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(54) **INNER TUB LOCK MECHANISM AND WASHING MACHINE**

(57) The present disclosure relates to a locking mechanism of an inner tub and a washing machine. The locking mechanism (300) comprises a locking rod (302) capable of reciprocating along an axial direction, a slideway (304) for the movement of the locking rod (302) and a driving unit for driving the locking rod (302) to move, the driving unit comprises a link, a crank and a rotating motor (324); wherein, a bearing (340) is mounted between the locking rod (302) and the slideway (304). The bearing (340) which mounted between the locking rod (302) and the slideway (304), is to reduce the friction between the locking rod (302) and the slideway (304), and to prevent the locking rod (302) from moving unsmooth that caused by got stuck from the slideway (304). When the crank rotates to 90° or 270°, and the friction between the locking rod (302) and the slideway (304) is maximum, the locking rod (302) is ensured to move smooth.

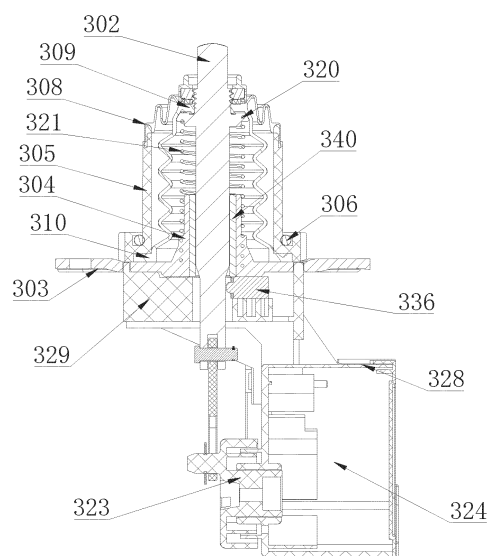


Fig. 3

Description

TECHNICAL FIELD

[0001] The present disclosure relates to the field of washing machines and particularly relates to a locking mechanism for an inner tub and a washing machine.

BACKGROUND

[0002] For the existing pulsator washing machines, through holes are provided in an inner tub and the inner tub is communicated with an outer tub. The inner tub serves as a washing tub, the outer tub serves as a water containing tub. The water filling an area between the side wall of the inner tub and the side wall of the outer tub does not participate in washing, and water which truly participates in washing is only in the inner tub, so that the wasting of water resources is relatively huge. In addition, too much water between the inner tub and the outer tub will lower the concentration of an abstergent/detergent powder in a washing solution. Meanwhile, because water flows frequently between the inner tub and the outer tub, the area between the side wall of the inner tub and the side wall of the outer tub becomes a space for filth after continuous use. Water scales in tap water, free substances of detergent powder, cellulose of clothing, organic matters of human bodies and dust and bacteria brought by clothing extremely easily stay between the side wall of the inner tub and the side wall of the outer tub. If the dirt cannot be effectively removed inside a washing machine which is used for a long time, mold will multiply and propagate from the great quantity of dirt accumulated. Bacteria will be attached to the clothing and brought to the human bodies after the next washing if the dirt, unseen to users, is not removed, and thus, the problem of cross contamination is caused.

[0003] A patent with the application number of CN200420107890.8 relates to a full automatic washing machine which mainly comprises a box body, a washing/dewatering tub, a water containing tub and a driving device. The water containing tub is mounted outside the washing/dewatering tub and is fixedly connected with the box body, a sealing device is arranged between a bottom face of an internal wall of the water containing tub and a bottom face of an external wall of the washing/dewatering tub, and a sealing chamber is formed in the sealing device. An external side wall of the washing/dewatering tub is free of through holes, and a drainage port communicating with the sealing chamber is formed in the bottom of the washing/dewatering tub. A drainage port communicating with a drainage pipe is formed in the water containing tub, and a drainage valve is arranged on the drainage pipe. The water containing tub is fixedly connected with the box body by a suspender, one end of the suspender is connected with an internal wall of the upper end of the box body, and the other end of the suspender is connected with an external wall of the water containing

tub. In long-time running, due to long-time running wear of the sealing structure, worn water leakage is easily caused, if water quality is relatively poor and the silt content is relatively high, the service life of the washing machine will be greatly shortened, and thus, due functions cannot be achieved. The washing machine cannot be used under the condition of large washing capacity, and the reliability is relatively poor.

[0004] During washing, the inner tub of the washing machine is locked by the locking mechanism, the drainage port at the bottom of the inner tub is controlled to close; and during drainage, the drainage port at the bottom of the inner tub is controlled to open; and during dewatering, the locking mechanism unlocks the inner tub, the inner tub rotates to dewater. During the control of the locking mechanism, the locking rod needs to be extended out and retracted. The extending and retraction of the locking rod is up-and-down motions of the locking rod which is driven by a crank-link that driven by the rotating motor. When the crank rotates to 90° or 270°, the friction between the locking rod and the slidway is maximum, then, the motor cannot rotate and get stuck due to the large friction.

[0005] In view of foregoing, the present disclosure is provided.

SUMMARY

[0006] An object of the present disclosure is to overcome defects in the prior art and provide a locking mechanism for an inner tub, the reciprocation of the locking rod is smooth.

[0007] Another object of the present disclosure is to provide a washing machine that is provided with the above-mentioned locking mechanism.

[0008] In order to achieve the object, the present disclosure adopts a technical scheme as follows: a locking mechanism for an inner tub comprising a locking rod capable of reciprocating along an axial direction, a slidway for a movement of the locking rod and a driving unit for driving the locking rod to move, the driving unit comprises a link, a crank and a rotating motor; a bearing is mounted between the locking rod and the slidway.

[0009] The locking mechanism further comprises a fixing seat, a slidway is arranged at the centre of the fixing seat, and the bearing is arranged in the slidway, preferably, an outer ring of the bearing is interference fit with the slidway.

[0010] The bearing is an oil-retaining bearing, the oil-retaining bearing is arranged in the slidway, the outer ring of the oil-retaining bearing is fixed with the slidway, and the locking rod is provided within the inner ring of the oil-retaining bearing.

[0011] The bearing is a linear bearing, the linear bearing is arranged in the slidway, the outer ring of the linear bearing is fixed with the slidway, and the locking rod is provided within the inner ring of the linear bearing, preferably, the linear bearing is a rolling bearing.

[0012] An idle stroke is arranged between the link and the crank and/or between the link and the locking rod.

[0013] The idle stroke is a movement space arranged along the length direction of the link, and a connecting end of the crank and/or the locking rod moves in the movement space, and the locking state does not change.

[0014] The link is a connecting arm, hinged holes are respectively formed in the two ends of the connecting arm, the hinged hole of one end of the connecting arm is hinged to the end part of the locking rod, and the hinged hole of the other end of the connecting arm is hinged with the crank, and one or both of the hinged holes are elliptical hole.

[0015] The link comprises a connecting arm, a first spring and a slider, one end of the first spring is fixed to the connecting arm, the other end of the first spring is fixed to the slider, the slider is in sliding connection with the connecting arm, and, one end, fixed to the first spring, of the connecting arm is hinged with the locking rod, and one end, where the slider is arranged, of the connecting arm is hinged to the crank through the slider.

[0016] Preferably, a groove/an opening is formed in the middle of the connecting arm, the first spring and the slider are connected in series and are arranged in the groove/opening along the length direction, the slider is in sliding connection with the groove/opening, one end of the first spring is fixed to an end part of the groove/opening, the other end of the first spring is fixed to the slider.

[0017] Preferably, mounting columns are respectively arranged at the end part of the groove/opening, and an end face, over against the end part, of the slider, and the two ends of the first spring separately sleeve the mounting columns.

[0018] Preferably, two end faces of the mounting columns which are right against to each other are slant faces or stepped end faces.

[0019] A boss is arranged at the upper part of the locking rod, a second spring is arranged below the lower part of the boss, one end of the second spring is in contact with the lower surface of the boss, the other end of the second spring is fixed, and the second spring is compressed when the locking rod moves downward, preferably, the other end of the second spring is fixed with the fixing seat.

[0020] A washing machine provides with the above-mentioned locking mechanism.

[0021] By adopting the technical scheme, the present disclosure has the following beneficial effects:

1. The bearing which is mounted between the locking rod and the slideway reduces the friction between the locking rod and the slideway, and it prevents the locking rod from being stuck in the slideway. It ensures the locking rod to move smooth when the crank rotates to 90° or 270°, that is the friction between the locking rod and the slideway is maximum.
2. In the present disclosure, the locking mechanism

set an idle stroke, when the locking rod stretches out after the locking mechanism receiving a false signal and it does not stick into the locking hole, the locking rod tightly jacks up to the bottom of the inner tub. Then, the rotating motor drives the crank or the link to move in the idle stroke, and when the motor passes through the motor-driven highest point, the motor continues to drive the locking rod to move downwards to reset and to re-enter the next working cycle. Thus, this will not cause any damage to the motor or the bottom of the inner tub, and manual setting or washing machine disassembled maintenance is not required, the failure of the washing machine is avoided, and unnecessary trouble to users is avoided.

[0022] The specific embodiments of the present disclosure are further described in detail below with reference to the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023]

Fig. 1 is a structural drawing of a washing machine of the present disclosure.

Fig. 2 is a stereogram of a locking mechanism of the present disclosure.

Fig. 3 is a sectional view of the locking mechanism of the present disclosure.

Fig. 4 is a position schematic diagram of a locking rod of the present disclosure.

Fig. 5 is another position schematic diagram of the locking rod of the present disclosure.

Fig. 6 is another position schematic diagram of the locking rod of the present disclosure.

Fig. 7 is another position schematic diagram of the locking rod of the present disclosure.

Fig. 8 is a structural drawing of a driving unit of the locking rod of another embodiment of the present disclosure.

Fig. 9 is a structural drawing of a bearing of the present disclosure.

Fig. 10 is a sectional view of a bearing of the present disclosure.

[0024] In the figures, numeric symbols are as follows: 100-inner tub, 101-inner tub body, 102-inner tub bottom, 103-inner tub flange, 104-balancing ring, 105-drainage port, 106-drainage hole, 200-outer tub, 201-first mounting hole, 202-outer tub bottom, 204-second mounting hole, 300-locking mechanism, 301-locking hole, 302-locking rod, 303-fixing seat, 304-slideway, 305-fixing shell, 306-sealing ring, 307-sealing sleeve, 308-first end, 309-second end, 310-third end, 320-boss, 321-second spring, 323-eccentric wheel, 324-rotating motor, 328-shell, 329-mounting part, 330-connecting arm, 331-elliptical hole, 332-first spring, 334-slider, 335-mounting column, 336-position switch, 337-first locking part, 338-sec-

ond locking part, 339-groove, 340-bearing

DETAILED DESCRIPTION

[0025] Referring to Fig. 1, a washing machine provided by the present disclosure comprises an inner tub 100 and an outer tub 200, an inner tub body 101 is free of water leakage hole communicating with the outer tub, a drainage port 105 is formed in an inner tub bottom 102, a circle of drainage holes 106 are formed in the upper part of the inner tub body. During washing, the drainage port 105 is closed, a water level is lower than height of the drainage holes 106, water is only present in the inner tub 100, and the water is absent between the inner tub 100 and the outer tub 200. After the washing completes, the drainage port 105 is opened, and the majority of the water is drained from the drainage port 105. During dewatering, the inner tub 100 rotates, and water which removed from clothing rises along a tub wall due to the action of a centrifugal force is discharged from the inner tub through the drainage holes 106 in the upper part of the inner tub, then enters a space between inner tub and outer tub and then is discharged via an outer tub drainage port of the outer tub 200. Thus, during washing, washing water is only present in the inner tub 100 and is absent between the inner tub and the outer tub, then, the water is saved, meanwhile, dirt is not accumulated in an area between the side wall of the inner tub and the side wall of the outer tub, thus, the space between the inner tub and the outer tub is cleaned, and the multiplication of the bacteria is avoided. During drainage and dewatering, the drainage port 105 is opened, the majority of the water and sediments such as silt and particles are discharged into the outer tub from lower drainage port 105, the water in the clothing is discharged into the outer tub from drainage holes 106 in the upper part of the inner tub during high-speed rotating-dewatering of the inner tub and is directly discharged out of the washing machine via drainage port in an outer tub bottom 202 and a drainage pipe, thus, rapid drainage is achieved, and water drainage and pollution discharge effects are good.

[0026] In the present disclosure, a drainage control mechanism 400 which is used for controlling the drainage port 105 to be opened/closed is arranged at the bottom of the drainage port 105, the drainage control mechanism is fixed at the bottom of the outer tub 200. During water inflow and washing, the drainage control mechanism blocks up the drainage port 105, and controls the drainage port 105 to be closed; and during drainage and dewatering, the drainage control mechanism 400 controls the drainage port 105 to be opened. A locking mechanism 300 is arranged at the bottom of the inner tub 100, the locking mechanism 300 is firstly used for locating the inner tub until the drainage port 105 and the drainage control mechanism 400 are of positional correspondence, then, the inner tub 100 is locked and the drainage port 105 is blocked up by the drainage control mechanism 400. The locking mechanism can also be used for pre-

venting the inner tub from rotating during water inflow and washing of the washing machine, causing the drainage control mechanism 400, which is used for controlling the drainage port 105 opened/closed, at the bottom of the inner tub to be out of operation.

[0027] A locking hole 301 is formed in the bottom of the inner tub, preferably, the locking hole 301 is formed on the inner tub flange 103, which is a blind hole and does not communicate with the interior of the inner tub. A locking mechanism is arranged at the bottom of the outer tub and the locking mechanism comprises a locking rod 302, a slideway 304 and a driving unit, wherein, the locking rod reciprocates along the axial direction, the slideway 304 is for the movement of the locking rod, and the driving unit is used for driving the locking rod to move. The driving unit comprises a link, a crank and a rotating motor. A bearing 340 is arranged between the locking rod 302 and the slideway 304. During washing and rinsing, the locking rod 302 moves upward and sticks into the locking hole, and the inner tub 100 is locked and cannot rotate; then, the drainage port 105 is blocked up by the drainage control mechanism 400, water is absent between the inner tub and the outer tub. The drainage control mechanism 400 can be prevented from being disabled due to the fact that the inner tub 100 is locked. During dewatering, the locking rod 302 moves downward and out of the locking hole, and the inner tub rotates in the circumferential direction and dewateres the clothing inside the inner tub. The reciprocation of the locking rod is the up-and-down motions of the locking rod which is driven by a crank-link that driven by the rotating motor.

[0028] When the crank rotates to 90° or 270°, the friction between the locking rod and the slideway is maximum, then, the motor cannot rotate and get stuck due to the large friction. While, in the present disclosure, the bearing between the locking rod and the slideway reduces the friction between the locking rod and the slideway, and it prevents the locking rod from being stuck in the slideway and not moving smooth.

[0029] The locking mechanism further comprises a fixing seat 303 of the locking rod 302, the slideway 304 is arranged at the centre of the fixing seat 303, the locking rod 302 goes through the slideway 304. Preferably, the fixing seat 303 is of an annular structure, and the center of the fixing seat 303 bends upwards or downwards to form the slideway 304. The bearing 340 is arranged in the slideway 304, preferably, an outer ring of the bearing 340 is interference fit with the slideway 304, and the interference fit makes the installation easy. A step hole is arranged inside the slideway 304, a positioning structure of the bearing 340 is arranged at the place where the diameter of the stepped hole changes dramatically.

[0030] Specific, the bearing 340 is an oil-retaining bearing, and the oil-retaining bearing is arranged in the slideway. An outer ring of the oil-retaining bearing is fixed with the slideway, and the locking rod is provided within an inner ring of the oil-retaining bearing. There will be lubricant overflowed when the locking rod rubbing

against the oil-retaining bearing, thus the friction between the locking rod and the oil-retaining bearing is greatly reduced. It makes sure that the movement of the locking rod inside the oil-retaining bearing is smooth, and makes sure that the rotating of the motor is normal.

[0031] Or, the bearing 340 is a linear bearing, and the linear bearing is arranged in the slideway. An outer ring of the linear bearing is fixed with the slideway and the locking rod is provided within an inner ring of the linear bearing. Preferably, the linear bearing is a rolling bearing, the internal wall of the linear bearing has balls. Thus, the locking rod rubs against the balls of the rolling bearing, and the friction is greatly reduced. It makes sure that the movement of the locking rod inside the linear bearing is smooth and makes sure that the rotating of the motor is normal.

[0032] A boss 320 is arranged at the upper part of the locking rod, a second spring 321 is arranged below the lower part of the boss 320, one end of the second spring 321 is in contact with the lower surface of the boss, the other end of the second spring 321 is fixed. The second spring 321 is compressed when the locking rod moves downward. Preferably, the other end of the second spring 321 is in contact with the fixing seat 303, and a resetting force of the second spring 321 drives the locking rod 302 to move upward.

[0033] The lower end of the locking rod is connected with a link of a crank-link structure, a crank is connected with a rotating motor 324. Preferably, the rotating motor 324 is arranged in a shell 328, the shell is provided with a mounting part 329, the mounting part 329 is mounted below the lower end of the fixing seat, and a through hole, which is used for enabling the locking rod 302 to pass through, is formed in the center of the mounting part.

[0034] Downward resetting movement of the locking rod 302 is driven by the crank-link structure, upward stretching of the locking rod 302 is driven by the resetting force of the second spring 321 after the crank-link structure release a tensile force.

[0035] Preferably, the crank is an eccentric wheel 323, an eccentric shaft of the eccentric wheel is hinged to the link, and the center of the eccentric wheel is connected with a motor shaft of the rotating motor. When the rotating motor rotates for 360 degrees, the locking rod works by a cycle, the locking rod can outward stretch into the locking hole from retracted state, is locked and then reset through retracting.

[0036] When the locking mechanism receives a false signal and the locking rod 302 stretches out, but does not stretch into the locking hole 301, the locking rod 302 jacks up other positions of the bottom of the inner tub, and the other position of the bottom of the inner tub are lower than that of the locking hole 301. Because the locking rod 302 does not rise to the highest point, thus, the locking rod will tightly jack up the bottom of the inner tub, then, the rotating motor 324 still drives the locking rod to move upward. Therefore, the motor is subjected to rotation blocking and stocking, even, the burnout of the motor

may be caused. Besides the locking rod cannot be reset and cannot enter the next working cycle, so manual setting and even inner tub disassembled are needed to enter the next working cycle.

[0037] In order to solve the above-mentioned problem, the lower end of the locking rod 302 is connected with the link of the crank-link structure, and an idle stroke is arranged between the link and the crank and/or between the link and the locking rod. The idle stroke is a movement space arranged along the length direction of the link, and a connecting end of the crank and/or the locking rod moves in the movement space, and the locking state does not change. When the locking mechanism receives a false signal, the locking rod 302 stretches out, but does not stretch into the locking hole 301, the locking rod 302 jacks up other positions of the bottom of the inner tub, and the other position of the bottom of the inner tub are lower than that of the locking hole 301. Therefore, the locking rod 302 does not rise to the highest point, thus, the locking rod will tightly jack up the bottom of the inner tub, then, the rotating motor 324 still drives the locking rod. Then, as the locking rod tightly jacks up the bottom of the inner tub, the idle stroke arranged between the link and the crank and/or between the link and the locking rod starts to be in action, the rotating motor drives the crank or the link to move in the idle stroke, and when the motor passes through the motor-driven highest point, the motor continues to drive the locking rod to move downwards to reset, and the locking bob re-enter the next working cycle. Thus, there is no damage caused to the motor or the bottom of the inner tub, manual setting or washing machine disassembled maintenance are not required, the failure of the washing machine is avoided, and unnecessary trouble to users is avoided.

[0038] The idle stroke is a compressible distance along the length direction of the link. When the locking rod 302 cannot be driven, the compressible distance is compressed, and when the motor passes through the motor-driven highest point, the motor continues to drive the locking rod to move downwards to reset, and the locking rod re-enter the next working cycle.

[0039] The idle stroke can be provided by an elliptical hole 331, the link is a connecting arm 330, hinged holes are respectively formed in the two ends of the connecting arm 330, the hinged hole of one end of the connecting arm is hinged to the end part of the locking rod 302, and the hinged hole of the other end of the connecting arm is hinged with the crank, and one or both of the hinged holes are elliptical hole 331. When the locking rod cannot be driven, the elliptical hole can provide a certain move displacement, thus, the motor can rotate the driven highest point, the motor continues to drive the locking rod to move downwards to reset, and the locking rod re-enter the next working cycle.

[0040] Or, the idle stroke is provided by a spring, when the locking rod 302 cannot be driven, the spring provides a certain move displacement, thus, the motor rotates through the driven highest point, the motor continues to

drive the locking rod to move downwards to reset, and the locking rod re-enter the next working cycle. The link comprises a connecting arm 330, a first spring 332 and a slider 334, one end of the first spring 332 is fixed to the connecting arm 330, the other end of the first spring 332 is fixed to the slider 334, and the slider 334 is in sliding connection with the connecting arm 330. One end, fixed to the first spring 332, of the connecting arm 330 is hinged with the locking rod 302, and one end, where the slider is arranged, of the connecting arm 330 is hinged to the crank through the slider 334. When the locking rod 302 jacks up other positions of the bottom of the inner tub and cannot be driven, the slider 334 will slide on the connecting arm and compresses the first spring 332, the motor can rotate through the driven highest point, the motor continues to drive the locking rod to downwards move to reset, and the locking rod re-enter the next working cycle.

[0041] A groove/an opening 339 is formed in the middle of the connecting arm, the first spring 332 and the slider 334 are connected in series and are arranged in the groove/opening 339 along the length direction, the slider 334 is in sliding connection with the groove/opening 339. One end of the first spring is fixed to the end part of the groove/opening 339, the other end of the first spring 332 is fixed to the slider 334.

[0042] Preferably, mounting columns 335 are respectively arranged at the end part of the groove/opening 339, and an end face, over against the end part, of the slider, and the two ends of the first spring separately sleeve on the mounting columns 335.

[0043] Preferably, two end faces of the mounting columns which are right against to each other are slant faces or stepped end faces. Under the condition of guaranteeing an amount of compression, the condition that the assembled length of the first spring and the mounting columns is the greatest is ensured, and thus, the spring is reliably mounted and is not prone to pop-up during compression; and compared with flat end face, the space is saved, and the occupied space in the height direction is minimum.

[0044] The locking mechanism further comprises a position switch 336, the locking rod 302 is provided with a triggering structure of the position switch. After the locking rod 302 sticks into the locking hole 301 and is locked in place, the triggering structure triggers the position switch, the position switch 336 sends out a locked-in-place signal; and after the locking rod retracts from the locking hole and is subjected to retracting resetting, the triggering structure triggers the position switch, an unlocked-in-place signal is send out, and thus, a master control board of the washing machine can control the washing machine to perform a procedure of the next step.

[0045] The position switch 336 is fixedly arranged on the slideway at the outer side of the locking rod 302 in a fixed arrangement manner; the triggering structure is arranged on the locking rod 302 and moves together with the locking rod 302. The locking rod 302 sticks into and/or leaves the locking hole 301, the triggering structure on

the locking rod triggers the position switch to send out locking rod stretching and/or leaving signals, whether the locking rod is locked in place or unlocked in place or not is accurately judged by using the position of the locking rod, the judgment is accurate, and the structure is simple.

[0046] The position switch 336 is a contact switch, a contact point of the contact switch faces to the locking rod 302, and a side face, facing to the contact, of the locking rod at least comprises two side face sections, of which vertical distance to the contact point are different. After the locking rod sticks into the locking hole and is locked-in-place, one side face section is in contact with the contact point, and the contact switch is triggered to send out a locked-in-place signal; and after the locking rod retracts to leave the locking hole and is subjected to retracting resetting, the other side face section is in contact with the contact point, the contact switch is triggered to send out an unlocked-in-place signal, so that the master control board of the washing machine can control the washing machine to perform a procedure of the next step. A joint of the two side face sections is an oblique transition face. During the retracting of the locking rod, the contact point is in contact with the oblique transition face; and by arranging the oblique transition face, the contact switching between the two side face sections and the contact can be successfully carried out, and the jamming of locking rod is avoided.

[0047] The locking rod 302 is of a column body which may be a triangular prism or poly prism, and at least comprises a first locking part 337 and a second locking part 338. The first locking part 337 and the second locking part 338 are different in diameter, and the diameter of the first locking part 337 is greater than that of the second locking part 338. After the locking rod 302 sticks into the locking hole 301 and is locked-in-place, the first locking part 337 is in contact with the contact point, and the contact switch is triggered to send out a locked-in-place signal; and after the locking rod 302 retracts to leave the locking hole 301 and is subjected to retracting resetting, the second locking part 338 is in contact with the contact point, the contact switch is triggered to send out an unlocked-in-place signal, so that the master control board of the washing machine can control the washing machine to perform a procedure of the next step. Or, after the locking rod 302 sticks into the locking hole 301 and is locked-in-place, the second locking part 338 is in contact with the contact point, and the contact switch is triggered to send out a locked-in-place signal; and after the locking rod 302 retracts to leave the locking hole 301 and is subjected to retracting resetting, the first locking part 337 is in contact with the contact point, the contact switch is triggered to send out an unlocked-in-place signal, so that the master control board of the washing machine can control the washing machine to perform a procedure of the next step. A joint of the first locking part and the second locking part is of smooth transition. During the retracting of the locking rod, the contact point is in contact with the oblique transition face; and by arranging the ob-

lique transition face, the contact switching between the locking parts of different diameter and the contact can be successfully carried out, and the sticking of locking rod is avoided.

[0048] Preferably, the locking rod 302 is of a cylinder body, which is conveniently matched with the locking hole and more easily sticks into the locking hole to lock the inner tub. The upper part of the locking rod serves as the first locking part 337, and the lower part of the locking rod serves as the second locking part 338; after the locking rod sticks into the locking hole and is locked in place, the second locking part is in contact with the contact point, and the contact switch is triggered to send out a locked-in-place signal; and after the locking rod retracts to leave the locking hole and is subjected to retracting resetting, the first locking part is in contact with the contact point, and the contact switch is triggered to send out an unlocked-in-place signal. The diameter of the first locking part is greater than that of the second locking part, the diameter changing portion is of smooth transition through a slant face, and the contact point is in contact with the oblique transition face during the retracting of the locking rod,

[0049] Or, the position switch 336 is an inductive switch, the triggering structure serves as a signal emission part, the signal emission part is arranged on the locking rod and moves together with the locking rod 302; the inductive switch is fixedly arranged at the outer side of the locking rod in a fixed arrangement manner, and an induction part of the inductive switch faces to the locking rod. The locking rod sticks into and/or leaves the locking hole, the signal emission part emitting stretching and/or leaving signals on the locking rod corresponds to the induction part of the inductive switch and triggers the inductive switch to send out locking rod stretching and/or leaving signals, whether the locking rod is locked in place or unlocked in place or not is accurately judged by using the position of the locking rod, the judgment is accurate, and the structure is simple. The signal emission part is a magnetic signal or photo-electric signal or microwave signal emission part.

[0050] A locking signal emission part and an unlocking signal emission part are separately arranged on the locking rod 302; after the locking rod 302 sticks into the locking hole 301 and is locked in place, the locking signal emission part is right against the induction part of the inductive switch, and the inductive switch receives a locking signal from the locking signal emission part and sends the locking signal to the master control board. After the locking rod leaving the locking hole and being subjected to retracting resetting, the unlocking signal emission part is right against the induction part of the inductive switch, and the inductive switch receives an unlocking signal from the unlocking signal emission part and sends the unlocking signal to the master control board.

[0051] The slideway 304 is arranged outside the locking rod and is used for guiding the locking rod 302 to move along the direction of the slideway 304, and thus,

the locking rod 302 is conveniently stretch into the locking hole 301. And the position switch 336 is arranged in the side wall of the slideway or arranged at the end part of the slideway. If the position switch 336 is arranged in the side wall of the slideway, an opening for mounting the position switch is formed in the internal wall of the slideway, and the position switch 336 is mounted in the opening.

[0052] The position switch 336 is arranged in the side wall of the slideway of the fixing seat 303 or arranged at the end part of the slideway; preferably, the position switch 336 is arranged in the through hole, which is used for enabling the locking rod 302 to pass through, of the mounting part 329 of the shell 328 of the rotating motor 324. An opening for mounting the position switch 336 is formed in the side wall of the through hole, the position switch 336 is arranged at such a position close to the rotating motor, thus, wiring is facilitated, and the wiring of the position switch 336 and the wiring of connecting wires of the rotating motor can be arranged together.

[0053] The locking mechanism further comprises a fixing shell 305, the fixing shell 305 is mounted at the upper part of the fixing seat 303 and is fixedly connected with the fixing seat 303, and the fixing shell 305 and the fixing seat 303 are threaded connection. The locking rod 302 and the slideway 304 are arranged in the fixing shell 305, and a sealing structure is arranged between the fixing shell 305 and the locking rod 302. The sealing structure is a stretchable and retractable structure, preferably a corrugated sealing sleeve 307. One end of the sealing sleeve is in sealed connection with the locking rod, and the other end of the sealing sleeve is in sealed connection with the fixing shell.

[0054] A sealing structure is arranged between the locking mechanism and the outer tub. Preferably, a first mounting hole 201 for the locking mechanism is formed in the outer tub; the fixing seat of the locking mechanism is mounted at the bottom of the outer tub, the fixing seat 303 is fixedly connected to the outer side of the bottom of the outer tub 200 through threads of bolts, screws or the like; the fixing shell of the locking mechanism is mounted in the mounting hole; the sealing structure is arranged between the fixing shell and the mounting hole. Thus, a place between the fixing shell and the mounting hole is sealed, and the sealing structure is an elastic sealing ring.

[0055] Preferably, the upper end of the first mounting hole 201 is inwards bent to form a bend, the lower end of the fixing shell is outwards bent to form a bend, the fixing shell 305 sticks into the first mounting hole 201. The upper end of the fixing shell 305 is abutted against the bend of the upper end of the first mounting hole 201, the end part of the sealing sleeve arranged between the fixing shell and the locking rod is squeezed between the upper end of the fixing shell 305 and the bend of the upper end of the first mounting hole 201 to form a seal. The lower end of the first mounting hole 201 is abutted against the bend of the lower end of the fixing shell, and

the sealing structure such as the elastic sealing ring is arranged between the lower end of the first mounting hole 201 and the bend of the lower end of the fixing shell.

[0056] The sealing structure between the fixing shell 305 and the locking rod 302 is a sealing sleeve 307 which can stretch and retract along with the stretching and retracting of the locking rod. A first end 308 of the sealing sleeve 307 is in sealed connection with the fixing shell 305, preferably, the first end of the sealing sleeve 307 is arranged between the upper end of the fixing shell 305 and the bend of the upper end of the first mounting hole 201, the sealing sleeve has elasticity and forms a seal. A second end 309 of the sealing sleeve 307 is in sealed connection with the locking rod 302, preferably, the second end 309 of the sealing sleeve 307 is squeezed to the boss of the locking rod 302 through a nut to form a seal, and thus, water in the outer tub cannot enter the fixing shell, cannot damage the locking mechanism 300 and cannot cause water leakage. Preferably, the sealing structure is a corrugated-tube-shaped sealing sleeve 307, has certain retractility, is water-impermeable and can achieve sealing. The sealing sleeve is a sealing sleeve made from an elastic material, such as a rubber sleeve.

[0057] A third end 310 extends from the second end 309 of the sealing sleeve 307 along the axial direction and is in sealed connection with the lower end of the fixing shell 305, and the extending part is a sealing sleeve capable of stretching and retracting along with the stretching and retracting of the locking rod, preferably a corrugated-tube-shaped sealing sleeve. The extending sealing sleeve exerts a secondary sealing action, even if the seal presents a problem, the extending sealing sleeve can further play a role in sealing, thus, the safety is improved, and water leakage is avoided. Preferably, the lower end of the fixing shell 305 and the fixing seat squeeze the third end 310 to form a seal.

[0058] The above-mentioned embodiments are only preferred embodiments of the present disclosure, and it should be noted that various alterations and improvements may be made therein by those of ordinary skill in the art without departing from the principle of the present disclosure and should also fall within the scope of protection of the present disclosure.

Claims

1. A locking mechanism for an inner tub comprising a locking rod capable of reciprocating along an axial direction, a slideway for a movement of the locking rod and a driving unit for driving the locking rod to move, and the driving unit comprising a link, a crank and a rotating motor;
wherein, a bearing is arranged between the locking rod and the slideway.
2. The locking mechanism for the inner tub according

to claim 1, wherein, the locking mechanism further comprises a fixing seat, the slideway is arranged at a centre of the fixing seat, the bearing is arranged in the slideway;

preferably, an outer ring of the bearing is interference fit with the slideway.

3. The locking mechanism for the inner tub according to claim 1 or claim 2, wherein the bearing is an oil-retaining bearing, the oil-retaining bearing is arranged in the slideway, an outer ring of the oil-retaining bearing is fixed with the slideway, and the locking rod is provided within an inner ring of the oil-retaining bearing.

4. The locking mechanism for the inner tub according to claim 1 or claim 2, wherein the bearing is a linear bearing, the linear bearing is arranged in the slideway, an outer ring of the linear bearing is fixed with the slideway, and the locking rod is provided within an inner ring of the linear bearing;
preferably, the linear bearing is a rolling bearing.

5. The locking mechanism for the inner tub according to any one of claims 1 to 4, wherein an idle stroke is arranged between the link and the crank and/or between the link and the locking rod.

6. The locking mechanism for the inner tub according to claim 5, wherein the idle stroke is a movement space arranged along a length direction of the link, and a connecting end of the crank and/or the locking rod moves in the movement space, and a locking state does not change.

7. The locking mechanism for the inner tub according to claim 6, wherein the link is a connecting arm, hinged holes are respectively formed in two ends of the connecting arm, the hinged hole of one end of the connecting arm is hinged to an end part of the locking rod, and the hinged hole of another end of the connecting arm is hinged with the crank, and one or both of the hinged holes are elliptical hole.

8. The locking mechanism for the inner tub according to claim 6, wherein the link comprises a connecting arm, a first spring and a slider, one end of the first spring is fixed to the connecting arm, another end of the first spring is fixed to the slider, the slider is in sliding connection with the connecting arm;
one end, fixed to the first spring, of the connecting arm is hinged with the locking rod, and one end, where the slider is arranged, of the connecting arm is hinged to the crank through the slider,
preferably, a groove/an opening is formed in a middle of the connecting arm, the first spring and the slider are connected in series and are arranged in the groove/opening along the length direction, the slider

is in sliding connection with the groove/opening, one end of the first spring is fixed to an end part of the groove/opening, another end of the first spring is fixed to the slider,

preferably, mounting columns are respectively arranged at the end part of the groove/opening and an end face, over against the end part, of the slider, and the two ends of the first spring separately sleeve on the mounting columns,
preferably, two end faces of the mounting columns which are right against to each other are slant faces or stepped end faces.

9. The locking mechanism for the inner tub according to any one of claims 2 to 8, wherein a boss is arranged at an upper part of the locking rod, a second spring is arranged below a lower part of the boss, one end of the second spring is in contact with a lower surface of the boss, another end of the second spring is fixed,
the second spring is compressed when the locking rod moves downward,
preferably, the another end of the second spring is fixed with the fixing seat.
10. A washing machine with the locking mechanism according to any one of claims 1 to 9.

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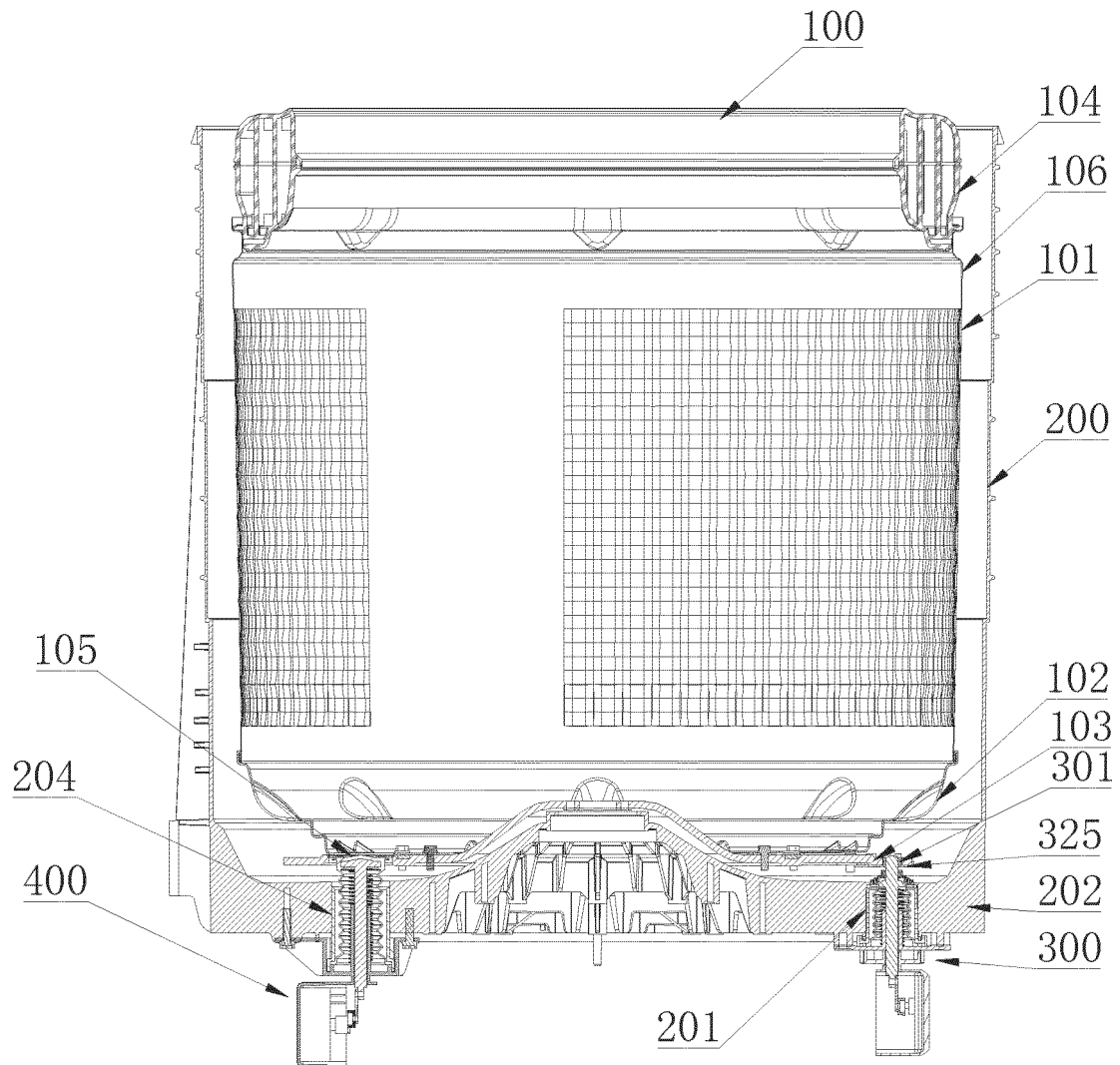


Fig. 1

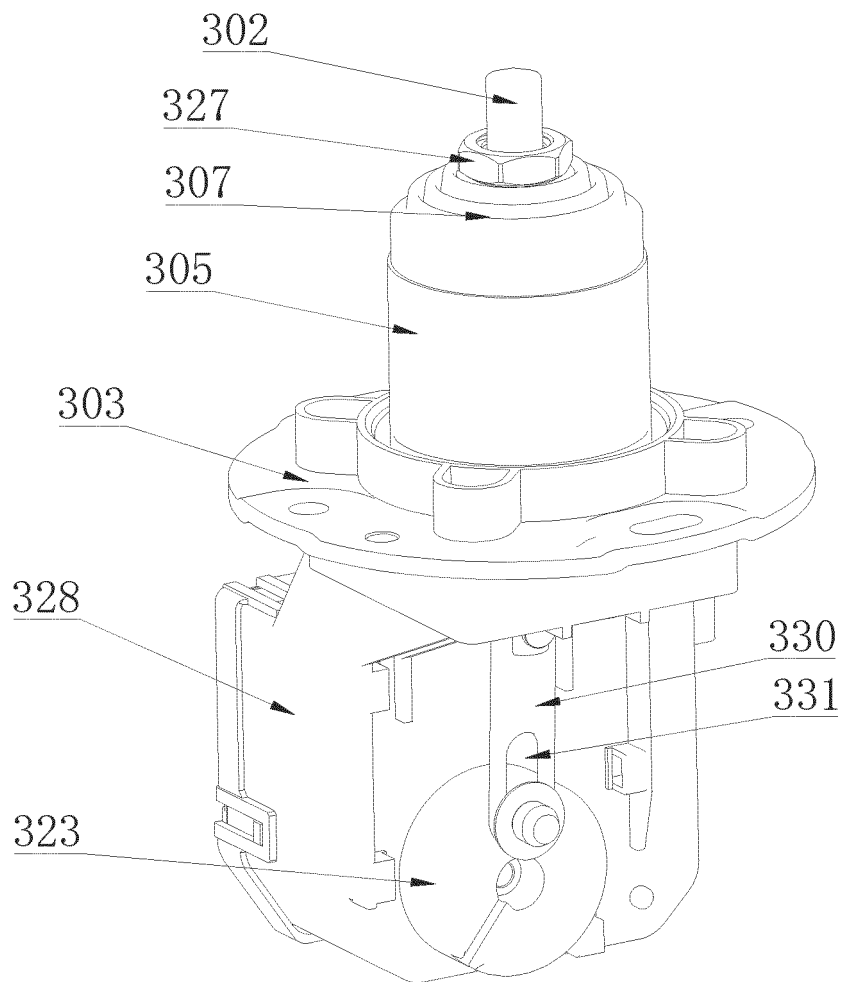


Fig. 2

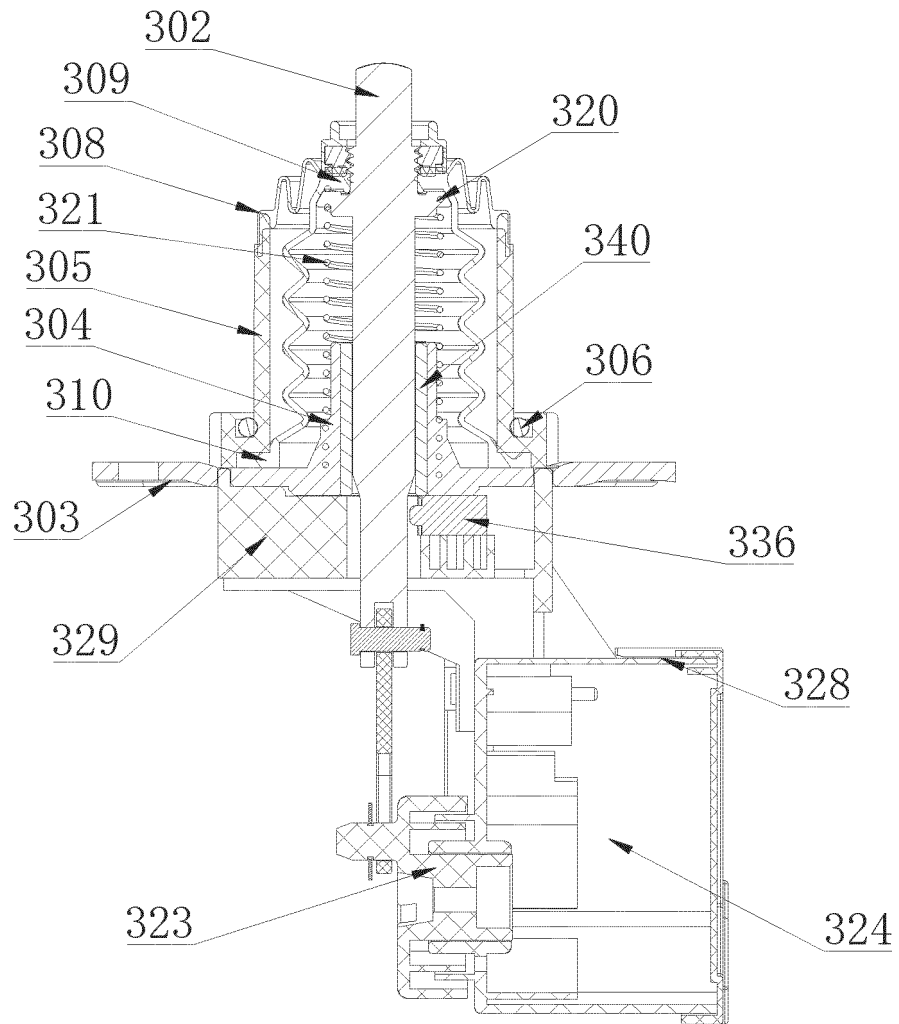


Fig. 3

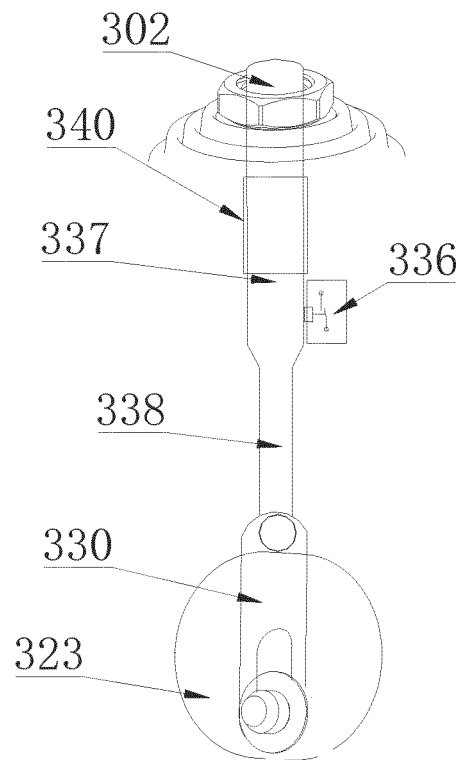


Fig. 4

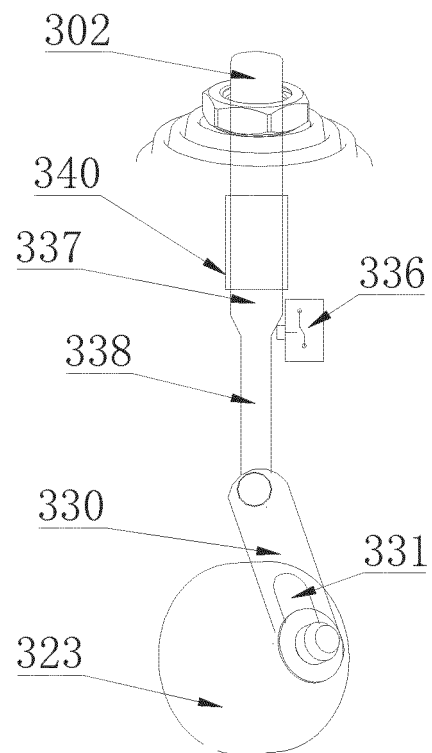


Fig. 5

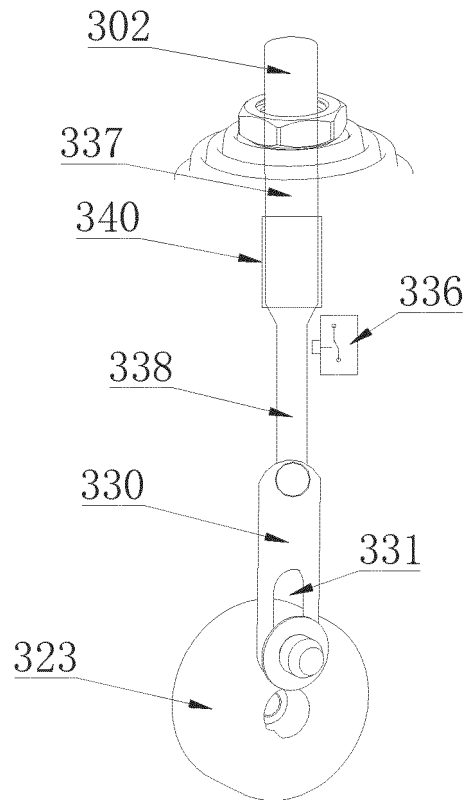


Fig. 6

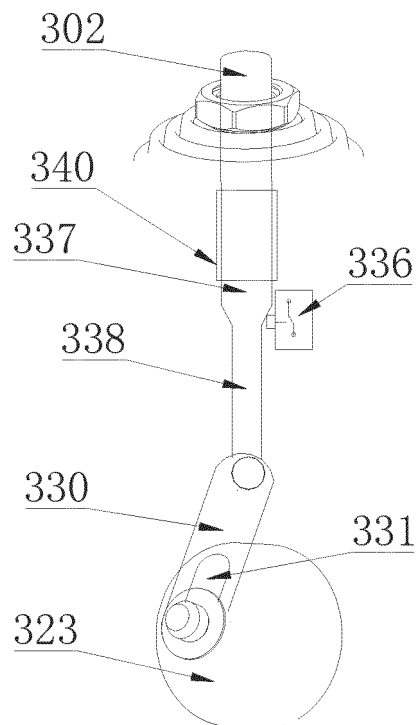


Fig. 7

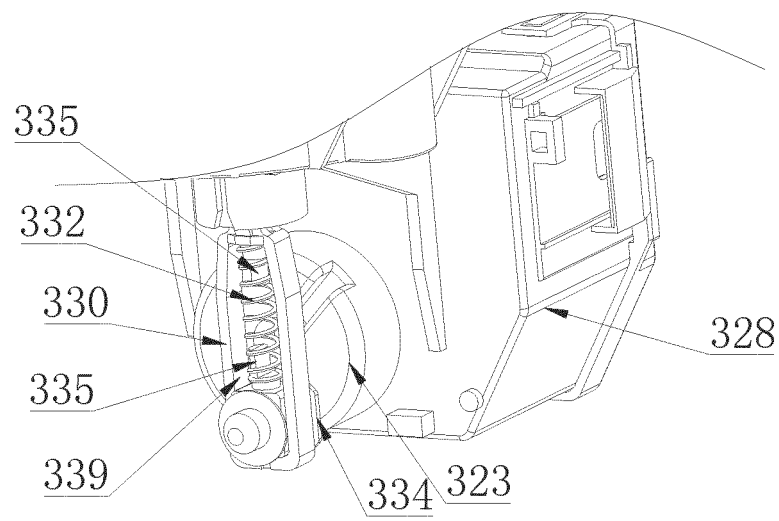


Fig. 8

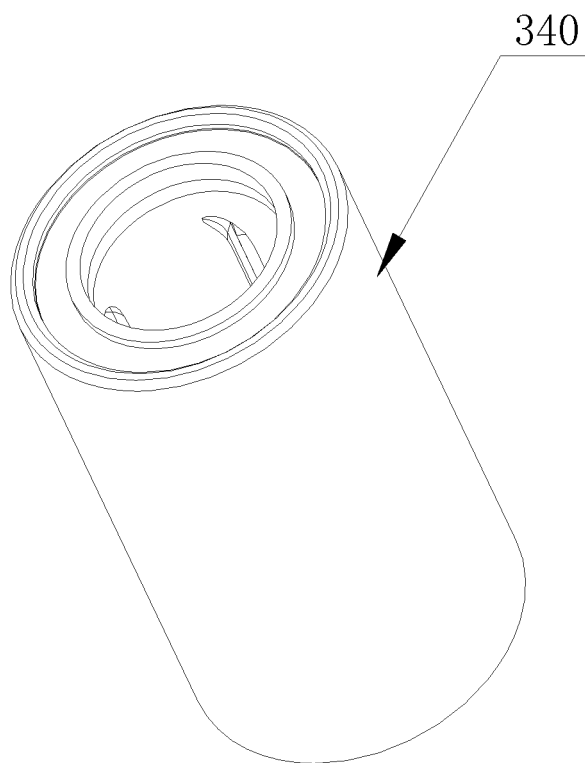


Fig. 9

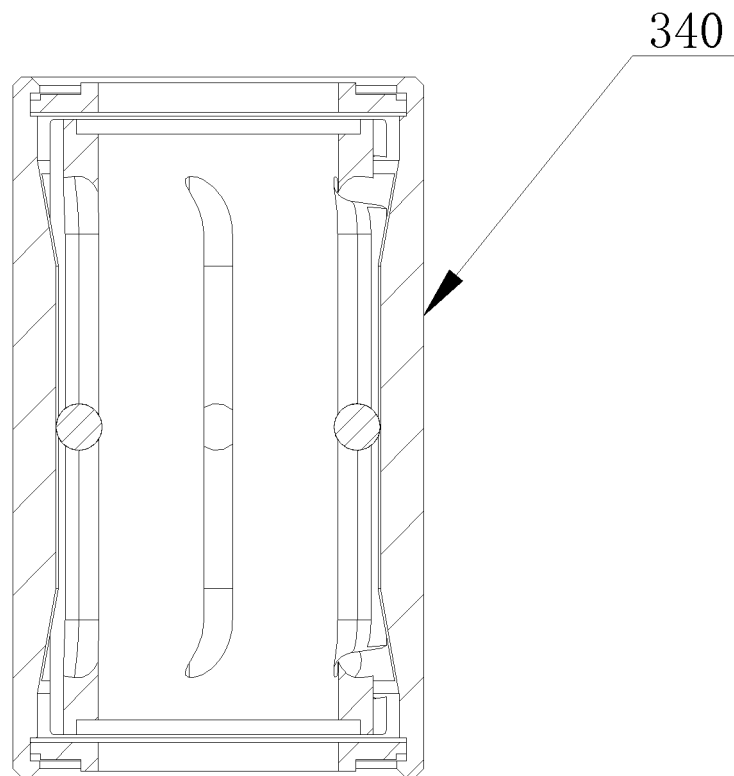


Fig. 10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2016/103553

A. CLASSIFICATION OF SUBJECT MATTER

D06F 39/00 (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, SIPOABS, DWPI: internal groove, lock, ock, fix, block, bearing, electric engine, drive, slideway, drum, lock???, brace, winch,
rod, bar, connecting, side, crank

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 105177928 A (XU, Dingshan) 23 December 2015 (23.12.2015) description, paragraphs [0025]-[0027] and figures 1-7	1-10
PX	CN 205024469 U (XU, Dingshan) 10 February 2016 (10.02.2016) description, paragraphs [0025]-[0027] and figures 1-7	1-10
A	CN 101729012 A (HEFEI RONGSHIDA SANYO ELECTRIC CO., LTD.) 09 June 2010 (09.06.2010) description, paragraphs [0004]-[0009] and figure 1	1-10

☐ 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	
"E" earlier application or patent but published on or after the international filing date	"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
"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)	"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
"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	"&" document member of the same patent family

Date of the actual completion of the international search 12 January 2017	Date of mailing of the international search report 20 January 2017
Name and mailing address of the ISA 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

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2016/103553

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 105177928 A	23 December 2015	None	
CN 205024469 U	10 February 2016	None	
CN 101729012 A	09 June 2010	None	

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 200420107890 [0003]