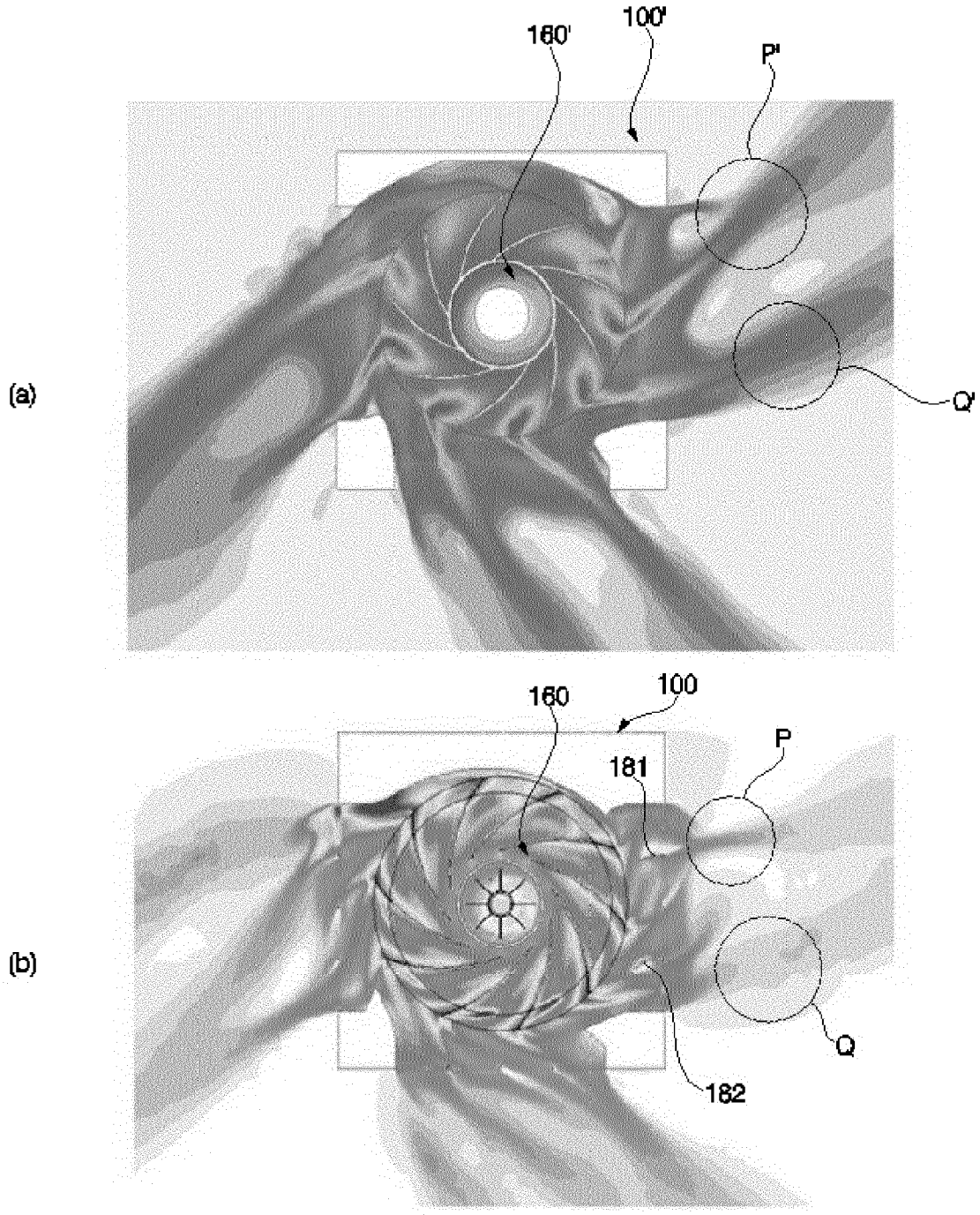
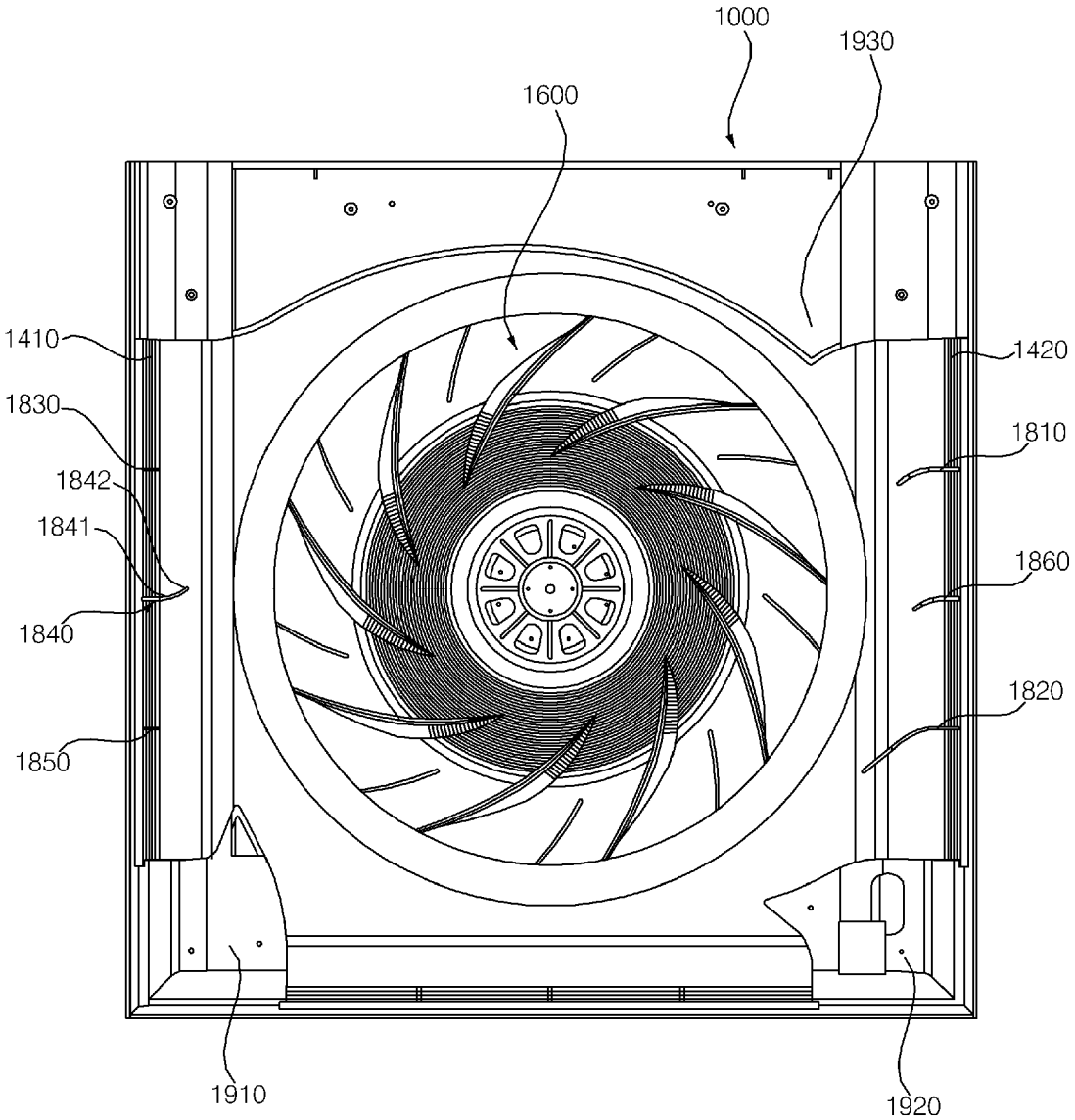


FIG. 8


1000
1930
1600
1410
1420
1830
1810
1842
1841
1860
1840
1820
1850
1910
1920

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EUROPEAN SEARCH REPORT

Application Number
EP 23 19 2460

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	KR 2007 0067975 A (LG ELECTRONICS INC [KR]) 29 June 2007 (2007-06-29) * figures 1-20 *	1-15	INV. F24F1/0011 F24F13/08 F24F13/20
A	KR 2005 0047161 A (LG ELECTRONICS INC [KR]) 20 May 2005 (2005-05-20) * figures 1-9 *	1-15	
A	KR 2007 0000894 A (LG ELECTRONICS INC [KR]) 3 January 2007 (2007-01-03) * figures 1-5 *	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	22 November 2023	Ismail, Youssef

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22-11-2023

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KR 20070067975 A	29-06-2007	NONE	
KR 20050047161 A	20-05-2005	NONE	
KR 20070000894 A	03-01-2007	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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- KR 100714591 **[0008]**
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