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(54) INDOOR UNIT FOR AIR CONDITIONER

(57) This indoor unit for an air conditioner comprises a unit body that has an inlet and an outlet, houses a heat exchanger and a blower inside, and is mounted on a wall surface of a room, a drain pan that is disposed at the bottom of the heat exchanger and receives drain water generated and dripping from the heat exchanger during the refrigeration cycle operation, and a drain hose that is connected to the drain pan and discharges the drain water received by the drain pan to the outside of the unit body. The unit body or the drain pan has a fixing part for positioning and fixing the drain hose. The drain hose has a part to be fixed that is positioned and fixed to the fixing part. The fixing part and the part to be fixed have a coupling mechanism that is accessed from the direction facing the wall surface and couples the two parts together.

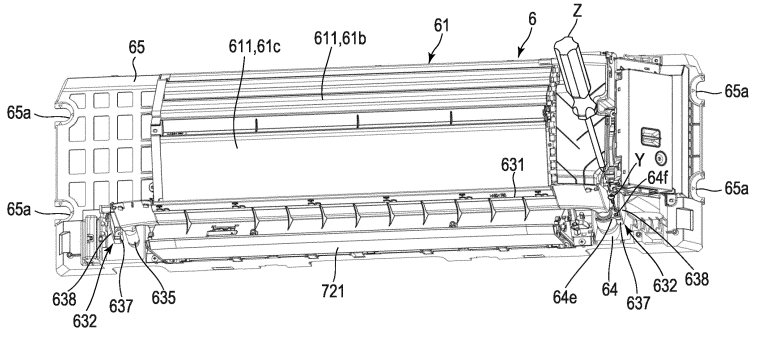

FIG. 6

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Description

Technical Field

[0001] Embodiments described herein relate generally to an indoor unit of an air conditioner.

Background Art

[0002] For example, an air conditioner includes a wall-mounted indoor unit to be installed mainly on a wall surface of an indoor high position of a building. The indoor unit includes a heat exchanger configured to carry out heat exchange between a refrigerant and indoor air, and fan configured to blow air temperature-adjusted by heat exchange toward the inside of a room. By operating a refrigerating cycle, the indoor air sucked by the fan into the inside of a housing of the indoor unit from a suction opening is temperature-adjusted by heat exchange. The temperature-adjusted air is blown toward the inside of the room from a blowout opening, and inside of the room is thereby temperature-adjusted.

[0003] A drain pan is provided at a lower part of the heat exchanger. The drain pan receives dew condensation water created by the heat exchanger at the time of a cooling operation or dehumidifying operation of the air conditioner and dropping therefrom. To the drain pan, a drain hose is connected. The drain hose is connected to the drain pan at one end thereof, outwardly extends from the one end to the outside of the indoor unit, and discharges the dew condensation water to the outside of the indoor unit from the other end thereof.

[0004] Here, for the purpose of sustention or the like of the air-conditioning performance, it is desirable that the inside of the indoor unit be periodically cleaned. For example, when the drain pan is to be cleaned, it is necessary to first remove the drain hose from the drain pan and thereafter detach the drain pan from which the drain hose is removed from the unit main body. For this reason, it is required that the aforementioned labor and trouble at the time of cleaning of the inside of the indoor unit be reduced and workability be thereby improved.

Citation List

Patent Literature

[0005] Patent Literature 1: JP 4274919 B

Summary of Invention

Technical Problem

[0006] The present invention has been contrived in light of the above, and an embodiment described herein aims to provide an indoor unit of an air conditioner intended to reduce the labor and trouble at the time of cleaning of the inside of the indoor unit and improve the workability.

Solution to Problem

[0007] An indoor unit of an air conditioner according to one embodiment includes a unit main body, a drain pan, a drain hose. The unit main body includes a suction opening and a blowout opening, accommodating therein a heat exchanger and a blower device. The unit main body is mounted on a wall surface inside a room. The drain pan is arranged at a lower part of the heat exchanger. The drain pan receives dew condensation water created by the heat exchanger concomitantly with a refrigerating cycle operation and dropping therefrom. The drain hose is connected to the drain pan, and discharges the dew condensation water received by the drain pan to the outside of the unit main body. The unit main body or the drain pan includes a fixing part used to positioning-fix the drain hose. The drain hose includes a fixed part to be positioning-fixed to the fixing part. Each of the fixing part and the fixed part includes a coupling mechanism to be accessed from a direction toward the wall surface and used to couple both the fixing part and the fixed part to each other.

Brief Description of Drawings

[0008]

FIG. 1 is a circuit diagram showing a refrigerating cycle of an air conditioner according to an embodiment.

FIG. 2 is an exploded perspective view showing the schematic configuration of an indoor unit of the air conditioner according to the embodiment.

FIG. 3 is a cross-sectional view of the indoor unit of the air conditioner according to the embodiment.

FIG. 4 is a view showing a state where a drain pan (second drain pan) is separated from a unit main body in the indoor unit of the air conditioner according to the embodiment.

FIG. 5 is a partially enlarged view of FIG. 4 showing the schematic configuration of a fixing part of the drain pan (second drain pan) of the indoor unit of the air conditioner according to the embodiment.

FIG. 6 is a view showing a state where the drain pan (second drain pan) is attached to the unit main body of the indoor unit of the air conditioner according to the embodiment.

FIG. 7A is a view schematically showing a configuration example of the vicinity of a tip end of a drain hose according to the embodiment.

FIG. 7B is a view schematically showing the configuration example of the vicinity of the tip end of the drain hose according to the embodiment from the direction of an arrow 7A of FIG. 7A.

FIG. 8 is a view schematically showing a screw-fixing aspect of a case where the drain hose is attached/de-

tached to/from the drain pan (second drain pan) in the indoor unit of the air conditioner according to the embodiment.

FIG. 9 is a view schematically showing an aspect of a case where the drain hose is connected to the drain pan (second drain pan) in the indoor unit of the air conditioner according to the embodiment.

FIG. 10 is a view schematically showing an aspect of a case where the drain hose is detached from the drain pan (second drain pan) in the indoor unit of the air conditioner according to the embodiment.

[0009] Mode for Carrying Out the Invention Hereinafter an embodiment of the present invention will be described below with reference to FIGS. 1 to 10.

[0010] In FIG. 1, an air conditioner 1 includes an outdoor unit 2 and indoor unit 3. The outdoor unit 2 and indoor unit 3 are connected to each other by a cyclic path 4 formed of copper piping or the like through which a refrigerant is circulated. The outdoor unit 2 includes, as main elements, a compressor 21, four-way valve 22, outdoor heat exchanger 23, outdoor blower device 24, expansion device 25, and accumulator 26. The indoor unit 3 includes, as main elements, an indoor heat exchanger 61 and indoor blower device 62.

[0011] As shown in FIG. 1, the discharge side of the compressor 21 is connected to a first port 22a of the four-way valve 22. A second port 22b of the four-way valve 22 is connected to the outdoor heat exchanger 23. The outdoor heat exchanger 23 is connected to the indoor heat exchanger 31 through the expansion device 25. The indoor heat exchanger 31 is connected to a third port 22c of the four-way valve 22. A fourth port 22d of the four-way valve 22 is connected to the suction side of the compressor 21 through the accumulator 26.

[0012] The refrigerant circulates through the cyclic path 4 from the discharge side of the compressor 21 to the suction side of the compressor 21 through the outdoor heat exchanger 23, expansion device 25, indoor heat exchanger 31, and accumulator 26. By switching of communication between the ports 22a to 22d of the four-way valve 22, the refrigerant circulates through the cyclic path 4 in the opposite direction, taking the four-way valve 22 as the starting point. Thereby, the operation mode of the air conditioner 1 is appropriately switched to the cooling operation, heating operation, and the like.

[0013] In FIG. 2 and FIG. 3, the direction indicated by an arrow Fr in FIG. 2 and FIG. 3 is defined as the front, direction indicated by an arrow Lh is defined as left, direction indicated by an arrow Up is defined as up, and directions opposite to the directions indicated by the arrows Fr, Lh, and Up are respectively defined as the back, right, and down. The direction indicated by the arrow Fr, direction indicated by the arrow Lh, and direction indicated by the arrow Up respectively correspond to the depth direction, width direction, and height direction.

[0014] As shown in FIG. 2 and FIG. 3, the indoor unit 3 is of the wall-mounted type and is attached to a mounting surface W which is a high position wall surface inside the building. The indoor unit 3 includes a mounting plate 5, unit main body 6, housing 7, and front panel 8.

[0015] The mounting plate 5 is a plate-like member sheet-metal-processed into, for example, a predetermined shape along a back surface plate 65 of the unit main body 6, and including a plurality of mounting holes. The mounting plate 5 is fixed to a wall surface W serving as the mounting surface by means of screws or the like inserted into the mounting holes and thereby becomes a base configured to mount the unit main body 6 on the wall surface W. The unit main body 6 is attached to the mounting plate 5 by means of mounting fittings such as claw hooks, screws, and the like provided on the back surface plate 65 and is thereby mounted on the wall surface W through the mounting plate 5.

[0016] The housing 7 covers the unit main body 6 and defines a contour of the indoor unit 3. The housing 7 includes a top part 7a, bottom part 7b, front part 7c, left side part 7d, and right side part 7e. These parts 7a to 7e make the back side (back surface side) of the housing 7 take a form opened as an accommodating opening to be utilized at the time of accommodating therein the unit main body 6. The housing 7 is retained by the unit main body 6 by fitting the inner peripheral edge of the aforementioned accommodating opening onto the outer peripheral edge of the back surface plate 65. At this time, the inner peripheral edge of the accommodating opening is brought into close contact with the outer peripheral edge of the back surface plate 65 by the elasticity thereof, and the housing 7 and unit main body 6 are thereby firmly unified with each other. Thereby, the housing 7 is brought into a state where the housing 7 is put on the unit main body 6 so as to accommodate therein the unit main body 6.

[0017] The top part 7a extends in each of the width direction and depth direction to define the top surface of the indoor unit 3 and includes an opening part serving as a suction opening 71 of the indoor air. The bottom part 7b extends in each of the width direction and depth direction to define the undersurface of the indoor unit 3 and includes an opening part serving as a blowout opening 72 of temperature-adjusted air at a central part thereof. The front part 7c extends in each of the width direction and height direction to define the front surface of the indoor unit 3 and includes an opening part serving as part of the suction opening 71. The left side part 7d extends in each of the depth direction and height direction to define the left side surface of the indoor unit 3. The right side part 7e extends in each of the depth direction and height direction to define the right side surface of the indoor unit 3 and is opposed to the left side part 7d in the width direction.

[0018] At each of the openings of the top part 7a and front part 7c, a filter 73 configured to filtrate the dust in the indoor air is provided so as to be attachable/detachable. The filter 73 is arranged at the top part 7a and front part 7c so as to cover the suction opening 71 and is op-

posed to fins 611 of the indoor heat exchanger 61 to be described later.

[0019] Part of each of the left side part 7d and right side part 7e from each of end parts of the front part 7c in the width direction to the wall surface W is curved into a swollen shape. Thereby, each of the side surfaces of the indoor unit 3 takes a gently continuous form having no steps between the front surface of the indoor unit 3 defined by the front part 7c and wall surface W. Accordingly, unification is achieved in such a manner that the indoor unit 3 apparently forms approximately a part of the wall surface W while smoothly swelling from the wall surface W.

[0020] Each of the left side part 7d and right side part 7e includes screw-receiving seats 7f for screws to be used to fix the housing 7 to the wall surface W. A through-hole into which a screw X is to be inserted is formed in each of the screw-receiving seats 7f. The housing 7 is put on the unit main body 6 so as to accommodate therein the unit main body 6 in the state where the unit main body 6 is mounted on the wall surface W through the mounting plate 5 and is positioning-fixed to the wall surface W by screwing the screw X inserted into each of the through-holes of the screw-receiving seats 7f into the wall surface W. At this time, in the wall surface W, screw holes Wa are formed.

[0021] In line with the positions of the screw-receiving seats 7f, notches 65a are formed in the back surface plate 65 of the unit main body 6. The notch 65a has such a form that the notch portion thereof communicates with the through-hole of the screw-receiving seat 7f and is not in contact with the screw X. The peripheral portion of the notch 65a overlaps the peripheral portion of the through-hole of the screw-receiving seat 7f in the depth direction.

[0022] The front panel 8 is a member configured to cover the front part 7c, left side part 7d, and right side part 7e of the housing 7 to thereby form the design (external appearance) of the front of the indoor unit 3. The front panel 8 includes a panel member 8a and fabric member (decorative fabric) 8b.

[0023] The panel member 8a is formed into an elongated shape along the surfaces of the front part 7c, left side part 7d, and right side part 7e of the housing 7. The panel member 8a includes a first part 81a along the front part 7c, second part 82a along the left side part 7d, and third part 83a along the right side part 7e. The first part 81a is formed into approximately a flat shape along the surface of the front part 7c and covers the surface of the front part 7c. Part of the first part 81a, more specifically, each of portions thereof at which the first part 81a is continuous with the second part 82a or third part 83a is formed into a curved shape. The second part 82a is partially formed into a curved shape along the surface of the left side part 7d and covers the surface of the left side part 7d. The third part 83a is partially formed into a curved shape along the surface of the right side part 7e and covers the surface of the right side part 7e. Thereby, the panel member 8a extends to the wall surface W in the form in which the first part 81a positioned at the central part in the longitudinal direction is gently continuous with each of the second part 82a and third part 83a positioned on both sides.

[0024] The panel member 8a is contrived in such a way as to be supported on supporting portions 84 attachable/detachable and rotatable, and to be forwardly and upwardly tipped up. Thereby, for example, at the time of cleaning of the suction opening 71, at the time of exchange of the filter 73 or the like, the filter 73 is configured in such a manner as to be exposable to the inside of a room. The supporting portions 84 are each provided in the vicinities of portions of continuity between the first part 81a of the panel member 8a and second part 82a thereof, and between the first part 81a and third part 83a. On the housing 7, engaging portions 74 each of which is configured to detachably engage with the supporting portion 84 are provided. The engaging portions 74 are each arranged on the left side part 7d and right side part 7e in line with the positions of the supporting portions 84.

[0025] The fabric member 8b is a member made of fabric, used for decorative purposes, and configured to cover the front surface (obverse surface) of the panel member 8a and form the design (external appearance) of the front surface of the indoor unit 3. The fabric member 8b is, as shown in FIG. 3, fixed to the panel member 8a by, for example, a hook and loop fastener so as to be attachable/detachable. Thereby, the fabric member 8b is freely attachable/detachable and exchangeable as the need arises, and changes the fine view of the indoor unit 3. Further, it is also possible to use the panel member 8a as it is as a decorative panel constituting the external appearance without attaching the fabric member 8b thereto. The panel member 8a is an integrated resin molded article, and the color thereof is white or cream identical to the housing 7 which is likewise an integrated resin molded article.

[0026] As shown in FIG. 3, the unit main body 6 includes, as main elements, a heat exchanger (indoor heat exchanger) 61, blower device (indoor blower device) 62, drain pan 63, and drain hose 64 (see FIG. 4). These elements are each arranged on and fixed to the back surface plate 65. In the back surface plate 65, notches 65a are formed in line with the positions of the screw-receiving seats 7f of the housing 7. The notch 65a is configured in such a manner as to communicate with the through-hole of the screw-receiving seat 7f and to be not in contact with the screw X. The peripheral portion of the notch 65a overlaps the peripheral portion of the through-hole of the screw-receiving seat 7f in the depth direction. The screw X inserted into the through-hole of the screw-receiving seat 7f is screwed into the wall surface W, whereby the peripheral portion of the notch 65a is pressed against the wall surface W through the peripheral portion of the screw-receiving seat 7f of the housing 7. Thereby, the posture of the unit main body 6 relative to the wall surface W is stabilized at both end portions thereof in the width direction and, at the same time, pos-

ture of the housing 7 is also stabilized. The aforementioned screw-fixed structure is appropriate for the purpose of installing an indoor unit 3 in which the width of the mounting plate 5 is shorter and width of the unit main body 6 is longer in comparison with the width dimension of the mounting plate 5 as in the case of this embodiment.

[0027] The indoor heat exchanger 61 includes a plurality of fins 611 and a plurality of heat exchanger tubes 612 through which the refrigerant flows, and these fins 611 and heat exchanger tubes 612 are arranged in juxtaposition throughout a predetermined range in the width direction of the unit main body 6. The fins 611 include a first fin part 61a, second fin part 61b, and third fin part 61c. The first fin part 61a is downwardly inclined from the upper part of the unit main body 6 in the rearward direction, and is arranged so as to be opposed to the air suction opening 71 opened at the top part 7a of the housing 7. The second fin part 61b is downwardly inclined in the anterior direction so as to be continuous with the upper end of the first fin part 61a, and is arranged so as to be opposed to the suction opening 71 and front part 7c of the housing 7. The third fin part 61c is downwardly inclined in the posterior direction so as to be continuous with the lower end of the second fin part 61b, and is arranged so as to be opposed to the front part 7c of the housing 7.

[0028] The indoor blower device 62 includes a fan motor (illustration omitted) and fan 621. The fan 621 is configured as a cylindrical multi-blade fan (transverse fan) extending in the width direction of the unit main body 6, and is coaxially attached to the rotating shaft of the fan motor. When the fan 621 is driven by the fan motor to be rotated, the air inside the room is sucked into the inside of the housing 7 from the suction opening 71, carries out heat exchange with the refrigerant flowing through the heat exchanger tubes 612 at the time passage thereof through the fins 611, and is cooled or is heated to thereby be temperature-adjusted. The temperature-adjusted air is blown toward the inside of the room from the blowout opening 72 formed in the bottom part 7b of the housing 7.

[0029] At the blowout opening 72, one horizontal louver 721 configured to define the wind direction in the vertical direction and a plurality of vertical louvers 722 arranged on the farther side of the louver 721 and configured to define the wind direction in the horizontal direction are provided.

[0030] The horizontal louver 721 is a movable plate member configured to control the wind direction at the time of operation and close the blowout opening 72 at the time of non-operation (at the normal time) and is formed into a shape flat and elongate in the width direction. The horizontal louver 721 includes a supporting part 724 provided with a supporting shaft 723, is operated by a drive mechanism (illustration omitted), and thereby opens/closes the blowout opening 72 relatively to the room inside with the supporting shaft 723 being the center. More specifically, at the time of an operation of the indoor unit 3, the horizontal louver 721 inclines downwardly toward the front so as to open (expose) the blowout opening 72 to the room inside. Thereby, the horizontal louver 721 defines the wind direction in the height direction (vertical direction). The drive mechanism is configured to include, for example, an electric motor configured to rotate the horizontal louver 721 around the predetermined supporting shaft 723, control circuit board configured to control the electric motor, link member configured to rotate the plurality of vertical louvers 722 at a time, and the like. The supporting shaft 723 is supported by a bearing part 639 provided on the drain pan 63 (more specifically, the second drain pan 63b to be described later) so as to be rotatable. The bearing part 639 protrudes from an air trunk part 633 of the second drain pan 63b to be described later toward the blowout opening 72.

[0031] Each of the vertical louvers 722 is constituted of a thin plate-shaped member configured to define the direction of the air (wind) blown out of the blowout opening 72 in the width direction (horizontal direction), and the plurality of vertical louvers 722 are arranged in juxtaposition in the width direction. The vertical louvers 722 protrude from part of a first drain pan 63a to be described later toward the blowout opening 72 and are enabled to swing (rotate). The vertical louvers 722 may automatically be operated by, for example, a drive mechanism similar to the horizontal louver 721 or may also be manually moved. At this time, it is sufficient if the plurality of vertical louvers 722 are swung (rotated) at a time by means of a link member.

[0032] The drain pan 63 is arranged at a lower part of the indoor heat exchanger 61 and receives dew condensation water created by the indoor heat exchanger 61 concomitantly with the refrigerating cycle operation and dropping therefrom. The drain pan 63 includes a first drain pan 63a and second drain pan 63b.

[0033] The first drain pan 63a is arranged at a rear part of the unit main body 6, supports thereon the lower end of the first fin part 61a, and receives the dew condensation water dropping from the first fin part 61a. The second drain pan 63b is arranged at a front part of the unit main body 6, supports thereon the lower end of the third fin part 61c, and receives the dew condensation water dropping from the second fin part 61b and third fin part 61c. The first drain pan 63a and second drain pan 63b communicate with each other through a communicating path (illustration omitted) installed between the pans 63a and 63b. Relatively, the first drain pan 63a is positioned on the upper side and second drain pan 63b is positioned on the lower side, and hence the dew condensation water received by the first drain pan 63a is guided to the second drain pan 63b through the communicating path. Thereby, the dew condensation water created by the indoor heat exchanger 61 and dropping therefrom is received by the first drain pan 63a and second drain pan 63b and is thereafter collected at the second drain pan 63b.

[0034] In FIG. 4, a state where the second drain pan 63b is separated from the unit main body 6 is shown. As shown in FIG. 3 and FIG. 4, the second drain pan 63b is

configured to include a gutter part 631, fixing part 632, and air trunk part 633.

[0035] The gutter part 631 is a part extending, in a gutter-like form, throughout a predetermined range of the unit main body 6 in the width direction, the second fin part 61b and third fin part 61c of the indoor heat changer 61 being arranged in the unit main body 6, and configured to receive the dew condensation water dropping from these fin parts 61b and 61c. It should be noted that at the gutter part 631, the dew condensation water dropping from the first fin part 61a and received by the first drain pan 63a is also collect through the communicating path. The gutter part 631 includes ribs at predetermined intervals in the width direction and the stiffness thereof is thereby enhanced.

[0036] On the gutter part 631, connection parts 635 for connection to the drain hose 64 are provided. The connection part 635 is contrived in such a manner that the part 635 is opened at a position on each of both sides of the gutter part 631, backwardly protrudes in, for example, a cylindrical form, and tip end part of the drain hose 64 is inserted into the outer circumferential part thereof to thereby be fitted therein. Thereby, the dew condensation water collected at the gutter part 631 is drained from the connection part 635 through the drain hose 64.

[0037] Further, on the gutter part 631, click parts 636 configured to position the second drain pan 63b to the unit main body 6 are provided. On the unit main body 6, click receiving parts 66 to be engaged with the click parts 636 are provided in line with the positions of the click parts 636. The second drain pan 63b positioned by the click parts 636 is fixed to the back surface plate 65 of the unit main body 6 by means of predetermined fixing fittings (for example, screws).

[0038] In FIG. 5, the schematic configuration of the fixing part 632 configured to positioning-fix the drain hose 64 to the second drain pan 63b is shown. It should be noted that the second drain pan 63b is configured so as to produce approximately a symmetric appearance and, although hereinafter the fixing part 632 of the right side part of the second drain pan 63b shown in FIG. 4 and FIG. 5 will be described, the description is true of the fixing part 632 of the left side part thereof.

[0039] The fixing part 632 is provided on each of both sides of the gutter part 631 in the width direction, in other words, the fixing part 632 is provided at each of both the ends thereof in the longitudinal direction. Each of these fixing parts 632 on both sides in the width direction includes a screw-receiving seat 637 for a screw to be used to positioning-fix the drain hose 64 to the second drain pan 63b. The screw-receiving seat 637 is joined to the end part of the gutter part 631 in the width direction by means of a joining part 638 with a gap S held between the seat 637 and end part, and is thereby provided in the vicinity of the connection part 635. The screw-receiving seat 637 includes a screw hole 637a through which a screw Y configured to join the drain hose 64 is tightened. The screw hole 637a is provided so as to face the front side, and is made accessible and operable from the front side, more specifically, it is made possible to tighten or loosen the screw Y from the front side.

[0040] That is, the screw hole 637a is contrived in such a manner that it is made possible to access the screw hole 637a from the direction toward the wall surface W and tighten or loosen the screw Y. It should be noted that the direction toward the wall surface W implies, for example, a direction between a direction perpendicular to the wall surface W which is the mounting surface and direction parallel to the wall surface W, the direction being upwardly inclined toward the rear. The screw hole 637a constitutes a coupling mechanism configured to couple the screw receiving seat 637 and drain hose 64 to each other.

[0041] In FIG. 4, to the right side part of the second drain pan 63b, the drain hose 64 is connected. The second drain pan 63b is configured so as to produce approximately a symmetric appearance and, as shown in FIG. 6, a fixing part 632 (screw-receiving seat 637, joining part 638) and connection part 635 are provided also on the left side part thereof. In FIG. 6, a state where the second drain pan 63b is attached to the unit main body 6 is shown. As in the cases of the examples shown in FIG. 4 and FIG. 6, when the drain hose 64 is connected to the right side part, the connection part 635 on the left side, i.e., on the non-use side is blocked by a sealing plug (illustration omitted). Thereby, the connection part 635 to which the drain hose 64 is not connected is blocked in a watertight manner, and the dew condensation water is prevented from leaking from the aforementioned connection part 635.

[0042] The drain hose 64 is connected to the drain pan 63 and drains the dew condensation water received by the drain pan 63. More specifically, the drain hose 64 is connected to the second drain pan 63b and discharges the dew condensation water collect at the second drain pan 63b to the outside of the indoor unit 3, in general, to the outdoors.

[0043] As shown in FIG. 7A and FIG. 7B, the drain hose 64 includes a hose part 64a made of a resin and covering part 64b covering the hose part 64a. The hose part 64a is formed of a resin such as polypropylene or the like into a pleated flexible hose. One end of the hose part 64a (hereinafter referred to as a tip end part) is connected to the second drain pan 63b and the other end (hereinafter referred to as a tail end part) thereof is exposed to an area outside the indoor unit 3 to which water can be discharged. It should be noted that the hose part 64a is extended from, for example, the bottom part of the unit main body 6 to the outside according to the aspect in which the indoor unit 3 is attached to the wall surface W. The hose part 64a includes, at the tip end part thereof, a smaller-diameter part 64c and larger-diameter part 64d which are different from each other in outer diameter and are continuous with the pleated part. The smaller-diameter part 64c is continuous with the pleated part of the hose part 64a and is covered with the covering part 64b

at an outer circumference thereof. The larger-diameter part 64d has an outer diameter greater than the smaller-diameter part 64c (Dd>Dc), is positioned closer to the tip end of the hose part 64a than the smaller-diameter part 64c, and is exposed from the covering part 64b. The covering part 64b is, for example, approximately a cylindrical heat-insulating member having a slit at a part of the circumferential surface thereof, covers the outer circumference of the hose part 64a, and prevents dew condensation on the outer surface of the drain hose 64 caused by the low-temperature dew condensation water flowing through the inside thereof from occurring.

[0044] Further, the drain hose 64 includes a fixed part 64e to be positioning-fixed to the fixing part 632 of the drain pan 63, more specifically, the second drain pan 63b. The fixed part 64e includes, as a coupling mechanism for coupling to the screw-receiving seat 637, a through-hole 64f into which the screw Y to be screwed into the screw hole 637a is inserted.

[0045] The fixed part 64e is, for example, a member formed by fabricating a metallic sheet into a plate-like shape (hereinafter referred to as a fixing metallic member 64e). The fixing metallic member 64e is attached to the tip end part of the drain hose 64, more specifically, the hose part 64a, and protrudes in a flange-like form.

[0046] In the example shown in FIG. 7A and FIG. 7B, the fixing metallic member 64e is configured to include a ring part 64g to be fitted onto the tip end part of the hose part 64a and flange part 64h including a through-hole 64f. The ring part 64g includes an opening to be fitted onto the tip end part of the hose part 64a. The opening of the ring part 64g has an inner diameter (Dg) less than each of the outer diameter (Dd) of the larger-diameter part 64d of the hose part 64a and outer diameter (Db) of the covering part 64b, and greater than the outer diameter (Dc) of the smaller-diameter part 64c, and is approximately circular.

[0047] Regarding the fitting metallic member 64e, the ring part 64g thereof is fitted onto, for example, the tail end part of the hose part 64a before being covered with the covering part 64b, and is arranged by shifting to the tip end part. Thereafter, the outer circumference of the hose part 64a is covered with the covering part 64b. In this state, the ring part 64g is interposed between the tip end of the covering part 64b and larger-diameter part 64d, further the inner circumferential part thereof interferes with these parts, and hence the ring part 64g is prevented from falling off the hose part 64a. The flange part 64h protrudes from a part of the outer circumference of the ring part 64g in the diameter-expanding direction. Although in FIG. 7B, a configuration example of the flange part 64h having approximately a triangular planar shape the apex part of which is curved is shown, the planar shape thereof is not particularly limited. The through-hole 64f penetrates the flange part 64h in the through-thickness direction.

[0048] The diameter of the ring part 64g is set as described above, and hence the fitting metallic member 64e is made rotatable relatively to the drain hose 64 around the central axis C of the hole of the drain hose 64 (hose part 64a). Thereby, it becomes possible for the through-hole 64f of the flange part 64h to make transition between the state where the through-hole 64f communicates with the screw hole 637a of the screw-receiving seat 637 and state where the through-hole 64f deviates from the screw hole 37a and does not communicate with the screw hole 37a.

[0049] In the state where the through-hole 64f communicates with the screw hole 637, the flange part 64h is in the state (first state) where the flange part 64h interferes with the screw-receiving seat 637 in the central axis C direction (see FIG. 8). On the other hand, in the state where the through-hole 64f deviates from the screw hole 37a and does not communicate with the screw hole 37a (second state), the flange part 64h is positioned at the gap S and is placed in the state where the flange part 64h does not interfere with the screw-receiving seat 637 in the central axis C direction (see FIG. 9 and FIG. 10). Further, in the second state, the joining part 638 joins the screw-receiving seat 637 to the end part of the second drain pan 63b (gutter part 631) in the longitudinal direction while creating the gap S into which the flange part 64h is made to retract so as not to interfere with the screw-receiving seat 637 in the central axis C direction.

[0050] Here, attachment/detachment of the drain hose 64 to/from the drain pan 63 (more specifically, second drain pan 63b) in this embodiment will be described. In FIG. 8, the screw-fixing aspect of the case where the drain hose 64 is attached/detached to/from the second drain pan 63b is schematically shown. FIG. 9 is a view schematically showing the aspect of the case where the drain hose 64 is connected to the second drain pan 63b. FIG. 10 is a view schematically showing the aspect of the case where the drain hose 64 is detached from the second drain pan 63b.

[0051] First, the case where the drain hose 64 is connected to the second drain pan 63b will be described. In this case, as shown in FIG. 6, the state where the housing 7 is removed from the unit main body 6 and second drain pan 63b is attached to the unit main body 6 is given. In this state, the tip end part of the drain hose 64 and vicinity thereof are bent so as to direct the opening to the front. Then, as indicated in FIG. 9 by an arrow A91, the tip end part of the drain hose 64 is inserted into the connection part 635 of the second drain pan 63b to thereby be fitted into the connection part 635. Subsequently, as indicated in FIG. 9 by an arrow A92, the fixing metallic member 64e is rotated relatively to the drain hose 64 and through-hole 64f of the flange part 64h is made to communicate with the screw hole 637a of the screw-receiving seat 637 (state shown in FIG. 8). In this state, the screw Y is tightly screwed into the screw hole 637a by means of a screwdriver Z. Thereby, the fixing metallic member 64e is joined to the screw-receiving seat 637 and drain hose 64 is connected to the second drain pan 63b.

[0052] When the drain hose 64 is detached from the

second drain pan 63b, as shown in FIG. 8, the screw Y tightly screwed into the screw hole 637a is loosened by using the screwdriver Z to be removed. Subsequently, as indicated in FIG. 10 by an arrow A101, the fitting metallic member 64e is rotated relatively to the drain hose 64, whereby the flange part 64h is placed in the state where the flange part 64h does not interfere with the screw-receiving seat 637 in the central axis C direction. Then, as indicated in FIG. 10 by an arrow A102, the tip end part of the drain hose 64 is pulled off the connection part 635 of the second drain pan 63b to be removed therefrom.

[0053] As described above, according to this embodiment, the screw hole 637a configured to attach/detach the drain hose 64 to/from the drain pan 63 is contrived in such a manner that the screw hole 637a is provided to face the front side, and is made accessible and operable from the front side, more specifically, it is made possible to tighten or loosen the screw Y from the front side. Accordingly, as shown in FIG. 6, in the state where the housing 7 is removed from the unit main body 6 and second drain pan 63b is attached to the unit main body 6, it is possible to loosen the screw Y from the front side. For example, heretofore, the screw hole of the screw-receiving seat is provided so as to face the rear side, and is operable by making access thereto from the rear side. For this reason, when the drain hose is to be detached from the drain pan, it is necessary to detach the unit main body from the mounting plate. Accordingly, for example, when the drain pan is to be cleaned, first the unit main body has to be detached from the mounting plate. However, the unit main body is connected to refrigerant piping constituted of copper pipes penetrating the wall surface W inside the room after mounting thereof, and hence the cleaning work is work requiring a lot of labor and trouble.

[0054] Conversely, in this embodiment, by only removing the housing 7 from the unit main body 6, it is possible to expose the screw-receiving seat 637 in the state where the screw Y is screwed into the screw hole 637a thereof to the front side. Accordingly, it is possible to loosen the screw Y from the front side and detach the drain hose 64 from the second drain pan 63b without detaching the unit main body 6 from the mounting plate 5. Accordingly, it is possible to largely lighten the labor and trouble at the time of detaching the drain hose 64 from the second drain pan 63b.

[0055] Further, also when the drain hose 64 is to be connected to the second drain pan 63b, in the process opposite to the case of removal, the drain hose 64 is inserted into the second drain pan 63b, and thereafter the screw Y is tightened from the front side, whereby it is possible to largely lighten the labor and trouble at the time of connecting the drain hose 64 to the second drain pan 63b.

[0056] That is, according to this embodiment, it becomes easy to detach the second drain pan 63b from the unit main body 6 and, it is possible to reduce the workload at the aforementioned time and realize an improvement in the workability at the time of inside cleaning of the indoor unit 3.

[0057] It should be noted that although in the embodiment described above, the fixed part 64e configured to positioning-fix the drain hose 64 is screw-fixed by using the fixing part 632 (screw-receiving seat 637, joining part 638) and connection part 635 of the drain pan 63, the above fixing work may also be carried out by providing the aforementioned fixing part 632 (screw-receiving seat 637, joining part 638) and connection part 635 not on the drain pan 63 but on the back surface plate 65 of the unit main body 6, and prevention of falling off of the drain hose 64 may also be carried out by using the back surface plate 65.

[0058] While certain embodiments have been described, these embodiments have been presented by way of example only, and are not intended to limit the scope of the inventions. Indeed, the novel embodiments described herein may be embodied in a variety of other forms; furthermore, various omissions, substitutions and changes in the form of the embodiments described herein may be made without departing from the spirit of the inventions. The accompanying claims and their equivalents are intended to cover such forms or modifications as would fall within the scope and spirit of the inventions.

Reference Signs List

[0059] 1 ··· air conditioner, 2 ··· outdoor unit, 3 ··· indoor unit, 5 ··· mounting plate, 6 ··· unit main body, 7 ··· housing, 8 ··· front panel, 8a ··· panel member, 61 ··· indoor heat exchanger, 611 ··· fin, 621 ··· fan, 63 ··· drain pan, 63a ··· first drain pan, 63b ··· second drain pan, 631 ··· gutter part, 632 ··· fixing part, 635 ··· connection part, 636 ··· click part, 637 ··· screw-receiving seat, 637a ··· screw hole, 638 ··· joining part, 64 ··· drain hose, 64a ··· hose part, 64b ··· covering part, 64c ··· smaller-diameter part, 64d ··· larger-diameter part, 64e ··· fixed part (fixing metallic member), 64f ··· through-hole, 64g ··· ring part, 64h ··· flange part, 65 ··· back surface plate, and W ··· mounting surface (wall surface).

Claims

1. An indoor unit of an air conditioner comprising:

a unit main body including a suction opening and a blowout opening, accommodating therein a heat exchanger and a blower device, and to be mounted on a wall surface inside a room;

a drain pan to be arranged at a lower part of the heat exchanger, and receiving dew condensation water created by the heat exchanger concomitantly with a refrigerating cycle operation and dropping therefrom; and

a drain hose to be connected to the drain pan, and discharging the dew condensation water re-

ceived by the drain pan to the outside of the unit main body, wherein
the unit main body or the drain pan includes a fixing part used to positioning-fix the drain hose,
the drain hose includes a fixed part to be positioning-fixed to the fixing part, and
each of the fixing part and the fixed part includes a coupling mechanism to be accessed from a direction toward the wall surface and used to couple both the fixing part and the fixed part to each other.

2. The indoor unit of an air conditioner of claim 1, wherein

as the coupling mechanism,
the fixing part includes a screw-receiving seat including a screw hole into which a predetermined screw is tightly screwed, and
the fixed part includes a through-hole into which the screw is inserted, and which communicates with the screw hole.

3. The indoor unit of an air conditioner of claim 2, wherein
the fixed part is formed into a planar shape in which the through-hole penetrates the fixed part in a through-thickness direction, and is arranged at a tip end part of the drain hose in such a manner as to be rotatable relatively to the drain hose around a central axis of the hole of the drain hose.

4. The indoor unit of an air conditioner of claim 3, wherein

the fixed part includes a ring part to be fitted onto the tip end part of the drain hose and a flange part protruding from the ring part in a flange-like form and including the through-hole,
the flange part makes a state transition between a first state where the through-hole communicates with the screw hole and a second state where the through-hole deviates from the screw hole and does not communicate with the screw hole according to a rotational position thereof relative to the drain hose, interferes with the screw-receiving seat in the central axis direction in the first state, and does not interfere with the screw-receiving seat in the central axis direction in the second state.

5. The indoor unit of an air conditioner of claim 4, wherein
the fixed part includes a joining part which joins the screw-receiving seat to an end part of the drain pan in the longitudinal direction while creating a gap into which the flange part is made to retract so as not to interfere with the screw-receiving seat in the central axis direction in the second state.

6. The indoor unit of an air conditioner of claim 4 or 5, wherein

the drain hose includes, at the tip end part thereof, a smaller-diameter part an outer circumference of which is covered with a heat-insulating material and a larger-diameter part an outer diameter of which is greater than an outer diameter of the smaller-diameter part and which is arranged closer to the tip end of the drain hose than the smaller-diameter part, and
a diameter of the ring part is less than each of an outer diameter of the larger-diameter part and an outer diameter of the heat-insulating material and is greater than the outer diameter of the smaller-diameter part.

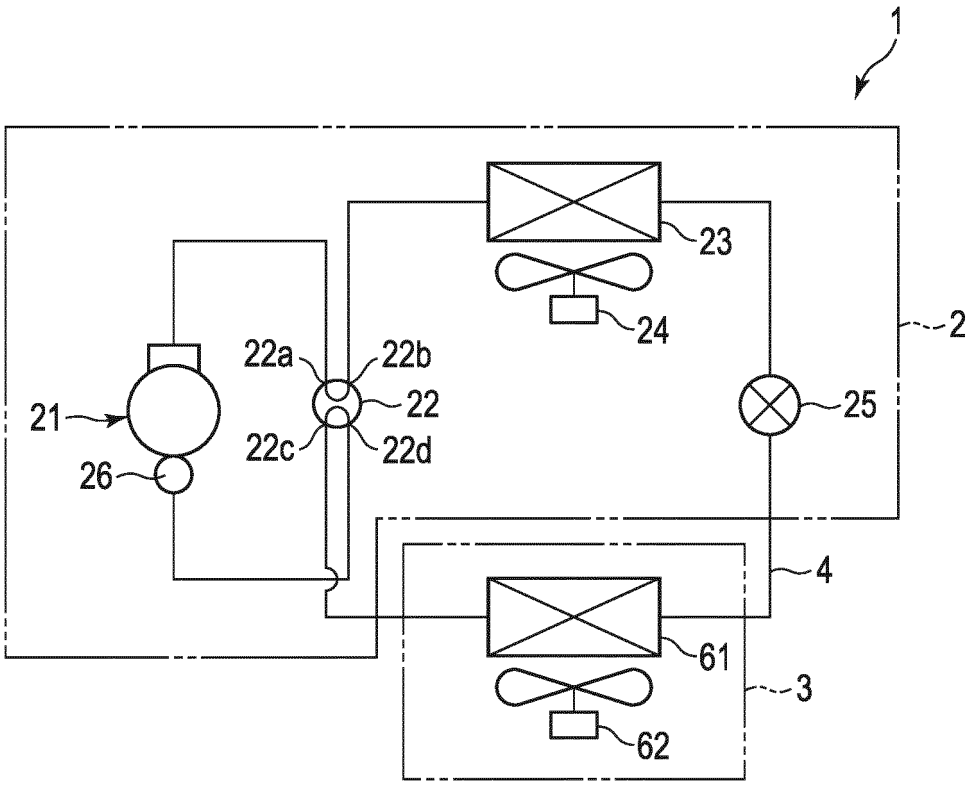
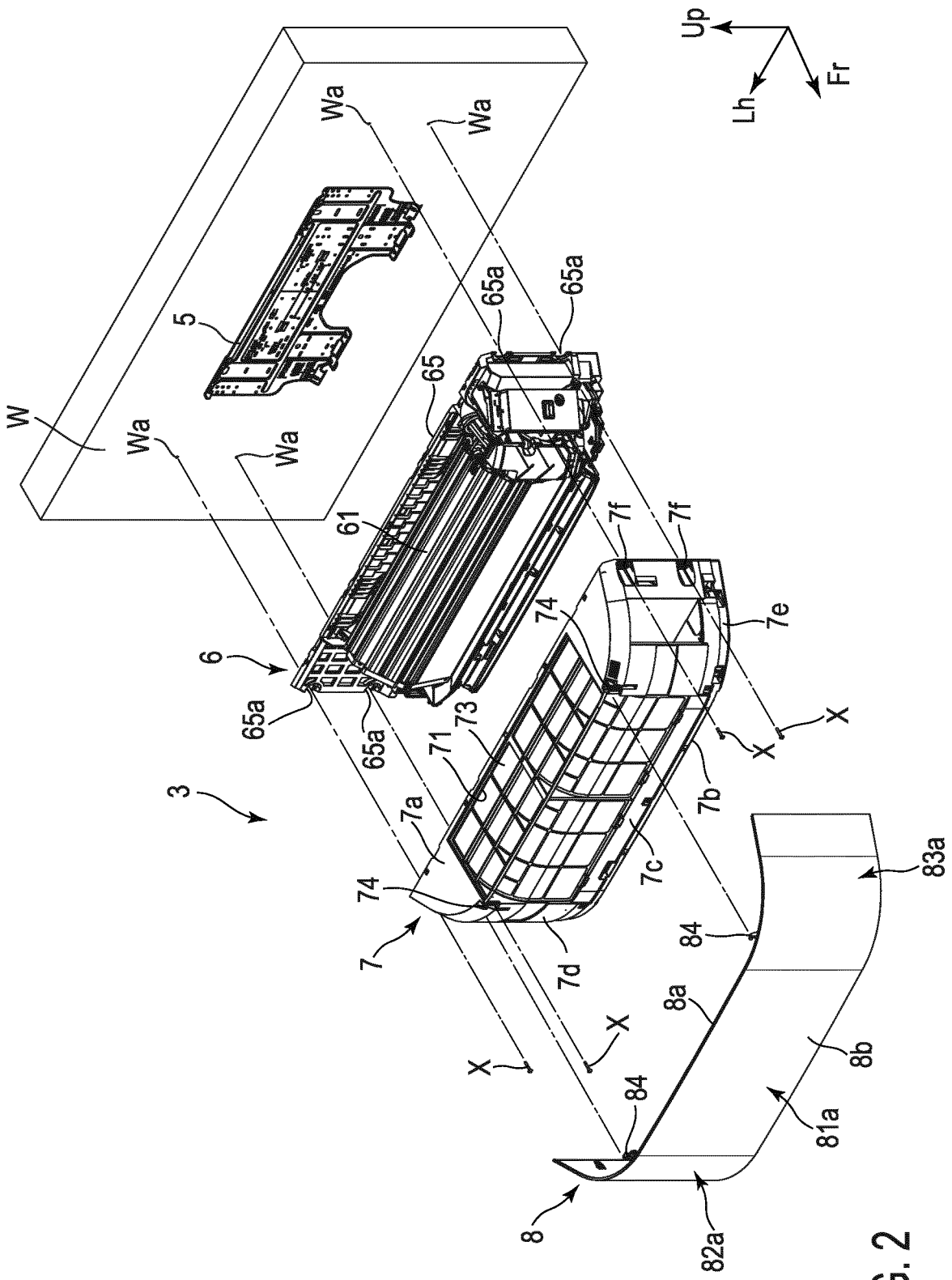


FIG. 1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73
71
7b
X
X
3
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74
7c
7
7d
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8
82a

FIG. 2

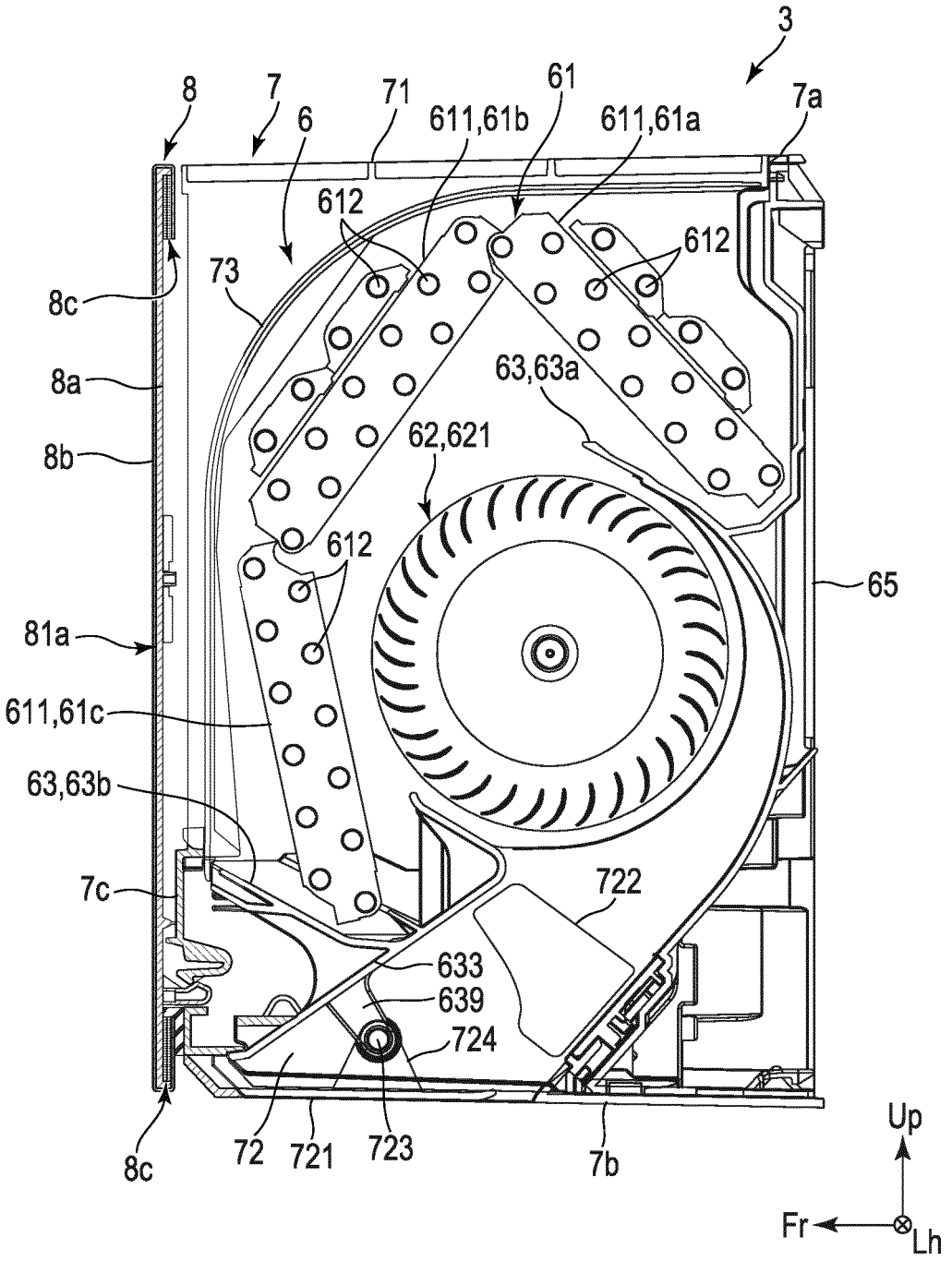
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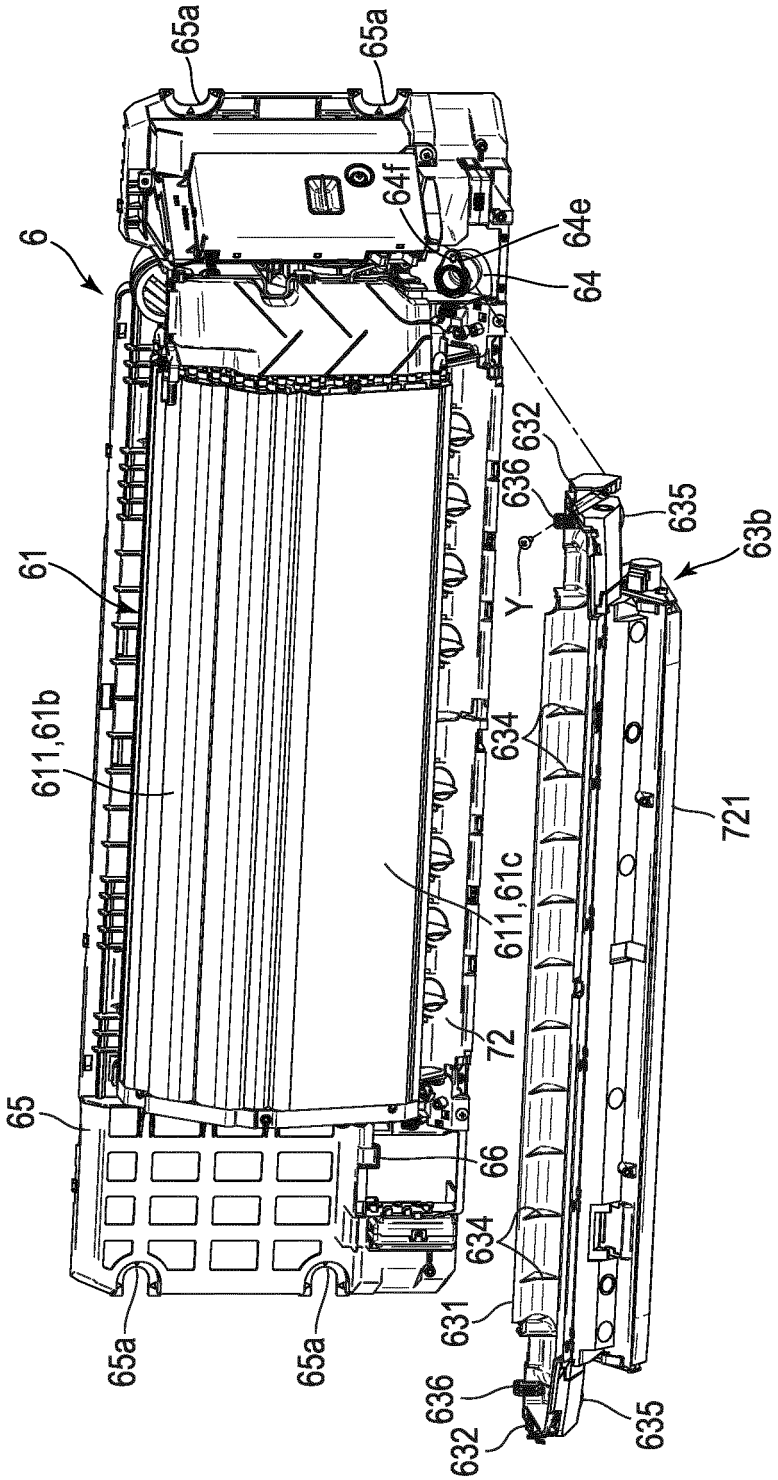
FIG. 3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636
635
632

FIG. 4

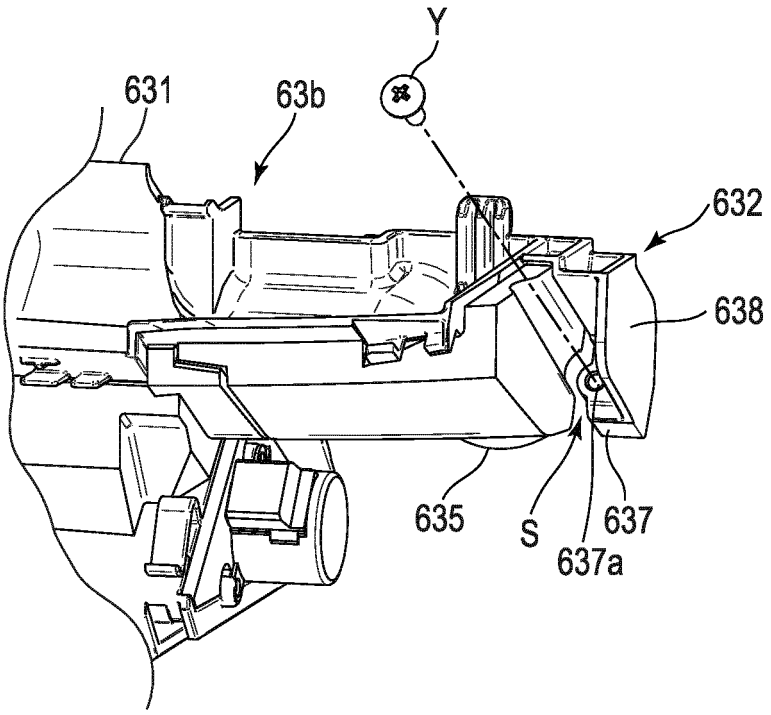
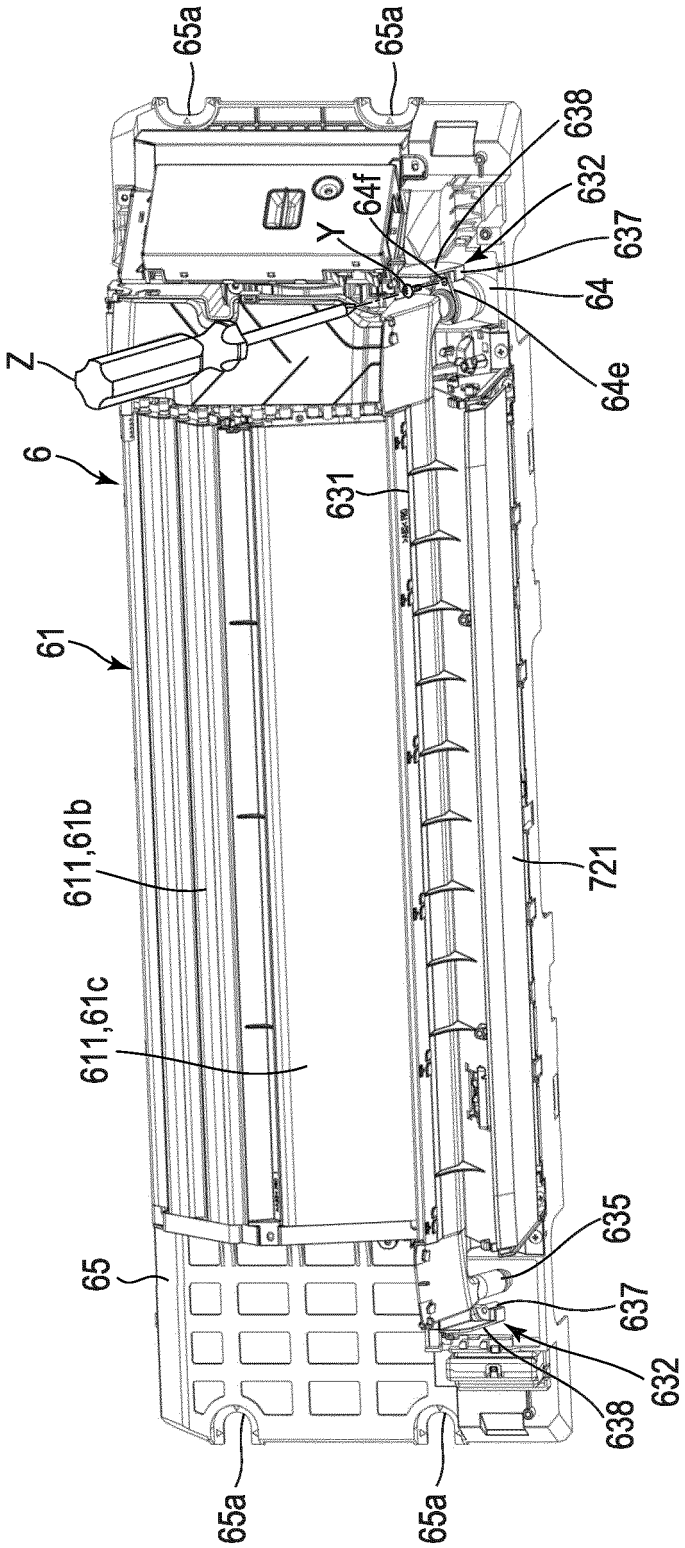


FIG. 5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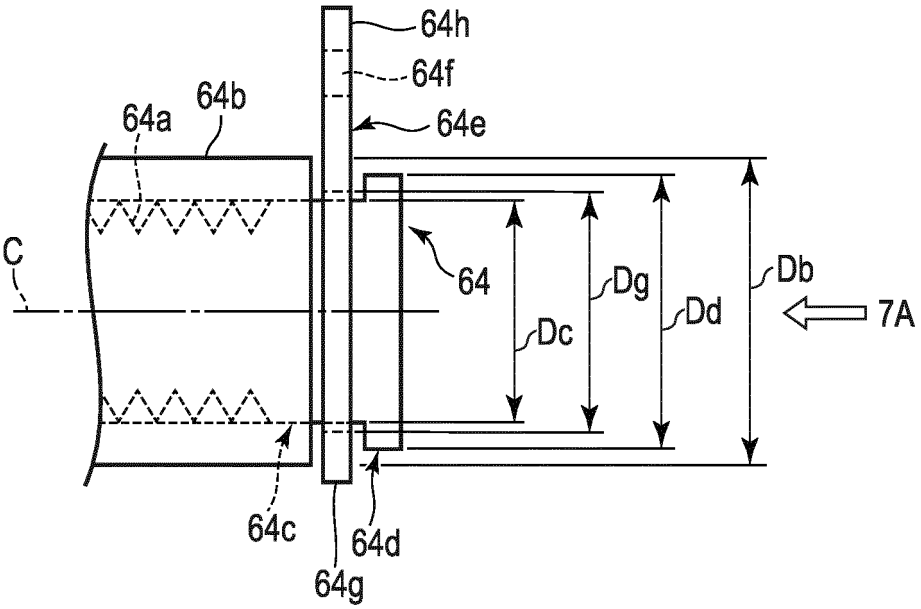
65a

FIG. 6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64c
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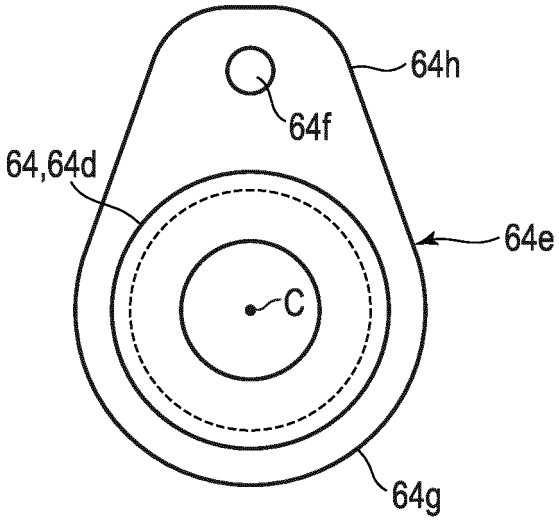
64g

FIG. 7A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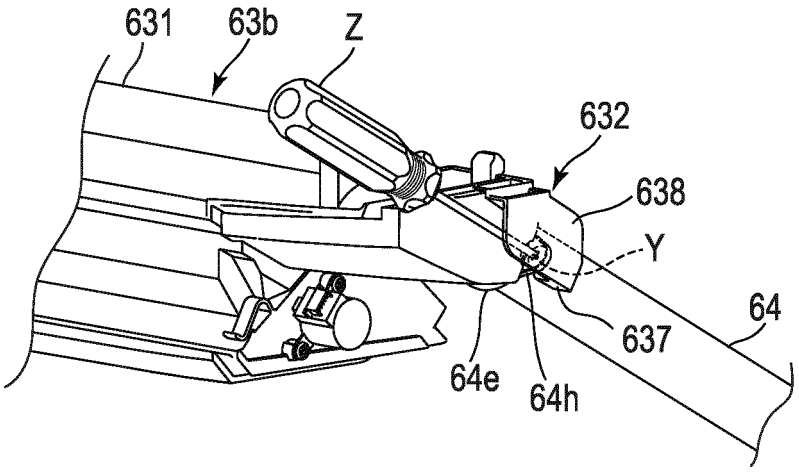
64e
C
64g

FIG. 7B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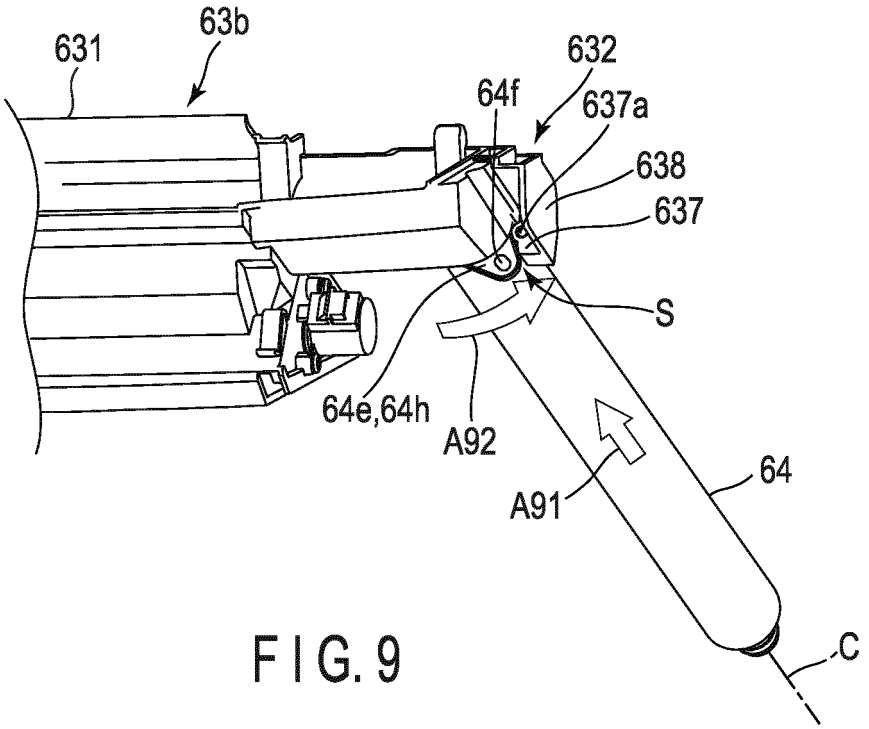
64h

FIG. 8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64e,64h
A92
A91
64
C

FIG. 9

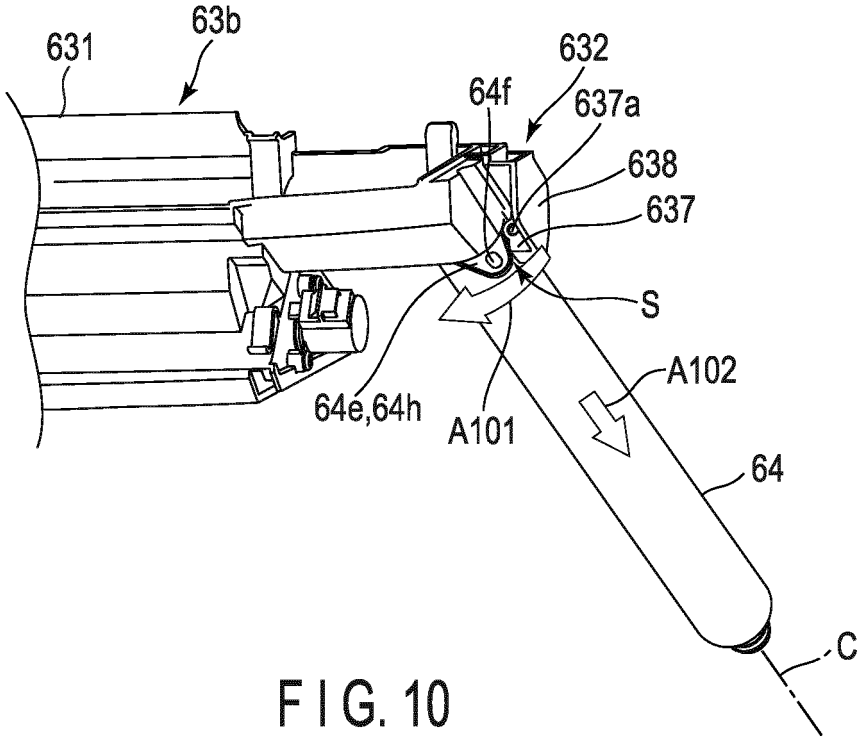

FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2020/040270

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl. F24F13/22(2006.01)i
FI: F24F1/0007 361D, F24F13/22 222

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)
Int. Cl. F24F13/22

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	1971-2020
Registered utility model specifications of Japan	1996-2020
Published registered utility model applications of Japan	1994-2020

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.
X Y A	JP 2004-93049 A (SHARP CORP.) 25 March 2004 (2004-03-25), paragraphs [0007]-[0009], fig. 1-9	1-3 1-3 4-6
X Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 24627/1991 (Laid-open No. 113819/1992) (FUJITSU GENERAL LTD.) 06 October 1992 (1992-10-06), paragraphs [0006]-[0009], fig. 1-3	1-2 1-2
Y	JP 2005-147433 A (SHARP CORP.) 09 June 2005 (2005-06-09), paragraphs [0030]-[0068], fig. 1-20	1-3

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24.11.2020	08.12.2020

Name and mailing address of the ISA/	Authorized officer
Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Telephone No.

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2020/040270

Patent Documents referred to in the Report	Publication Date	Patent Family	Publication Date
JP 2004-93049 A	25.03.2004	(Family: none)	
JP 4-113819 U1	06.10.1992	(Family: none)	
JP 2005-147433 A	09.06.2005	(Family: none)	

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 4274919 B **[0005]**