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(54) **WASHING MACHINE AND CONTROL METHOD**

(57) A washing machine and a control method. The washing machine comprises an outer cylinder (13), and an inner cylinder (1). A gimbal ring is disposed at a cloth dropping port of the inner cylinder (1). The gimbal ring is a round ring structure. A water input port (2) is disposed on an inner circumference of the gimbal ring, so that water can enter the gimbal ring to function as equilibrium liquid to balance a load offset, and at least one water drainage port (8) that can be opened and closed is disposed on an outer circumference of the gimbal ring; or the inside of the gimbal ring is a hollow cavity, and the washing machine is also provided with a water input structure and a water drainage structure, the water input structure being used for inputting water to the hollow cavity to balance a load offset, and the water drainage structure being used for draining away water in the gimbal ring. The inside of the gimbal ring has no fixed fillings, which can reduce the weight of the gimbal ring. When the washing machine works, the washing machine does not need to drive the fillings in the gimbal ring to rotate, which reduces power consumption. A proper amount of water is input according to the measured load offset, which solves a problem that the amount of the fillings inside the gimbal ring of an ordinary washing machine cannot be changed, thereby accurately controlling the balance, reducing the distribution times, and shortening the dehydration time.

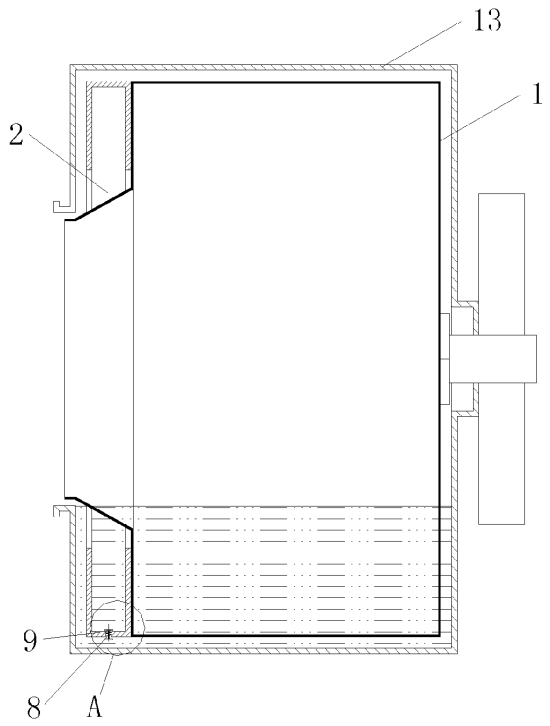

FIG. 1

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Description

BACKGROUND

Technical Field

[0001] The present invention relates to the field of washing machines, and in particular, to a washing machine and a control method of same.

Related Art

[0002] An existing washing machine mostly uses a sealed gimbal ring, and filler therein uses liquid or substances such as a steel ball and a steel ingot, which is filled in a cavity of the gimbal ring. When the washing machine performs dehydration at a high speed, according to a vibration point, the filler that can move in the cavity of the gimbal ring will automatically slide to a position eccentrically symmetric to the load of the washing machine, thereby reducing the overall eccentricity and reducing the vibration noise. The eccentricity distributed during each work of the washing machine differs, especially when loads having a large water absorption capability, such as cotton-padded clothes, are dehydrated, the gimbal ring having fixed filler cannot completely balance the eccentric mass. Meanwhile, when less loads or clothes having a small water absorption capability are dehydrated, the eccentricity is small, and the quantity of the filler in the gimbal ring will have a negative effect on the vibration during low-speed rotation or distribution and eccentricity calculation, which greatly affects the eccentric effect.

[0003] The existing washing machine uses the movement of the filler in the gimbal ring to balance the eccentricity, the internal filler is sealed inside the gimbal ring, and the internal filler is liquid or substances such as steel balls or steel ingots, so that it is required that the leakproofness of the gimbal ring is rather high. The service life of a washing machine is up to dozens of years, and the requirements on the manufacturing process of the gimbal ring are high; therefore, the cost is high, and the production efficiency is relatively low. Moreover, the weight of the gimbal ring together with the filler therein is very large, which brings some difficulties in assembling of the washing machine.

[0004] The patent invention with the application No. 200910158225.9 disclosed a gimbal ring device for a roller washing machine, the gimbal ring device includes at least two annular chambers which are coaxial with a roller and disposed at an edge of the roller, where at least one chamber is a spherical gimbal ring provided with a ball, and at least one chamber is a liquid gimbal ring provided with a flowing liquid; by using the two different counterweights, that is, the ball and the liquid, at least two balance forces having different reaction speeds are generated respectively, thereby improving the balance state of rotation of the roller of the washing machine during dehydration. When the rotation speed is lower than a resonance point of the roller and the outer cylinder, the liquid gimbal ring absorbs the vibration; when the rotation speed is stabilized with the resonance point, the spherical gimbal ring exerts the high vibration absorption performance to absorb the vibration of the outer cylinder; for the eccentricity exceeding the total amount of the spherical gimbal ring, the liquid gimbal ring is used to absorb the vibration. The gimbal ring device can inhibit the vibration amplitude of the outer cylinder when it is started and it rotates stably, thereby implementing low vibration, low noise and low cost. However, in the above patent, once the gimbal ring is assembled to the washing machine, the mass of the internal counterweight is determined, and cannot be adjusted according to the load offset of the washing machine; moreover, in the working process of the washing machine, the counterweight inside the gimbal ring also needs to be driven to rotate, which wastes the driving energy consumption of the motor.

[0005] Therefore, the present invention is provided.

SUMMARY

[0006] An objective of the present invention is to overcome the defects of the prior art, and provide a washing machine, the washing machine includes an outer cylinder and an inner cylinder, where a cloth dropping port of the inner cylinder is provided with a gimbal ring, the inside of the gimbal ring is hollow and has no fixed filler, thereby reducing the weight of the gimbal ring; during working of the washing machine, it is not needed to drive the filler inside the gimbal ring to rotate together, thereby reducing the energy consumption. An appropriate quantity of water may be injected according to the measured load offset to balance the load, so as to solve the problem of a common washing machine that the quantity of the filler inside the gimbal ring cannot be changed, thereby precisely controlling the balance, reducing the number of distributions, and greatly reducing the time of dehydration.

[0007] Another objective of the present invention is to provide a control method of the washing machine.

[0008] To implement the objectives, the present invention adopts the following technical solutions: a washing machine is provided, the washing machine includes an outer cylinder and an inner cylinder, where a cloth dropping port of the inner cylinder is provided with a gimbal ring, the gimbal ring is a round ring structure, an inner circumference of the gimbal ring is provided with a water input port configured to supply water into the gimbal ring to serve as an equilibrium liquid to balance the load offset, and an outer circumference of the gimbal ring is provided with at least one water drainage port that can be opened and closed.

[0009] The water input port is a round of annular water input ports disposed on the inner circumference of the gimbal ring, a water injection component is disposed corresponding to the water input port, the water injection component is a pipe fixed to the outer cylinder or a shell

of the washing machine, one end of the pipe is inserted into the water input port of the gimbal ring and is not in contact with a wall of the gimbal ring, and the other end of the pipe is in communication with a running water and/or washing water pipeline.

[0010] The water injection component is a pipe fixedly connected to the outer cylinder, the bottom of the outer cylinder is provided with a drainage chamber that can reserve a part of washing water, one end of the pipe is inserted into the water input port of the gimbal ring and is not in contact with a wall of the gimbal ring, and the other end is in communication with the drainage chamber through a drainage pump that can pump water flows.

[0011] A filter screen is disposed at a junction of the drainage chamber and the water injection component, and the bottom of the drainage chamber is further provided with a water outlet in communication with a drainage pipeline of the washing machine.

[0012] The outer circumference of the gimbal ring is provided with 2 to 10 water drainage ports configured to discharge an equilibrium liquid, and the water drainage port is provided with a drainage valve that can control open and close of the water drainage port.

[0013] The drainage valve is an automatic opening and closing structure, the drainage valve includes a spring and a baffle, the spring is located in the water drainage port, one end of the spring is connected to an outer end of the water drainage port, the other end is connected to the baffle, the baffle is located inside the gimbal ring, the shape of the baffle matches with the shape of the water drainage port, and when the spring is in a free state, the water drainage port keeps open.

[0014] The drainage valve is an automatic opening and closing structure, the section of the water drainage port is "V"-shaped, and a movable ball valve spool is disposed inside the "V"-shaped water drainage port.

[0015] A control method of the washing machine is provided, where water is injected into the gimbal ring through the gimbal ring water input port, so as to balance the load offset of the inner cylinder during dehydration.

[0016] After dehydration distribution, washing water is discharged from the washing machine, the washing water entering the gimbal ring through the gimbal ring water input port balances the load offset during dehydration of the inner cylinder, and after the dehydration ends, the washing water in the gimbal ring is discharged through the water drainage port.

[0017] Before the dehydration distribution, the washing water is discharged, and during the dehydration distribution, according to the load offset of the inner cylinder, running water suitable to the eccentricity is injected into the gimbal ring through the gimbal ring water input port, so as to balance the eccentricity of the load inside the inner cylinder during the dehydration, and after the dehydration ends, the running water inside the gimbal ring is discharged through the water drainage port.

[0018] Before the dehydration distribution, the washing water is discharged, and a part of washing water is reserved in the drainage chamber; during the dehydration distribution, according to the load offset of the inner cylinder, the drainage pump injects washing water suitable to the load offset into the gimbal ring through the gimbal ring water input port, so as to balance the eccentricity of the internal load of the inner cylinder during the dehydration, and after the dehydration ends, the washing water in the gimbal ring is discharged through the water drainage port.

[0019] During dehydration, the inner cylinder rotates at a high speed, the centrifugal force generated by the rotation is greater than the resistance of the spring, so that the baffle compresses the spring, the baffle closely attaches an inner wall of the gimbal ring to enclose the water drainage port, when the dehydration ends, the inner cylinder gradually stops rotation, the centrifugal force gradually reduces along with the reduction of the speed, when the centrifugal force is less than the restoring force of the spring, the restoring force of the spring resets the baffle, and the equilibrium liquid inside the gimbal ring is discharged through the water drainage port; or, during dehydration, the centrifugal force generated by high-speed rotation of the inner cylinder is greater than the buoyancy force of the ball valve spool, the ball valve spool closely attaches the inner wall of the "V"-shaped water drainage port to enclose the water drainage port, when the dehydration ends, the inner cylinder gradually stops rotation, and the centrifugal force gradually reduces along with the reduction of the speed, when the centrifugal force is less than the buoyancy force of the ball valve spool, the ball valve spool is in a free active state, and the equilibrium liquid inside the gimbal ring is discharged through the water drainage port.

[0020] A washing machine is provided, the washing machine includes an outer cylinder and an inner cylinder, where an opening of the inner cylinder is provided with a gimbal ring, the gimbal ring is a round ring structure, the inside of the gimbal ring is a hollow chamber, and the washing machine is further provided with a water intake structure configured to inject water into the hollow chamber to balance the load offset and a drainage structure configured to discharge the water in the gimbal ring.

[0021] The water intake structure extends from the gimbal ring at the front end opening of the inner cylinder to an inner cylinder shaft at the rear end of the inner cylinder along an outer surface of a sidewall of the inner cylinder, and is in communication with a water intake end of the washing machine through the internal of the inner cylinder shaft; the drainage structure extends from the gimbal ring at the front end opening of the inner cylinder to an inner cylinder shaft at the rear end of the inner cylinder along an outer surface of a sidewall of the inner cylinder, and is in communication with a drainage end of the washing machine through the internal of the inner cylinder shaft.

[0022] The water intake structure includes an intake pump that is located at the rear portion of the washing machine and configured to transmit water flows and an

intake waterway that is in communication with the intake pump and the gimbal ring and configured to inject water into the gimbal ring, the drainage structure includes a controllable stop valve that is located at the rear portion of the washing machine and configured to control opening and closing of the drainage structure and a drainage waterway that is in communication with the controllable stop valve and the gimbal ring and configured to discharge the water in the gimbal ring.

[0023] The outer circumference of the gimbal ring is provided with a water drainage port, one end of the drainage waterway is connected to the water drainage port and the other end is connected to the controllable stop valve, an end face of the gimbal ring close to the inner circumference of the gimbal ring is provided with a water inlet, one end of the intake waterway is connected to the water inlet and the other end is connected to the intake pump.

[0024] The intake waterway includes an intake pipe that is located at an outer surface of the sidewall of the inner cylinder and rotates together with the inner cylinder, a first rotation connector that is located in the outer cylinder axle sleeve and is fixed, where a first annular sink is disposed at a junction of the inner cylinder shaft and the first rotation connector, the first annular sink is in communication with the intake pipe, and the other end of the first rotation connector is in communication with the water intake end of the washing machine through the intake pump.

[0025] The drainage waterway includes a drainage pipe that is located at the outer surface of the sidewall of the inner cylinder and rotates together with the inner cylinder, and a second rotation connector that is located in the outer cylinder axle sleeve and is fixed, where a second annular sink is disposed at a junction of the inner cylinder shaft and the second rotation connector, the second annular sink is in communication with the drainage pipe, and the other end of the second rotation connector is in communication with the water drainage end of the washing machine through the controllable stop valve.

[0026] The inner circumference of the gimbal ring is provided with at least one vent hole.

[0027] A control method of the washing machine is provided, where water is injected into the gimbal ring through the water intake structure, so as to balance the load offset of the inner cylinder during dehydration, and the water in the gimbal ring is discharged through the drainage structure to reduce the mass of the gimbal ring.

[0028] During dehydration distribution, a control board of the washing machine calculates or measures the load offset inside the inner cylinder, and controls the intake pump to pump water corresponding to the load offset into the gimbal ring, so as to balance the eccentricity of the load inside the inner cylinder, and after the dehydration ends, the control board of the washing machine controls the controllable stop valve to be open, and the water inside the gimbal ring is discharged through a drainage end of the washing machine under the action of the centrifugal force.

[0029] The control board of the washing machine controls the rotation speed of the inner cylinder to rise to a high rotation speed, and controls water injection into the washing machine gimbal ring to balance the load offset, and the high rotation speed is a rotation speed higher than 75 rpm.

[0030] By means of the technical solution of the present invention, the following benefits are achieved:

1. The inside of the gimbal ring is hollow and does not have any fixed filler, which greatly reduces the weight of the gimbal ring, and it is not needed to consider sealing, so that the manufacturing process of the gimbal ring is simplified, the manufacturing cost is reduced, and the production efficiency is improved.

2. The drainage valve of the gimbal ring of the present invention is automatically controlled by the centrifugal force, external control is not required, and the structure is simple.

3. During work of the washing machine of the present invention, it is not required to drive the filler in the gimbal ring to rotate together, thereby reducing the energy consumption.

4. The washing machine of the present invention injects appropriate quantity of equilibrium liquid according to the measured load offset, or inject water into the gimbal ring through the intake waterway and the drainage waterway to conveniently balance the load offset, the quantity of the filler inside the gimbal ring is variable, so as to avoid the unbalanced effect caused by insufficient filler or excessive balance due to excessive filler, thereby solving the problem that the quantity of the filler inside the gimbal ring of the common washing machine cannot be changed.

5. The washing machine of the present invention precisely control the balance, removes the eccentricity, reduces the vibration and noise of dehydration, reduces the number of distributions, and greatly reduces the dehydration time.

6. In the gimbal ring of the present invention, the rotation connector and the annular sink convert the intake waterway and the drainage waterway that rotate together with the inner cylinder into a water intake end and a drainage end that are fixed and do not rotate, being convenient for water injection and drainage.

[0031] Specific implementation manners of the present invention are described in further detail through the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032]

FIG. 1 is a structural assembly diagram of a water input port-type gimbal ring and a washing machine according to the present invention;

FIG. 2 is an enlarged diagram of A of FIG. 1;

FIG. 3 is a structural assembly diagram of a water input port-type gimbal ring and a washing machine according to another embodiment of the present invention;

FIG. 4 is an enlarged diagram of B of FIG. 3;

FIG. 5 is a schematic diagram of balance of an internal load of a washing machine and balance water according to the present invention;

FIG. 6 is a flow chart of dehydration of a washing machine according to the present invention;

FIG. 7 is a structural assembly diagram of an active water injection gimbal ring and a washing machine according to the present invention;

FIG. 8 is an enlarged diagram of A of FIG. 7;

FIG. 9 is an enlarged diagram of B of FIG. 7;

FIG. 10 is an enlarged diagram of C of FIG. 7; and

FIG. 11 is a flow chart of dehydration of a washing machine according to the present invention.

[0033] In the drawings, 1. Inner cylinder, 2. Water input port, 3. Drainage chamber, 4. Drainage pump, 5. Water injection component, 6. Filter screen, 7. Water outlet, 8. Water drainage port, 9. Drainage valve, 10. Spring, 11. Baffle, 12. Second baffle, 13. Outer cylinder, 14. Bump, 15. Connection member, 16. Load, 17. Balance water, 18. Ball valve spool, 20. Drainage pipe, 21. Controllable stop valve, 22. Intake pipe, 23. Intake pump, 24. Water inlet, 25. Vent hole, 26. Second rotation connector, 27. Second annular sink, 28. First rotation connector, 29. First annular sink, 30. Outer cylinder axle sleeve, 31. Inner cylinder shaft.

DETAILED DESCRIPTION

[0034] As shown in FIG. 1, a washing machine of the present invention is provided, the washing machine includes an outer cylinder 13 and an inner cylinder 1, where a cloth dropping port of the inner cylinder 1 is provided with a gimbal ring, the gimbal ring is a round ring structure having a water input port, an inner circumference of the gimbal ring is provided with a water input port 2 configured to supply water into the gimbal ring to serve as an equilibrium liquid to balance the load offset, and an outer circumference of the gimbal ring is provided with at least one water drainage port 8 that can be opened and closed. In washing and rinsing processes of the washing machine, there is no water in the gimbal ring, and during dehydration distribution, the water enters the internal of the gimbal ring through the water input port 2, so as to balance the load offset (referring to FIG. 5).

[0035] The water input port 2 is configured as a round of annular water input port disposed on the inner circumference of the gimbal ring, a water injection component is disposed corresponding to the water input port, the water injection component 5 is a pipe fixed to the outer cylinder 13 or a shell of the washing machine, one end of the pipe is inserted into the water input port of the gimbal ring and is not in contact with a wall of the gimbal ring to avoid noise generated by relative movement during contact, and the other end of the pipe is in communication with a running water and/or washing water pipeline. The running water and/or washing water may be used to balance the load offset.

[0036] The water input port 2 is configured as a round of annular water input port disposed on the inner circumference of the gimbal ring, a water injection component is disposed corresponding to the water input port, the water injection component 5 is a pipe fixed to the outer cylinder 13 and/or a shell of the washing machine, one end of the pipe is inserted into the water input port of the gimbal ring and is not in contact with a wall of the gimbal ring to avoid noise generated by relative movement during contact, and the other end of the pipe is in communication with the running water. The running water may be used to balance the load offset.

[0037] The water injection component 5 is a pipe fixedly connected to the outer cylinder 13, the bottom of the outer cylinder 13 is provided with a drainage chamber 3 that can reserve a part of washing water, one end of the pipe is inserted into the water input port of the gimbal ring and is not in contact with the wall of the gimbal ring, and the other end is in communication with the drainage chamber 3 through a drainage pump 4 that can pump water flows. During drainage of the washing water in the washing inner cylinder 1, a part of the washing water is reserved in the drainage chamber 3, and during the dehydration distribution, the washing machine pumps corresponding quantity of washing water into the gimbal ring according to the internal load offset, so as to balance the load offset.

[0038] A junction of the drainage chamber 3 and the water injection component assumes an inclined surface, a filter screen 6 is disposed at the junction, and the bottom of the drainage chamber 3 is further provided with a water outlet 7 in communication with a drainage pipeline of the washing machine. The filter screen functions to filter lint, thereby avoiding the lint in the washing water from entering the gimbal ring pipeline 5 to block the gimbal ring

pipeline 5, and the water outlet 7 at the bottom of the drainage chamber 3 may discharge the residual washing water when the washing water is no longer required inside the gimbal ring after the dehydration distribution is completed.

[0039] The outer circumference of the gimbal ring is provided with 2 to 10 water drainage ports 8 configured to discharge the equilibrium liquid, and the water drainage port is provided with a drainage valve 9 that can control opening and closing of the water drainage port 8. Preferably, there are 3 water drainage ports 8 uniformly distributed to the outer circumference of the gimbal ring.

[0040] The drainage valve is an automatic opening and closing structure, the drainage valve 9 includes a spring 10 and a baffle 11, the spring 10 is located in the water drainage port 8, one end of the spring 10 is connected to an outer end of the water drainage port 8, the other end is connected to the baffle 11, the baffle 11 is located inside the gimbal ring, and there is a gap between the baffle 11 and an inner wall of the gimbal ring.

[0041] The shape of the baffle 11 matches with the shape of the water drainage port 8, the area of the baffle 11 is greater than the area of the water drainage port, the length of the spring 10 in a free state is greater than the thickness of the gimbal ring, and the length of the spring in an extreme compression state is less than the thickness of the gimbal ring. When the washing inner cylinder 1 does not rotate, the spring 10 is in a naturally stretched state, and there is a gap between the baffle 11 and the inner wall of the gimbal ring, that is, the drainage valve 9 is in an open state. When the washing inner cylinder 1 rotates, because of the centrifugal force, the baffle 11 compresses the spring 10 until the baffle 11 is attached to the inner wall of the gimbal ring, and the drainage valve 9 is in a closed state.

[0042] The drainage valve 9 may also be a solenoid valve, and the solenoid valve is electrically connected to a control board of the washing machine, and controls open and close of the solenoid valve through an electromagnetic signal.

[0043] A control method of a washing machine having a water input port-type gimbal ring injects water into the gimbal ring through the gimbal ring water input port 2, so as to balance the load offset during dehydration of the inner cylinder 1.

[0044] After dehydration distribution, the washing water is discharged from the washing machine, and the washing water entering the gimbal ring through the gimbal ring water input port 2 balances the load offset of the inner cylinder 1 during the dehydration, and after the dehydration ends, the washing water in the gimbal ring is discharged through the water drainage port 8.

[0045] Before the dehydration distribution, the washing water is discharged, and during the dehydration distribution, the washing machine calculates the load offset in the inner cylinder 1, and injects running water corresponding to the eccentricity into the gimbal ring through the gimbal ring water input port 2, so as to balance the eccentricity of the internal load during dehydration of the inner cylinder 1, and after the dehydration ends, the running water in the gimbal ring is discharged through the water drainage port 8.

[0046] Before the dehydration distribution, the washing water is discharged, and a part of washing water is reserved in the drainage chamber, during the dehydration distribution, the washing machine calculates the load offset in the inner cylinder 1, the drainage pump 4 injects washing water corresponding to the load offset into the gimbal ring through the gimbal ring water input port 2, so as to balance the eccentricity of the internal load during dehydration of the inner cylinder 1, and after the dehydration, the washing water in the gimbal ring is discharged through the water drainage port 8.

[0047] During the dehydration, the inner cylinder 1 rotates at a high speed, the centrifugal force generated by the rotation is greater than the resistance of the spring 10, so that the baffle 11 compresses the spring 10, and the baffle 11 closely attaches the inner wall of the gimbal ring to enclose the water drainage port 8; when the dehydration ends, the inner cylinder 1 gradually stops rotation, the centrifugal force gradually reduces along with the reduction of the speed, when the centrifugal force is less than the restoring force of the spring 10, the restoring force of the spring 10 resets the baffle 11, and the equilibrium liquid inside the gimbal ring is discharged through the water drainage port 8.

[0048] As shown in FIG. 7, the present invention provides a washing machine, the washing machine includes an outer cylinder 13 and an inner cylinder 1, an opening of the inner cylinder 1 is provided with a gimbal ring, the gimbal ring is a round ring structure, it is an active water injection-type gimbal ring, the inside of the gimbal ring is a hollow chamber, and the washing machine is further provided with a water intake structure configured to inject water into the hollow chamber to balance the load offset and a drainage structure configured to discharge the water in the gimbal ring; during the dehydration distribution of the washing machine, a control board injects water into the gimbal ring through the water intake structure according to the magnitude of the load offset, so as to balance the load offset (referring to FIG. 5); and after the dehydration ends, the drainage structure discharges water in the gimbal ring, and during washing and rising of the washing machine, it is not required to drive the filler in the gimbal ring to rotate, thereby reducing the mass of the inner cylinder and reducing the drive energy consumption.

[0049] The water intake structure extends from the gimbal ring at the front end opening of the inner cylinder 1 to an inner cylinder shaft at the rear end of the inner cylinder 1 along an outer surface of a sidewall of the inner cylinder 1, and is in communication with a water intake end of the washing machine through the internal of the inner cylinder shaft; the drainage structure extends from the gimbal ring at the front end opening of the inner cylinder 1 to an inner cylinder shaft at the rear end of the

inner cylinder 1 along an outer surface of a sidewall of the inner cylinder 1, and is in communication with a drainage end of the washing machine through the internal of the inner cylinder shaft.

the water intake structure includes an intake pump 23 that is located at the rear portion of the washing machine and configured to transmit water flows and an intake waterway that is in communication with the intake pump 23 and the gimbal ring and configured to inject water into the gimbal ring, the drainage structure includes a controllable stop valve 21 that is located at the rear portion of the washing machine and configured to control opening and closing of the drainage structure and a drainage waterway that is in communication with the controllable stop valve 21 and the gimbal ring and configured to discharge the water in the gimbal ring. The intake pump 23 can provide power to pump the water into the internal of the gimbal ring, and the controllable stop valve 21 controls the drainage structure to discharge the water in the gimbal ring when filler is not needed in the gimbal ring, thereby avoiding the gimbal ring from rotating along with the filler to waste the energy. The controllable stop valve 21 may be a solenoid valve, and the solenoid valve is electrically connected to the control board of the washing machine.

[0050] As shown in FIG. 9 and FIG. 10, the outer circumference of the gimbal ring is provided with a water drainage port 8, one end of the drainage waterway is connected to the water drainage port 8 and the other end is connected to the controllable stop valve 21, an end face of the gimbal ring close to the inner circumference of the gimbal ring is provided with a water inlet 23, one end of the intake waterway is connected to the water inlet 23 and the other end is connected to the intake pump 23. The water drainage port 8 is disposed on the outer circumference of the gimbal ring (referring to FIG. 10), after the controllable stop valve 21 is opened, the water in the gimbal ring rotates together with the gimbal ring and is then discharged under the action of the centrifugal force, the drainage pump is not needed, and the water inlet 23 is disposed at the end face of the gimbal ring, and preferably, disposed at a front end face of the gimbal ring (referring to FIG. 9) to facilitate entering of the water flow, or disposed at a position near the inner circumference of the gimbal ring (referring to FIG. 9), so that more water can enter into the gimbal ring to balance a large load offset.

[0051] The intake waterway includes an intake pipe 22 that is located at an outer surface of the sidewall of the inner cylinder 1 and rotates together with the inner cylinder 1, a first rotation connector 28 that is located in the outer cylinder axle sleeve 30 and is fixed, where a first annular sink 29 is disposed at a junction of the inner cylinder shaft 31 and the first rotation connector 28, the first annular sink 29 is in communication with the intake pipe 22, and the other end of the first rotation connector 28 is in communication with the water intake end of the washing machine through the intake pump 23.

[0052] The drainage waterway includes a drainage pipe 20 that is located at the outer surface of the sidewall of the inner cylinder 1 and rotates together with the inner cylinder 1, and a second rotation connector 26 that is located in the outer cylinder axle sleeve 30 and is fixed, where a second annular sink 27 is disposed at a junction of the inner cylinder shaft 31 and the second rotation connector 26, the second annular sink 27 is in communication with the drainage pipe 20, and the other end of the second rotation connector 26 is in communication with the water drainage end of the washing machine through the controllable stop valve.

[0053] Because the water inlet 23 and the water drainage port 8 are disposed at fixed positions on the gimbal ring, when the gimbal ring rotates, the water inlet 23, the intake pipe 22, the water drainage port 8 and the drainage pipe 20 rotate together with the gimbal ring, and therefore, it is very inconvenient to connect the fixed water intake end and the water drainage end of the washing machine. In the present invention, the rotation connectors and the annular sinks are used to skillfully convert the rotating ends into fixed ends.

[0054] As shown in FIG. 8, the first rotation connector 28 in the intake pipeline is a pipe connector that is disposed on the outer cylinder axle sleeve 30 and has one end exposed out of the outer cylinder axle sleeve 30, and the other end passing through the outer cylinder axle sleeve 30 to be connected to the inner cylinder shaft 31. The first annular sink 29 is disposed at the junction of the inner cylinder shaft 31 and the first rotation connector 28, the first annular sink 29 and a position at the outer surface of the inner cylinder shaft 31 is communicated through a pipe disposed inside the inner cylinder shaft 31. The inner cylinder shaft 31 drives the inner cylinder 1 to rotate, the inner cylinder 1 is fixedly connected to the gimbal ring; therefore, the position at the outer surface of the inner cylinder shaft 31 and the water inlet 23 of the gimbal ring are relative static. The position at the outer surface of the inner cylinder shaft 31 is connected to the water inlet 23 of the gimbal ring through the intake pipe 22, water entering from the first rotation connector 28 is stored in the first annular sink 29 temporarily, and the water temporarily stored in the first annular sink 29 may enter the gimbal ring.

[0055] As shown in FIG. 8, the structure of the drainage pipeline is the same as the structure of the intake pipeline, the second rotation connector 26 is a pipe connector that is disposed on the outer cylinder axle sleeve 30 and has one end exposed out of the outer cylinder axle sleeve 30 and the other end passing through the outer cylinder axle sleeve 30 to be connected to the inner cylinder shaft 31. The second annular sink 27 is disposed at the junction of the inner cylinder shaft 31 and the second rotation connector 26, the second annular sink 27 and a position at the outer surface of the inner cylinder shaft 31 is communicated through a pipe disposed inside the inner cylinder shaft 31. The inner cylinder shaft 31 drives the inner cylinder 1 to rotate, the inner cylinder 1 is fixedly con-

nected to the gimbal ring; therefore, the position at the outer surface of the inner cylinder shaft 31 and the water drainage port 8 of the gimbal ring are relative static. The position at the outer surface of the inner cylinder shaft 31 is connected to the water drainage port 8 of the gimbal ring through the drainage pipe 20, water discharged from the water drainage port 8 is temporarily stored in the second annular sink 27 through the drainage pipe 20 and a pipe disposed in the inner cylinder shaft 31, and the water temporarily stored in the second annular sink 27 may be discharged through the second rotation connector 26 and then through the controllable stop valve 21.

[0056] The inner circumference of the gimbal ring is provided with at least one vent hole 25. The air pressure is adjusted to facilitate the intake pump 23 to pump the water into the gimbal ring.

Embodiment 1

[0057] As shown in FIG. 1 and FIG. 2, a washing machine having a water input port-type gimbal ring described in this embodiment is a roller washing machine, the water input port-type gimbal ring is embedded into a cloth dropping port of an inner cylinder 1 and is connected to the inner cylinder 1, the diameter of the inner circumference of the water input port-type gimbal ring is greater than the diameter of a water input port of the inner cylinder 1, so as to ensure that washing water can enter into the gimbal ring.

[0058] In this embodiment, no water injection component 5 and drainage pump 4 are provided, the washing water enters the gimbal ring portion, where a part of the washing water is located in the gimbal ring, and a part of the washing water is brought away when the gimbal ring rotates. When the rotation speed is large, the washing water brought away by the gimbal ring will attach the outer circumference in the gimbal ring and rotate together with the gimbal ring, thereby balancing the load offset (referring to FIG. 5).

[0059] For the washing machine of this embodiment, the washing water is discharged from the washing machine after the dehydration distribution, and the load offset of the inner cylinder 1 during the dehydration is balanced with the washing water entering the gimbal ring through the gimbal ring water input port 2, and after the dehydration ends, the washing water in the gimbal ring is discharged through the water drainage port 8.

Embodiment 2

[0060] As shown in FIG. 3 and FIG. 4, a washing machine having a water input port-type gimbal ring described in this embodiment is a roller washing machine, the gimbal ring is disposed at a cloth dropping port of an inner cylinder 1 of the washing machine, the gimbal ring is a round ring structure, a round of water input ports 2 are disposed in the gimbal ring along the inner circumference thereof, for washing water to enter the gimbal ring to balance the internal load offset of the inner cylinder 1. The water input port is a round of water input ports distributed on the inner circumference of the annular gimbal ring, and the water injection component 5 is fixed and can be disposed at the bottom of the washing machine. When the inner cylinder 1 rotates, the water injection component 5 and the gimbal ring rotate relatively; however, the water injection component 5 always can be inserted into the gimbal ring. During washing and rising processes of the washing machine, there is no water in the gimbal ring, and during the dehydration distribution, the washing water enters the gimbal ring through the water input port 2, so as to balance the load offset (referring to FIG. 5).

[0061] A water injection component 5 is disposed on a drainage chamber 4, the water injection component 5 is inserted into the gimbal ring through the water input port 2 of the gimbal ring, to communicate the drainage chamber 3 and the gimbal ring, and the water injection component 5 is provided with a drainage pump 4. A part of the washing water in the inner cylinder 1 is reserved in the drainage chamber 3 during drainage, and during dehydration distribution, the washing machine pumps a corresponding quantity of washing water into the gimbal ring according to the load offset, so as to balance the load offset. The junction of the drainage chamber 3 and the water injection component assumes an inclined surface, a filter screen 6 is disposed at the junction, and the bottom of the drainage chamber 3 is further provided with a water outlet 7 in communication with a drainage pipeline of the washing machine. The water outlet 7 at the bottom of the drainage chamber 3 may discharge the residual washing water when the washing water is no longer required inside the gimbal ring after the dehydration distribution is completed.

[0062] At least one water drainage port 8 configured to discharge the equilibrium liquid is disposed outside the gimbal ring along a radial direction of the outer diameter of the ring, the water drainage port is provided with a drainage valve 9, and the drainage valve 9 is an automatic opening and closing structure. The drainage valve 9 is closed under the action of the centrifugal force when the inner cylinder 1 of the washing machine rotates at a high speed, and after the dehydration ends, the rotation speed of the inner cylinder 1 gradually reduces, the centrifugal force gradually reduces, and the drainage valve 9 is opened to discharge the washing water in the gimbal ring.

[0063] Before the dehydration distribution, the washing water is discharged, a part of the washing water is reserved in the drainage chamber; during the dehydration distribution, the washing machine calculates the load offset of the inner cylinder 1, and the drainage pump 4 injects the washing water corresponding to the load offset into the gimbal ring through the gimbal ring water input port 2, so as to balance the internal load offset of the inner cylinder 1 during the dehydration; and after the dehydration ends, the washing water in the gimbal ring is dis-

charged through the water drainage port 8.

[0064] The water input port-type gimbal ring described in this embodiment may also be applied to a pulsator washing machine. If it is applied to the pulsator washing machine, the water input port-type gimbal ring is disposed at the top of an inner cylinder, a drainage chamber is disposed at the bottom of the washing machine and is in communication with the internal of the gimbal ring through a water injection component and a drainage pump, and a drainage valve is disposed at a gimbal ring water drainage port.

Embodiment 3

[0065] As shown in FIG. 2, a drainage valve of this embodiment includes a spring 10, and a baffle 11 and a second baffle 12 that are disposed at two ends of the spring. A connection member 15 is disposed between the baffle 11 and the second baffle 12, the spring 10 sleeves the connection member 15, and the spring 10 and the connection member 15 are located in the water drainage port 8. One end of the spring 10 is connected to an outer end of the water drainage port 8, and the other end is connected to the baffle 11. The baffle 11 is located in the gimbal ring, the second baffle 15 is located out of the gimbal ring, a gap is formed between the baffle 11 and an inner wall of the gimbal ring, a bump 14 configured to position and fix the spring 10 is disposed at an outer portion of the water drainage port 8 of the gimbal ring, and the spring 10 is connected to the bump 14.

[0066] The shape of the baffle 11 matches with the shape of the water drainage port 8, the area of the baffle 11 is greater than the area of the water drainage port, the length of the spring 10 in a free state is greater than the thickness of the gimbal ring, and the length of the spring in an extreme compression state is less than the thickness of the gimbal ring. When the inner cylinder 1 does not rotate, the spring 10 is in a naturally stretched state, and there is a gap between the baffle 11 and the inner wall of the gimbal ring, that is, the drainage valve 9 is in an open state. When the washing inner cylinder 1 rotates, because of the centrifugal force, the baffle 11 compresses the spring 10 until the baffle 11 is attached to the inner wall of the gimbal ring, and the drainage valve 9 is in a closed state.

[0067] Preferably, there are 3 water drainage ports 8 uniformly distribution on the outer circumference of the gimbal ring.

Embodiment 4

[0068] As shown in FIG. 4, a drainage valve of this embodiment is an automatic opening and closing structure, the water drainage port 8 is a water drainage port having a "V"-shaped section, and a movable ball valve spool 18 is disposed inside the "V"-shaped water drainage port, the density of the ball valve spool 18 is less than the density of the water and can float in the water. During the dehydration, the inner cylinder 1 rotates at a high speed, the centrifugal force generated by the rotation is greater than the buoyancy force of the ball valve spool 18, the ball valve spool 18 closely attaches the inner wall of the "V"-shaped water drainage port to enclose the water drainage port; after the dehydration ends, the inner cylinder 1 gradually stops rotation, the centrifugal force gradually reduces when the rotation speed reduces, and when the centrifugal force is less than the buoyancy force of the ball valve spool 18, the ball valve spool 18 is in a free active state, and the equilibrium liquid in the gimbal ring is discharged through the water drainage port 8.

[0069] Preferably, there are 4 water drainage ports 8 uniformly distributed on the outer circumference of the gimbal ring.

[0070] The water intake manner of the water input port and the drainage manner of the water drainage port may be combined randomly.

Embodiment 5

[0071] In a washing machine having a water input port-type gimbal ring described in this embodiment (not shown), the water input port 2 of the gimbal ring is a round of annular water input ports disposed on the inner circumference of the gimbal ring, a water injection component is disposed corresponding to the water input port, the water injection component is a pipe fixedly connected to the outer cylinder 13 and/or a shell of the washing machine, one end of the pipe is inserted into the water input port of the gimbal ring and is not in contact with the gimbal ring to avoid noise generated by relative movement during contact, and the other end of the pipe is in communication with the running water. The running water may be used to balance the load offset.

[0072] Before the dehydration distribution, the washing water is discharged; during the dehydration distribution, the washing machine calculates the load offset in the inner cylinder 1, and injects running water corresponding to the eccentricity into the gimbal ring through the gimbal ring water input port 2, so as to balance the eccentricity of the internal load during dehydration of the inner cylinder 1, and after the dehydration ends, the running water in the gimbal ring is discharged through the water drainage port 8.

[0073] In Embodiment 2 and Embodiment 4, water may be injected into the gimbal ring according to the eccentricity to balance the eccentricity, and in Embodiment 1, water of corresponding quantity cannot be entered according to the eccentricity, and only a part of water can enter to balance the eccentricity.

Embodiment 6

[0074] As shown in FIG. 6, a washing machine having a water input port-type gimbal ring is provided. During dehydration distribution, the washing machine calculates

the load offset in an inner cylinder 1, a drainage pump 4 pumps washing water into the gimbal ring until the pumped washing water and load reach preset balance.

[0075] During dehydration, the inner cylinder rotates at a high speed, the centrifugal force generated by rotation enables a baffle 11 to compress the spring 10, the baffle 11 closely attached to the inner wall of the gimbal ring to enclose the water drainage port 8, and the washing water in the gimbal ring and the load are balance eccentrically until the dehydration ends.

[0076] When the dehydration ends, the inner cylinder 1 gradually stops rotation, the centrifugal force is smaller along with the reduction of the speed, and when the centrifugal force is less than the restoring force of the spring 10, the restoring force of the spring 10 resets the baffle 11, and the washing water in the gimbal ring is discharged through the water drainage port 8.

Embodiment 7

[0077] A control method of a washing machine having an active water injection gimbal ring is provided, where water is injected through a water intake structure, so as to balance the load offset of an inner cylinder 1 during dehydration, and the water in the gimbal ring is discharged through a drainage structure to reduce the mass of the gimbal ring.

[0078] An active water injection gimbal ring is disposed at an opening of the inner cylinder 1 of the washing machine, the gimbal ring is connected to the inner cylinder 1, a water intake end of the washing machine is in communication with the gimbal ring through a intake pump 23 and an intake waterway, and the gimbal ring is in communication with a drainage end of the washing machine through a drainage waterway and a controllable stop valve 21. During dehydration distribution, a control board of the washing machine calculates or measures the load offset inside the inner cylinder, and controls the intake pump to pump water corresponding to the load offset into the gimbal ring, so as to balance the eccentricity of the load inside the inner cylinder, and after the dehydration ends, the control board of the washing machine controls the controllable stop valve 21 to be open, and the water inside the gimbal ring is discharged through the drainage end of the washing machine under the action of the centrifugal force.

[0079] The control board of the washing machine controls the rotation speed of the inner cylinder to rise to a high rotation speed, and controls water injection into the washing machine gimbal ring to balance the load offset, and the high rotation speed is a rotation speed higher than 75 rpm.

[0080] As shown in FIG. 11, during the dehydration distribution, the control board of the washing machine calculates or measures the internal load offset of the inner cylinder, controls the intake pump to pump water into the gimbal ring until preset balance is reached, so as to enter the dehydration stage till the dehydration ends, the control board controls the controllable stop valve to open to discharge the water in the gimbal ring.

[0081] While there has been shown several and alternate embodiments of the present invention, it is to be understood that certain changes can be made as would be known to one skilled in the art without departing from the underlying scope of the present invention as is discussed and set forth above and below including claims. Furthermore, the embodiments described above and claims set forth below are only intended to illustrate the principles of the present invention and are not intended to limit the scope of the present invention to the disclosed elements.

Claims

1. A washing machine, comprising an outer cylinder (13), and an inner cylinder (1), a cloth dropping port of the inner cylinder (1) being provided with a gimbal ring, wherein the gimbal ring is a round ring structure, an inner circumference of the gimbal ring is provided with a water input port (2) configured to supply water into the gimbal ring to serve as an equilibrium liquid to balance the load offset, and an outer circumference of the gimbal ring is provided with at least one water drainage port (8) that can be opened and closed.

2. The washing machine according to claim 1, wherein the water input port (2) is configured as a round of annular water input port disposed on the inner circumference of the gimbal ring, a water injection component (5) is disposed corresponding to the water input port, the water injection component (5) is a pipe fixed to the outer cylinder (13) or a shell of the washing machine, one end of the pipe is inserted into the water input port (5) of the gimbal ring and is not in contact with a wall of the gimbal ring, and the other end of the pipe is in communication with a running water and/or washing water pipeline.

3. The washing machine according to claim 2, wherein the water injection component (5) is a pipe fixedly connected to the outer cylinder (13), the bottom of the outer cylinder (13) is provided with a drainage chamber (3) that can reserve a part of washing water, one end of the pipe is inserted into the water input port (2) of the gimbal ring and is not in contact with the wall of the gimbal ring, and the other end is in communication with the drainage chamber (3) through a drainage pump (4) that can pump water flows.

4. The washing machine according to claim 3, wherein a filter screen (6) is disposed at a junction of the drainage chamber (3) and the water injection component (5), and the bottom of the drainage chamber

(3) is further provided with a water outlet (7) in communication with a drainage pipeline of the washing machine.

5. The washing machine according to claim 1, wherein the outer circumference of the gimbal ring is provided with 2 to 10 water drainage ports (8) configured to discharge the equilibrium liquid, and the water drainage port is provided with a drainage valve (9) that can control opening and closing of the water drainage port (8).

6. The washing machine according to claim 5, wherein the drainage valve is an automatic opening and closing structure, the drainage valve (9) comprises a spring (10) and a baffle (11), the spring (10) is located in the water drainage port (8), one end of the spring (10) is connected to an outer end of the water drainage port (8), the other end is connected to the baffle (11), the baffle (11) is located inside the gimbal ring, the shape of the baffle (11) matches with the shape of the water drainage port (8), and when the spring is in a free state, the water drainage port (8) keeps open.

7. The washing machine according to claim 5, wherein the drainage valve is an automatic opening and closing structure, the section of the water drainage port (8) is "V"-shaped, and a movable ball valve spool (18) is disposed inside the "V"-shaped water drainage port.

8. A control method of the washing machine according to any one of claims 1 to 7, wherein water is injected to the gimbal ring through the gimbal ring water input port (2), so as to balance the load offset of the inner cylinder (1) during dehydration.

9. The control method according to claim 8, wherein after dehydration distribution, washing water is discharged from the washing machine, the washing water entering the gimbal ring through the gimbal ring water input port (2) balances the load offset of the inner cylinder during dehydration, and after the dehydration ends, the washing water in the gimbal ring is discharged through the water drainage port (8).

10. The control method according to claim 8, wherein before the dehydration distribution, the washing water is discharged, and during the dehydration distribution, according to the load offset of the inner cylinder (1), running water suitable to the eccentricity is injected into the gimbal ring through the gimbal ring water input port (2), so as to balance the eccentricity of the load inside the inner cylinder (2) during the dehydration, and after the dehydration ends, the running water inside the gimbal ring is discharged through the water drainage port.

11. The control method according to claim 8, wherein before the dehydration distribution, the washing water is discharged, and a part of washing water is reserved in the drainage chamber; during the dehydration distribution, according to the load offset of the inner cylinder (1), the drainage pump (4) injects washing water suitable to the load offset into the gimbal ring through the gimbal ring water input port (2), so as to balance the eccentricity of the internal load of the inner cylinder (1) during the dehydration, and after the dehydration ends, the washing water in the gimbal ring is discharged through the water drainage port (8).

12. The control method according to any one of claims 9 to 11, wherein during dehydration, the inner cylinder (1) rotates at a high speed, the centrifugal force generated by the rotation is greater than the resistance of the spring (10), so that the baffle (11) compresses the spring (10), the baffle (11) closely attaches an inner wall of the gimbal ring to enclose the water drainage port (8), when the dehydration ends, the inner cylinder (1) gradually stops rotation, the centrifugal force gradually reduces along with the reduction of the speed, when the centrifugal force is less than the restoring force of the spring (10), the restoring force of the spring (10) resets the baffle (11), and the equilibrium liquid inside the gimbal ring is discharged through the water drainage port (8); or, during dehydration, the centrifugal force generated by high-speed rotation of the inner cylinder (1) is greater than the buoyancy force of the ball valve spool (18), the ball valve spool (18) closely attaches the inner wall of the "V"-shaped water drainage port to enclose the water drainage port, when the dehydration ends, the inner cylinder (1) gradually stops rotation, and the centrifugal force gradually reduces along with the reduction of the speed, when the centrifugal force is less than the buoyancy force of the ball valve spool (18), the ball valve spool (18) is in a free active state, and the equilibrium liquid inside the gimbal ring is discharged through the water drainage port (8).

13. A washing machine, comprising an outer cylinder (13), and an inner cylinder (1), a gimbal ring being disposed at an opening of the inner cylinder (1), wherein the gimbal ring is a round ring structure, the inside of the gimbal ring is a hollow chamber, and the washing machine is further provided with a water intake structure configured to inject water into the hollow chamber to balance the load offset and a drainage structure configured to discharge the water in the gimbal ring.

14. The washing machine according to claim 13, wherein the water intake structure extends from the gimbal ring at the front end opening of the inner cylinder (1)

to an inner cylinder shaft at the rear end of the inner cylinder (1) along an outer surface of a sidewall of the inner cylinder (1), and is in communication with a water intake end of the washing machine through the internal of the inner cylinder shaft; the drainage structure extends from the gimbal ring at the front end opening of the inner cylinder (1) to an inner cylinder shaft at the rear end of the inner cylinder (1) along an outer surface of a sidewall of the inner cylinder (1), and is in communication with a drainage end of the washing machine through the internal of the inner cylinder shaft.

15. The washing machine according to claim 14, wherein water intake structure comprises an intake pump (23) that is located at the rear portion of the washing machine and configured to transmit water flows and an intake waterway that is in communication with the intake pump (23) and the gimbal ring and configured to inject water into the gimbal ring, the drainage structure comprises a controllable stop valve (21) that is located at the rear portion of the washing machine and configured to control opening and closing of the drainage structure and a drainage waterway that is in communication with the controllable stop valve (21) and the gimbal ring and configured to discharge the water in the gimbal ring.

16. The washing machine according to claim 15, wherein the outer circumference of the gimbal ring is provided with a water drainage port (8), one end of the drainage waterway is connected to the water drainage port (8) and the other end is connected to the controllable stop valve (21), an end face of the gimbal ring close to the inner circumference of the gimbal ring is provided with a water inlet (24), one end of the intake waterway is connected to the water inlet (24) and the other end is connected to the intake pump (23).

17. The washing machine according to claim 16, wherein the intake waterway comprises an intake pipe (22) that is located at an outer surface of the sidewall of the inner cylinder (1) and rotates together with the inner cylinder (1), a first rotation connector (28) that is located in an outer cylinder axle sleeve (30) and is fixed, wherein a first annular sink (29) is disposed at a junction of an inner cylinder shaft (31) and the first rotation connector (28), the first annular sink (29) is in communication with the intake pipe (22), and the other end of the first rotation connector (28) is in communication with a water intake end of the washing machine through the intake pump (23).

18. The washing machine according to claim 16, wherein the drainage waterway comprises a drainage pipe (20) that is located at the outer surface of the sidewall of the inner cylinder (1) and rotates together with the inner cylinder (1), and a second rotation connector (26) that is located in an outer cylinder axle sleeve (30) and is fixed, wherein a second annular sink (27) is disposed at a junction of an inner cylinder shaft (31) and the second rotation connector (26), the second annular sink (27) is in communication with the drainage pipe (20), and the other end of the second rotation connector (26) is in communication with a water drainage end of the washing machine through the controllable stop valve (21).

19. The washing machine according to claim 16, wherein the inner circumference of the gimbal ring is provided with at least one vent hole (25).

20. A control method of the washing machine according to any one of claims 13 to 19, wherein water is injected into the gimbal ring through the water intake structure, so as to balance the load offset of the inner cylinder (1) during dehydration, and water in the gimbal ring is discharged through the drainage structure to reduce the mass of the gimbal ring.

21. The control method according to claim 20, wherein during dehydration distribution, a control board of the washing machine calculates or measures the internal load offset of the inner cylinder, and controls the intake pump to pump water corresponding to the load offset into the gimbal ring, so as to balance the eccentricity of the internal load of the inner cylinder, and after the dehydration ends, the control board of the washing machine controls the controllable stop valve (21) to be open, and the water inside the gimbal ring is discharged through the drainage end of the washing machine under the action of the centrifugal force.

22. The control method according to claim 21, wherein the control board of the washing machine controls the rotation speed of the inner cylinder to rise to a high rotation speed, and controls water injection into the washing machine gimbal ring to balance the load offset, and the high rotation speed is a rotation speed higher than 75 rpm.

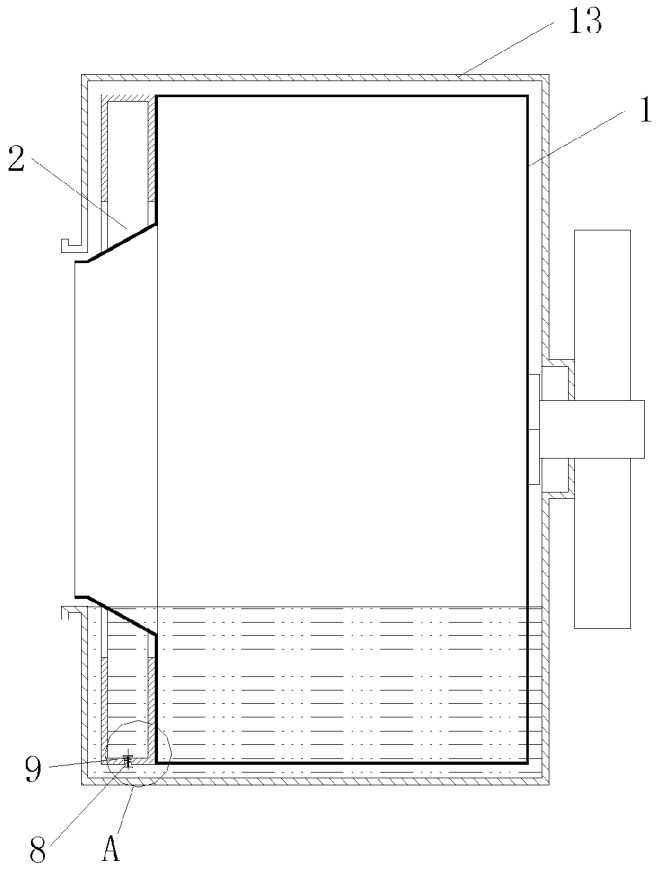

FIG. 1

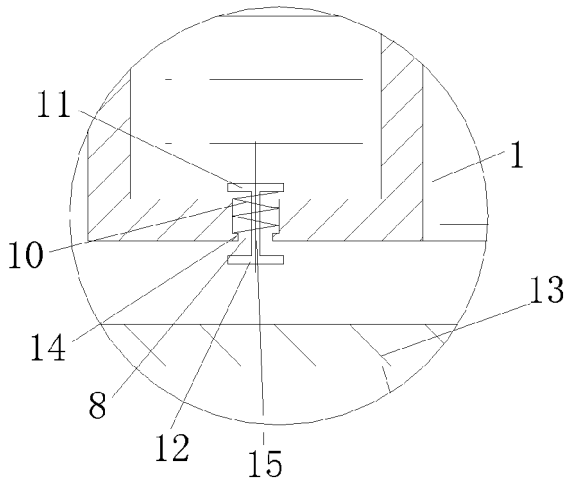

FIG. 2

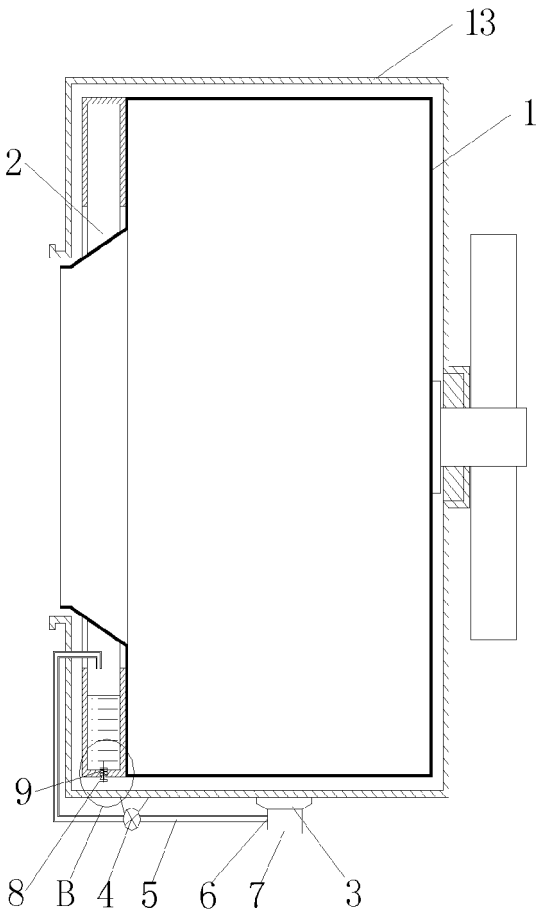

FIG. 3

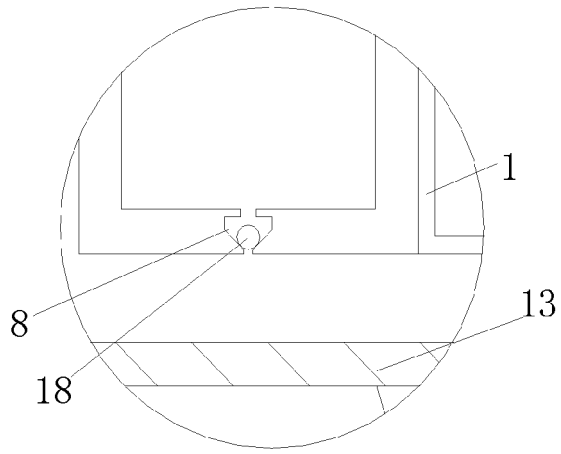

FIG. 4

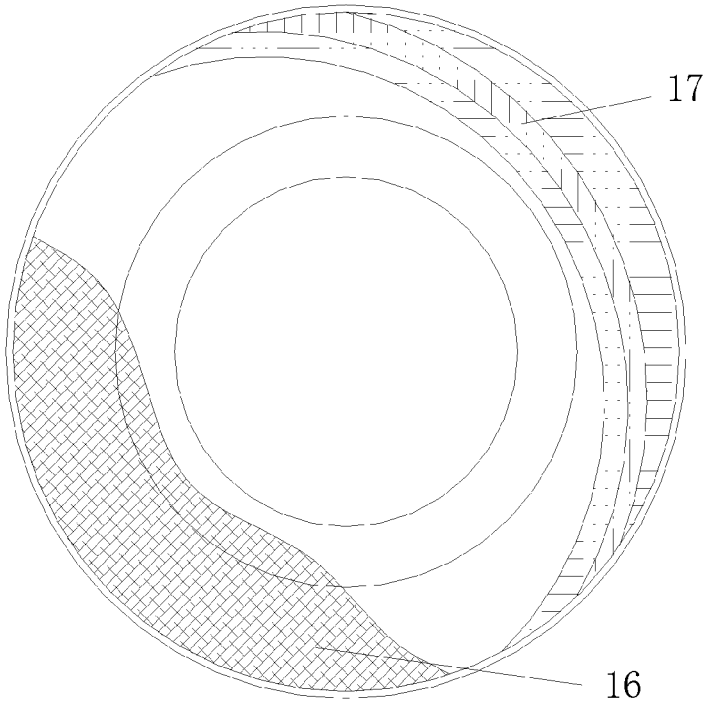

FIG. 5

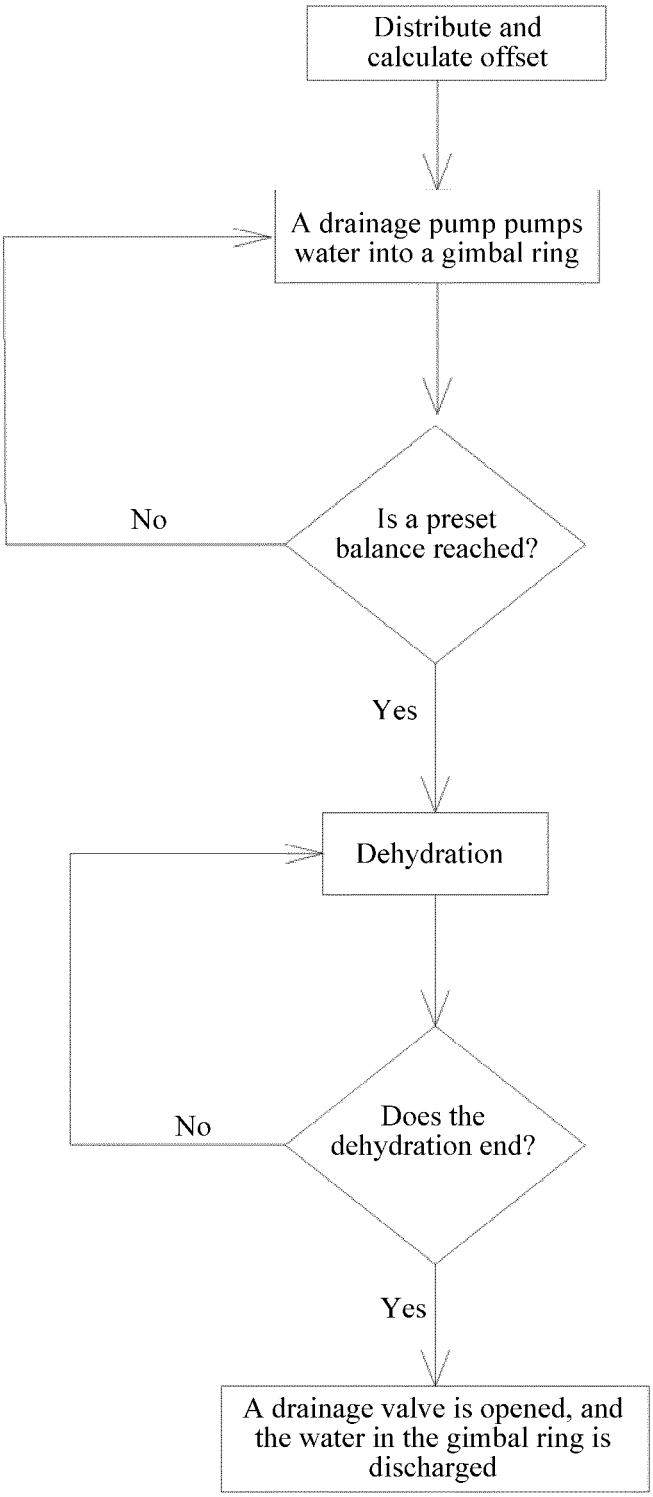
Distribute and calculate offset
A drainage pump pumps water into a gimbal ring
Is a preset balance reached?
No
Yes
Dehydration
Does the dehydration end?
No
Yes
A drainage valve is opened, and the water in the gimbal ring is discharged

FIG. 6

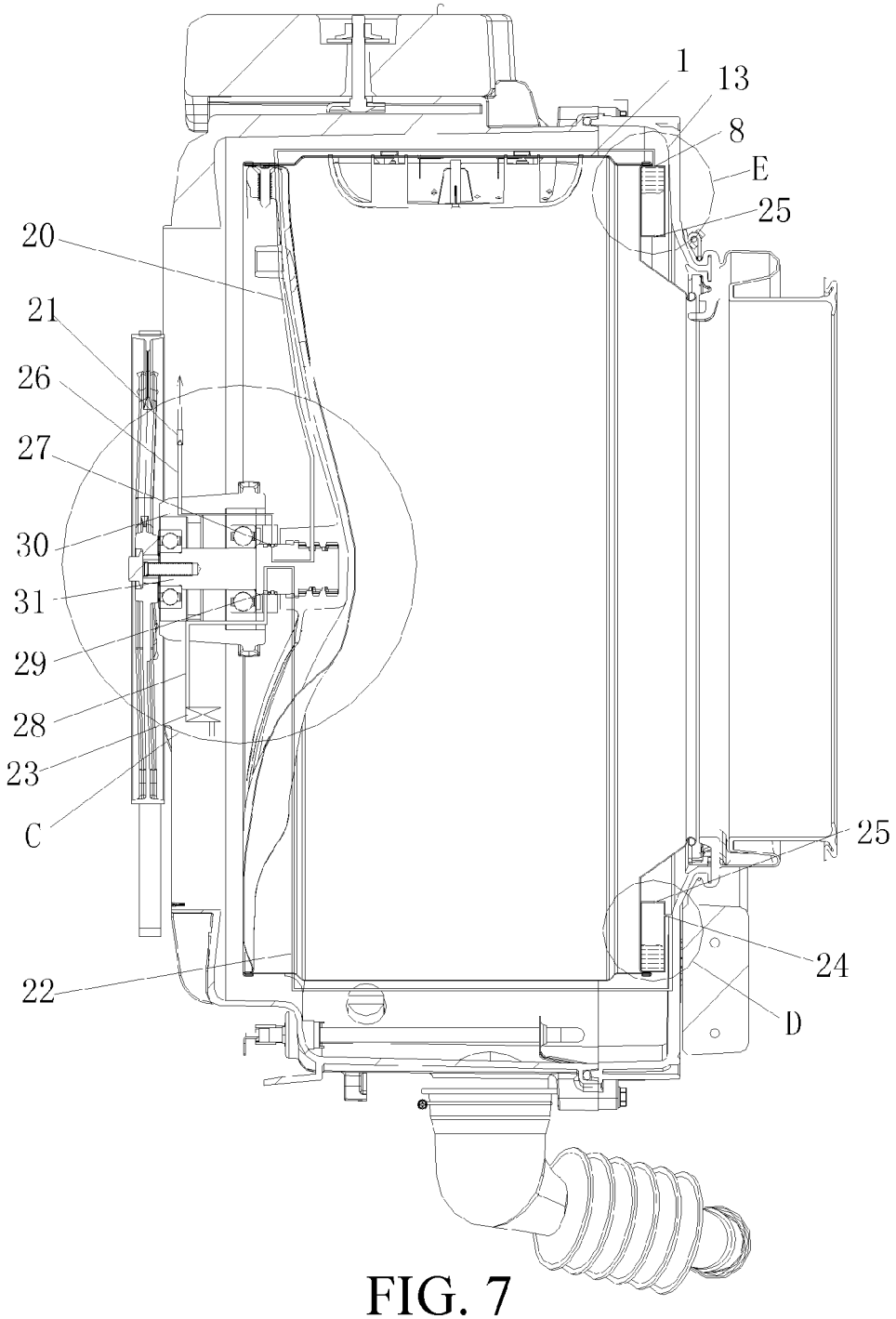

FIG. 7

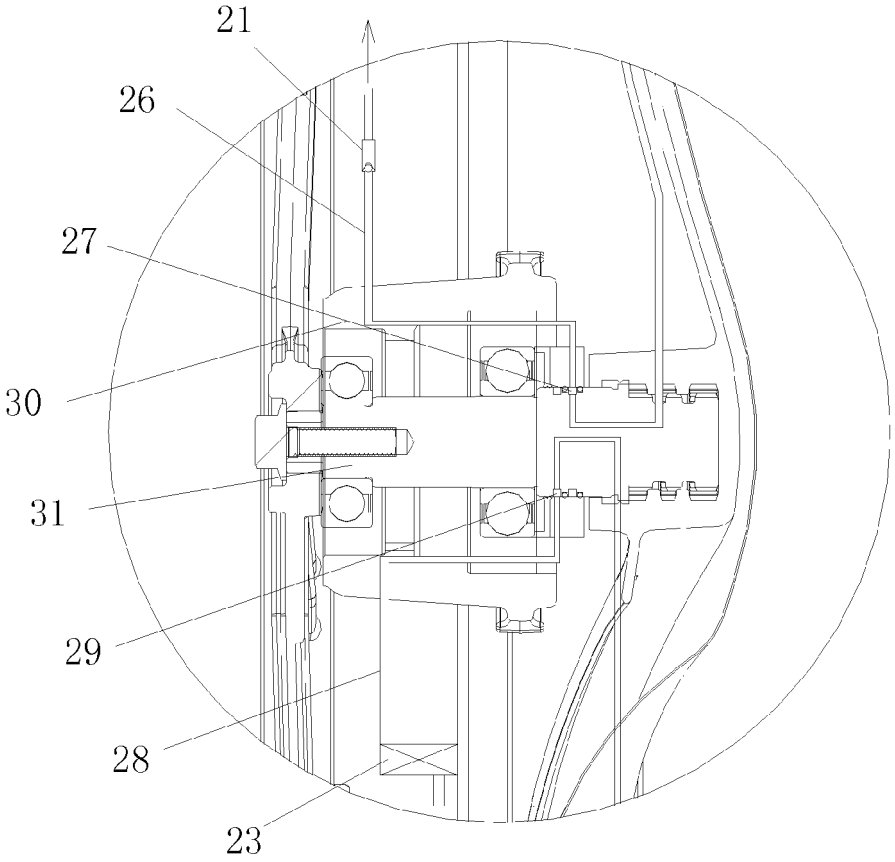

FIG. 8

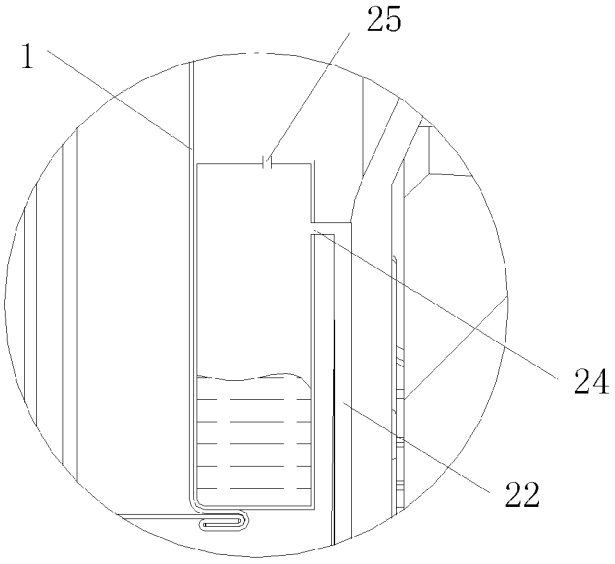

FIG. 9

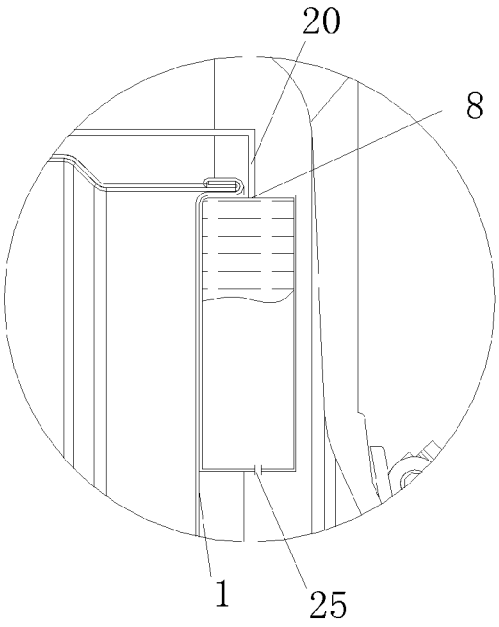

FIG. 10

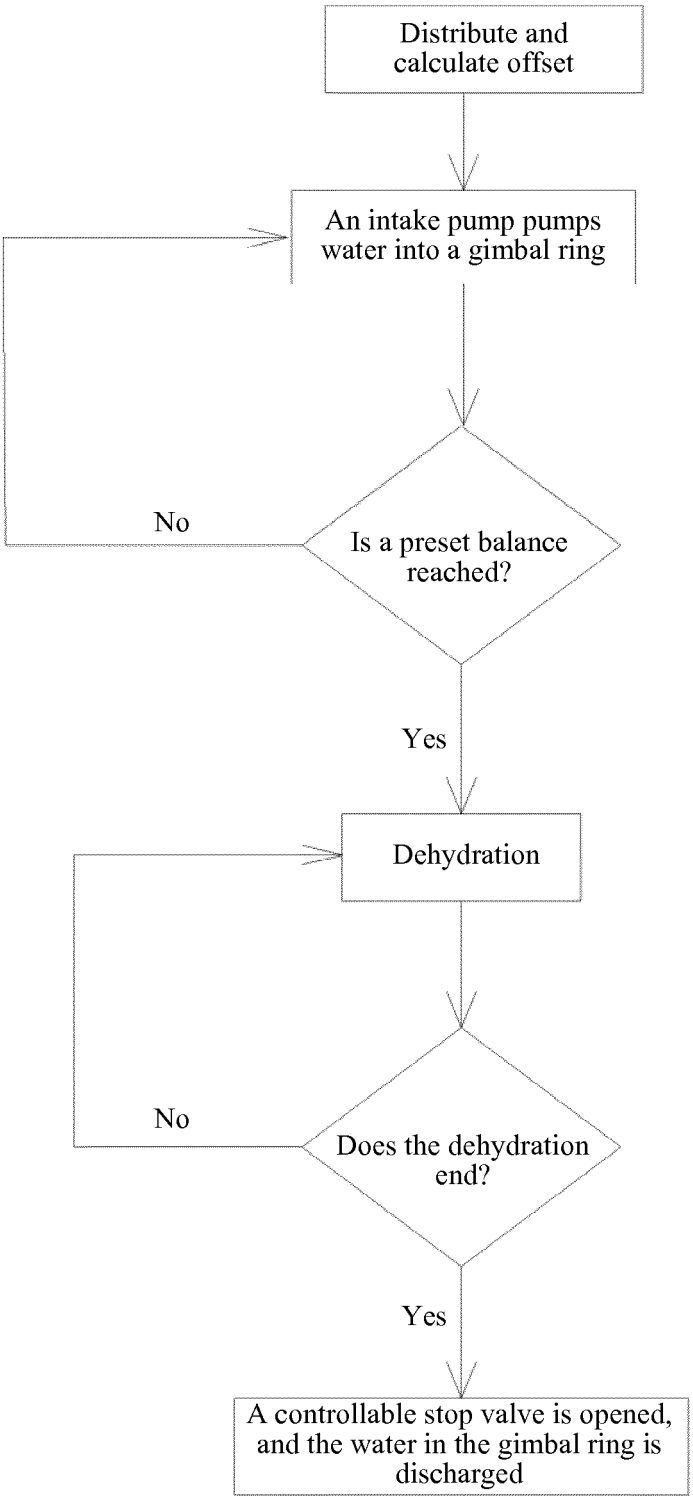
Distribute and calculate offset
An intake pump pumps water into a gimbal ring
Is a preset balance reached?
No
Yes
Dehydration
Does the dehydration end?
No
Yes
A controllable stop valve is opened, and the water in the gimbal ring is discharged

FIG. 11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2013/090105

A. CLASSIFICATION OF SUBJECT MATTER

D06F 37/00 (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)

IPC: 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, CNTXT, VEN: washing w machine?, balancer, balancing ring, water filling nozzle, water inlet, water supply, saltwater injection, water outlet, ring, inlet, outlet, outfall, valve, spring, sphere, ball, plug, spherical valve core

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 102341539 A ((MATU) MATSUSHITA ELECTRIC IND CO., LTD.), 01 February 2012 (01.02.2012), description, paragraphs [0024]-[0026], [0039] and [0040], figure 1	1, 5, 8-10, 13, 20-22
Y	CN 102341539 A ((MATU) MATSUSHITA ELECTRIC IND CO., LTD.), 01 February 2012 (01.02.2012), description, paragraphs [0024]-[0026], [0039] and [0040], figure 1	2
Y	CN 1408932 A ((SAOL) SANYO ELECTRIC CO., LTD.),09 April 2003 (09.04.2003) description, page 4, line 29 to description, page 5, line 5, figure 2	2

☒ Further documents are listed in the continuation of Box C. ☒ 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	Date of mailing of the international search report
28 February 2014 (28.02.2014)	27 March 2014 (27.03.2014)

Name and mailing address of the ISA	Authorized officer
State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No. (86-10) 62019451	JIN, Yong Telephone No. (86-10) 62084461

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2013/090105

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 202755224 U ((WUXI-N) WUXI LITTLE SWAN CO., LTD.),27 February 2013 (27.02.2013), the whole document	1-22

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2013/090105

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 102341539 A	01.02.2012	WO 2010103775 A1	16.09.2010
		JP 2010207316 A	24.09.2010
		EP 2385164 A1	09.11.2011
		CN 102341539 B	20.03.2013
CN 1408932 A	09.04.2003	EP 1295978 A1	26.03.2003
		JP 2003093790 A	02.04.2003
		US 2003056555 A1	27.03.2003
		KR 20030027678 A	07.04.2003
		US 6782722 B2	31.08.2004
		KR 100843931 B1	03.07.2008
CN 202755224 U	27.02.2013	None	

Form PCT/ISA /210 (patent family annex) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 200910158225 A **[0004]**