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(54) **AIR CONDITIONING DEVICE**

(57) There is proposed an air conditioner capable of preventing a suitable connection between a silencer and a pipe member from being hindered by vibration of an outdoor unit associated with operation. An air conditioner (1) includes an outdoor unit (2) and an indoor unit (4). The outdoor unit (2) includes a first casing (210), a humidifying unit (3), a first pipe member (220), and a silencer (230). A first casing (210) includes a side plate (210s). The humidifying unit (3) takes in outside air and sends the outside air into a room. One end of the first pipe member (220) is connected to the humidifying unit (3), and air sent from the humidifying unit (3) passes through the first pipe member (220). The silencer (230) is connected to the other end of the first pipe member (220), and reduces sound radiated from the humidifying unit (3) and transmitted through the first pipe member (220). The silencer (230) is fixed to the side plate (210s).

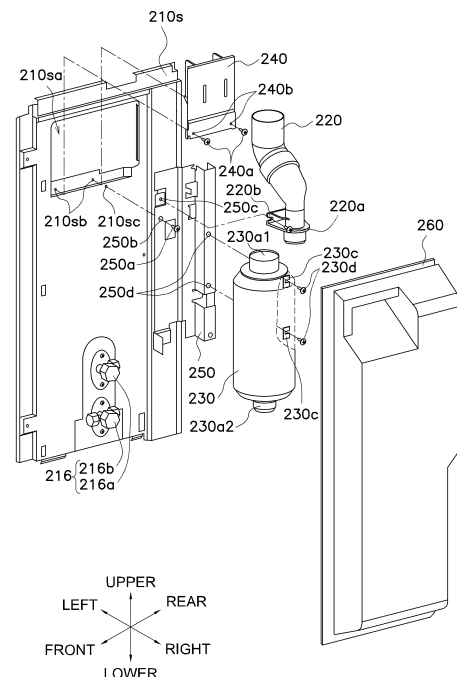


FIG. 6

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Description

TECHNICAL FIELD

[0001] The present disclosure relates to an air conditioner.

BACKGROUND ART

[0002] Patent Literature 1 (JP 2004-69173 A) discloses an air conditioner including a blower (humidifying unit) that takes in outside air and sends the outside air to an indoor unit, a conveyance path through which air sent to the indoor unit passes, and a silencer (muffler) that reduces sound transmitted along the conveyance path. In Patent Literature 1, the silencer is provided in the middle of a pipe member constituting the conveyance path, and is accommodated between a side plate of an outdoor unit and a cover covering a side plate.

SUMMARY OF THE INVENTION

<Technical Problem>

[0003] Vibration generated in the outdoor unit in accordance with operation of the air conditioner acts on the silencer provided near the outdoor unit. Thus, the orientation of the silencer changes from an initial state, and there is a possibility that suitable connection between the silencer and the pipe member is hindered.

[0004] The present disclosure proposes an air conditioner capable of preventing a suitable connection between a silencer and a pipe member from being hindered by vibration of an outdoor unit associated with operation.

<Solution to Problem>

[0005] An air conditioner according to a first aspect includes an outdoor unit and an indoor unit. The outdoor unit includes a first casing, a humidifying unit, a pipe member, and a silencer. The casing includes a side plate. The humidifying unit takes in outside air and sends the outside air into a room. One end of the pipe member is connected to the humidifying unit, and air sent from the humidifying unit passes through the pipe member. The silencer is connected to the other end of the pipe member, and reduces sound radiated from the humidifying unit and transmitted through the pipe member. The silencer is fixed to the side plate.

[0006] Since the silencer is fixed to the side plate of the outdoor unit, the air conditioner prevents a change in the orientation of the silencer from an initial state due to vibration of the outdoor unit associated with the operation. As a result, a suitable connection between the silencer and the pipe member is maintained.

[0007] Therefore, the air conditioner prevents the suitable connection between the silencer and the pipe member from being hindered by the vibration of the outdoor

unit associated with the operation.

[0008] An air conditioner according to a second aspect is the air conditioner according to the first aspect, in which the silencer is fixed to the side plate with the attachment plate interposed between the silencer and the side plate.

[0009] In the air conditioner, the silencer can be separated from the side plate by the attachment plate. Therefore, the diameter of a bend (radius) provided in the pipe member that sends the air sent from the humidifying unit to the silencer can be ensured to be larger than in the case where the silencer and the side plate are not separated from each other. As a result, the air conditioner can suppress noise caused by sound (collision sound) generated by the air passing through the pipe member vigorously colliding with an inner surface of the pipe member.

[0010] An air conditioner according to a third aspect is the air conditioner according to the second aspect, in which the attachment plate is fixed to the side plate by a first fixing member.

[0011] In the air conditioner, the silencer is securely fixed to the side plate.

[0012] An air conditioner according to a fourth aspect is the air conditioner according to the third aspect, in which the attachment plate is fixed to the side plate by a plurality of the first fixing members. The plurality of first fixing members is disposed at positions not overlapping each other in either a vertical direction or a horizontal direction.

[0013] In the air conditioner, the attachment plate can prevent vibration in any of the vertical direction or the horizontal direction from changing the orientation of the silencer against.

[0014] An air conditioner according to a fifth aspect is the air conditioner according to the third or fourth aspect, in which the silencer is fixed to the attachment plate by a plurality of second fixing members.

[0015] An air conditioner according to a sixth aspect is the air conditioner according to the fifth aspect, in which the plurality of second fixing members is disposed at positions not overlapping each other in either the vertical direction or the horizontal direction.

[0016] In the air conditioner, the orientation of the silencer is prevented from being changed due to vibration in any of the vertical direction or the horizontal direction.

[0017] An air conditioner according to a seventh aspect is one of the air conditioners according to the first to sixth aspects, in which the outdoor unit further includes a cover that covers the side plate and the silencer.

[0018] In the air conditioner, since the members attached to the side plate, such as the silencer, are not exposed to the outside, a weather resistance of these members is secured.

[0019] An air conditioner according to an eighth aspect is the air conditioner according to the seventh aspect, in which the outdoor unit further includes a shutoff valve. The cover further covers the shutoff valve. The cover includes a partition plate that separates the silencer and

the shutoff valve from each other.

[0020] In the air conditioner, a space in which the silencer is accommodated and a space in which the shutoff valve is accommodated are separated from each other. Therefore, air whose temperature has increased by a high-temperature refrigerant flowing through the shutoff valve directly contacts the silencer, and thus, a silencing material is prevented from being heated.

[0021] An air conditioner according to a ninth aspect is the air conditioner according to the eighth aspect, in which the partition plate includes a slit that connects the space in which the silencer is accommodated and the space in which the shutoff valve is accommodated.

[0022] In the air conditioner, the air in the space heated by air flowing through the silencer flows to the outside of the cover through the space and an opening, and thus, a temperature rise of the silencing material is suppressed.

[0023] An air conditioner according to a tenth aspect is one of the air conditioners according to the seventh to ninth aspects, in which the cover has a protrusion protruding downward in the vertical direction of the silencer from the partition plate.

[0024] In the air conditioner, the silencer is prevented from coming out of the pipe member due to vibration or the like of the outdoor unit.

[0025] An air conditioner according to an eleventh aspect is one of the air conditioners according to the seventh to tenth aspects, in which the cover has a heat insulator on a surface facing the silencer.

[0026] In the air conditioner, the silencing material of the silencer is prevented from being heated by a temperature rise of the cover associated with sunlight or the like.

[0027] An air conditioner according to a twelfth aspect is one of the air conditioners according to the seventh to eleventh aspects, in which the cover has a buffer on a surface facing the silencer.

[0028] In the air conditioner, since the vibration of the outdoor unit transmitted to the silencer is absorbed by the buffer, a change in the orientation of the silencer from the initial state is more effectively suppressed.

[0029] An air conditioner according to a thirteenth aspect is one of the air conditioners according to the first to twelfth aspects, in which the outdoor unit has an opening formed in the side plate. A part of the opening is closed by a shielding plate. The shielding plate is provided with a first guide groove for partially cutting the shielding plate.

[0030] In the air conditioner, an installation operator or the like can change the size of the shielding plate in accordance with the presence or absence of the silencer at the time of installing the air conditioner or the like. It is therefore not necessary to prepare the shielding plates having different sizes depending on the presence or absence of the silencer, and thus, a manufacturing cost of the air conditioner is suppressed.

[0031] An air conditioner according to a fourteenth aspect is one of the air conditioners according to the first to thirteenth aspects, in which the pipe member is pro-

vided with a second guide groove for partially cutting off the pipe member.

[0032] In the air conditioner, the installation operator or the like can change the length of the first pipe member in accordance with the position of the silencer at the time of installing the air conditioner 1 or the like. It is therefore not necessary to prepare the pipe members having different sizes depending on the installation place of the air conditioner 1, and thus, the manufacturing cost of the air conditioner 1 is suppressed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0033]

FIG. 1 is a diagram showing an overall configuration of an air conditioner 1 according to an embodiment. FIG. 2 is a diagram schematically showing a refrigerant circuit 100 and a humidifying unit 3.

FIG. 3 is a control block diagram of the control unit 9.

FIG. 4 is a perspective view of an outdoor unit 2.

FIG. 5 is a right side view of the outdoor unit 2.

FIG. 6 is an exploded perspective view of a member attached to a side plate 210s.

FIG. 7 is a sectional view of a silencer 230.

FIG. 8 is a perspective view showing a surface of a cover 260 facing the side plate 210s.

FIG. 9 is a diagram showing the cover 260 of the air conditioner 1 according to Modification C and Modification D.

FIG. 10 is a perspective view showing a shielding plate 240 of the air conditioner 1 according to Modification E.

FIG. 11 is a perspective view showing a first pipe member 220 of the air conditioner 1 according to Modification F.

FIG. 12 is a right side view of the outdoor unit 2 of the air conditioner 1 according to Modification G.

DESCRIPTION OF EMBODIMENTS

(1) Overall configuration

[0034] The air conditioner 1 performs air conditioning of the inside of a room RM (indoor) as a target space by a vapor compression refrigerant cycle. The air conditioner 1 mainly includes an outdoor unit 2, an indoor unit 4, a liquid-refrigerant connection pipe 5, a gas-refrigerant connection pipe 6, a second pipe member 7, a remote controller 8, and a control unit 9. The outdoor unit 2 includes the humidifying unit 3, which will be described in detail later.

[0035] The liquid-refrigerant connection pipe 5 and the gas-refrigerant connection pipe 6 connect the outdoor unit 2 and the indoor unit 4. The outdoor unit 2, the indoor unit 4, the liquid-refrigerant connection pipe 5, and the gas-refrigerant connection pipe 6 are annularly connected by a refrigerant pipe to constitute a refrigerant circuit

100. The refrigerant circuit 100 has a refrigerant sealed inside.

[0036] The second pipe member 7 connects the humidifying unit 3 and the indoor unit 4. The second pipe member 7 is a hose-shaped pipe that sends outside air, which is air outside the room RM, from the humidifying unit 3 toward the indoor unit 4. The second pipe member 7 is manufactured with, for example, a soft resin. The outside air sent from the humidifying unit 3 to the indoor unit 4 includes humidified air obtained by humidifying outside air.

[0037] The control unit 9 controls each device of the air conditioner 1 to perform an air conditioning operation such as a heating operation, a cooling operation, and a humidifying operation, which will be described in detail later.

[0038] The upper, lower, front, rear, left, and right directions used in the following description follow directions indicated by arrows in FIGS. 1, 4 to 10, and 13.

(2) Detailed configuration

(2-1) Outdoor unit

[0039] The outdoor unit 2 is installed outside the room RM (outdoors; for example, a rooftop of a building, a vicinity of an outer wall surface of a building, or the like). The outdoor unit 2 mainly includes a first casing 210, a compressor 211, a four-way switching valve 212, a heat source heat exchanger 213, a heat source expansion valve 214, an outdoor fan 215, a shutoff valve 216, a first pipe member 220, a silencer 230, a shielding plate 240, an attachment plate 250, a cover 260, and the humidifying unit 3.

(2-1-1) First casing

[0040] The first casing 210 is a housing having a substantially rectangular parallelepiped shape. The first casing 210 accommodates the compressor 211, the four-way switching valve 212, the heat source heat exchanger 213, the heat source expansion valve 214, and the outdoor fan 215 inside. The first casing 210 includes a front plate 210f, two side plates 210s, and a top panel 210t.

[0041] The first casing 210 is an example of a casing.

[0042] The front plate 210f is provided with a blow-out port 210fa which is an opening for blowing out air after heat exchange. The blow-out port 210fa is covered with a grill.

[0043] The top panel 210t has an opening 210ta through which the first pipe member 220 passes.

[0044] One of the two side plates 210s is provided with an opening 210sa, a bolt hole 210sb, and a bolt hole 210sc. In the present embodiment, an example will be described where the opening 210sa, the bolt hole 210sb, and the bolt hole 210sc are formed in the right side plate 210s and the silencer 230 and the like are attached, but these components may be attached to the left side plate

210s. Hereinafter, the term "side plate 210s" refers to the right side plate 210s.

[0045] The opening 210sa is an opening formed in an upper part of the side plate 210s to allow the first pipe member 220 to pass through. The bolt hole 210sb is a bolt hole to which a bolt 240a for fixing the shielding plate 240 is fastened. The bolt hole 210sc is a bolt hole to which a bolt 250a for fixing the attachment plate 250 is fastened.

(2-1-2) Compressor

[0046] In the refrigerant circuit 100, the compressor 211 sucks a low-pressure refrigerant from a suction side 211a, compresses the refrigerant to a high pressure, and then discharges the refrigerant from a discharge side 211b. The compressor 211 includes a compression element (not shown) and a compressor motor (not shown) that drives the compression element to rotate. The number of rotations of the compressor motor is controlled by the control unit 9 via an inverter or the like. The capacity of the compressor 211 is controlled by the control unit 9 changing the number of rotations of the compressor motor.

(2-1-3) Four-way switching valve

[0047] The four-way switching valve 212 switches a refrigerant flow direction in the refrigerant circuit 100. The four-way switching valve 212 includes a first port P1, a second port P2, a third port P3, and a fourth port P4. The four-way switching valve 212 is switched by the control unit 9 between a first state (a state indicated by a broken line in FIG. 2) in which the first port P1 and the fourth port P4 communicate with each other and the second port P2 and the third port P3 communicate with each other and a second state (a state indicated by a solid line in FIG. 2) in which the first port P1 and the second port P2 communicate with each other and the third port P3 and the fourth port P4 communicate with each other.

[0048] The first port P1 is connected to the discharge side 211b of the compressor 211. The second port P2 is connected to a gas side of the heat source heat exchanger 213. The third port P3 is connected to the suction side 211a of the compressor 211. The fourth port P4 is connected to the gas-refrigerant connection pipe 6.

(2-1-4) Heat source heat exchanger

[0049] The heat source heat exchanger 213 is a heat exchanger that exchanges heat between the refrigerant and the outside air. One end of the heat source heat exchanger 213 is connected to the heat source expansion valve 214. The other end of the heat source heat exchanger 213 is connected to the second port P2 of the four-way switching valve 212.

(2-1-5) Heat source expansion valve

[0050] The heat source expansion valve 214 is an expansion mechanism that decompresses the refrigerant in the refrigerant circuit 100. The heat source expansion valve 214 is provided between the liquid-refrigerant connection pipe 5 and a liquid side of the heat source heat exchanger 213. The heat source expansion valve 214 is an electric expansion valve whose opening degree is controllable. The opening degree of the heat source expansion valve 214 is controlled by the control unit 9.

(2-1-6) Outdoor fan

[0051] The outdoor fan 215 generates an air flow and sends the outside air to the heat source heat exchanger 213. The outdoor fan 215 sends the outside air to the heat source heat exchanger 213 to promote heat exchange between the refrigerant in the heat source heat exchanger 213 and the outside air. The outdoor fan 215 is rotationally driven by an outdoor fan motor 215a. The air volume of the outdoor fan 215 is controlled by the control unit 9 changing the number of rotations of the outdoor fan motor 215a.

(2-1-7) Shutoff valve

[0052] The shutoff valve 216 is a valve that is manually opened and closed, and is opened and closed by an installation operator when the air conditioner 1 is installed, for example. The shutoff valve 216 includes a liquid-side shutoff valve 216a and a gas-side shutoff valve 216b. The liquid-side shutoff valve 216a is a valve provided between the heat source expansion valve 214 and the liquid-refrigerant connection pipe 5 in the refrigerant circuit 100. The gas-side shutoff valve 216b is a valve provided between the fourth port P4 of the four-way switching valve 212 and the gas-refrigerant connection pipe 6 in the refrigerant circuit 100. The liquid-side shutoff valve 216a and the gas-side shutoff valve 216b are collectively referred to as the shutoff valve 216.

[0053] In the present embodiment, the shutoff valve 216 protrudes from the first casing 210 in a lower part of the side plate 210s so as to be able to connect the liquid-refrigerant connection pipe 5 and the gas-refrigerant connection pipe 6.

(2-1-8) First pipe member

[0054] The first pipe member 220 is a duct that sends air sent from a supply fan 313 (described later) of the humidifying unit 3 to the second pipe member 7 via the silencer 230. The first pipe member 220 has one end connected to the supply fan 313 of the humidifying unit 3 and the other end connected to the silencer 230. The first pipe member 220 is manufactured with, for example, a hard resin.

[0055] The first pipe member 220 is an example of a

pipe member.

[0056] In the present embodiment, the first pipe member 220 is disposed so as to pass through the opening 210ta formed in the top panel 210t of the first casing 210 and the opening 210sa formed in the side plate 210s. The other end of the first pipe member 220 is connected to the silencer 230 on the right side of the first casing 210.

[0057] The first pipe member 220 is provided with a bolt hole 220b through which a bolt 220a is inserted.

(2-1-9) Silencer

[0058] The silencer 230 is a member through which air sent from the humidifying unit 3 passes and which reduces sound radiated from the humidifying unit 3 and transmitted the inside of the first pipe member 220. The silencer 230 includes a substantially cylindrical body casing 230a and a silencing material 230b accommodated in the body casing 230a.

[0059] The body casing 230a has an inflow port 230a1 through which air flows into the inside and an outflow port 230a2 through which air flows out from the inside. The inflow port 230a1 and the outflow port 230a2 have a cylindrical shape. The inflow port 230a1 is formed in an upper part of the body casing 230a. The outflow port 230a2 is formed in a lower part of the body casing 230a.

[0060] The inflow port 230a1 and the first pipe member 220 are connected by inserting the other end of the first pipe member 220 into the inflow port 230a1. The outflow port 230a2 and the second pipe member 7 are connected by inserting the outflow port 230a2 into one end of the second pipe member 7.

[0061] The body casing 230a, the inflow port 230a1, and the outflow port 230a2 are formed such that an axial center c1 of the body casing 230a, an axial center c2 of the inflow port 230a1, and an axial center c3 of the outflow port 230a2 overlap each other on a straight line C extending in an up-down direction. In other words, the body casing 230a of the silencer 230 is symmetrical with respect to the straight line C in a plan view of the side plate 210s (see FIG. 7).

[0062] The silencing material 230b is a material that absorbs sound energy. The silencing material 230b accommodated in the body casing 230a forms a cylindrical flow path 230b1 surrounded by the silencing material 230b inside of the body casing 230a.

[0063] The sound radiated from the humidifying unit 3 and transmitted inside of the first pipe member 220 enters the flow path 230b1 from the inflow port 230a1, and most of the energy is absorbed by the silencing material 230b when passing through the flow path 230b1. As a result, the sound transmitted inside of the first pipe member 220 is reduced in volume inside of the silencer 230.

[0064] The body casing 230a includes two plate-shaped supports 230c protruding from an outer surface. Each of the supports 230c is provided with a hole into which a bolt 230d is inserted. The two supports 230c are aligned in the up-down direction. As shown in FIG. 6, the

silencer 230 is fixed to the attachment plate 250 by the bolts 230d being inserted into the two supports 230c and fastened to the attachment plate 250.

(2-1-10) Shielding plate

[0065] The shielding plate 240 is a plate-shaped member that closes at least a part of a gap generated between the first pipe member 220 and the opening 210sa. As shown in FIG. 5, the shielding plate 240 is fixed to the side plate 210s by the bolt 240a screwed into the bolt hole 210sb of the side plate 210s.

[0066] The shielding plate 240 is provided with a bolt hole 240b through which the bolt 240a is inserted.

(2-1-11) Attachment plate

[0067] The attachment plate 250 is a plate-shaped member for fixing the silencer 230 to the side plate 210s. As shown in FIG. 5, the attachment plate 250 is fixed to the side plate 210s by the bolt 250a fastened to the bolt hole 210sc of the side plate 210s.

[0068] The attachment plate 250 is provided with the bolt hole 250b through which the bolt 250a is inserted. The attachment plate 250 is provided with a bolt hole 250c for fastening the bolt 220a for fixing the first pipe member 220 and is provided with two bolt holes 250d for fastening two bolts 230d for fixing the silencer 230.

[0069] The bolt 250a is an example of a first fixing member.

(2-1-12) Cover

[0070] The cover 260 is a member that covers the shut-off valve 216, the side plate 210s, the silencer 230, the shielding plate 240, and the attachment plate 250. The cover 260 includes a flange 260a and a cover body 260b. The flange 260a is a flange formed so as to be in contact with at least a part of an outer edge of the side plate 210s. The cover body 260b bulges from the flange 260a toward the outside of the first casing 210 and covers the shutoff valve 216, the side plate 210s, the silencer 230, the shielding plate 240, and the attachment plate 250. The cover body 260b is provided with a partition plate 260c and an opening 260d. In FIG. 5, only an outer edge of the cover 260 is indicated by a dotted line for convenience.

[0071] The partition plate 260c partitions a space formed by the cover body 260b and the side plate 210s into a space S1 in which the silencer 230 is accommodated and a space S2 in which the shutoff valve 216 is accommodated. The partition plate 26c is formed on a surface of the cover body 260b facing the side plate 210s. The partition plate 26c is provided with a plurality of slits 260c1 connecting the space S1 and the space S2 and an opening 260c2 through which the second pipe member 7 passes. In addition, the partition plate 260c has a protrusion 260c3 protruding from an end forming the

opening 260c2 toward the lower part of the silencer 230.

[0072] The protrusion 260c3 is provided so as to protrude from the partition plate 260c downward in a vertical direction of the silencer 230. The protrusion 260c3 is provided to prevent the silencer 230 from coming out of the first pipe member 220. The protrusion 260c3 is formed to be in contact with the lower part of the silencer 230 or to have a slight gap from the lower part of the silencer 230 in a state where the cover 260 is attached to the side plate 210s.

[0073] The opening 260d is an opening through which the second pipe member 7 is passed to the outside of the cover 260. In the present embodiment, the opening 260d is formed on a rear surface of the cover body 260b.

(2-1-13) Humidifying unit

[0074] The humidifying unit 3 is a device that takes in the outside air and sends the outside air to indoors (specifically, the indoor unit 4). The outside air here includes humidified air obtained by humidifying outside air. The humidifying unit 3 is integrally provided on an upper part of the top panel 210t of the first casing 210. The humidifying unit 3 includes a second casing 310, a humidifying rotor 311, a heater 312, the supply fan 313, an adsorption fan 314, a first path 315, and a second path 316.

[0075] The humidifying unit 3 is an example of a blower.

(2-1-14) Second casing

[0076] The second casing 310 is a housing having a substantially rectangular parallelepiped shape. The second casing 310 accommodates the humidifying rotor 311, the heater 312, the supply fan 313, the adsorption fan 314, the first path 315, and the second path 316 inside. The second casing 310 includes a front plate 310f and a bottom plate 310b.

[0077] The front plate 310f is provided with an opening 310fa which is a first intake port 315a, a second intake port 316a, and a second exhaust port 316c which will be described later.

[0078] The bottom plate 310b is provided with an opening 310ba communicating with the opening 210ta of the first casing 210.

(2-1-15) Humidifying rotor

[0079] The humidifying rotor 311 is a humidity control rotor that adsorbs moisture in the outside air and releases the adsorbed moisture by being heated. The humidifying rotor 311 has a honeycomb structure and has a substantially disk-shaped outer shape. The humidifying rotor 63 is manufactured with a material that adsorbs moisture in air at normal temperature and releases moisture when exposed to heated air or the like to be increased in temperature. The material of the humidifying rotor 63 is not limited, but is, for example, an adsorbent such as silica gel or zeolite.

[0080] The humidifying rotor 311 is provided to be rotatable in a circumferential direction inside of the humidifying unit 3, and is rotated by a rotor drive motor 311a. The rotor drive motor 311a is controlled by the control unit 9.

(2-1-16) Heater

[0081] The heater 312 heats the humidifying rotor 311. Specifically, the heater 312 is provided in the first path 315 and heats the outside air sent to the humidifying rotor 311 through the first path 315. The heated outside air is sent to the humidifying rotor 311. The heater 312 is controlled by the control unit 9.

(2-1-17) Supply fan

[0082] The supply fan 313 causes the outside air to flow into the first path 315 and sends the outside air to the first pipe member 220. The supply fan 313 is controlled by the control unit 9.

(2-1-18) Adsorption fan

[0083] The adsorption fan 314 causes the outside air to flow into the second path 316. The adsorption fan 314 is controlled by the control unit 9.

(2-1-19) First path

[0084] The first path 315 is a ventilation path for sending the outside air having passed through the humidifying rotor 311 to the supply fan 313. Specifically, as shown in FIG. 2, the first path 315 is a path connecting the first intake port 315a, the heater 312, a humidifying portion 315b, and a first exhaust port 315c in this order.

[0085] The first intake port 315a is an opening formed in the second casing 310. The outside air flows into the first path 315 through the first intake port 315a.

[0086] The humidifying portion 315b is a portion where a predetermined range in the circumferential direction of the humidifying rotor 311 is exposed. The moisture adsorbed by the humidifying rotor 311 is released to the outside air heated by the heater 312 passing through the humidifying portion 315b.

[0087] The first exhaust port 315c is connected to the supply fan 313. The outside air flows into the supply fan 313 through the first exhaust port 315c.

(2-1-20) Second path

[0088] The second path 316 is a ventilation path that causes the humidifying rotor 311 to adsorb moisture contained in the outside air having flowed in. Specifically, as shown in FIG. 2, the second path 316 is a path connecting the second intake port 316a, the adsorption portion 316b, the adsorption fan 314, and the second exhaust port 316c in that order.

[0089] The second intake port 316a is an opening formed in the second casing 310. The outside air flows into the second path 316 through the second intake port 316a.

5 **[0090]** The adsorption portion 316b is a portion where a predetermined range in the circumferential direction of the humidifying rotor 311 is exposed. The range exposed in the adsorption portion 316b is different from the range exposed in the humidifying portion 315b. The moisture contained in the outside air flowing into the second path 316 is adsorbed by the humidifying rotor 311 in the adsorption portion 316b.

10 **[0091]** The second exhaust port 316c is an opening formed in the second casing 310. The outside air in which moisture is adsorbed by the humidifying rotor 311 passes through the second exhaust port 316c and flows out from the second path 316 (in other words, from the humidifying rotor 311).

20 (2-2) Indoor unit

[0092] The indoor unit 4 is a wall-mounted indoor air conditioner installed on a wall WL in the room RM. The indoor unit 4 mainly includes a third casing 410, a utilization heat exchanger 411, an indoor fan 412, and a third pipe member 413. The indoor unit 4 is not limited to a wall-mounted indoor air conditioner. The indoor unit 4 may be, for example, a ceiling-embedded indoor air conditioner or a floor-standing indoor air conditioner.

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(2-2-1) Third casing

[0093] The third casing 410 is a housing having a substantially rectangular parallelepiped shape. The third casing 410 accommodates the utilization heat exchanger 411, the indoor fan 412, the indoor fan 412, and the third pipe member 413 inside. A blow-out port 410a, which is an opening through which air having exchanged heat with the refrigerant in the utilization heat exchanger 411 blows out, is formed on a lower part of the third casing 410.

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(2-2-2) Utilization heat exchanger

[0094] The utilization heat exchanger 411 exchanges heat between the refrigerant and indoor air in the refrigerant circuit 100. One end of the utilization heat exchanger 411 is connected to the liquid-refrigerant connection pipe 5. The other end of the utilization heat exchanger 411 is connected to the gas-refrigerant connection pipe 6.

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(2-2-3) Indoor fan

[0095] The indoor fan 412 generates an air flow. The indoor fan 412 generates an air flow, so that the indoor air passes through the utilization heat exchanger 411. The indoor air passes through the utilization heat exchanger 411 to promote heat exchange between the refrigerant in the utilization heat exchanger 411 and the

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outside air.

[0096] The indoor fan 412 is rotationally driven by an indoor fan motor 412a. The air volume of the indoor fan 412 is controlled by the control unit 9 changing the number of rotations of the indoor fan motor 412a.

(2-2-4) Third pipe member

[0097] The third pipe member 413 is a duct that sends the outside air sent from the humidifying unit 3 to a predetermined location inside of the indoor unit 4. One end of the third pipe member 413 is connected to the second pipe member 7. The other end of the third pipe member 413 is disposed at a predetermined location inside of the indoor unit 4. The outside air sent from the humidifying unit 3 is sent from the other end of the third pipe member 413 to the inside of the indoor unit 4 through the second pipe member 7 and the third pipe member 413.

(2-3) Remote controller

[0098] The remote controller 8 receives an execution instruction of a heating operation, a cooling operation, a humidifying operation, and the like, a stop instruction of the air conditioner 1, and a set value of a set temperature Ts and the like from the user, and transmits the received result to the control unit 9 as a control signal.

(2-4) Control unit

[0099] The control unit 9 is mainly connected to the compressor 211, the four-way switching valve 212, the heat source expansion valve 214, the outdoor fan 215, the indoor fan 412, the rotor drive motor 311a, the heater 312, the supply fan 313, the adsorption fan 314, and the remote controller 8 so as to be able to transmit and receive control signals. The control unit 9 controls the operations of the compressor 211, the four-way switching valve 212, the heat source expansion valve 214, the outdoor fan 215, and the indoor fan 412 to control the refrigerant circuit 100, which will be described in detail later.

[0100] The control unit 9 is typically implemented by a computer including a control calculator and a storage (both omitted in the drawing). Examples of the control calculator include a processor such as a CPU or a GPU. The control calculator reads a control program stored in the storage, and performs operation control in accordance with the control program. Furthermore, the control calculator can write calculation results in the storage and read information stored in the storage in accordance with the control program.

[0101] Note that FIG. 2 is a schematic diagram. The control unit 9 includes an outdoor control unit provided inside of the outdoor unit 2 and an indoor control unit provided inside of the indoor unit 4, and the outdoor control unit and the indoor control unit may be connected by a communication line capable of transmitting and receiving control signals to and from each other.

(3) Air conditioning operation

[0102] Next, the heating operation, the cooling operation, and the humidifying operation, which are the air conditioning operation executed by the control unit 9, will be described.

(3-1) Heating operation

[0103] The control unit 9 starts the heating operation when receiving a control signal related to an instruction to execute the heating operation from the remote controller 8. During the heating operation, the control unit 9 switches the four-way switching valve 212 to the first state (see the broken line in FIG. 2). Furthermore, the control unit 9 sets the heat source expansion valve 214 to have an opening degree corresponding to the set temperature Ts received from the remote controller 8, operates the compressor 211, and drives the indoor fan 412 to rotate. As a result, the heat source heat exchanger 213 functions as an evaporator of the refrigerant, and the utilization heat exchanger 411 functions as a condenser of the refrigerant.

[0104] During the heating operation, the refrigerant circuit 100 functions as follows. The high-pressure refrigerant discharged from the compressor 211 exchanges heat with the indoor air sent by the indoor fan 412 in the utilization heat exchanger 411 to be condensed. As a result, the air in the room is heated and exhausted into the room as conditioned air. The condensed refrigerant passes through the heat source expansion valve 214 to be decompressed, and then exchanges heat with the outside air sent by the outdoor fan 215 in the heat source heat exchanger 213 to be evaporated. The refrigerant that has passed through the heat source heat exchanger 213 is sucked into the compressor 211 and compressed.

(3-2) Cooling operation

[0105] The control unit 9 starts the cooling operation when receiving a control signal related to an instruction to execute the cooling operation from the remote controller 8. During the cooling operation, the control unit 9 switches the four-way switching valve 212 to the second state (see the solid line in FIG. 1). Furthermore, the control unit 9 sets the heat source expansion valve 214 to have an opening degree corresponding to the set temperature Ts received from the remote controller 8, operates the compressor 211, and drives the indoor fan 412 to rotate. As a result, the heat source heat exchanger 213 functions as a condenser of the refrigerant, and the utilization heat exchanger 411 functions as an evaporator of the refrigerant.

[0106] During the cooling operation, the refrigerant circuit 100 functions as follows. The high-pressure refrigerant discharged from the compressor 211 exchanges heat with the outside air sent by the outdoor fan 215 in the heat source heat exchanger 213 to be condensed.

The condensed refrigerant passes through the heat source expansion valve 214 to be decompressed, and then exchanges heat with the indoor air sent by the indoor fan 412 in the utilization heat exchanger 411 to be evaporated. As a result, the air in the room is cooled and exhausted into the room as conditioned air. The refrigerant that has passed through the utilization heat exchanger 411 is sucked into the compressor 211 and compressed.

(3-3) Humidifying operation

[0107] The humidifying operation is an air conditioning operation for humidifying conditioned air by using humidified air obtained by humidifying the outside air taken in. The control unit 9 starts the humidifying operation when receiving a control signal related to an instruction to execute the humidifying operation from the remote controller 8. During the humidifying operation, the control unit 9 rotates the humidifying rotor 311 by the rotor drive motor 311a, causes the supply fan 313 and the adsorption fan 314 to blow air, causes the heater 312 to heat the outside air flowing through the first path 315, and drives the indoor fan 412 to rotate. While the humidifying operation is being executed, the refrigerant circuit 100 can execute the heating operation or the cooling operation.

[0108] During the humidifying operation, the humidifying unit 3 functions as follows. When the adsorption fan 314 rotates, the outside air flows into the second path 316 from the second intake port 316a. The outside air flowing into the second path 316 passes through a predetermined range of the rotating humidifying rotor 311 in the adsorption portion 316b. When the outside air passes through the humidifying rotor 311, moisture contained in the outside air is adsorbed by the humidifying rotor 311. The outside air in which moisture is adsorbed by the humidifying rotor 311 is exhausted from the second exhaust port 316c to the outside of the humidifying unit 3.

[0109] When the supply fan 313 rotates, the outside air flows into the first path 315 from the first intake port 315a. The outside air flowing into the first path 315 is heated by the heater 312, and then passes through a predetermined range of the rotating humidifying rotor 311 in the humidifying portion 315b. When the heated outside air passes through the humidifying rotor 311, the moisture adsorbed in the adsorption portion 316b is released from the heated humidifying rotor 311. As a result, the outside air that has passed through the humidifying rotor 311 is humidified to become humidified air, and flows into the supply fan 313 through the first exhaust port 315c. The humidified air flowing into the supply fan 313 is sent to the first pipe member 220, and then sequentially passes through the silencer 230 and the second pipe member 7 to flow into the third pipe member 413 of the indoor unit 4. The humidified air flowing into the third pipe member 413 is blown out from an end of the third pipe member 413 into the third casing 410. The humidified air blown out from the supply duct 38 is integrated with the air flow passing through the utilization heat exchanger 411. As

a result, the humidified conditioned air is blown from the indoor unit 4.

[0110] Alternatively, the air conditioner 1 may be capable of executing an air-supplying operation (not described in detail) in which the humidifying unit 3 sends outside air to the room RM without humidifying the outside air.

(4) Characteristics

[0111] (4-1)

The air conditioner 1 includes the outdoor unit 2 and the indoor unit 4. The outdoor unit 2 includes the first casing 210, the humidifying unit 3, the first pipe member 220, and the silencer 230. The first casing 210 includes the side plate 210s. The humidifying unit 3 takes in outside air and sends the outside air into the room. One end of the first pipe member 220 is connected to the humidifying unit 3, and the air sent from the humidifying unit 3 passes through the first pipe member 220. The silencer 230 is connected to the other end of the first pipe member 220, and reduces sound radiated from the humidifying unit 3 and transmitted through the first pipe member 220. The silencer 230 is fixed to the side plate 210s.

[0112] Since the silencer 230 is fixed to the side plate 210s of the outdoor unit 2, the air conditioner 1 prevents a change in the orientation of the silencer 230 from an initial state due to vibration of the outdoor unit 2 associated with the operation. As a result, a suitable connection between the silencer 230 and the first pipe member 220 is maintained.

[0113] Therefore, the air conditioner 1 prevents the suitable connection between the silencer 230 and the first pipe member 220 from being hindered by the vibration of the outdoor unit 2 associated with the operation.

[0114] Here, "fixed" means a state in which the orientation does not change due to the vibration of the outdoor unit 2 associated with the operation. In the present embodiment, the fixing by fastening of the bolts 230d has been described as an example, but the method of "fixing" is not limited thereto as long as the silencer 230 can be brought into a state where the orientation does not change even by the vibration of the outdoor unit 2 associated with the operation. For example, the outdoor unit 2 may be fixed by engagement, adhesion, or the like.

[0115] (4-2)

The silencer 230 is fixed to the side plate 210s with the attachment plate 250 interposed between the silencer 230 and the side plate 210s.

[0116] In the air conditioner 1, the silencer 230 can be separated from the side plate 210s by the attachment plate 250. Therefore, the diameter of a bend (radius) provided in the first pipe member 220 that sends the air sent from the humidifying unit 3 to the silencer 230 can be ensured to be larger than in the case where the silencer 230 and the side plate 210s are not separated from each other. As a result, the air conditioner 1 can suppress noise caused by sound (collision sound) generated by the air

passing through the first pipe member 220 vigorously colliding with an inner surface of the first pipe member 220.

[0117] (4-3)

The attachment plate 250 is fixed to the side plate 210s by the bolt 250a.

[0118] As a result, in the air conditioner 1, the attachment plate 250 is reliably fixed to the side plate 210s.

[0119] (4-4)

The silencer 230 is fixed to the attachment plate 250 by a plurality of the bolts 230d.

[0120] As a result, in the air conditioner 1, the silencer 230 is reliably fixed to the attachment plate 250. In particular, since the silencer 230 is fixed to the attachment plate 250 at multiple points by the plurality of bolts 230d, the silencer is more firmly fixed.

[0121] (4-5)

The outdoor unit 2 further includes the cover 260 that covers the side plate 210s and the silencer 230.

[0122] As a result, in the air conditioner 1, since the members attached to the side plate 210s, such as the silencer 230, are not exposed to the outside, a weather resistance of these members is secured.

[0123] (4-6)

The outdoor unit 2 further includes the shutoff valve 216. The cover 260 further covers the shutoff valve 216 and has the partition plate 260c separating the silencer 230 and the shutoff valve 216.

[0124] As a result, in the air conditioner 1, the space S1 in which the silencer 230 is accommodated and the space S2 in which the shutoff valve 216 is accommodated are separated from each other. Therefore, the air whose temperature has increased by the high-temperature refrigerant flowing through the shutoff valve 216 directly contacts the silencer 230, and thus, the silencing material 230b is prevented from being heated.

[0125] (4-7)

The partition plate 260c is provided with the slit 260c1 that connects the space S1 in which the silencer 230 is accommodated and the space S2 in which the shutoff valve 216 is accommodated.

[0126] As a result, in the air conditioner 1, the air in the space S1 heated by the air flowing through the silencer 230 flows to the outside of the cover 260 through the space S2 and the opening 260d, and thus, a temperature rise of the silencing material 230b is suppressed.

[0127] (4-8)

The cover 260 has the protrusion 260c3 protruding from the partition plate 260c downward in the vertical direction of the silencer 230.

[0128] The protrusion 260c3 is formed to be in contact with the lower part of the silencer 230 or to have a slight gap from the lower part of the silencer 230 in a state where the cover 260 is attached to the side plate 210s, and thus, a downward movement of the silencer 230 is restricted. As a result, in the air conditioner 1, the silencer 230 is prevented from coming out of the first pipe member 220 due to vibration or the like of the outdoor unit 2.

(5) Modifications

[0129] (5-1) Modification A

[0130] A plurality of the bolts 250a that fixes the attachment plate 250 to the side plate 210s may be provided. In this case, the plurality of bolts 250a that fixes the attachment plate 250 to the side plate 210s may be disposed at positions not overlapping each other in either the vertical direction or a horizontal direction.

[0131] As a result, the attachment plate 250 can prevent vibration in any of the vertical direction or the horizontal direction from changing the orientation of the silencer 230 against.

[0132] For a similar reason, the plurality of bolts 230d that fixes the silencer 230 to the attachment plate 250 may also be disposed at positions not overlapping each other in either the vertical direction or the horizontal direction.

[0133] (5-2) Modification B

[0134] The silencer 230 may be directly fixed to the side plate 210s of the first casing 210 without the attachment plate 250 interposed between the silencer 230 and the side plate 210s. In this case, the silencer 230 can be fixed to the side plate 210s by fastening the plurality of bolts 230d to the side plate 210s.

[0135] For a similar reason to the reasons in Modification A, also in this case, the plurality of bolts 230d may be disposed at positions not overlapping each other in either the vertical direction or the horizontal direction.

[0136] The bolt 230d of the air conditioner 1 according to Modification B is an example of a second fixing member.

[0137] (5-3) Modification C

[0138] The cover 260 may have a heat insulator 260e on a surface facing the silencer 230. In the air conditioner 1 according to Modification C, as illustrated in FIG. 9, the cover 260 includes the heat insulator 260e that insulates the cover body 260b and the silencer 230 from each other on the surface of the cover body 260b facing the silencer 230. The heat insulator 260e is manufactured with a heat insulating material.

[0139] As a result, the silencing material 230b of the silencer 230 is prevented from being heated by a temperature rise of the cover 260 associated with sunlight or the like.

[0140] (5-4) Modification D

[0141] The cover 260 may have a buffer 260f on a surface facing the silencer 230. In the air conditioner 1 according to Modification D, as illustrated in FIG. 9, the cover 260 includes the buffer 260f that contacts the silencer 230 and absorbs vibration of the silencer 230 on a surface of the cover body 260b facing the silencer 230. The buffer 260f is manufactured with a buffer member that absorbs vibration.

[0142] As a result, since the vibration of the outdoor unit 2 transmitted to the silencer 230 is absorbed by the buffer 260f, a change in the orientation of the silencer 230 from the initial state is more effectively suppressed.

[0143] (5-5) Modification E

[0144] The shielding plate 240 may be provided with a first guide groove 240c for partially cutting the shielding plate 240. In the air conditioner 1 according to Modification E, as illustrated in FIG. 10, the shielding plate 240 is formed in such a size as to close the entire opening 210sa of the side plate 210s. The first guide groove 240c is formed in such a size that the shielding plate 240 partially cut along the first guide groove 240c can close the gap generated between the first pipe member 220 and the opening 210sa.

[0145] As a result, the installation operator or the like can change the size of the shielding plate 240 in accordance with the presence or absence of the silencer 230 at the time of installing the air conditioner 1 or the like. It is therefore not necessary to prepare the shielding plates 240 having different sizes depending on the presence or absence of the silencer 230, and thus, a manufacturing cost of the air conditioner 1 is suppressed.

[0146] (5-6) Modification F

[0147] The first pipe member 220 may be provided with a second guide groove 220c for partially cutting the first pipe member 220. In the air conditioner 1 according to Modification F, as illustrated in FIG. 11, in the first pipe member 220, the circumferential second guide groove 220c is formed around an extending direction of the first pipe member 220 near both ends. The length of the first pipe member 220 is changed by cutting an end of the first pipe member 220 along the second guide groove 220c.

[0148] As a result, the installation operator or the like can change the length of the first pipe member 220 in accordance with the position of the silencer 230 at the time of installing the air conditioner 1 or the like. It is therefore not necessary to prepare the first pipe members 220 having different sizes depending on the installation place of the air conditioner 1, and thus, the manufacturing cost of the air conditioner 1 is suppressed.

[0149] (5-7) Modification G

[0150] The silencer 230 may be fixed to the side plate 210s outside of the cover 260.

[0151] In the air conditioner 1 according to Modification G, as illustrated in FIG. 12, the silencer 230 is fixed to the side plate 210s on a rear side of the cover 260. Note that, in FIG. 12, for convenience, a part of the cover 260 is shown in a transparent manner.

[0152] The embodiments of the present disclosure have been described above. It will be understood that various changes to modes and details can be made without departing from the gist and scope of the present disclosure recited in the claims.

REFERENCE SIGNS LIST

[0153]

1: air conditioner
100: refrigerant circuit

2: outdoor unit
210: first casing (casing)
210s: side plate
210sa: opening
216: shutoff valve
220: first pipe member (pipe member)
220c: second guide groove
230: silencer
230a: body casing
230a1: inflow port
230a2: outflow port
230d: bolt (second fixing member)
240: shielding plate
240c: first guide groove
250: attachment plate
250a: bolt (first fixing member)
260: cover
260c: partition plate
260c1: slit
260c3: protrusion
260e: heat insulator
260f: buffer
3: humidifying unit (blower)
4: indoor unit
5: liquid-refrigerant connection pipe
6: gas-refrigerant connection pipe
7: second pipe member
8: remote controller
9: control unit
c2: axial center of inflow port
c3: axial center of outflow port
S1: space in which silencer 230 is accommodated
S2: space in which shutoff valve 216 is accommodated
RM: room

CITATIONS LIST

PATENT LITERATURE

[0154] Patent Literature 1: JP 2004-69173 A

Claims

1. An air conditioner (1) comprising:
 - an outdoor unit (2); and
 - an indoor unit (4),
 - wherein the outdoor unit includes
 - a casing (210) having a side plate (210s),
 - a blower (3) that takes in outside air and sends the outside air into a room,
 - a pipe member (220) having one end connected to the blower and through which air sent from the blower passes, and
 - a silencer (230) that is connected to another end of the pipe member and reduces sound radiated

- from the blower and transmitted through the pipe member, and
the silencer is fixed to the side plate.
2. The air conditioner according to claim 1, wherein the silencer is fixed to the side plate with an attachment plate (250) interposed between the silencer and the side plate. 5
 3. The air conditioner according to claim 2, wherein the attachment plate is fixed to the side plate by a first fixing member (250a). 10
 4. The air conditioner according to claim 3, wherein
the attachment plate is fixed to the side plate by a plurality of the first fixing members, and
the plurality of first fixing members is disposed at positions not overlapping each other in either a vertical direction or a horizontal direction. 15 20
 5. The air conditioner according to claim 3 or 4, wherein the silencer is fixed to the attachment plate by a plurality of second fixing members (230d). 25
 6. The air conditioner according to claim 5, wherein the plurality of second fixing members is disposed at positions not overlapping each other in either the vertical direction or the horizontal direction. 30
 7. The air conditioner according to any one of claims 1 to 6, wherein the outdoor unit further includes a cover (260) that covers the side plate and the silencer.
 8. The air conditioner according to claim 7, wherein
the outdoor unit further includes a shutoff valve (216), and
the cover further covers the shutoff valve and includes a partition plate (260c) that separates the silencer and the shutoff valve from each other. 35 40
 9. The air conditioner according to claim 8, wherein the partition plate is provided with a slit (260c1) that connects a space (S1) in which the silencer is accommodated and a space (S2) in which the shutoff valve is accommodated. 45
 10. The air conditioner according to any one of claims 7 to 9, wherein the cover includes a protrusion (260c3) protruding downward in the vertical direction of the silencer from the partition plate. 50
 11. The air conditioner according to any one of claims 7 to 10, wherein the cover includes a heat insulator (260e) on a surface facing the silencer. 55
 12. The air conditioner according to any one of claims 7 to 11, wherein the cover includes a buffer (260f) on a surface facing the silencer.
 13. The air conditioner according to any one of claims 1 to 12, wherein
the outdoor unit has an opening (210sa) formed in the side plate,
a part of the opening is closed by a shielding plate (240), and
the shielding plate is provided with a first guide groove (240c) for partial cutting the shielding plate.
 14. The air conditioner according to any one of claims 1 to 13, wherein the pipe member is provided with a second guide groove (220c) for partial cutting the pipe member.

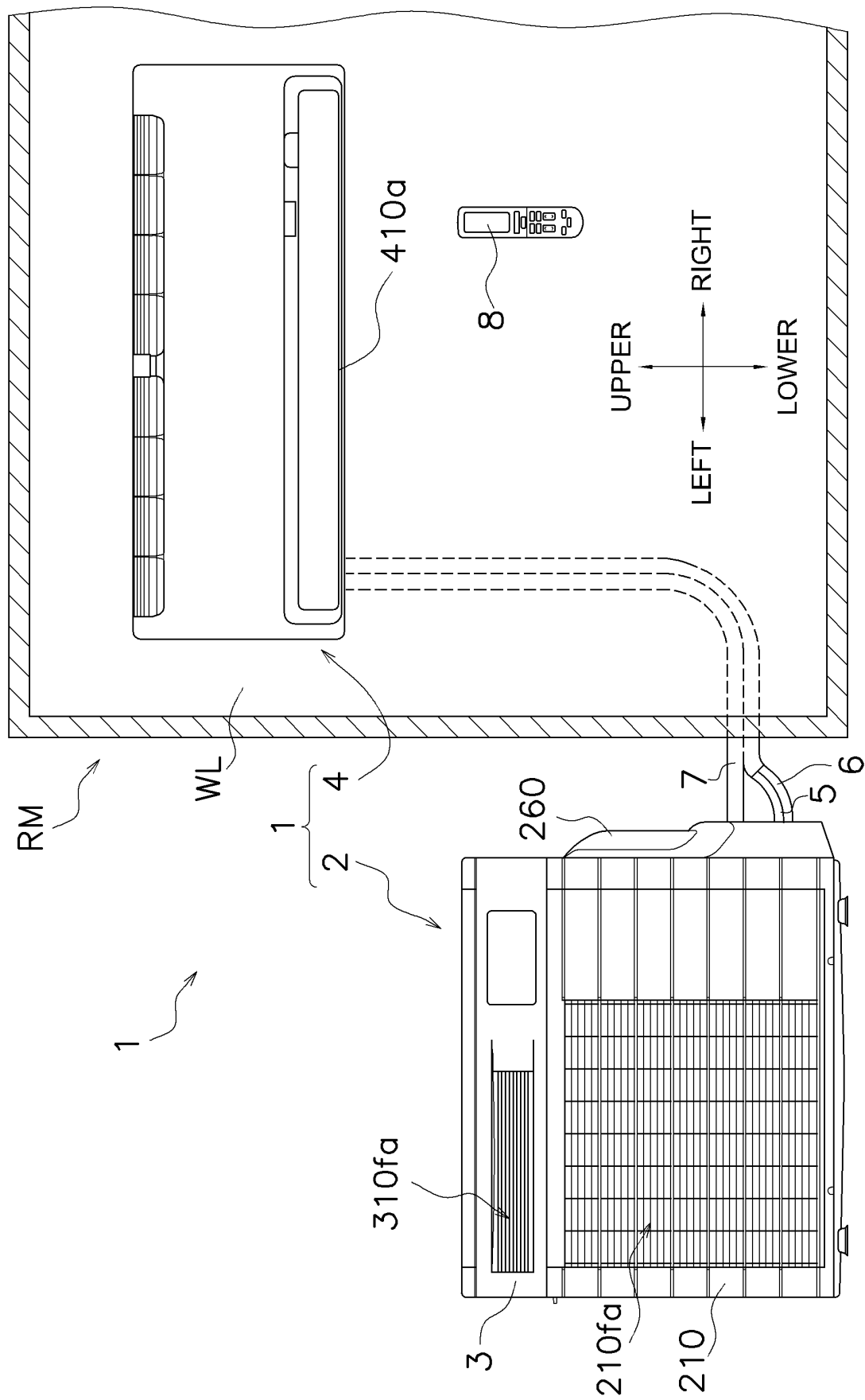


FIG. 1

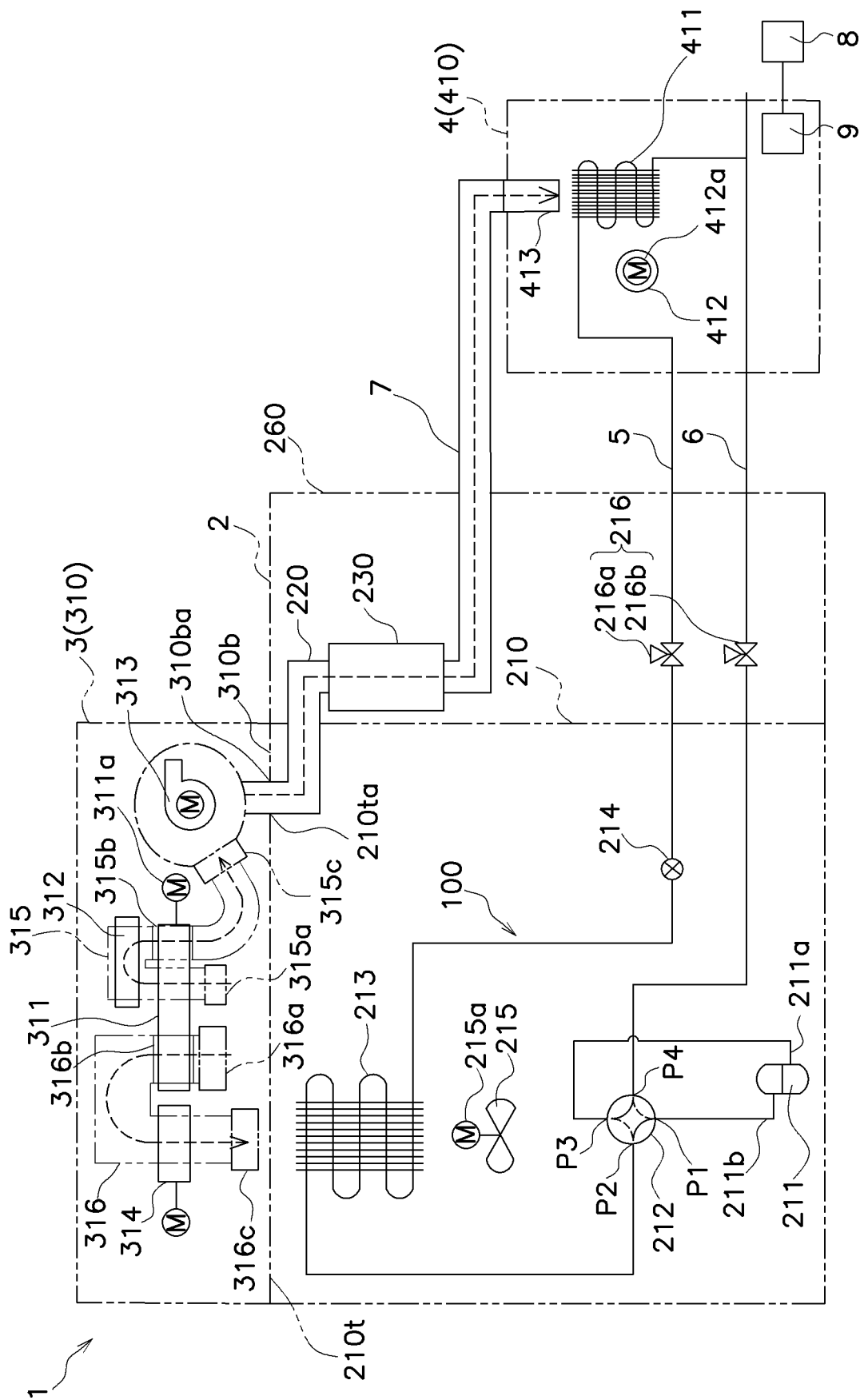


FIG. 2

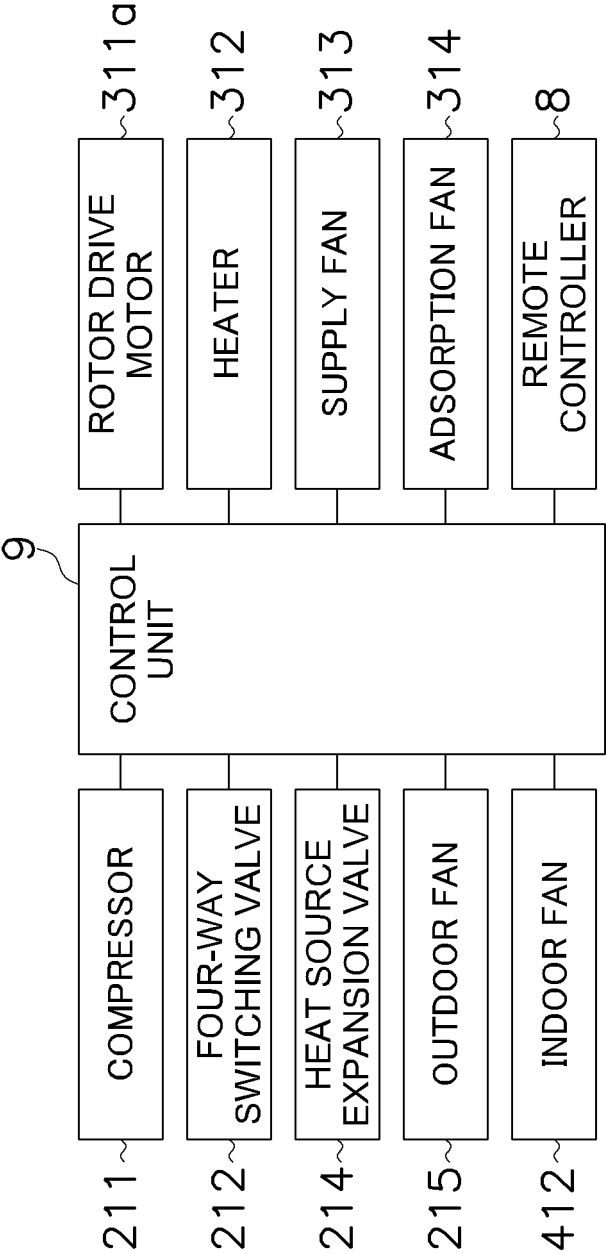


FIG. 3

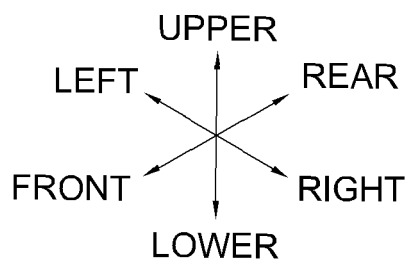
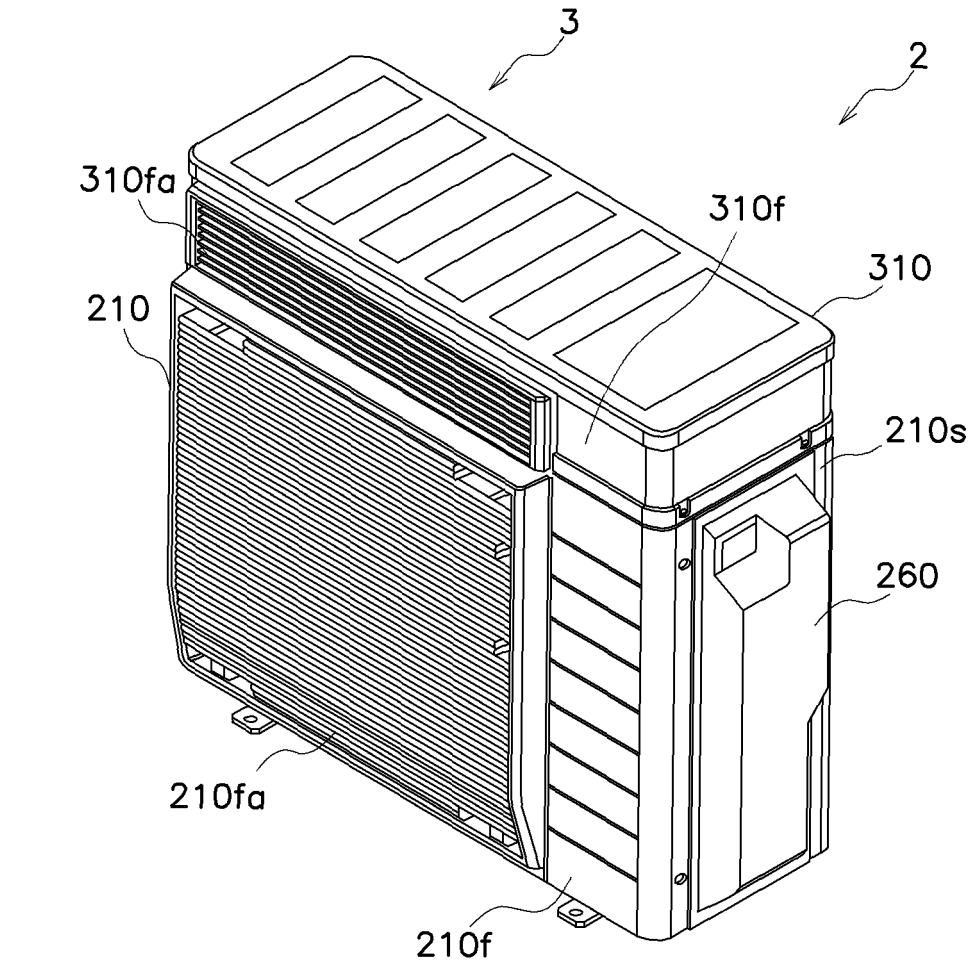


FIG. 4

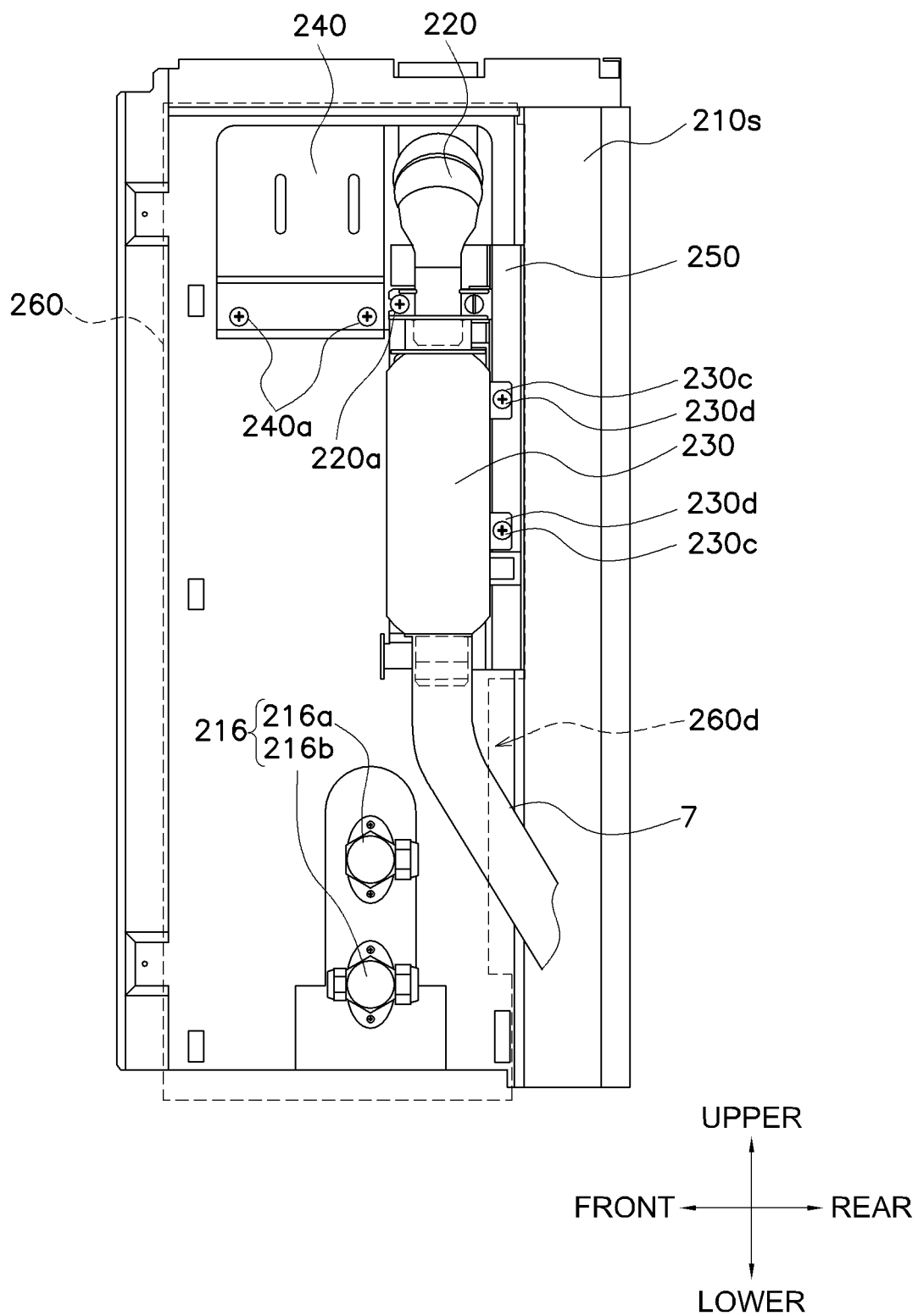


FIG. 5

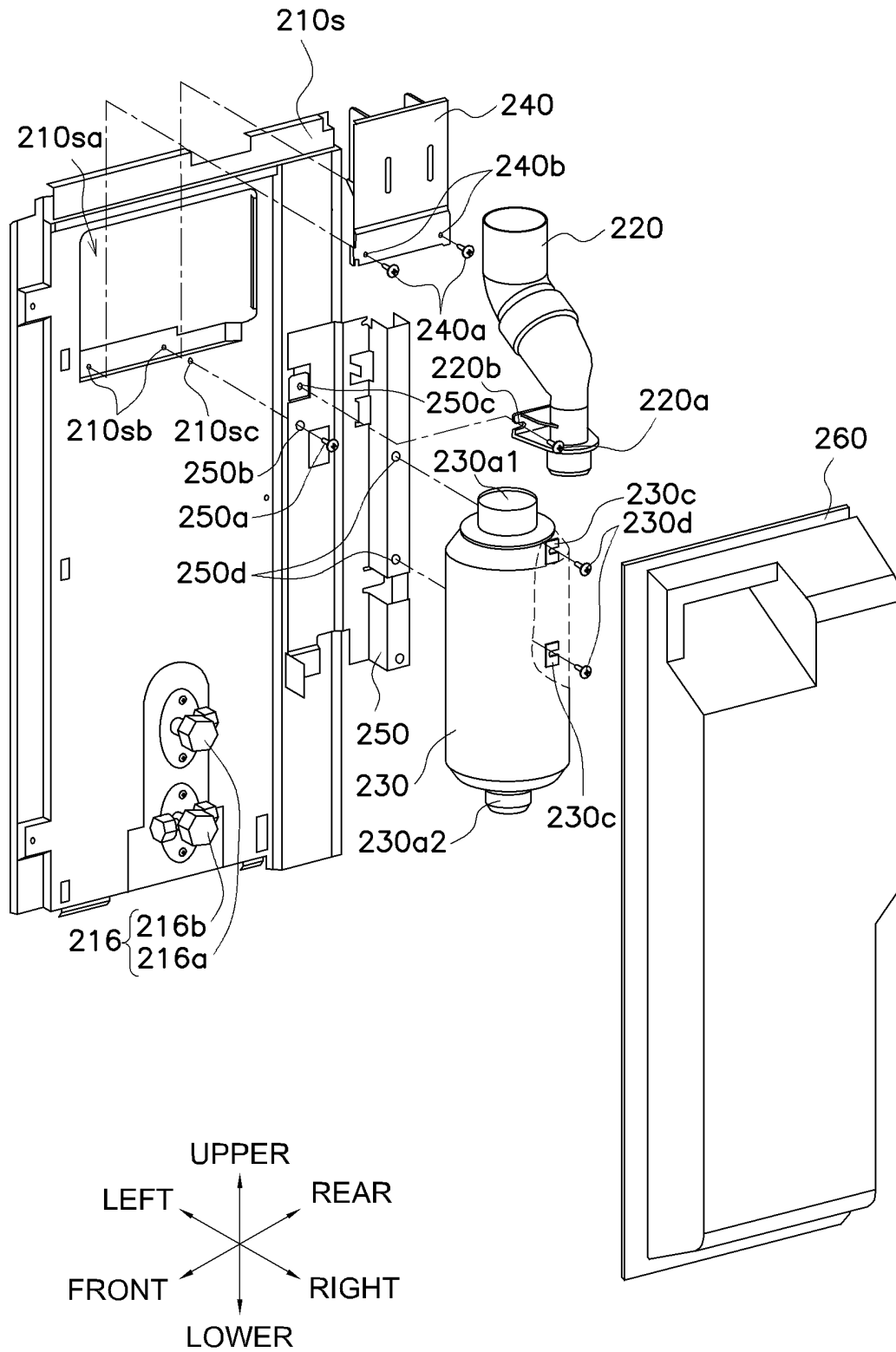


FIG. 6

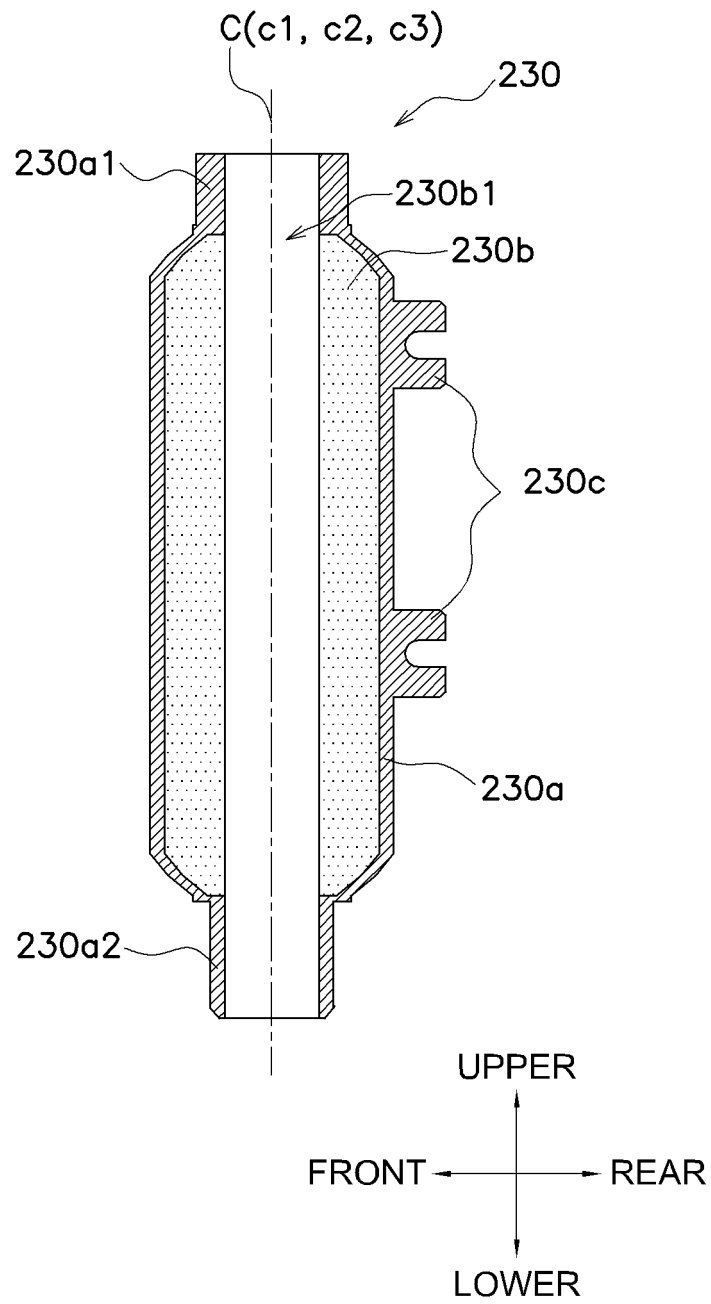


FIG. 7

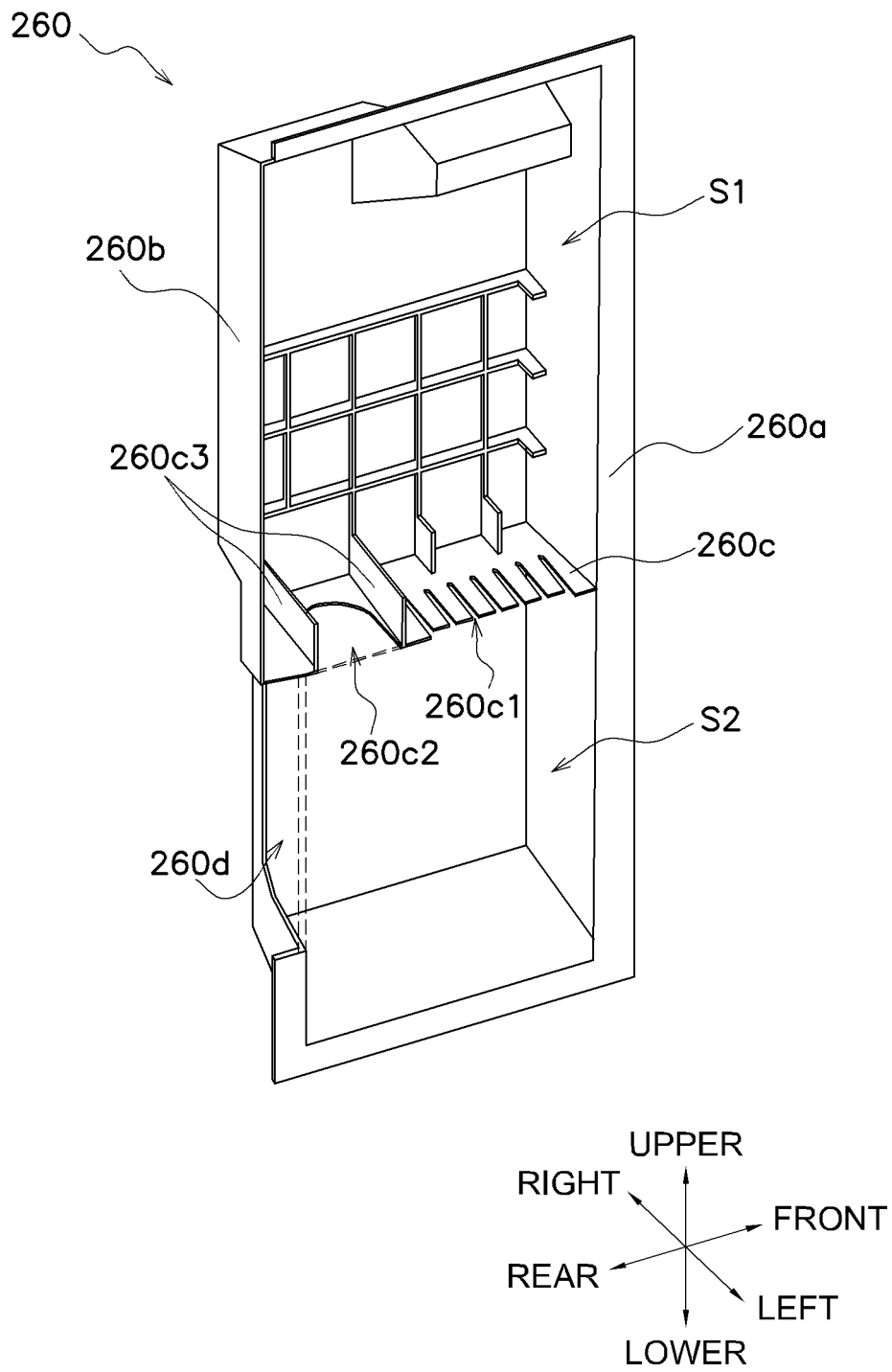


FIG. 8

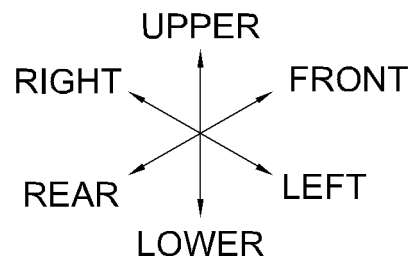
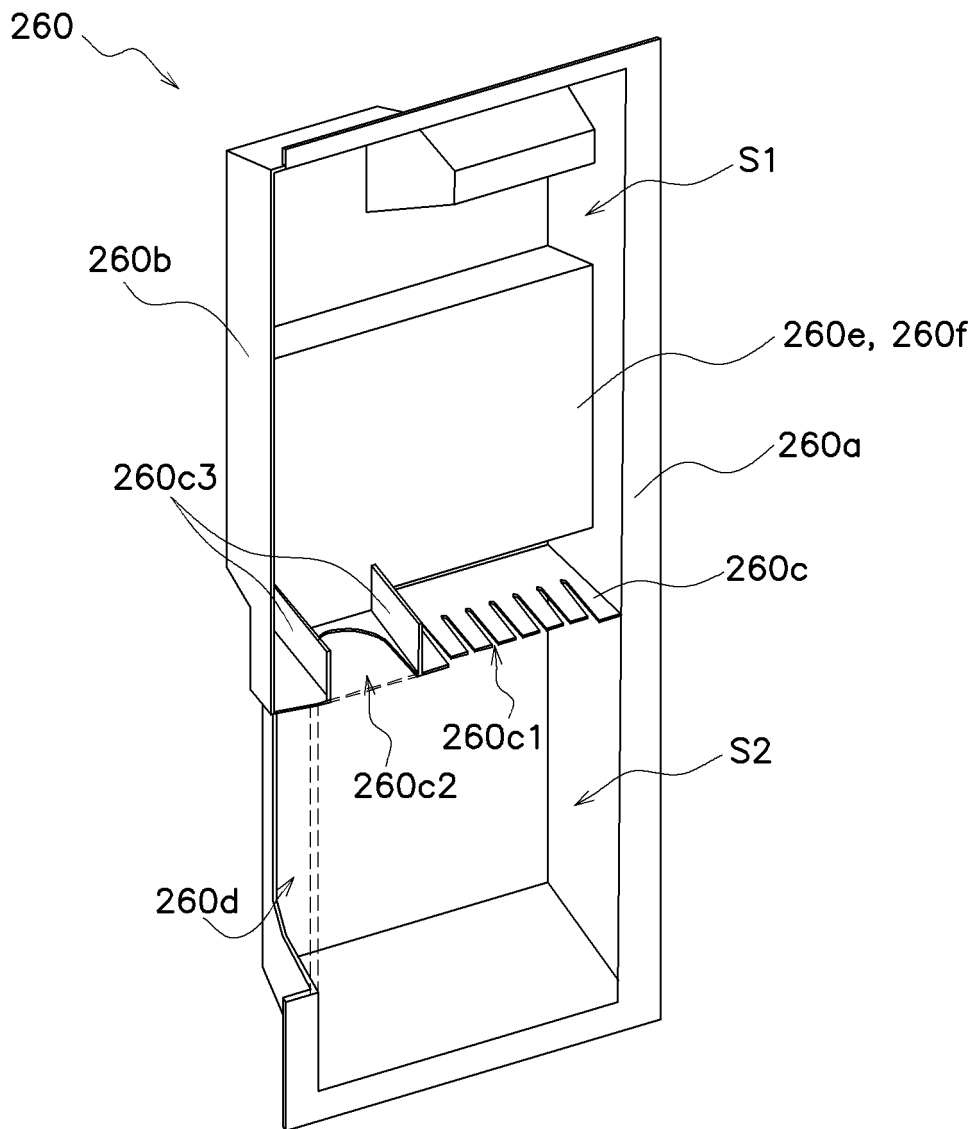


FIG. 9

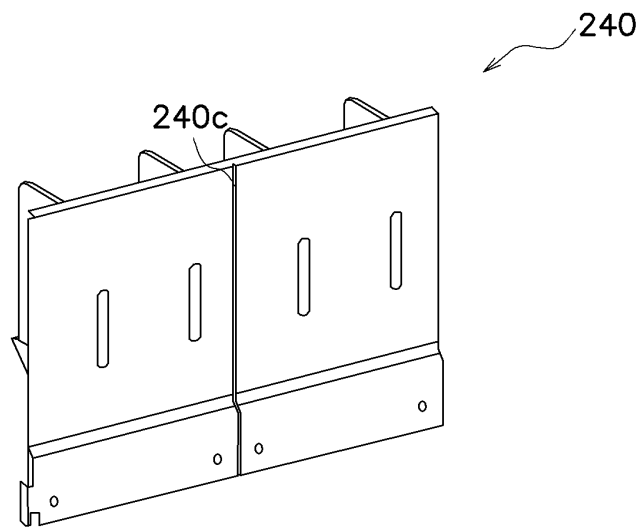


FIG. 10

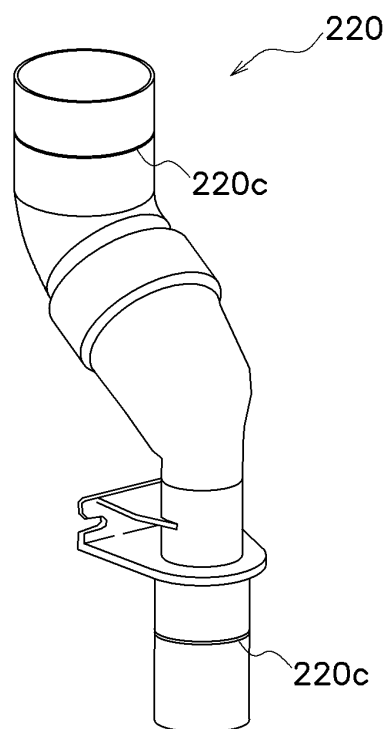


FIG. 11

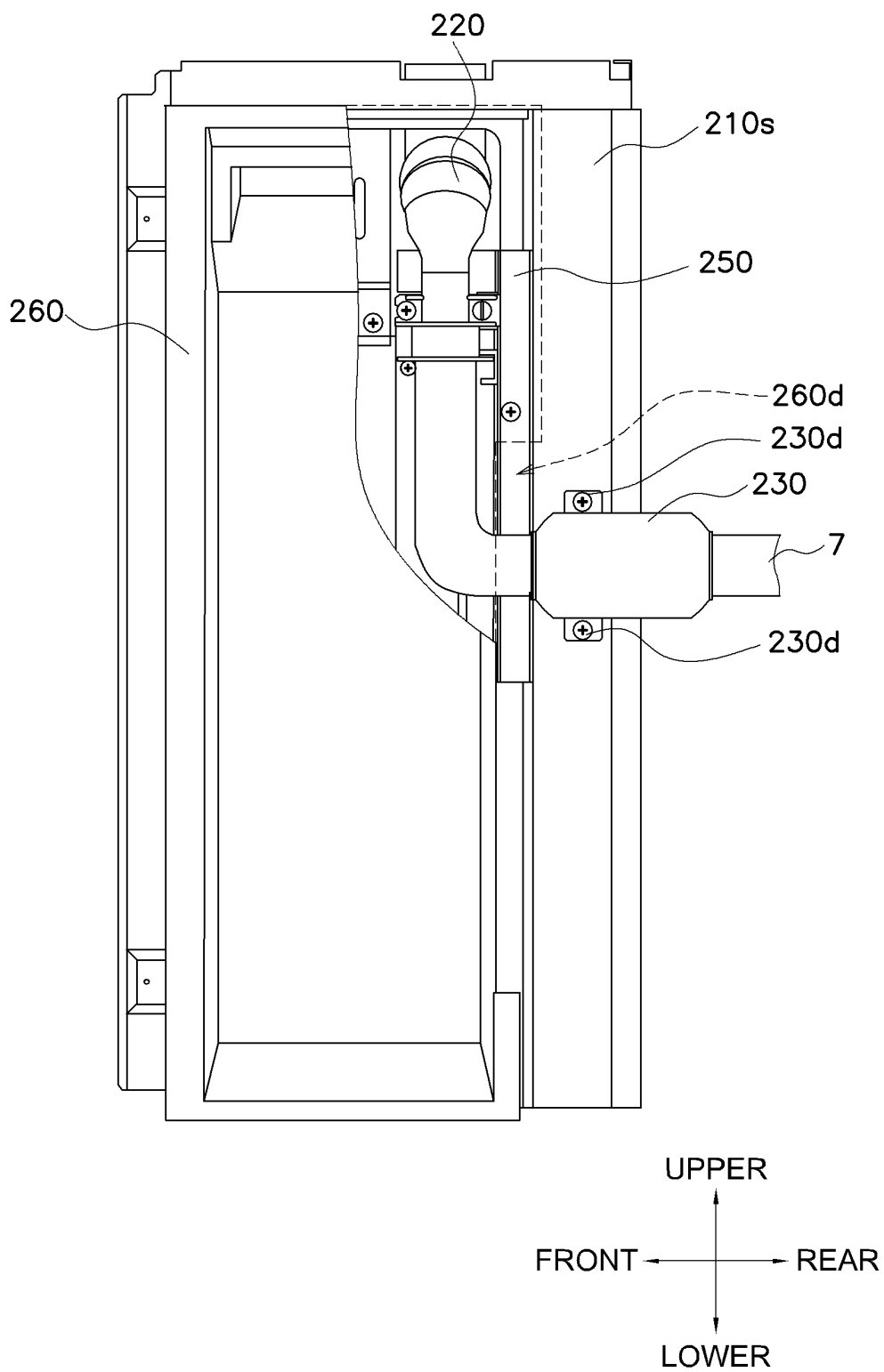


FIG. 12

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2022/043519

A. CLASSIFICATION OF SUBJECT MATTER

F24F 1/40(2011.01)i; **F24F 1/32**(2011.01)i; **F24F 1/56**(2011.01)i; **F24F 13/24**(2006.01)i
FI: F24F1/40; F24F1/32; F24F13/24; F24F1/56

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F24F1/40; F24F1/32; F24F1/56; F24F13/24

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2023
Registered utility model specifications of Japan 1996-2023
Published registered utility model applications of Japan 1994-2023

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2004-69173 A (DAIKIN INDUSTRIES LTD) 04 March 2004 (2004-03-04) paragraphs [0014]-[0050], fig. 1-6	1-14
Y	JP 2005-188804 A (MITSUBISHI ELECTRIC CORP) 14 July 2005 (2005-07-14) paragraph [0022], fig. 7	1-14
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Y	CN 110440347 A (QINGDAO HAIER AIR CONDITIONER GENERAL CO., LTD.) 12 November 2019 (2019-11-12) paragraphs [0039]-[0074], fig. 1-18	8-14
Y	JP 2019-074284 A (SHARP KK) 16 May 2019 (2019-05-16) paragraph [0039], fig. 10	11-14

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

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

26 January 2023

Date of mailing of the international search report

14 February 2023

Name and mailing address of the ISA/JP

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Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No. PCT/JP2022/043519

C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	JP 2007-270602 A (TAKAHASHI SETSUBI KK) 18 October 2007 (2007-10-18) paragraph [0026], fig. 1-2	14

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/JP2022/043519

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Patent documents cited in the description

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