

(19)



(11)

EP 2 278 059 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
13.08.2014 Bulletin 2014/33

(51) Int Cl.:
D06F 39/08 (2006.01)

(21) Application number: **10164558.8**

(22) Date of filing: **01.06.2010**

(54) **An automatic washing machine with multi-functional watering**

Automatische Waschmaschine mit Multifunktionswasserzufuhr

Machine à laver automatique avec arrosage multifonction

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO SE SI SK SM TR**

(30) Priority: **05.06.2009 CN 200920157977 U**

(43) Date of publication of application:
26.01.2011 Bulletin 2011/04

(73) Proprietors:
• **Haier Group Corporation**
Qingdao,
Shandong 266101 (CN)
• **Qingdao Haier Washing Machine Co. Ltd.**
Qingdao,
Shandong 266101 (CN)
• **Hefei Haier Washing Machine Co., Ltd.**
Hefei Anhui 230601 (CN)

(72) Inventors:
• **Cao, Chunhua**
266101, Qingdao Shandong (CN)
• **Lui, Peishi**
266101, Qingdao Shandong (CN)
• **Wang, Kaiming**
266101, Qingdao Shandong (CN)
• **Yang, Lin**
266101, Qingdao Shandong (CN)
• **Xu, Sheng**
266101, Qingdao Shandong (CN)

(74) Representative: **Beck, Michael Rudolf**
Beck & Rössig
European Patent Attorneys
Cuvilliesstrasse 14
81679 München (DE)

(56) References cited:
EP-A2- 0 335 485 DE-A1- 1 775 108
US-A- 3 195 561

EP 2 278 059 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

Field of the Invention

[0001] The present invention refers to an automatic washing machine, preferably to an automatic washing machine with multi-functional watering, which can meet varied watering requirements.

Background of the Invention

[0002] An existing automatic washing machine has a water inlet valve which is only connected with normally opened water-supply. When providing water in washing clothes, the water inlet valve is opened. With the improvement of the living level, in order to reduce the washing time and improve washing efficiency, the water temperature and flooding velocity are also required. Thus it is required to arrange a water inlet valve connected with a solar water heater or an electrical water heater on an automatic washing machine. But whether a solar water heater or not electrical water heater, the water pressure of them is low, thus how to achieve normal watering is a problem that must be solved.

[0003] A known valve for controlling fluid flow is shown in US 3 195 561 A.

[0004] In present, water pressure of water-supply in lots of regions such as rural area is lower to the washing machine with an inlet for tap water. The water pressure is more lower in the areas with water shortage or abnormal water supply and water is stored in tank. Therefore, regarding the water inlet valve of the washing machine connected with water-supply, the ordinary automatic washing machine cannot achieve normal feeding process. On the lower water pressure such as lower than 0.02 Mpa, water cannot be fed through the water inlet valve, so the automatic washing machine cannot normally operate in the area with lower water pressure. Or it takes too long time to provide water, the time wasted on providing water is generally added by 20 min, and the time wasted on the total washing process is added by about one hour, so it would take a long time.

[0005] As shown in FIG. 1, the current water inlet valve is a pilot electromagnetic feed valve, the feeding movements is as the follows: a piston cap sealing the center pressure released vent(a) of the diaphragm plate when an electromagnetic coils is not in electrifying state, water in water supply chamber(b) flowing into a back pressure chamber(d) through by-pass hole (c), the pressure of the water supply chamber (b) is equal to the one of the back pressure chamber(d), and a water outlet chamber (e) is opened to the environment, so the pressure exerted to diaphragm from the back pressure chamber(d) is greater than the pressure from the water supply chamber(b), the pressure difference= water supply pressure $\times$ area difference S_1 (S_1 i.e. the cross-sectional area of the channel of outlet chamber), thus the diaphragm is contacted with the valve seat (f) by the pressure. When the electromag-

netic coils is in electrifying state, the piston inside the pipe is magnetized, so the piston cap is driven to detach from the center pressure released vent (a), and the water in back pressure chamber (d) flows into the outlet chamber (e) by the center pressure released vent(a). Since the area of the center pressure released vent (a) is larger than the area of by-pass hole (c), the pressure release rate of back pressure chamber (d) is more than the pressure supply rate of by-pass hole (c), so the pressure of the back pressure chamber (d) decreases. The diaphragm and the diaphragm plate are detached from the valve seat (f) when the pressure exerted to the diaphragm from the back pressure chamber (d) is lower than the pressure from the water supply (b), and most of water directly flows out through the main channel of the inflow tract, valve seat A and outflow tract. The effective area that water supply chamber exert force on diaphragm is supposed as S_2 .

[0006] The movement for closing the water supply is as follows: the spring set in tube drives the piston to reset the piston cap when electromagnetic coils is in state of power off, and the piston cap blocks the center pressure released vent (a) of the diaphragm plate, so the water flowing into the back pressure chamber (d) through the by-pass hole (c) of the diaphragm plate cannot flow out through the center pressure released vent (a), and the pressure of the back pressure chamber (d) is increased. When the force applied onto diaphragm by the water in the back pressure chamber (d) is larger than that in the water supply chamber (b), the diaphragm and the diaphragm plate detached from the valve seat (f) is pressed on the valve seat f, thus the water cannot flow out.

[0007] When the water pressure is high, the pressure difference generated by area S_1 can make the diaphragm and valve seat remain sealed, supposed the water pressure $P=0.1\text{Mpa}$, the stress applied onto the diaphragm by the water is calculated as follows:

[0008] It is supposed that the diameter of the outlet chamber (e) is 9mm, so the cross-sectional area S_1 is 0.64cm^2 ,

$$F=P \times S_1=0.1 \times 0.64 \times 10000=640 \text{ g}$$

[0009] However, when the pressure is lower or even up to 0, the pressure difference generated by area difference is small, for instance the pressure is equal to 6.4g when the pressure of water is 0.001Mpa pressure (equivalent to 10 cm high water).

[0010] Such a small force can not generate the sealing effect to the diaphragm and the valve seat, so the diaphragm is generally given a certain initial deformation, and the sealing property between the diaphragm and the valve seat is improved by the resilience of the diaphragm rubber. For example, the problem of seal in lower water pressure is solved by 150g of the initial deformation.

[0011] However, it is a problem that the pilot electro-

magnetic feed valve is opened at low pressure. The core is magnetized by the electromagnetism, the center pressure released vent (a) is opened. When the pressure of the back pressure chamber (d) is released, the pressure difference between the water inlet chamber and the back pressure chamber (pressure $\times S_2$) must be greater than the initial deformation force of the diaphragm, thus the diaphragm is detached from valve seat, and the valve is opened. The required pressure in opening the diaphragm is calculated as follows: $P=F/S_2$, S_2 is supposed as 1.5cm^2 , then, $P=(150/1.5) \div 10000=0.01\text{Mpa}$.

[0012] The Data is approximately equal to that of 100cm high water. When the electromagnetic valve is in electrifying state, the relation of the stress of diaphragm and water pressure in the range of low pressure is shown in FIG 2. Even if the water pressure reaches the balance point of the above mentioned pressure, the diaphragm can not fully be opened in a certain range of low pressure (generally $0.01\text{Mpa} \sim 0.03\text{Mpa}$), and the valve seat can only generate a small gap, and even the valve can not be opened. The water only fractionally flows out from the center pressure released vent, and the water flow is small, the flow characteristic is shown in FIG 3. This performance can not meet the requirements of the automatic washing machine in the low water pressure areas, or in the cases that the inlet valve of the washing machine is connected with a solar water heater or an electrical water heater.

[0013] Presently, a zero-pressure washing machine by adding a suction pump pumping water to the washing machine is as follows:

China Patent Application No. CN200520080919 discloses a zero-pressure washing machine with a suction pump, which comprises a washing machine and a control panel of the washing machine, and a relay being connected with the control panel of the washing machine is arranged in the washing machine, and the relay is also respectively connected with the electromagnetic water inlet valve and a submersible pump by wires, the outlet entrance of the submersible pump is connected with the inlet entrance of washing machine.

[0014] China Patent Application No.200410057535.9 discloses a structure of an inlet valve employed in the condition of low-pressure. Since a pair of suspension devices is arranged on the diaphragm plate of the valve, the iron core can not completely detach from the diaphragm plate. Simultaneously, when the iron core is dragged backwards by electromagnetic valve, the diaphragm plate is opened by the suspension device, and the low-pressure water smoothly flow, thus the low-pressure water flow is effectively increased.

[0015] However, the above devices is complex, and the cost is large, so they does not be suitable for using in the underdeveloped rural areas or water-deficient areas; and the structure of the washing machine with va-

riety water inlets is complicated, and the additional cost is also increased.

[0016] In view of this, the present invention is provided.

Summary of the invention

[0017] The technical problem to be solved by the present invention is to overcome the technical deficiencies existing in the prior arts. The present invention provides an automatic washing machine which achieves good feeding water effects on a low water pressure such as less than 0.2Mpa by improving the structure of an inlet valve and a control method. The inlet valve meets requirement of an automatic washing machine, meanwhile is suitable for the washing machine operated in the normal water pressure. Thus it is more suitable for the rural market.

[0018] In order to solve the above mentioned problem, the basic conception of the technical scheme of the present invention comprises: an automatic washing machine with multi-functional watering comprising an inlet valve, the inlet valve comprising a valve body, a valve seat, a diaphragm plate, a piston, a spring, an electromagnetic coil, the valve body comprising a water supply chamber, an water outlet chamber, a back pressure chamber, the valve seat being located between the water supply chamber and the water outlet chamber, the back pressure chamber being located on the side of the diaphragm plate corresponding to the piston, the water supply chamber and the water outlet chamber being located on the other side of the diaphragm plate corresponding to the piston, a lug boss being set on the end of the piston corresponding to the back pressure chamber, a junction being set on the diaphragm plate corresponding to the lug boss, a activity space in which the lug boss axially moves being set in the junction, an opening which is jogged with the lug boss being set on the junction.

[0019] A diaphragm is installed on the valve seat, and perforation is settled in the centre of the diaphragm, and a pipe is fixed on the valve body, and the radially expanding bottom end of the pipe is clipped by a sealing part on the circumferential of the diaphragm; a center pressure released vent is arranged on the centre of the diaphragm, and a pressure hole is set on the peripheral of the diaphragm plate, the water supply chamber being connected with the back pressure chamber by the pressure hole; the electromagnetic coil is installed around the periphery of the pipe, and a magnetic circuit is formed by a bracket settled on the outside of the electromagnetic coil, and the piston is set in the pipe, and a piston cap is installed on the lug boss of the piston, the other end of the piston opposite the lug boss touches the spring, and a pilot valve formed by the piston cap and the pressure released vent of the diaphragm plate controls the communication and incommunication of the back pressure chamber with the outlet water chamber, and a main valve formed by the valve seat and the diaphragm controls the communication and incommunication of the water supply chamber

with the outlet water chamber.

[0020] The diaphragm plate is in bowl-shape, of which the centre lug boss of the small end bulges toward the water outlet chamber, and the pressure released vent is connected with the water outlet chamber through the center lug boss, and an embedding slot on the external of the centre lug boss is embedded with the perforation on the centre of the diaphragm, and the junction projects from the opening of the bowl, and a limbers which connected the activity space with the back pressure chamber is set on the side of the junction, and the opening is facing to the axial direction of the piston, and the piston cap is a elastic inverted frustum of a cone structure, of which the upper area is larger than the area of the opening, and the bottom area is smaller than the area of the opening and larger than the area of the pressure released vent.

[0021] The diaphragm plate is in bowl-shape, of which the lug boss of the small end bulges toward the water outlet chamber, and an embedding slot on the external of the lug boss of the small end is embedded with the perforation on the centre of the diaphragm, and the junction projects from the opening of the bowl, and a limbers which connects the activity space with the back pressure chamber is set on the side of the junction, the opening includes a piston opening on the upside and a limbers settled on the sides, and an embedding gap in which the piston could be installed is set between the piston opening and the limbers, and the size of the piston opening, the limbers and the embedding gap must guarantee that the piston cap can be installed in the activity space through the limbers on the sides, but not run out from the piston opening on the upside and the embedding gap.

[0022] The diaphragm plate comprises a first clapboard and a second clapboard, the first clapboard is tabled with the second clapboard to form a cavity, and the pressure hole is formed by a water inlet on the second clapboard being connected with the water supply chamber, an inflow entrance of the back pressure chamber on the first clapboard, and the cavity. The flow from supply water chamber to the back pressure chamber is limited by the cavity, thus the area of the inflow entrance on the diaphragm plate is increased. The probability of jamming the side channel by the organic substance in water accumulating on the inflow entrance of the pressure hole can be decreased.

[0023] The axial section of the lug boss of the piston is in rectangle or concave shape; the axial section of the piston cap is in concave shape or rectangle.

[0024] One or more protrusions are set on the outer peripheral of the side of the diaphragm plate corresponding to the water outlet chamber, and an embedding slot is set on the protrusion, and an embedding hole corresponding to the protrusion is arranged on the peripheral of the diaphragm, and the embedding slot is embedded in the embedding hole. The structure can strengthen the embedment effect between the diaphragm and the diaphragm plate, so that the stroke of the piston is completely converted to that of the diaphragm.

[0025] The electromagnetic coil is connected with direct current circuit, and the movement of the piston is controlled by the opening and closing of direct current circuit. The inlet valve of the washing machine in the prior arts is primarily controlled by AC. In the invention, there is a gap between the piston cap arranged on the inlet valve of the automatic washing machine and the diaphragm plate. If the AC control is adopted, the piston cap would shake in the activity space and produce noise with the change of the voltage frequency due to the characteristic of the AC control. So it is the change of the control mode in the present invention that AC control of the inlet valve is changed to DC control, thus the noise produced by the shake induced by the piston cap moving in the activity space of the diaphragm plate is avoided by the stable characteristic of the DC output.

[0026] The inlet valve is connected with the pipe of water supply, solar water heater, hot water heater, or the other water storage devices.

[0027] At least one inlet valve is set on the washing machine, therein an inlet valve is connected with the pipe of water supply, and an inlet valve is connected with the pipe of solar water heater, hot water heater, or the other water storage devices.

[0028] The washing machine also comprises a water storage box and a detergent dispenser, the water storage box set between the inlet valve and the detergent dispenser, and the water storage box being connected with the detergent dispenser, a temperature detection device being set in the water storage box or a temperature detection device and a flow measuring device being set between the inlet valve and the water storage box.

[0029] The other water storage devices comprise a water storage box, a water storage barrel, a water storage pool or a water storage tank etc. for temporary water storage. Generally in rural areas or water-deficient area, those devices are set on the height place, and especially in rural areas, a water storage device is almost set on the roof of every household, in which rainwater is conserved, and in summer the rainwater in high temperature can replace the hot water heater.

[0030] When water is fed in washing process of the automatic washing machine, the control device sends signal to the electromagnetic coil. In an area with relatively high water pressure such as 0.1Mpa ~ 1.0Mpa, since the length of the lug boss of the piston is smaller than the activity space of the junction, the piston cap arranged on the lug boss is detached from the pressure released vent by a certain distance when the piston is magnetized, and the lug boss of the piston together with the piston cap can freely move in the activity space. In generally case, when the piston together with the lug boss and the piston cap moves about 0.5mm, the pressure released vent is opened, and the water in back pressure chamber flows to the water outlet chamber through the pressure released vent. Since the diameter of the pressure released vent is larger than one of the pressure hole, the pressure release rate produced by the drainage of the

back pressure chamber is larger than the pressure supply rate produced by the influent through the pressure hole, and so the pressure of the back pressure chamber declines. When the pressure difference between the water supply chamber and the back pressure chamber is enough large, the force would drive the diaphragm and the diaphragm plate to be detached from the valve seat, and the main valve is opened, and the water in water supply chamber flows to the water outlet chamber through the valve seat. As the diameter of the main valve is large, and the flow rate can reach over 20 l/min.

[0031] When the water pressure is lower than the specified requirements, such as lower than 0.01Mpa, even up to 0.001Mpa, the piston is magnetized and moves toward the direction away from the valve seat after that electromagnetic coils is in electrifying state, and the lug boss of the piston and the piston cap are detached from the pressure released vent, thus the pressure released vent is open and water flows from the back pressure chamber. Though the pressure released vent has already been opened before that the lug boss of the piston touches the top of the junction of the diaphragm plate, the main valve can not be opened, and a little water can only flow out from the pressure released vent. The above mentioned result is from as follows: since the water supply pressure is low and the pressure difference between the back pressure chamber and the water inlet chamber is small, the force cannot overcome the initial sealing force of the diaphragm, so the diaphragm and the diaphragm plate can not complete be lifted. Meanwhile, due to the small water supply pressure, the diaphragm has no enough pressure to completely seal the valve seat, but the magnetism on the piston produced by electromagnetic coils in electrifying state overcomes the sailing force. The piston would keep on moving towards the direction away from the valve seat when the lug boss of the piston touches the junction of the diaphragm plate, and the lug boss of the piston pulls the diaphragm plate and the diaphragm to move toward the direction away from the valve seat by the junction, and the main valve is opened, so that water in the water supply chamber directly flows into the water outlet chamber through the valve seat.

[0032] When the water inflow is finished in the washing process of the washing machine, the control device makes the electromagnetic coils be in blackout state, and the magnetism on the piston in pipe disappears, so the piston moves toward the direction of the valve seat under the action of the spring until the piston cap pushes against the diaphragm plate. Thus the pressure released vent of the diaphragm plate is sealed, and the channel for draining water in the back pressure chamber to the water outlet chamber is closed. Moreover, the water in the water supply chamber flows into the back pressure chamber through the pressure hole, and the pressure of the back pressure chamber is increased, which drives the diaphragm and the diaphragm plate to move toward the valve seat until the diaphragm touches and seals the valve seat, thus the main valve is closed.

[0033] Even in zero-pressure condition, the valve of the washing machine of the present is opened by using the magnetism of electromagnetic coil to overcome the initial sealing force of the diaphragm in the main valve.

In the low pressure range, the valve port between the diaphragm and the valve seat is even largely opened by the magnetism before the buoyancy of water is 3 times larger than the resilience of the diaphragm (water pressure range is from 0.01Mpa to 0.03Mpa), thus large flow effect at low water pressure could be achieved.

[0034] After adopting the above technical scheme, compared with the prior art, the beneficial effects of the present invention are as follows: The automatic washing machine of the present invention mainly comprises cylinder washing machine or pulsator automatic washing machine, which is employed the inlet valve, thus the range of the water pressure is expanded from the original range 0.02Mpa-1.0Mpa to the range 0Mpa-1.0Mpa, and the scope of water pressure used in the automatic washing machine is greatly expanded; meanwhile the flow through the original the electromagnetic inlet valve at low water pressure (less than 0.03MPa) is improved by the electromagnetic inlet valve of the present invention, in particularly, at 0.2Mpa, if the feeding time of inflow of 30L in washing process of the automatic washing machine is 15min, the feeding time is shortened by about 6 min due to employing the electromagnetic inlet valve of the present invention, and if twice inflows are required in the total washing cycle, the feeding time is saved by 12min; even at zero-pressure, water can not flow into the washing machine through the electromagnetic inlet valve of the prior art, and a pump is employed to feed water, thus the cost is high and it is complicated to use, however the washing machine of the present invention can be normally fed with water at zero-pressure.

[0035] In accordance with the above improved water inlet device, the range of water pressure for feeding water of the present is expanded. The inlet valve can be connected with not only water supply with low pressure, but also solar water heater, electrical water heater, or other water storage device for temporary water storage comprising a water storage box, a water storage barrel, a water storage pool or a water storage tank etc., thus good washing effect is achieved in the rural.

[0036] Combining with the drawings, the embodiment of the present invention is described in detail as follows.

Detailed description of the drawings

[0037]

FIG 1 a cross-section schematic view of an electromagnetic inlet valve in the prior arts;

FIG 2 a relation view between the force of the electromagnetic inlet valve and the pressure of the water supply in the prior arts;

FIG 3 a curve of the pressure-flow of the electromagnetic inlet valve in the prior arts;

FIG 4 a schematic view of the water inlet device of the automatic washing machine with multi-functional watering of the present invention;

FIG 5 a cross-section schematic view of the inlet valve of the present invention;

FIG 6 a locally enlarged view of the center of the diaphragm plate of the inlet valve of the present invention;

FIG 7 a state view of the piston cap of the inlet valve being detached from the pressure released vent and the valve seat being not open in the present invention;

FIG 8 a state view of the piston cap of the inlet valve being detached from the pressure released vent and the valve seat being open in the present invention;

FIG 9 a relation curve between the force of the diaphragm of the inlet valve and the pressure of the water supply in the present invention;

FIG 10 a relation curve of pressure-flow of the inlet valve in the present invention;

FIG 11 an enlarged schematic view of the diaphragm plate with double structure in the present invention;

FIG 12 an enlarged schematic view of the diaphragm plate being fixed on the diaphragm by a plurality of by-pass port in the present invention;

FIG 13 a schematic view of three-dimensional structure of the junction of the inlet valve in the present invention;

FIG 14 a schematic view of another three-dimensional structure of the junction of the inlet valve in the present invention;

FIG 15 a cross-section schematic view of the inlet valve in FIG 14

FIG 16 a exploded schematic view of the diaphragm plate with double-layer structure in the present invention;

FIG 17 another cross-section schematic view of the diaphragm plate in the present invention;

FIG 18 a schematic view of three-dimensional structure of the diaphragm in the present invention;

FIG 19 a cross-section schematic view of the diaphragm in the present invention;

FIG 20 a cross-section schematic view of one kind piston cap in the present invention;

FIG 21 a curve of feeding - time of water inlet valve in the present invention.

Embodiment

[0038] The automatic washing machine of the present invention mainly comprises cylinder automatic washing machine or pulsator automatic washing machine, preferably cylinder automatic washing machine.

Example 1

[0039] The washing machine in the embodiment includes two inlet valves, one is connected with the water

supply, and the other is connected with a solar water heater, a electrical water heater, or other storage devices for temporarily storing water which comprise water storage tank, water storage barrels, water storage pool, water pot and so on. Considering that the detergent can not complete dissolve in tap water with lower temperature, which affects on washing effect, solar water heater or electrical water heater is connected with the inlet valve, meanwhile other storage devices for temporarily storing water which comprise water storage tank, water storage barrels, water storage pool, water pot and so on is connected with the inlet valve in rural areas or water-deficient area. Commonly those devices are set on the high place, especially in rural areas, almost every household has a water storage device on their roofs to collect and conserve rainwater. Since the pressure of solar water heater or electrical water heater is low, the inlet valve is required to be improved.

[0040] As shown in FIGS. 5, 6, 7 and 8, the inlet valve of this embodiment includes a valve body 1 comprising a water supply chamber 101 and a water outlet chamber 102. A valve seat 103 is located between the water supply chamber 101 and the water outlet chamber 102, a diaphragm 2 is arranged on the valve seat 103, and a perforation 201 on the centre of the diaphragm is embedded on the embedding slot 301 set on the diaphragm plate 3. A pipe 4 is set on the valve body 1, the radially expanded bottom of the pipe 4 is clipped by the sealing part 202 (as shown in FIG. 19) set on the circumferentia of the diaphragm 2, thus the back pressure chamber 104 is formed. The pressure released vent 302 is set on the center of the diaphragm plate 3, and a pressure pore 303 is set on the circumference of the diaphragm plate 3. The water supply chamber 101 is connected with the back pressure chamber 104 by the pressure pore 303. An electromagnetic coil 7 is fixed on the periphery of the pipe 4, and a magnetic circuit is formed by a bracket 9 settled on the outside of the electromagnetic coil. A piston 5 is fixed inside the pipe 4, and a piston cap 8 is installed on the top of the piston 5, and a spring 6 props the end of the piston. In case of the electromagnetic coils in state of power off, the spring makes the piston cap 8 sit on the pressure released vent 201, and the main valve is formed by the piston cap 8 and the pressure released vent 302 to control the flow of water from the back pressure chamber 104 to the water outlet chamber 102. The main valve formed by the valve seat 103 and the diaphragm 2 controls the flow of water from the water supply chamber 101 to the water outlet chamber 102. A lug boss 501 is set on the end of the piston 5 corresponding to the valve seat 103, and the piston cap 8 is arranged on the lug boss 501. A junction 304 is set on the diaphragm plate 3, and a activity space 3042 in which the lug boss of the piston moves along axial direction is set on the junction 304, a opening 3041 is set on the junction 304. The axial length of activity space 3042 is slightly longer than the axial length of the lug boss 501 of the piston. The lug boss 501 of the piston is embedded in the activity space 3042

through the opening 3041. The lug boss 501 of the piston is fasten to the rim 3043 of the top of the junction after the lug boss 501 of the piston being detached from the valve seat 103 and moving a certain distance, and the diaphragm plate 3 and the diaphragm 2 are driven to move towards the direction away from the valve seat 103 by the lug boss of piston when the lug boss of piston continues to move.

[0041] As shown in FIG.13, 16, the diaphragm plate 3 is in bowl-shape, of which the lug boss 305 of the small end bulges toward the water outlet chamber, and the embedding slot 301 on the external of the lug boss of the small end is embedded in the perforation 201 on the centre of the diaphragm, and the junction 304 projects from the opening of the bowl. A limber 3040 which connects the activity space with the back pressure chamber is set on the sides of the junction 304, and the opening 3041 includes a piston opening 306 on the upside and the limber 3040 on the sides. An embedding gap 307 in which the piston could be conveniently installed is set between the piston opening 306 and the limber, and the size of the piston opening 306, the limber 3040 and the embedding gap 307 must ensures that the piston cap 8 can be installed in the activity space 3042 through the limber 3040 on the side, but not run out from the piston opening 306 on the upside and the embedding gap 307.

[0042] The axial cross-section of the lug boss of the piston is in concave shape; the axial cross-section of the piston cap is concave or rectangle-shaped.

[0043] The watering action (open the flow path) of the electromagnetic inlet valve is as follows: In the area with low water pressurer, when the electromagnetic coils 7 is in state of power on, the piston 5 set inside pipe 4 is magnetized, and the lug boss 501 of the piston moves in the activity space 3042 set in the junction 304 of the diaphragm plate 3, thus the piston cap 8 is driven to be detached from the pressure released vent 302 of the diaphragm plate and the pilot valve is open (the piston moves about 0.5 mm). The water in the back pressure chamber 104 flows into the water outlet chamber 102 through the pressure released vent 302. Since the diameter of the pressure released vent 302 is larger than that of the pressure pore 303, the pressure release rate produced by the drainage of the back pressure chamber 104 is larger than the pressure supply rate produced by the influent through the pressure pore 303, so the pressure of the back pressure chamber 104 is decreased. When the pressure difference between the water supply chamber 101 and the back pressure chamber 104 is enough large, the diaphragm 2 is lifted up, and the main valve is open, and the water in the water supply chamber 101 can directly flows into the water outlet chamber through the valve seat 103.

[0044] As shown in FIG6, 7 and 8, when the water pressure is below the specified requirements, the piston 5 is magnetized and moves toward the direction away from the valve seat 103 after the electromagnetic coil 7 is in the state of power on. Though the back pressure chamber

104 is connected with the water outlet chamber 102, the main valve can not be opening, and a little water can only flow out from the pressure released vent 302 before the lug boss 501 touching the rim 3043 of the top of the junction of the diaphragm plate. The above mentioned result is from as follows: since the water supply pressure is low and the pressure difference between the back pressure chamber 104 and the water inlet chamber 101 is small, the force cannot overcome the initial sealing force of the diaphragm. Meanwhile, due to the small water supply pressure, the diaphragm 2 can not completely seal the valve seat 103, but the magnetism on the piston 5 produced by electromagnetic coils 7 in electrifying state can overcome the sailing force. With the piston moving, the lug boss 501 of the piston moves in the junction 304 of the diaphragm plate 3 to touching the rim 3043 of the top of the junction, and the piston 5 continues to move toward the direction away from the valve seat 103, thus the diaphragm plate 3 together with the diaphragm 2 is pulled to move toward the direction away from the valve seat 103, and the main valve is opened, and the water in the water supply 101 directly flows into the water outlet chamber 102. The magnetism produced by the appropriately arranged electromagnetic coils is enough to overcome the force on the diaphragm produced by the back pressure chamber at low pressure or zero pressure. FIG.9 shows the relation of the force on the diaphragm when the magnetism of electromagnetic coil is about 150g.

[0045] The water stopping action (close the flow path) of the electromagnetic inlet valve is as follows: the electromagnetic coils is power off, and the magnetism on the piston disappeared, so the lug boss of the piston together with the piston cap moves toward the direction close to the valve seat 103 under the action of the spring 6. When the piston cap 8 touches the pressure released vent 302 of the diaphragm plate, the pilot valve is closed, and the channel through which the water in the back pressure chamber 104 flows into the water outlet chamber 102 is closed. Meanwhile, the water in the water supply chamber 101 flows into the back pressure chamber 104 through the pressure pore 303, so the increased pressure of the back pressure chamber 104 pulls the diaphragm plate 3 and the diaphragm 2 to move toward the valve seat 103, until the diaphragm 2 is sealed the valve seat 103. Therefore the main valve is closed.

[0046] FIG4 shows a schematic view of the water inlet device of the automatic washing machine with multi-function watering of the present invention. The water inlet device includes two inlet valves 10 and 11, a water storage box 12 and a detergent dispenser 13, the water storage box being set between the inlet valve and the detergent dispenser, and the water storage box being connected with the detergent dispenser. Therein one inlet valve is connected with water supply, and the other inlet valve is connected with solar water heater or electrical water heater. A temperature detection device is set in the water storage box, or the temperature detection device and the flow measuring device are set between the inlet valve

and the water storage box, by which the temperature of the mixed water in the water storage box is detected, or the inlet temperature is detected in opening the inlet valve. In washing process, clothes is put into the washing tub, and the water demand is estimated according to the weight of clothes or other turbidity level by the washing machine, simultaneously the inlet valve being connected with solar water heater or electrical water heater and that connected with the water supply are opened. The temperature of the mixing water is adjusted to the optimal temperature for dissolving detergent by the washing machine, and the optimal temperature for dissolving detergent is from 30°C to 50°C.

[0047] In order to dissolve detergent better, an internal cycling sprinkler system is also set in the washing machine. The water in tub is pumped to the top of the tub and is sprayed to the tub through the sprinkler port by the circulating pump.

[0048] The users can determine whether to dissolve detergent in warm water or not in using the washing machine. If the users do not select the step of detergent dissolved in warm water, he can open the inlet valve connected with water supply, and the water flows into the washing tub through the water storage box and the detergent dispenser to achieve the set water level, thus the washing machine is in normal operation. If the users determine dissolve detergent in warm water, then two inlet valves are opened at the same time, and the feeding time is controlled to make the mixed water temperature in water storage box achieve the set temperature, and the water flowing into the detergent dispenser for dissolving detergent.

[0049] After the water being heated up to the set temperature, the water demand is calculated according to the water temperature, the amount of water in the water storage box, the set temperature and the set temperature of the mixed water. The inlet valve is opened again, and the water is mixed with the heated water and flows into the detergent dispenser. Detergent begins to be dissolved in the mixed water in the detergent dispenser. If the detergent does not be completely dissolved once, the heated water is added again according to the above steps, or heated water is repeatedly added until the detergent is completely dissolved and flushed into the tub. Here, stop heating and continue to add water to the tub. After the set water level being achieved, the washing procedure is operated.

Example 2

[0050] The difference between example 1 and the present example is as follows: in the present example one inlet valve is set on the washing machine, the inlet valve is connected with water supply or other water storage devices. Or in the present example, many inlet valves are set, the inlet valves are separately connected with water supply, solar water heater, electrical water heater or other water storage devices.

Example 3

[0051] The difference between example 1, example 2 and the present example is as follows: in the electromagnetic inlet valve of the inlet device of the washing machine in the present example shown in FIG. 14 and 15, the diaphragm plate 3 is in bowl-shape, of which the center lug boss 305 of the small end bulges faces the water outlet chamber, and the pressure released vent 302 is connected with the water outlet chamber through the center lug boss 305, and the embedding slot 301 on the external of the lug boss 305 is embedded with the perforation 201 on the centre of the diaphragm, and the junction 304 projects from the bowl, and a limber connected the activity space 3042 with the back pressure chamber is set on the sides of the junction, and the opening 3041 faces to the axial direction of the piston 5, and the piston cap 8 is a elastic inverted frustum of a cone (shown in FIG 20), of which the upper area is larger than the area of the opening 3041, and the bottom area is smaller than the area of the opening 3041 and larger than the area of the pressure released vent 302. During the installation process, the lug boss of the piston and the piston cap are inserted into the activity space 3042 through the opening 3041 by squeezing the upper side.

Example 4

[0052] The electromagnetic inlet valve of the present example is shown in FIG. 11, 12, 16 and 17. The difference between the present example and the above example is as follows: the diaphragm plate 3 is composed of the first diaphragm plate 31 and the second diaphragm plate 32, and a cavum 33 being formed by the inlet 3201 of the second diaphragm plate 32, the first diaphragm plate 31 and the second diaphragm plate 32 in embedding each other, and the pressure pore 303 is formed by the inlet 3101 of the back pressure chamber on the first diaphragm plate 31.

Example 5

[0053] The electromagnetic inlet valve of the present example is shown in FIG. 17 and 18. A protrusion or multiple protrusions 34 are set on the outer peripheral of the diaphragm plate, the embedding slot 3401 is set on the protrusion, and the corresponding embedding hole 203 to the protrusion is arranged on the peripheral of the diaphragm 2, and the embedding slot 3401 is embedded in the embedding hole 203. Other structure is same as the above examples.

[0054] The automatic washing machine of the present invention mainly comprises cylinder washing machine or pulsator automatic washing machine, which employs the inlet valve, thus the range of the water pressure is expanded from the original range 0.02Mpa to 1.0Mpa to the range 0Mpa to 1.0Mpa, and the scope of water pressure used in the automatic washing machine is greatly

expanded; meanwhile the flow of the electromagnetic inlet valve of prior art at low water pressure (less than 0.03MPa) is improved by the electromagnetic inlet valve of the present invention, in particularly, at 0.2Mpa, if the feeding time of inflow of 30 l in washing process of the automatic washing machine is 15min, the feeding time is shortened by about 6 min due to employing the electromagnetic inlet valve of the present invention, and if twice inflows are required in the total washing cycle, the feeding time saved by 12min (shown in FIG.21).

[0055] Even in zero-pressure, the valve of the washing machine of the present is opened by using the magnetism of electromagnetic coil to overcome the initial sealing force. In the low pressure area, the valve port between the diaphragm and the valve seat is even larger opened by the magnetism before the buoyancy of water is 3 times larger than the resilience of the diaphragm (water pressure range is from 0.01Mpa to 0.03Mpa), thus large flow effect at low water pressure could be achieved (shown in FIG.10). Water can not flow into the washing machine through the electromagnetic valve in prior arts, and a pump is employed to feed water, thus the cost is high and the use is complicated. However the washing machine of the present invention can normally feed water at zero-pressure.

Claims

1. An automatic washing machine with multi-functional watering, comprising an inlet valve, said inlet valve comprising a valve body (1), a valve seat (103), a diaphragm plate (3), a piston (5), a spring (6), and an electromagnetic coil (7), wherein the valve body (1) comprises a water supply chamber (101), a water outlet chamber (102), and a back pressure chamber (104), the valve seat (103) is located between the water supply chamber (101) and the water outlet chamber (102), the back pressure chamber (104) is located on the side of the diaphragm plate (3) corresponding to the piston (5), the water supply chamber (101) and the water outlet chamber (102) are located on the other side of the diaphragm plate (3) corresponding to the piston (5), **characterized in that** a lug boss (501) is set on the end of the piston (5) corresponding to the back pressure chamber (104), a junction (304) is set on the diaphragm plate (3) corresponding to the lug boss (501), an activity space (3042) in which the lug boss (501) axially moves is set in the junction (304), and an opening which is jogged with the lug boss (501) is set on the junction (304).

2. An automatic washing machine with multi-functional

watering according to claim 1, wherein a diaphragm (2) is installed on the valve seat (103), and a perforation is settled in the centre of the diaphragm (2), and a pipe is fixed on the valve body (1), and the radially expanding bottom end of the pipe is clipped by a sealing part on the circumferential of the diaphragm (2);

a center pressure released vent (302) is arranged on the centre of the diaphragm (2), and a pressure hole is set on the peripheral of the diaphragm plate (3), the water supply chamber (101) being connected with the back pressure chamber (104) by the pressure hole;

the electromagnetic coil (7) is installed around the periphery of the pipe, and a magnetic circuit is formed by a bracket settled on the outside of the electromagnetic coil, and the piston (5) is set in the pipe, and a piston cap (8) is installed on the lug boss (501) of the piston, the other end of the piston opposite the lug boss touches the spring (6), and a pilot valve formed by the piston cap and the pressure released vent (302) of the diaphragm plate (3) controls the communication and incommunication of the back pressure chamber (104) with the outlet water chamber (102), and a main valve formed by the valve seat and the diaphragm controls the communication and incommunication of the water supply chamber (101) with the outlet water chamber (102).

3. An automatic washing machine with multi-functional watering according to claim 2, wherein the diaphragm plate (3) is in bowl-shape, of which a centre lug boss (305) of the small end bulges toward the water outlet chamber (102), and the pressure released vent (302) is connected with the water outlet chamber (102) through the center lug boss (305), and an embedding slot on the external of the centre lug boss is embedded with the perforation (202) on the centre of the diaphragm (2), and the junction (304) projects from the opening of the bowl, and a limb which connects the activity space (3042) with the back pressure chamber (104) is set on the side of the junction (304), and the opening is facing to the axial direction of the piston (5), and the piston cap (8) is a elastic inverted frustum of a cone structure, of which the upper area is larger than the area of the opening, and the bottom area is smaller than the area of the opening and larger than the area of the pressure released vent (302).

4. An automatic washing machine with multi-functional watering according to claim 2, wherein the diaphragm plate (3) is in bowl-shape, of which the lug boss of the small end bulges toward the water outlet chamber (102), and an embedding slot (301) on the external of the lug boss of the small end is embedded with the perforation (202) on the centre of the diaphragm (2), and the junction (304) projects from the

opening of the bowl, and a limbers which connects the activity space (3042) with the back pressure chamber (104) is set on the side of the junction, the opening includes a piston opening on the upside and a limbers (3040) settled on the sides, and an embedding gap (307) in which the piston (5) could be installed is set between the piston opening and the limbers, and the size of the piston opening, the limbers and the embedding gap must guarantee that the piston cap (8) can be installed in the activity space (3042) through the limbers on the sides, but not run out from the piston opening on the upside and the embedding gap (307).

5. An automatic washing machine with multi-functional watering according to one of claims 2 to 4, wherein the diaphragm plate (3) comprises a first clapboard and a second clapboard, the first clapboard is tabled with the second clapboard to form a cavity, and the pressure hole is formed by a water inlet on the second clapboard being connected with the water supply chamber, an inflow entrance of the back pressure chamber on the first clapboard, and the cavity.
6. An automatic washing machine with multi-functional watering according to one of claims 2 to 5, wherein one or more protrusions are set on the outer peripheral of the side of the diaphragm plate corresponding to the water outlet chamber, and an embedding slot is set on the protrusion, and an embedding hole corresponding to the protrusion is arranged on the peripheral of the diaphragm, and the embedding slot is embedded in the embedding hole.
7. An automatic washing machine with multi-functional watering according to one of claims 1 to 6, wherein the electromagnetic coil (7) is connected with direct current circuit, and the movement of the piston (5) is controlled by the opening and closing of direct current circuit.
8. An automatic washing machine with multi-functional watering according to any one of claims 1 to 7, wherein the inlet valve is connected with the pipe of water supply, solar water heater, hot water heater, or the other water storage devices.
9. An automatic washing machine with multi-functional watering according to any one of claims 1 to 7, wherein at least one inlet valve is set on the washing machine, therein an inlet valve is connected with the pipe of water supply, and an inlet valve is connected with the pipe of solar water heater, hot water heater, or the other water storage devices.
10. An automatic washing machine with multi-functional watering according to claim 8 or 9, wherein the washing machine also comprises a water storage box (12)

and a detergent dispenser (13), the water storage box (12) being set between the inlet valve and the detergent dispenser (13), and the water storage box (12) being connected with the detergent dispenser (13), a temperature detection device being set in the water storage box, or a temperature detection device and a flow measuring device being set between the inlet valve and the water storage box.

Patentansprüche

1. Automatische Waschmaschine mit Multifunktionswasserzufuhr, umfassend ein Einlassventil, wobei das Einlassventil einen Ventilkörper (1), einen Ventilsitz (103), einen Membranteller (3), einen Kolben (5), eine Feder (6) und eine elektromagnetische Spule (7) umfasst, wobei
 der Ventilkörper (1) eine Wasserversorgungskammer (101), eine Wasserauslasskammer (102) und eine Gegendruckkammer (104) umfasst, der Ventilsitz (103) zwischen der Wasserversorgungskammer (101) und der Wasserauslasskammer (102) angeordnet ist, die Gegendruckkammer (104) auf der Seite des Membrantellers (3) angeordnet ist, die mit dem Kolben (5) korrespondiert, die Wasserversorgungskammer (101) und die Wasserauslasskammer (102) auf der anderen Seite des Membrantellers (3) angeordnet sind, die mit dem Kolben (5) korrespondiert,
dadurch gekennzeichnet, dass
 ein Mitnehmernocken (501) an dem Ende des Kolbens (5) angeordnet ist, das mit der Gegendruckkammer (104) korrespondiert, eine Verbindung (304) an dem Membranteller (3) angeordnet ist, die mit dem Mitnehmernocken (501) korrespondiert, ein Aktionsraum (3042), in dem sich der Mitnehmernocken (501) axial bewegt, in der Verbindung (304) angeordnet ist und eine Öffnung, die von dem Mitnehmernocken (501) berührt wird, an der Verbindung (304) angeordnet ist.
2. Automatische Waschmaschine mit Multifunktionswasserzufuhr nach Anspruch 1, wobei
 eine Membran (2) an dem Ventilsitz (103) installiert ist und eine Perforation in der Mitte der Membran (2) angebracht ist, ein Rohr an dem Ventilkörper (1) fixiert ist, und das sich radial ausbreitende untere Ende des Rohrs von einem dichtenden Teil am Umfang der Membran (2) umschlossen ist;
 eine mittige Druckentlastungsöffnung (302) in der Mitte der Membran (2) angeordnet ist und eine Drucköffnung am Rand des Membrantellers (3) eingerichtet ist, wobei die Wasserversorgungskammer (101) über die Drucköffnung mit der Gegendruck-

kammer (104) verbunden ist;

die elektromagnetische Spule (7) um den Umfang des Rohrs herum angeordnet ist, eine Magnetschaltung von einem Bügel gebildet wird, der außen an der elektromagnetischen Spule angeordnet ist, und der Kolben (5) in dem Rohr angeordnet ist, und ein Kolbendeckel (8) an dem Mitnehmernocken (501) des Kolbens installiert ist, das andere Ende des Kolbens gegenüber dem Mitnehmernocken die Feder (6) berührt, und ein Vorsteuerventil, das von dem Kolbendeckel und der Druckentlastungsöffnung (302) des Membrantellers (3) gebildet wird, die Verbindung und Trennung der Gegendruckkammer (104) und der Wasserauslasskammer (102) steuert, und die Membran die Verbindung und Trennung der Wasserversorgungskammer (101) und der Wasserauslasskammer (102) steuert.

3. Automatische Waschmaschine mit Multifunktionswasserzufuhr nach Anspruch 2, wobei der Membranteller (3) schalenförmig ist, mittig davon ein Mitnehmernocken (305) des schmalen Endes in Richtung der Wasserauslasskammer (102) vorsteht, die Druckentlastungsöffnung (302) über den mittigen Mitnehmernocken (305) mit der Wasserauslasskammer (102) verbunden ist, und ein Einbettungsschlitz außen an dem mittigen Mitnehmernocken in die Perforation (202) in der Mitte der Membran (2) eingebettet ist, und die Verbindung (304) von der Öffnung der Schale vorsteht, und eine Stütze, die den Aktionsraum (3042) mit der Gegendruckkammer (104) verbindet, an der Seite der Verbindung (304) angeordnet ist, die Öffnung in der axialen Richtung des Kolbens (5) ausgerichtet ist, der Kolbendeckel (8) ein elastisch umgekehrter Kegelstumpf ist, dessen obere Fläche größer als die Fläche der Öffnung ist und dessen untere Fläche kleiner als die Fläche der Öffnung und größer als die Fläche der Druckentlastungsöffnung (302) ist.
4. Automatische Waschmaschine mit Multifunktionswasserzufuhr nach Anspruch 2, wobei der Membranteller (3) schalenförmig ist, der Mitnehmernocken des schmalen Endes davon in Richtung der Wasserauslasskammer (102) vorsteht, ein Einbettungsschlitz (301) außen an dem Mitnehmernocken des schmalen Endes in die Perforation (202) in der Mitte der Membran (2) eingebettet ist, und die Verbindung (304) von der Öffnung der Schale vorsteht, und eine Stütze, die den Aktionsraum (3042) mit der Gegendruckkammer (104) verbindet, an der Seite der Verbindung angeordnet ist, die Öffnung auf der Oberseite eine Kolbenöffnung und an den Seiten eine Stütze (3040) aufweist, und ein Einbettungsspalt (307), in welchen der Kolben (5) eingesetzt werden kann, zwischen der Kolbenöffnung und der Stütze angeordnet ist, und die Größe der Kolbenöffnung, der Stütze und des Einbettungsspalt sicherstellen

muss, dass der Kolbendeckel (8) durch die Stütze an den Seiten in den Aktionsraum (3042) eingesetzt werden kann, jedoch nicht aus der Kolbenöffnung auf der Oberseite und dem Einbettungsspalt (307) herausragen kann.

5. Automatische Waschmaschine mit Multifunktionswasserzufuhr nach einem der Ansprüche 2 bis 4, wobei der Membranteller (3) eine erste Klappe und eine zweite Klappe umfasst, die erste Klappe so zu der zweiten Klappe angeordnet ist, dass ein Hohlraum gebildet wird, und die Drucköffnung von einem Wassereinlass an der zweiten Klappe gebildet wird, der mit der Wasserversorgungskammer verbunden ist, einem Einlaufeingang der Gegendruckkammer an der ersten Klappe und dem Hohlraum.
6. Automatische Waschmaschine mit Multifunktionswasserzufuhr nach einem der Ansprüche 2 bis 5, wobei ein oder mehrere Vorsprünge an dem Außenumfang der Seite des Membrantellers in Korrespondenz mit der Wasserauslasskammer angeordnet sind, und ein Einbettungsschlitz an dem Vorsprung ausgebildet ist, und eine Einbettungsöffnung, die mit dem Vorsprung korrespondiert, an dem Umfang der Membran ausgebildet ist, und der Einbettungsschlitz in die Einbettungsöffnung eingebettet ist.
7. Automatische Waschmaschine mit Multifunktionswasserzufuhr nach einem der Ansprüche 1 bis 6, wobei die elektromagnetische Spule (7) mit einem Gleichstromkreis verbunden ist, und die Bewegung des Kolbens (5) durch das Öffnen und Schließen des Gleichstromkreises gesteuert wird.
8. Automatische Waschmaschine mit Multifunktionswasserzufuhr nach einem der Ansprüche 1 bis 7, wobei das Einlassventil mit dem Rohr der Wasserversorgung, einer solaren Wasserheizung, einem Warmwasserbereiter oder anderen Wasserspeichervorrichtungen verbunden ist.
9. Automatische Waschmaschine mit Multifunktionswasserzufuhr nach einem der Ansprüche 1 bis 7, wobei mindestens ein Einlassventil an der Waschmaschine angeordnet ist, ein Einlassventil darin mit dem Rohr der Wasserversorgung, und ein Einlassventil mit dem Rohr einer solaren Wasserheizung, einem Warmwasserbereiter oder anderen Wasserspeichervorrichtungen verbunden ist.
10. Automatische Waschmaschine mit Multifunktionswasserzufuhr nach Anspruch 8 oder 9, wobei die Waschmaschine außerdem einen Wasserspeicherkasten (12) und ein Waschmittelfach (13) umfasst, wobei der Wasserspeicherkasten (12) zwischen dem Einlassventil und dem Waschmittelfach (13) angeordnet ist und der Wasserspeicherkasten (12) mit

dem Waschmittelfach (13) verbunden ist, eine Temperaturerfassungsvorrichtung in dem Wasserspeicherkasten angeordnet ist, oder eine Temperaturerfassungsvorrichtung und eine Durchflussmessvorrichtung zwischen dem Einlassventil und dem Wasserspeicherkasten angeordnet sind.

Revendications

1. Machine à laver automatique avec alimentation en eau multifonctionnelle comprenant une vanne d'entrée, ladite vanne d'entrée comprenant un corps de vanne (1), un siège de vanne (103), une assiette de membrane (3), un piston (5), un ressort (6) et une bobine électromagnétique (7), le corps de vanne (1) comprenant une chambre d'alimentation en eau (101), une chambre de sortie d'eau (102) et une chambre de contre-pression (104), le siège de vanne (103) étant situé entre la chambre d'alimentation en eau (101) et la chambre de sortie d'eau (102), la chambre de contre-pression (104) étant située sur le côté de l'assiette de membrane (3) correspondant au piston (5),

caractérisée en ce qu'un bossage d'oeillet (501) est mis sur l'extrémité du piston (5) correspondant à la chambre de contre-pression (104), une jonction (304) est mise sur l'assiette de membrane (3) correspondant au bossage d'oeillet (501), un espace d'activité (3042) dans lequel le bossage d'oeillet (501) se déplace axialement est mis dans la jonction (304) et une ouverture qui est déplacée avec le bossage d'oeillet (501) est mise sur la jonction (304).

2. Machine à laver automatique avec alimentation en eau multifonctionnelle selon la revendication 1 dans laquelle une membrane (2) est installée sur le siège de vanne (103) et une perforation est ménagée dans le centre de la membrane (2) et un tuyau est fixé sur le corps de la vanne (1) et l'extrémité inférieure du tuyau qui s'étend radialement est attachée par une partie d'étanchéité sur la circonférence de la membrane (2), une aération de centre actionnée par pression (302) est arrangée au centre de la membrane (2) et un trou de pression est mis sur la périphérie de l'assiette de membrane (3), la chambre d'alimentation en eau (101) étant reliée à la chambre de contre-pression (104) par le trou de pression, la bobine électromagnétique (7) étant installée autour de la périphérie du tuyau et un circuit magnétique étant formé par une équerre installée sur le côté extérieur de la bobine électromagnétique et le piston (5) étant mis dans le tuyau et un couvercle de piston (8) étant installé sur le bossage d'oeillet (501) du piston, l'autre extrémité du piston en face du bossage

d'oeillet touchant le ressort (6) et une vanne pilote formée par le couvercle de piston et l'aération actionnée par pression (302) de l'assiette de diaphragme (3) commandant la communication et la non communication de la chambre de contre-pression (104) avec la chambre de sortie d'eau (102) et une vanne principale formée par le siège de vanne commandant la communication et la non communication de la chambre d'alimentation en eau (101) avec la chambre de sortie d'eau (102).

3. Machine à laver automatique avec alimentation en eau multifonctionnelle selon la revendication 2, l'assiette de membrane (3) ayant la forme d'une cuvette dont un bossage d'oeillet de centre (305) de la petite extrémité est renflé vers la chambre de sortie d'eau (102) et l'aération actionnée par pression (302) étant reliée à la chambre de sortie d'eau (102) par le bossage d'oeillet de centre (305) et une fente d'encastrement sur l'extérieur du bossage d'oeillet de centre étant encastrée avec la perforation (202) sur le centre de la membrane (2) et la jonction (304) faisant saillie de l'ouverture de la cuvette et un support qui relie l'espace d'activité (3042) à la chambre de contre-pression (104) étant mis sur le côté de la jonction (304) et l'ouverture étant tournée vers la direction axiale du piston (5) et le couvercle du piston (8) étant un tronc inversé élastique d'une structure de cône dont la zone supérieure est plus grande que la zone de l'ouverture et la zone inférieure est plus petite que la zone de l'ouverture et plus grande que la zone de l'aération actionnée par pression (302).

4. Machine à laver automatique avec alimentation en eau multifonctionnelle selon la revendication 2, l'assiette de membrane (3) ayant la forme d'une cuvette dont le bossage d'oeillet de la petite extrémité est renflé vers la chambre de sortie d'eau (102) et une fente d'encastrement sur l'extérieur du bossage d'oeillet de centre étant encastrée avec la perforation (202) sur le centre de la membrane (2) et la jonction (304) faisant saillie de l'ouverture de la cuvette et un support qui relie l'espace d'activité (3042) avec la chambre de contre-pression (104) étant mis sur le côté de la jonction (304), l'ouverture comprenant une ouverture de piston sur le côté supérieur et un support (3040) fixé sur les côtés et un vide d'encastrement (307) dans lequel le piston (5) pourrait être installé étant mis entre l'ouverture de piston et le support et la taille de l'ouverture du piston, du support et du vide d'encastrement devant garantir que le couvercle du piston (8) peut être installé dans l'espace d'activité (3042) par les supports mobiles sur les côtés mais ne peut pas sortir de l'ouverture du piston sur le côté supérieur et le vide d'encastrement (307).

5. Machine à laver automatique avec alimentation en eau multifonctionnelle selon l'une des revendica-

- tions 2 à 4, l'assiette de membrane (3) comprenant un premier panneau à clin et un second panneau à clin, le premier panneau à clin étant raccordé au second panneau à clin pour former une cavité et le trou de pression étant formé par une entrée d'eau sur le second panneau à clin qui est relié à la chambre d'alimentation en eau, à une entrée de flux d'entrée de la chambre de contre-pression sur le premier panneau à clin et à la cavité. 5
- 10
6. Machine à laver automatique avec alimentation en eau multifonctionnelle selon l'une des revendications 2 à 5, une ou plusieurs saillies étant mises sur la périphérie extérieure du côté de l'assiette de membrane correspondant à la chambre de sortie d'eau et une fente d'encastrement étant mise sur la saillie et un trou d'encastrement correspondant à la saillie étant arrangé sur la périphérie de la membrane et la fente d'encastrement étant encastrée dans le trou d'encastrement. 15 20
7. Machine à laver automatique avec alimentation en eau multifonctionnelle selon l'une des revendications 2 à 6, la bobine électromagnétique (7) étant reliée au circuit de courant continu et le mouvement du piston (5) étant commandé par l'ouverture et la fermeture du circuit de courant continu. 25
8. Machine à laver automatique avec alimentation en eau multifonctionnelle selon l'une des revendications 1 à 7, la vanne d'entrée étant reliée au tuyau d'alimentation en eau, d'un chauffeur à eau solaire, d'un chauffe-eau ou des autres dispositifs d'accumulation d'eau. 30 35
9. Machine à laver automatique avec alimentation en eau multifonctionnelle selon l'une des revendications 1 à 7, au moins une vanne d'entrée étant mise sur la machine à laver, une vanne d'entrée y étant reliée au tuyau d'alimentation en eau et une vanne d'entrée étant reliée au tuyau du chauffeur à eau solaire, du chauffe-eau ou des autres dispositifs d'accumulation d'eau. 40
10. Machine à laver automatique avec alimentation en eau multifonctionnelle selon la revendication 8 ou 9, la machine à laver comprenant également un bac de stockage de l'eau (12) et un distributeur de détergent (13), le bac de stockage de 9, et l'eau (12) étant mise entre la vanne d'entrée et le distributeur de détergent (13) et le bac de stockage de l'eau (12) étant relié au distributeur de détergent (13), un dispositif de détection de la température étant mis dans le bac de stockage de l'eau ou un dispositif de détection de la température et un dispositif de mesure du flux étant mis entre la vanne d'entrée et le bac de stockage de l'eau. 45 50 55

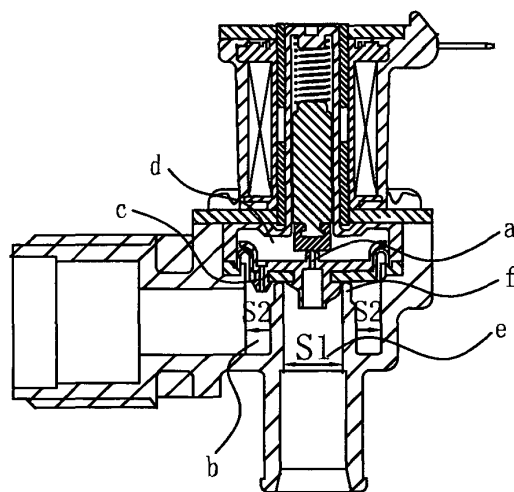


FIG. 1

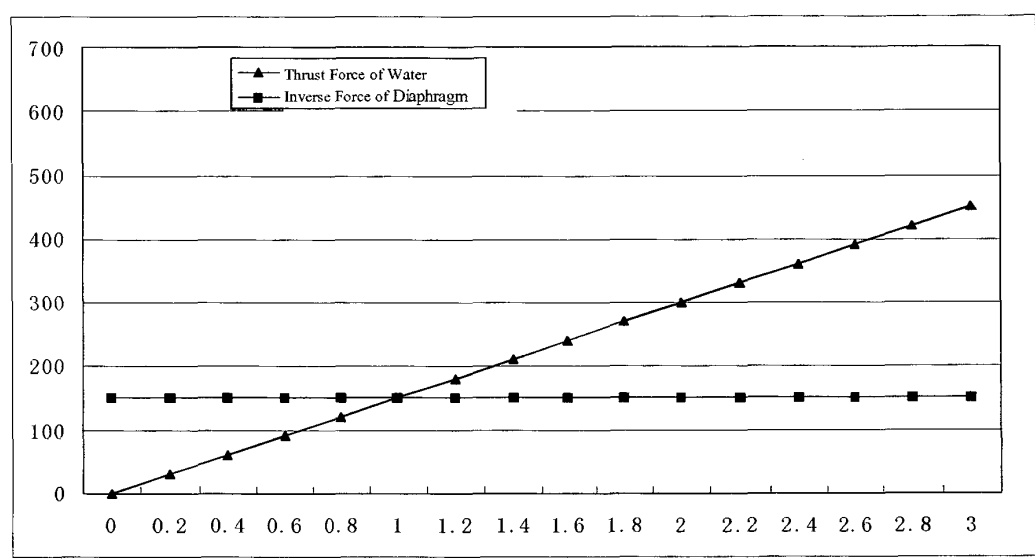


FIG. 2

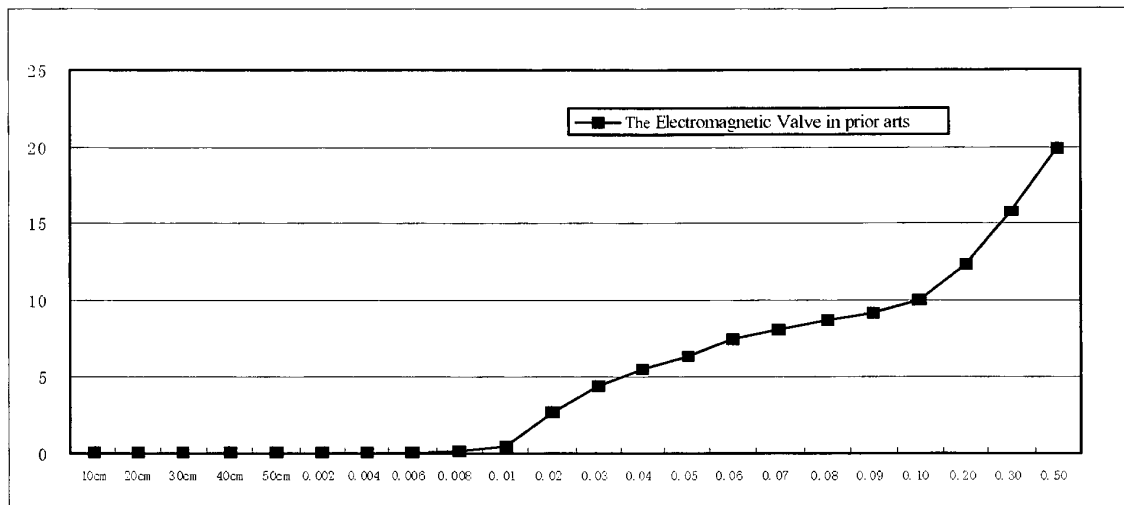


FIG. 3

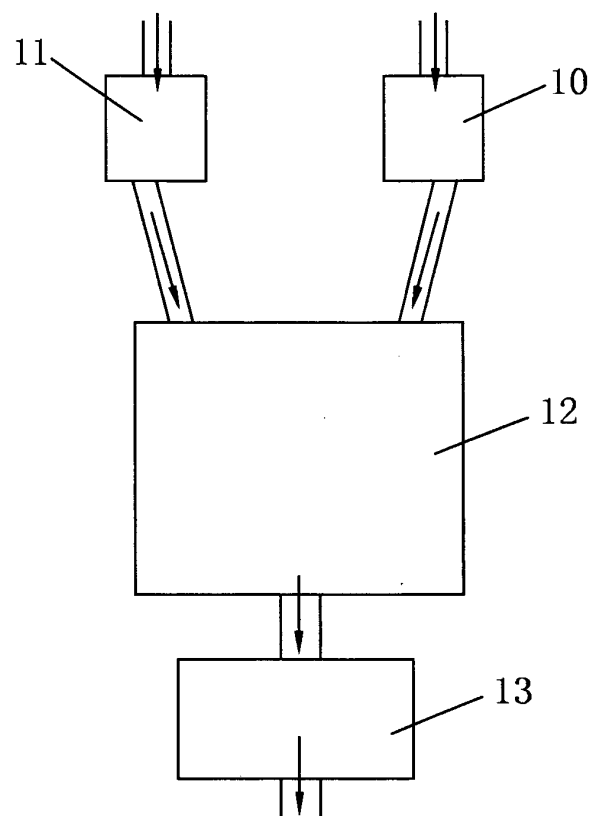


FIG. 4

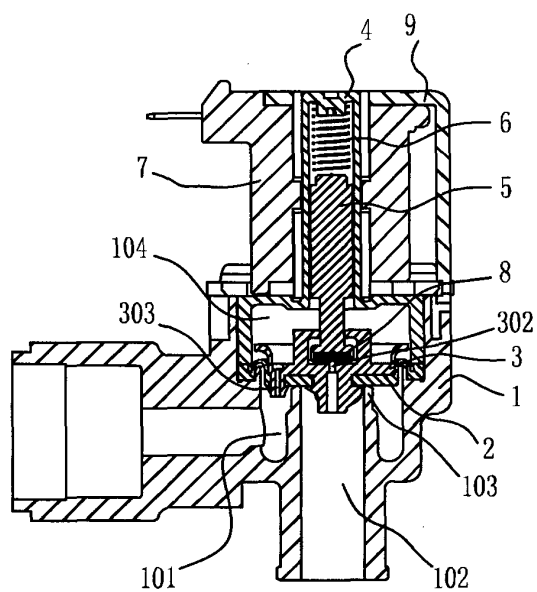


FIG. 5

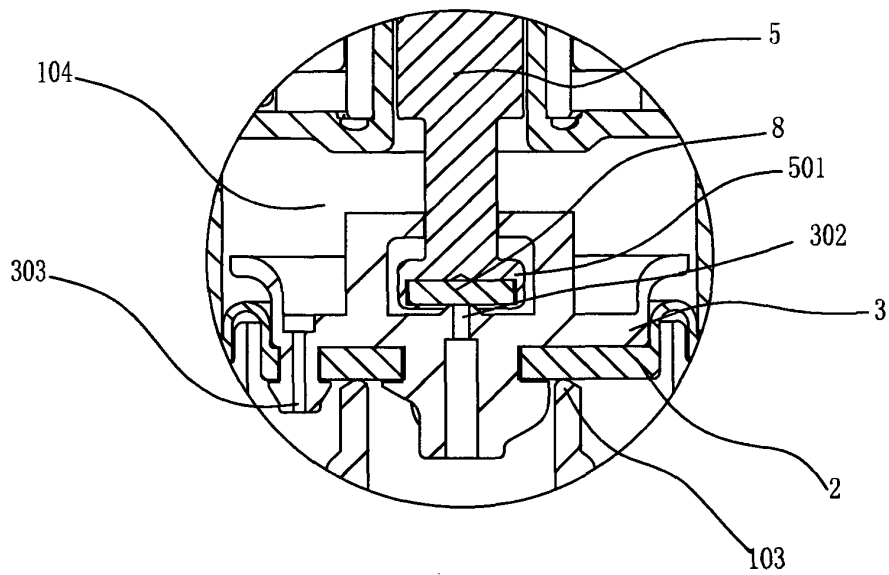


FIG. 6

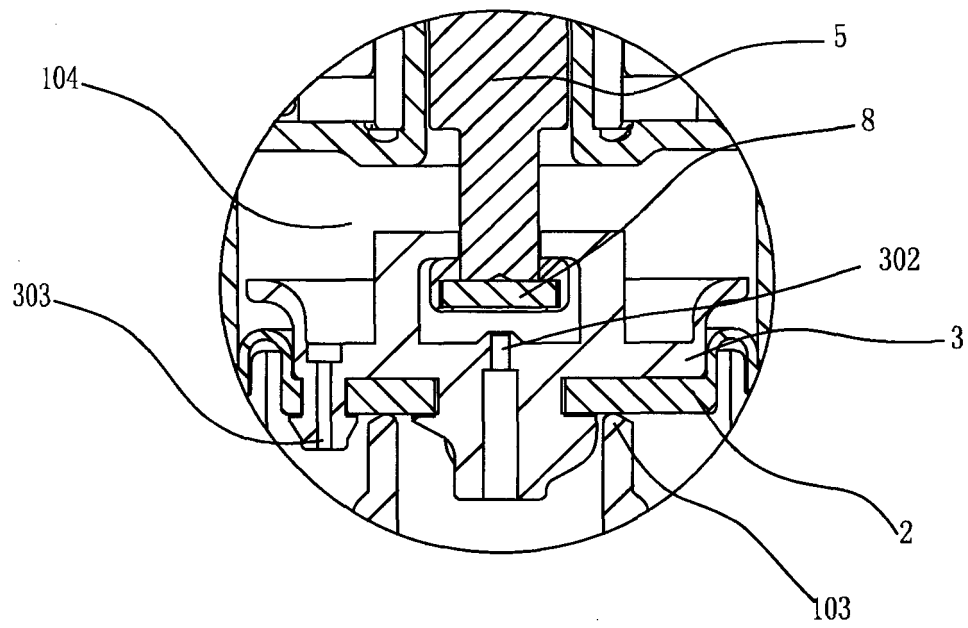


FIG. 7

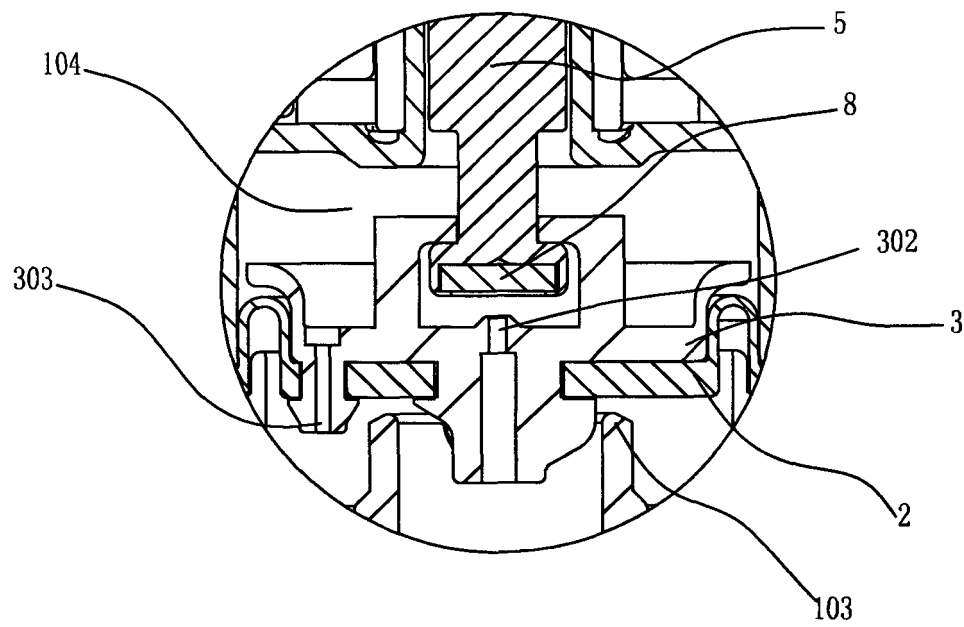


FIG. 8

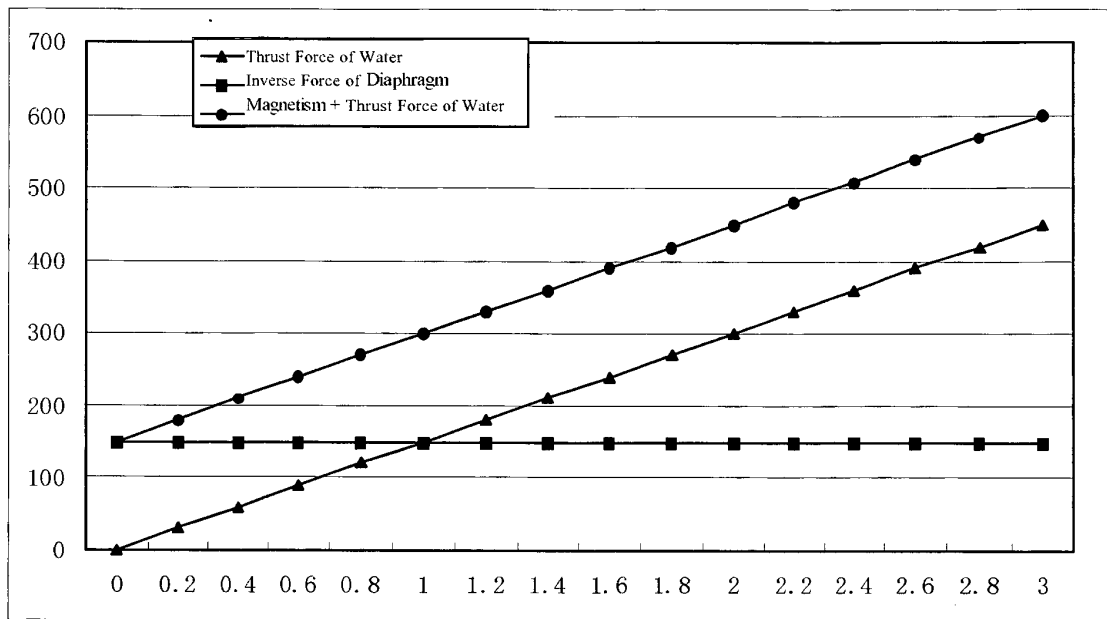


FIG. 9

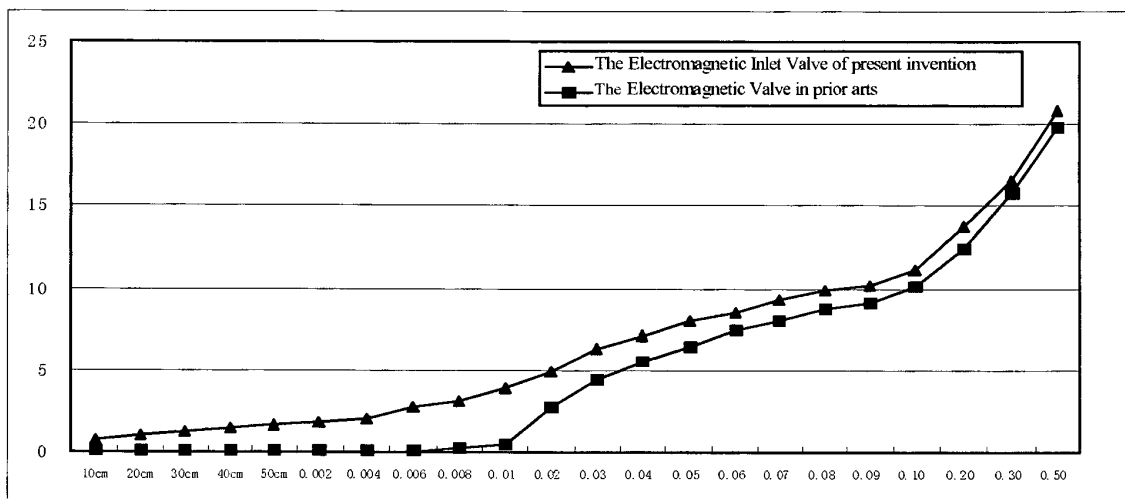


FIG. 10

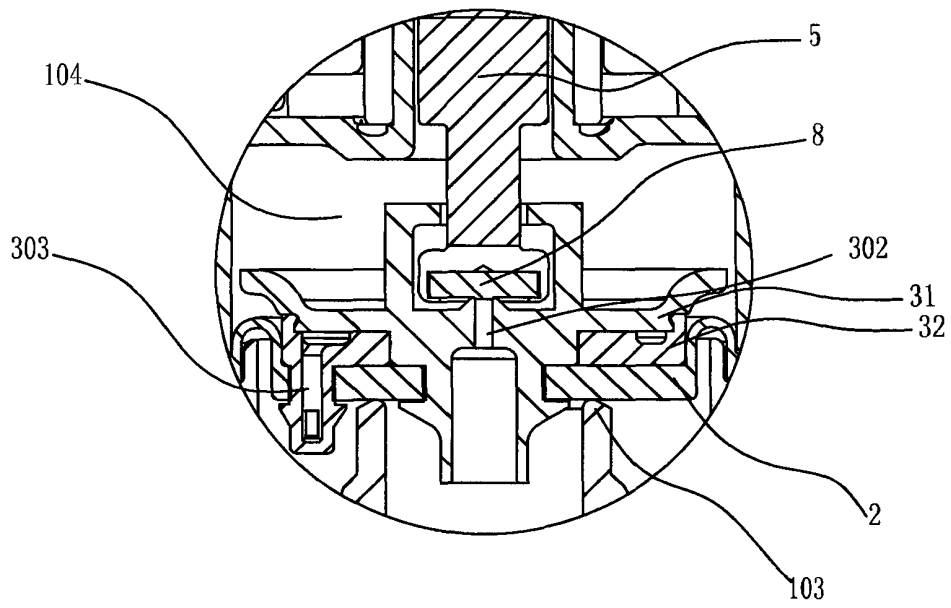


FIG. 11

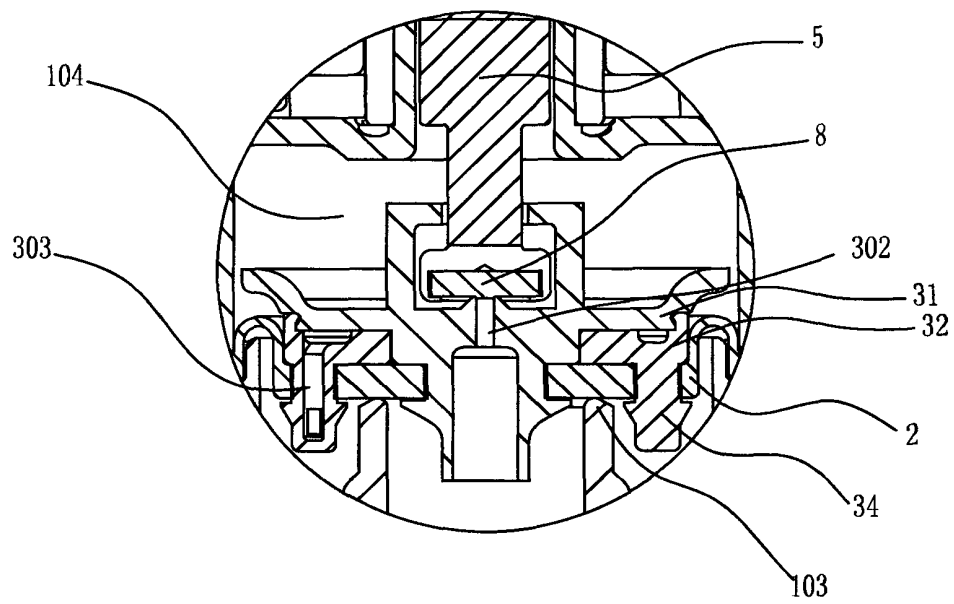


FIG. 12

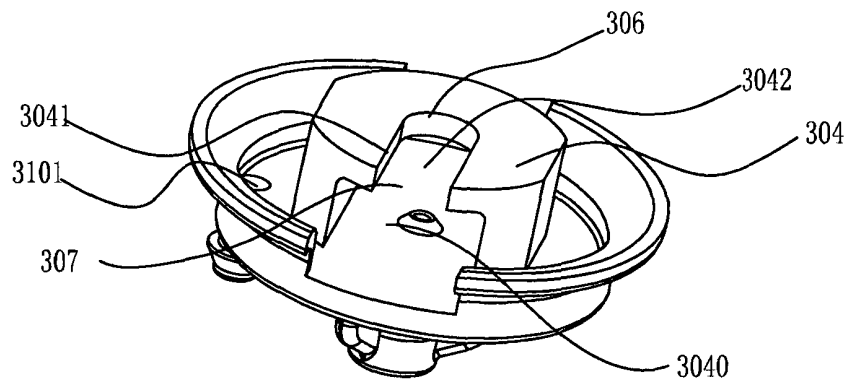


FIG. 13

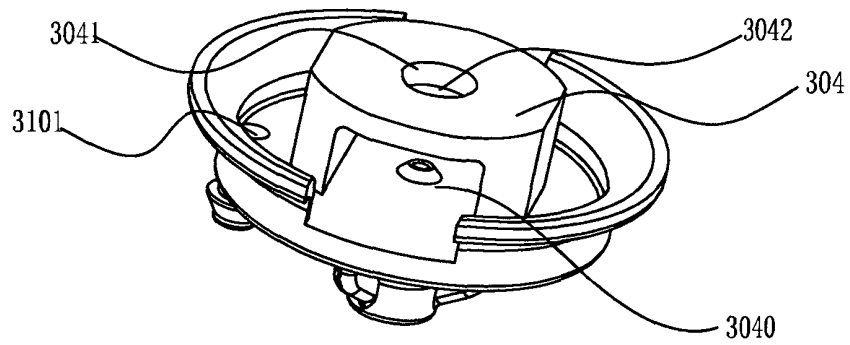


FIG. 14

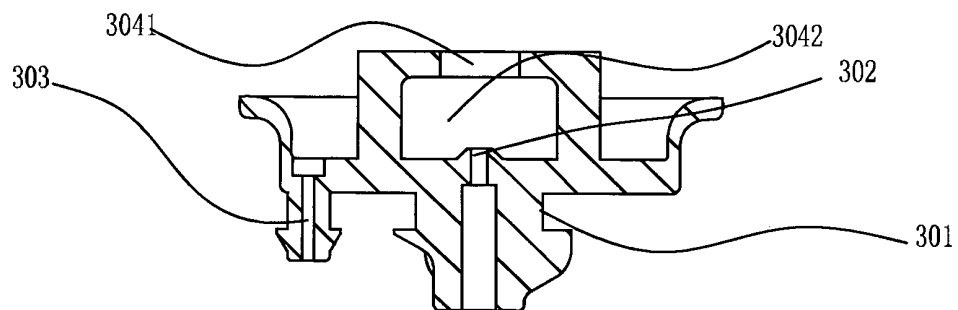


FIG. 15

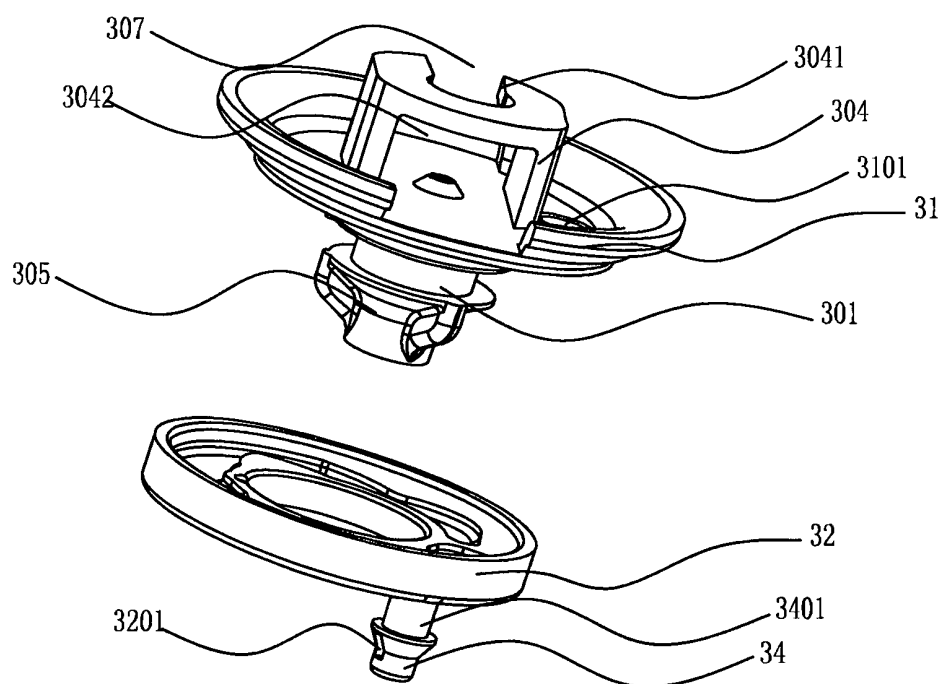


FIG. 16

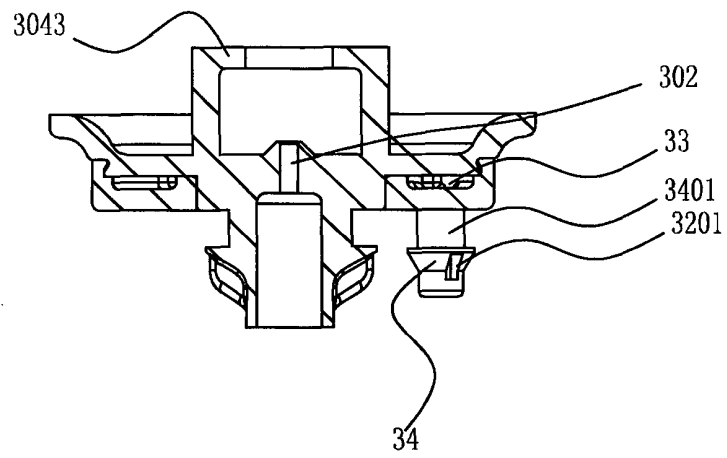


FIG. 17

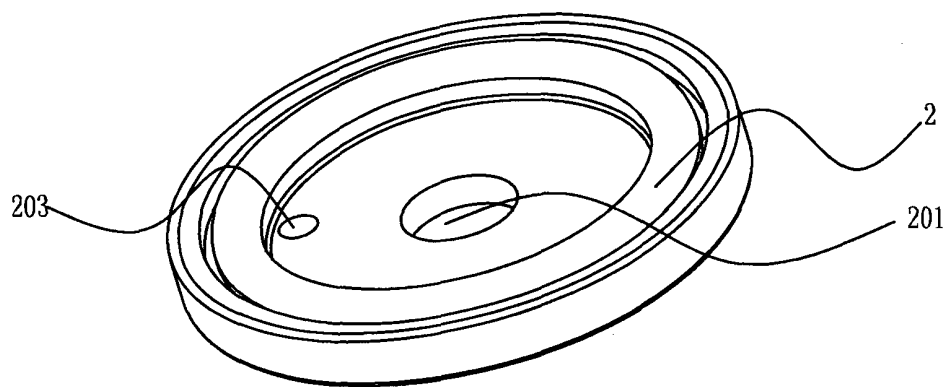


FIG. 18

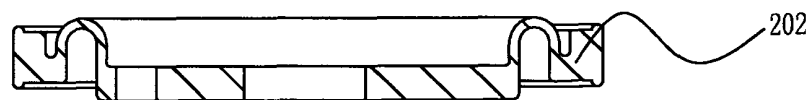


FIG. 19

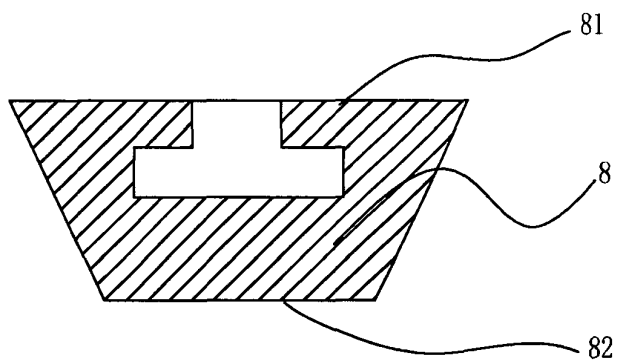


FIG. 20

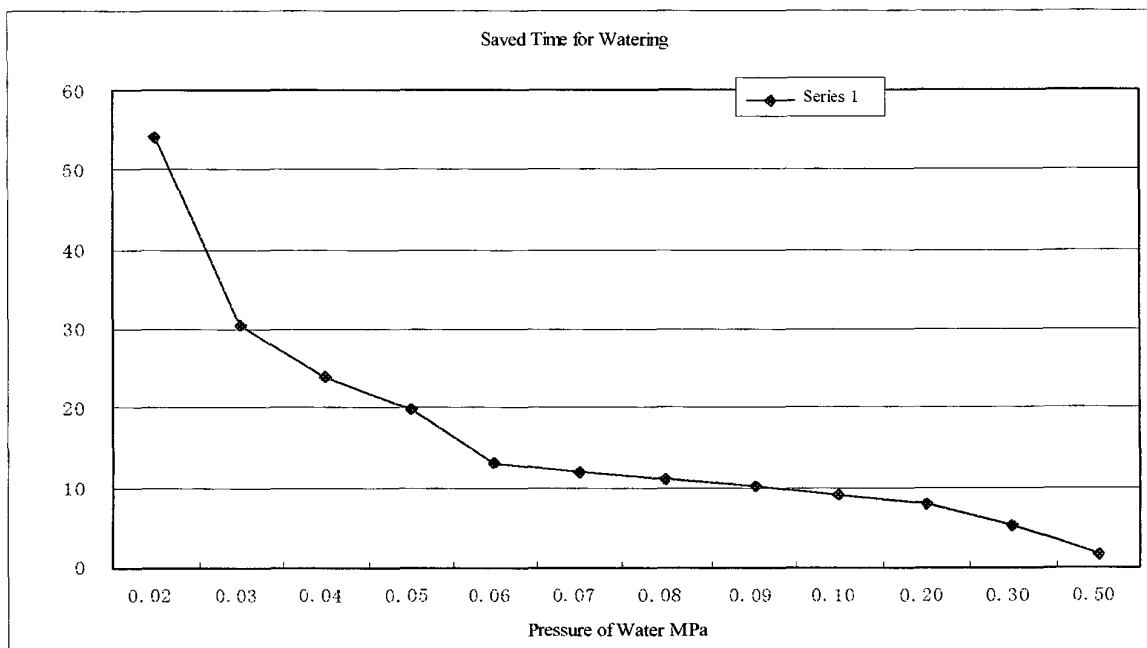


FIG. 21

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 3195561 A **[0003]**
- CN 200520080919 **[0013]**
- JP 200410057535 B **[0014]**