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(54) **LAUNDRY TREATMENT DEVICE**

(57) Embodiments of the present application provide a laundry treatment device, comprising an inner tub, a driving apparatus, and a drain valve assembly. The inner tub can hold water and is provided with a drain hole; the drain valve assembly comprises a valve element, a transmission rod mechanism, an elastic positioning member, and an elastic reset member; the valve element is provided with a sealing position and a drainage position; a first end of the transmission rod mechanism drives the valve element to move; during the rotation process of the inner tub, the driving apparatus can selectively toggle a second end of the transmission rod mechanism so as to drive the transmission rod mechanism to rotate around a center line of rotation; the elastic positioning member can maintain the valve element at the sealing position or the drainage position; and the elastic reset member can drive at least the second end of the transmission rod mechanism to reset. According to the laundry treatment device in the embodiments of the present application, regardless of the rotational speed of the inner tub, the switching of the valve element between the sealing position and the drainage position can be implemented by

rotating the transmission rod mechanism, thereby facilitating drainage, and achieving high reliability.

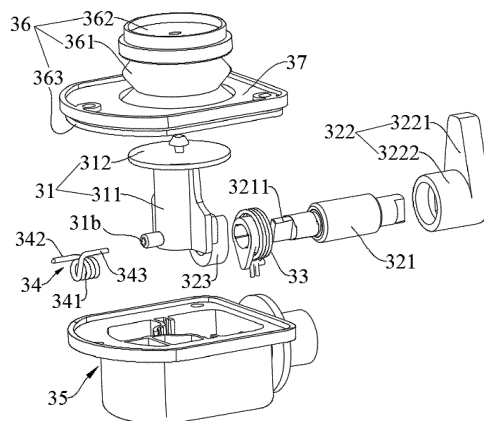


FIG. 8

Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is filed based on and claims priority to Chinese Patent Application No. 202010876545.4 filed on August 27, 2020, the contents of which are hereby incorporated by reference in its entirety.

TECHNICAL FIELD

[0002] The application relates to the technical field of laundry washing and care, and in particular to a laundry treatment device.

BACKGROUND

[0003] In an existing washing machine, an inner tub and an outer tub are communicated with each other, the inner tub is used to hold clothes, the outer tub is used to hold water, a large number of water passing holes are arranged in the inner tub, so that the inner tub and the outer tub are communicated through the water passing holes, water in the outer tub enters the inner tub, injection and drainage of water is implemented through the outer tub. In this type of washing machine, dirt is easily accumulated between the inner tub and the outer tub, which breeds bacteria which are not easily cleaned. To this end, a washing machine with a single tub used for washing is present in the related art is different from existing washing modes in that the inner tub is a non-porous inner tub and is isolated from the outer tub, and the single tub is not only used to hold clothes and beat or stir the clothes, but also used to hold water. However, drainage and dewatering of the washing machine with a single tub used for washing is a difficult technology urgently to be overcome.

[0004] In the related art, a side wall of the inner tub is provided with a dewatering port and a dewatering valve, the dewatering valve is connected to the inner tub through a spring, and when dewatering is performed in the inner tub, the dewatering valve opens the dewatering port under an action of a centrifugal rotation force of the inner tub, and water in the inner tub may be discharged out of the inner tub through the dewatering port; and when washing is performed in the inner tub, the dewatering valve closes the dewatering port under an action of the spring.

[0005] In the above solution, the dewatering valve may be opened only when the inner tub rotates at a high speed. When a washing process in the inner tub is finished, a large amount of water is held in the inner tub, and a motor needs to drive the inner tub and water in the inner tub to rotate at a high speed to implement drainage. On one hand, drainage of water may not be implemented when the inner tub rotates at a low speed, and on the other hand, the motor may operate in an overload manner.

SUMMARY

[0006] In view of this, it is desirable for embodiments of the application to provide a laundry treatment device which facilitates drainage.

[0007] In order to achieve the above purpose, an embodiment of the application provides a laundry treatment device, comprising an inner tub, a driving device and a drainage valve assembly. The inner tub is configured to hold water, and be provided with a drainage hole. The drainage valve assembly includes a valve core, a transmission rod mechanism, an elastic positioning member and an elastic reset member.

[0008] The valve core has a sealing position for sealing the drainage hole and a drainage position for opening the drainage hole.

[0009] The transmission rod mechanism is connected to the inner tub, and has a rotation center line, a first end of the transmission rod mechanism drives the valve core to move, and during rotation of the inner tub, the driving device is operative to selectively toggle a second end of the transmission rod mechanism to drive the transmission rod mechanism to rotate around the rotation center line.

[0010] The elastic positioning member is operative to keeping the valve core at the sealing position or the drainage position, and the elastic reset member is operative to drive at least the second end of the transmission rod mechanism to idle to be reset.

[0011] In some embodiments, the valve core may have an intermediate critical position between the sealing position and the drainage position, and when the transmission rod mechanism drives the valve core to cross the intermediate critical position, the elastic positioning member is operative to drive the valve core to continue to move to the sealing position or the drainage position, and the elastic reset member is operative to drive at least the second end of the transmission rod mechanism to idle to be reset.

[0012] In some embodiments, the transmission rod mechanism may comprise a transmission rod, a first shifting rod, and a reversal mechanism connected between the valve core and a first end of the transmission rod, the transmission rod mechanism drives the valve core to translate through the reversal mechanism, the first shifting rod is connected to a second end of the transmission rod, and the driving device selectively toggles the first shifting rod.

[0013] In some embodiments, the valve core may be provided with a sliding groove, the reversal mechanism includes a turntable and a protruding column. The protruding column protrudes from a side of the turntable, is eccentrically arranged relative to the rotation center line and extends into the sliding groove. The turntable is provided with a first driving groove comprising first driving surfaces on opposite sides along a rotation direction, the first end of the transmission rod is at least partially positioned in the first driving groove and slidable in the first

driving groove, and the first end of the transmission rod is operative to be alternatively driving-fitted with one of the first driving surfaces to drive the reversal mechanism to rotate around the rotation center line.

[0014] In some embodiments, a through hole may be formed in the turntable, the first end of the transmission rod is arranged in the through hole and passes through the through hole, an inner wall of the through hole is provided with two rotationally symmetrical protrusions which divide a part of space of the through hole to form two first driving grooves distributed in a circumferential direction, the first end of the transmission rod is provided with a flat shaft portion positioned on the rotation center line, and opposite ends of the flat shaft portion in a radial direction of the through hole extend into their respective first driving grooves respectively.

[0015] In some embodiments, a through hole may be formed in the turntable, the first driving groove penetrates through a part of side wall corresponding to the through hole in a radial direction of the through hole, a bump is arranged on a surface of the transmission rod and positioned in the first driving groove, and the transmission rod is arranged in the through hole and passes through the through hole.

[0016] In some embodiments, the elastic reset member may be a first torsion spring sleeved on the transmission rod.

[0017] In some embodiments, the elastic positioning member may be a second torsion spring comprising a spiral body, a first rotation arm and a second rotation arm. The first rotation arm is fixed relative to the inner tub, the spiral body is suspended, and the second rotation arm is operative to moving along with the valve core or the transmission rod mechanism.

[0018] In some embodiments, the second rotation arm may be connected to the valve core, and when the valve core is positioned at the sealing position, an acting force applied by the second torsion spring to the valve core has at least a force component parallel to a movement direction of the valve core and facing toward the drainage hole, and when the valve core is positioned at the drainage position, an acting force applied by the second torsion spring to the valve core has at least a force component parallel to the movement direction of the valve core and away from the drainage hole, and when the valve core is positioned at the intermediate critical position, an acting force applied by the second torsion spring to the valve core has a direction perpendicular to the movement direction of the valve core.

[0019] In some embodiments, the second rotation arm may be connected to the reversal mechanism, and when the valve core is positioned at the sealing position, the second torsion spring applies a first torque around the rotation center line to the reversal mechanism, and when the valve core is positioned at the drainage position, the second torsion spring applies a second torque around the rotation center line to the reversal mechanism, the first torque has a direction opposite to the second torque,

and when the valve core is positioned at the intermediate critical position, a torque applied by the second torsion spring to the reversal mechanism is zero.

[0020] In some embodiments, the drainage valve assembly may comprise a valve seat of which a side facing toward the drainage hole is opened, at least a part of the valve core and the reversal mechanism are arranged in the valve seat, and an end of the valve core is operative to extend out from the opened part of the valve seat; a side wall of the valve seat is provided with an avoidance groove, the transmission rod is arranged in the avoidance groove and passes through the avoidance groove, and the first shifting rod is positioned outside the valve seat.

[0021] In some embodiments, one of the valve seat or the valve core may be provided with a guide groove, the other of the valve seat or the valve core may be provided with a convex rib, and the convex rib is sliding-fitted with the guide groove.

[0022] In some embodiments, the drainage valve assembly may comprise a flexible sealing member sleeved on the opened side of the valve seat, the flexible sealing member and the valve seat enclose together to form a sealing cavity, and the valve core, the elastic positioning member, the elastic reset member and the reversal mechanism are positioned in the sealing cavity, and the valve core is connected to the flexible sealing member to drive the flexible sealing member to move.

[0023] In some embodiments, the valve core may comprise a valve plate and a valve column which are fixedly connected, the flexible sealing member includes a telescopic pipe, a supporting end plate and a flange. The flange is arranged at an axial end of the telescopic pipe and connected to the opened side of the valve seat, the supporting end plate closes the other axial end of the telescopic pipe, the valve plate is stacked on an inner surface of the supporting end plate, and when the valve core is positioned at the sealing position, the valve plate abuts the supporting end plate around the drainage hole.

[0024] In some embodiments, the transmission rod mechanism may comprise a transmission rod and a first shifting rod, the valve core is provided with a second driving groove comprising second driving surfaces on opposite sides along a rotation direction respectively, a first end of the transmission rod is positioned in the second driving groove and slidable in the second driving groove, the transmission rod is operative to be alternatively driving-fitted with one of the second driving surfaces to drive the valve core to rotate, the first shifting rod is connected to a second end of the transmission rod, and the driving device selectively toggles the first shifting rod.

[0025] In some embodiments, the laundry treatment device may comprise a lifting rib in which the valve core, the elastic positioning member and the elastic reset member are arranged, the first end of the transmission rod is positioned in the lifting rib, the second end of the transmission rod extends outside an axial end of the inner tub, and the first shifting rod is positioned outside the axial end of the inner tub.

[0026] In some embodiments, the laundry treatment device may comprise an outer tub in which the inner tub is rotatably arranged, the driving device is arranged on the outer tub, the first shifting rod is positioned between the inner tub and the outer tub, the driving device includes a second shifting rod and a power unit driving the second shifting rod to selectively extend towards the shifting rod or retract, and in an extending state of the second shifting rod, the second shifting rod is operative to selectively toggle the first shifting rod to rotate forward or backward around the rotation center line.

[0027] According to the laundry treatment device provided by the embodiments of the application, regardless of a rotation speed of the inner tub, switching of the valve core between the sealing position and the drainage position may be implemented as long as the transmission rod mechanism may rotate, so that the laundry treatment device has a simple structure, facilitates drainage of the inner tub and has high reliability, and service life of the drainage valve assembly may be effectively prolonged. Furthermore, the elastic reset member drives at least the second end of the transmission rod mechanism to be reset, so that the driving device may conveniently toggle the second end of the transmission rod mechanism at the same position.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028]

FIG. 1 is a schematic structural diagram of part of a laundry treatment device according to an embodiment of the application.

FIG. 2 is a cross-sectional view of the structure shown in FIG. 1, here, a valve core is positioned at a sealing position and a second shifting rod is retracted.

FIG. 3 is a schematic view of the structure shown in FIG. 2 after the second shifting rod extends out.

FIG. 4 is a schematic view of the structure shown in FIG. 2 in another state, here, the valve core is positioned at a drainage position and the second shifting rod is retracted.

FIG. 5 is a schematic view of movement of an inner tub, a first shifting rod and a second shifting rod according to an embodiment of the application, here, the first shifting rod begins to contact the first shifting rod.

FIG. 6 is a schematic view of the inner tub of FIG. 5 rotated clockwise by a certain angle.

FIG. 7 is a schematic structural diagram of a drainage valve assembly according to a first embodiment of

the application.

FIG. 8 is a schematic exploded view of the structure shown in FIG. 7.

FIG. 9 is a schematic view from another perspective of FIG. 8.

FIG. 10 is a schematic view of the structure shown in FIG. 7 after a flexible sealing member, a valve cover and a valve plate are omitted.

FIG. 11 is a cross-sectional view of the drainage valve assembly shown in FIG. 7 along an A-A direction of FIG. 10, here, a valve core is positioned at a sealing position.

FIG. 12 is a schematic view of the structure shown in FIG. 11 in another state, here, the valve core is positioned at a drainage position.

FIG. 13 is a schematic structural diagram of a reversal mechanism shown in FIG. 8.

FIG. 14 is a schematic view of cooperation of a flat shaft portion and a reversal mechanism shown in FIG. 8, here, the flat shaft portion is positioned at an initial position, and at the position, the reversal mechanism enables a valve core to be positioned at a sealing position.

FIG. 15 is a schematic view of the structure shown in FIG. 14 in another state, here, the flat shaft portion drives the reversal mechanism to move by a certain angle in an arrow direction.

FIG. 16 is a schematic view of the structure shown in FIG. 15 in another state, here, the reversal mechanism continues to rotate by a certain angle in a counterclockwise direction of FIG. 2, and at the position, the reversal mechanism enables the valve core to be positioned at a drainage position, and the flat shaft portion rotates by a certain angle in a clockwise direction of FIG. 2 to be reset to the initial position.

FIG. 17 is a schematic exploded view of a drainage valve assembly according to a second embodiment of the application.

FIG. 18 is a schematic view from another perspective of the structure shown in FIG. 17.

FIG. 19 is a schematic structural diagram of a reversal mechanism shown in FIG. 18.

FIG. 20 is a schematic view from another perspective of the structure shown in FIG. 17 after it is assem-

bled, here, a flexible sealing member, a valve cover and a valve plate are omitted.

FIG. 21 is a cross-sectional view of the drainage valve assembly according to the second embodiment of the application taken along a B-B direction of FIG. 20.

DETAILED DESCRIPTION

[0029] It should be noted that embodiments of the application and technical features in the embodiments may be combined with each other without conflict, and detailed descriptions in specific embodiments should be understood as explanation and illustration of the purpose of the application, and should not be regarded as an improper limitation to the application.

[0030] In descriptions of the embodiments of the application, orientations or positional relationships such as "upper", "lower", "front", "rear" are based on an orientation or positional relationship shown in FIG. 2. In FIG. 2, an upper part is "upper", a lower part is "lower", a left part is "front", and a right part is "rear".

[0031] It should be understood that these orientation terms are merely intended to facilitate descriptions of the application and simplify the descriptions, rather than indicating or implying that a referred device or element must have a specific orientation, constructed and operated in a specific orientation, and thus cannot be understood as limitation to the application.

[0032] An embodiment of the application provides a laundry treatment device, with reference to FIG. 1 to FIG. 4, the laundry treatment device includes an inner tub 11, a drainage valve assembly 3, and a driving device 20. The inner tub 11 may hold water. That is, washing water is held in the inner tub 11 in a process of the laundry treatment device washing laundries, and the inner tub 11 may also be referred to as a non-porous inner tub 11, which may avoid the problem of accumulating dirt easily due to water accumulated in an outer tub 12 of the related art; and a drainage hole 11a is formed on the inner tub 11 (see FIG. 4).

[0033] With reference to FIG. 8, FIG. 9, FIG. 17 and FIG. 18, the drainage valve assembly 3 includes a valve core 31, an elastic positioning member, an elastic reset member, and a transmission rod mechanism 32 connected to the inner tub 11. That is, the transmission rod mechanism 32 may rotate along with the inner tub 11. With reference to FIG. 10 and FIG. 20, the transmission rod mechanism 32 has a rotation center line L, that is, the transmission rod mechanism 32 revolves around a rotation axis of the inner tub 11 while rotating around the rotation center line L.

[0034] The valve core 31 has a sealing position for sealing the drainage hole 11a (see FIG. 2) and a drainage position for opening the drainage hole 11a (see FIG. 4).

[0035] A first end of the transmission rod mechanism 32 drives the valve core 31 to move, and during rotation

of the inner tub 11, the driving device 20 may selectively toggle a second end of the transmission rod mechanism 32 to drive the transmission rod mechanism 32 to rotate around the rotation center line L, that is, the driving device 20 provides a power source for the transmission rod mechanism 32.

[0036] The elastic positioning member may keep the valve core 31 at the sealing position or the drainage position, that is, when the valve core is positioned at the sealing position, the valve core 31 may be kept at the sealing position under an action of the elastic positioning member, and when the valve core is positioned at the drainage position, the valve core 31 may be kept at the drainage position under an action of the elastic positioning member. The elastic reset member may drive at least the second end of the transmission rod mechanism 32 to be reset. During washing or in other cases where drainage is not required, with reference to FIG. 2 and FIG. 3, the valve core 31 is positioned at the sealing position, the drainage hole 11a is blocked by the valve core 31, and water in the inner tub 11 does not flow out of the inner tub 11. When drainage or dewatering is required, with reference to FIG. 4, the valve core 31 is switched from the sealing position to the drainage position, the drainage hole 11a is opened, and water in the inner tub 11 is discharged from the inner tub 11 through the drainage hole 11a.

[0037] According to the laundry treatment device provided by the embodiments of the application, regardless of a rotation speed of the inner tub 11, switching of the valve core 31 between the sealing position and the drainage position may be implemented as long as the transmission rod mechanism 32 may rotate, so that the laundry treatment device has a simple structure, facilitates drainage of the inner tub 11 and has high reliability, and service life of the drainage valve assembly 3 may be effectively prolonged. Furthermore, the elastic reset member drives at least the second end of the transmission rod mechanism 32 to be reset, so that the driving device 20 may conveniently toggle the second end of the transmission rod mechanism 32 at the same position.

[0038] It should be noted that resetting of the second end of the transmission rod mechanism 32 means that the second end of the transmission rod mechanism 32 returns to an initial position before it is toggled by the driving device 20.

[0039] It should be noted that the laundry treatment device discharges water through the drainage hole 11a during washing or after washing is finished, and may also discharges water through the drainage hole 11a during dewatering.

[0040] In an embodiment, the valve core 31 further has an intermediate critical position between the sealing position and the drainage position. It should be noted that the intermediate critical position between the sealing position and the drainage position refers to the intermediate critical position between the sealing position and the drainage position in a movement stroke of the valve core

31, that is, the valve core 31 passes through the intermediate critical position in a process of the valve core 31 moving from the sealing position to the drainage position, and also passes through the intermediate critical position in a process of the valve core 31 moving from the drainage position to the sealing position.

[0041] When the transmission rod mechanism 32 drives the valve core 31 to cross the intermediate critical position, the elastic positioning member may drive the valve core 31 to continue to move to the sealing position or the drainage position. Specifically, when the valve core 31 moves in a direction from the sealing position to the drainage position and crosses the intermediate critical position, the elastic positioning member may drive the valve core 31 to continue to move to the drainage position, that is, after the valve core 31 crosses the intermediate critical position, even though the transmission rod mechanism 32 stops driving the valve core 31, the valve core 31 may continue to move to the drainage position under an action of the elastic positioning member. When the valve core 31 moves from the drainage position to the sealing position and crosses the intermediate critical position, the elastic positioning member may drive the valve core 31 to continue to move to the sealing position, that is, after the valve core 31 crosses the intermediate critical position, even though the transmission rod mechanism 32 stops driving the valve core 31, the valve core 31 may continue to move to the sealing position under an action of the elastic positioning member.

[0042] When the transmission rod mechanism 32 drives the valve core 31 to move to cross the intermediate critical position, the elastic reset member may drive at least the second end of the transmission rod mechanism 32 to idle to be reset. The elastic positioning member may drive the valve core 31 to continue to move to the sealing position or the drainage position, therefore, as long as the transmission rod mechanism 32 drives the valve core 31 to cross the intermediate critical position, even when the driving device 20 stops driving the transmission rod mechanism 32, at least the second end of the transmission rod mechanism 32 may idle to be reset under an action of the elastic reset member. In this way, when the driving device 20 needs to toggle the transmission rod mechanism 32 next time, the driving device 20 will toggle the second end of the transmission rod mechanism 32 at the same position, which may simplify driving and fitting structures of the transmission rod mechanism 32 and the driving device 20.

[0043] It should be noted that "idle" refers to that the transmission rod mechanism 32 does not form a driving force on the valve core 31 during idling.

[0044] In order to facilitate supporting and mounting the inner tub 11, with reference to FIG. 1 to FIG. 4, in an embodiment, the laundry treatment device includes an outer tub 12 in which the inner tub 11 is rotatably arranged, the outer tub 12 supports the inner tub 11. The laundry treatment device may discharge water through the outer tub 12, specifically, water discharged from the

drainage hole 11a enters the outer tub 12, and the outer tub 12 discharges collected water out of the laundry treatment device.

[0045] The drainage hole 11a may be arranged at a suitable position of the inner tub 11, as long as water in the inner tub 11 may be discharged through the drainage hole 11a. The number and specific shape of the drainage hole 11a are not limited.

[0046] In the embodiment of the application, with reference to FIG. 4, the drainage hole 11a is formed in a circumferential direction of rotation of the inner tub 11, so that the inner tub 11 spins water out from the drainage hole 11a by a centrifugal force during dewatering.

[0047] It should be noted that a rotation axis L1 of the inner tub 11 may extend in a horizontal direction, or may extend in a vertical direction, or may extend in an oblique direction between the horizontal direction and the vertical direction, which is not limited here.

[0048] In an embodiment of the application, with reference to FIG. 2 to FIG. 4, the rotation axis L1 of the inner tub 11 is approximately in the horizontal direction, and during rotation of the inner tub 11, the drainage hole 11a may circularly pass through a lowest point of a rotation trajectory of the inner tub 11, so that water in the inner tub 11 may be emptied without a dead angle. It should be noted that the transmission rod mechanism 32 may drive the valve core 31 to rotate, or may drive the valve core 31 to translate.

[0049] Specific structural forms of the transmission rod mechanism 32 are not limited. Exemplarily, in some embodiments, with reference to FIG. 8, FIG. 9, FIG. 17 and FIG. 18, the transmission rod mechanism 32 includes a transmission rod 321, a first shifting rod 322, and a reversal mechanism 323 connected between the valve core 31 and a first end of the transmission rod 321, the transmission rod mechanism 32 drives the valve core 31 to translate through the reversal mechanism 323, that is, the reversal mechanism 323 is configured to convert rotation of the transmission rod mechanism 32 into translation of the valve core 31. The first shifting rod 322 is connected to a second end of the transmission rod 321, and the driving device 20 selectively toggles the first shifting rod 322. Specifically, after the driving device 20 toggles the first shifting rod 322, since the transmission rod mechanism 32 rotates along with the inner tub 11, the first shifting rod 322 rotates under a combined action of the driving device 20 and the inner tub 11, and the first shifting rod 322 drives the transmission rod 321 to rotate synchronously.

[0050] In the embodiment, a movement mode of the valve core 31 is translation, so that a side of the valve core 31 used to close the drainage hole 11a always faces the drainage hole 11a, and when the valve core 31 is switched from the drainage position to the sealing position, the side of the valve core 31 used to close the drainage hole 11a may stably, reliably, directly or indirectly press against periphery of the drainage hole 11a, so that sealing reliability of the drainage hole 11a may be greatly

improved, and sealing effect thereof is good.

[0051] Connection modes of the first shifting rod 322 and the transmission rod 321 are not limited, as long as the first shifting rod 322 and the transmission rod 321 may implement synchronous movement, for example, the first shifting rod 322 and the transmission rod 321 may be integrally formed, clamped, screwed, or the like with respect to each other, which is not limited here.

[0052] It may be understood that in order to facilitate connection between the first shifting rod 322 and the transmission rod 321, in some embodiments, with reference to FIG. 8 and FIG. 17, the first shifting rod 322 includes a rod portion 3221 and a barrel portion 3222 which are fixedly connected, the driving device 20 is in contact with the rod portion 3221, the barrel portion 3222 is connected to an end of the rod portion 3221 and is sleeved on the second end of the transmission rod 321.

[0053] In an embodiment, with reference to FIG. 9 and FIG. 21, the valve core 31 is provided with a sliding groove 31a, the reversal mechanism 323 includes a turntable 3231 and a protruding column 3232. The protruding column 3232 protrudes from a side of the turntable 3231, is eccentrically arranged relative to the rotation center line L, extends into the sliding groove 31a and may rotate in the sliding groove 31a. The reversal mechanism 323 is equivalent to a cam transmission mechanism, and when the reversal mechanism 323 rotates around the rotation center line L, the protruding column 3232 may drive the valve core 31 to translate.

[0054] With reference to FIG. 13 and FIG. 19, the turntable 3231 is provided with a first driving groove 3231a comprising first driving surfaces 3231b on opposite sides along a rotation direction, the first end of the transmission rod 321 is at least partially positioned in the first driving groove 3231a and slidable in the first driving groove 3231a, and the first end of the transmission rod 321 may be alternatively driving-fitted with one of the first driving surfaces 3231b to drive the reversal mechanism 323 to rotate around the rotation center line L.

[0055] It should be noted that a rotation direction of the transmission rod mechanism 32 is related to a rotation direction of the inner tub 11. For example, when the inner tub 11 rotates in a clockwise direction of FIG. 5, in case that the driving device 20 toggles the first shifting rod 322, the first shifting rod 322 only drives the transmission rod mechanism 32 to rotate around the rotation center line L in a counterclockwise direction of FIG. 5. When the inner tub 11 rotates in the counterclockwise direction of FIG. 5, in case that the driving device 20 toggles the first shifting rod 322, the first shifting rod 322 only drives the transmission rod mechanism 32 to rotate around the rotation center line L in the clockwise direction of FIG. 5.

[0056] Specifically, during washing of the laundry treatment device, the valve core 31 is positioned at the sealing position. Then, with reference to FIG. 14, a part of the first end of the transmission rod 321 is in contact with one of the first driving surfaces 3231b, and at this time, the inner tub 11 continues to rotate in the same direction.

In case that the first shifting rod 322 is toggled due to misoperation of the driving device 20, then the first shifting rod 322 may drive the transmission rod mechanism 32 to rotate in a clockwise direction of FIG. 14, and the first end of the transmission rod 321 idles in the first driving groove 3231a, that is, the first shifting rod 322 and the transmission rod 321 generate an idle stroke. At this time, the transmission rod mechanism 32 does not drive the valve core 31 to move, and the valve core 31 may be still kept at the current sealing position, so that reliability of the laundry treatment device may be improved. When the inner tub 11 rotates reversely, the first end of the transmission rod 321 biases the first driving surface 3231b after the driving device 20 toggles the first shifting rod 322, so that the reversal mechanism 323 is forced to rotate in a counterclockwise direction of FIG. 14. When the reversal mechanism 323 rotates to a position shown in FIG. 15, the valve core 31 has crossed the intermediate critical position, and thereafter, in case that the driving device 20 no longer applies an acting force to the first shifting rod 322, the transmission rod 321 rotates backward in a clockwise direction of FIG. 15, the reversal mechanism 323 continues to rotate in a counterclockwise direction shown in FIG. 15 until the reversal mechanism 323 moves to a state shown in FIG. 16, in which the valve core 31 is successfully switched from the sealing position to the drainage position, the transmission rod 321 is also reset to the initial position, and at this time, the first end of the transmission rod 321 is in contact with the other of the first driving surfaces 3231b.

[0057] With reference to FIG. 16, when the inner tub 11 does not change its rotation direction, in case that the first shifting rod 322 is toggled due to misoperation of the driving device 20, then the first shifting rod 322 may drive the transmission rod mechanism 32 to rotate in a counterclockwise direction of FIG. 16, and the first end of the transmission rod 321 idles in the first driving groove 3231a, that is, the first shifting rod 322 and the transmission rod 321 generate an idle stroke, the transmission rod mechanism 32 does not drive the valve core 31 to move, the valve core 31 may be still kept at the current drainage position, and after idling, the transmission rod 321 still returns to the initial position under an action of the elastic reset member, so that reliability of the laundry treatment device may be improved. When the inner tub 11 rotates reversely, the first end of the transmission rod 321 biases the other of the first driving surfaces 3231b after the driving device 20 toggles the first shifting rod 322, so that the reversal mechanism 323 is forced to rotate so as to drive the valve core 31 to translate, and drive the valve core 31 to switch from the drainage position to the sealing position.

[0058] Specific connection structures of the turntable 3231 and the transmission rod 321 are not limited.

[0059] Exemplarily, in an embodiment, with reference to FIG. 13, a through hole 3231c is formed in the turntable 3231, an inner wall of the through hole 3231c is provided with two rotationally symmetrical protrusions 32311

which divide a part of space of the through hole 3231c to form two first driving grooves 3231a distributed in a circumferential direction, and the first end of the transmission rod 321 is provided with a flat shaft portion 3211 positioned on the rotation center line L. With reference to FIG. 14 to FIG. 16, opposite ends of the flat shaft portion 3211 in a radial direction of the through hole 3231c extend into their respective first driving grooves 3231a respectively. In this way, on one hand, torque transmission of the turntable 3231 and the transmission rod 321 may be more stable, and on the other hand, two reaction forces applied by the turntable 3231 to the flat shaft portion 3211 may be balanced with respect to each other, thereby avoiding or reducing a shear force borne by the transmission rod 321 and improving stressing conditions of the transmission rod 321.

[0060] In another embodiment, with reference to FIG. 19, a through hole 3231c is formed in the turntable 3231, the first driving groove 3231a penetrates through a part of side wall corresponding to the through hole 3231c in a radial direction of the through hole 3231c, that is, the first driving groove 3231a is generally notch-shaped. With reference to FIG. 17 and FIG. 18, a bump 3212 is arranged on a surface of the transmission rod 321, the transmission rod 321 is arranged in the through hole 3231c and passes through the through hole 3231c, and the bump 3212 is positioned in the first driving groove 3231a. In the embodiment, torque transmission is implemented by driving cooperation of the bump 3212 and two first driving surfaces 3231b of the first driving groove 3231a. It should be noted that specific shapes of the bump 3212 are not limited.

[0061] Specific shape and type of the elastic reset member are not limited, as long as the elastic reset member may drive the transmission rod 321 to be reset. It should be noted that since the transmission rod 321 may rotate forward and backward relative to the initial position, the elastic reset member needs to drive the transmission rod 321 to be reset after the transmission rod 321 rotates forward, and also needs to drive the transmission rod 321 to be reset after the transmission rod 321 rotates backward.

[0062] It should be noted that in the embodiments of the application, forward rotation and backward rotation have opposite meanings, and definitions of forward rotation and backward rotation may be interchanged.

[0063] For example, in an embodiment, the elastic reset member includes a first cylindrical spring and a second cylindrical spring arranged on opposite lateral sides of the transmission rod 321. When the transmission rod 321 rotates forward, the first cylindrical spring is compressed, and then the first cylindrical spring may drive the transmission rod 321 to be reset, and when the transmission rod 321 rotates forward, the second cylindrical spring is compressed, and then the second cylindrical spring may drive the transmission rod 321 to be reset.

[0064] In another embodiment, with reference to FIG. 8, FIG. 9, FIG. 17 and FIG. 18, the elastic reset member

is a first torsion spring 33 sleeved on the transmission rod 321. No matter the transmission rod 321 rotates forward or backward, the transmission rod 321 may force the first torsion spring 33 to be twisted to store torque potential energy, and then the first torsion spring 33 may drive the transmission rod 321 to be reset. In the embodiment, the transmission rod 321 may be driven to be reset by only one first torsion spring 33, which has a simple structure, is easy to implement mounting, and also saves mounting space.

[0065] It may be understood that in some embodiments, a plurality of first torsion springs 33 may also be provided simultaneously.

[0066] It should be noted that mounting modes of two rotation arms of the first torsion spring 33 are not limited, as long as the first torsion spring 33 may be twisted during rotation of the transmission rod 321.

[0067] Specific structural forms of the elastic positioning member are not limited.

[0068] Exemplarily, in an embodiment, with reference to FIG. 8, FIG. 9, FIG. 17 and FIG. 18, the elastic positioning member is a second torsion spring 34. With reference to FIG. 8, the second torsion spring 34 includes a spiral body 341, a first rotation arm 342 and a second rotation arm 343, position of the first rotation arm 342 is fixed relative to the inner tub 11, that is, the first rotation arm 342 does not move relative to the inner tub 11; the spiral body 341 is suspended, and the second rotation arm 343 may move along with the valve core 31 or the transmission rod mechanism 32. During movement of the second rotation arm 343 along with the valve core 31 or the transmission rod mechanism 32, the second rotation arm 343 drives the spiral body 341 to move therewith. When the second rotation arm 343 are positioned at different positions, direction of an acting force applied by the second rotation arm 343 to the valve core 31 directly or indirectly also changes, so that the second torsion spring 34 may drive the valve core 31 to translate in a direction within a certain stroke range, and drive the valve core 31 to translate in a reverse direction within another stroke range.

[0069] In an embodiment, with reference to FIG. 8 to FIG. 12, the second rotation arm 343 is connected to the valve core 31. With reference to FIG. 11, when the valve core 31 is positioned at the sealing position, position of the second rotation arm 343 is positioned on a side of the first rotation arm 342 close to the drainage hole 11a. An acting force applied by the second torsion spring 34 to the valve core 31 has at least a force component parallel to a movement direction of the valve core 31 and facing toward the drainage hole 11a. Specifically, the acting force applied by the second torsion spring 34 to the valve core 31 has an upward force component in FIG. 11, and this force component abuts the valve core 31 around the drainage hole 11a.

[0070] With reference to FIG. 12, when the valve core 31 is positioned at the drainage position, position of the second rotation arm 343 is positioned on a side of the

first rotation arm 342 away from the drainage hole 11a. An acting force applied by the second torsion spring 34 to the valve core 31 has at least a force component parallel to the movement direction of the valve core 31 and away from the drainage hole 11a. Specifically, the acting force applied by the second torsion spring 34 to the valve core 31 has a downward force component in FIG. 12, and this force component keeps the valve core 31 at the drainage position relatively stable.

[0071] When the valve core 31 is positioned at the intermediate critical position, an acting force applied by the second torsion spring 34 to the valve core 31 has a direction perpendicular to the movement direction of the valve core 31. Specifically, the acting force applied by the second torsion spring 34 to the valve core 31 is perpendicular to direction of a paper surface of FIG. 11 or FIG. 12, that is, at this time, the second torsion spring 34 does not drive the valve core 31 to move upward, and does not drive the valve core 31 to move downward.

[0072] It should be noted that the intermediate critical position is only a transition position, and the valve core 31 is not required to be kept at this position.

[0073] In another embodiment, with reference to FIG. 17, FIG. 18, FIG. 20 and FIG. 21, the second rotation arm 343 is connected to the reversal mechanism 323. With reference to FIG. 21, when the valve core 31 is positioned at the sealing position, the second torsion spring 34 applies a first torque around the rotation center line L to the reversal mechanism 323, and the reversal mechanism 323 abuts the valve core 31 around the drainage hole 11a under an action of the first torque, and specifically, direction of the first torque is a clockwise direction of FIG. 21. When the valve core 31 is positioned at the drainage position, the second torsion spring 34 applies a second torque around the rotation center line L to the reversal mechanism 323, and the reversal mechanism 323 keeps the valve core 31 at the drainage position under an action of the second torque, and the first torque has a direction opposite to the second torque. When the valve core 31 is positioned at the intermediate critical position, a torque applied by the second torsion spring 34 to the reversal mechanism 323 is zero.

[0074] In an embodiment, with reference to FIG. 8, FIG. 9, FIG. 17 and FIG. 18, the drainage valve assembly 3 includes a valve seat 35 of which a side facing toward the drainage hole 11a is opened, and at least a part of the valve core 31, the reversal mechanism 323, the elastic positioning member and the elastic reset member are arranged in the valve seat 35, and an end of the valve core 31 may extend out from the opened part of the valve seat 35. A side wall of the valve seat 35 is provided with an avoidance groove 35a, the transmission rod 321 is arranged in the avoidance groove 35a and passes through the avoidance groove 35a, and the first shifting rod 322 is positioned outside the valve seat 35. The valve seat 35 provides mounting support for the valve core 31 and the transmission rod mechanism 32, and also protects the valve core 31, the transmission rod mechanism

32, the elastic positioning member and the elastic reset member, thereby avoiding interference with other structures of the laundry treatment device and improving reliability of the drainage valve assembly 3.

[0075] In an embodiment, with reference to FIG. 9, FIG. 10, FIG. 17 and FIG. 20, one of the valve seat 35 or the valve core 31 is provided with a guide groove 35b, the other of the valve seat 35 or the valve core 31 is provided with a convex rib 3110, and the convex rib 3110 is sliding-fitted with the guide groove 35b. In this way, translation reliability of the valve core 31 may be improved, and the valve core 31 is prevented from biasing.

[0076] In an embodiment, with reference to FIG. 8, FIG. 9, FIG. 17 and FIG. 18, the drainage valve assembly 3 includes a flexible sealing member 36 sleeved on the opened side of the valve seat 35, the flexible sealing member 36 and the valve seat 35 enclose together to form a sealing cavity 3a, and the valve core 31, the elastic positioning member, the elastic reset member and the reversal mechanism 323 are positioned in the sealing cavity 3a, and the valve core 31 is connected to the flexible sealing member 36 to drive the flexible sealing member 36 to move.

[0077] The valve core 31, the reversal mechanism 323, the elastic reset member, the elastic sealing member, or the like may not in contact with washing water, since all of them are arranged in the sealing cavity 3a. On one hand, hairs and scraps in the washing water may not enter the sealing cavity 3a, therefore, hairs, scraps and other impurities are prevented from blocking or winding on the transmission rod mechanism 32 and the valve core 31, normal movement of the drainage valve may be guaranteed, working reliability and service life of the sealing valve assembly are improved. On the other hand, when the transmission rod mechanism 32 or the valve core 31 is made of a metal material, corrosion effect of the washing water on the metal material may also be prevented.

[0078] Specific structural forms of the flexible sealing member 36 are not limited.

[0079] With reference to FIG. 8, the valve core 31 includes a valve plate 312 and a valve column 311 which are fixedly connected, the flexible sealing member 36 includes a telescopic pipe 361, a supporting end plate 362 and a flange 363. The supporting end plate 362 and the flange 363 are positioned at opposite ends of the telescopic pipe 361, the flange 363 is arranged at an axial end of the telescopic pipe 361 and connected to the opened side of the valve seat 35, the supporting end plate 362 closes the other end of the telescopic pipe 361, the valve plate 312 is stacked on an inner surface of the supporting end plate 362, and when the valve core 31 is positioned at the sealing position, the valve plate 312 abuts the supporting end plate 362 around the drainage hole 11a.

[0080] It should be noted that the flexible sealing member 36 may be an integrally formed structure to improve structural reliability of the flexible sealing member 36.

Material of the flexible sealing member 36 is not limited, for example, includes but is not limited to: silica gel, rubber, or the like.

[0081] On one hand, the flexible sealing member 36 needs to reliably seal the drainage hole 11a when it is positioned at the sealing position, and may reliably elude the drainage hole 11a when it is positioned at the drainage position, to avoid a great movement acting force on the valve core 31, and improve movement reliability of the sealing valve. To this end, in an embodiment of the application, the telescopic pipe 361 is a corrugated tube, to be adapted to movement of the valve core 31 by stretching or folding of the corrugated tube itself, and does not have great elastic deformation resistance itself.

[0082] In order to facilitate reliable connection between the flange 363 and the valve seat 35, in some embodiments, with reference to FIG. 8, FIG. 9, FIG. 11, FIG. 12, FIG. 18 and FIG. 21, the drainage valve assembly 3 includes a valve cover 37, and with reference to FIG. 11, FIG. 12 and FIG. 21, the valve cover 37 is pressed against a side of the flange 363 away from the valve seat 35, the flange 363 is sandwiched between the valve cover 37 and an end surface of the opened side of the valve seat 35, and a screw passes through the valve cover 37 and the flange 363 and is screwed into the valve seat 35 to connect the flange 363 to the valve seat 35.

[0083] In some other embodiments, the transmission rod mechanism 32 drives the valve core 31 to rotate. Specifically, the transmission rod mechanism 32 includes a transmission rod 321 and a first shifting rod 322, the valve core 31 is provided with a second driving groove comprising second driving surfaces on opposite sides along a rotation direction respectively, a first end of the transmission rod 321 is positioned in the second driving groove and slidable in the second driving groove, the transmission rod 321 may be alternatively driving-fitted with one of the second driving surfaces to drive the valve core 31 to rotate, the first shifting rod 322 is connected to a second end of the transmission rod 321, and the driving device 20 selectively toggles the first shifting rod 322. In the embodiment, structures of the transmission rod 321 and the second shifting rod 22 may be the same as structures in any one of the above embodiments. The structure of the second driving groove may also be the same as the structure of the first driving groove in any one of the above embodiments. The principle of the first end of the transmission rod 321 fitting with the second driving groove may refer to the principle of the transmission rod 321 fitting and the first driving groove, which are not elaborated here.

[0084] In an embodiment, with reference to FIG. 2 to FIG. 4, the laundry treatment device includes a lifting rib 14 in which the valve core 31, the elastic positioning member and the elastic reset member are arranged, the first end of the transmission rod 321 is positioned in the lifting rib 14, the second end of the transmission rod 321 extends outside an axial end of the inner tub 11, and the first shifting rod 322 is positioned outside the axial end

of the inner tub 11. It should be noted that in the embodiment of the drainage valve assembly 3 comprising the valve seat 35, the valve seat 35 is also arranged in the lifting rib 14, and the valve seat 35 is fixedly connected to the lifting rib 14.

[0085] In a process of the laundry treatment device washing laundries, the laundries are carried by the lifting rib 14 to rotate together with the lifting rib 14, and after the laundries are lifted to a certain height, the laundries fall into water again under an action of gravity of the laundries themselves, so that rod beating and falling effects are generated, achieving washing effect. On one hand, the lifting rib 14 protects the drainage valve assembly 3 and prevents the laundries from winding on the drainage valve assembly 3. On the other hand, existing structures of the laundry treatment device are fully utilized, space inside the lifting rib 14 is fully utilized, and capacity of the inner tub 11 used to wash laundries is not reduced.

[0086] Specific arrangement positions of the driving device 20 are not limited, as long as the driving device 20 may provide a mounting position, so that the driving device 20 does not rotate along with the inner tub 11.

[0087] In an embodiment, with reference to FIG. 2 to FIG. 4, the driving device 20 is arranged on the outer tub 12, the first shifting rod 322 is positioned between the inner tub 11 and the outer tub 12. The driving device 20 includes a second shifting rod 22 and a power unit 21 driving the second shifting rod 22 to selectively extend towards the shifting rod or retract, and in an extending state of the second shifting rod 22, the second shifting rod 22 may selectively toggle the first shifting rod 322 to rotate forward or backward around the rotation center line L.

[0088] Movement forms of the second shifting rod 22 are not limited, and may be linear movement or rotation.

[0089] Specific structures of the power unit 21 are not limited. For example, in an embodiment, the power unit 21 may be a linear motor driving the second shifting rod 22 to extend or retract along a length direction of the second shifting rod 22. In another embodiment, the power unit 21 may be a rotation motor with a rotation shaft fixedly connected to the second shifting rod 22, and the rotation motor drives the second shifting rod 22 to rotate forward or backward, so as to extend or retract the second shifting rod 22.

[0090] The drainage valve assembly according to a plurality of specific embodiments of the application is described below with reference to the drawings.

50 First embodiment

[0091] With reference to FIG. 8 to FIG. 16, in the embodiment, the transmission rod mechanism 32 drives the valve core 31 assembly to translate.

[0092] The drainage valve assembly 3 includes the transmission rod mechanism 32, the valve seat 35, the valve core 31, the flexible sealing member 36, the reversal mechanism 323, the first torsion spring 33 and the

second torsion spring 34 as described above.

[0093] The first torsion spring 33 is sleeved on the transmission rod 321. A first end of the transmission rod 321 is provided with a flat shaft portion 3211, and a second end of the transmission rod 321 is sleeved on the first shifting rod 322 so that synchronous rotation may be implemented.

[0094] The turntable 3231 is formed with a through hole 3231c, two rotationally symmetrical protrusions 32311 are arranged on an inner wall of the through hole 3231c and divide a part of space of the through hole 3231c to form two first driving grooves 3231a distributed in a circumferential direction, and opposite ends of the flat shaft portion 3211 along a radial direction of the through hole 3231c extend into their respective first driving grooves 3231a respectively.

[0095] The turntable 3231 is connected to a transverse side of the valve column 311, and the second rotation arm 343 of the second torsion spring 34 is connected to the other side of the valve column 311.

[0096] The first rotation arm 342 of the second torsion spring 34 is connected to the valve seat 35, and specifically, the valve seat 35 is provided with a first insertion hole, and the first rotation arm 342 is inserted into the first insertion hole and may rotate in the first insertion hole. The second rotation arm 343 of the second torsion spring 34 is connected to the valve column 311, and specifically, with reference to FIG. 8, a side of the valve column 311 is provided with a second insertion hole 31b, and the second rotation arm 343 is inserted into the second insertion hole 31b and may rotate in the second insertion hole 31b.

[0097] In order to limit movement amplitude of the second torsion spring 34, in an embodiment, with reference to FIG. 11 and FIG. 12, the valve seat 35 is provided with a first blocking rib 351 and a second blocking rib 352, and the second rotation arm 343 may move within a range defined by the first blocking rib 351 and the second blocking rib 352. Specifically, with reference to FIG. 11, when the valve core 31 is positioned at the sealing position, the second rotation arm 343 is in blocking-contact with the first blocking rib 351. With reference to FIG. 12, when the valve core 31 is positioned at the drainage position, the second rotation arm 343 is in blocking-contact with the second blocking rib 352. The first blocking rib 351 and the second blocking rib 352 may limit and block movement of the second rotation arm 343 to prevent excessive movement of the second rotation arm 343.

[0098] With reference to FIG. 10, convex ribs 3110 are arranged on opposite sides of the valve core 31 along the rotation center line L respectively and extend along the movement direction of the valve core 31, two guide grooves 35b arranged at an interval are arranged in the valve seat 35, the convex ribs 3110 extend into the guide grooves 35b in a sliding manner respectively, and specifically, the valve core 31 is sandwiched between the two guide grooves 35b.

Second embodiment

[0099] With reference to FIG. 17 to FIG. 21, most of the structures according to the embodiment of the application are substantially the same as those of the first embodiment, and differences there-between comprise structure of the second end of the transmission rod 321, structure of the reversal mechanism 323, and connection position of the second torsion spring 34.

[0100] Specifically, the turntable 3231 is formed with a through hole 3231c, and the first driving groove 3231a penetrates through a part of side wall corresponding to the through hole 3231c along a radial direction of the through hole 3231c, that is, the first driving groove 3231a is generally notch-shaped. A surface of the transmission rod 321 is provided with a bump 3212, the transmission rod 321 is arranged in the through hole 3231c and passes through the through hole 3231c, and the bump 3212 is positioned in the first driving groove 3231a.

[0101] The second torsion spring 34 and the reversal mechanism 323 are arranged on the same side of the valve core 31, and the second rotation arm 343 of the second torsion spring 34 is connected to the reversal mechanism 323. Specifically, with reference to FIG. 19, the reversal mechanism 323 is provided with a third insertion hole 3231d, and the second rotation arm 343 extends into the third insertion hole 3231d and may rotate in the third insertion hole 3231d.

[0102] The drainage principle of the laundry treatment device is described below.

[0103] With reference to FIG. 5, it is assumed that the inner tub 11 rotates in the clockwise direction of FIG. 5, the second shifting rod 22 extends towards the drainage valve assembly 3, there is relative movement between the second shifting rod 22 and the inner tub 11, and a trajectory of the second shifting rod 22 relative to the inner tub 11 is a circle I. The second shifting rod 22 is in contact with the first shifting rod 322 from a right side of the first shifting rod 322, and since the first shifting rod 322 continues to rotate along with the inner tub 11, with reference to FIG. 6, the second shifting rod 22 forces the first shifting rod 322 to rotate counterclockwise, and the first shifting rod 322 drives the transmission rod 321 to rotate counterclockwise synchronously, so as to drive the valve core 31 to move. After the first shifting rod 322 is disengaged from the second shifting rod 22, the first shifting rod 322 rotates clockwise under an action of the elastic reset member to be reset to the position shown in FIG. 5. Since position of the valve core 31 has been switched, then the shifting rod is retracted, or the inner tub 11 rotates several circles and then the shifting rod is retracted.

[0104] Even though the second shifting rod 22 is not retracted, when the inner tub 11 rotates for a next circle, the second shifting rod 22 toggles the first shifting rod 322 again, and the first shifting rod 322 and the transmission rod 321 may idle counterclockwise in a direction of FIG. 5, without changing the position of the valve core

31. That is, in case that the position of the valve core 31 has been successfully switched, even though the second shifting rod 22 is not retracted, the second shifting rod 22 does not jam the first shifting rod 322, and thus, in subsequent rotation, the second shifting rod 22 does not affect rotation of the inner tub 11, and the second shifting rod 22 does not hold the inner tub 11 and does not mistakenly trigger change of the position of the valve core 31.

[0105] When the inner tub 11 rotates reversely, i.e., in the counterclockwise direction of FIG. 5, the second shifting rod 22 extends toward the drainage valve assembly 3, the second shifting rod 22 is in contact with the first shifting rod 322 from a left side of the first shifting rod 322 and forces the first shifting rod 322 to rotate clockwise, and the first shifting rod 322 drives the transmission rod 321 to rotate clockwise synchronously, so as to drive the valve core 31 to move. When the first shifting rod 322 is disengaged from the second shifting rod 22, the first shifting rod 322 rotates counterclockwise under an action of the elastic reset member to be reset to the position shown in FIG. 5. Since the position of the valve core 31 has been switched, then the shifting rod is retracted, or the inner tub 11 rotates several circles and then the shifting rod is retracted.

[0106] It should be noted that as long as a rotation angle of the first shifting rod 322 enables the valve core 31 to bypass the above intermediate critical position, after the valve core 31 crosses the critical position, the valve core 31 may continue to rotate under an action of the elastic positioning member, until the valve core 31 moves to the drainage position.

[0107] Various embodiments/embodiments provided in the application may be combined with each other without contradiction.

[0108] The foregoing are merely preferred embodiments of the application, and are not intended to limit the application, and various changes and variations may be made to the application for those skilled in the art. Any modification, equivalent replacement, improvement, or the like made within the spirit and principle of the application shall fall within the scope of protection of the application.

Claims

1. A laundry treatment device, comprising: an inner tub, configured to hold water, and be provided with a drainage hole; a driving device; and a drainage valve assembly, comprising: a valve core, having a sealing position for sealing the drainage hole and a drainage position for opening the drainage hole; a transmission rod mechanism, connected to the inner tub, and having a rotation center line, a first end of the transmission rod mechanism driving the valve core to move, and during rotation of the inner tub, the driving device operative to selectively toggle a second end of the transmission rod mechanism to drive the trans-

mission rod mechanism to rotate around the rotation center line; and an elastic positioning member and an elastic reset member, the elastic positioning member operative to keep the valve core at the sealing position or the drainage position, the elastic reset member operative to drive at least the second end of the transmission rod mechanism to be reset.

2. The laundry treatment device of claim 1, wherein the valve core has an intermediate critical position between the sealing position and the drainage position, and when the transmission rod mechanism drives the valve core to cross the intermediate critical position, the elastic positioning member is operative to drive the valve core to continue to move to the sealing position or the drainage position, and the elastic reset member is operative to drive at least the second end of the transmission rod mechanism to idle to be reset.

3. The laundry treatment device of claim 2, wherein the transmission rod mechanism comprises a transmission rod, a first shifting rod, and a reversal mechanism connected between the valve core and a first end of the transmission rod, the transmission rod mechanism drives the valve core to translate through the reversal mechanism, the first shifting rod is connected to a second end of the transmission rod, and the driving device selectively toggles the first shifting rod.

4. The laundry treatment device of claim 3, wherein the valve core is provided with a sliding groove, the reversal mechanism comprises a turntable, and a protruding column protruding from a side of the turntable, eccentrically arranged relative to the rotation center line and extending into the sliding groove, the turntable is provided with a first driving groove comprising first driving surfaces on opposite sides along a rotation direction, the first end of the transmission rod is at least partially positioned in the first driving groove and slidable in the first driving groove, and the first end of the transmission rod is operative to be alternatively driving-fitted with one of the first driving surfaces to drive the reversal mechanism to rotate around the rotation center line.

5. The laundry treatment device of claim 4, wherein a through hole is formed in the turntable, the first end of the transmission rod is arranged in the through hole and passes through the through hole, an inner wall of the through hole is provided with two rotationally symmetrical protrusions which divide a part of space of the through hole to form two first driving grooves distributed in a circumferential direction, the first end of the transmission rod is provided with a flat shaft portion positioned on the rotation center line, and opposite ends of the flat shaft portion in a

radial direction of the through hole extend into their respective first driving grooves respectively.

6. The laundry treatment device of claim 4, wherein a through hole is formed in the turntable, the first driving groove penetrates through a part of side wall corresponding to the through hole in a radial direction of the through hole, a bump is arranged on a surface of the transmission rod and positioned in the first driving groove, and the transmission rod is arranged in the through hole and passes through the through hole.
7. The laundry treatment device of claim 3, wherein the elastic reset member is a first torsion spring sleeved on the transmission rod.
8. The laundry treatment device of claim 3, wherein the elastic positioning member is a second torsion spring comprising a spiral body, a first rotation arm and a second rotation arm, the first rotation arm is fixed relative to the inner tub, the spiral body is suspended, and the second rotation arm is operative to move along with the valve core or the transmission rod mechanism.
9. The laundry treatment device of claim 8, wherein the second rotation arm is connected to the valve core, and when the valve core is positioned at the sealing position, an acting force applied by the second torsion spring to the valve core has at least a force component parallel to a movement direction of the valve core and facing toward the drainage hole, and when the valve core is positioned at the drainage position, an acting force applied by the second torsion spring to the valve core has at least a force component parallel to the movement direction of the valve core and away from the drainage hole, and when the valve core is positioned at the intermediate critical position, an acting force applied by the second torsion spring to the valve core has a direction perpendicular to the movement direction of the valve core.
10. The laundry treatment device of claim 8, wherein the second rotation arm is connected to the reversal mechanism, and when the valve core is positioned at the sealing position, the second torsion spring applies a first torque around the rotation center line to the reversal mechanism, and when the valve core is positioned at the drainage position, the second torsion spring applies a second torque around the rotation center line to the reversal mechanism, the first torque has a direction opposite to the second torque, and when the valve core is positioned at the intermediate critical position, a torque applied by the second torsion spring to the reversal mechanism is zero.
11. The laundry treatment device of any one of claims 3 to 10, wherein the drainage valve assembly comprises a valve seat of which a side facing toward the drainage hole is opened, at least a part of the valve core and the reversal mechanism are arranged in the valve seat, and an end of the valve core is operative to extend out from the opened part of the valve seat; a side wall of the valve seat is provided with an avoidance groove, the transmission rod is arranged in the avoidance groove and passes through the avoidance groove, and the first shifting rod is positioned outside the valve seat.
12. The laundry treatment device of claim 11, wherein one of the valve seat or the valve core is provided with a guide groove, the other of the valve seat or the valve core is provided with a convex rib, and the convex rib is sliding-fitted with the guide groove.
13. The laundry treatment device of claim 11, wherein the drainage valve assembly comprises a flexible sealing member sleeved on the opened side of the valve seat, the flexible sealing member and the valve seat enclose together to form a sealing cavity, and the valve core, the elastic positioning member, the elastic reset member and the reversal mechanism are positioned in the sealing cavity, and the valve core is connected to the flexible sealing member to drive the flexible sealing member to move.
14. The laundry treatment device of claim 13, wherein the valve core comprises a valve plate and a valve column which are fixedly connected, the flexible sealing member comprises a telescopic pipe, a supporting end plate and a flange, the flange is arranged at an axial end of the telescopic pipe and connected to the opened side of the valve seat, the supporting end plate closes the other axial end of the telescopic pipe, the valve plate is stacked on an inner surface of the supporting end plate, and when the valve core is positioned at the sealing position, the valve plate abuts the supporting end plate around the drainage hole.
15. The laundry treatment device of claim 2, wherein the transmission rod mechanism comprises a transmission rod and a first shifting rod, the valve core is provided with a second driving groove comprising second driving surfaces on opposite sides along a rotation direction respectively, a first end of the transmission rod is positioned in the second driving groove and slidable in the second driving groove, the transmission rod is operative to be alternatively driving-fitted with one of the second driving surfaces to drive the valve core to rotate, the first shifting rod is connected to a second end of the transmission rod, and the driving device selectively toggles the first shifting rod.

16. The laundry treatment device of any one of claims 3 to 10 and 15, comprising a lifting rib in which the valve core, the elastic positioning member and the elastic reset member are arranged, the first end of the transmission rod is positioned in the lifting rib, the second end of the transmission rod extends outside an axial end of the inner tub, and the first shifting rod is positioned on outside the axial end of the inner tub.
17. The laundry treatment device of claim 16, comprising an outer tub in which the inner tub is rotatably arranged, the driving device is arranged on the outer tub, the first shifting rod is positioned between the inner tub and the outer tub, the driving device comprises a second shifting rod and a power unit driving the second shifting rod to selectively extend towards the shifting rod or retract, and in an extending state of the second shifting rod, the second shifting rod is operative to selectively toggle the first shifting rod to rotate forward or backward around the rotation center line.

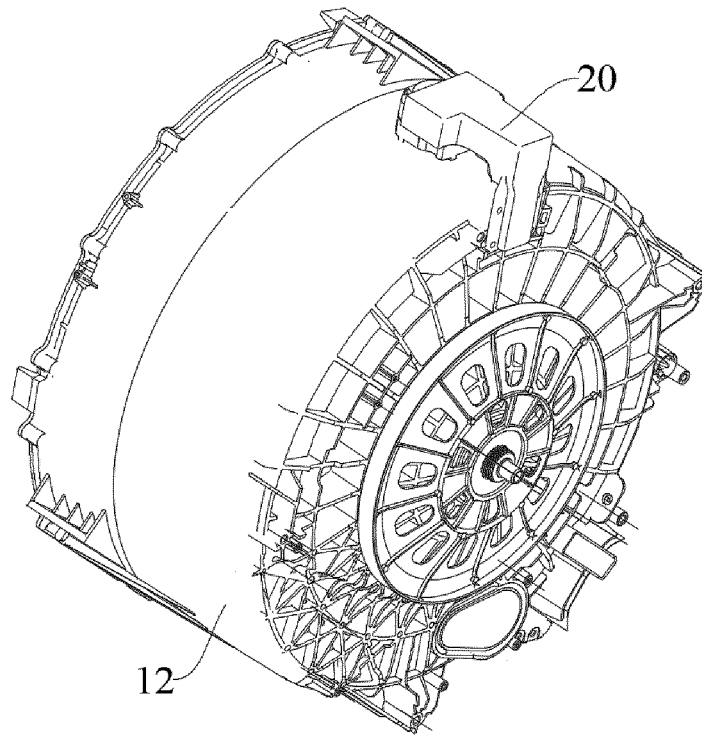


FIG. 1

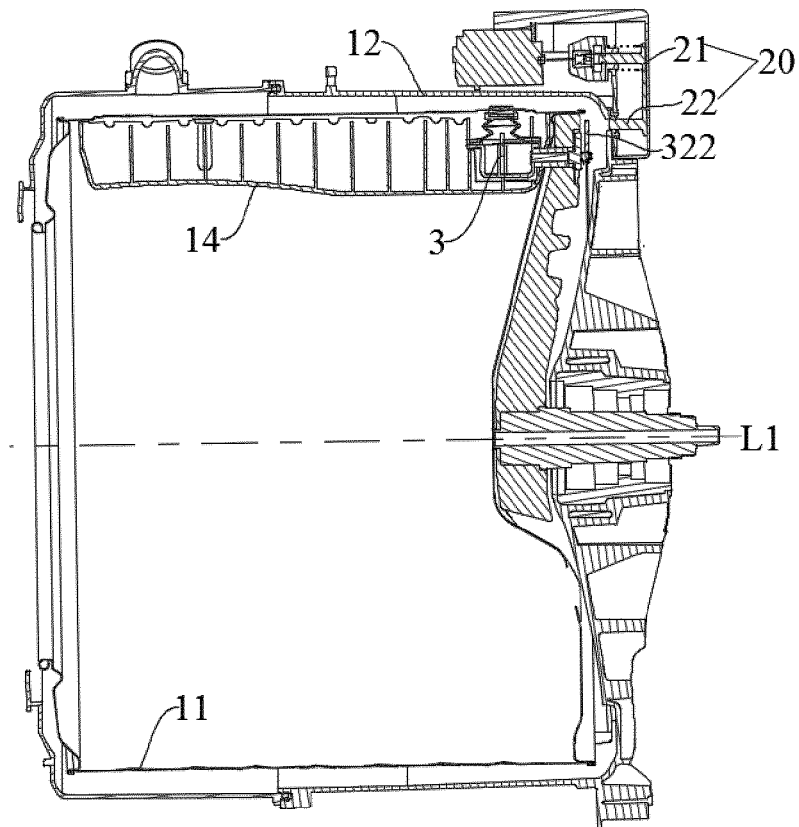


FIG. 2

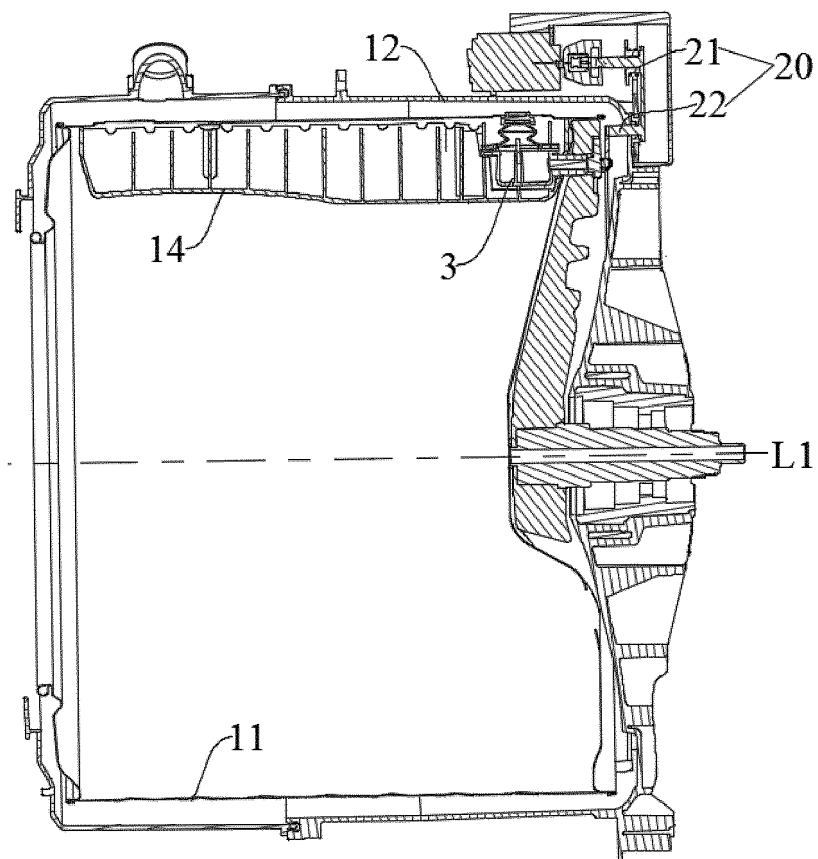


FIG. 3

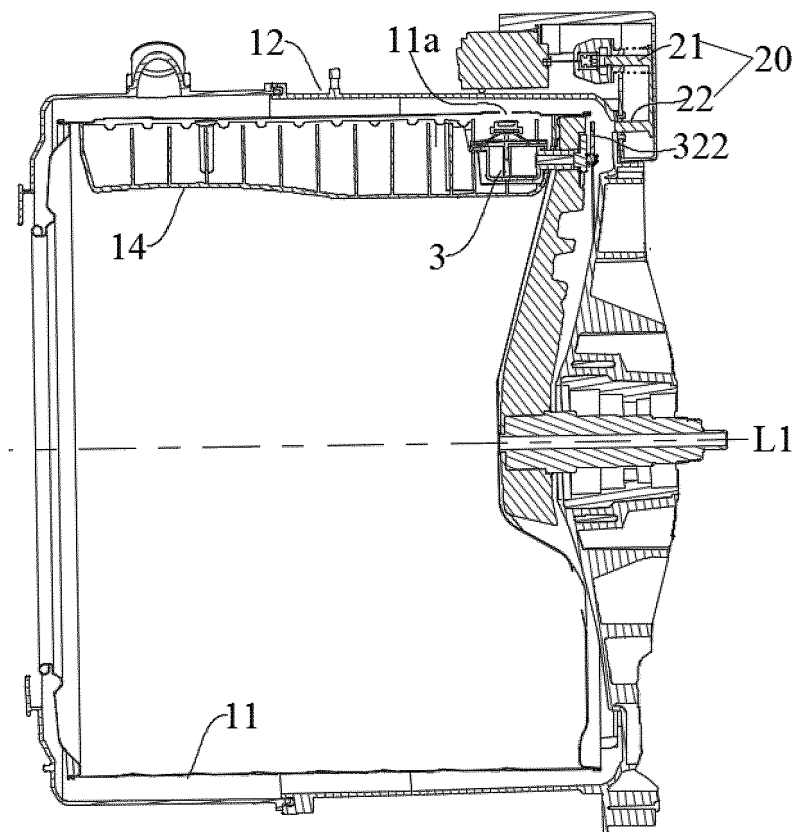


FIG. 4

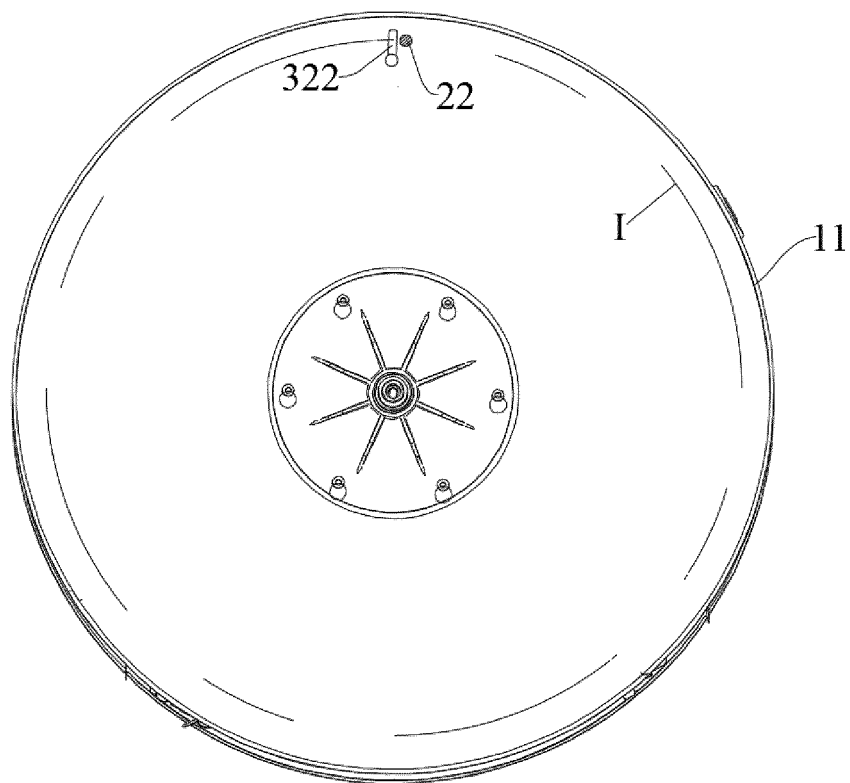


FIG. 5

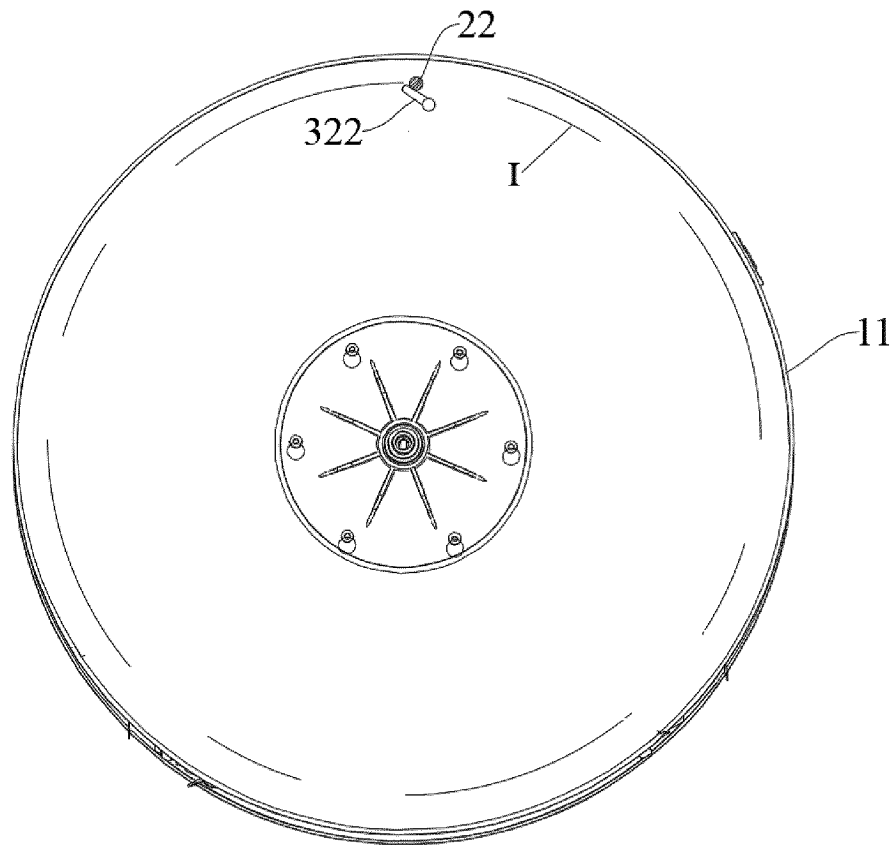


FIG. 6

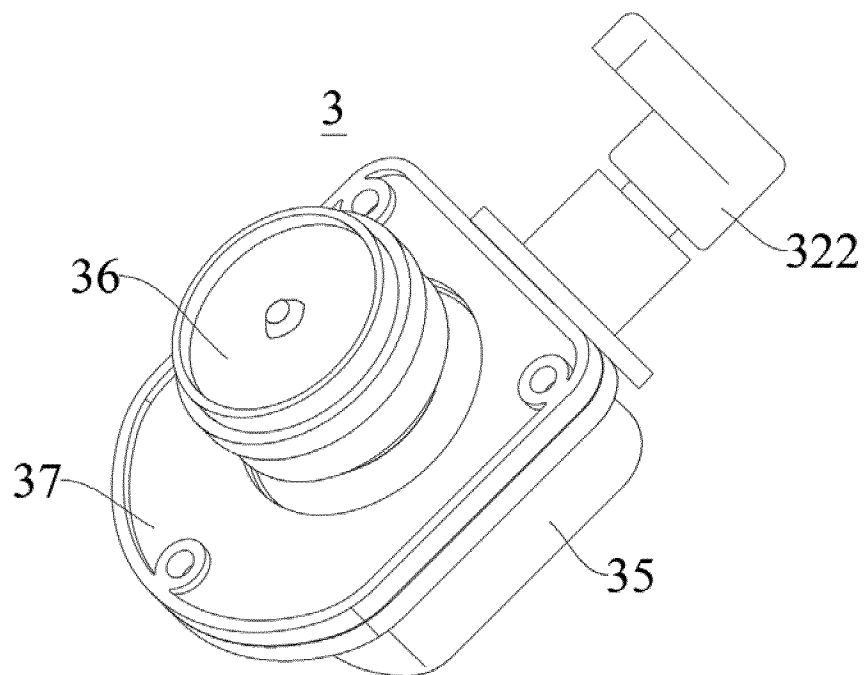


FIG. 7

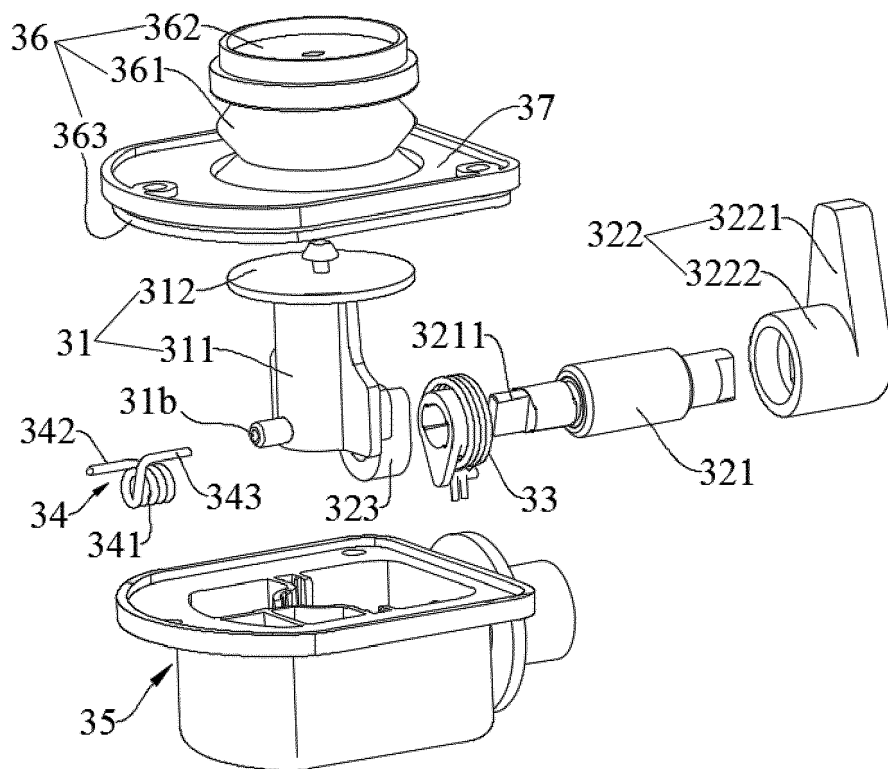


FIG. 8

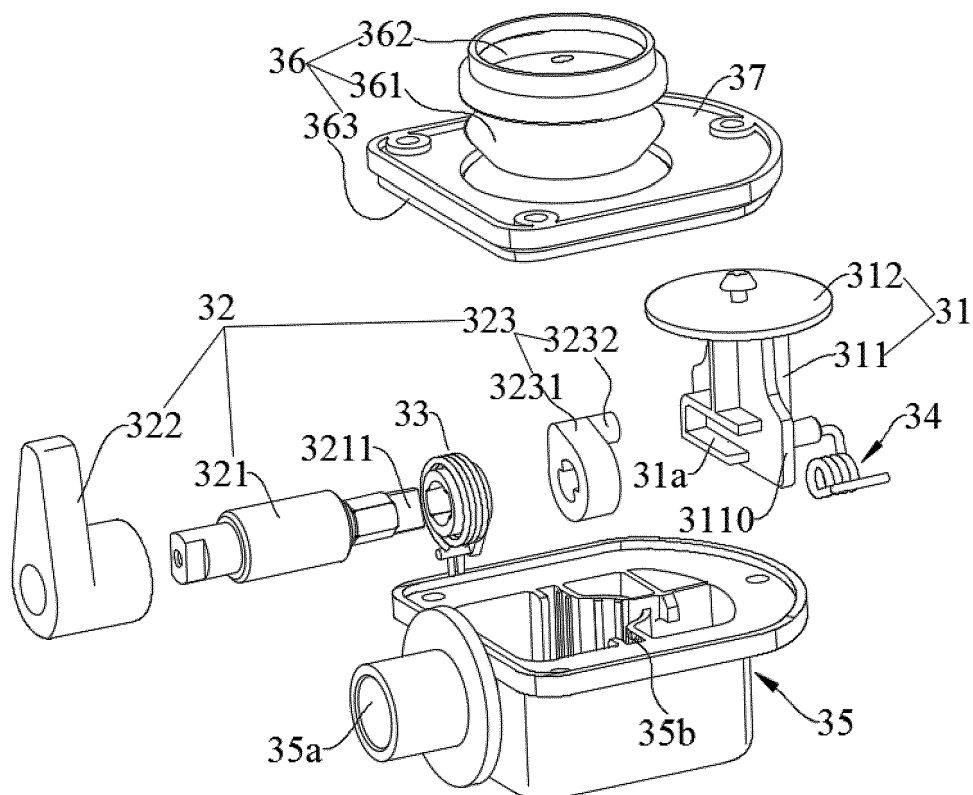


FIG. 9

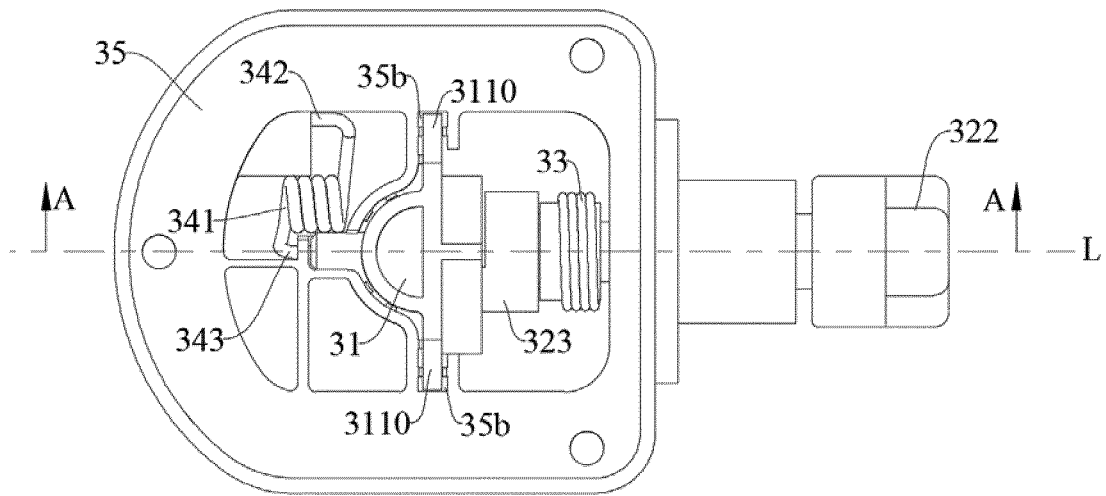


FIG. 10

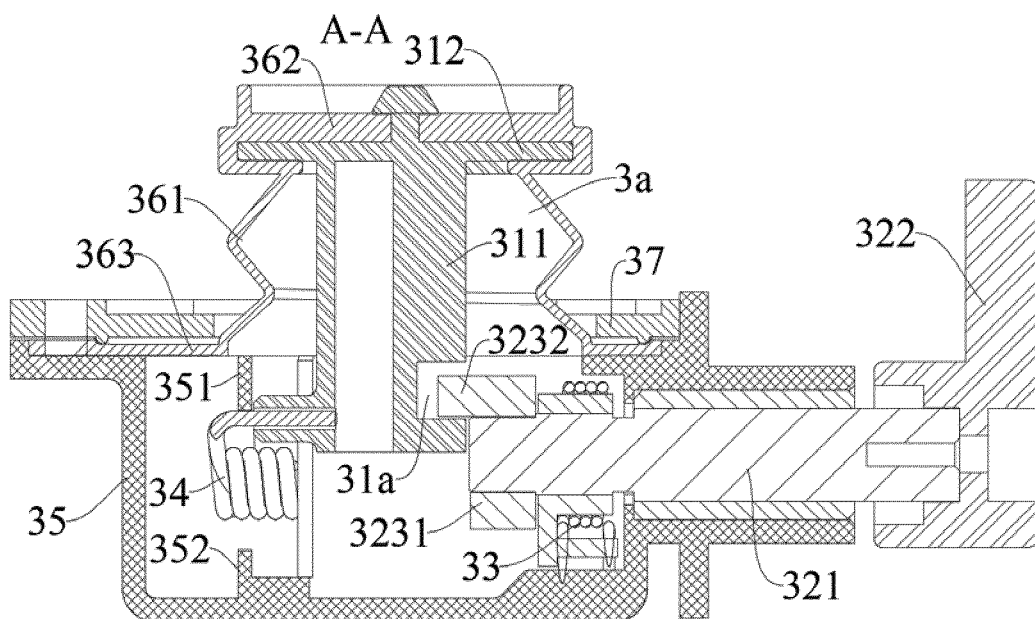


FIG. 11

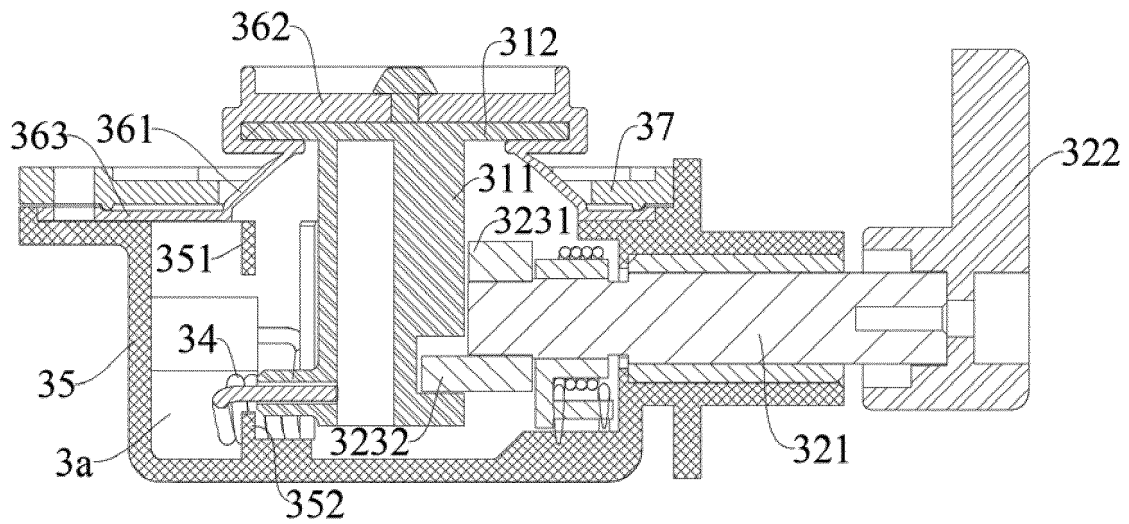


FIG. 12

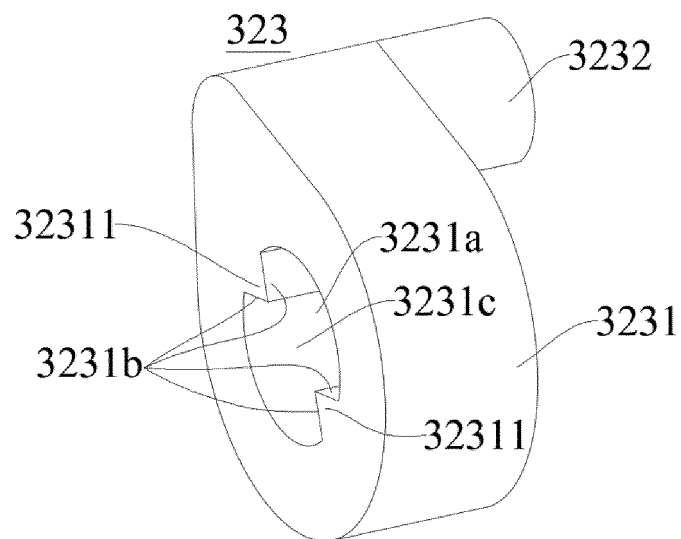


FIG. 13

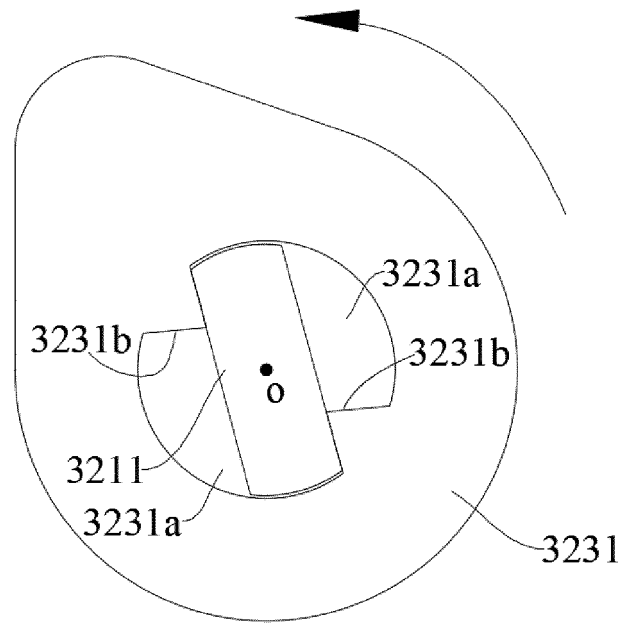


FIG. 14

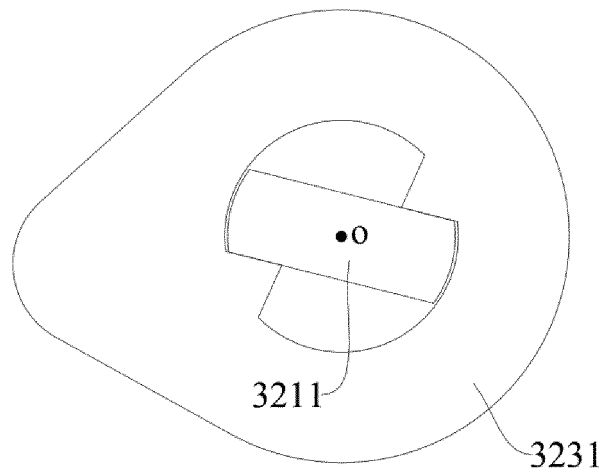


FIG. 15

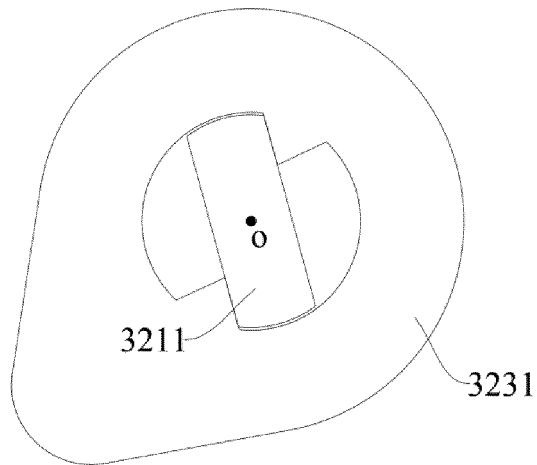


FIG. 16

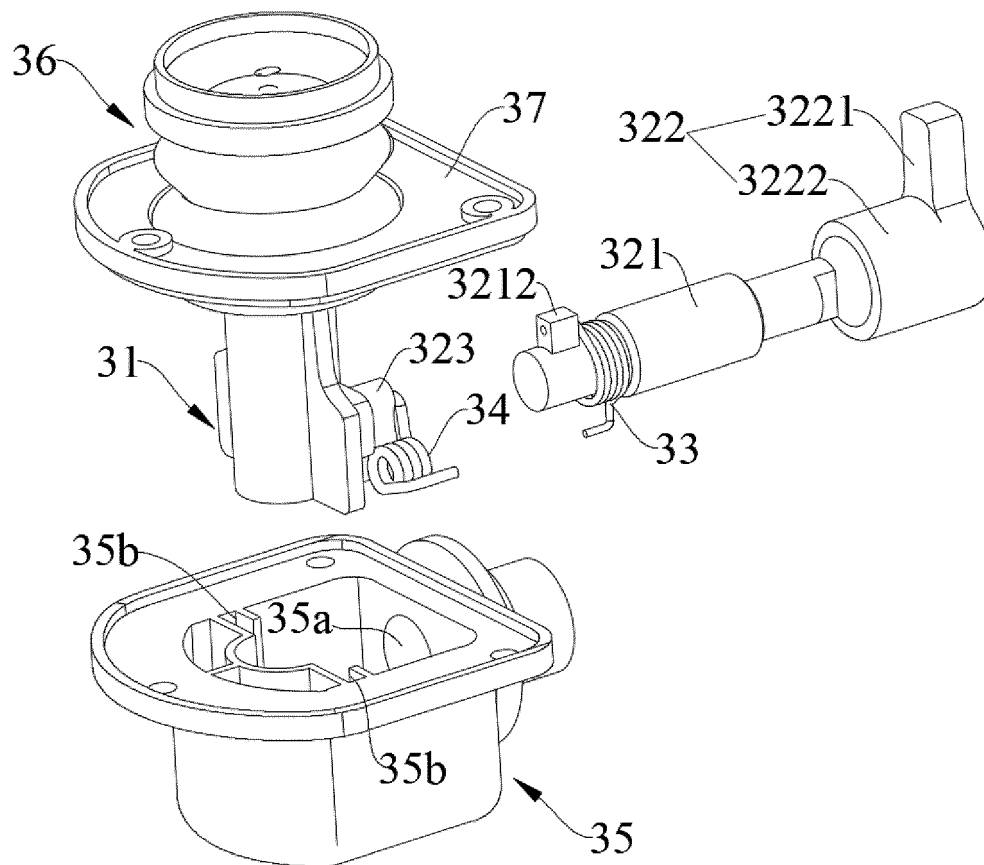


FIG. 17

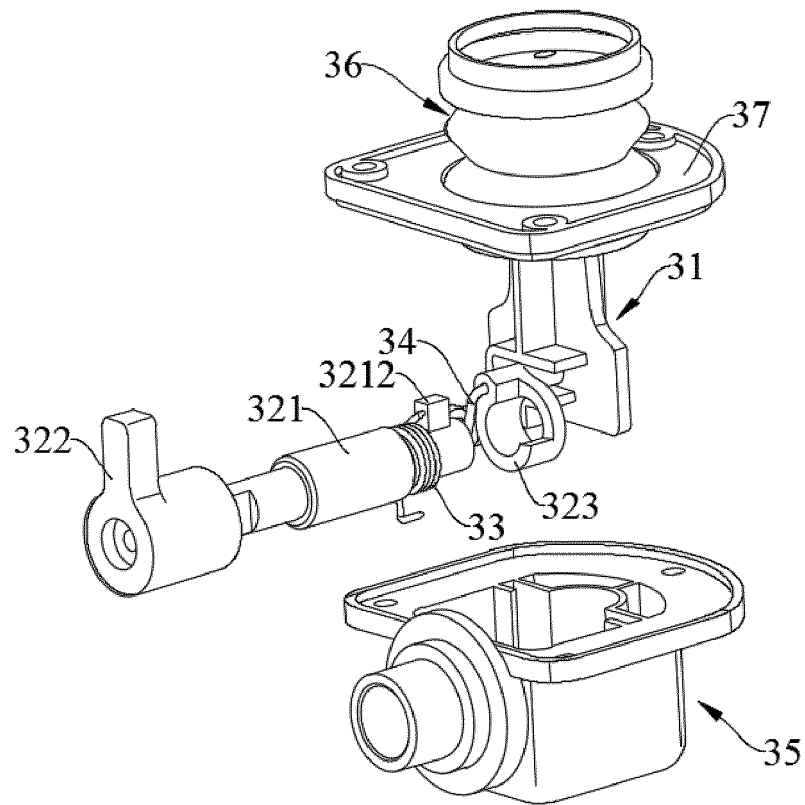


FIG. 18

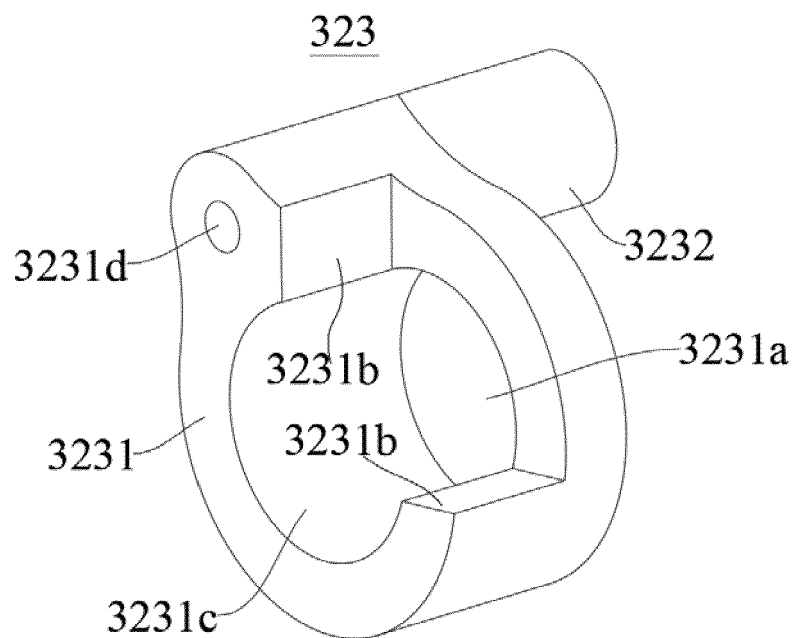


FIG. 19

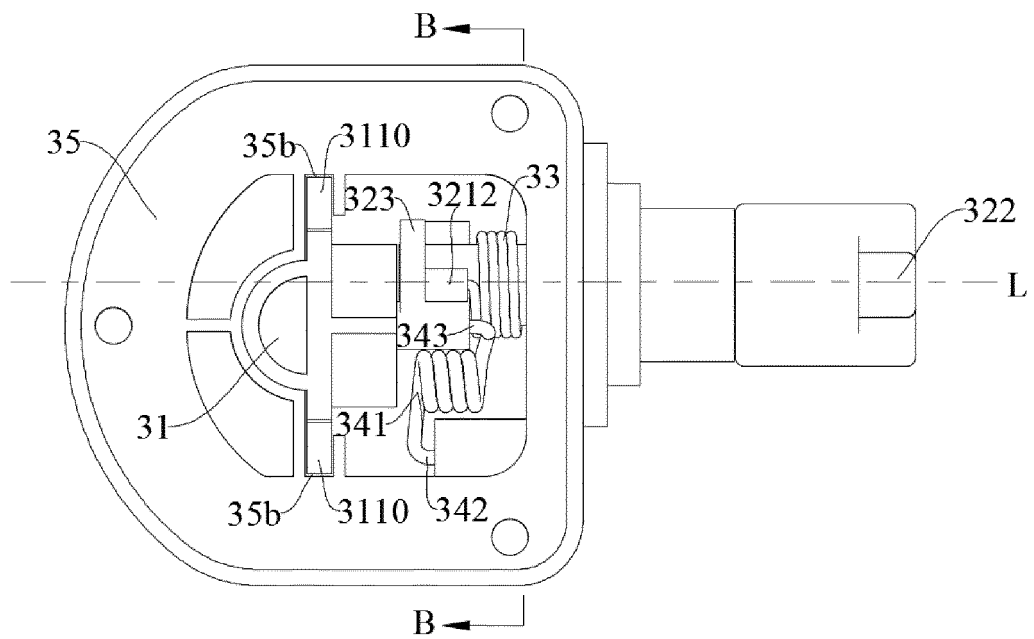


FIG. 20

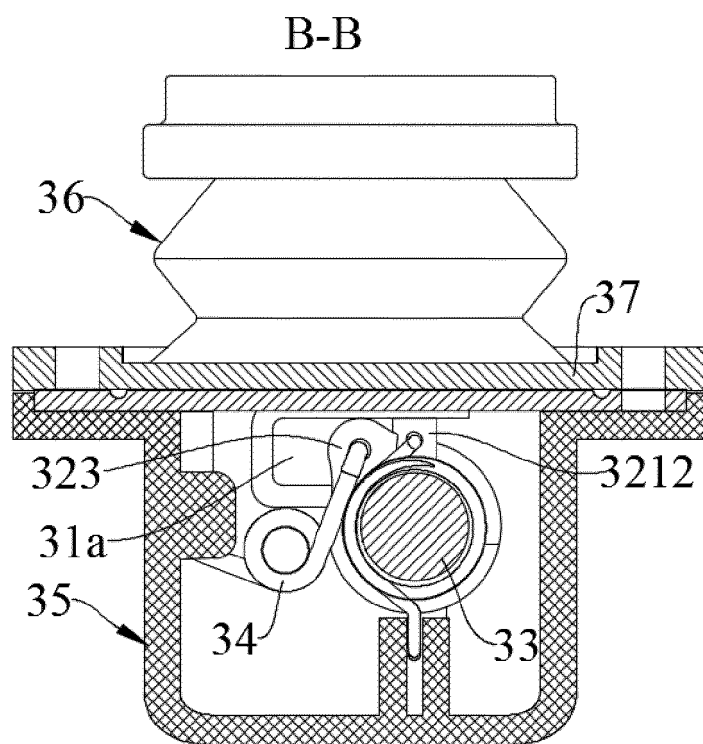


FIG. 21

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/118591

A. CLASSIFICATION OF SUBJECT MATTER D06F 39/08(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) CNKI; CNABS; CNTXT; DWPI; SIPOABS: 排, 阀, 弹性, 扭簧, 弹簧, 复位, 临界, 无水, 没有水, 无孔, 没有孔, 单筒, 单桶, 单内筒, 单内桶, 单滚筒, 单滚桶, drain???, valve, spring, drum, tub, critical, water, no, not																		
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>E</td> <td>CN 112095275 A (WUXI LITTLE SWAN ELECTRICAL APPLIANCE CO., LTD.) 18 December 2020 (2020-12-18) description, paragraphs [0064]-[0160], and figures 1-28</td> <td>1-17</td> </tr> <tr> <td>E</td> <td>CN 112011970 A (WUXI LITTLE SWAN ELECTRICAL APPLIANCE CO., LTD.) 01 December 2020 (2020-12-01) description, paragraphs [0048]-[0119], and figures 1-19</td> <td>1-17</td> </tr> <tr> <td>E</td> <td>CN 112095277 A (WUXI LITTLE SWAN ELECTRICAL APPLIANCE CO., LTD.) 18 December 2020 (2020-12-18) description, paragraphs [0043]-[0091], and figures 1-16</td> <td>1-17</td> </tr> <tr> <td>E</td> <td>CN 112095288 A (WUXI LITTLE SWAN ELECTRICAL APPLIANCE CO., LTD.) 18 December 2020 (2020-12-18) description, paragraphs [0068]-[0154], and figures 1-24</td> <td>1-17</td> </tr> <tr> <td>E</td> <td>CN 112095276 A (WUXI LITTLE SWAN ELECTRICAL APPLIANCE CO., LTD.) 18 December 2020 (2020-12-18) description, paragraphs [0037]-[0073], and figures 1-8</td> <td>1-17</td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	E	CN 112095275 A (WUXI LITTLE SWAN ELECTRICAL APPLIANCE CO., LTD.) 18 December 2020 (2020-12-18) description, paragraphs [0064]-[0160], and figures 1-28	1-17	E	CN 112011970 A (WUXI LITTLE SWAN ELECTRICAL APPLIANCE CO., LTD.) 01 December 2020 (2020-12-01) description, paragraphs [0048]-[0119], and figures 1-19	1-17	E	CN 112095277 A (WUXI LITTLE SWAN ELECTRICAL APPLIANCE CO., LTD.) 18 December 2020 (2020-12-18) description, paragraphs [0043]-[0091], and figures 1-16	1-17	E	CN 112095288 A (WUXI LITTLE SWAN ELECTRICAL APPLIANCE CO., LTD.) 18 December 2020 (2020-12-18) description, paragraphs [0068]-[0154], and figures 1-24	1-17	E	CN 112095276 A (WUXI LITTLE SWAN ELECTRICAL APPLIANCE CO., LTD.) 18 December 2020 (2020-12-18) description, paragraphs [0037]-[0073], and figures 1-8	1-17
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<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex. * Special categories of cited documents: “A” document defining the general state of the art which is not considered to be of particular relevance “E” earlier application or patent but published on or after the international filing date “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 27 May 2021	Date of mailing of the international search report 04 June 2021																	
Name and mailing address of the ISA/CN China National Intellectual Property Administration (ISA/CN) No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088 China Facsimile No. (86-10)62019451	Authorized officer Telephone No.																	

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/118591

C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 105986430 A (QINGDAO HAIER WASHING MACHINE CO., LTD.) 05 October 2016 (2016-10-05) description, paragraphs [0006]-[0021], and figures 1-7	1-17
A	CN 105986429 A (QINGDAO HAIER WASHING MACHINE CO., LTD.) 05 October 2016 (2016-10-05) entire document	1-17
A	CN 106637795 A (QINGDAO HAIER WASHING MACHINE CO., LTD.) 10 May 2017 (2017-05-10) entire document	1-17
A	CN 106480631 A (QINGDAO HAIER WASHING MACHINE CO., LTD.) 08 March 2017 (2017-03-08) entire document	1-17
A	JP 05228293 A (TOSHIBA CORP. et al.) 07 September 1993 (1993-09-07) entire document	1-17
A	JP 0461896 A (TOSHIBA CORP.) 27 February 1992 (1992-02-27) entire document	1-17

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2020/118591

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 112095275 A	18 December 2020	None	
CN 112011970 A	01 December 2020	None	
CN 112095277 A	18 December 2020	None	
CN 112095288 A	18 December 2020	None	
CN 112095276 A	18 December 2020	None	
CN 105986430 A	05 October 2016	JP 6614511 B2	04 December 2019
		KR 20170117146 A	20 October 2017
		US 2018030641 A1	01 February 2018
		WO 2016127686 A1	18 August 2016
		EP 3258001 A4	31 October 2018
		JP 2018508272 A	29 March 2018
		EP 3258001 A1	20 December 2017
		US 10550507 B2	04 February 2020
		CN 105986430 B	27 August 2019
CN 105986429 A	05 October 2016	EP 3255199 A4	10 January 2018
		JP 6762307 B2	30 September 2020
		WO 2016124037 A1	11 August 2016
		KR 20170107566 A	25 September 2017
		US 10577740 B2	03 March 2020
		EP 3255199 A1	13 December 2017
		JP 2018504225 A	15 February 2018
		CN 105986429 B	05 November 2019
		US 2018237977 A1	23 August 2018
		EP 3255199 B1	04 November 2020
CN 106637795 A	10 May 2017	CN 106637795 B	11 February 2020
		WO 2018095309 A1	31 May 2018
CN 106480631 A	08 March 2017	CN 106480631 B	01 October 2019
		EP 3346043 B1	04 November 2020
		US 2019024283 A1	24 January 2019
		KR 102071956 B1	31 January 2020
		KR 20180042426 A	25 April 2018
		EP 3346043 A4	29 August 2018
		EP 3346043 A1	11 July 2018
		WO 2017036276 A1	09 March 2017
		JP 2018528821 A	04 October 2018
JP 05228293 A	07 September 1993	JP H05228293 A	07 September 1993
JP 0461896 A	27 February 1992	JP H0461896 A	27 February 1992

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Patent documents cited in the description

- CN 202010876545 [0001]