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(54) **WASHING MACHINE**

(57) Provided is a washing machine effectively utilizing a volume of a drum by preventing water in the drum from leaking from a tub. The washing machine (1) of the present disclosure includes: a packing water-sealing part (34) having a packing component (35) arranged between an upper end part of the tub (3) and an upper end part of the drum (4) to inhibit water from leaking outwards from the tub (3); a labyrinth part (8) adopting a labyrinth structure and for arranging ribs (81, 82) lower than the packing water-sealing part (34) between a tub cover (32) and the upper end part of the drum (4) at an inner side of the packing water-sealing part (34); and a hopper (7) serving as a heightened drum and arranged integrally with the tub cover (32) for retaining water whose water level is higher than a water level at the upper end of the drum (4).

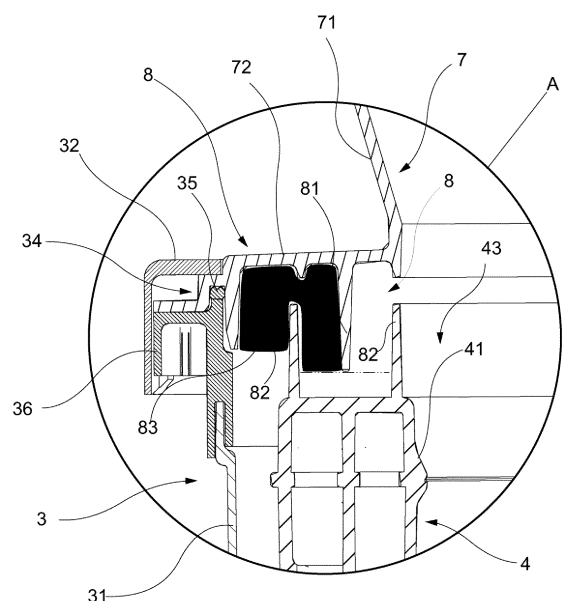


FIG. 6

Description

TECHNICAL FIELD

[0001] The present disclosure mainly relates to a washing machine suitable for household use.

BACKGROUND

[0002] In the past, a so-called vertical washing machine is known and has a drum which is open upwards for accommodating laundry and a tub for accommodating the drum (e.g., refer to a patent literature 1). To prevent water from overflowing to an outer side of the tub, a water level of supplied water is generally set in a low position with a certain degree of allowance compared with a balancer arranged on an upper end of the drum in a washing process and a rinsing process of the washing machine. Moreover, with respect to water exceeding the balancer of the drum and reaching an inner surface side of a tub body of the tub, such a manner also exists that a packing component is arranged between the tub and a tub cover to prevent the water from leaking outwards from the tub.

[0003] However, not only the above patent literature, but also an existing vertical washing machine cannot pursue the washing process and the rinsing process of storing the water on the water level near the upper end part in order to flexibly utilize a volume of the drum more effectively. If the set water level is raised to increase the water which flows into the tub side, a water sealing measure will become not effective if a thread fixing position fastened by a packing component arranged between the tub and the tub cover is not raised.

[0004] Further, when such a requirement exists that the water level is raised to a position higher than the upper end part of the balancer and the like provided with the drum, a present situation is that, an existing packing water-sealing structure for preventing the water from leaking between a packing water-sealing part and the tub cannot deal with the requirement.

Existing Technical Literature

Patent Literature

[0005] Patent Literature 1: Japan specifically disclosed No. 2011-240004 Bulletin

SUMMARY

Problems to be solved by the invention

[0006] The present disclosure aims to effectively solve such problems. A purpose of the present disclosure is to provide a washing machine so as to effectively utilize a volume of a drum by preventing water in the drum from leaking from a tub.

Solution for solving the problems

[0007] In view of the above problems, the present disclosure adopts the following solution.

[0008] That is, the washing machine of the present disclosure includes: a drum for accommodating laundry; a tub for accommodating the drum; a packing water-sealing part having a packing component arranged between an upper end part of the tub and an upper end part of the drum to inhibit water from leaking outwards from the tub; a labyrinth part adopting a labyrinth structure and for arranging ribs lower than the packing water-sealing part between a tub cover and the upper end part of the drum at an inner side of the packing water-sealing part; and a heightened drum arranged integrally with the tub cover for retaining water whose water level is higher than a water level at the upper end of the drum.

[0009] In addition, in the present invention, the heightened drum includes a lower end part configured to be continuous with the upper end part of the drum and a large-diameter upper end part formed with a diameter which gradually increases upwards from the lower end part.

[0010] In addition, in the present invention, the heightened drum is provided with an overflow hole in a side wall, and has an overflow hose for enabling the water to overflow outwards from the overflow hole.

Effects of the invention

[0011] According to the present disclosure described above, by providing a labyrinth part adopting a labyrinth structure and ribs lower than the packing water-sealing part are arranged between a tub cover and the upper end part of the drum at an inner side of the packing water-sealing part, so that clothes can be prevented from being entered into the labyrinth part even if a set water level is raised to enable the clothes to enter a clearance between the upper end part of the drum and the tub.

[0012] In addition, since a highest water level in a washing process and/or a rinsing process is set to be higher than an upper end part of the drum, when the labyrinth part is in a state of air accumulation due to increase of a water level in the labyrinth part, and water is blocked and cannot enter due to the air accumulation. The water in the drum can be prevented from flowing out of the tub side even if the water level is increased, thereby increasing water quantity for effectively implementing the washing process and the rinsing process.

[0013] The heightened drum is also arranged and the heightened drum is arranged integrally with the tub cover for retaining the water higher than a water level at the upper end of the drum. Therefore, the same effect as the washing machine with an increased volume of the drum can be obtained.

[0014] In addition, according to the present disclosure that the heightened drum has a lower end part configured to be continuous with the upper end part of the drum and

a large-diameter upper end part formed with a diameter which gradually increases upwards from the lower end part, the volume can be increased more effectively and throwing-in and taking-out of the drum of the laundry are performed easier.

[0015] In addition, according to the present disclosure that the heightened drum is provided with an overflow hole in a side wall of the heightened drum and has an overflow hose for enabling the water to overflow outwards from the overflow hole, the freedom of a connecting position of the overflow hose can be effectively increased.

BRIEF DESCRIPTION OF DRAWINGS

[0016]

FIG. 1 is a three-dimensional diagram illustrating an appearance of a washing machine in an embodiment of the present disclosure;

FIG. 2 is another three-dimensional diagram illustrating the same embodiment;

FIG. 3 is a side sectional view illustrating the same embodiment;

FIG. 4 and FIG. 5 are diagrams illustrating the effects of the same embodiment; and

FIG. 6 is an enlarged view illustrating part A in FIG. 3.

DETAILED DESCRIPTION

[0017] According to drawings, a detailed description on an embodiment of the present disclosure is given as follows.

[0018] FIG. 1 is a three-dimensional diagram illustrating an appearance of a washing machine 1 in the present embodiment. FIG. 2 is an external view illustrating a state seen in a washing machine 1 of the present embodiment. In addition, FIG. 3 is a sectional view illustrating a main internal structure of a same washing machine 1. A driving part, a control-related part and a figure of the control-related part of the washing machine 1 are properly omitted in the same figure.

[0019] The washing machine 1 in the present embodiment is a washing machine suitable for use in, for example, families, and includes: a drum 4 for accommodating laundry; a tub 3 for accommodating the drum 4; and a housing for accommodating the drum 4 and the tub 3 in such a manner that the drum 4 and the tub 3 can be well seen from outside. In addition, in the present embodiment, besides the above tub 3, the drum 4 and the housing, the washing machine further includes: a hopper 7 installed at an upper part of the tub 3; a damper 6 installed at a lower side of the tub 3; and a labyrinth part 8 arranged between the upper end of the tub 3 and the drum 4,

[0020] Herein, the washing machine 1 in the present embodiment includes: a packing water-sealing part 34 having a packing component 35 arranged between an upper end part of the tub 3 and an upper end part of the

drum 4 to inhibit water from leaking outwards from the tub 3; and a labyrinth part 8 adopting a labyrinth structure and arranging ribs 81 and 82 lower than the packing water-sealing part 34 between a tub cover 32 and the upper end part of the drum 4 at an inner side of the packing water-sealing part 34.

[0021] A description on structures of composition elements which form the washing machine 1 is given as follows. Firstly, the housing 2, as shown in FIG. 1 and FIG. 2, has a bottomed approximately-cylindrical shape and is separated from the tub 3 accommodated inside by an approximately uniform dimension when observed from top. The housing 2 includes: a housing body 20 providing a cylindrical body 22 which is cylindrical and open at an upper end as a main body; a bottom wall 21 arranged on the housing body 20, i.e., a lower end of the cylindrical body 22, and supporting the tub 3 from the lower side; a fixing lid 24 fixed to the upper end of the housing body 20 and has a circular annular shape when observed from top; and a movable lid 25 has an approximately circular shape when observed from top and movably arranged on the fixing lid 24, which enables the upper end of the housing body 20 to be selectively opened outwards and forming a lid side opening 28 with a drum side opening 43 formed in the upper end part of the drum 4 open upwards.

[0022] The housing body 20 includes: a cylindrical body 22 having a cylindrical shape formed by, for example, transparent or semitransparent resin of acrylic acid and the like; a wire cover 23 arranged across the top and bottom of the cylindrical body 22 and provided to accommodate various wires; and a bottom wall 21 indirectly supporting the tub 3 from the lower side at a bottom surface side of the housing body 20. The fixing lid 24 has a lid side opening 28 with an approximately circular-shaped opening at an inner circumferential side, and has a hinging part 26 movably supporting the movable lid 25 in a manner of opening and closing. Moreover, a water supply part 27 is arranged. The water supply part is disposed in a position for displacing from the hinging part 26 to a circumferential direction and is provided to supply water to the drum 4.

[0023] The tub 3 is a bottomed cylindrical component configured in the housing 2, and can store washing water inside. The tub 3 includes: a tub body 31 for storing water; a tub cover 32 arranged on an upper end of the tub body 31; and a packing water-sealing part 34 clamped between the tub body 31 and the tub cover 32 to prevent water from leaking outside. The packing water-sealing part 34 has a water-sealing component 36 arranged at a lower side of the tub cover 32 and a packing component 35 provided to prevent the water from leaking. In addition, nearby specific structures about the packing water-sealing part 34 are described later.

[0024] The drum 4 is a bottomed cylindrical component configured coaxially with the tub 3 in the tub 3 and supported in a manner of free rotation. The drum 4 is an ordinary component accommodating laundry inside and

having a plurality of water through holes in a wall surface. As shown in FIG. 3, a balancer 41 protruding inwards to form a circular annular shape and three lifters 42 protruding inwards on a lower side of the balancer 41 are arranged on an upper end side of an inner circumferential surface of the drum 4. Moreover, in a vertical full automatic washing machine 1 in the present embodiment, a pulsator (agitating wing) 5 driven by a driving device 50 shown by an imaginary line is configured in a manner of free rotation in a bottom center of the drum 4.

[0025] The pulsator 5 is an ordinary component having an approximately disk-shaped pulsator body and a plurality of blade parts formed on an upper surface of the pulsator body. The pulsator 5 agitates the washing water stored in the tub 3 to produce a water flow. Although the position of the driving device 50 is shown only by the imaginary line in the same figure, a motor not shown is used as a main body so that a driving shaft extending to a bottom of the drum 4 rotates to rotate the drum 4 and the pulsator 5. The washing machine 1 mainly rotates the pulsator 5 in a washing process and rotates the drum 4 and the pulsator 5 integrally at high speed in a dewatering process.

[0026] In addition, in the present embodiment, the tub 3 and the drum 4 in the housing 2 are supported on the bottom wall 21 of the housing 2 by means of the damper 6 from the lower side. In addition, the tub 3 is not supported by a hoisting rod from a side surface or an upper side. That is, the configuration of the hoisting rod is avoided in the washing machine 1 of the present embodiment, thereby further improving visibility of the laundry to be observed from the upper side, which will be detailed below. The damper 6 is a component supporting the operating tub 3 from a lower side and provided to effectively reduce vibration generated by the operating tub 3. The damper 6 includes: an inner shaft 61 fixed to the bottom wall 21 of the housing 2; an outer shaft 62 covering an outer side of the inner shaft 61 and fixed to the tub 3 side; and a spring 63 which is a compression helical spring provided to reduce the vibration transferred to the housing 2 by being clamped at a lower end of the outer shaft 62 and the bottom wall 21 side of the housing 2 and properly extended and contracted with up and down movement or vibration of the tub 3. In addition, buffer rubber 64 is arranged between the outer shaft 62 and the tub 3 and between the inner shaft 61 and the bottom wall 21. In the present embodiment, the damper 6, as shown in FIG. 2 and FIG. 3, is configured in a position with a largest diameter or near the position within a range without protrusion when observed from top from the bottom of the tub 3. In addition, in the present embodiment, the spring 63 reduces an elastic constant in such a degree that the spring is not close during dewatering and such a degree that the tub 3 is not inclined during operation.

[0027] In addition, in the present embodiment, as described above, the hopper 7 is arranged in such a manner of being clamped from an upper side of the tub 3, i.e., specifically from the lid side opening 28 of the fixing lid

24, to the drum side opening 43.

[0028] The hopper 7, as shown in FIG. 2 and FIG. 3, is arranged between the lid side opening 28 and the drum side opening 43, performs a function as a water receiving guidance component for guiding throwing-in and taking-out of the laundry from the lid side opening 28 to the drum side opening 43, and is provided to guide throwing-in and taking-out of the laundry from the lid side opening 28 to the drum side opening 43.

[0029] The hopper 7 is formed by an integrally formed product constituted to be transparent or semitransparent resinous, and includes a hopper body 71 with an approximately conical shape, i.e., conical shape, and a protrusion part 72 extending from a lower end part of the hopper body 71 to an outer side. A diameter of an opening part as an inner edge of the protrusion part 72 is formed into a diameter approximately corresponding to the drum 4 side opening. In addition, the hopper body 71 includes: a large-diameter upper end part 73 with an upper end opening larger than the drum side opening 43; a retracing end 74 arranged on the large-diameter upper end part 73; and an overflow hole 75 which is an opening formed in any position of a middle position in an up-down direction of the hopper body 71 for setting upper limit water levels of the washing process and the rinsing process.

[0030] The material of the hopper 7 is a resin material, a material with a specific gravity smaller than the material used in the tub 3 is also used sometimes; and compared with the tub 3, the hopper 7 is a light-weight structure.

[0031] In addition, at the outer side of the overflow hole 75, as shown in FIG. 2 and FIG. 4, an overflow pipe 76 for discharging water from the overflow hole 75 to the outer side of the washing machine is connected to avoid storing the water in the upper side of the overflow hole 75. The overflow pipe 76 uses a part which has a bent oval shape when observed from a top view as a main body to effectively utilize a circumferential space between the housing 2 bent into a cylindrical shape and the tub 3. Moreover, since components and structures for discharging the water from the overflow pipe 76 to the outer side of the washing machine are existing mechanisms and structures, description is omitted.

[0032] In addition, in the present embodiment, especially as shown in FIG. 4, the inner circumference of the lid side opening 28 of the fixing lid 24 is configured as a shape and size of integrally opening the drum side opening 43 approximately upwards, and the drum side opening 43 arranged in the upper end part of the drum 4 is approximately integrally set as a shape and a size of upward opening. In other words, an opening edge of the lid side opening 28 is located on the outer side of any position of the drum side opening 43.

[0033] In addition, in the present embodiment, the hopper 7 performs a function as a heightened drum for storing the water with a water level higher than the upper end of the drum 4. In other words, in the washing machine 1 of the present embodiment, a highest water level in the washing process and/or the rinsing process is set to be

higher than the upper end part of the drum 4. In addition, in the present embodiment, as described above, since the cylindrical body 22, the movable lid 25 and the hopper 7 of the housing body 20 are provided to be transparent or semitransparent, it is easy to see laundry which rise near a water surface of the hopper 7 by means of the fixing lid 24 during washing, and from the side surface, it is also easy to see laundry near the water surface from the side surface by means of the cylindrical body 22 and the hopper 7. In other words, visualization of the laundry is optimized. Moreover, by providing the cylindrical body 22 to be transparent or semitransparent, visualization of internal mechanism elements is also improved. Therefore, the grasping of the operating state by a user and the convenience for maintenance operation are improved.

[0034] In addition, although the hopper 7 performs a function as the heightened drum during washing in the present embodiment, the hopper 7 is set into an approximately conical shape, i.e., a conical shape, so as to guide the laundry to the drum 4 as a dewatering drum during dewatering, thereby reliably storing the laundry into the drum 4.

[0035] In addition, in the present embodiment, especially as shown in FIG. 5, the damper 6 is configured at the lower part of the tub 3 and the hopper 7 as the heightened drum is formed into a light-weight type, thereby increasing natural vibration frequency of the part supported by the damper 6, further inhibiting a torque of an inclining direction of the outer drum 3 while reducing vibration during dewatering and reducing the vibration transferred from the damper 6.

[0036] Further, in the present embodiment, although the hopper 7 is fixed to the tub 3 and cannot rotate, in another aspect, the drum 4 is certainly formed to be rotatable, water will not leak between the drum 4 and the hopper 7.

[0037] That is, in the present embodiment, especially as shown in FIG. 6, the labyrinth part 8 is a component formed across regions of the hopper 7, the tub 3 and the upper end of the drum 4, and includes: an upper side rib 81 arranged on the protrusion part 72 of the hopper 7 and extending to the lower side of a vertical direction; a lower side rib 82 arranged on the upper end of the drum 4 and extending to the upper side of the vertical direction; and an air accumulation part 83. The packing component 35 is arranged on the upper end of the tub 3, and is arranged in a position including the upper side of the vertical direction of an imaginary plane of the front end part of the upper side rib 81 to seal the upper end of the tub 3 and the protrusion part 73. Thus, air of the air accumulation part 83 can be prevented from exceeding the packing component 35 and leaking from the tub 3.

[0038] When the water is accumulated on the upper side of the balancer 41 of the drum 4, a liquid level in the labyrinth part 8 is formed to be in a same plane approximately as the front end part of the upper side rib 81, and the air accumulation part 83 is formed between the liquid

level and the inner circumferential surface of the protrusion part 72 above the liquid level. By forming the air accumulation part 83, even if the water in the hopper 7 moves from a place between the upper and the lower ribs 81 and 82 to the outer side, the water moving to the outer side may be strongly inhibited by the air accumulation part 83 since the air accumulation part is already formed near the packing component 35. In addition, since the packing component 35 is arranged, even if the water exceeds the air accumulation part 83 and immerses, the water can be prevented from flowing to the outer side of the tub 3. Thus, the quantity of fastening elements required for connecting the tub 3 with the hopper 7 can be effectively reduced.

[0039] As mentioned above, the washing machine 1 in the present embodiment includes the labyrinth part 8 adopting a labyrinth structure and arranging ribs lower than the packing water-sealing part 34 between the tub cover 32 and the upper end part of the drum 4 at the inner side of the packing water-sealing part 34, so that clothes can be prevented from entering through the labyrinth part 8 even if a set water level is raised to enable the clothes to enter a clearance between the upper end part of the drum 4 and the tub 3.

[0040] In addition, even if a highest water level in the washing process and/or the rinsing process is set to be higher than the upper end part of the drum 4 in the present embodiment, when the labyrinth structure part 8 is in a state of forming the air accumulation part 83 due to increase of a water level in the labyrinth structure part 8, the water is blocked by the air accumulation part 83 and cannot enter. The water in the drum 4 can be effectively prevented from flowing out of the tub 3 side even if the water level is increased.

[0041] In addition, in the present embodiment, through use of the hopper 7, the hopper and the tub cover 32 are integrally arranged as the heightened drum for storing the water with the water level higher than the upper end of the drum 4, so that the same effect as the washing machine with an increased volume of the drum 4 can be obtained though a simple structure is used.

[0042] In addition, the hopper 7 performing the function as the heightened drum becomes an approximately conical shape having a lower end part to be continuous with the upper end part of the drum 4 and a large-diameter upper end part 73 formed with a diameter which gradually increases upwards from the lower end part, so that the volume can be increased effectively and throwing-in and taking-out of the drum 4 of the laundry are performed easier.

[0043] Moreover, in the present embodiment, according to the present disclosure that the hopper 7 is provided with the overflow hole in the side wall and has an overflow hose capable of enabling the water to overflow outwards from the overflow hole, the freedom of a connecting position of the overflow hose can be consistent with the freedom of an upper limit position of the water level, and the upper limit water level can be set by changing the

shape of the hopper 7 independent of the drum 4 only.

[0044] Although an embodiment of the present disclosure is described above, the structure of the present embodiment is not limited to the above-mentioned embodiment and can be varied in any form.

[0045] For example, although the structure formed by the ribs extending along the up-down direction is disclosed in the above embodiment as the labyrinth part, a mode of a labyrinth sealing shape is achieved certainly as long as the structure is a component capable of achieving the labyrinth sealing shape, for example, as long as the structure extends through local ribs along an inclined direction or a horizontal direction.

[0046] In addition, although the hopper, the movable lid and even the majority of the housing body disclosed in the above embodiment and a variation example are structures made of transparent material, certainly the structures can be transparent or colored as long as the structures are components capable of achieving respective functions.

[0047] Various variations can be made to other structures without departing from the scope of the spirit of the present disclosure.

A list of reference numerals

[0048] 1: washing machine; 3: tub; 34: a packing water-sealing part; 35: packing component; 4: drum; 8: labyrinth part; 81: rib (upper rib); and 82: rib (lower rib).

Claims

1. A washing machine, comprising:

a drum for accommodating laundry;
a tub for accommodating the drum;
a packing water-sealing part having a packing component arranged between an upper end part of the tub and an upper end part of the drum to inhibit water from leaking outwards from the tub;
a labyrinth part adopting a labyrinth structure and for arranging ribs lower than the packing water-sealing part between a tub cover and the upper end part of the drum at an inner side of the packing water-sealing part; and
a heightened drum arranged integrally with the tub cover for retaining water whose water level is higher than a water level at the upper end of the drum.

2. The washing machine according to claim 1, wherein the heightened drum comprises a lower end part configured to be continuous with the upper end part of the drum and a large-diameter upper end part formed with a diameter which gradually increases upwards from the lower end part.

3. The washing machine according to claim 1 or 2, wherein the heightened drum is provided with an overflow hole in a side wall of the heightened drum, and has an overflow hose for enabling the water to overflow outwards from the overflow hole.

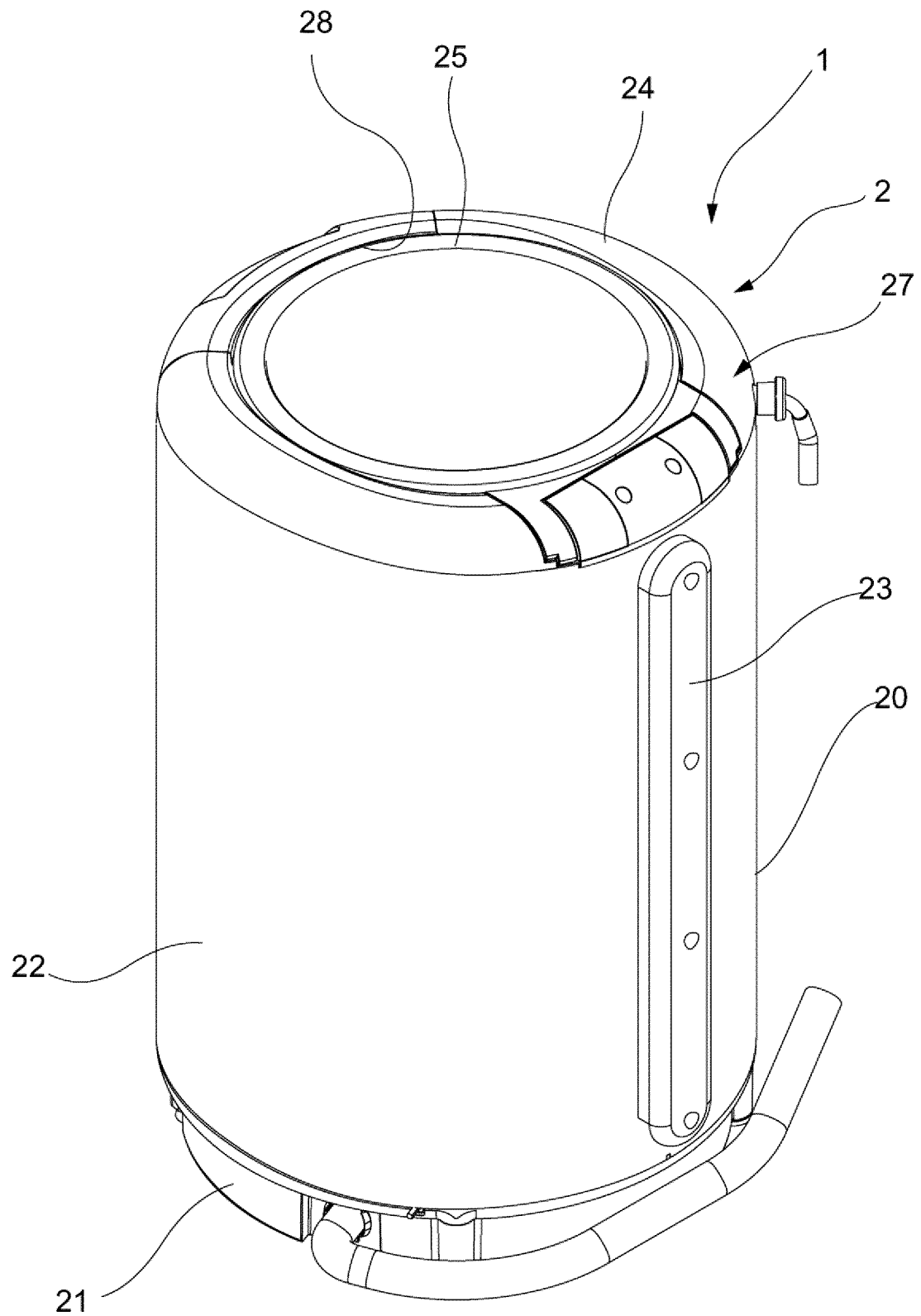


FIG. 1

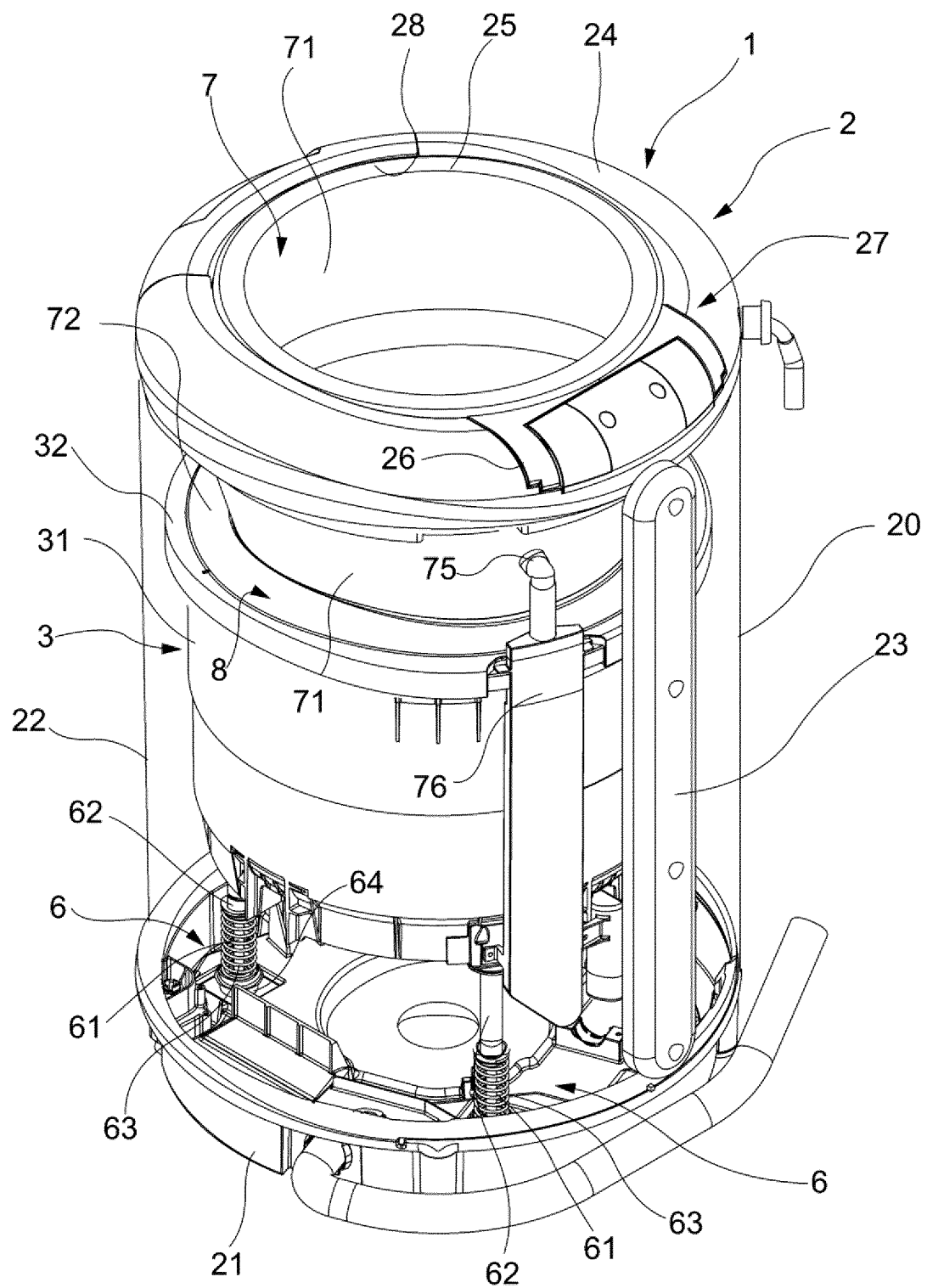


FIG. 2

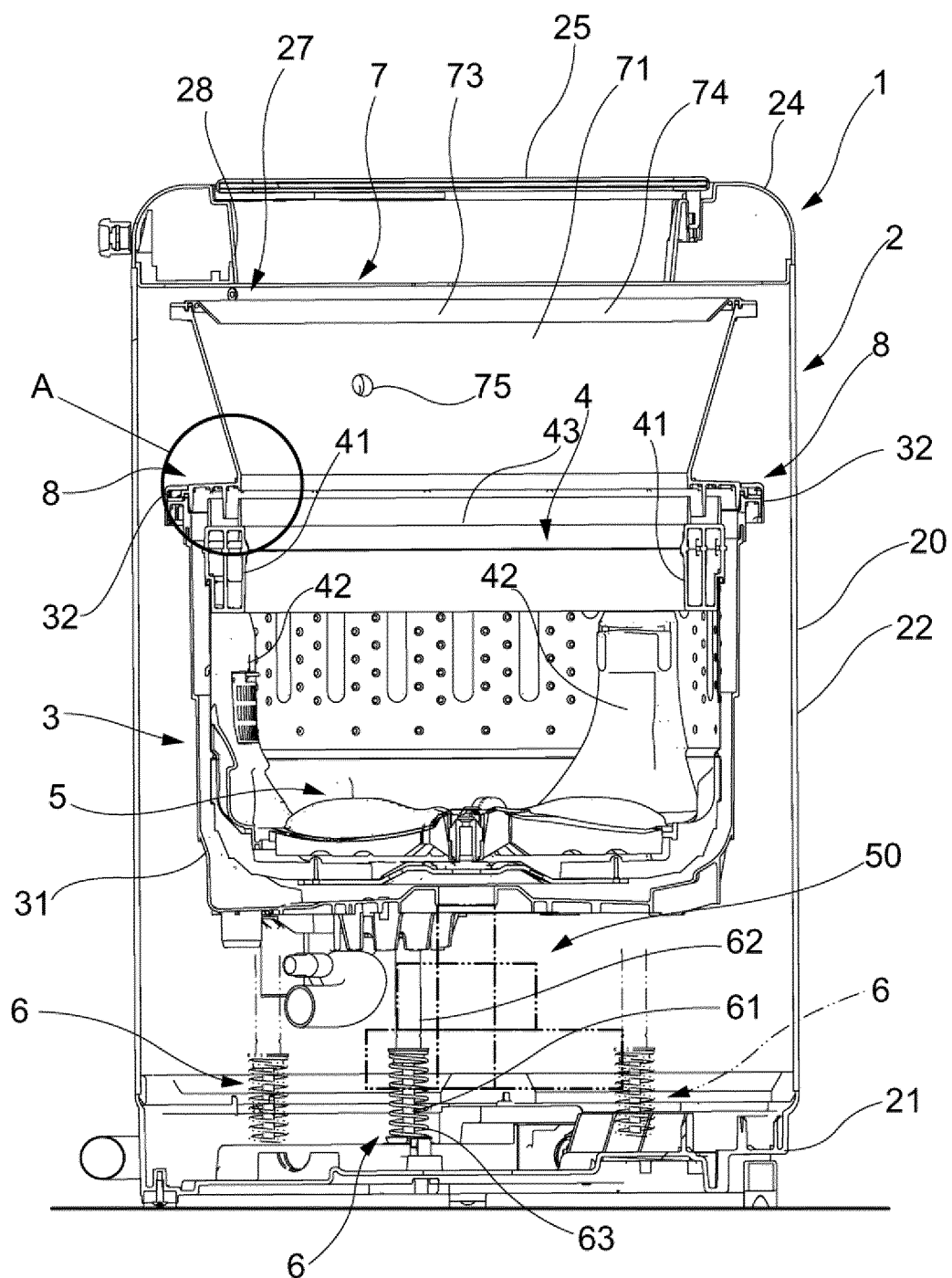


FIG. 3

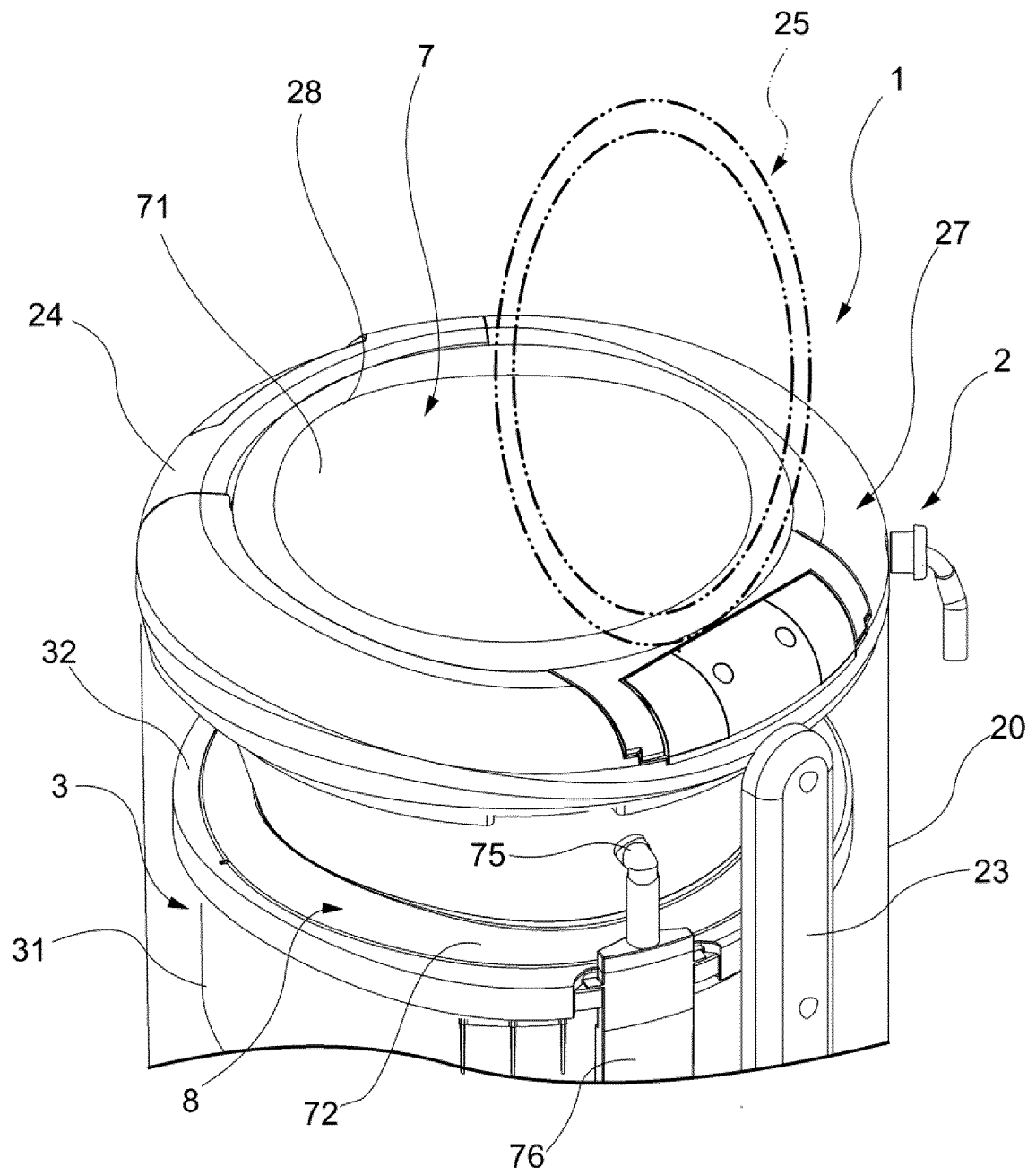


FIG. 4

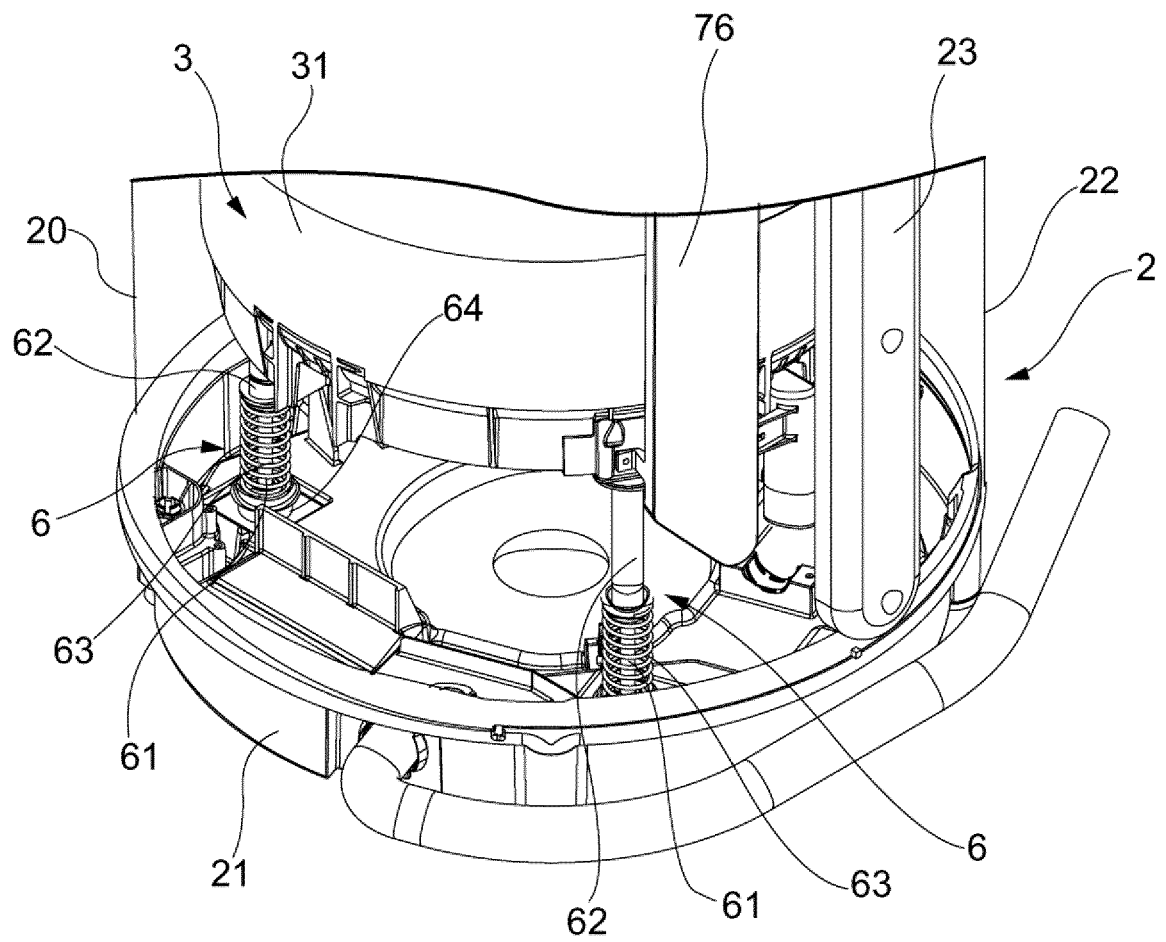


FIG. 5

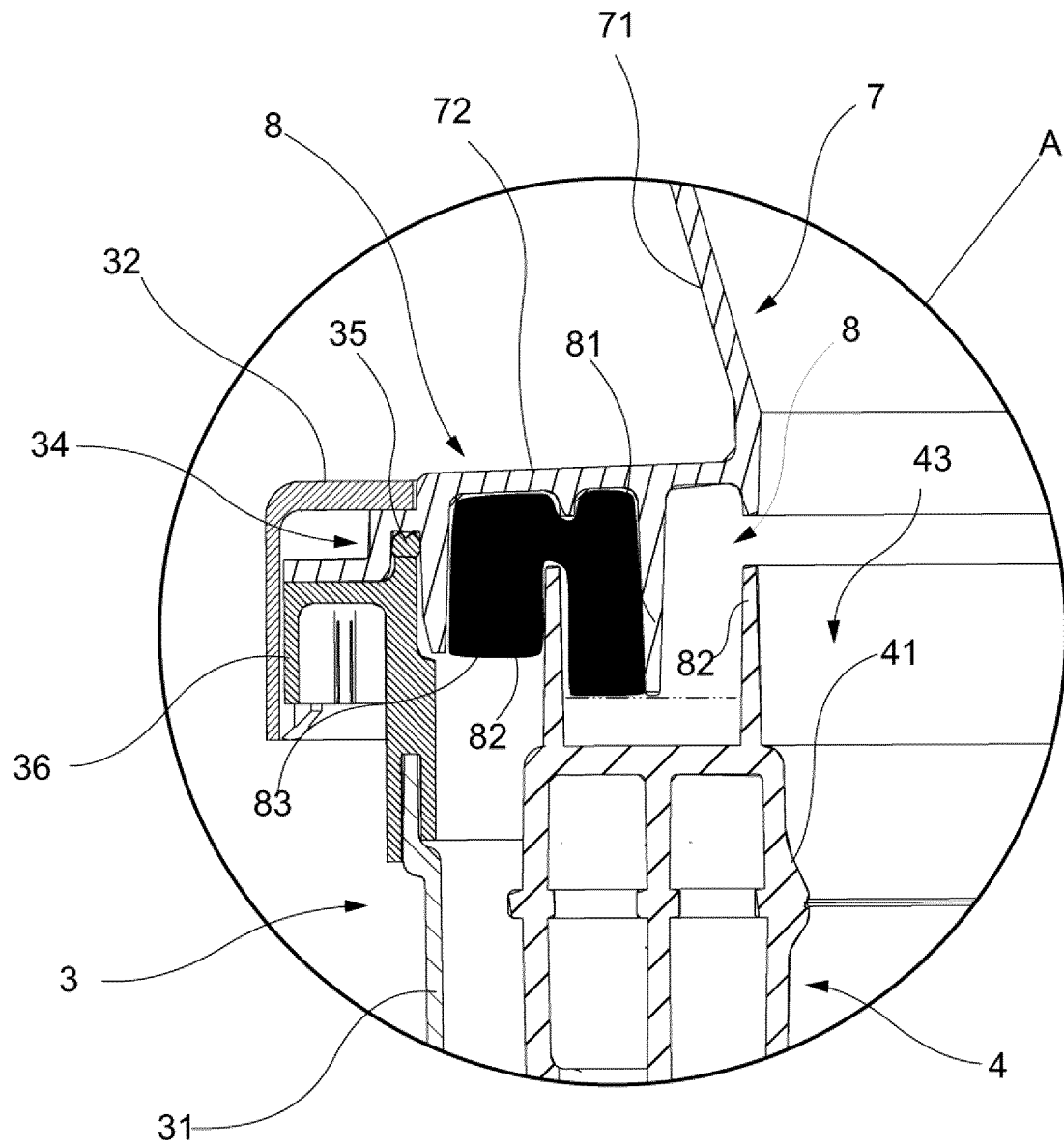


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2017/074952

A. CLASSIFICATION OF SUBJECT MATTER

D06F 37/12 (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

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

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

CNABS; DWPI; SIPOABS; CNKI: high tub, higher, excessive water, water seal, water level, water volume, between outer tubs, heighten, tub, drum, top+, water, seal???, rib, high???, height, maze, leak

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 201116343 Y (NANJING LG PANDA APPLIANCES CO., LTD.), 17 September 2008 (17.09.2008), description, pages 1-2	1-3
A	CN 1138120 A (HITACHI LTD.), 18 December 1996 (18.12.1996), the whole document	1-3
A	CN 1148648 A (DAEWOO ELECTRONICS CO., LTD.), 30 April 1997 (30.04.1997), the whole document	1-3

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

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
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"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 23 May 2017 (23.05.2017)	Date of mailing of the international search report 06 June 2017 (06.06.2017)
Name and mailing address of the ISA/CN: State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No.: (86-10) 62019451	Authorized officer CHEN, Pengfei Telephone No.: (86-10) 62084627

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2017/074952

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
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Form PCT/ISA/210 (patent family annex) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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