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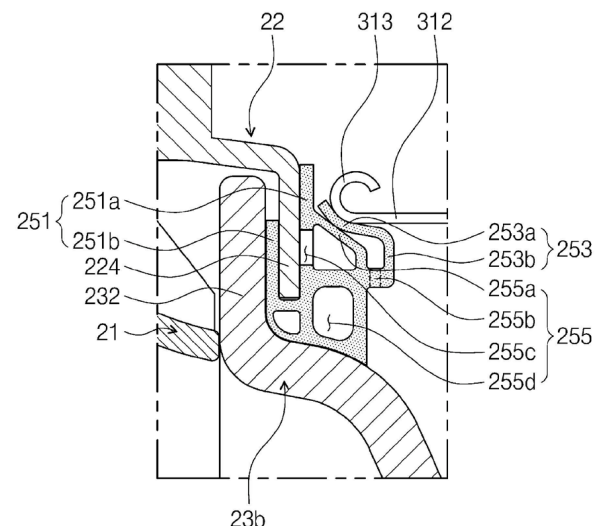
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(54) **CLOTHING TREATMENT APPARATUS**

(57) The present invention relates to a clothing treatment apparatus comprising: a cabinet; a tub provided in the cabinet, the tub including a tub body in which water is stored, and a tub front surface which forms a front side of the tub body and has a tub inlet through which clothing is introduced; a drum rotatably provided inside the tub body, the drum including a drum body in which clothing is accommodated, and a drum inlet communicating with the tub inlet; and a door rotatably fixed to the tub so as to open and close the tub inlet, wherein the tub front surface includes a curling portion that is curved outward along an edge of the tub inlet, the door includes a sealing portion extending along the circumference of the tub inlet and provided between the door and the tub inlet, and the sealing portion is pressed by the curling portion when the door closes the tub inlet, thereby sealing the door and the tub inlet.

【Fig. 21】



Description

[Technical Field]

[0001] The present disclosure relates to a clothing treatment apparatus.

[Background Art]

[0002] A clothing treatment apparatus refers to a washing machine that launders items to be treated such as clothing through a washing cycle, and a dryer that dries items to be treated through a drying cycle. In general, a washing machine and a dryer may be provided as separate apparatuses. There are clothing treatment apparatuses capable of performing washing and drying simultaneously to overcome space constraints and improve user convenience.

[0003] For execution of the washing cycle, a clothing treatment apparatus includes a cabinet, a tub in which water is stored, a drum providing a space for accommodating items to be treated, a drive unit fixed to the tub to rotate the drum, a support arranged to support the tub, a water supply part arranged to supply water to the tub, and a drainage part arranged to drain water from the tub.

[0004] For execution of the drying cycle, the clothing treatment apparatus includes a flow passage arranged to draw air from inside the tub and resupply the air to the tub, and a heat exchanger provided in the flow passage to sequentially perform dehumidification and heating of the air.

[0005] That is, there are conventional clothing treatment apparatuses in which both an apparatus for a washing cycle and an apparatus for a drying cycle are provided inside the cabinet to selectively execute the washing cycle and the drying cycle according to the user's convenience.

[0006] The above-described structure of conventional clothing treatment apparatuses is difficult to apply to commercial clothing treatment apparatuses that need to treat large quantities of items frequently and quickly.

[0007] Commercial clothing treatment apparatuses are generally configured to treat a larger amount of laundry than a household clothing treatment apparatus or to treat heavy laundry such as blankets.

[0008] Accordingly, for commercial clothing treatment apparatuses, a treatment space for accommodating heavy and bulky laundry, and a heat exchanger for fast washing and drying of items to be treated are necessary, which makes it difficult to install both a washing apparatus and a drying apparatus in a cabinet with a limited volume. While it might be possible to install both the washing apparatus and the drying apparatus by designing a large-size cabinet, this presents difficulties in manufacturing and transportation. Therefore, for commercial clothing treatment apparatuses, the cou-

pling or arrangement of the washing apparatus and the drying apparatus is one of the important design considerations.

[0009] In addition, Korean Patent No. 10-2018-0027046 discloses a clothing treatment apparatus that performs drying and washing using a single tub. A door for opening and closing a tub inlet of the clothing treatment apparatus is coupled to a panel constituting the cabinet.

[0010] When the door is coupled to the cabinet to open and close the tub inlet, vibration of the tub may be transmitted to the door and the cabinet. At this time, when the tub has a large self-weight and contains a large amount of water and clothes therein, as in a commercial clothing treatment apparatus, the door and the cabinet may not stably withstand the force and vibration transmitted from the tub.

[0011] Accordingly, the reliability of the door closing the tub inlet may decrease.

[0012] Therefore, there is a need for a structure that effectively seals the gap between the door and the tub inlet to prevent leakage of water and others inside the tub and leakage of hot air during drying.

[0013] In addition, when the door moves in the front-rear direction due to vibration of the tub, the sealing member may push the door in a direction resisting external force, which tends to reduce watertightness. Therefore, developing a structure capable of address this issue is an important task in the art.

[Disclosure]

[Technical Problem]

[0014] An object of the present disclosure is to provide a clothing treatment apparatus capable of preventing leakage of water and air from a tub.

[0015] Another object of the present disclosure is to provide a clothing treatment apparatus capable of stably sealing a tub inlet despite vibration of the tub.

[0016] Another object of the present disclosure is to provide a clothing treatment apparatus having a structure in which a portion of a sealing member is compressed by a curling portion of a tub inlet and inserted into the tub.

[0017] Another object of the present disclosure is to provide a clothing treatment apparatus including a sealing member that is stably fixed to a door and effectively seals a tub inlet.

[0018] Another object of the present disclosure is to provide a clothing treatment apparatus including a sealing member configured to provide a structurally robust connection between a door and a tub.

[Technical Solution]

[0019] Provided herein is a clothing treatment apparatus including a cabinet, a tub arranged in the cabinet,

the tub including a tub body configured to store water, and a tub front surface defining a front of the tub body and having a tub inlet allowing laundry to be introduced therethrough, a drum body rotatably arranged inside the tub body to accommodate the laundry, a drum having a drum inlet communicating with the tub inlet, and a door rotatably fixed to the tub to open and close the tub inlet. The tub front surface may include a curling portion curled outward along an edge of the tub inlet, and the door may include a sealing member extending along a circumference of the tub inlet and arranged between the door and the tub inlet. Based on the tub inlet being closed by the door, the sealing member may be pressed by the curling portion to seal the door and the tub inlet.

[0020] The sealing member may include a contact body extending in a radial direction of the tub inlet and having one surface pressed by the curling portion. The contact body may include a first contact body having one end fixed to and extending from the main body, and a second contact body extending from an end of the first contact body so as to be inclined in a direction away from the curling portion.

[0021] Based on the tub inlet being closed by the door, the second contact body may be compressed by the curling portion and at least a portion of the first contact body may be accommodated in the tub inlet.

[0022] An extended end of the second contact body may be a free end.

[0023] The sealing member may include a coupling body coupled to the door, a contact body extending in a radial direction of the tub inlet and having one surface pressed by the curling portion, and a main body extending from the coupling body and fixing one end of the contact body.

[0024] Based on the tub inlet being closed by the door, a portion of the contact body fixed by the main body may be positioned inside the tub inlet.

[0025] The tub may include a door mounting part fixed to the tub front surface to fix the door to the tub, the door mounting part having an inlet communication hole communicating with the tub inlet, wherein the inlet communication hole may be arranged not to interfere with the curling portion.

[0026] The door may include a door frame rotatably fixed to the tub and having a frame through-hole, and an inner window arranged in the door frame to cover the frame through-hole and face the tub inlet, wherein the sealing member may be press-fitted and fixed in a space between the door frame and the inner window.

[0027] At least a portion of the inner window may be inserted into the tub inlet.

[0028] The sealing member may be arranged to interconnect the inner window and the tub inlet.

[0029] The main body may include a fixing end portion extending toward the tub body such that at least a portion thereof is positioned inside the tub inlet when the door closes the tub inlet, the one end of the contact

body being fixed to the fixing end portion, and a support inclined portion supporting the contact body compressed by the curling portion.

[0030] The coupling body may include a first coupling body interposed between the door frame and the inner window, and a second coupling body connected to the first coupling body to define a groove accommodating a portion of the door frame, and connected to the support inclined portion.

[0031] The sealing member may be coupled to the door frame by a fastening member arranged through the second coupling body and coupled to the door frame.

[0032] The sealing member may be formed of an elastic material and has a hollow portion formed therein.

[0033] A curled end of the curling portion may be spaced apart from the tub.

[0034] The tub front surface may include a connection body extending forward to surround the tub inlet, wherein the curling portion may be formed at an extended end of the connection body.

[0035] The tub may include a door mounting part fixed to the tub front surface to fix the door to the tub, the door mounting part having an inlet communication hole communicating with the tub inlet, wherein the inlet communication hole may be formed to surround an outer circumferential surface of the connection body.

[0036] The door mounting part may include a first mounting cover coupled to the tub front surface, and a second mounting cover arranged to cover a front of the first mounting cover and contact the door.

[0037] The clothing treatment apparatus may further include a washing unit including a circulation pump configured to move water drained from the tub, a circulation nozzle fixed to the connection body to spray water toward the drum, and a circulation flow passage connecting the circulation pump and the circulation nozzle.

[Advantageous Effects]

[0038] The present disclosure may provide a clothing treatment apparatus capable of preventing leakage of water and air from a tub.

[0039] The present disclosure may provide a clothing treatment apparatus capable of stably sealing a tub inlet despite vibration of the tub.

[0040] The present disclosure may provide a clothing treatment apparatus having a structure in which a portion of a sealing member is compressed by a curling portion of a tub inlet and inserted into the tub.

[0041] The present disclosure may provide a clothing treatment apparatus including a sealing member that is stably fixed to a door and effectively seals a tub inlet.

[0042] The present disclosure may provide a clothing treatment apparatus including a sealing member configured to provide a structurally robust connection be-

tween a door and a tub.

[Description of Drawings]

[0043]

FIGS. 1 and 2 illustrate an example of a clothing treatment apparatus.

FIGS. 3 and 4 illustrate an example of a first treatment apparatus.

FIG. 5 illustrates an example of a tub, a drive unit, and a water supply part provided in the first treatment apparatus.

FIGS. 6 and 7 illustrate an example of a tub support, a drainage part, and a sprayer.

FIG. 8 illustrates an example of a second washing unit unit.

FIG. 9 illustrates an example of a first mounting cover.

FIG. 10 illustrates an example of a second mounting cover.

FIG. 11 illustrates an example of the first mounting cover provided on the tub.

FIG. 12 illustrates an example of a door mounting part provided on the tub.

FIG. 13 illustrates an example of a door provided on the tub.

FIG. 14 illustrates an example in which a support protrusion is accommodated in a support groove.

FIG. 15 illustrates an example of the support groove.

FIGS. 16 and 17 illustrate an example of a door.

FIGS. 18 and 19 illustrate an example of a door provided with a frame coupling portion.

FIGS. 20 and 21 illustrate an example of a door provided with a sealing member.

FIGS. 22 and 23 illustrate an example of a door lock.

FIGS. 24 and 25 illustrate an example of a rotary plate.

FIG. 26 illustrates an example of a second treat-

ment apparatus.

FIG. 27 illustrates an example of a second cabinet provided in the second treatment apparatus.

FIG. 28 illustrates an example of a first flow passage and a second flow passage provided in the second treatment apparatus.

[Best Mode]

[0044] The configuration or control method of the apparatus described below is intended solely to illustrate the embodiments of the present disclosure and is not intended to limit the scope of the present disclosure. Reference numerals are used consistently throughout the specification to refer to the same components.

[0045] Singular expressions include plural expressions unless the context clearly indicates otherwise. In the present disclosure, terms such as "comprise," "include," or "have" are intended to specify the presence of stated features, numbers, steps, operations, components, parts, or combinations thereof, and do not preclude the possibility of the presence or addition of one or more other features, numbers, steps, operations, components, parts, or combinations thereof unless otherwise defined.

[0046] Expressions indicating relative or absolute arrangements such as "in a certain direction," "along a certain direction," "parallel," "perpendicular," "centered," "concentric," or "coaxial" are intended not only to strictly indicate such arrangements but also to indicate states of relative displacement with a tolerance or an angle or distance that achieve substantially the same function.

[0047] In addition, terms including ordinal numbers such as "first" and "second" as used in the present specification may be used to describe various components, but the components are not limited by these terms, and the terms are used only for the purpose of distinguishing one component from another. Therefore, a first component may be named a second component, and similarly a second component may be named a first component.

[0048] In addition, terms such as "front," "rear," "upper," "lower," "side," "front end," "rear end," "top," and "bottom" as used in the present specification are defined based on the drawings or based on the arrangement/disposition state of components or between components, and the shape and position of each component are not limited by these terms.

[0049] Hereinafter, preferred embodiments of a clothing treatment apparatus and a control method thereof will be described in detail with reference to the accompanying drawings.

[0050] As shown in FIGS. 1 and 2, the clothing treatment apparatus 100 may include a first treatment apparatus (or treatment module or washing module) 100a

that provides a space for washing or drying items to be treated such as laundry, and a second treatment apparatus (or drying module, heat exchange module, or detachable module) 100b detachably coupled to the first treatment apparatus 100a for drying items to be treated that have been introduced into the first treatment apparatus 100a.

[0051] The first treatment apparatus 100a may include a first cabinet 1, and the second treatment apparatus 100b may include a second cabinet 6. As shown in the drawings, the second treatment apparatus 100b may be positioned on the first treatment apparatus 100a. In this case, the exterior of the clothing treatment apparatus 100 may be defined by the first cabinet 1 and the second cabinet 6.

[0052] The first treatment apparatus 100a may be installed as a standalone unit to perform a washing cycle. When the second treatment apparatus 100b is coupled thereto afterward, it may perform a drying cycle for removing moisture from the laundry.

[0053] Accordingly, in the present disclosure, when the first treatment apparatus 100a is arranged alone, the first treatment apparatus 100a may be used as a washing machine. When the first treatment apparatus 100a and the second treatment apparatus 100b are provided together, the clothing treatment apparatus 100 may be used as both a washing machine and a dryer.

[0054] As a result, depending on the user's situation and selection, only the first treatment apparatus 100a may be installed, or the second treatment apparatus 100b may be coupled to the first treatment apparatus 100a and installed.

[0055] In particular, when the first treatment apparatus 100a is configured to treat a large amount of laundry like a commercial clothing treatment apparatus and thus the overall size thereof is larger than that of a household clothing treatment apparatus, the option of selectively coupling the second treatment apparatus 100b may be more useful for a user who may have installation space limitations.

[0056] In addition, since the second treatment apparatus 100b is provided separately from the first treatment apparatus 100a, excessive increase in the size, volume, and weight of the first treatment apparatus 100a may be prevented, and the manufacturing process of the first treatment apparatus 100a and the second treatment apparatus 100b and the process of installing or transporting the first treatment apparatus 100a and the second treatment apparatus 100b may also be facilitated.

[0057] The first cabinet 1 may include a front panel (first front panel) 11 defining the front surface of the first treatment apparatus 100a, a side panel (first side panel) 12 connected to the first front panel to define the side surface of the first treatment apparatus 100a, and a rear panel (first rear panel) 13 disposed to face the first front panel 11 and define the rear surface of the

first treatment apparatus 100a.

[0058] The first front panel 11 may be provided with a control panel 112 for controlling the clothing treatment apparatus 100. The control panel 112 may be configured to control only one of the first treatment apparatus 100a and the second treatment apparatus 100b, or may be configured to control both the first treatment apparatus 100a and the second treatment apparatus 100b.

[0059] As shown in FIG. 2, the first front panel 11 may include a first panel body 113 and a second panel body 114. The first panel body 113 may be provided as a panel fixed to the first treatment apparatus 100a to define a mounting space for the control panel 112, and the second panel body 114 may be provided as a panel separable from the first treatment apparatus 100a.

[0060] The first panel body 113 may include a cabinet through-hole 111 communicating with the inside of the first treatment apparatus 100a, and the second panel body 114 may be positioned to expose at least some of the components provided inside the first treatment apparatus 100a to the outside of the first treatment apparatus 100a.

[0061] The second panel body 114 may be detachably arranged under the first panel body 113. Even when a wall or another home appliance is disposed on a side of the first cabinet 1, the second panel body 114 may be detached and coupled without being affected thereby.

[0062] When the second panel body 114 is detached, at least some of the electrical components disposed inside the first cabinet 1 may be inspected, repaired, or replaced.

[0063] FIG. 2 illustrates as an example the case where the first panel body 113 defines the upper region of the first front panel 11 and the second panel body 114 defines the lower region of the first front panel 11.

[0064] The first side panel 12 may include a left panel (first left panel) 121 defining the left side surface of the first treatment apparatus 100a (part of the left side surface of the clothing treatment apparatus), and a right panel (first right panel) 122 defining the right side surface of the first treatment apparatus 100a (part of the right side surface of the clothing treatment apparatus).

[0065] As shown in FIG. 2, the first treatment apparatus 100a may be provided with a mounting space 15 to which the second treatment apparatus 100b is fixed. The mounting space 15 may be provided as an open space formed in the top surface of the first cabinet 1. FIG. 2 illustrates as an example the case where the mounting space 15 is defined by the upper end of the first front panel 11, the upper end of the first left panel 121, the upper end of the first right panel 122, and the upper end of the first rear panel 13.

[0066] The height of the first front panel 11 and the height of the first rear panel 13 may be set to be greater than the height of the first left panel 121 and the height of the first right panel 122 (by H). Setting the height of

the first front panel 11 and the first rear panel 13 to be greater than that of the side panels 121 and 122 may be advantageous for positioning and fixing the second treatment apparatus 100b in mounting the second treatment apparatus 100b in the mounting space 15, while also reducing the overall height of the clothing treatment apparatus 100.

[0067] In addition, by setting the height of the first front panel 11 to be greater than that of the side panels 121 and 122, a space allowing other devices (such as a detergent storage unit) to be installed on the first front panel 11 may be formed, while minimizing the increase in height of the clothing treatment apparatus 100. The bottom surface of the second cabinet 6 and the top surface of the first cabinet 1 may be directly coupled to each other without any gap therebetween.

[0068] Accordingly, when the second cabinet 6 is seated on the first cabinet 1, the first cabinet 1 and the second cabinet 6 may be arranged in parallel in the height direction, and the second cabinet 6 may be seen as vertically extending from the first cabinet 1.

[0069] In addition, moisture or outside air may be prevented from flowing into a coupling portion between the second cabinet 6 and the first cabinet 1.

[0070] A first controller 19 configured to control at least one of the first treatment apparatus 100a and the second treatment apparatus 100b may be provided inside the first cabinet 1. The first controller 19 may be configured to receive a control signal from the input unit of the control panel 112 or to transmit a control signal requesting display of information to the display of the control panel 112. The controller may be fixed to the first rear panel 13.

[0071] An accommodation part 3 defining a washing space or drying space for items to be treated may be provided inside the first cabinet 1. FIG. 3 illustrates, as an example, a case where the accommodation part 3 includes a tub 3a defining a water storage space and an air movement path, and a drum 3b rotatably arranged inside the tub to define a space in which items to be treated are accommodated.

[0072] The tub 3a may include a tub body 30 that provides a space for storing water and is fixed inside the first cabinet 1 through a tub support 34.

[0073] The tub body 30 may be formed in a hollow cylindrical shape. The tub body 30 may include a tub front surface 31 arranged on a side facing the first front panel 11, a tub rear surface 31a arranged on a side facing the first rear panel 13, and a tub circumferential surface 31b connecting the tub front surface 31 and the tub rear surface 31a.

[0074] The tub front surface 31 may be provided with a tub inlet 311 communicating with the inside of the drum 3b, and a connection body 312 formed in a shape surrounding the tub inlet 311 and protruding from the tub front surface 31 toward the cabinet through-hole 111.

[0075] That is, the connection body 312 may be pro-

vided as a cylinder protruding from the tub front surface 31 toward the first front panel 11, and the tub inlet 311 may be provided as a hole formed through the tub front surface 31 and positioned inside the connection body 312.

[0076] The connection body 312 may not only provide a mounting space for a sprayer or tub air supply part 35a to be described later, but may also serve as a means to guide items to be treated that are introduced into the drum 3b through the cabinet through-hole 111, toward the tub inlet 311.

[0077] When the door 2 is coupled to the first cabinet 1 to open and close the tub inlet 311, vibration of the tub 3a may be transmitted to the door 2 and the first cabinet 1. When the tub 3a is formed of a metal material and is heavy, and additionally contains a large amount of water and laundry, the door 2 and the first cabinet 1 may not stably withstand the force and vibration transmitted from the tub 3a.

[0078] Accordingly, in the clothing treatment apparatus of the present disclosure, the door 2 may be installed on the tub 3a. When the door 2 is coupled to the tub 3a, the door 2 may vibrate integrally with the tub 3a, thereby preventing the door 2 from being damaged or broken by the vibration of the tub 3a.

[0079] In addition, since the position at which the door 2 opens and closes the tub inlet 311 is fixed, the door 2 may stably seal the tub inlet 311 even when the tub 3a vibrates.

[0080] That is, the tub inlet 311 may be opened and closed by the door 2 rotatably fixed to the tub front surface 31. As shown in FIG. 2, the door 2 is rotatably fixed not to the first front panel 11 but to the tub body 30. Accordingly, the cabinet through-hole 111 may have a size and be positioned such that it does not interfere with rotation of the door 2 (rotation for opening or closing the inlet).

[0081] When the tub inlet 311 is closed, the door 2 remains exposed to the outside of the first cabinet 1 through the cabinet through-hole 111. However, when the tub inlet 311 is opened, the door 2 may rotate outward from the first cabinet 1 through the cabinet through-hole 111.

[0082] The cabinet through-hole 111 may be formed so as not to interfere with the door 2 when the door 2 rotates.

[0083] According to one embodiment of the present disclosure, at least a portion of the door 2 may be positioned in front of the first front panel 11.

[0084] As shown in FIG. 3, in order to fix the door 2 to the tub front surface 31, the tub 3a may be provided with a door mounting part T/D. The door mounting part T/D may include a first mounting cover 32 fixed to the tub front surface 31 to surround the connection body 312, and a second mounting cover 33 fixed to the first mounting cover 32 and on which the hinge 27 of the door is mounted.

[0085] In order to prevent the tub inlet 311 from being

blocked by the door mounting part T/D, the first mounting cover 32 may be provided with a first inlet communication hole 322 communicating with the tub inlet 311, and the second mounting cover 33 may be provided with a second inlet communication hole 334 communicating with the tub inlet 311 and the first inlet communication hole 322.

[0086] The tub 3a may be connected to the second treatment apparatus 100b through the tub air supply part 35a and a tub air discharge part 35b. That is, the second treatment apparatus 100b may be detachably connected to the tub air supply part 35a and the tub air discharge part 35b.

[0087] The tub air supply part 35a may be configured to supply air into the tub body 30 through the connection body 312, and the tub air discharge part 35b may be configured to discharge air from the tub body 30 to the outside of the tub 3a through the tub circumferential surface 31b.

[0088] The tub air supply part 35a may include a first air supply hole 351 and a second air supply hole 352 provided in the connection body 312, and a distribution pipe 353 guiding air to each of the air supply holes 351 and 352.

[0089] The first air supply hole 351 and the second air supply hole 352 may be arranged through the connection body 312 to communicate with the tub inlet 311. The distribution pipe 353 may include a connection pipe 353a connected to the second treatment apparatus 100b, a first branch pipe 353b guiding part of the air introduced into the connection pipe 353a to the first air supply hole 351, and a second branch pipe 353c guiding part of the air introduced into the connection pipe 353a to the second air supply hole 352.

[0090] In order for the clothing treatment apparatus 100 to perform washing or drying of a large amount of treatment objects, it is necessary to design the volume of the tub body 30 and the volume of the drum 3b to be large. Since the drum 3b must be supported by the tub rear surface 31a and rotatable inside the tub body 30, durability of the tub body 30 is important in order to design the drum 3b to have a large volume. Therefore, the tub body 30 may be made of a metal material.

[0091] When the tub body 30 is made of a metal material, the connection body 312 is also preferably made of a metal material, whereas the distribution pipe 353 may be made of a material different from that of the connection body 312. The distribution pipe 353 having the first branch pipe and the second branch pipe described above may be more advantageous in terms of cost and time when molded from a material such as plastic rather than metal. Therefore, when the distribution pipe 353 and the connection body 312 are made of different materials, the first treatment apparatus 100a may further include a bracket 354 connecting the distribution pipe 353 to the connection body 312.

[0092] The distribution pipe 353 may be provided as a flow passage protruding from the connection body

312 toward the second treatment apparatus 100b. The free end of the connection pipe 353a (i.e., the portion to which the second treatment apparatus is connected) may be arranged to be exposed to the outside of the first treatment apparatus 100a through the mounting space 15 of the first cabinet 1. That is, the free end of the connection pipe 353a may be arranged to be located at a point higher than the upper end of the first front panel 11. This is intended to facilitate the coupling of the first treatment apparatus 100a and the second treatment apparatus 100b.

[0093] The tub air discharge part 35b may be provided as an air discharge pipe protruding from the tub circumferential surface 31b toward the second treatment apparatus 100b. That is, the tub air discharge part 35b may be provided as an air discharge pipe protruding toward the mounting space 15 formed on the upper surface of the first treatment apparatus 100a.

[0094] The free end of the tub air discharge part 35b (the portion to which the second treatment apparatus is connected) may be positioned at a point higher than the upper end of the side panel 12 or may be positioned at a point lower than the upper end of the side panel 12. The former case may facilitate coupling between the first treatment apparatus 100a and the second treatment apparatus 100b. The latter case may reduce the height of the clothing treatment apparatus 100.

[0095] As shown in FIG. 4, the door 2 may include a door frame 20 rotatably fixed to the hinge 27, a frame through-hole 20a formed through the door frame, and a door window 23 fixed to the door frame 20 to close the frame through-hole.

[0096] The door frame through-hole 20a may be provided at a position corresponding to the tub inlet 311 (i.e., a position communicating with the inlet), and the door window 23 may be formed of a light-transmitting material. In this case, a user may be allowed to check the inside of the drum 3b from outside the first treatment apparatus 100a.

[0097] The door window 23 may include a first window (outer window) 23a fixed to the door frame 20 so as to be exposed to the outside through the cabinet through-hole 111, and a second window (inner window) 23b fixed to the door frame 20 so as to be positioned inside the connection body 312.

[0098] The first window 23a may be provided as glass positioned in the cabinet through-hole 111 to form a part of the first front panel 11, and the second window 23b may be provided as glass protruding from the door frame 20 toward the tub inlet 311.

[0099] The tub body 30 may be supplied with water through a water supply part 5, and the water inside the tub body 30 may be discharged to the outside of the clothing treatment apparatus 100 through a drainage part 39.

[0100] The drainage part 39 may include a drain pipe 391 that guides water inside the tub body 30 to the out-

side of the first cabinet 1. The drain pipe 391 may be provided as a hose with one end fixed to the lower space of the tub circumferential surface 31b (the area of the tub circumferential surface located below the horizontal line passing through the center of the inlet) and the opposite end extending through the first rear panel 13.

[0101] The drain pipe 391 may be arranged to discharge water inside the tub body 30 to the outside of the first cabinet 1 by gravity, or may be arranged to discharge water inside the tub body 30 to the outside of the first cabinet 1 using a drain pump 393. FIG. 4 illustrates the former case as an example. In this case, the drainage part 39 may further include a drain valve 392 configured to control opening and closing of the drain pipe 391 according to a control signal from the first controller 19.

[0102] The drainage part 39 may further include a drain filter that filters water flowing into the drain pipe 391. The drain filter may be arranged to be separable from the drain pipe 391. The drain valve 392 and the drain filter may be provided at a position where they are exposed to the outside when the second panel body 114 is separated from the first treatment apparatus 100a.

[0103] The drum 3b may include a drum body 36 formed in a hollow cylindrical shape and positioned inside the tub body 30.

[0104] A drum inlet 361 communicating with the tub inlet 311 may be formed in the front surface of the drum body 36, and multiple drum through-holes 363 allowing the inside of the drum body 36 to communicate with the inside of the tub body 30 therethrough may be formed in the circumferential surface of the drum body 36.

[0105] In addition, a lifter 362 may be provided inside the drum 3b, protruding from the inner surface of the drum body 36 toward the rotation center of the drum body 36 to assist movement of laundry accommodated in the drum 3b.

[0106] As shown in FIG. 5, the drum body 36 is rotatable by a drum shaft 37 and a drive unit 38. The drum shaft 37 may be fixed to the rear surface of the drum body 36 and arranged through the tub rear surface 31a, and the drive unit 38 may be positioned outside the tub body 30 to rotate the drum shaft 37.

[0107] The drive unit 38 may include a bearing housing 382 fixed to the tub rear surface 31a to rotatably fix the drum shaft 37 to the tub body 30, a motor 383 fixed to the tub support 34, and a power transmitter configured to transmit power of the motor to the drum shaft 37. The motor 383 may be controlled by the first controller 19.

[0108] The bearing housing 382 may be fixed to the tub rear surface 31a through a drive unit support body 381. The drive unit support body 381 may include a hub to which the bearing housing 382 is fixed, and multiple hub fixing bars radially arranged from the hub.

[0109] A tub rear surface through-hole is provided in

the tub rear surface 31a, and a hub through-hole connected to the tub rear surface through-hole is provided in the hub. The drum shaft 37 is exposed to the outside of the tub body 30 through the tub rear surface through-hole and the hub through-hole. The drum shaft 37 exposed to the outside of the tub body 30 is rotatably fixed to the hub through the bearing housing 382.

[0110] The power transmitter may include a first pulley 385 fixed to a rotating shaft 384 of the motor, a second pulley 386 fixed to the drum shaft 37, and a belt 387 connecting the two pulleys.

[0111] As described above, the tub body 30 is fixed inside the first cabinet 1 through the tub support 34 and is supplied with water through the water supply part 5.

[0112] The tub support 34 may include a first support body 341 defining a bottom surface of the clothing treatment apparatus 100, and a second support body 345 disposed over the first support body 34 and providing a space in which the tub body 30 is fixed.

[0113] The tub body 30 may be fixed to the second support body 345 through a tub fixing member 348. The tub fixing member 348 may include a first strap 348a and a second strap 348b for fixing the tub circumferential surface 31b to the second support body 345.

[0114] The first strap 348a may be arranged to fix the front region of the tub circumferential surface 31b to the second support body 345, and the second strap 348b may be arranged to fix the rear region of the tub circumferential surface 31b to the second support body 345.

[0115] In order to reduce vibration of the tub body 30, the second support body 345 may be connected to the first support body 341 through a damper 346 and a spring 347.

[0116] In addition, to reduce vibration of the tub body 30, the first treatment apparatus 100a may further include tub weights 349a and 349b. The tub weights 349a and 349b may include at least one of a first weight 349a fixed to the second support body 345 and a second weight 349b fixed to the tub circumferential surface 31b.

[0117] The water supply part 5 is a means to guide water provided from a water source located outside the clothing treatment apparatus 100 to the tub body 30.

The water supply part 5 may be provided as a flow path that directly connects the water source and the tub body 30, or as a flow path along which detergent is supplied to the tub body 30 together with water supplied from the water source. FIG. 5 illustrates the latter case as an example.

[0118] The water supply part 5 may include a detergent storage part 51 defining a space for storing detergent, a storage part water supply pipe 52 arranged to supply water from the water source to the detergent storage part 51, a water supply valve 54 (see FIG. 3) configured to control opening and closing of the storage part water supply pipe 52 according to a control signal from the first controller 19, and a tub supply pipe 55b

arranged to supply liquid discharged from the detergent storage part 51 (water, or a mixture of water and detergent) to the tub body 30.

[0119] The detergent storage part 51 may include a housing body 51a fixed to the first front panel 11 and positioned inside the first cabinet 1, and a housing cover 51b fixed to the housing body 51a to define the top surface of the detergent storage part 51. A drawer outlet may be provided in the first front panel 11 such that the drawer 51c may be withdrawn from the detergent storage part 51 to the outside of the first cabinet 1.

[0120] A detergent storage space 516 provided in the drawer 51c may include multiple spaces to separately store detergents. Hereinafter, a case where the multiple spaces of the detergent storage space 516 include a first storage part 517, a second storage part 518, and a third storage part 519 will be described as an example.

[0121] In this case, the storage water supply pipe 52 may include a first water supply pipe 521 arranged to supply water to the first storage part 517, a second water supply pipe 522 arranged to supply water to the second storage part 518, and a third water supply pipe 523 arranged to supply water to the third storage part 519.

[0122] Water and detergent discharged from the drawer 51c to the housing body 51a may move to the outside of the housing body 51a through a housing outlet, and the water and detergent discharged from the housing body 51a may move to the tub body 30 through the tub supply pipe 55b.

[0123] The housing cover 51b may further include a sprayer supply flow passage provided to supply water to a sprayer, which will be described later. In this case, the storage water supply pipe 52 may further include a fourth water supply pipe 524 connecting the water source and the sprayer supply flow passage.

[0124] The first treatment apparatus 100a may include a communication portion 59 (outside air communication portion) configured to supply outside air into the tub body 30 or to allow outside air to be supplied to the tub body 30.

[0125] Water may remain in the tub body 30 and the drum body 36, and the clothing treatment apparatus 100 including the communication portion 59 may reduce the possibility of water remaining in the tub body 30 and the drum body 36, thereby enabling hygienic management of the tub 3a and the drum 3b.

[0126] In addition, the clothing treatment apparatus 100 including the communication portion 59 may prevent the inside of the tub body 30 from being sealed even when the door 2 closes the tub inlet 311. Accordingly, the clothing treatment apparatus 100 may prevent accidents that may occur due to sealing of the tub body 30.

[0127] In order to prevent fluid (water, foam, or foreign substances) inside the tub body 30 from being discharged to the outside of the first cabinet 1 through

the communication portion 59, the first treatment apparatus 100a may further include a connector 56 connecting a flow passage formed by the water supply part 5 and a flow passage formed by the communication portion 59.

[0128] As shown in FIGS. 6, 7, and 8, the first treatment apparatus 100a may include a sprayer 4a, 4b.

[0129] The sprayer 4a, 4b may include at least one of a first washing unit unit 4a fixed to the connection body 312 to spray water toward the door 2, and a second washing unit unit 4b fixed to the connection body 312 to spray water into the drum 3b.

[0130] Each of the first washing unit unit 4a and the second washing unit unit 4b may be configured to spray water supplied from the water source, or may be configured to spray water inside the tub body 30. The first washing unit unit 4a may be configured to spray water supplied from the water source, and the second washing unit unit 4b may be configured to spray water inside the tub body 30.

[0131] When the first washing unit unit 4a is configured to spray water supplied from the water source, the first washing unit unit 4a may receive water through a nozzle supply pipe connected to the sprayer supply flow passage.

[0132] The first treatment apparatus 100a may include a temperature sensor 318 configured to perform temperature measurement, and the connection body 312 may include a mounting hole 317 in which the temperature sensor 318 is mounted.

[0133] The temperature sensor 318 may be configured to measure at least one of the temperature inside the drum body 36, the temperature of items to be treated inside the drum body, and the temperature of air supplied from the second treatment apparatus 100b. An infrared temperature sensor configured to measure the temperature of the items to be treated by sensing infrared rays emitted from the items to be treated may be an example of the temperature sensor 318.

[0134] In order to measure the temperature inside the drum body 36, the temperature of the items to be treated, or the temperature of air supplied to the tub body 30, the temperature sensor 318 may be arranged in an upper region of the connection body 312.

[0135] The second washing unit unit 4b may include a circulation pump 45 configured to move water inside the tub body 30, a circulation nozzle 46 fixed to the connection body 312 to spray water toward the drum inlet 361, and a circulation flow passage 47 connecting the circulation pump 45 and the circulation nozzle 46.

[0136] The circulation pump 45 may include a pump chamber 451 provided to receive water inside the tub body 30 through the drain pipe 454, a pump discharge pipe 454 connecting the pump chamber 451 to the circulation flow passage 47, and a pump motor 453 configured to rotate a pump impeller positioned inside the pump chamber 451 to move water to the pump discharge pipe 454.

[0137] The discharge pipe 454, the pump chamber 451, and the pump motor 453 may be positioned in a space defined between the first support body 341 and the second support body 345. Accordingly, when the second panel body 114 is separated from the first treatment apparatus 100a, the pump chamber 451 and the pump motor 453 may be exposed to the outside of the first treatment apparatus 100a. In terms of durability of the pump motor 453, the pump motor 453 may be fixed to the first support body 341 and positioned between the first support body 341 and the second support body 345.

[0138] The circulation nozzle 46 may include a first nozzle 46a fixed to the connection body 312 and positioned on the left side of a vertical line passing through the center of the tub inlet 311, and a second nozzle 46b fixed to the connection body 312 and positioned on the right side of the vertical line.

[0139] The first nozzle 46a may be fixed in an area positioned between the highest point of the mounting tube and a point 90 degrees counterclockwise therefrom on the circumferential surface of the connection body 312, and the second nozzle 46b may be fixed in an area positioned between the highest point of the mounting tube and a point at 90 degrees clockwise therefrom on the circumferential surface of the connection body 312. Since the items to be treated are usually positioned on the bottom surface of the drum body 36 during the washing cycle, washing performance may be improved by arranging each of the nozzles 46a and 46b to spray water toward the bottom surface of the drum body 36 from above a horizontal line passing through the tub inlet 311.

[0140] The circulation flow passage 47 may include a connector 471 connected to the pump discharge pipe 454, a first circulating water supply pipe 476 arranged to guide water introduced into the connector 471 to the first nozzle 46a, and a second circulating water supply pipe 477 arranged to guide water introduced into the connector 471 to the second nozzle 46b.

[0141] The connector 471 is a means to set the spray timing of the first nozzle 46a and the spray timing of the second nozzle 46b to be the same.

[0142] The connector 471 may include a connector body 472 fixed to the second support body 345, a connector flow passage 473 provided inside the connector body 472 to receive water through the pump discharge pipe 454, a first connector discharge pipe 474 arranged to supply water inside the connector flow passage 473 to the first circulating water supply pipe 476, and a second connector discharge pipe 475 arranged to guide water inside the connector flow passage 473 to the second circulating water supply pipe 477.

[0143] The connector body 472 may be fixed to one surface of the second support body 345 through a connector bracket so as to be positioned below the tub inlet 311. Since the second support body 345 is connected to the first support body 341 through the damper 346

and the spring 347, the second support body 345 moves together with the tub body 30 when the drum body 36 vibrates. Therefore, at least a portion of the pump discharge pipe 454 may be provided as a corrugated pipe.

[0144] In order to mount the first nozzle 46a and the second nozzle 46b to the connection body 312, the connection body 312 may include a circulation nozzle mounting portion.

[0145] As shown in FIG. 8, the circulation nozzle mounting portion may include a mounting tube through-hole 316 formed in the connection body 312 in a penetrating manner.

[0146] The first nozzle 46a may include a first circulation nozzle body 461 fixed to the inner circumferential surface of the connection body 312, a first spray flow passage 462 provided inside the first circulation nozzle body 461 to guide water toward the position of the drum inlet 361, and a first nozzle supply pipe 463 arranged to supply water to the first spray flow passage 462.

[0147] The first nozzle supply pipe 463 protrudes from the first circulation nozzle body 461 and is inserted into the mounting tube through-hole 316, and the first circulating water supply pipe 476 may be connected to one end of the first nozzle supply pipe 463 exposed to the outside of the connection body 312.

[0148] A first nozzle fixing hole 465 communicating with the mounting tube through-hole 316 may be provided in one surface of the first circulation nozzle body 461 (i.e., a surface contacting the inner circumferential surface of the mounting tube and the bottom surface of the first circulation nozzle body). Accordingly, by fastening a first fastening member 316a (such as a bolt) to the first nozzle fixing hole 465 through the mounting tube through-hole 316, the first circulation nozzle body 461 may be fixed to the inner circumferential surface of the connection body 312.

[0149] In order to prevent water leakage through the mounting tube through-hole 316, the first treatment apparatus 100a may include a first supply pipe sealer 466 disposed on the circumferential surface of the first nozzle supply pipe 463 to close the mounting tube through-hole 316.

[0150] The second nozzle 46b may have the same structure as the first nozzle 46a.

[0151] FIG. 9 illustrates the first mounting cover 32. The first mounting cover 32 may be mounted in front of the tub front surface 31.

[0152] The first mounting cover 32 may be separately fixed to the tub front surface 31. It may be designed to have a structure capable of withstanding vibration or external force transmitted from the door 2, or may be formed of a material having greater rigidity or thickness than the tub front surface 31.

[0153] The first mounting cover 32 may include a first front body 320 covering the tub front surface 31 from the front and having a first inlet communication hole 322 communicating with the tub inlet 311, a fixing rib

323 extending from an outer peripheral surface of the first front body 320 toward the tub front surface 31, an upper open surface 324 formed between an upper side of the first front body 320 and an upper side of the tub front surface 31, and a lower open surface 325 formed between a lower side of the first front body 320 and a lower side of the tub front surface 31.

[0154] The fixing rib 323 may be provided with a coupling bending portion 323a formed by bending an extended end portion thereof in a radial direction of the tub inlet 31.

[0155] Through contact between the coupling bending portion 323a and the tub front surface 31, the first mounting cover 32 may be stably mounted to the tub 3a.

[0156] The air supply holes 351 and 352, which are inlets of air delivered to the tub 3a, may be positioned on the upper open surface 324, and the tub air supply part 35a may be connected to the air supply holes 351 and 352 so as to be connected to an air supply flow passage 72 of the second treatment apparatus 1000 through the upper open surface 324.

[0157] The circulation flow passage 47 of the second washing unit (circulation unit) 4a is provided on the lower open surface 325 such that the circulation nozzle 46 for supplying water to the tub front surface 31 may not interfere with the first mounting cover 32.

[0158] The first mounting cover 32 may be provided with a door lock accommodating portion 326 to which a door lock 28 that fixes the door 2 to the tub 3a is fixed.

[0159] The door lock accommodating portion 326 may be formed on the rear surface of the first front body 320 and positioned between the tub front surface 31 and the first mounting cover 32.

[0160] Since the fixing rib 323 is not formed around the door lock accommodating portion 326, installation and repair of the door lock accommodating portion 326 may be facilitated.

[0161] In one embodiment of the present disclosure, when the door lock 28 is provided on one side in a width direction of the first mounting cover 32, the fixing rib 323 extending toward the tub front surface 31 may not be formed on the one side in the width direction of the first front body 320.

[0162] The first mounting cover 32 may be provided with a latch through-hole 282 opened toward the door such that a door latch 281, which will be described later and is coupled to the door lock 28, may pass there-through.

[0163] The first mounting cover 32 may be provided with a hinge fixing portion 327 to which a door hinge 27 for rotatably fixing the door 2 so as to open and close the tub inlet 311 is mounted.

[0164] In one embodiment of the present disclosure, the door lock accommodating portion 326 may be provided on one side of the first front body 320 in the width direction, and the hinge fixing portion 327 may be provided on the opposite side.

[0165] Depending on the volume or width of the door 2, multiple hinge fixing portions 327 may be provided.

[0166] The first mounting cover 32 may be provided with a hook fastening portion mounting part 328 to which a hook fastening portion 292 of an opening unit 29 for fixing the door 2 to the tub 3a is fixed.

[0167] In one embodiment of the present disclosure, the hook fastening portion mounting part 328 may be disposed on the front surface of the first front body 320, and the door lock accommodating portion 326 may be formed on the rear surface of the first front body 320.

[0168] Accordingly, the door opening/closing unit O/C, which fixes the door 2 including the opening unit 29 and the door lock 28 to the tub 3a, may fix the door 2 to the front and the rear of the first mounting cover 32.

[0169] The first mounting cover 32 may be provided with a mounting sensor 329 configured to sense whether the door 2 opens and closes the tub inlet 311.

[0170] The mounting sensor 329 may be a pressure sensor, a contact sensor, or the like, and may be configured to sense whether the door 2 comes into contact with the tub 3a.

[0171] In one embodiment of the present disclosure, when the door hinge 27 is arranged on one side of the first front body 320 in the width direction, the mounting sensor 329 may be arranged on the opposite side of the first front body 320 in the width direction. In this case, when the door 2 rotates about the door hinge 27 around the hinge shaft 272 extending in the height direction of the first cabinet 1, the mounting sensor 329 may sense whether the door 2 contacts the opposite side of the first front body 320.

[0172] In one embodiment of the present disclosure, the door lock accommodating portion 326 and the mounting sensor 329 may be arranged adjacent to each other on one side of the first mounting cover 32, such that when the mounting sensor 329 senses the door 2 closing the tub inlet 311, the door lock 28 may operate.

[0173] The first mounting cover 32 may be provided with a support protrusion 321 protruding toward the door 2.

[0174] When the door opening/closing unit O/C couples the door 2 to the tub 3a, the support protrusion 321 may be accommodated in a support groove 223, which is provided in the door 2, to restrict movement of the door 2.

[0175] In one embodiment of the present disclosure, the support protrusion 321 may be provided on the door 2 so as to protrude toward the tub 3a, and the support groove 223 may be provided on the tub 3a so as to accommodate the support protrusion 321.

[0176] FIG. 10 illustrates the second mounting cover 33 arranged to cover the front of the first mounting cover 32 and contact the door 2.

[0177] The second mounting cover 33 may include a second front body 330 covering the front surface of the first front body 320 of the first mounting cover 32 and

having a second inlet communication hole 334 communicating with the first inlet communication hole 322 and the tub inlet 311.

[0178] The second front body 330 may include a cover peripheral portion 331 arranged to contact the door 2 and having at least a portion exposed to the outside of the first cabinet 1 through the panel through-hole 111, and a cover wing portion 332 extending in a radial direction of the cover peripheral portion 331 and having forward movement restricted by the first front panel 11.

[0179] The second mounting cover 33 may include a support protrusion through-hole 333 opened toward the door 2 such that the support protrusion 321 may be accommodated in the support groove 223 of the door 2.

[0180] The second mounting cover 33 may include a latch through-hole 282 through which the door latch 281 of the door lock 28 may pass such that the door latch 281 may be coupled to the door lock 28 accommodated on the rear surface of the first mounting cover 32.

[0181] The second mounting cover 33 may include a hook through-hole 293 through which the hook 291 of the opening unit 29 passes such that the hook 291 may be coupled to the hook fastening portion 292 provided on the first mounting cover 32.

[0182] The cover peripheral portion 331 may include a door fixing surface 3312 contacting the door 2 to seal the tub inlet 311, a cover bending surface 3311 extending from an inner circumferential surface of the door fixing surface 3312 toward the tub inlet 311, a door peripheral surface 3313 extending from an outer circumferential surface of the door fixing surface 3312 in a radial direction of the second inlet communication hole 334, and a cover inclined surface 3314 extending rearward in the radial direction of the second inlet communication hole 334 along the outer circumferential surface of the door peripheral surface 3313.

[0183] The cover peripheral portion 331 may be provided with a hinge body 270 to fix the door hinge 27 to the tub 3a. The hinge body 270 may be arranged to be exposed on the front surface of the second mounting cover 33 and may be fixed to the hinge fixing portion 327 of the first mounting cover 32 and the second mounting cover 33.

[0184] The door hinge 27 may include a hinge arm 271 extending from the hinge body 270 toward the door 2, and a hinge shaft 272 fixed to the door 2.

[0185] The support protrusion through-hole 333, the hook through-hole 293, and the latch through-hole 282 may be formed in the cover peripheral portion 331 so as to fix the door 2 to close the tub inlet 311.

[0186] The support protrusion through-hole 333 and the hook through-hole 293 may be formed in the door fixing surface 3312 such that the door 2 may be completely brought into close contact with the door fixing surface 3312.

[0187] The latch through-hole 282 is formed in the door peripheral surface 3313, and thus the degree of

freedom in the module size of the door lock 28 is improved. In addition, as the door 2 is fixed to the tub 3a from outside the door fixing surface 3312, the reliability of closing the door 2 may be improved.

[0188] The extended end of the cover bending surface 3311 may define an opening larger than the tub inlet 311 so as not to interfere with the tub inlet 311. Accordingly, as will be described later, watertightness of the tub 3a may be ensured only by sealing between the tub inlet 311 and the door 2.

[0189] The cover inclined surface 3314 extends so as to be inclined rearward from the outer circumferential surface of the door peripheral surface 3313. Accordingly, damage may be minimized when the second mounting cover 33 collides with the first front panel 11 due to operation of the tub 3a.

[0190] The second mounting cover 33 may be provided with a door rotation portion 335 formed to avoid interference with the door 2 when the door 2 rotates by the door hinge 27, thereby preventing damage to the second mounting cover 33 or the door 2 and improving the user's tactile impression in opening and closing the door.

[0191] FIG. 11 illustrates the first mounting cover 32 mounted on the tub front surface 31.

[0192] The tub front surface 31 may be provided with a curling portion 313 that is rounded outward along the edge of the tub inlet 311.

[0193] The curling portion 313 may be formed by processing in which the edge of the tub inlet 311 is rolled outward during injection molding of the tub 3a, thereby reinforcing the strength of the tub 3a.

[0194] The tub inlet 311 is formed at a point spaced forward from the front of the tub body 30, and the tub front surface 31 may include a connection body 312 provided to connect the tub inlet 311 to the front of the tub body 30.

[0195] The tub front surface 31 may shield the front surface of the tub body 30 except for the tub inlet 311 and may include the connection body 312 extending along the circumference of the tub inlet 311.

[0196] That is, the tub front surface 31 may be provided with the tub inlet 311 communicating with the inside of the drum 3b and the connection body 312 formed in a shape surrounding the tub inlet 311 and protruding from the tub front surface 31 toward the cabinet through-hole 111.

[0197] The connection body 312 may be provided as a cylinder protruding from the tub front surface 31 toward the first front panel 11, and the tub inlet 311 may be provided as a hole formed through the tub front surface 31 and positioned inside the connection body 312.

[0198] The curling portion 313 may be bent from the protruding end of the connection body 312 in the radial direction of the tub inlet 311.

[0199] The first inlet communication hole 322 formed at the center of the first front body 320 of the first mounting cover 32 may be provided so as not to inter-

fere with the curling portion 313.

[0200] In one embodiment of the present disclosure, the first inlet communication hole 322 may be provided to surround the outer circumferential surface of the connection body 312 and may be positioned behind the front end of the connection body 312 or outside the outer circumferential surface of the curling portion 313.

[0201] Since the fixing rib 323 extends along the outer circumferential surface of the first front body 320 and is fixed to the tub front surface 31, a space may be formed between the first front body 320 and the tub front surface 31. The circulating water supply pipes 476 and 477 may be accommodated in the above-described space such that water may be supplied stably.

[0202] Preferably, the circulating water supply pipes 476 and 477 may be arranged spaced apart from the door lock 28. Accordingly, mechanical defects of the door lock 28, which may be driven by a motor or the like, and safety accidents that may be caused by water leakage or the like through the circulating water supply pipes 476 and 477 may be minimized.

[0203] In one embodiment of the present disclosure, the door lock 28 may be accommodated in close contact with the rear surface of the first front body 320, and the circulating water supply pipes 476 and 477 may be disposed rearward with respect to the connection body 312 such that a separation distance between the two components may be secured. Accordingly, the extending length of the fixing rib 323 may be set in consideration of the separation distance between the two components.

[0204] The support protrusion 321 may be disposed on the upper portion or the lower portion of the first front body 320 based on the center of the first inlet communication hole 322. The hinge fixing portion 327 may be provided on one side in the width direction based on the center of the first inlet communication hole 322, and the door opening and closing portion O/C may be provided on the other side opposite to the one side.

[0205] In one embodiment of the present disclosure, multiple hinge fixing portions 327 may be provided on one side in the width direction based on the center of the first inlet communication hole 322 and may be arranged in a line in the vertical direction. The door opening/closing unit O/C may be provided on the other side opposite to the one side where the hinge fixing portions 327 are formed, such that the hook fastening portion 292 is installed on the opposite side of the first front body 320, and the door lock 28 may be disposed relatively on a lower portion of the first front body 320 based on the hook fastening portion 292.

[0206] In the above-described embodiment, at least one support protrusion 321 may be disposed between the hinge fixing portion 327 disposed on the upper side and the hook fastening portion 292, and at least one support protrusion 321 may be disposed between the hinge fixing portion 327 disposed on the lower side and

the door lock 28.

[0207] FIG. 12 illustrates the door mounting part T/D fixed to the tub front surface 31.

[0208] The door mounting part T/D includes the first mounting cover 32 fixed to the tub front surface 31 to surround the connection body 312, and the second mounting cover 33 which is fixed to the first mounting cover 32 and on which the door hinge 27 is mounted. Thus, the second mounting cover 33 may be disposed at the foremost position among the components.

[0209] The front portion of the second front body 330 of the second mounting cover 33 may be disposed forward of the front end of the connection body 312. Accordingly, the cover bending surface 3311 may extend from the inner circumferential surface of the front portion of the second front body 330 toward the connection body 312.

[0210] The extended end of the cover bending surface 3311 may be arranged so as not to interfere with the curling portion 313.

[0211] In one embodiment of the present disclosure, the extended end of the cover bending surface 3311 may be arranged to surround the circumference of the extension body 312, and the second inlet communication hole 322 defined by the cover bending surface 3311 may be provided to be spaced apart from the curling portion 313 in the radial direction.

[0212] Accordingly, since it is only necessary to shield the gap between the curling portion 313 and the door 2 without a need for another component for preventing leakage of water stored in the tub 3a, such as the sealing body 25 described later, reliability of leakage prevention may be improved and the structure may be simplified.

[0213] The second mounting cover 33 may cover the exposed surface of the first mounting cover 32 such that the first mounting cover 32 is not exposed to the outside of the cabinet 1, thereby improving the unity of appearance of the clothing treatment apparatus 100a.

[0214] Specifically, the cover inclined surface 3314 may prevent the outer circumferential surface of the first mounting cover 32 from being exposed, the door fixing surface 3312 and the door peripheral surface 3313 may prevent the front portion of the first front body 320 from being exposed, and the cover inclined surface 3314 may prevent the fixing rib 323 from being exposed. Also, the cover bending surface 3311 may prevent the circumference of the first inlet communication hole 322 from being exposed.

[0215] The support protrusion 321 may be disposed to extend through the upper portion or the lower portion of the second front body 330 based on the center of the second inlet communication hole 334, the door hinge 27 may be provided on one side in the width direction based on the center of the second inlet communication hole 334, and the door opening and closing portion O/C may be provided on the other side opposite to the one side.

[0216] In one embodiment of the present disclosure, multiple door hinges 27 may be provided on one side in the width direction based on the center of the first inlet communication hole 322 and may include a first hinge 27a on the upper side and a second hinge 27b on the lower side. The door opening/closing unit O/C may be provided on the other side opposite to the one side where the door hinge 27 is formed, such that the hook through-hole 293 is installed on the opposite side of the second front body 330, and the latch through-hole 282 may be disposed on the lower portion of the second front body 330 based on the hook through-hole 293.

[0217] In the above-described embodiment, at least one support protrusion 321 may be disposed between the first hinge 27a disposed on the upper side and the hook through-hole 293, and at least one support protrusion 321 may be disposed between the second hinge 27b disposed on the lower side and the latch through-hole 282.

[0218] Since water is stored in the tub 3a, and the sprayers 4a and 4b are provided in the connection body 312, it is necessary to prevent the door 2 from being unintentionally separated from the tub 3a. Accordingly, based on the first hinge 27a, the door 2 is fixed to the tub 3a at at least six points sequentially by the second hinge 27b, the support protrusion 321, the door lock 28, and the opening unit 29, whereby the door 2 may be stably fixed to the tub 3a and unintended separation of the door 2 may be prevented.

[0219] The support protrusion 321 may be provided on the door fixing surface 3312 to fix the door 2, and the contact sensor 329 may also be provided on the door fixing surface 3312 contacting the door 2.

[0220] One of the opening unit 29 and the door lock 28 may be provided on the door fixing surface 3312, and the other may be provided on the door peripheral surface 3313 so as to fix the door 2 to the tub 3a.

[0221] Preferably, when the hook 291 of the door 2 described later is inserted into the hook through-hole 293 provided on the door fixing surface 3312 to couple the door 2 to the tub 3a, the door lock 28 may operate to fix the door 2 to the tub 3a.

[0222] FIG. 13 illustrates the door 2 rotatably provided on the tub 3a to open and close the tub inlet 311.

[0223] The door 2 may have a door bracket to which the door hinge 27 is coupled, and the hinge shaft 272 may be inserted therein such that the door is rotatably arranged on the tub 3a.

[0224] The door 2 may have a hinge through-hole 221 into which the hinge arm 271, on which the hinge shaft 272 is formed, is inserted, and an interference prevention groove 222 may be provided around the hinge through-hole 221 to accommodate the hinge body 270 from which the hinge arm 271 protrudes such that the hinge body does not interfere with the door 2 when the door 2 closely contacts and shields the tub inlet 311.

[0225] The shape of the door rotation portion 355

may be set such that part of the outer circumferential surface of the door 2 does not interfere with the second mounting cover 33 when the door 2 rotates in a direction to open the tub inlet 311.

[0226] To maintain the shape of the door 2, the door 2 may include a door frame 20, which includes an inner frame 22 facing the tub inlet 311 and an outer frame 21 provided on one surface of the inner frame 22 described later and arranged outside the cabinet 1.

[0227] The door 2 may be provided with a support groove 223 to accommodate the support protrusion 321 provided on the tub 3a.

[0228] The objects on which the support protrusion 321 and the support groove 223 are formed may be interchanged. The protrusion and the groove only need to face each other and be fastened when the door 2 closes the tub inlet 311.

[0229] The support groove 223 may be provided in the inner frame 22 and may be recessed inward toward the outer frame 21.

[0230] The door 2 may be provided with a hook 291 protruding toward the tub 3a to be coupled to the door mounting part T/D.

[0231] The door 2 may be provided with a door latch 281 protruding toward the tub 3a and fixed to the door lock 28 such that the door 2 is prevented from being unintentionally separated from the tub 3a.

[0232] The door 2 may be provided with a handle 228 that may be gripped by a user to open or close the door 2.

[0233] One surface of the inner frame 22 facing the tub 3a may include a frame contact surface 225 contacting the tub 3a and a frame peripheral surface 226 extending along the circumference of the frame contact surface 225 and provided with the handle 228.

[0234] In one embodiment of the present disclosure, the support groove 223 may be positioned on the upper side or the lower side based on the center of the frame through-hole 20a. The door hinge 27 may be provided on one side in the width direction based on the center of the frame through-hole 20a, and the other side opposite to the one side may be fixed to the tub 3a by the door opening/closing unit O/C.

[0235] The frame contact surface 225 may be provided with the support groove 223, the hook 291, and a sensor detection portion 229 sensed by the mounting sensor 329.

[0236] The frame peripheral surface 226 may extend radially from the outer circumferential surface of the frame contact surface 225 so as to incline toward the outside of the cabinet 1. Accordingly, it is spaced apart from the tub 3a by a predetermined distance or more, and thus the handle 228 may be provided on the frame peripheral surface 226 such that a user may conveniently open the door 2 by inserting a hand into the gap between the door 2 and the tub 3a.

[0237] The handle 228 may be recessed inward from the frame peripheral surface 226 toward the outside of

the cabinet 1 such that it is easy for a user to grip the handle, and the surface thereof may be processed to be uneven so as to prevent slipping.

[0238] The frame peripheral surface 226 may be provided with a door latch forming portion 227 in which the door latch 281 is formed. The door latch forming portion 227 may protrude from the frame peripheral surface 226 toward the tub 3a to contact the door peripheral surface 3313.

[0239] Hereinafter, with reference to FIGS. 12 and 13, a process in which the door 2 opens and closes the tub inlet 311 according to one embodiment of the present disclosure will be described.

[0240] One of the door 2 and the tub 3a may be provided with the support protrusion 321 protruding toward the other, and the other may be provided with the support groove 223 in which the support protrusion is accommodated. When the door opening/closing unit O/C couples the door 2 to the tub 3a, the support protrusion 321 may be accommodated in the support groove 223 to restrict movement of the door 2.

[0241] The support protrusion 321 may be fixed to the first mounting cover 32 so as to extend through the second mounting cover 33.

[0242] The door 2 may rotate to open and close the tub inlet 311 by the door hinge 27, which is provided with the hinge shaft 272 arranged in the height direction of the cabinet 1, and the support protrusion 321 may be disposed to restrict movement of at least one of the upper side and the lower side of the door 2 based on the door hinge 27.

[0243] The door hinge 27 may be coupled to one side of the door 2 in the width direction, and the door opening/closing part O/C may be disposed to fix the opposite side of the door 2 in the width direction to the tub 3a. The support protrusion 321 may be arranged in a section between the door opening/closing part O/C and the upper portion of the door hinge 27 and in a section between the door opening/closing part O/C and the lower portion of the door hinge.

[0244] The door lock 28 may be disposed at one of the upper portion and the lower portion of the opening unit 29. FIGS. 12 and 13 illustrate that the door lock 28 is disposed at the lower portion of the opening unit 29.

[0245] The door hinge 27 may include multiple hinges, which may include a first hinge 27a and a second hinge 27b disposed under the first hinge 27a. The door lock 28 may be disposed below the opening unit 29, and the support protrusion 321 may include support protrusions. At least one of the support protrusions may be arranged between the first hinge 27a and the opening unit 29 and another one thereof may be arranged between the second hinge 27b and the door lock 28.

[0246] Accordingly, one side of the door 2 may be constantly fixed to the tub 3a by the first hinge 27a and the second hinge 27b. When the door 2 closes the tub inlet 311, the opposite side thereof may be coupled to the tub 3a by the opening unit 29. When the opposite

side is coupled by the opening unit 29, the lower side of the opening unit may be fixed by the door lock 28. When the opposite side of the door 2 is fixed to the tub 3a by the door opening/closing part O/C, the support protrusion 321 may be inserted into the support groove 223 such that the upper side and the lower side of the door 2 may be fixed to the tub 3a. Accordingly, since the door 2 is fixed to the tub 3a at at least six points along the circumference of the door 2, reliability of closing of the tub inlet 311 by the door 2 may be ensured.

[0247] FIG. 14 illustrates the support protrusion 321 inserted into the support groove 223.

[0248] The support protrusion 321 may include a coupling portion 3212 coupled to a fastening member 3211, which fastens the support protrusion 321 to the first mounting cover 32, a pillar portion 3213 extending forward from the coupling portion 3212 and having at least a portion accommodated in the support groove 223, and a through-hole 3214 formed through the coupling portion 3212 and the pillar portion 3213 in a penetrating manner.

[0249] Specifically, the fastening member 3211 may be inserted into the through-hole 3214 of the support protrusion 321, and the inserted fastening member 3211 may be fixed to extend through the first mounting cover 32, and the pillar portion may be arranged to extend through the second mounting cover 33 and be inserted into the door 2.

[0250] The fastening member 3211 may be arranged through the through-hole 3214 and fastened to the first mounting cover 32, and at least a portion thereof may be accommodated in the pillar portion 3213. For example, when the fastening member 311 is a nail or the like, the head portion of the nail may be fixed in the pillar portion 3213.

[0251] Hereinafter, the support groove 223 will be described with reference to FIG. 15.

[0252] The support groove 223 may include a support groove bottom surface 2231 facing the protruding end of the support protrusion 321, and a support groove circumferential surface 2232 extending along the circumference of the support groove bottom surface 2231 to define a space in which the support protrusion 223 is accommodated. The support groove circumferential surface 2232 may be formed in a shape contacting one end of the support protrusion 321. The support protrusion 321 may include a contact end 3215 contacting the support groove circumferential surface 2232.

[0253] A cross-sectional area formed by the support groove circumferential surface 2232 of the support groove 223 may be larger than a cross-sectional area perpendicular to the extending direction of the pillar portion 3213. When the door 2 is not completely coupled to the tub 3a, the support protrusion 321 may not interfere with the support groove 223.

[0254] In one embodiment of the present disclosure, the contact end 3215 of the support protrusion 321 may be directed toward one side where the door hinge 27 is

formed. The support groove 223 may be formed in an oval shape having a major axis extending from the one side toward the opposite side, and the pillar portion 3213 may be formed in a circular shape. Accordingly, the contact end 3215 may be disposed at a vertex of the major axis. In this case, rotation of the door 2 may not be hindered by interference between the support protrusion 321 and the support groove 223. In addition, when the door 2 closes the tub inlet 311, the intensity of closing may be improved due to contact of the contact end 3215.

[0255] Since the door 2 is rotatably fixed not to the first front panel 11 but to the tub body 30, it may vibrate when the drive unit 38 is driven. At this time, the support protrusion 321 may suppress vibration of the door 2 in the circumferential direction and radial direction. In addition, when the support protrusion 321 is inserted into the support groove 223, it may rub against the inner circumferential surface of the support groove 223 to suppress vibration of the door 2 in the front-rear direction.

[0256] In one embodiment of the present disclosure, the contact end 3215 of the support protrusion 321 may be directed toward the center of the tub inlet 311. Accordingly, suppression of radial-direction vibration of the door 2 may be increased.

[0257] FIG. 16 is an exploded view of the door 2.

[0258] The door 2 may include the door frame 20 including the outer frame 21 that is larger than the area of the tub inlet 311 and exposed to the outside of the cabinet 1, and the inner frame 22 coupled to the outer frame 21 to open and close the tub inlet 311.

[0259] The door 2 may rotate, in a direction of opening and closing the tub inlet 311, by the door hinge 27 fixed to the door frame 20.

[0260] The door frame 20 may include a frame through-hole 20a having a center portion penetrated to expose the inside of the tub inlet 311.

[0261] The door 2 may include the second window 23b fixed to the door frame 20, covering the frame through-hole 20a and allowing light to be transmitted therethrough.

[0262] The second window 23b may include an insertion body 231 protruding toward the tub inlet 311, such that when the door 2 closes the tub inlet 311, at least a portion thereof may be inserted into the tub 3a to restrict forward movement of laundry accommodated in the drum 3b.

[0263] The door 2 may include the first window 23a disposed at the front of the outer frame 21 to cover a space formed by the front surface of the second window 23b and allowing light to be transmitted therethrough.

[0264] The door 2 may include a frame coupling portion 26 coupled to the outer circumferential surfaces of the outer frame 21, the inner frame 22, and the first window 23a to couple the outer frame 21, the inner frame 22, and the first window 23a.

[0265] The frame coupling portion 26 may be formed in a ring shape and arranged to accommodate the outer circumferential surfaces of the outer frame 21, the inner frame 22, and the first window 23a.

[0266] The frame coupling portion 26 may be arranged to surround at least a portion of the outer circumferential surface of the door 2. One end thereof may be fixed to the door frame 20, and the opposite end thereof may be disposed in front of the first window 23a to prevent separation of each component.

[0267] The door 2 may include a sealing member 25 installed on the inner circumferential surface of the inner frame 22 to closely contact the inner circumferential surface of the tub inlet 311 to prevent water and laundry from leaking out through the tub inlet 311. The sealing member 25 may be formed in a shape corresponding to the tub inlet 311.

[0268] As will be described later, the inner frame 22 may include a window coupling rib (frame protrusion) 224 protruding toward the tub inlet 311 to fix the second window 23b. The sealing member 25 may be formed of an elastic material fixed to the window coupling rib 224.

[0269] FIG. 17 is a side cross-sectional view of the door 2.

[0270] Based on the side cross-section of the door 2, the first window 23a, the outer frame 21, the inner frame 22, and the second window 23b may be disposed in this order.

[0271] The frame coupling portion 26 may be arranged to surround outer circumferential surfaces of the outer frame 21, the inner frame 22, and the first window 23a.

[0272] The frame coupling portion 26 may be arranged to surround at least a portion of the outer circumferential surface of the door 2.

[0273] In one embodiment of the present disclosure, the frame circumferential surface 226 of the inner frame 22 may extend in a radial direction so as to be inclined from the outer circumferential surface of the frame contact surface 225 toward the outside of the cabinet 1.

[0274] In this case, one end of the frame coupling portion 26 may be fixed to an extended end of the frame circumferential surface 226 so as to surround the outer circumferential surface of the door frame 20, and the opposite end thereof may be bent at the front of the first window 23a to face the center of the first window 23a.

[0275] The outer frame 21 may include a window mounting portion 211 on which the first window 23a is mounted. Thus, the first window 23a may be mounted on the window mounting portion 211.

[0276] On the inner circumferential surface of the frame contact surface 225 of the inner frame 22, the window coupling rib 224 may be formed to extend by a predetermined distance toward the tub inlet 311, with an extended end bent toward the center of the frame through-hole 20a, such that the second window 23b may be fixed to the door frame 20.

[0277] The sealing member 25 may be provided on a rear surface of the window fixing rib (or frame protrusion) 224 to prevent water leakage through a space between the tub inlet 311 and the door 2.

[0278] FIG. 18 illustrates the frame coupling portion 26 coupled to surround the outer circumferential surfaces of the door frame 20 and the first window 23a, and FIG. 19 illustrates, in a side cross-sectional view of the door 20, a point where the frame coupling portion 26 is coupled.

[0279] Hereinafter, a process in which the frame coupling portion 26 is fixed to prevent separation of the door frame 20 and the first window 23a will be described.

[0280] The frame coupling portion 26 may include a fixing protrusion 261 protruding toward the outer circumferential surface of the door frame 20.

[0281] The door frame 20 may include a guide groove 20b guiding the fixing protrusion 261 such that the frame coupling portion 26 is inserted from the front toward the rear of the door frame 20, and a restricting groove 20c guiding the fixing protrusion 261 moved along the guide groove 20b to rotate by a predetermined angle in one direction so as to limit movement of the fixing protrusion 261.

[0282] Once the movement of the fixing protrusion 261 is restricted by the restricting groove 20c, the frame coupling portion 26 may be fixed to the door frame 20 by a separate fastening member.

[0283] The frame coupling portion 26 may have a fixing protrusion 261 provided at one end thereof and fixed to the door frame 20, and a restricting rib 263 provided at an opposite end thereof and disposed in front of the first window 23a.

[0284] A movement restricting surface 20d, which is the rear surface of the restricting groove 20c constituting the restricting groove 20c, may extend in a radial direction of the door frame 20 to restrict rearward movement of the frame coupling portion 26.

[0285] The extending length of the movement restricting surface 20d may be greater than or equal to the protruding length of the fixing protrusion 261.

[0286] The rear surface of the restricting groove 20c may be provided at a rear end of the outer circumferential surface of the inner frame 22 so as to stably protect the outer circumferential surface of the inner frame 22 and prevent the frame coupling portion 26 from being separated.

[0287] The window mounting portion 211 formed on the front surface of the outer frame 21 may include a window mounting rib 211a arranged to surround the circumference of the first window 23a.

[0288] In one embodiment of the present disclosure, the frame coupling portion 26 may be inserted from the front toward the rear of the door frame 20 with the inner frame 22 and the outer frame 21 fastened to each other.

[0289] Once the fixing protrusion 261 of the frame

coupling portion 26 is inserted into the door frame 20 along the guide groove 20b, the frame coupling portion 26 may be rotated in one direction and seated in the restricting groove 20c. Accordingly, forward movement of the fixing protrusion 261 may be restricted by the front surface of the restricting groove 20c, and rearward movement thereof may be restricted by the movement restricting surface 20d.

[0290] The fixing protrusion 261 may be formed at one end of the frame coupling portion 26 and fixed to the inner frame 22, and the restricting rib 263 may be formed at the opposite end thereof to extend along the outer circumferential surface of the outer frame 21 and the window mounting rib 211a and be disposed in front of the first window 23a such that separation of the first window 23a may be prevented.

[0291] The restricting rib 263 may be formed in a rib shape bent and extending toward the center of the first window 23a.

[0292] The first window 23a may be fixed by being press-fitted into a space between the window mounting portion 211 of the outer frame 21 and the frame coupling portion 26, or may be fixed to the window mounting portion 211 and the window mounting rib 211a by a separate fastening member such as an adhesive or a bolt.

[0293] Accordingly, the frame coupling portion 26 may be coupled to the door frame 20 when the first window 23a is attached to the door frame 20. Alternatively, the frame coupling portion 26 may first be coupled to the door frame 20 while the first window 23a is not attached to the door frame 20, and then the first window 23a may be fixed by the door frame 20 and the frame coupling portion 26.

[0294] In one embodiment of the present disclosure, the outer circumferential surface of the outer frame 21 may be hidden from the outside by the frame coupling portion 26, thereby improving the unity of appearance of the door 2.

[0295] The door frame 20 and the frame coupling portion 26 may be formed of different materials. When the frame coupling portion 26 is formed of a material having elasticity, the first window 23a may be easily coupled and separated afterward, and the door 2 may be easily protected from external impact.

[0296] The frame coupling portion 26 may be provided with a hinge groove 262 to avoid interference with the door hinge 27.

[0297] The hinge groove 262 may be a groove or the like formed so as not to interfere with the door hinge 27 when the door 2 rotates to open and close the tub inlet 311.

[0298] In one embodiment of the present disclosure, the hinge groove 262 may be provided as a groove recessed in a direction away from the door hinge 27 so as not to interfere with the door hinge 27 when the door 2 rotates.

[0299] A reinforcing member may be arranged

around the hinge groove 262 to restrict movement beyond the opening angle of the door 2 when an external force is applied beyond the opening angle and to prevent breakage of the frame coupling portion 26 when the door is opened beyond the opening angle.

[0300] Multiple fixing protrusions 261 may be arranged along the circumference of the frame coupling portion 26 such that the frame coupling portion 26 may be stably fixed.

[0301] Multiple hinge grooves 262 may be provided to avoid interference with the multiple door hinges 27, and the fixing protrusions 261 may be arranged to be fixed between the hinge grooves 262 such that fixing at points where collision with the tub 3a is likely to occur during rotation of the door 2 may be reinforced.

[0302] At least a portion of the frame coupling portion 26 may be positioned in front of the first front panel 11.

[0303] FIG. 20 is a partial side cross-sectional view of the door 20 to which the sealing member 25 is coupled, and FIG. 21 is a view illustrating that the door 2 closes the tub inlet 311 with the sealing member 25 sealing a gap between both components. Hereinafter, the sealing member 25 will be described based on these views.

[0304] The tub front surface 31a may include the curling portion 313 that is rounded and bent outward along the edge of the tub inlet 311. When the door 2 closes the tub inlet 311, the sealing member 25 may be pressed by the curling portion 25 to connect the door 2 and the tub inlet 311.

[0305] As described above, the first inlet communication hole 322 formed at the center of the first front body 320 of the first mounting cover 32 may be provided so as not to interfere with the curling portion 313.

[0306] In one embodiment of the present disclosure, the first inlet communication hole 322 may be formed to surround the outer circumferential surface of the connection body 312. It may be positioned behind the front end of the connection body 312, or may be arranged outside the outer circumferential surface of the curling portion 313.

[0307] In addition, the extended end of the cover bending surface 3311 of the second mounting cover 33 may define an opening larger than the tub inlet 311 so as not to interfere with the tub inlet 311. Accordingly, watertightness of the tub 3a may be ensured only by sealing between the tub inlet 311 and the door 2.

[0308] The door 2 may include the second window (or inner window) 23b arranged on the door frame 20 to cover the frame through-hole 20a of the door frame 20 and face the tub inlet 311.

[0309] The second window 23b may be arranged inserted into the tub inlet 311 by a predetermined distance, and the sealing member 25 may seal the gap between the second window 23b and the tub inlet 311.

[0310] The curled end of the curling portion 313 may be spaced apart from the tub 3a. Specifically, the curling portion 313 may be bent in the radial direction of the connection body 312 along the edge of the tub inlet

311 and curled toward the tub front surface 31a. The curled end may again extend toward the connection body 312. At this time, the end may be spaced apart from the connection body 312.

[0311] The sealing member 25 may include a coupling body 251 coupled to the door 2, a contact body 253 extending in the radial direction of the tub inlet 311 and having one surface pressed by the curling portion 313, and a main body 255 extending from the coupling body 251 and fixing one end of the contact body 253.

[0312] The contact body 253 may include a first contact body 253a having one end fixed and extending from the main body 255, and a second contact body 253b extending from an end of the first contact body 253a so as to be inclined in a direction away from the curling portion 313.

[0313] An extended end of the second contact body 253b may be a free end. When the door 2 closes the tub inlet 311, the second contact body 253b may be compressed by the curling portion 313 and at least a portion of the first contact body 253a may be accommodated in the tub inlet 311. Accordingly, a point at which the first contact body 253a is fixed by the main body 255 may be positioned inside the tub inlet 311.

[0314] The contact body 253 may be formed of an elastic material. The second contact body 253b may extend to be inclined in a direction away from the tub inlet 311 so as to be pressed against the curling portion 311 in a sliding manner and tilted forward, and the first contact body 253a may naturally move as if pushed rearward and be partially inserted into the tub inlet 311, thereby improving watertightness of the tub inlet 311.

[0315] In one embodiment of the present disclosure, the second contact body 253b may extend forward to form a predetermined angle A with respect to the radial direction of the tub inlet 311. The predetermined angle A may be approximately 20° to 60°, but is not limited thereto. Any angle is sufficient as long as the body is inclined forward.

[0316] The main body 255 may include a fixing end portion 255a extending toward the tub body 30 and fixing one end of the contact body 253, and a support inclined portion 255b supporting the contact body 253 compressed by the curling portion 313.

[0317] The fixing end portion 255a may be arranged such that at least a portion thereof is positioned inside the tub inlet 311 when the door 2 closes the tub inlet 311.

[0318] That is, the closed cross-section formed by the fixing end portion 255a of the main body 255 may be smaller than the cross-sectional area of the tub inlet 311. Accordingly, when the door 2 closes the tub inlet 311, part of the first contact body 253a may be easily inserted into the tub inlet 311.

[0319] The support inclined portion 255b may be inclined forward with respect to the radial direction of the tub inlet 311 at an angle greater than or equal to a predetermined angle A. Accordingly, the degree to

which the second contact body 253b is compressed by the curling portion 313 and tilted forward may be limited. Therefore, the second contact body 253b may be prevented from being excessively compressed by the curling portion 313 as to excessively move the first contact body 253a toward the tub inlet 311 and release the close contact between the curling portion 313 and the second contact body 253b.

[0320] The coupling body 251 may include a first coupling body 251a interposed between the door frame 20 and the second window 23b, and a second coupling body 251b connected to the support inclined portion 255b and connected to the first coupling body 251a to define a groove in which a portion of the door frame 20 is accommodated.

[0321] In one embodiment of the present disclosure, the coupling body 251 may be fixed between the door frame 20 and the second window 23b by press-fitting.

[0322] The outer circumferential surface of the second window 23b may be provided with a frame insertion protrusion 232 extending in the radial direction and inserted into the door frame 20 to fix the second window 23b to the door frame 20. The first coupling body 251a may be fitted onto the frame insertion protrusion 232 and the window coupling rib 224.

[0323] The coupling body 251 may be fixed to the door 2 by bolt fastening. Specifically, the second coupling body 251b may be provided with a fastening portion 251c to which the bolt may be fastened, and the bolt may be fastened through the fastening portion 251c so as to extend through the second coupling body 251b and the window coupling rib 224, thereby fixing the sealing member 25 to the door frame 2.

[0324] The first coupling body 251a may be fitted onto the frame insertion protrusion 232 and the window coupling rib 224, and then the bolt may be fastened through the fastening portion 251c so as to extend through the second coupling body 251b and the window coupling rib 224.

[0325] The sealing member 25 may be formed of an elastic material and may include a hollow portion 255c therein. When vibration occurs in the tub 3a or the door 2 with the door 2 driven to close the tub inlet 311 by the driving of the drive unit 38 or an external force, the hollow portion 255c may effectively resist the vibration.

[0326] The hollow portion 255c may be provided under the support inclined portion 255b, to which external force is easily transmitted, in the central portion of the main body 255, and below the window coupling rib 224.

[0327] FIG. 22 illustrates the door 2 fixed to the tub 3a by the door lock 28, and FIG. 23 illustrates the structure of internal components of the door lock 28.

[0328] The door lock 28 may include the door latch 281 provided on the door 2 and protruding toward the tub 3a, an accommodation body 283 provided on the tub 3a to accommodate the door latch 281, a rotary plate 286 rotatably accommodated in the accommodation body 283 and contacting the door latch 281, and a

gear motor (not shown) configured to rotate the rotary plate 286 in one direction.

[0329] The accommodation body 283 may be fixed to the first mounting cover 32 and may be provided with an accommodation body through-hole 283a communicating with the latch through-hole 282.

[0330] The door 2 may rotate in a direction for closing the tub inlet 311 such that the door latch 281 may be inserted into the accommodation body 283 through the accommodation body through-hole 283a.

[0331] The accommodation body 283 may be provided with the rotary plate 286 rotatable by the gear motor, and may be provided with an accommodation groove portion 289 through which the door latch 281 inserted into the accommodation body 283 may be arranged.

[0332] The door latch 281 may include a first end 2811 extending toward the tub 3a, and a second end 2812 bent at a predetermined angle from an end portion of the first end so as to contact the guide portion.

[0333] The door 2 may rotate to close the tub inlet 311 such that the door latch 281 is inserted into the accommodation groove portion 289 of the rotary plate 286. When the rotary plate 286 rotates, the second end 2812 may be arranged to contact the rear surface of the rotary plate 286.

[0334] In one embodiment of the present disclosure, when the driving worm 286a is rotated by the gear motor, the worm wheel 286b arranged along the circumference of the rotary plate 286 may rotate. The worm wheel 286b and the rotary plate 286 may be connected so as to be driven together. A gear wheel 286c engaged with the rotary plate 286 may be provided to guide the rotary plate 286 to rotate in one direction. Accordingly, the rotary plate 286 may be rotated in one direction by the driving of the gear motor.

[0335] The configuration above is merely one embodiment, and any driving means such as a motor may be used as long as the rotary plate 286 can rotate in one direction.

[0336] The accommodation body 283 may be provided with a drainage structure 285 to drain water that has infiltrated into the accommodation body 283 through the accommodation body through-hole 283a or the like.

[0337] Preferably, the drainage structure 285 may be provided at a lower portion of the accommodation body 283 so as to facilitate water collection by gravity, and may be arranged at a position spaced apart from the gear motor.

[0338] The accommodation body 283 may further include an installation body 284 arranged to shield internal components from the outside and fixed to the first mounting cover 32.

[0339] The accommodation body 283 may be spaced apart from the sprayer 4a, 4b in order to prevent safety-related accidents due to water leakage to the gear motor and corrosion of internal components.

[0340] In one embodiment of the present disclosure, the door lock 28 may be arranged adjacent to the first mounting cover 32 on the outer circumferential surface of the connection body 312, and the circulation flow passage 47 may be disposed adjacent to the tub front surface 31 on the outer circumferential surface of the connection body 312, thereby minimizing interference between the above-described structures.

[0341] FIG. 24 illustrates the rear surface of the rotary plate 286 contacting the second end 2812 of the door latch 281.

[0342] The rotary plate 286 may include the accommodation groove portion 289, and a guide portion L/G extending along the circumference of the rotary plate 286 from one end of the accommodation groove portion 289 to the other end thereof and contacting the door latch 281.

[0343] The guide portion L/G may include an inclined surface 287 formed as a slope applying pressure to the door latch 281 to bring the door 2 into close contact with the tub 3a in the rearward direction.

[0344] The inclined surface 287 may be provided only with a slope that guides the door latch 281 inserted into the accommodation groove portion 289 toward the rear side of the tub 3a.

[0345] Accordingly, the door latch 281 may be moved in a direction parallel to the rotation axis of the rotary plate 286 by rotation of the rotary plate 286.

[0346] The guide portion L/G may include a seating surface 288 applying pressure to the door latch 281 such that displacement of the door latch 281 moved along the inclined surface 287 is maintained.

[0347] The rotary plate 286 may repeatedly rotate through a first section 287b, in which the rotary plate is rotated by less than a first rotation angle 287a from a reference point at which the inclined surface 287 starts to a point at which the seating surface 288 starts, a second section 288b, in which the rotary plate is rotated by at least the first rotation angle 287a and by less than a second rotation angle 288a at which the seating surface 288 ends and the accommodation groove portion 289 starts, and a third section 289b, in which the rotary plate is rotated by at least the second rotation angle 288a and by less than a third rotation angle 289a at which the accommodation groove portion 289 ends and the reference point starts.

[0348] The door 2 may be fixed to the tub 3a when the rotary plate 286 is rotated to position the door latch 281 in the first section 287b and the second section 288b, and may be separated from the tub 3a when the rotary plate 286 is rotated to position the door latch 281 in the third section 289b.

[0349] When the door latch 281 is positioned in the first section 287b, the door 2 is moved rearward of the tub 3a by the door latch 281, and thus the fixing force by which the door 2 closes the tub inlet 311 may be gradually increased.

[0350] When the door latch 281 moves in the second

section 288b, the displacement of the door latch 281 may be maintained as the seating surface 288 is arranged parallel to the rotation axis of the rotary plate 286.

[0351] In the third section 289b, interference between the door latch 281 and the rotary plate 286 may be released such that the door 2 may be separated from the tub 3a.

[0352] Since the door latch 281 released from interference with the seating surface 288 is separated while the rotary plate 286 applies the greatest external force to the door latch 281, fine vibration or sound may be generated in the door 2 due to the difference in displacement, such that the user may intuitively recognize that the door lock 28 has been released.

[0353] The first rotation angle 287a may be greater than the second rotation angle 288a and the third rotation angle 289a.

[0354] Accordingly, as the section in which the door latch 281 passes along the inclined surface 287 becomes longer, the inclination of the inclined surface 287 may relatively decrease compared to a reference distance by which the door latch 281 should move toward the rear side of the tub 3a in order for the door 2 to be fixed to the tub 3a with reliability greater than or equal to a reference value. Therefore, load torque applied to the gear motor may be reduced.

[0355] In one embodiment of the present disclosure, the first rotation angle 287a may be greater than or equal to the sum of the second rotation angle 288a and the third rotation angle 289a. Accordingly, since the upper limit of the inclination of the inclined surface 287 is limited, adjustment of the load torque applied to the gear motor may become easier.

[0356] The gear motor may be operated by the first controller 19. When the door 2 is fixed to the tub 3a by the opening unit 29, the gear motor may rotate the rotary plate 286 until the door latch 281 is positioned in the second section 288b of the rotary plate 286.

[0357] The door 2 may rotate to open and close the tub inlet 311 by the door hinge 27 provided with the hinge shaft 272 in the height direction of the cabinet 1, the door hinge 311 may be coupled to one side of the door 2 in the width direction, and the door lock 28 may be provided on the opposite side of the door 2 in the width direction. The opening unit 29 may be provided on the one side in the width direction of the door 2 where the door lock 28 is provided, and may be controlled such that the door lock 28 operates when the one side of the door 2 contacts the tub 3a.

[0358] The door hinge 27 may be fixed to one side of the door 2 in the width direction to rotatably fix the door 2 to the tub 3a, and the mounting sensor 329 may be provided on the opposite side of the door 2 in the width direction to sense that the opposite side of the door 2 in the width direction contacts the tub. Even in this case, the door lock 28 may be provided on the opposite side of the door 2 in the width direction, and the first control-

ler 19 may operate the gear motor when it is sensed by the mounting sensor 329 that the door 2 contacts the tub 3a.

[0359] FIG. 25 illustrates step-by-step states in which the rotary plate 286 rotates.

[0360] FIG. 25(a) illustrates a state in which the door latch 281 is accommodated in the accommodation groove portion 289 and positioned in the third section 289b, FIG. 25(b) illustrates a state in which the door latch 281 is positioned in the first section 287b from the reference point at which the inclined surface 287 starts to the point at which the seating surface 288 starts, and FIG. 25(c) illustrates a state in which the door latch 281 is positioned in the second section 288b where the seating surface 288 ends and the accommodation groove portion 289 starts. Hereinafter, the operation process of the door lock 28 will be described based on these states.

[0361] When the door 2 closes the tub inlet 311, the door latch 281 provided on the door 2 may pass through the latch through-hole 282 and be inserted into the accommodation body 283.

[0362] The door latch 281 inserted into the accommodation body 283 may be accommodated in the accommodation groove portion 289 of the rotary plate 286.

[0363] While the door latch 281 is accommodated in the accommodation groove portion 289, the gear motor may rotate the rotary plate 286. As the rotary plate 286 rotates, the door latch 281 contacts the inclined surface 287 such that the door 2 may be fixed to the tub 3a.

[0364] When the rotary plate 286 is gradually rotated up to the first rotation angle 287a, the door latch 281 may gradually move toward the rear surface of the tub 3a along the first section 281 from the reference point at which the inclined surface 287 starts to a point just before the seating surface 288 starts. Accordingly, the door 2 may be fixed to the tub 3a with gradually increasing force.

[0365] When the rotary plate 286 is gradually rotated from the first rotation angle 287a to an angle less than the second rotation angle 288a, the door latch 281 may be seated on the seating surface 288 such that the state in which the door latch 281 is moved with the greatest displacement toward the rear of the tub 3a may be maintained.

[0366] When an operation cycle of the clothing treatment apparatus 100 is completed or when a user inputs a signal requesting opening of the door 2, the gear motor may rotate the rotary plate 286 to a position between the second rotation angle 288a and the third rotation angle 289a, thereby positioning the door latch 281 in the accommodation groove 289. In this case, the door latch 281 may be released from interference of the rotary plate 286, and may thus be withdrawable through the latch through-hole 282. Accordingly, the door 2 may be brought into a state in which it is separable from the tub 3a.

[0367] FIG. 26 illustrates an example of the second treatment apparatus 100b.

[0368] The second treatment apparatus 100b may include a second cabinet 6, flow passages 7 and 8 provided inside the second cabinet 6, and a heat exchanger 9 provided in the flow passages and configured to remove moisture from air (dehumidify) or heat the air.

[0369] The second cabinet 6 may include a support frame 61 mounted on the first cabinet 1, side panels (second side panels) 65 fixed to the support frame 61 to define side surfaces of the second cabinet, a rear panel (second rear panel) 64 fixed to the support frame 61 to define a rear surface of the second cabinet, and an upper panel 66 fixed to the support frame 61 to define a top surface of the second cabinet.

[0370] The second rear panel 64 may be provided with a panel air discharge port 641 that allows the inside of the second cabinet 6 to communicate with the outside. Accordingly, air inside the second cabinet 6 may be discharged to the outside through the panel air discharge port 641, and outside air may be introduced into the second cabinet 6 through the port.

[0371] A frame panel 62 may be provided on the front surface of the support frame 61. The frame panel 62 may define a space in which a part of the flow passage portions 7 and 8 is supported.

[0372] Further, the support frame 61 may include a front panel (second front panel) 67 defining THE front surface of the second cabinet. The second front panel 67 may be formed in a shape surrounding the frame panel 62 such that the frame panel 62 is not exposed to the outside. In addition, in order to allow a user to easily access the frame panel 62, the second front panel 67 may be rotatably fixed to the support frame 61 or the frame panel 62.

[0373] When the second cabinet 6 is mounted on the first cabinet 1, a lower end of the second side panel 65 may be connected to an upper end of the first side panel 12 of the first treatment apparatus, and a lower end of the second rear panel 64 may be connected to an upper end of the first rear panel 13. When the second cabinet 6 is mounted on the first cabinet 1, the second front panel 67 may be positioned in the same plane as the first front panel 11.

[0374] As shown in FIG. 27, the support frame 61 may include a lower frame 611 detachably coupled to the mounting space 15 of the first cabinet 1, an upper frame 617 positioned above the lower frame 611 and to which the upper panel 66 is fixed, and a connection frame 618 connecting the frames 611 and 617.

[0375] The front surface of the support frame 61 may be closed by the frame panel 62, both side surfaces of the support frame 61 may be closed by the second side panels 65, the top surface of the support frame 61 may be closed by the upper panel 66, and the rear surface of the support frame 61 may be closed by the second rear panel 64.

[0376] As mentioned above, the internal space of the first cabinet 1 communicates with the outside through the mounting space 15. In order to connect the internal space of the first cabinet 1 and the internal space of the support frame 61, a communication space 612 communicating with the mounting space 15 may be provided on the bottom surface of the support frame 61.

[0377] The support frame 61 may be provided with a support panel 613 dividing the communication space 612 into an open surface and a closed surface. The closed surface may be defined as an area of the communication space 612 where the support panel 613 is positioned, and the open surface may be defined as an area of the communication space 612 where the support panel 613 is not positioned. Since the communication space 612 communicates with the mounting space 15, the mounting space 15 may also be regarded as being divided into an open surface and a closed surface by the support panel 613.

[0378] The inside of the support frame 61 may be divided into a front space 6a where the frame panel 62 is positioned and a rear space 6b where the second rear panel 64 is positioned. The support panel 613 may be fixed to the lower frame 611 and positioned in the rear space 6b.

[0379] The support panel 613 may be fixed to the lower frame 611 and arranged along the width direction (Y-axis direction) of the clothing treatment apparatus or the length direction (X-axis direction) of the clothing treatment apparatus. FIG. 15 illustrates, as an example, a case where the support panel 613 is arranged along the width direction of the clothing treatment apparatus.

[0380] The support panel 613 may include a support body 614 supporting a part of the components of the flow passages 7 and 8 or a part of the components of the heat exchanger 9, and a fixing body 615 fixing the support body 614 to the lower frame 611.

[0381] The support body 614 may be positioned at a lower point than the lower frame 611. That is, the lowermost end of the support body 614 may be positioned at a lower point than the bottom surface of the support frame 61 (the lowermost end of the communication space or the lower frame). When the second cabinet 6 is mounted on the first cabinet 1, the edge of the bottom surface of the support frame 61 is supported by the panels 11, 12, and 13 of the first cabinet, which define the mounting space 15, and the support body 614 is positioned inside the first cabinet 1. That is, when the second cabinet 6 is fixed to the first cabinet 1, the support body 614 may be positioned at a lower point than the upper end of the first side panel 12.

[0382] Since the support panel 613 is arranged to support the flow passages 7 and 8 or the heat exchanger 9, positioning the support body 614 at a lower point than the lower frame 611 may be expected to reduce the overall height of the clothing treatment apparatus 100.

[0383] The frame panel 62 may include a first panel through-hole 621, a second panel through-hole 622, and a third panel through-hole 623, which allow the inside of the second cabinet 6 to communicate with the outside.

[0384] The first panel through-hole 621 may be opened and closed by a first panel door 624 rotatably fixed to the frame panel 62, and the second panel through-hole 622 may be opened and closed by a second panel door 626 rotatably fixed to the frame panel 62.

[0385] The first panel door 624 may be provided with a space in which the second controller 63, which is configured to control the second treatment apparatus 100b, is mounted. In this case, the first panel through-hole 621 may serve as a controller outlet through which the second controller 63 is exposed to the outside of the second cabinet 6.

[0386] A filter may be provided in the flow passages 7 and 8 to filter air discharged from the tub body 30. In this case, the second panel through-hole 622 may serve as a filter outlet through which the filter may be drawn out of the second cabinet 6.

[0387] The third panel through-hole 623 may serve as a means (panel air inlet) through which air from the outside of the second cabinet 6 is supplied to the flow passages 7 and 8.

[0388] As shown in FIG. 26, the flow passages may include a first flow passage 7 connected to the tub body 21 to define a circulation path of air, and a second flow passage 8 defining a movement path of outside air.

[0389] As shown in FIG. 28, the first flow passage 7 may include an air discharge flow passage 71 connected to the tub air discharge part 25, an air supply flow passage 72 connected to the tub air supply part 24, a heat exchange flow passage 73 connected to the air discharge flow passage, and a blowing flow passage 74 in which a fan for moving air is mounted and which connects the heat exchange flow passage 73 and the air supply flow passage 72.

[0390] The air discharge flow passage 71 may include an air discharge duct 711 detachably fixed to the tub air discharge part 25 of the first treatment apparatus. In order to reduce transmission of vibration of the tub body 30 to the heat exchange flow passage 73, at least a partial section of the air discharge duct 711 may be provided with an air discharge flow passage corrugated portion 712.

[0391] The air supply flow passage 72 may include an air supply duct 721 fixed to the blowing flow passage 74 and providing a movement path of air discharged from the blowing flow passage. In order to reduce transmission of vibration of the tub body 30 to the air supply duct 721, at least a partial section of the air supply duct 721 or one end of the air supply duct 721 may be provided with an air supply flow passage corrugated portion 722.

[0392] The heat exchange flow passage 73 may in-

clude a heat exchange duct 73b fixed to the support panel 613. The heat exchange duct 73b may include a first heat exchange duct 734 in which a first heat exchanger included in the heat exchanger 9 is mounted, a second heat exchange duct 735 in which a second heat exchanger included in the heat exchanger 9 is mounted, and a connection duct 736 connecting the heat exchange ducts 734 and 735.

[0393] The heat exchange duct 73b may be fixed to the bottom surface of the support panel 613 (the support body 614), or may be fixed to a duct seating portion 616 provided on the support panel 613. The duct seating portion 616 is a means protruding from the support body 614 toward the heat exchange duct 73b to maintain a gap between the bottom surface of the heat exchange duct 73b and the support body 614.

[0394] As will be described later, air introduced from the tub body 30 into the first heat exchange duct 73b through the air discharge duct 711 condenses while passing through the first heat exchanger. Accordingly, condensed water may remain inside the heat exchange duct 73b. In order to discharge the condensed water remaining inside the heat exchange duct 73b, the second treatment apparatus 100b may be provided with a condensed water discharge part 75. The condensed water discharge part 75 may be arranged in a space defined between the bottom surface of the heat exchange duct 73b and the support body 614 by the duct seating portion 616.

[0395] The condensed water drain tube 76 may include a first condensed water drain tube 761 fixed to the support body 614 and connected to the first chamber drain tube 758, and a second condensed water drain tube 762 fixed to the support body 614 and connected to the second chamber drain tube 759.

[0396] The first condensed water drain tube 761 and the second condensed water drain tube 762 are means arranged to guide condensed water to the outside of the second cabinet 6. The first condensed water drain tube 761 and the second condensed water drain tube 762 may guide the condensed water to the drain pipe 281 provided in the first treatment apparatus 100a.

[0397] The heat exchange duct 73b may be directly connected to the air discharge duct 711, or may be connected to the air discharge duct 711 through a filtration duct 73a. The filtration duct 73a is a space where a filter 733 for filtering air supplied to the air discharge duct 711 is mounted.

[0398] One surface of the filtration duct 73a may be provided with a filter outlet 731 communicating with the second panel through-hole 622, and another surface of the filtration duct 73a may be provided with an air discharge duct connector 732 connected to the air discharge duct 711. FIG. 16 illustrates, as an example, a case where the filter outlet 731 is provided in the front surface of the filtration duct 73a (the surface facing the frame panel) and the air discharge duct connector 732 is provided on the bottom surface of the filtration duct

73a.

[0399] The blowing flow passage 74 may include a blowing duct 74a fixed to the support panel 613 and connecting the heat exchange duct 73b and the air supply duct 721, and a blowing fan (first flow passage fan) 74b that moves air along the first flow passage part 7.

[0400] As shown in FIG. 26, the second treatment apparatus 100a may be provided with the second flow passage 8. As described above, the second flow passage 8 is a means provided to introduce outside air into the second cabinet 6 and may be fixed to the support frame 61 through a fixing frame 619. As shown in FIG. 15, the fixing frame 619 may connect the lower frame 611 and the upper frame 617 (which may reinforce the strength of the support frame).

[0401] The clothing treatment apparatus and control method described above relate to one example of the present disclosure, and therefore the scope of the present disclosure is not limited to the above-described structure or control method.

Claims

1. A clothing treatment apparatus comprising:

a cabinet;
a tub arranged in the cabinet, the tub comprising:

a tub body configured to store water; and
a tub front surface defining a front of the tub body and having a tub inlet allowing laundry to be introduced therethrough;
a drum rotatably arranged inside the tub body to accommodate the laundry; and
a door rotatably fixed to the tub to open and close the tub inlet,
wherein the tub front surface comprises a curling portion curled outward along an edge of the tub inlet,
wherein the door comprises a sealing member extending along a circumference of the tub inlet and arranged between the door and the tub inlet, and
wherein, based on the tub inlet being closed by the door, the sealing member is pressed by the curling portion to seal the door and the tub inlet.

2. The clothing treatment apparatus of claim 1, wherein the sealing member comprises:

a coupling body coupled to the door;
a contact body extending in a radial direction of the tub inlet and having one surface pressed by the curling portion; and

a main body extending from the coupling body and fixing one end of the contact body.

3. The clothing treatment apparatus of claim 2, wherein the contact body comprises:
 - a first contact body having one end fixed to and extending from the main body; and
 - a second contact body extending from an end of the first contact body so as to be inclined in a direction away from the curling portion.
4. The clothing treatment apparatus of claim 3, wherein, based on the tub inlet being closed by the door, the second contact body is compressed by the curling portion and at least a portion of the first contact body is accommodated in the tub inlet.
5. The clothing treatment apparatus of claim 2, wherein an extended end of the contact body is a free end.
6. The clothing treatment apparatus of claim 5, wherein, based on the tub inlet being closed by the door, a portion of the contact body fixed by the main body is positioned inside the tub inlet.
7. The clothing treatment apparatus of claim 1, wherein the tub comprises:
 - a door mounting part fixed to the tub front surface to fix the door to the tub, the door mounting part having an inlet communication hole communicating with the tub inlet, wherein the inlet communication hole is arranged not to interfere with the curling portion.
8. The clothing treatment apparatus of claim 1, wherein the door comprises:
 - a door frame rotatably fixed to the tub and having a frame through-hole; and
 - an inner window arranged in the door frame to cover the frame through-hole and face the tub inlet, wherein the sealing member is press-fitted and fixed in a space between the door frame and the inner window.
9. The clothing treatment apparatus of claim 8, wherein at least a portion of the inner window is inserted into the tub inlet.
10. The clothing treatment apparatus of claim 9, wherein the sealing member is arranged to interconnect the inner window and the tub inlet.
11. The clothing treatment apparatus of claim 2,

wherein the main body comprises:

a fixing end portion extending toward the tub body such that at least a portion thereof is positioned inside the tub inlet when the door closes the tub inlet, the one end of the contact body being fixed to the fixing end portion; and a support inclined portion supporting the contact body compressed by the curling portion.

12. The clothing treatment apparatus of claim 11, wherein the coupling body comprises:
 - a first coupling body interposed between the door frame and the inner window; and
 - a second coupling body connected to the first coupling body to define a groove accommodating a portion of the door frame, and connected to the support inclined portion.
13. The clothing treatment apparatus of claim 12, wherein the sealing member is coupled to the door frame by a fastening member arranged through the second coupling body and coupled to the door frame.
14. The clothing treatment apparatus of claim 1, wherein the sealing member is formed of an elastic material and has a hollow portion formed therein.
15. The clothing treatment apparatus of claim 1, wherein a curled end of the curling portion is spaced apart from the tub.
16. The clothing treatment apparatus of claim 1, wherein the tub front surface comprises a connection body extending forward to surround the tub inlet, wherein the curling portion is formed at an extended end of the connection body.
17. The clothing treatment apparatus of claim 16, wherein the tub comprises:
 - a door mounting part fixed to the tub front surface to fix the door to the tub, the door mounting part having an inlet communication hole communicating with the tub inlet, wherein the inlet communication hole is formed to surround an outer circumferential surface of the connection body.
18. The clothing treatment apparatus of claim 17, wherein the door mounting part comprises:
 - a first mounting cover coupled to the tub front surface; and
 - a second mounting cover arranged to cover a

front of the first mounting cover and contact the door.

19. The clothing treatment apparatus of claim 16, further comprising:
a washing unit comprising:

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a circulation pump configured to move water drained from the tub;
a circulation nozzle fixed to the connection body to spray water toward the drum; and
a circulation flow passage connecting the circulation pump and the circulation nozzle.

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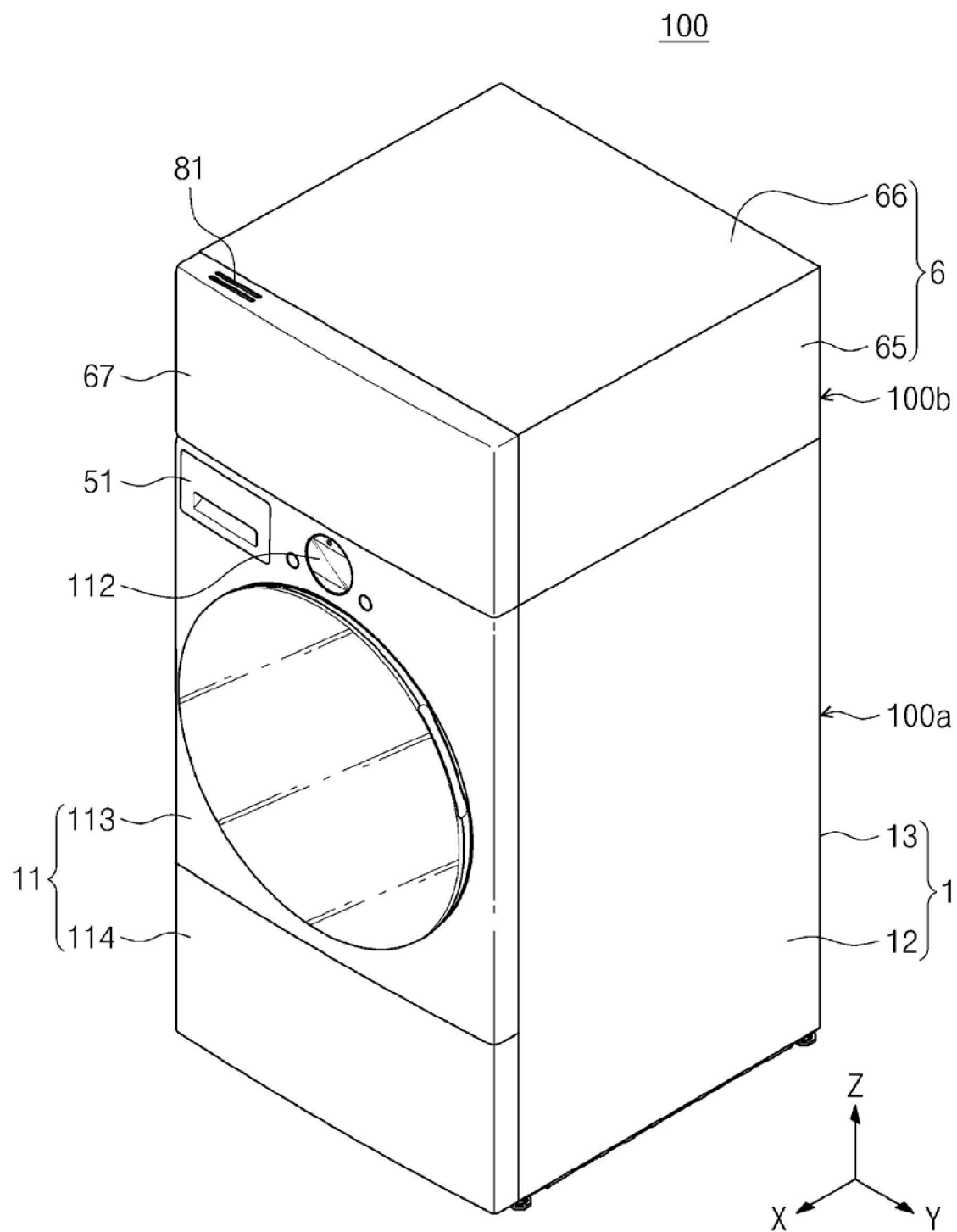
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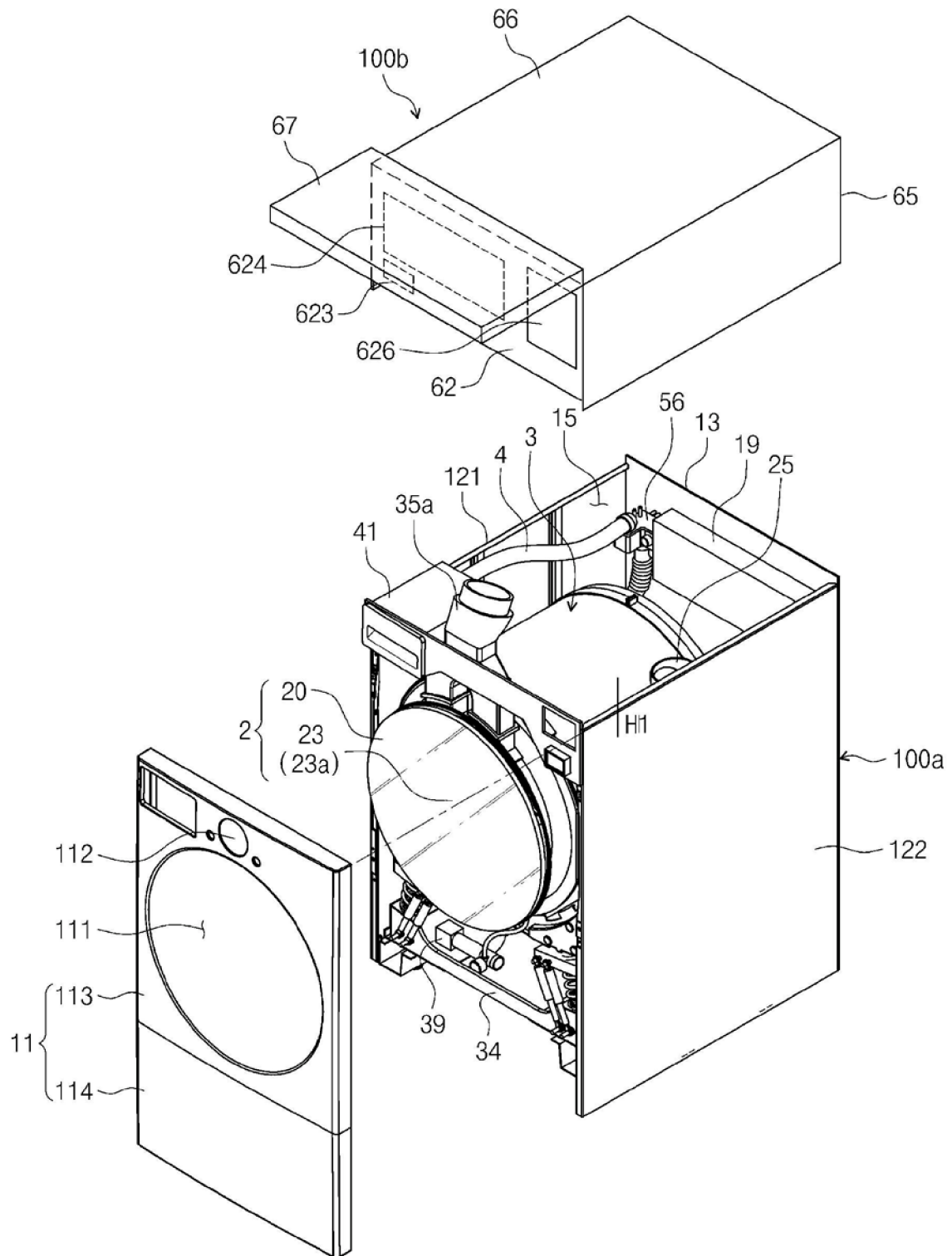
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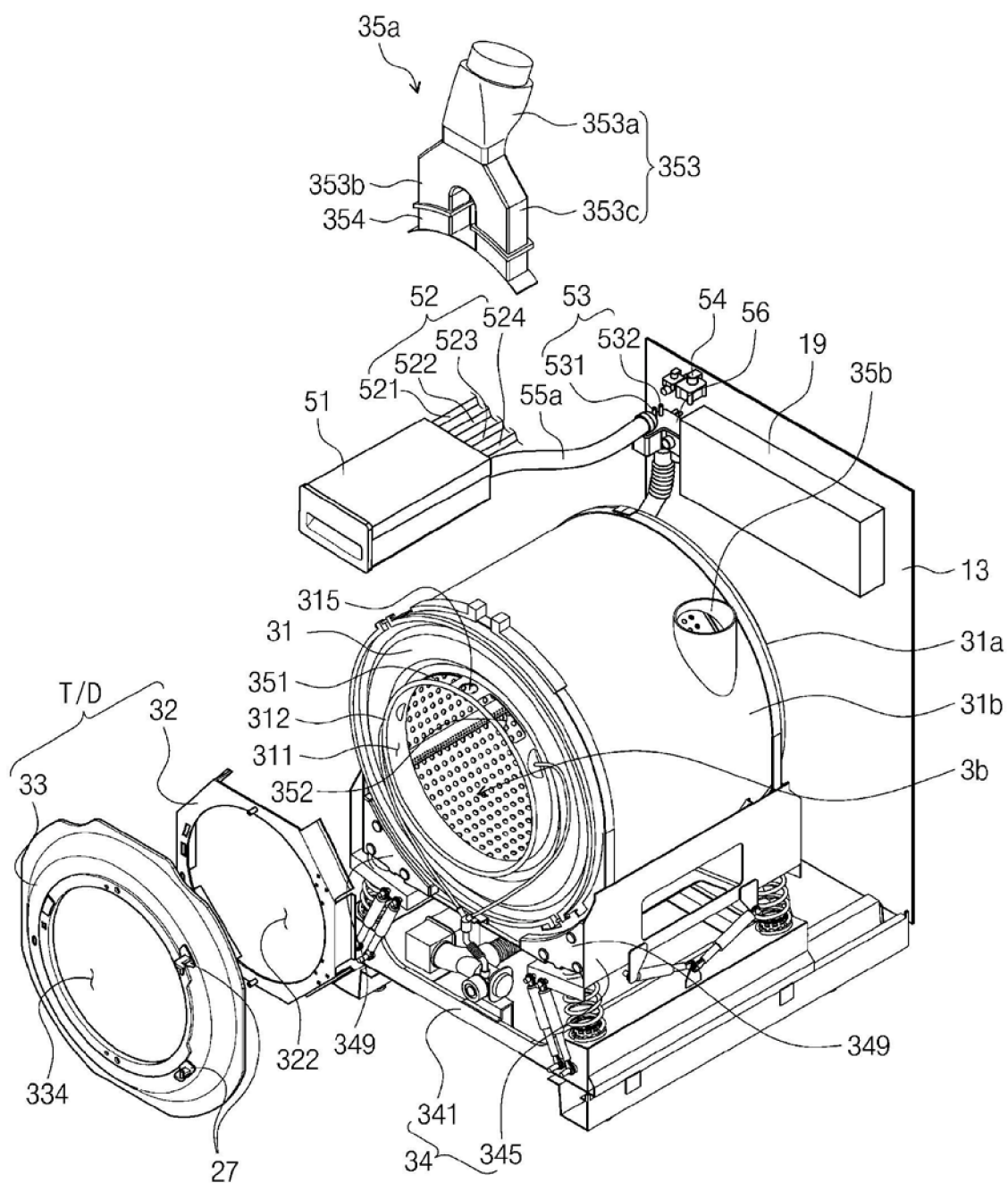
【Fig. 1】



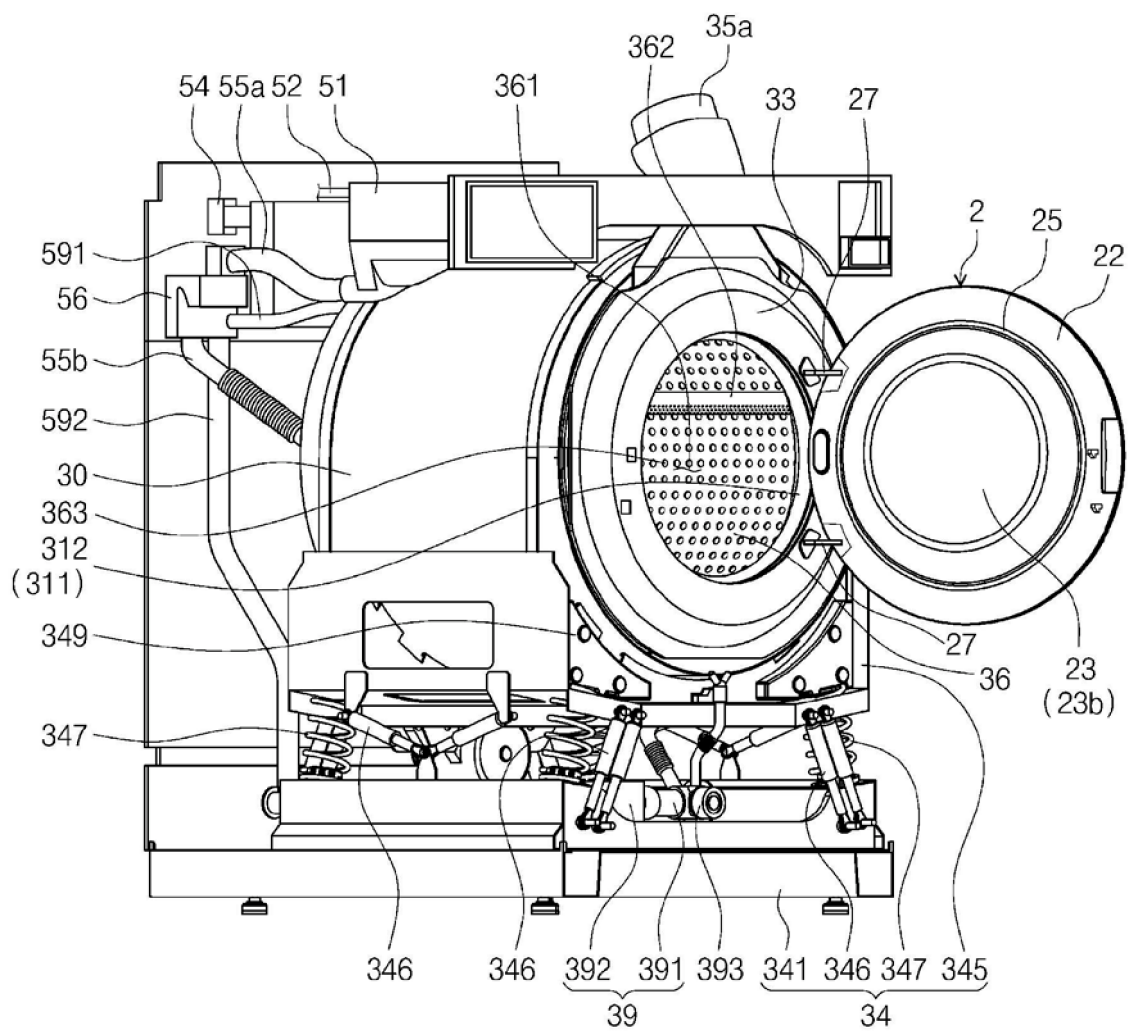
【Fig. 2】



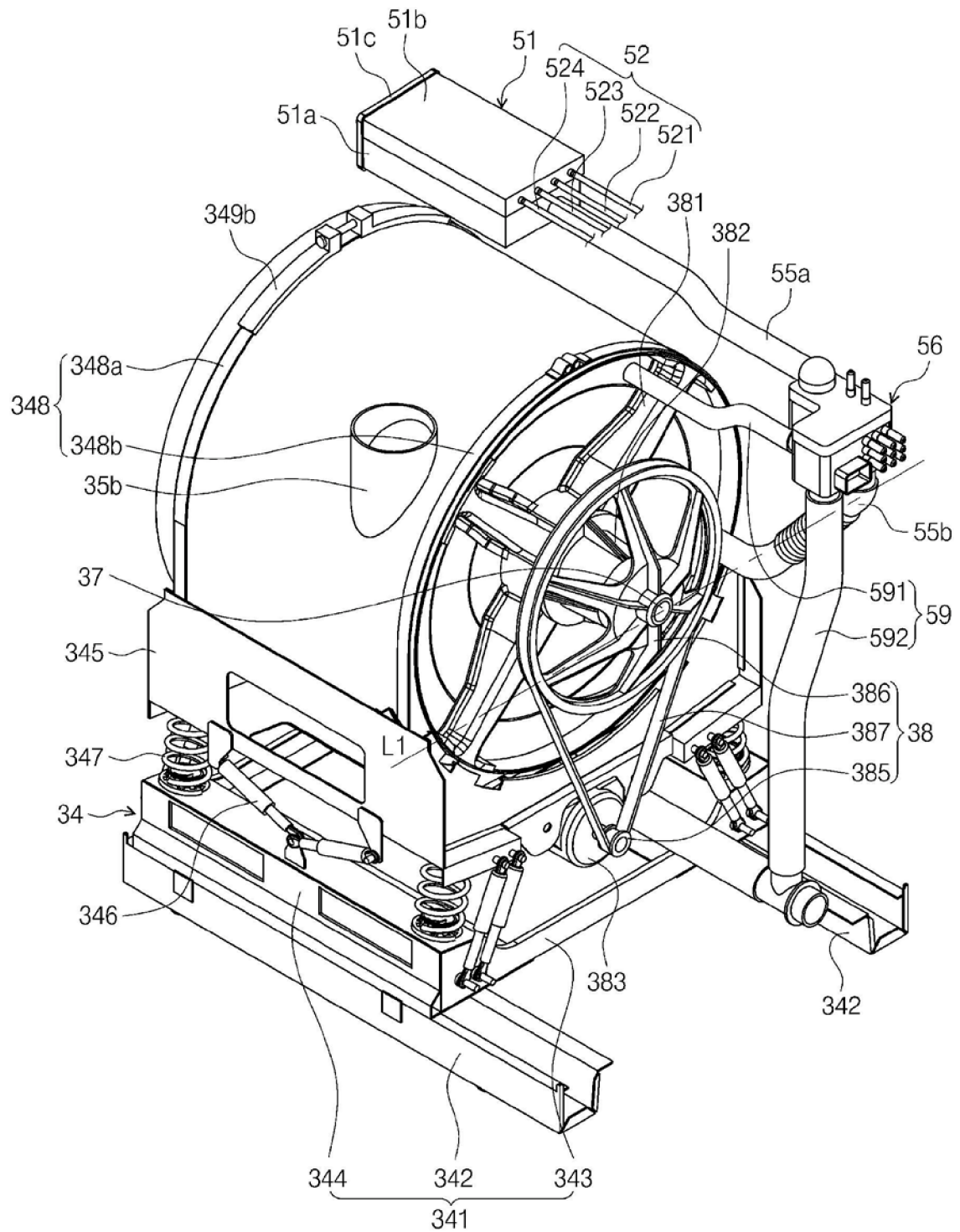
【Fig. 3】



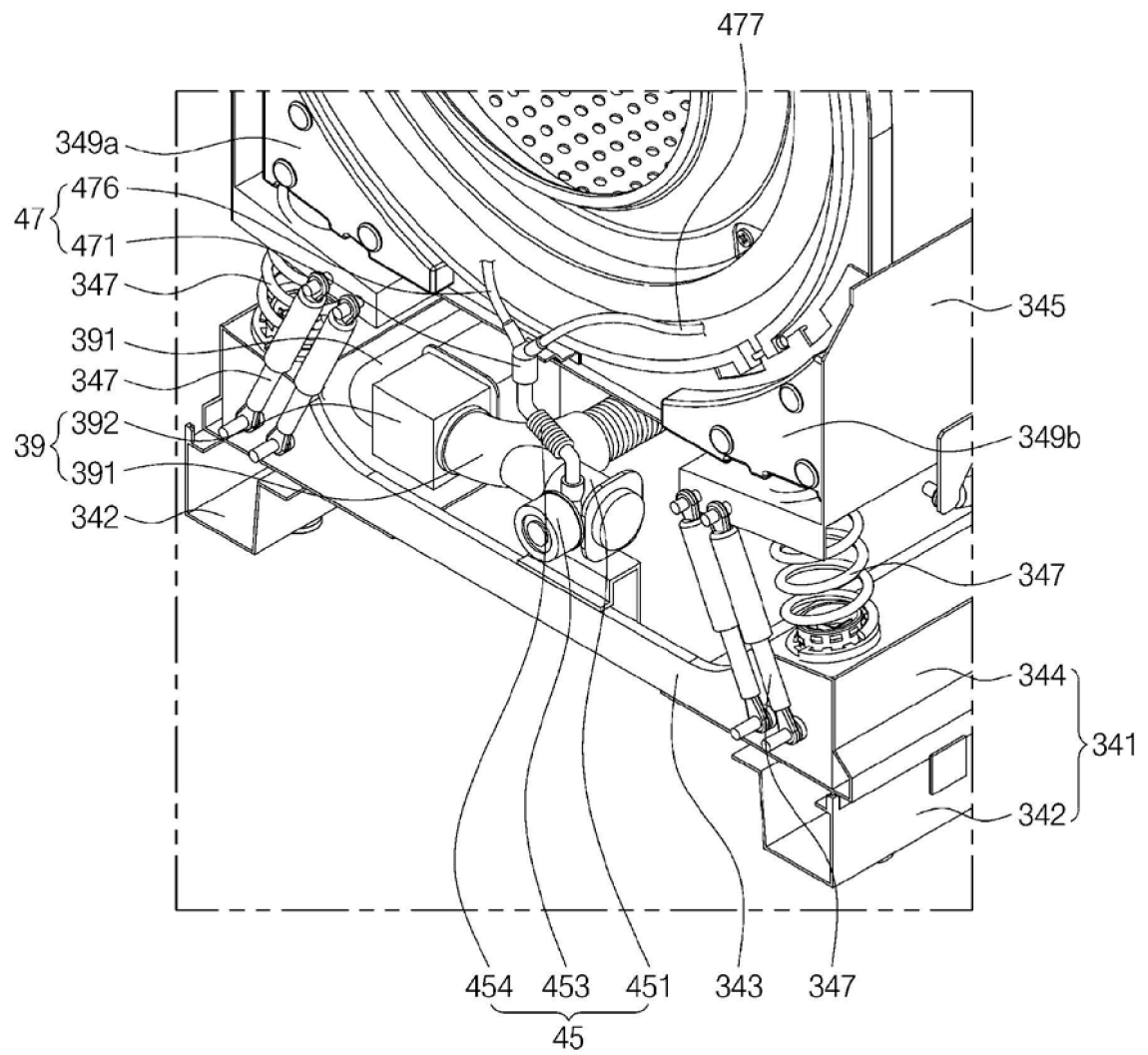
【Fig. 4】



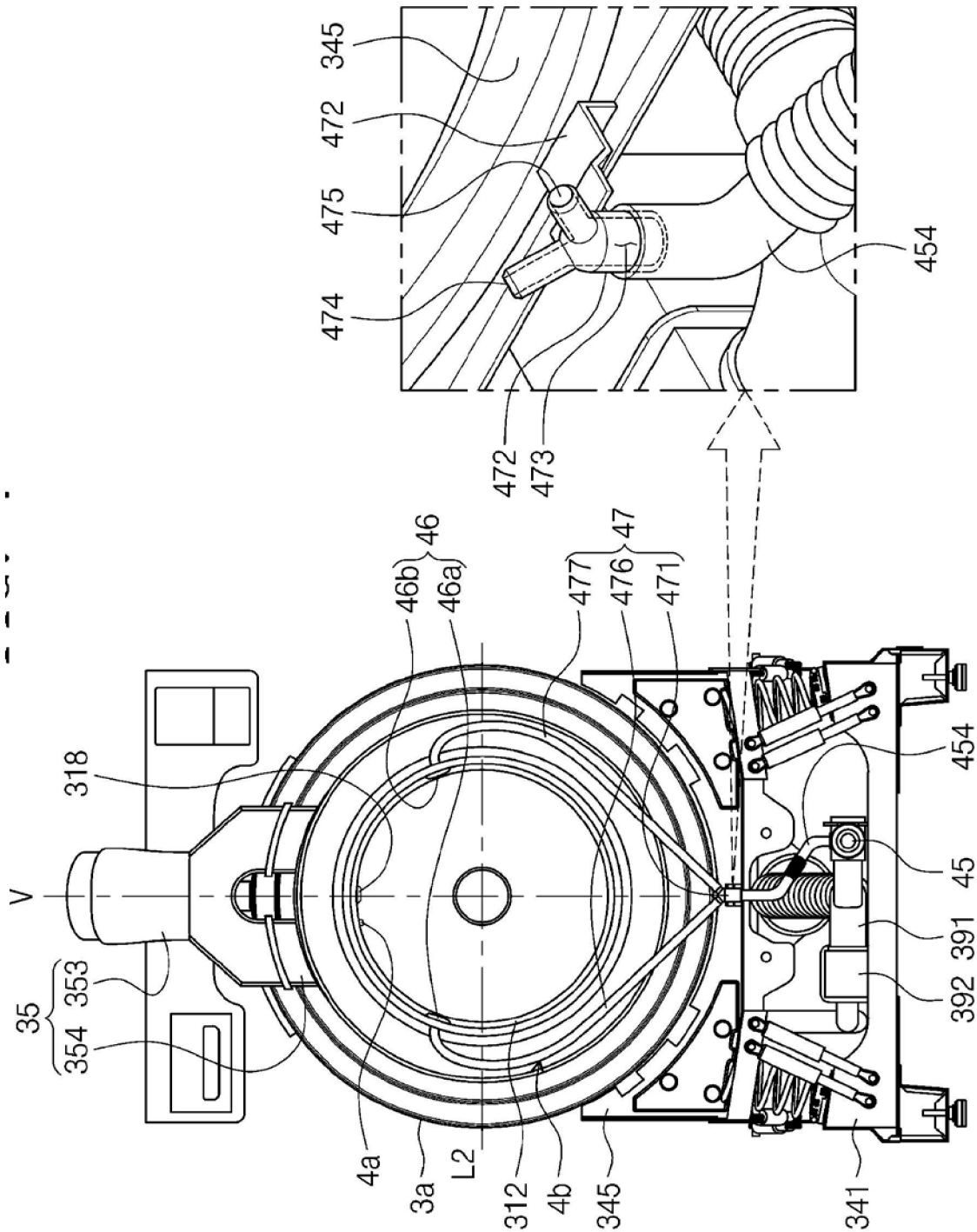
【Fig. 5】



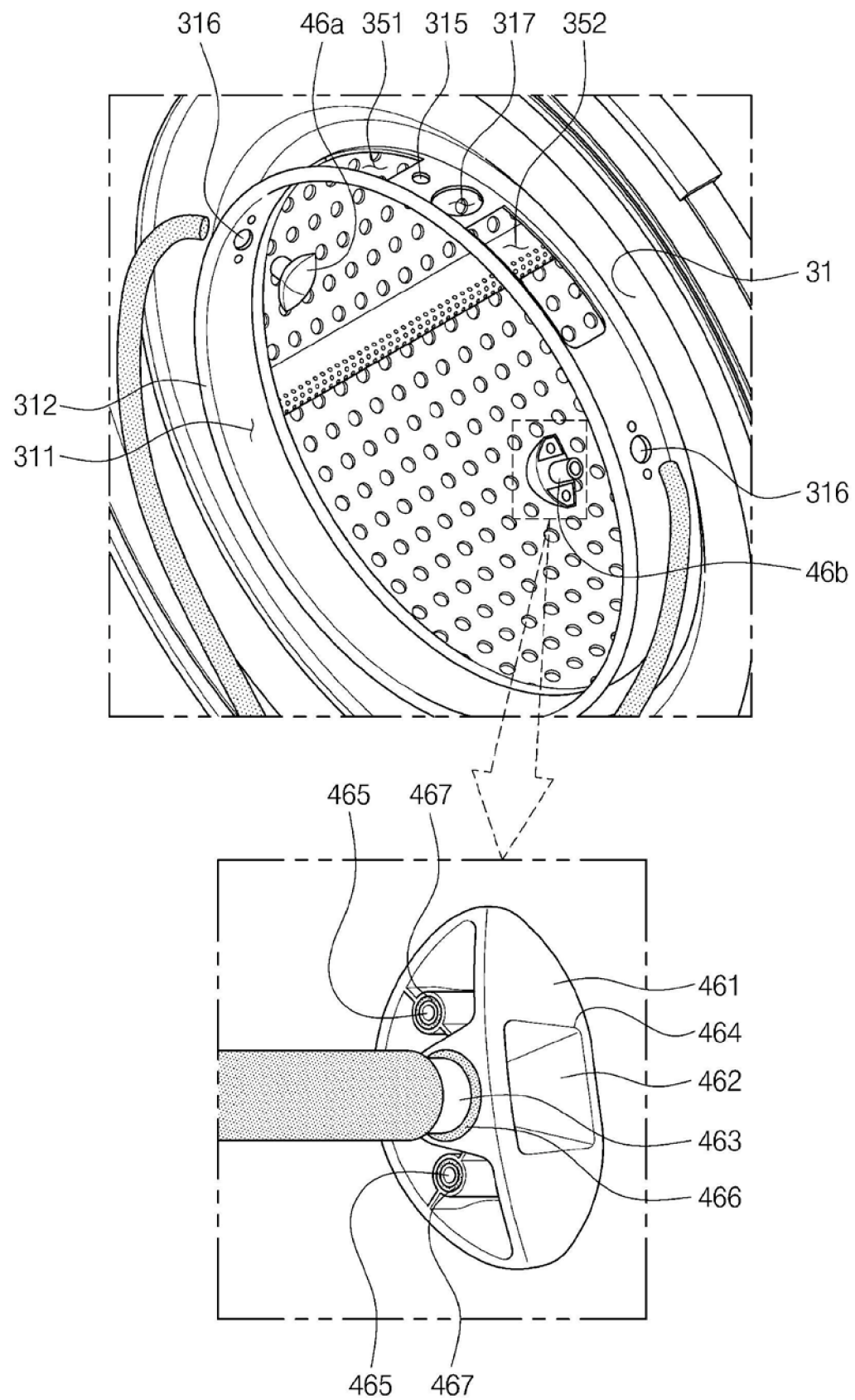
【Fig. 6】



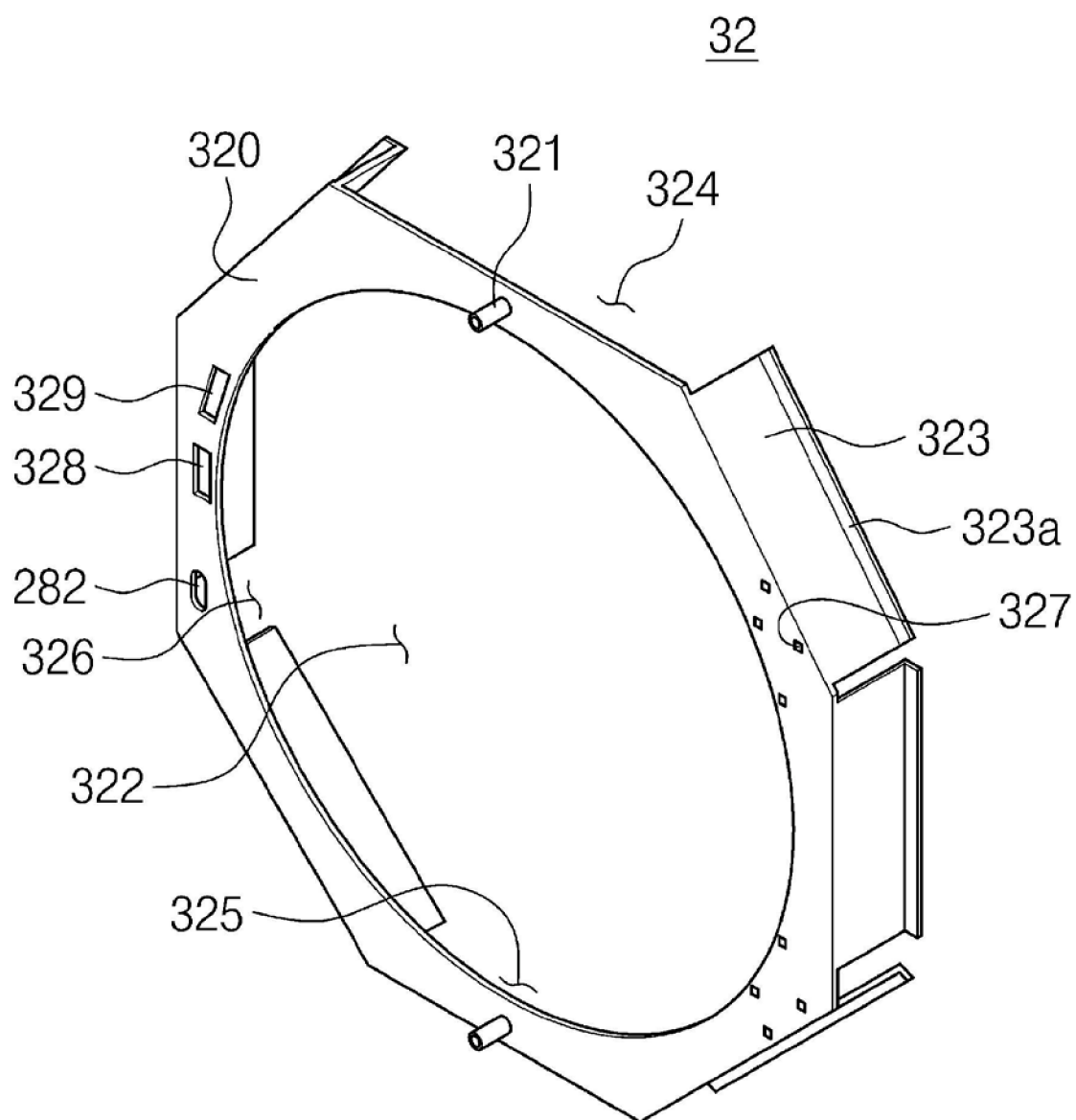
【Fig. 7】



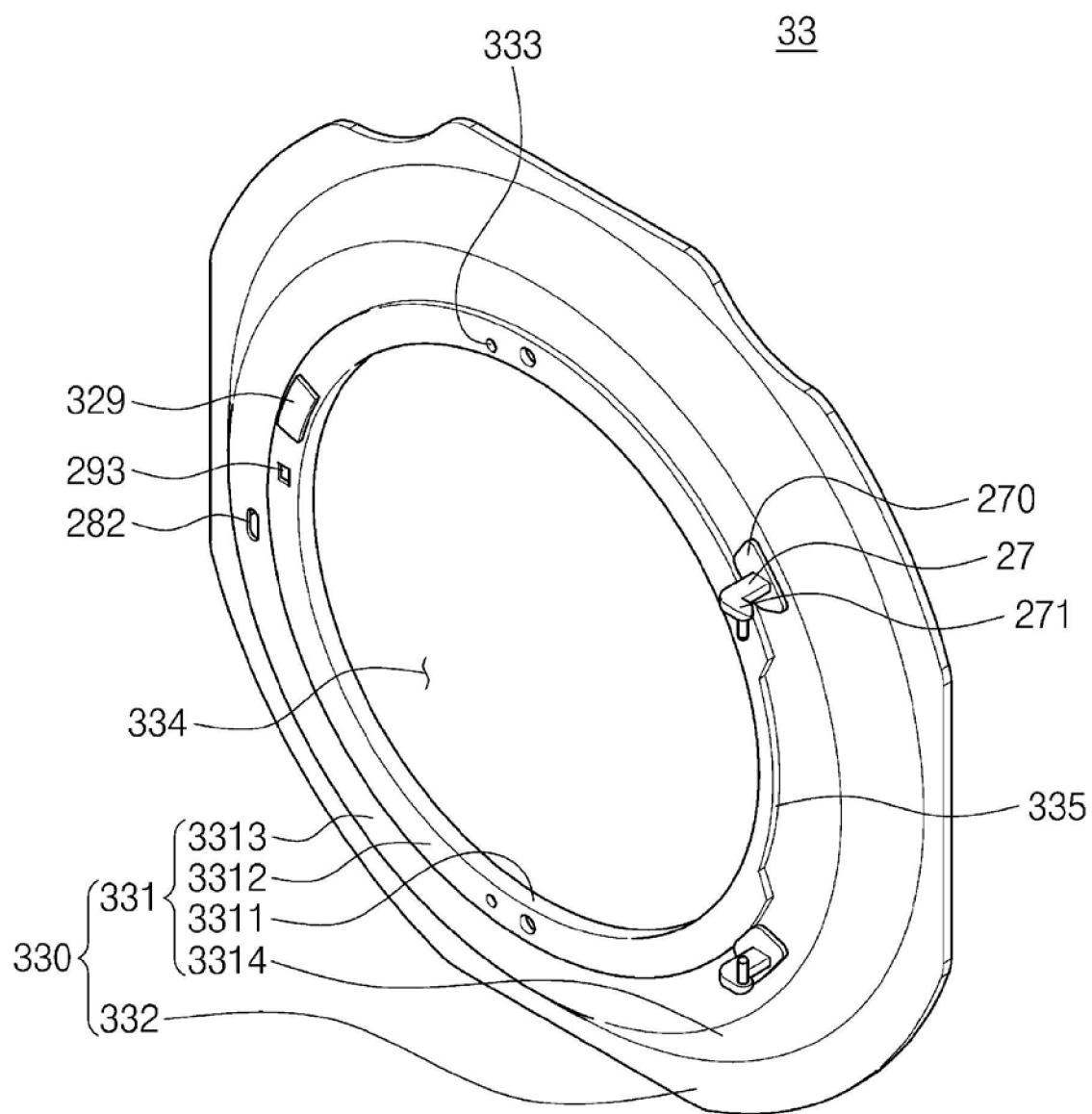
【Fig. 8】



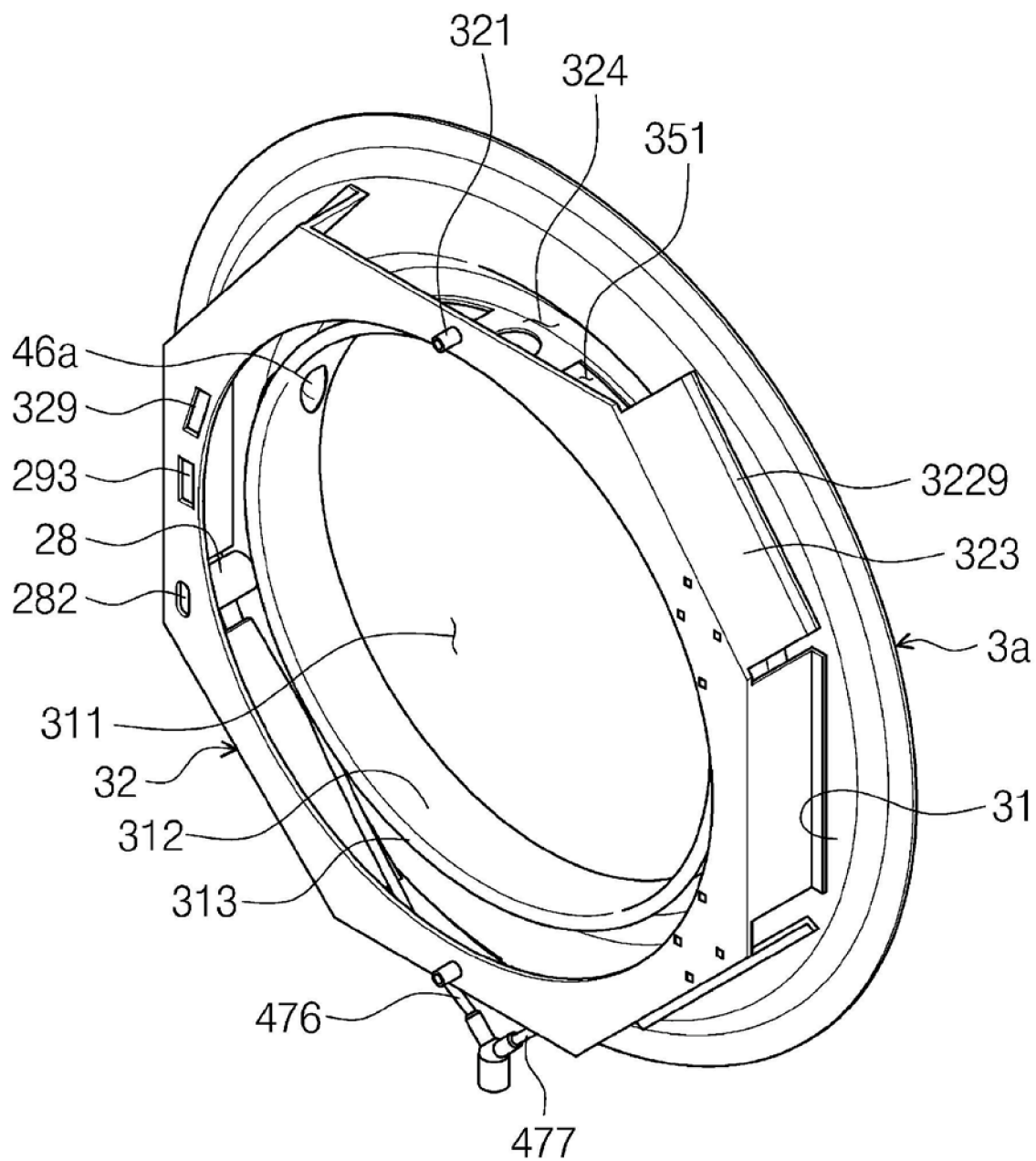
【Fig. 9】



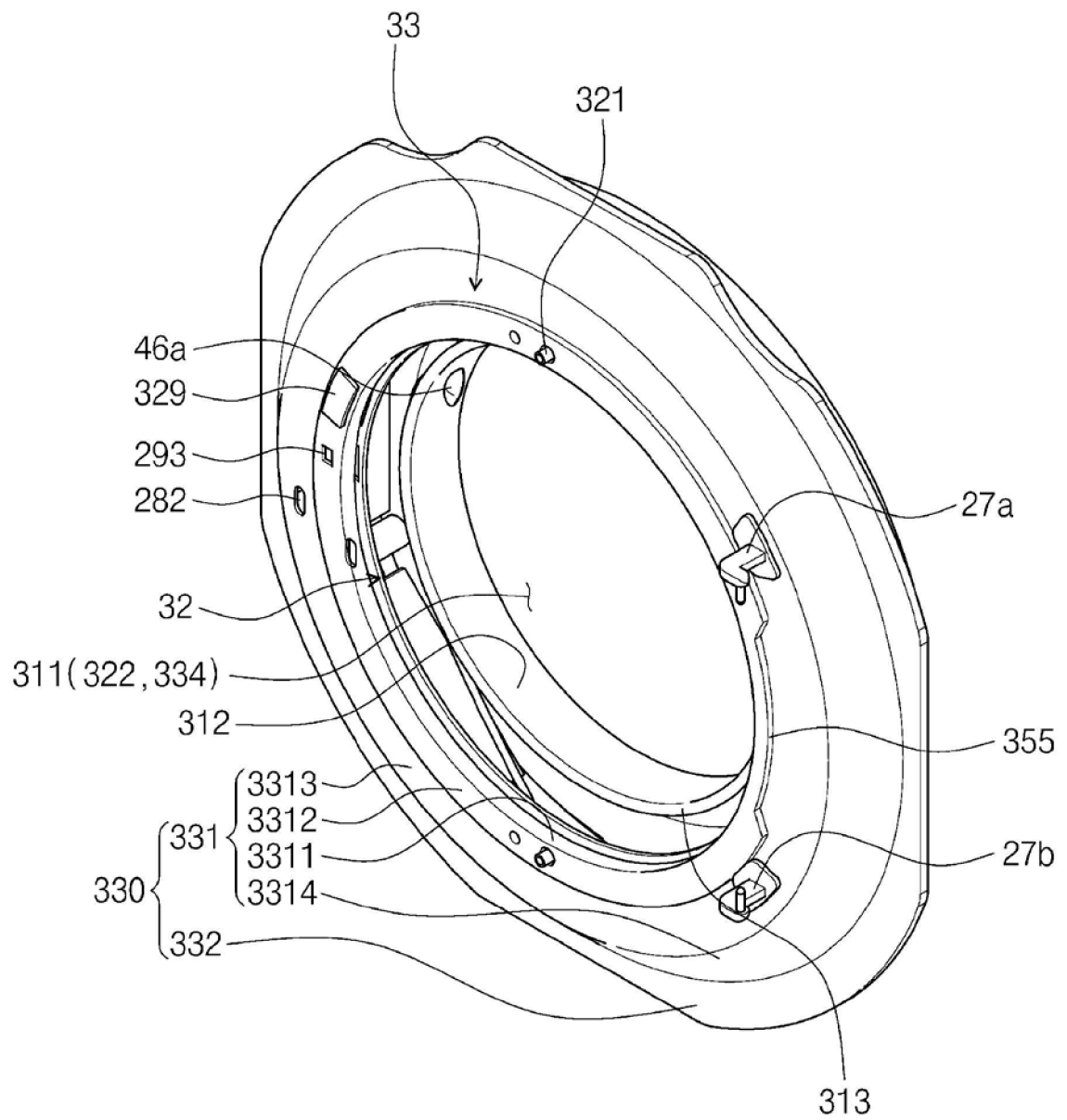
【Fig. 10】



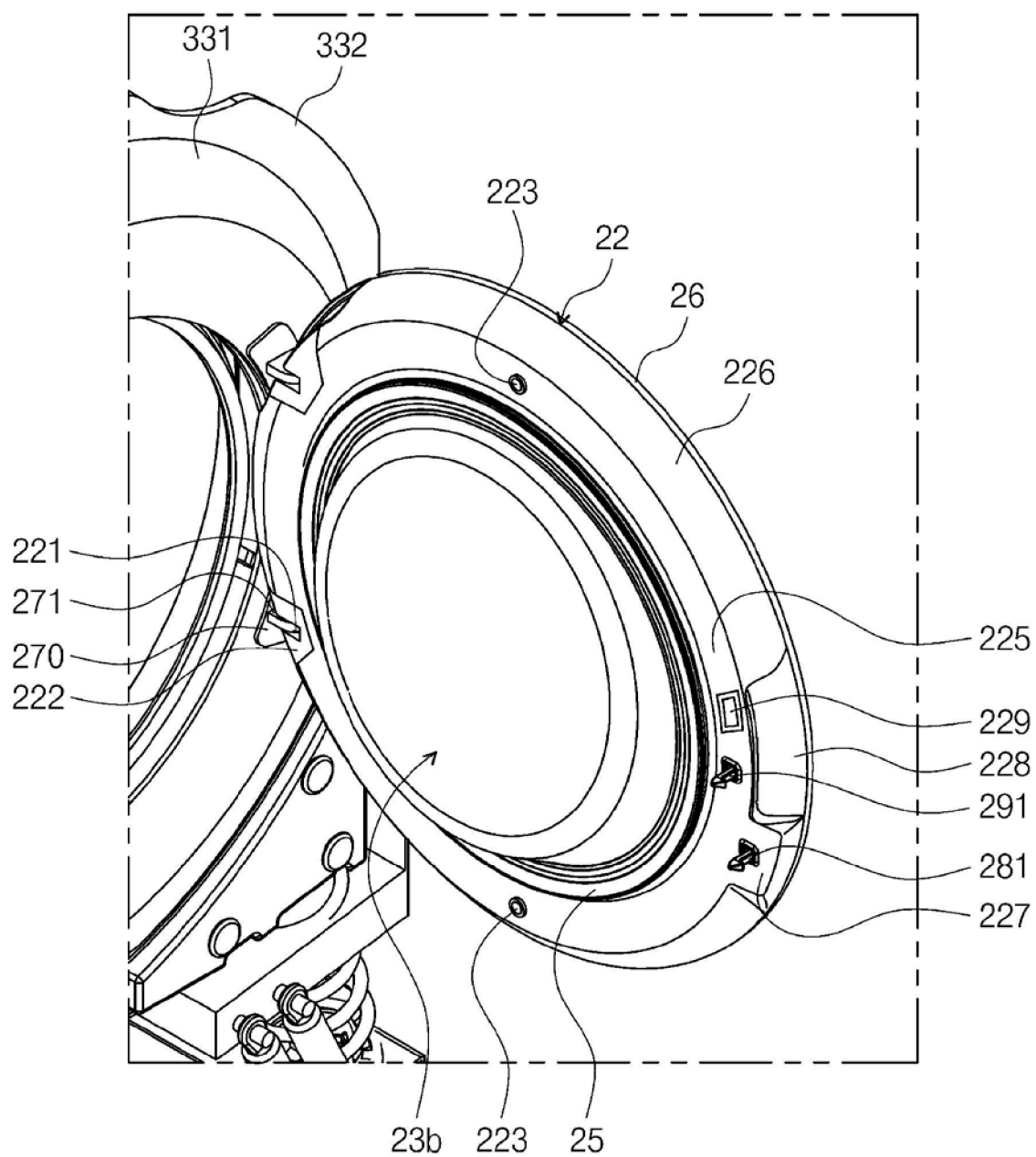
【Fig. 11】



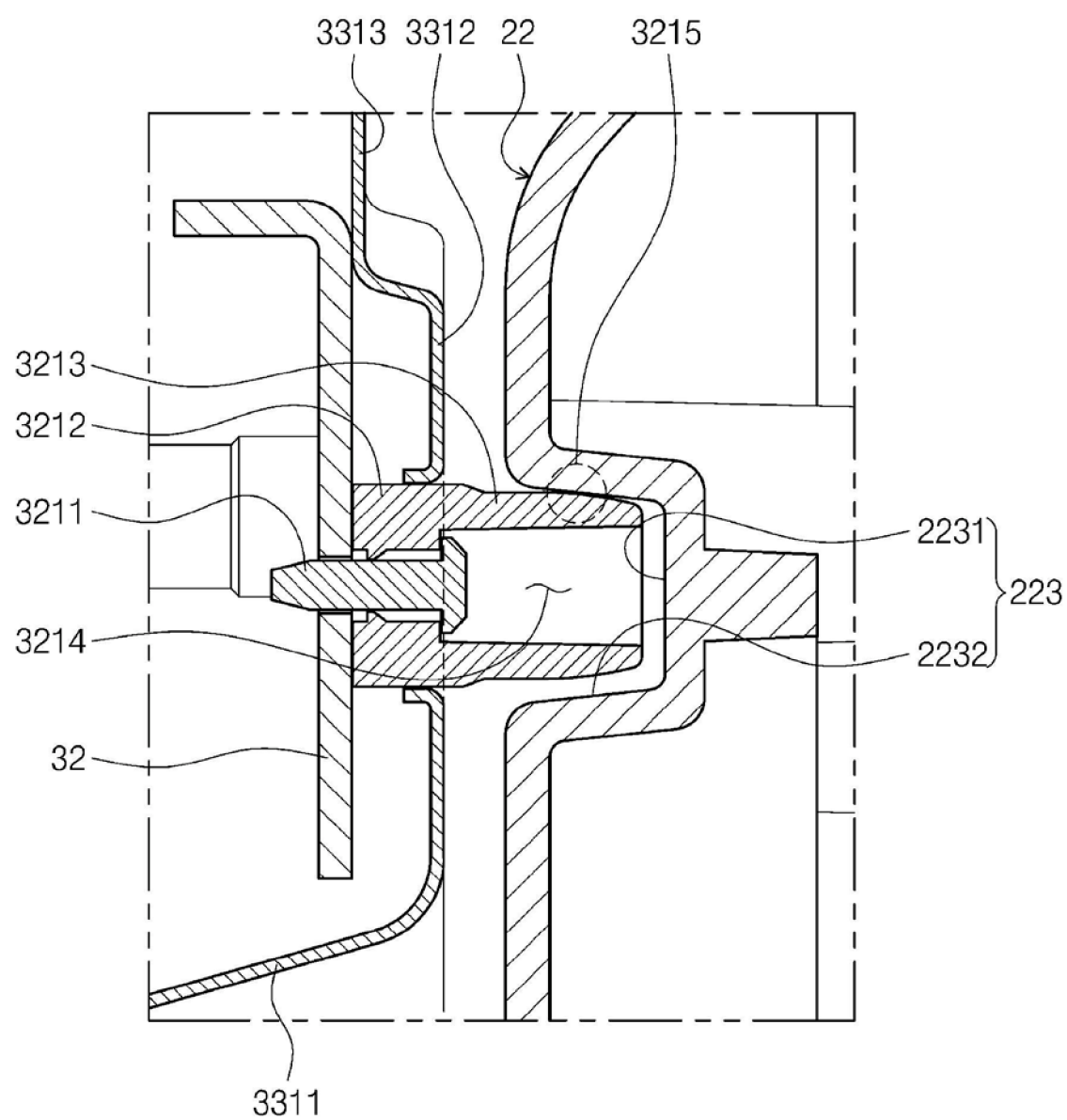
【Fig. 12】



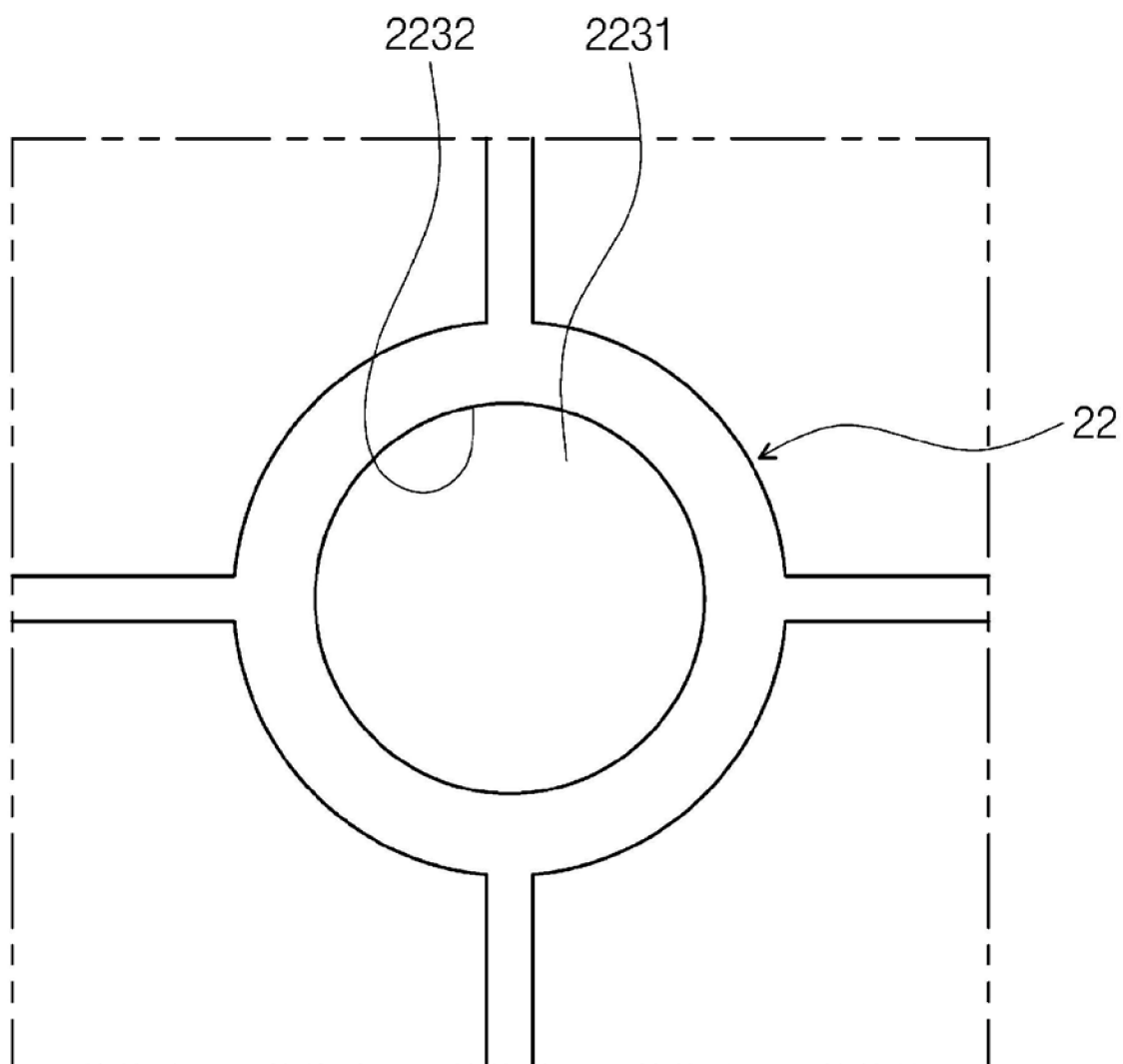
【Fig. 13】



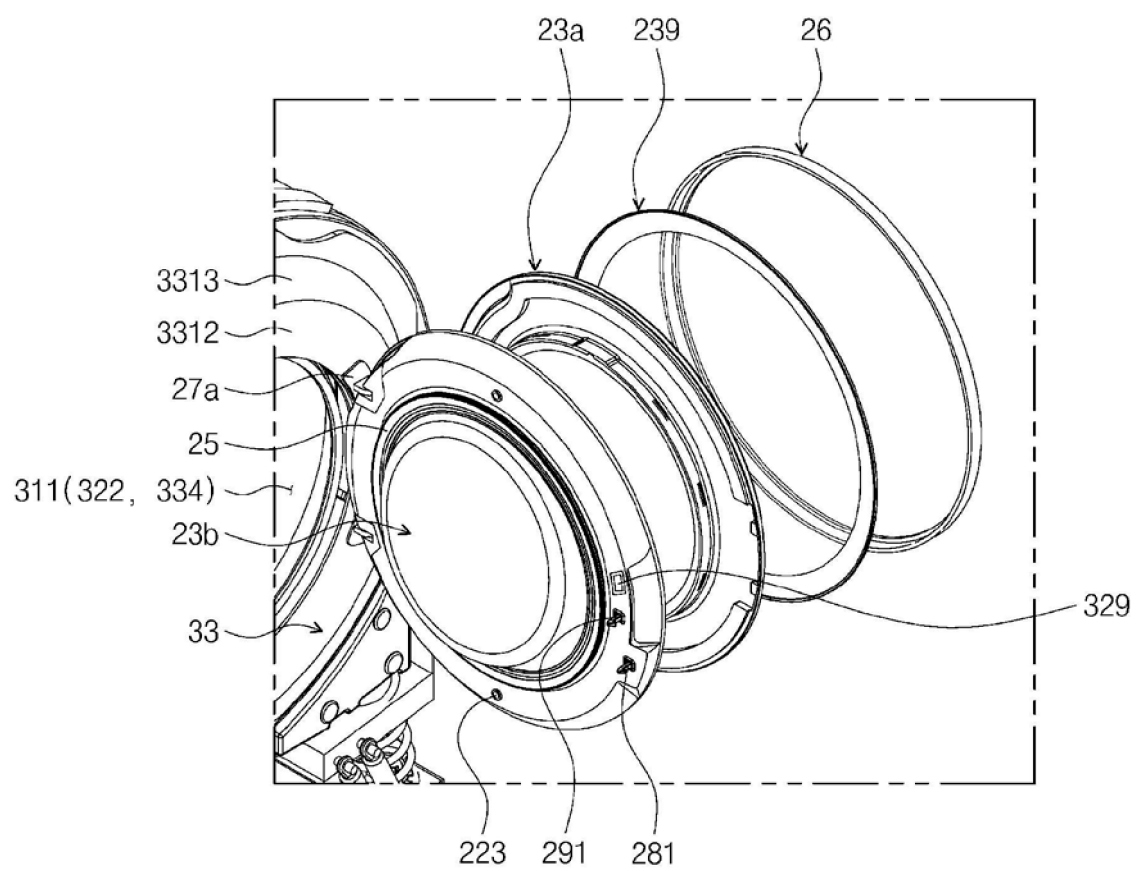
【Fig. 14】



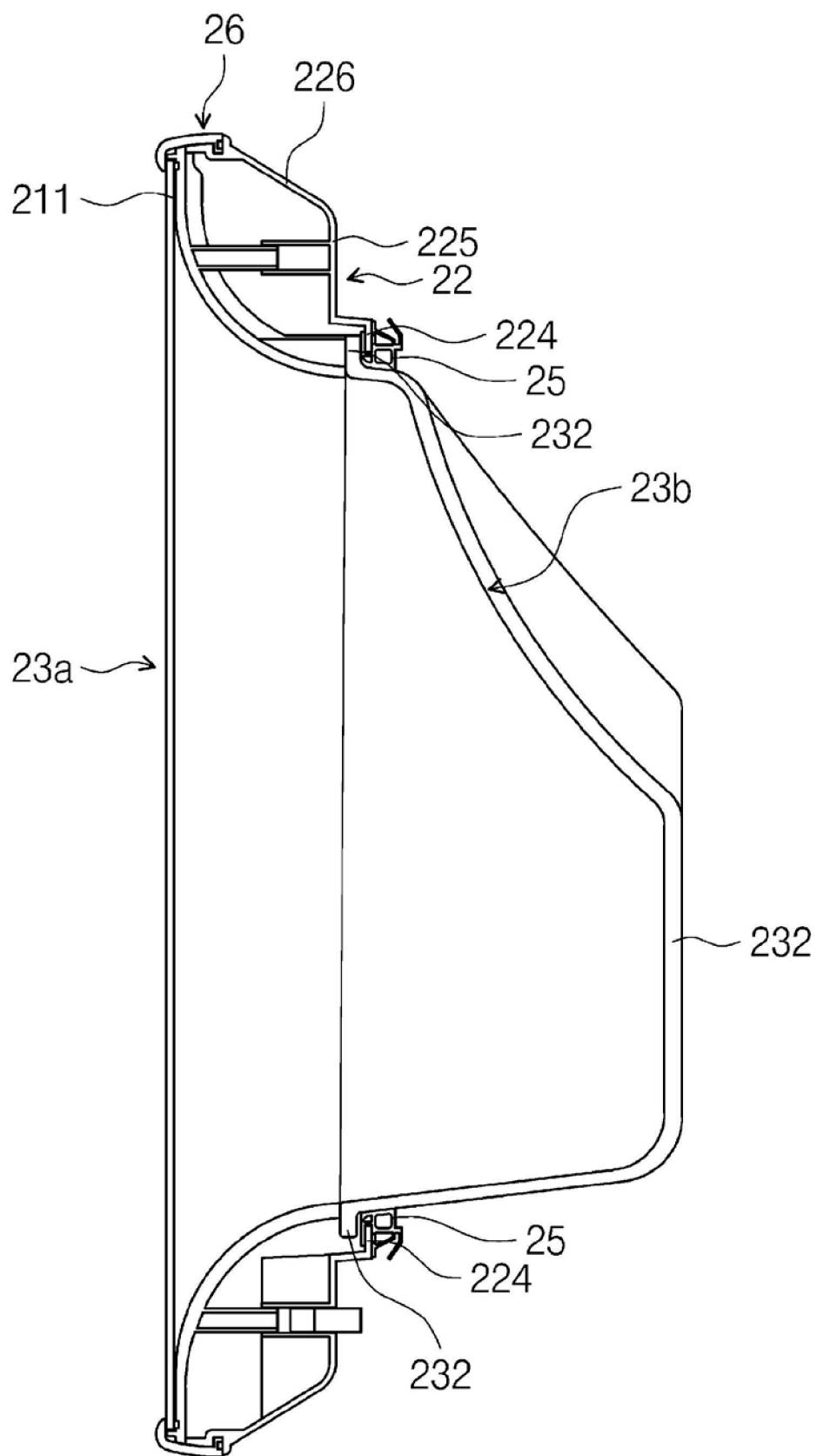
【Fig. 15】



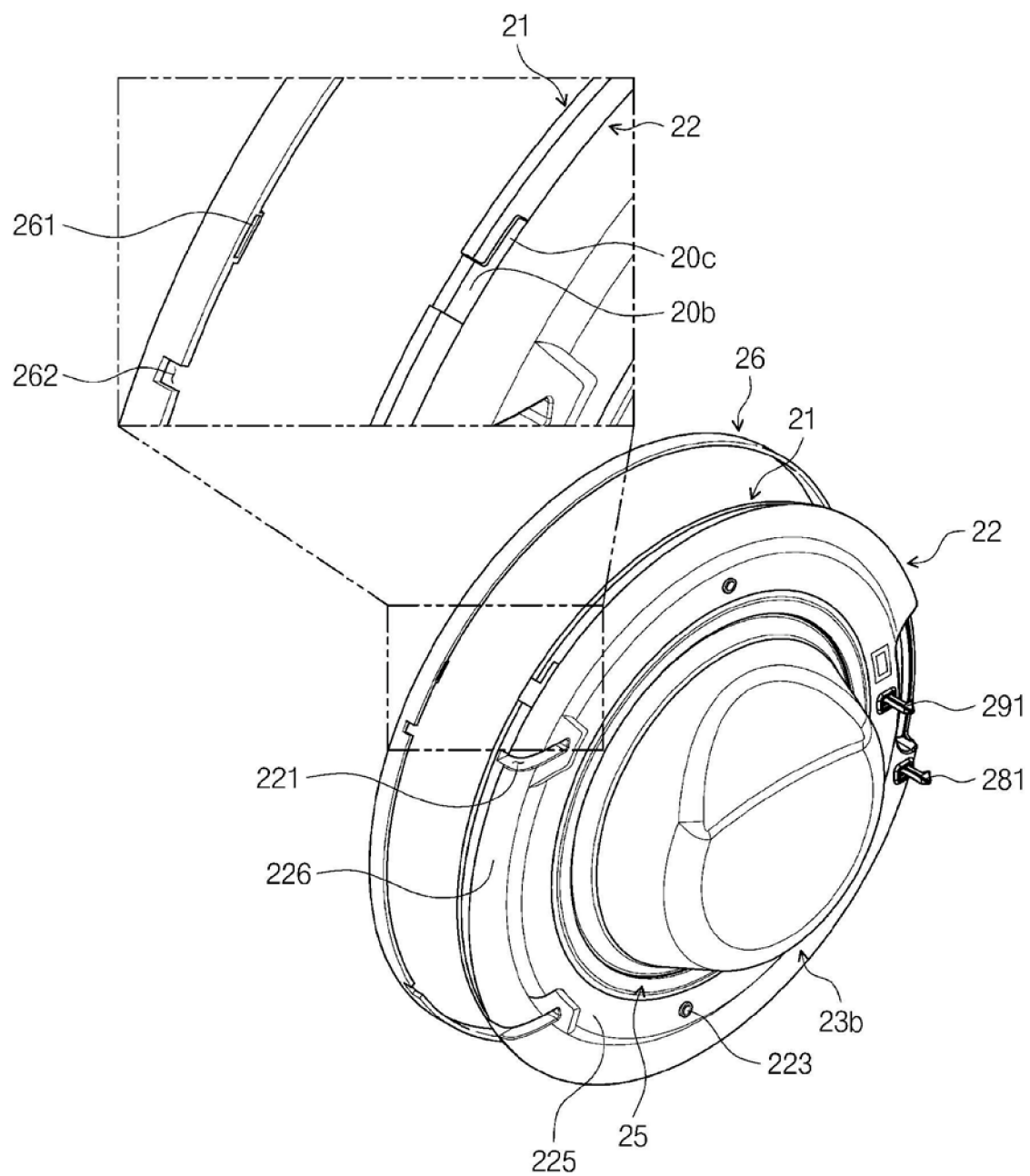
【Fig. 16】



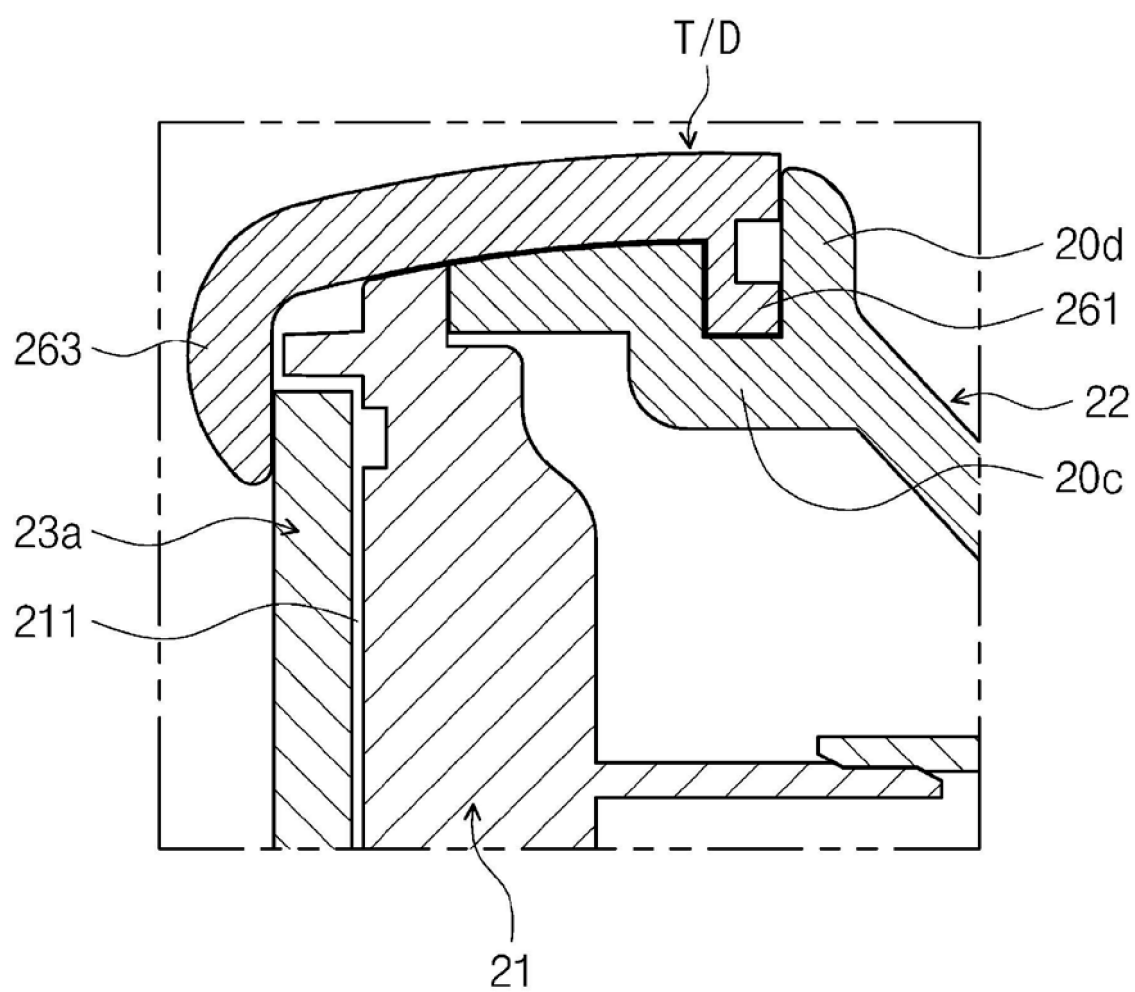
【Fig. 17】



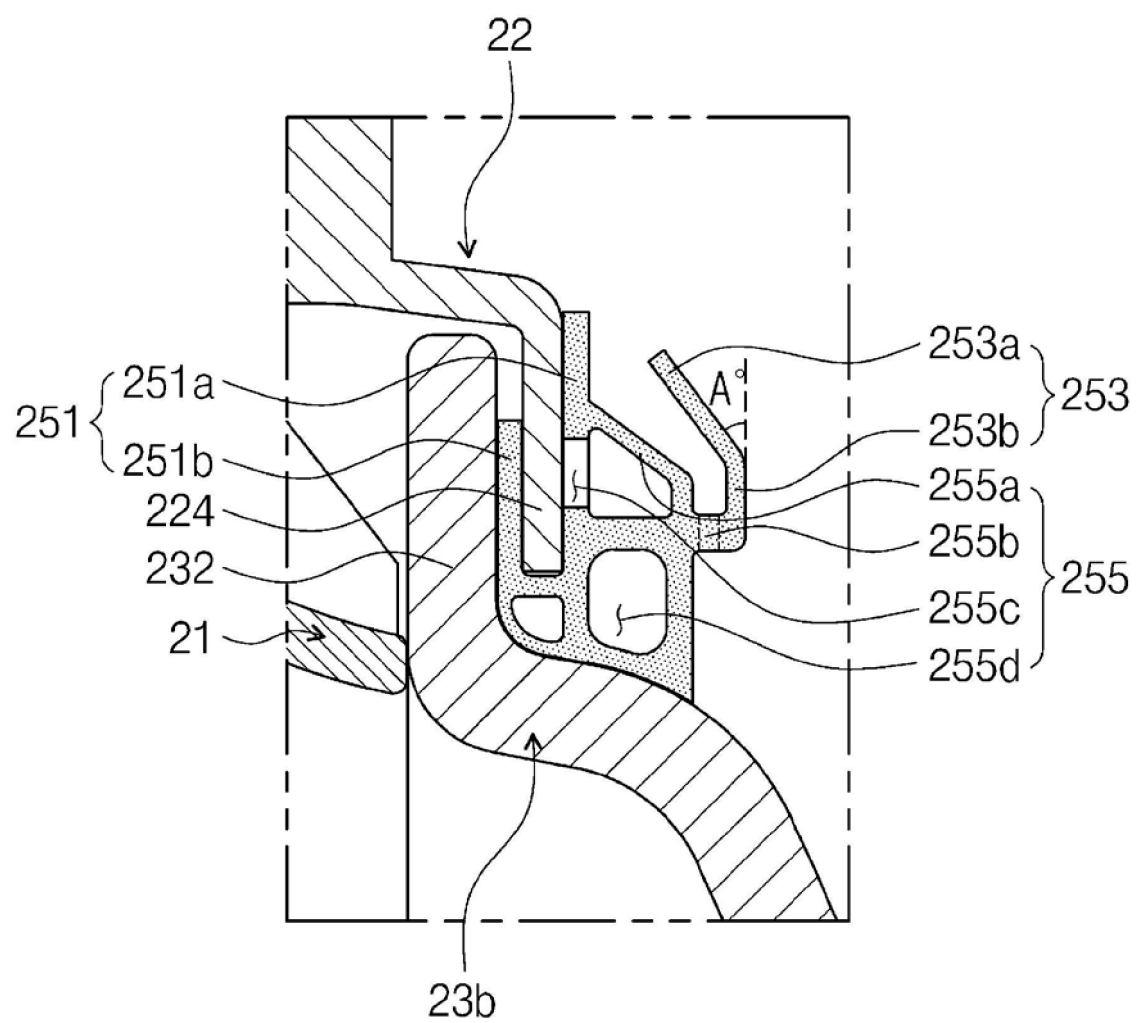
【Fig. 18】



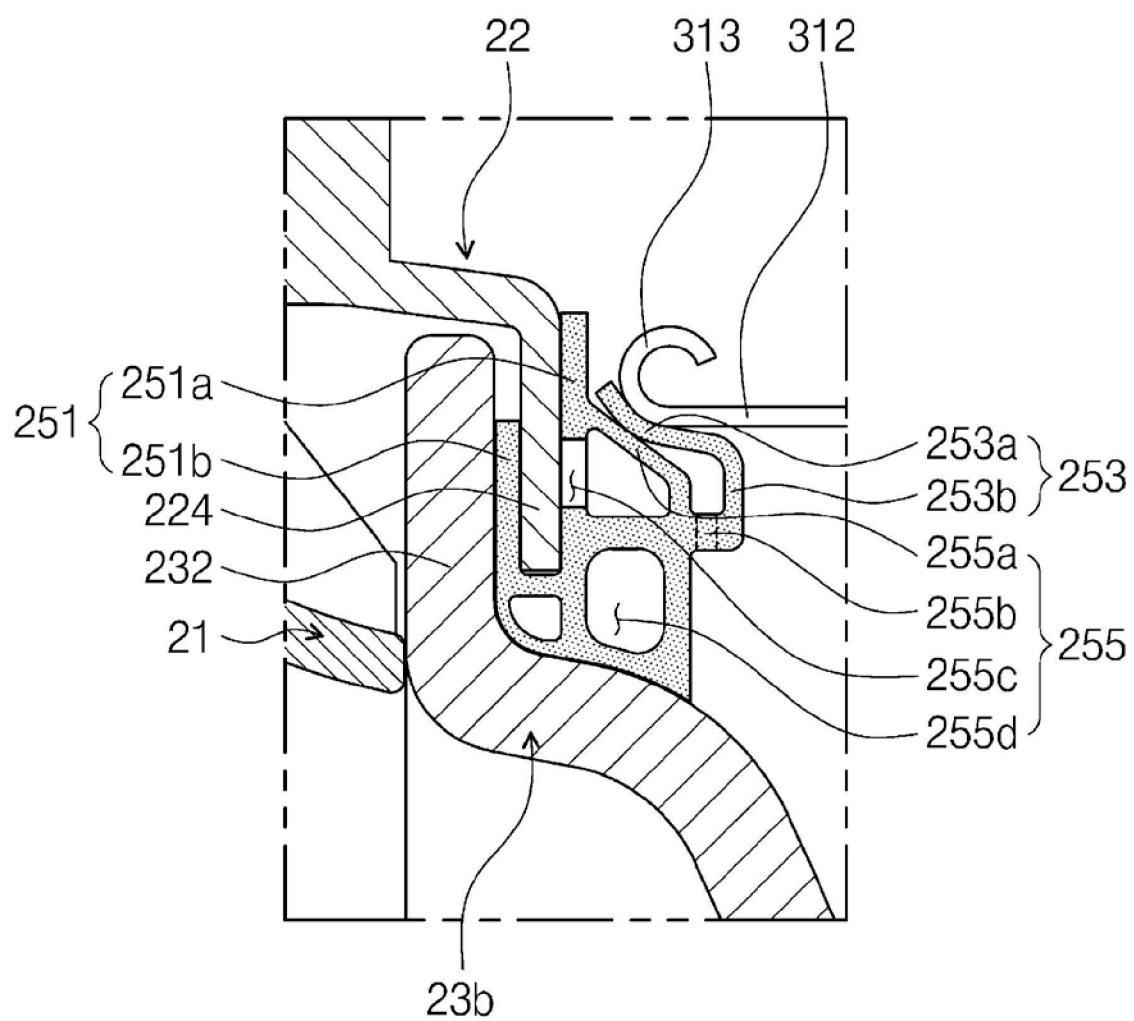
【Fig. 19】



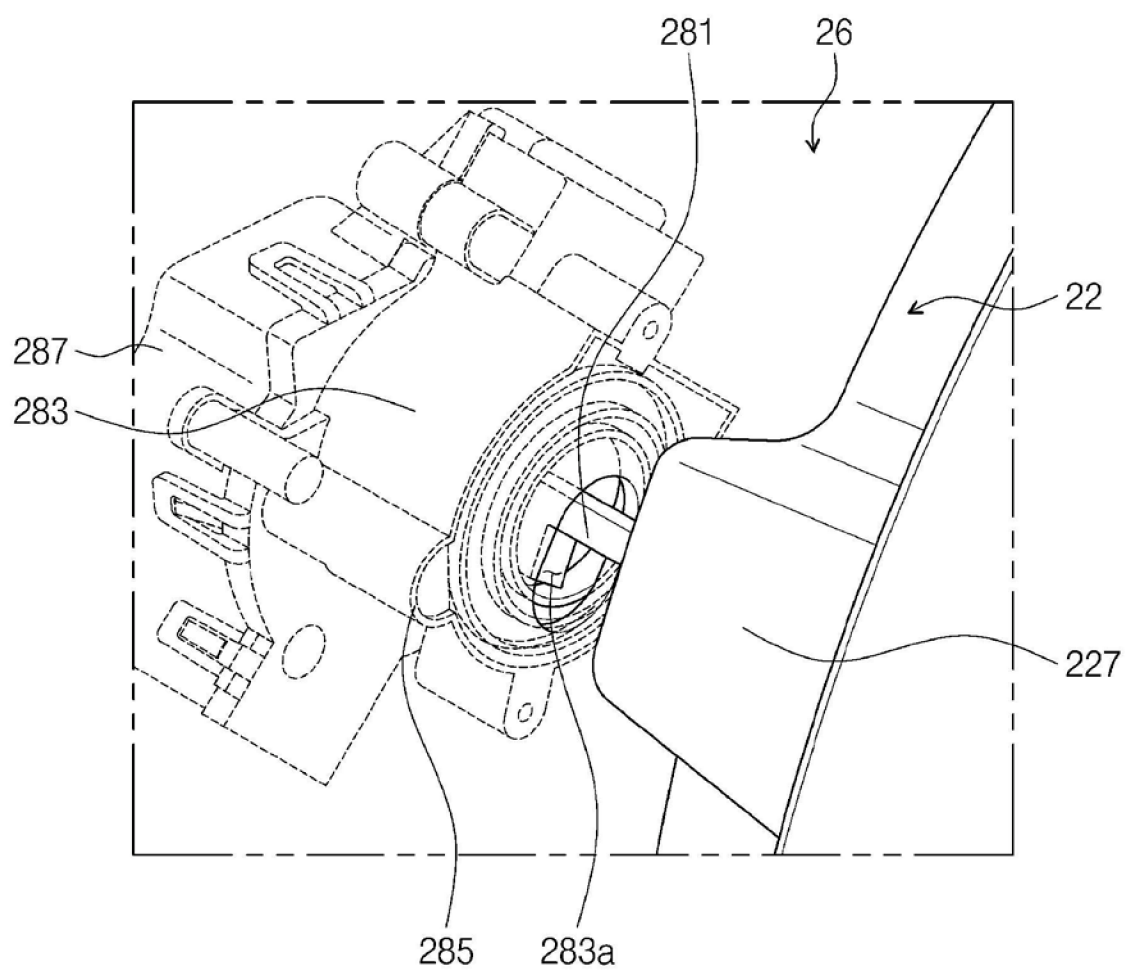
【Fig. 20】



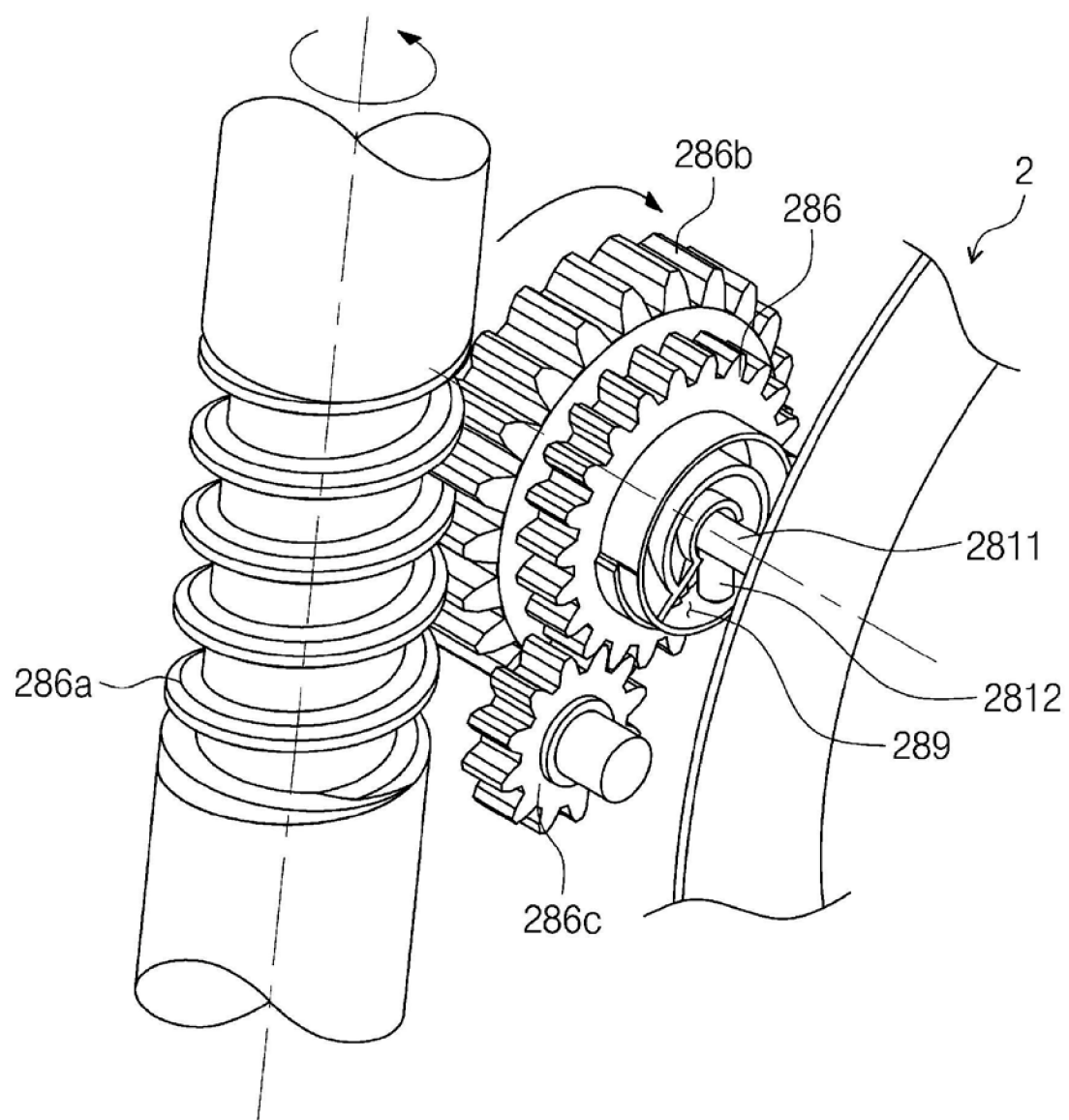
【Fig. 21】



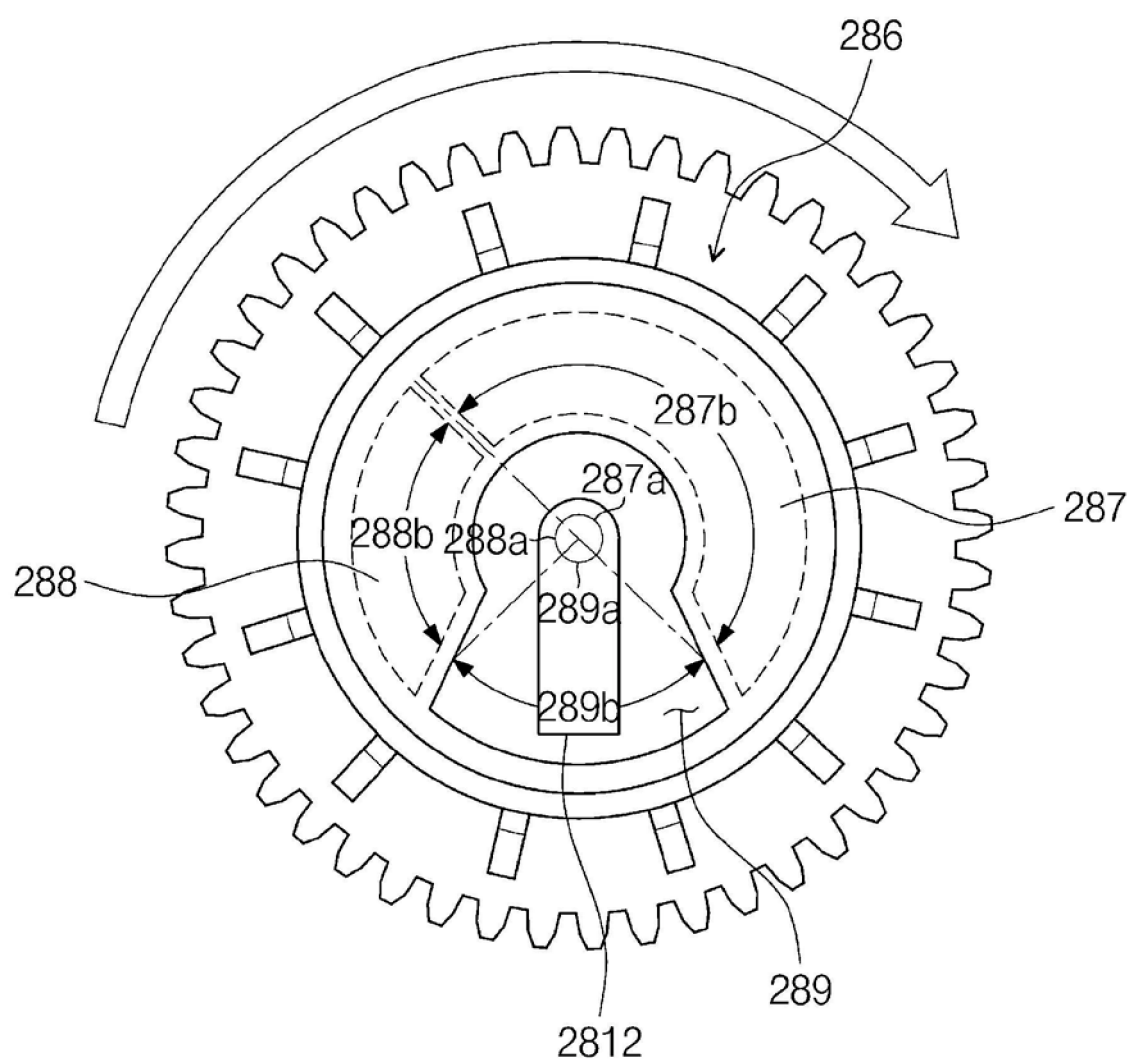
【Fig. 22】



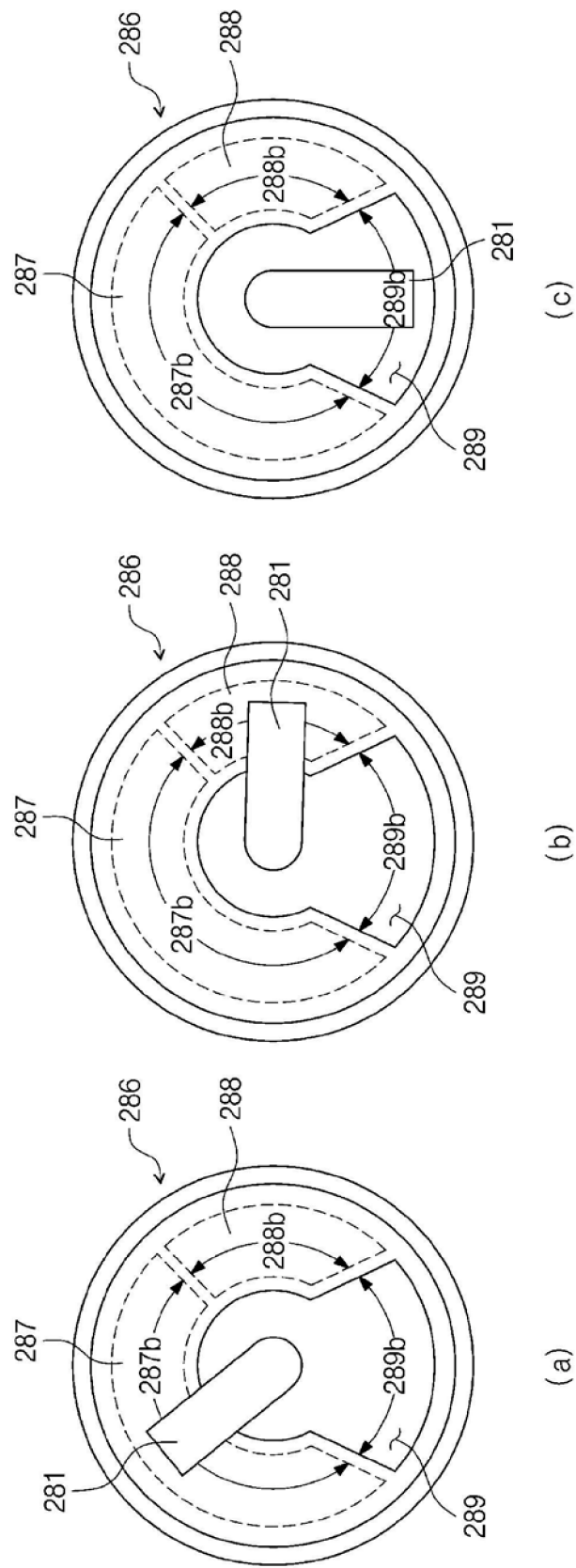
【Fig. 23】



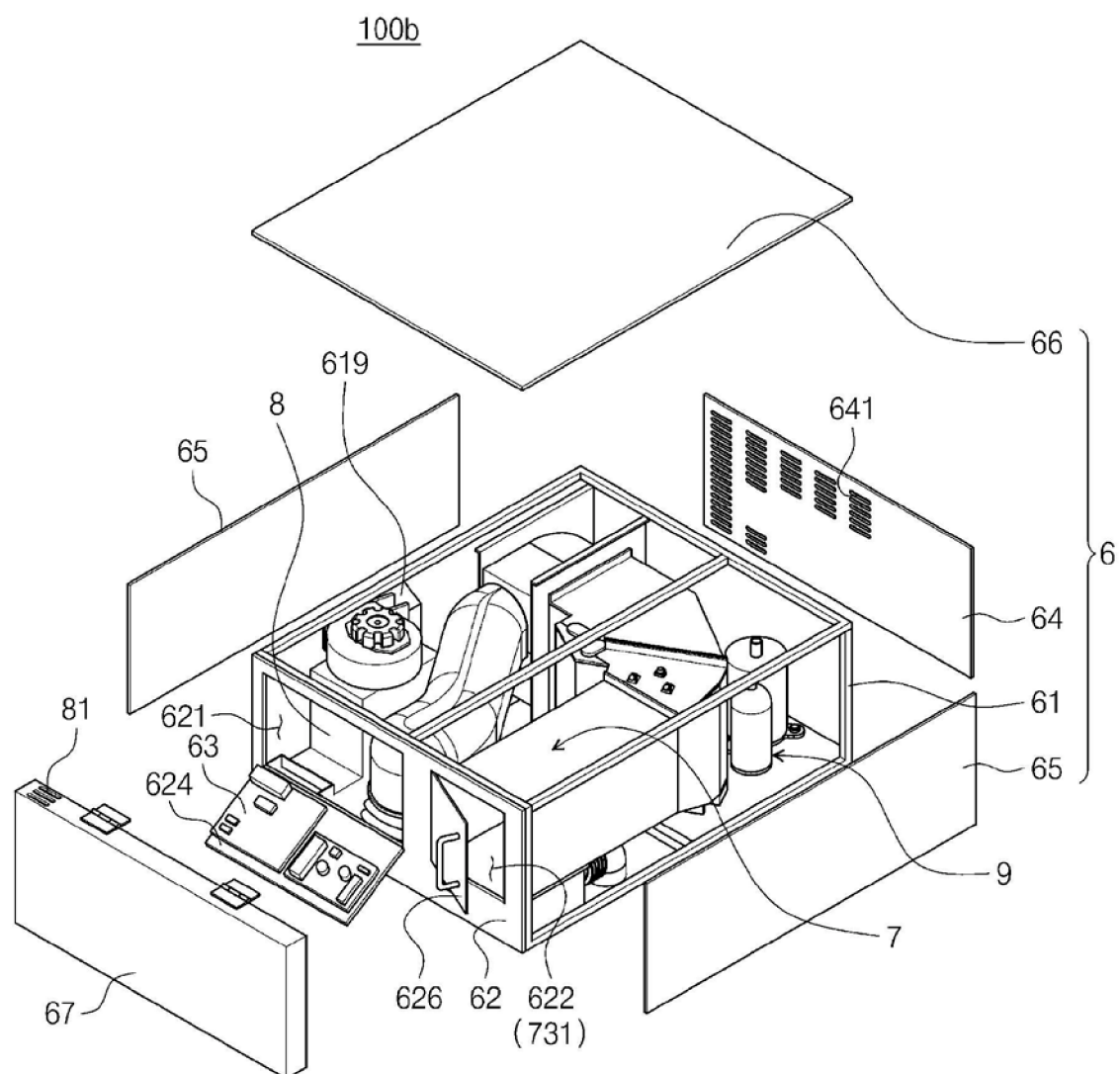
【Fig. 24】



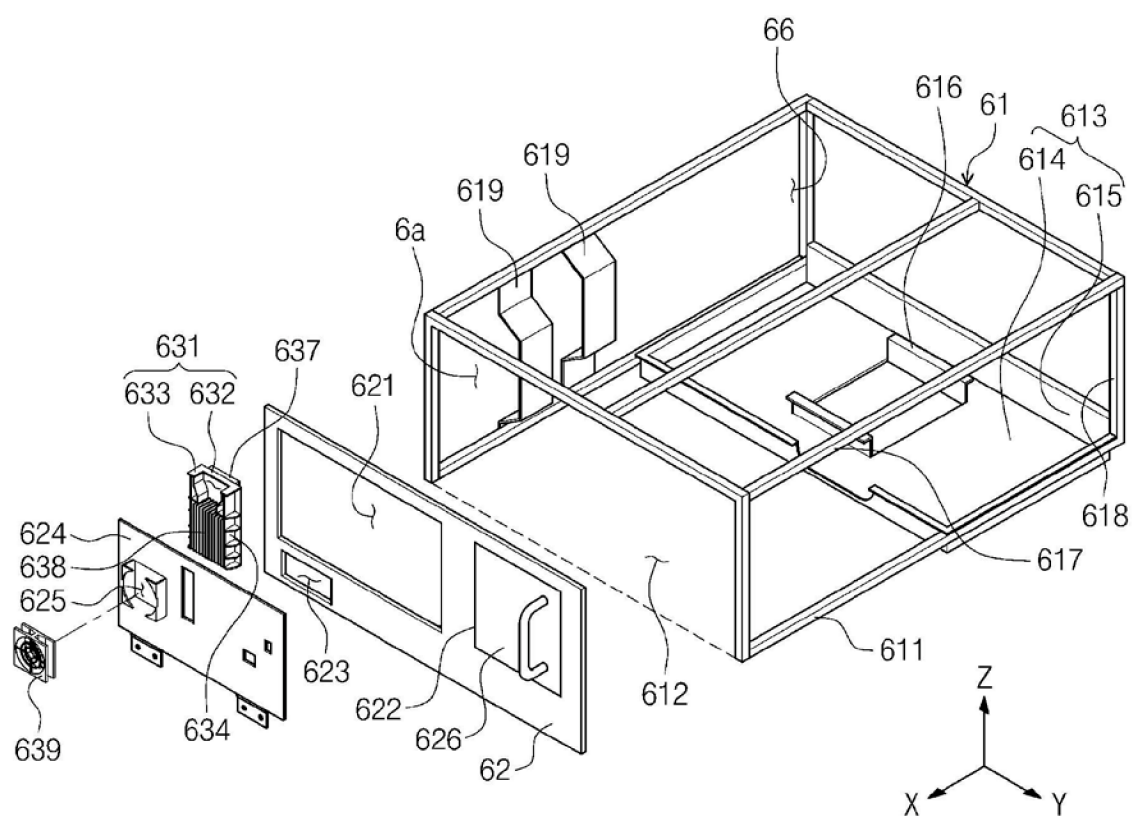
【Fig. 25】



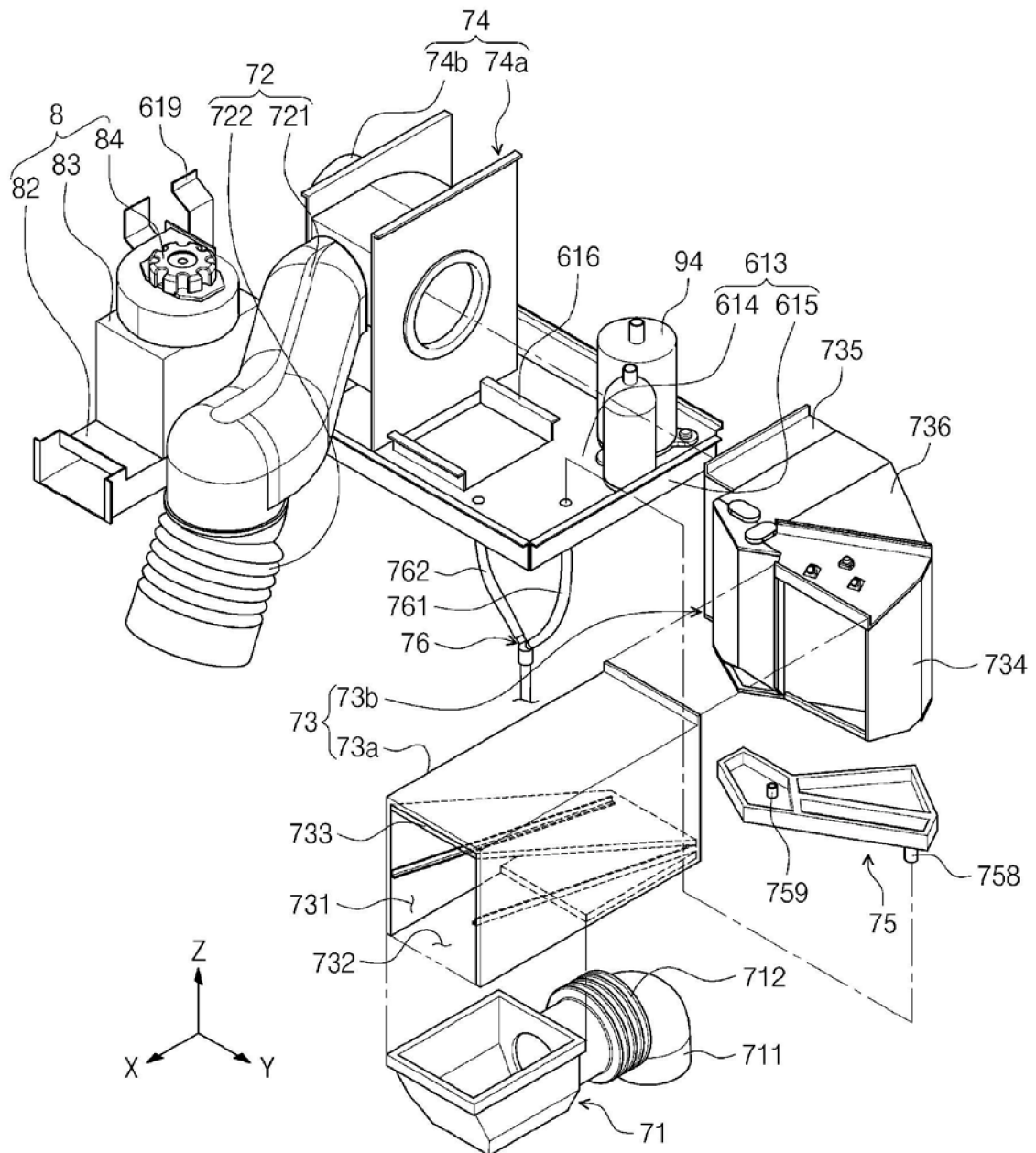
【Fig. 26】



【Fig. 27】



【Fig. 28】



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2024/020053

A. CLASSIFICATION OF SUBJECT MATTER

D06F 37/26(2006.01)i; **D06F 37/28**(2006.01)i; **D06F 25/00**(2006.01)i; **D06F 37/10**(2006.01)i; **D06F 39/14**(2006.01)i;
D06F 37/22(2006.01)i; **D06F 58/04**(2006.01)i; **D06F 58/20**(2006.01)i

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)

D06F 37/26(2006.01); D06F 33/30(2020.01); D06F 37/28(2006.01); D06F 37/30(2006.01); D06F 39/08(2006.01);
D06F 39/14(2006.01); D06F 58/04(2006.01); D06F 58/06(2006.01); D06F 58/20(2006.01)

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

Korean utility models and applications for utility models: IPC as above

Japanese utility models and applications for utility models: IPC as above

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

eKOMPASS (KIPO internal) & keywords: 의류처리장치(clothes treating apparatus), 도어(door), 실링부(sealing member), 컬링부(curling member), 터브(tub)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2001-162086 A (ELECTROLUX AB) 19 June 2001 (2001-06-19) See paragraphs [0001]-[0010] and figure 1.	1,8-10,14-16
Y		7,17-19
A		2-6,11-13
Y	KR 10-2257346 B1 (SAMSUNG ELECTRONICS CO., LTD.) 31 May 2021 (2021-05-31) See paragraphs [0109]-[0112] and [0132]-[0134] and figures 14-20.	7,17-18
Y	KR 10-2017-0089108 A (SAMSUNG ELECTRONICS CO., LTD.) 03 August 2017 (2017-08-03) See paragraphs [0041]-[0043] and figures 1-11.	19
A	KR 10-2019-0101574 A (SAMSUNG ELECTRONICS CO., LTD.) 02 September 2019 (2019-09-02) See paragraphs [0044]-[0045] and figure 5b.	1-19

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

☒ See patent family annex.

* Special categories of cited documents:

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“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)

“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

“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

“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

“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

“&” document member of the same patent family

Date of the actual completion of the international search

26 March 2025

Date of mailing of the international search report

27 March 2025

Name and mailing address of the ISA/KR

**Korean Intellectual Property Office
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2024/020053

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