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(54) **DRUM WASHING MACHINE**

(57) A drum washing machine comprising a drum (400), wherein a door (200) capable of being correspondingly opened and closed is provided at the drum opening; an automatic dispensing device (100) is mounted on the door (200); the automatic dispensing device (100) comprises: a liquid storage chamber (114) for storing washing additives; a water supply waterway (102) for controllably introducing inlet water flow of the drum washing machine; and an automatic dispensing mechanism (101) for extracting washing additives stored in the liquid storage chamber (114) and dispensing them into the drum (400) of the drum washing machine along with the inlet water flow introduced by the water supply waterway (102). Through this configuration, an automatic dispensing device is added to the door of the drum washing machine to achieve the effect of automatically dispensing washing additives into the drum using the dispensing device on the door of the drum washing machine, thereby achieving significant technical progress wherein the automatic dispensing device on the door can automatically dispense pre-stored washing additives into the drum during multiple washing programs. Meanwhile, the structure is simple, the effect is significant, and it is convenient for

promotion and use.

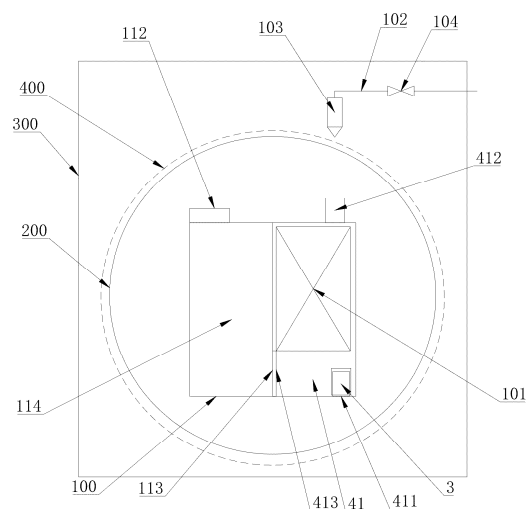


FIG. 1

Description

TECHNICAL FIELD

[0001] The present invention belongs to a drum washing machine in the technical field of household appliances, and more particularly, relates to a drum washing machine having an automatic washing additive dispensing device mounted on the door.

BACKGROUND

[0002] At present, with the continuous improvement of living standards, household appliances such as washing machines are gradually being widely used. In order to facilitate washing of laundry and the like, washing machines are generally provided with automatic washing additive dispensing devices for dispensing washing additives. The washing additives include detergent for washing, disinfectant for disinfection, fabric softener for improving the softness of laundry, and the like, so as to improve the treatment effect of the washing machine on laundry.

[0003] Existing automatic washing additive dispensing devices are generally installed on the housing of the washing machine, and utilize the inlet water flow of the washing machine to dispense the extracted washing additives into the drum of the washing machine. However, when the automatic washing additive dispensing device is installed on the housing of the washing machine, it occupies a portion of the space of the housing and affects the overall design of the washing machine.

[0004] In order to solve the above problems, in some existing technical solutions, the washing additive is installed on the door of the washing machine; in particular, since the door of the drum washing machine is generally provided on the front side of the machine body, when the user opens the door outward to load or unload laundry in the drum, it is convenient to operate on the inner side of the door, so some solutions have provided washing additive dispensing devices on the door.

[0005] However, since the door needs to be movably and openably/closably installed on the housing of the washing machine, the washing additive dispensing device added to the door generally dispenses the injected washing additives into the drum in a single operation, rather than being an automatic dispensing device that can automatically extract and controllably dispense pre-stored washing additives in multiple batches.

[0006] In view of this, the present invention is proposed.

SUMMARY

[0007] The technical problem to be solved by the present invention is to overcome the deficiencies of the prior art and provide a drum washing machine to achieve the purpose of adding an automatic dispensing device on the

door of the drum washing machine; meanwhile, another object of the present invention is to provide a drum washing machine to achieve the purpose of automatically extracting and dispensing pre-stored washing additives using the dispensing device on the door, and utilizing pre-stored washing additives for automatic dispensing in batches during multiple working programs.

[0008] To solve the above technical problems, the basic concept of the technical solution adopted by the present invention is:

The present invention provides a drum washing machine, comprising a drum, wherein a door capable of being correspondingly opened and closed is provided at the drum opening; an automatic dispensing device is mounted on the door; the automatic dispensing device comprises: a liquid storage chamber for storing washing additives; a water supply waterway for controllably introducing inlet water flow of the drum washing machine; and an automatic dispensing mechanism for extracting washing additives stored in the liquid storage chamber and dispensing them into the drum of the drum washing machine along with the inlet water flow introduced by the water supply waterway.

[0009] Furthermore, a dispensing chamber is provided on the door; the dispensing chamber has a water inlet, and the outlet of the water supply waterway is correspondingly connected to the water inlet of the dispensing chamber; the dispensing chamber has a liquid inlet, and the liquid outlet of the liquid storage chamber is connected to the dispensing chamber via the automatic dispensing mechanism, utilizing the automatic dispensing mechanism to controllably extract washing additives stored in the liquid storage chamber into the dispensing chamber; the dispensing chamber has a dispensing outlet, and the dispensing outlet is connected to the drum for dispensing washing additives and/or inlet water flow in the dispensing chamber into the drum.

[0010] Furthermore, the automatic dispensing mechanism comprises a pump, wherein an inlet of the pump is connected to the liquid outlet of the liquid storage chamber, and an outlet of the pump is connected to the liquid inlet of the dispensing chamber, for pumping washing additives contained in the liquid storage chamber into the dispensing chamber using suction force generated when the pump operates; and/or;

the automatic dispensing mechanism comprises a negative pressure suction structure, wherein the negative pressure suction structure has a negative pressure flow channel inside, the negative pressure flow channel has a negative pressure port, the negative pressure port is connected to the liquid outlet of the liquid storage chamber, and the negative pressure flow channel is connected in series in the water supply waterway, for forming negative pressure at the negative pressure port using inlet water flow flowing through the internal negative pressure flow channel, and then using the negative pressure to draw washing additives contained in the liquid storage

chamber into the dispensing chamber.

[0011] Furthermore, the automatic dispensing mechanism comprises a control valve waterway, wherein the liquid outlet of the liquid storage chamber is controllably connected to the liquid inlet of the dispensing chamber via the waterway, for dispensing washing additives in the liquid storage chamber into the dispensing chamber when connected; preferably, a control valve for controlling connection and disconnection of the waterway is installed on the control valve waterway, and the control valve may be any one or combination of existing valve assemblies, such as an electrically controlled valve, a float valve, a push-bounce valve, and the like.

[0012] Of course, the washing additive automatic dispensing device 100 in the embodiments of the present invention may also adopt the structure of the automatic dispensing device described in Embodiment 1 or 2 below.

[0013] In the embodiments of the present invention, the washing machine comprises a housing, the drum is installed inside the housing, and a laundry loading opening is provided on the housing corresponding to the drum opening, for forming a passage for loading and unloading laundry in the drum; generally, an outer tub is fitted around the outside of the drum, the opening of the outer tub is coaxially and codirectionally provided with the drum opening, and a tubular, elastically expandable window gasket is connected between the opening of the outer tub and the laundry loading opening to form a passage for loading and unloading laundry; a door capable of correspondingly opening and closing the laundry loading opening is installed on the housing, and the automatic dispensing device is installed on the door. Preferably, the door is provided with a protruding portion protruding toward the inside of the housing, at least a portion of the protruding portion extends into the drum opening, the automatic dispensing device is installed on the protruding portion, and the dispensing outlet of the dispensing chamber of the automatic dispensing device is provided facing the inside of the drum, so that the dispensed washing additives and/or inlet water flow directly flows into the drum of the washing machine.

[0014] In the embodiments of the present invention, a water supply waterway is provided on the housing of the washing machine, a spray head is provided at the outlet of the water supply waterway, and the spray head is installed on the housing of the washing machine; the spray head has a water spray port for spraying inlet water flow outward, and the water spray port is provided facing the water inlet of the dispensing chamber of the automatic dispensing device provided on the door; preferably, the water inlet of the dispensing chamber is arranged vertically upward; when the door is in the closed position, the spray head is located vertically above the water inlet of the dispensing chamber, and the water spray port is located directly below the spray head, arranged coaxially with the water inlet of the dispensing chamber and provided vertically downward; further preferably, a control valve for controlling connection and disconnection of the

waterway is provided on the water supply waterway.

[0015] In the embodiments of the present invention, the protruding portion provided on the door is made of transparent material, and at least a portion of the protruding portion is arranged interleaved with the automatic dispensing device, for allowing a user to observe the inside of the drum.

[0016] In the embodiments of the present invention, a filling port is provided at the top of the liquid storage chamber for a user to inject washing additives into the liquid storage chamber; the liquid outlet of the liquid storage chamber is located at the bottom of the chamber, connected to the dispensing chamber via the automatic dispensing mechanism.

[0017] In the embodiments of the present invention, a siphon tube structure is provided at the dispensing outlet of the dispensing chamber, for intercepting and mixing washing additives and inlet water flow flowing into the dispensing chamber to form a washing additive mixture, and dispensing the formed washing additive mixture into the drum along with the inlet water flow.

[0018] In the embodiments of the present invention, the siphon tube structure comprises: a siphon tube provided at the dispensing outlet at the bottom of the dispensing chamber, extending vertically upward into the dispensing chamber; a siphon cap fitted over the top of the siphon tube, having a sleeve portion extending downward and fitted around the periphery of the siphon tube; a first predetermined height difference exists between the bottom end of the sleeve portion of the siphon cap and the bottom wall of the dispensing chamber, and a second predetermined height difference exists between the top of the siphon cap and the top of the siphon tube, for triggering a siphon effect when the liquid level in the liquid storage chamber reaches the height of the top of the siphon tube, such that the washing additive mixture in the liquid storage chamber flows toward the dispensing outlet of the dispensing chamber along the gap between the siphon cap and the siphon tube and the internal flow channel of the siphon tube.

[0019] After adopting the above technical solutions, the present invention has the following beneficial effects compared with the prior art:

Through the above configuration, an automatic dispensing device is added to the door of the drum washing machine to achieve the effect of automatically dispensing washing additives into the drum using the dispensing device on the door of the drum washing machine, thereby achieving significant technical progress wherein the automatic dispensing device provided on the door can automatically dispense pre-stored washing additives into the drum during multiple washing programs.

[0020] Meanwhile, the present invention has a simple structure, significant effects, and is suitable for promotion and use.

[0021] The technical problem to be solved by the present invention is to overcome the deficiencies of the prior art and provide an automatic additive dispensing device.

By providing a switch structure in the dispensing chamber, the switch structure can open the liquid outlet at the same time as opening the water inlet under the action of inlet water pressure, realizing automatic opening of the liquid outlet, so that the additive in the liquid storage chamber can automatically flow into the dispensing chamber for dispensing, avoiding additionally providing a suction pump as a power source to extract the additive in the liquid storage chamber into the dispensing chamber for dispensing, thereby achieving the purpose of reducing energy consumption and saving production and maintenance costs.

[0022] To solve the above technical problems, the basic concept of the technical solution adopted by the present invention is:

The present invention provides an automatic dispensing device, wherein a liquid storage chamber and a dispensing chamber are provided inside the automatic dispensing device, a liquid outlet communicating with the dispensing chamber is provided on the liquid storage chamber, a water inlet is provided on the dispensing chamber, and a switch structure is provided in the dispensing chamber for opening and closing the water inlet, and for linkedly opening and closing the liquid outlet as the liquid level in the dispensing chamber changes.

[0023] Furthermore, the switch structure comprises a push-bounce switch provided at the water inlet and a floating switch provided at the liquid outlet, the push-bounce switch moves reciprocally relative to the water inlet in the water inlet direction, the floating switch moves reciprocally relative to the liquid outlet in the liquid outlet direction, and the floating switch switches between being linked with the push-bounce switch and moving relative to the push-bounce switch.

[0024] Furthermore, the push-bounce switch comprises a push-bounce rod and a return spring, both ends of the return spring are connected to a first end of the push-bounce rod and a side wall of the dispensing chamber respectively, a second end of the push-bounce rod is a blocking end for blocking the water inlet, and the floating switch is provided on the outer periphery of the push-bounce rod and is slidably connected to the outer periphery of the push-bounce rod in the axial direction of the push-bounce rod.

[0025] Furthermore, a radially protruding boss portion is provided on the outer periphery of the push-bounce rod, an through-hole is provided in the boss portion, an axis of the through-hole is parallel to an axis of the push-bounce rod, the floating switch is a columnar structure, the floating switch is fitted in the through-hole and is slidably connected to the inner periphery of the through-hole, a blocking portion for blocking the liquid outlet is provided on an end wall of the floating switch, and the blocking portion is exposed outside the through-hole.

[0026] Furthermore, a radially protruding slider is provided on the outer periphery of the floating switch, a strip-shaped slideway communicating with the through-hole is provided on a peripheral wall of the through-hole, one end

of the strip-shaped slideway is a blocking end and the other end is an open end, the slider enters the strip-shaped slideway through the open end of the strip-shaped slideway, and passes through the strip-shaped slideway to be slidably connected to the strip-shaped slideway.

[0027] Furthermore, a circumferentially extending torsion spring is provided on an outer peripheral wall of the through-hole, a middle portion of the torsion spring is fitted around the periphery of the slider passing through the strip-shaped slideway, protruding portions are provided on both sides of the strip-shaped slideway on the outer peripheral wall of the through-hole, both sides of the torsion spring are respectively fitted around the peripheries of the two protruding portions, and the torsion spring provides a return force for returning the floating switch and the push-bounce rod.

[0028] Furthermore, the push-bounce switch further comprises a locking rod, the locking rod has a locking segment, an axially extending sliding groove is provided on the outer periphery of the push-bounce rod, a locking groove is provided in the sliding groove, the locking segment is slidably connected to the sliding groove, and the locking segment is inserted into the locking groove to lock the push-bounce rod when the locking segment slides into position in the sliding groove.

[0029] Furthermore, the sliding groove comprises a first groove segment and a second groove segment and a third groove segment formed by bifurcation of the first groove segment, a switching chamber is formed at the intersection of the first groove segment, the second groove segment, and the third groove segment, a rib is provided in the switching chamber, a recessed portion recessed toward the first groove segment is provided on the rib, the recessed portion cooperates with the inner wall of the switching chamber to form the locking groove, and the locking segment periodically moves sequentially in the first groove segment, the second groove segment, the locking groove, and the third groove segment.

[0030] Furthermore, the dispensing chamber is provided with a tubular guide portion protruding outward from the dispensing chamber, a water inlet and a water outlet communicating with the water inlet of the dispensing chamber are provided at the top and bottom ends of the guide portion respectively, an annular limiting portion is formed by radially protruding from the inner periphery of the guide portion, and the second end of the push-bounce rod extends into the guide portion through the water outlet of the guide portion to abut against the annular limiting portion and block an opening surrounded by the inner periphery of the annular limiting portion.

[0031] Furthermore, the liquid storage chamber and the dispensing chamber are distributed vertically, the liquid outlet is provided at the bottom of the liquid storage chamber, and the water inlet is provided at the top of the dispensing chamber.

[0032] After adopting the above technical solutions, the present invention has the following beneficial effects

compared with the prior art:

By providing a switch structure in the dispensing chamber, the switch structure can open the liquid outlet at the same time as opening the water inlet under the action of inlet water pressure, realizing automatic opening of the liquid outlet, so that the additive in the liquid storage chamber can automatically flow into the dispensing chamber for dispensing, avoiding additionally providing a suction pump as a power source to extract the additive in the liquid storage chamber into the dispensing chamber for dispensing, thereby reducing energy consumption and saving production and maintenance costs.

[0033] The technical problem to be solved by the present invention is to overcome the deficiencies of the prior art and provide an automatic dispensing device. By providing a water storage chamber that can be connected to and disconnected from outside atmosphere at the water outlet of the negative pressure generator, the water storage chamber can be disconnected from outside atmosphere and be filled with water when inlet water flushes the additive in the dispensing chamber, so that the inlet water of the negative pressure generator can flow into the dispensing chamber from the negative pressure port to flush the additive, realizing that the inlet water for flushing the additive comes from the inlet water of the negative pressure generator, avoiding additionally providing an inlet water pipeline to supply water into the dispensing chamber to flush the additive, improving the compactness of the automatic dispensing device structure while reducing production costs.

[0034] To solve the above technical problems, the basic concept of the technical solution adopted by the present invention is:

The present invention provides an automatic dispensing device, wherein a liquid storage chamber, a dispensing chamber, and a negative pressure generator are provided inside the dispensing device, a liquid outlet communicating with the dispensing chamber is provided on the liquid storage chamber, a water outlet and a negative pressure port communicating with the dispensing chamber are provided on the negative pressure generator, a first control valve that opens and closes the liquid outlet in response to negative pressure changes and a second control valve that opens and closes the negative pressure port in response to liquid level changes are provided in the dispensing chamber, and a water storage chamber that can be connected to and disconnected from outside atmosphere is provided at the water outlet.

[0035] Furthermore, an overflow chamber is connected to the water storage chamber, an overflow port communicating with outside atmosphere is provided on the overflow chamber, a water inlet and a water outlet of the negative pressure generator are connected through a constriction port, the negative pressure port is provided on the constriction port, the overflow port is arranged higher than the negative pressure port, and a connection between the water storage chamber and the overflow chamber is arranged lower than the negative pressure

port.

[0036] Furthermore, the negative pressure generator comprises a linearly extending negative pressure tube, the water inlet and the water outlet of the negative pressure generator are provided at both ends of the negative pressure tube respectively, a water storage tube forming the water storage chamber is provided at the water outlet of the negative pressure generator, the water storage tube is arranged inclined relative to the negative pressure tube, one end of the water storage tube intersects with the water outlet end of the negative pressure tube, and the other end is connected to an overflow tube that is parallel to the negative pressure tube and forms the overflow chamber, one end of the overflow tube is connected to the water storage tube, and the other end is provided with the overflow port.

[0037] Furthermore, a storage tube is provided at the intersection of the water storage tube and the negative pressure tube, an accommodation chamber is formed inside the storage tube, a float valve that connects and disconnects the connection between the water storage chamber and the overflow chamber in response to liquid level changes is provided in the accommodation chamber, and the water outlet of the negative pressure generator is arranged facing the accommodation chamber.

[0038] Furthermore, the water storage tube is provided with a tapering segment at the connection between the water storage chamber and the overflow chamber, the tapering segment gradually narrows into the overflow chamber and is inclined along with the water storage tube, an opening communicating with the overflow chamber is surrounded by the inner periphery of the small-size end of the tapering segment, and a radial dimension of the float valve is smaller than a radial dimension of the opening.

[0039] Furthermore, a blocking rib is provided at the water outlet of the negative pressure generator, the blocking rib divides the water outlet of the negative pressure generator into a plurality of water outlet regions that restrict the float valve from entering the negative pressure tube.

[0040] Furthermore, the storage tube is arranged coaxially with the negative pressure tube, one end of the storage tube is connected to the negative pressure tube and the water storage tube, and the other end is provided with a drain port, a pressure relief valve that opens and closes the drain port in response to water pressure changes is provided at the drain port, the pressure relief valve is provided outside the accommodation chamber, a water passage hole communicating with the drain port is provided on the accommodation chamber, and the float valve opens and closes the water passage hole in response to water pressure changes.

[0041] Furthermore, an annular separating rib coaxial with the storage tube is provided on an inner wall of the storage tube, a central opening of the annular separating rib forms the water passage hole, the annular separating rib divides the interior of the storage tube into a first

chamber segment connected to the water storage tube and the negative pressure tube and a second chamber segment provided with the drain port, the annular separating rib and an inner periphery of the first chamber segment form the accommodation chamber, and the pressure relief valve is provided in the second chamber segment.

[0042] Furthermore, the pressure relief valve comprises a valve core reciprocally moving in an axial direction of the second chamber segment and a return spring providing a return force for returning the valve core, the return spring is fitted around an outer periphery of the valve core, one end of the return spring is connected to the valve core and the other end is connected to an inner wall of the storage tube at an outer periphery of the drain port, a protrusion is provided at an end of the valve core facing the water passage hole, and the protrusion passes through the water passage hole to abut against the float valve.

[0043] Furthermore, the liquid storage chamber and the dispensing chamber are distributed vertically, the liquid outlet is provided at the bottom of the liquid storage chamber, and a liquid inlet communicating with the negative pressure port is provided at the top of the dispensing chamber.

[0044] After adopting the above technical solutions, the present invention has the following beneficial effects compared with the prior art:

By providing a water storage chamber that can be connected to and disconnected from outside atmosphere at the water outlet of the negative pressure generator, the water storage chamber can be disconnected from outside atmosphere and be filled with water when inlet water flushes the additive in the dispensing chamber, so that the inlet water of the negative pressure generator can flow into the dispensing chamber from the negative pressure port to flush the additive, realizing that the inlet water for flushing the additive comes from the inlet water of the negative pressure generator, avoiding additionally providing an inlet water pipeline to supply water into the dispensing chamber to flush the additive, improving the compactness of the automatic dispensing device structure while reducing production costs.

[0045] The specific embodiments of the present invention are described in detail below in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF DRAWINGS

[0046] The accompanying drawings, as a part of the present invention, are used to provide further understanding of the present invention. The schematic embodiments of the present invention and their descriptions are used to explain the present invention and do not constitute improper limitations on the present invention. Obviously, the drawings in the following description are only some embodiments. For those of ordinary skill in the art, other drawings can be obtained based on these

drawings without creative effort. In the drawings:

FIG. 1 is a schematic structural view of a drum washing machine in an embodiment of the present invention;

FIG. 2 is a schematic structural view of an automatic additive dispensing device provided in an embodiment of the present invention;

FIG. 3 is an exploded view of the automatic additive dispensing device provided in an embodiment of the present invention;

FIG. 4 is a schematic structural view of the interior of the lower housing provided in an embodiment of the present invention;

FIG. 5 is a schematic view showing the positional relationship between a locking rod and a sliding groove provided in an embodiment of the present invention;

FIG. 6 is a schematic structural view of the sliding groove provided in an embodiment of the present invention;

FIG. 7 is a schematic structural view of a floating switch provided in an embodiment of the present invention;

FIG. 8 is a schematic structural view of an automatic dispensing device from one perspective provided in an embodiment of the present invention;

FIG. 9 is a cross-sectional view at A-A in FIG. 8;

FIG. 10 is a schematic structural view of an automatic dispensing device provided in an embodiment of the present invention;

FIG. 11 is a schematic structural view of an automatic dispensing device from one perspective provided in an embodiment of the present invention;

FIG. 12 is an exploded view of an automatic dispensing device provided in an embodiment of the present invention;

FIG. 13 is a schematic structural view of an automatic dispensing device from another perspective provided in an embodiment of the present invention;

FIG. 14 is a cross-sectional view at B-B in FIG. 13.

[0047] Reference numerals: 100-automatic dispensing device; 101-automatic dispensing mechanism; 102-water supply waterway; 103-spray head; 104-control valve; 200-door; 300-housing; 400-drum; 2-push-bounce switch; 1-outer housing; 11-upper housing; 111-water inlet; 112-filling port; 113-liquid outlet; 114-liquid storage chamber; 12-lower housing; 21-push-bounce switch; 211-push-bounce rod; 2111-sliding groove; 2111a-first groove segment; 2111b-second groove segment; 2111c-third groove segment; 2112-locking groove; 2113-switching chamber; 2114-rib; 2115-recessed portion; 212-return spring; 213-boss portion; 2131-through-hole; 2132-strip-shaped slideway; 2133-protruding portion; 214-mounting seat; 215-locking rod; 2151-locking segment; 216-spring plate; 2161-first bent portion; 2162-second bent portion; 217-positioning

hole; 22-floating switch; 221-assembly portion; 2211-slider; 222-switch portion; 2221-groove portion; 2222-blocking portion; 23-torsion spring; 3-siphon structure; 4-dispensing housing; 41-dispensing chamber; 411-dispensing outlet; 412-water inlet; 413-liquid inlet; 5-top cover; 51-guide portion; 511-annular limiting portion; 52-upper protrusion; 53-lower protrusion; 121-dispensing outlet; 31-second float valve; 414-first float valve; 415-check valve; 54-protruding portion; 55-connecting tube; 56-dispensing tube; 6-negative pressure generator; 61-negative pressure port; 62-water inlet; 63-negative pressure tube; 64-water outlet; 65-blocking rib; 7-float valve; 8-water storage tube; 81-water storage chamber; 811-tapering segment; 9-overflow tube; 91-overflow chamber; 92-overflow port; 10-storage tube; 101-first chamber segment; 102-second chamber segment; 103-accommodation chamber; 104-water passage hole; 105-drain port; 106-pressure relief valve; 1061-valve core; 1062-return spring; 1063-protrusion; 107-annular separating rib; 108-guide rib.

[0048] It should be noted that these drawings and textual descriptions are not intended to limit the conceptual scope of the present invention in any way, but to illustrate the concept of the present invention for those skilled in the art by referring to specific embodiments.

DETAILED DESCRIPTION

[0049] In order to make the objects, technical solutions, and advantages of the embodiments of the present invention clearer, the following will clearly and completely describe the technical solutions in the embodiments of the present invention in conjunction with the accompanying drawings in the embodiments of the present invention. The following embodiments are used to illustrate the present invention but are not used to limit the scope of the present invention.

[0050] In the description of the present invention, it should be noted that the orientation or positional relationships indicated by the terms "upper", "lower", "front", "rear", "left", "right", "vertical", "inner", "outer", etc. are based on the orientation or positional relationships shown in the drawings, and are only for the convenience of describing the present invention and simplifying the description, rather than indicating or implying that the device or element referred to must have a specific orientation, be constructed and operated in a specific orientation, and therefore cannot be understood as a limitation on the present invention.

[0051] In the description of the present invention, it should be noted that, unless otherwise clearly specified and limited, the terms "mounted", "connected", and "coupled" should be understood in a broad sense. For example, they may be fixed connections, detachable connections, or integral connections; they may be mechanical connections or electrical connections; they may be direct connections or indirect connections through intermediate media. For those of ordinary skill in the

art, the specific meanings of the above terms in the present invention can be understood according to specific circumstances.

[0052] As shown in FIG. 1, an embodiment of the present invention provides a drum washing machine, comprising a drum 400, wherein a door 200 capable of being correspondingly opened and closed is provided at the drum opening; an automatic dispensing device 100 is mounted on the door 200; the automatic dispensing device 100 comprises a liquid storage chamber 114 for storing washing additives; a water supply waterway 102 for controllably introducing inlet water flow of the drum washing machine; and an automatic dispensing mechanism 101 for extracting washing additives stored in the liquid storage chamber 114 and dispensing them into the drum 400 of the drum washing machine along with the inlet water flow introduced by the water supply waterway 102.

[0053] Through the above configuration, an automatic dispensing device is added to the door of the drum washing machine to achieve the effect of automatically dispensing washing additives into the drum using the dispensing device on the door of the drum washing machine, thereby achieving significant technical progress wherein the automatic dispensing device provided on the door can automatically dispense pre-stored washing additives into the drum during multiple washing programs.

[0054] In the embodiments of the present invention, the automatic dispensing device 100 may be any structure in the prior art that can achieve the function of automatic dispensing of washing additives in batches and in fixed quantities; for example: the automatic dispensing device described in Embodiment 1 or 2 below.

[0055] In the embodiments of the present invention, a dispensing chamber 41 is provided on the door 200; the dispensing chamber 41 has a water inlet 412, and the outlet of the water supply waterway 102 is correspondingly connected to the water inlet 412 of the dispensing chamber 41; the dispensing chamber 41 has a liquid inlet 413, and the liquid outlet 113 of the liquid storage chamber 114 is connected to the dispensing chamber 41 via the automatic dispensing mechanism 101, utilizing the automatic dispensing mechanism 101 to controllably extract washing additives stored in the liquid storage chamber 114 into the dispensing chamber 41; the dispensing chamber 41 has a dispensing outlet 411, and the dispensing outlet 411 is connected to the drum 400 for dispensing washing additives and/or inlet water flow in the dispensing chamber 41 into the drum 400.

[0056] In the embodiments of the present invention, the automatic dispensing mechanism 101 may be any existing structure that can achieve the function of drawing washing additives contained in the liquid storage chamber 114 into the dispensing chamber 41, for example: The automatic dispensing mechanism 101 comprises a pump, wherein an inlet of the pump is connected to the liquid outlet 113 of the liquid storage chamber 114, and an

outlet of the pump is connected to the liquid inlet 413 of the dispensing chamber 41, for pumping washing additives contained in the liquid storage chamber 114 into the dispensing chamber 41 using suction force generated when the pump operates.

[0057] Also, for example:

The automatic dispensing mechanism 101 comprises a negative pressure suction structure, wherein the negative pressure suction structure has a negative pressure flow channel inside, the negative pressure flow channel has a negative pressure port, the negative pressure port is connected to the liquid outlet 113 of the liquid storage chamber 114, and the negative pressure flow channel is connected in series in the water supply waterway 102, for forming negative pressure at the negative pressure port using inlet water flow flowing through the internal negative pressure flow channel, and then using the negative pressure to draw washing additives contained in the liquid storage chamber 114 into the dispensing chamber 41.

[0058] Also, for example:

The automatic dispensing mechanism comprises a control valve waterway, which is a waterway with a control valve installed; the liquid outlet 113 of the liquid storage chamber 114 is controllably connected to the liquid inlet 413 of the dispensing chamber 41 via the waterway, for dispensing washing additives in the liquid storage chamber 114 into the dispensing chamber 41 when connected; preferably, a control valve for controlling connection and disconnection of the waterway is installed on the control valve waterway, and the control valve may be any existing valve assembly, such as an electrically controlled valve, a float valve, a push-bounce valve, and the like, or a combination thereof.

[0059] Of course, the washing additive automatic dispensing device 100 in the embodiments of the present invention may also adopt the structure of the automatic dispensing device described in Embodiment 1 or 2 below.

[0060] In the embodiments of the present invention, the washing machine comprises a housing 300, the drum 400 is installed inside the housing 300, and a laundry loading opening is provided on the housing 300 corresponding to the opening of the drum 400, for forming a passage for loading and unloading laundry in the drum 400; generally, an outer tub is fitted around the outside of the drum, the opening of the outer tub is coaxially and codirectionally provided with the drum opening, and a tubular, elastically expandable window gasket is connected between the opening of the outer tub and the laundry loading opening to form a passage for loading and unloading laundry; a door 200 capable of correspondingly opening and closing the laundry loading opening is installed on the housing 300, and the automatic dispensing device 100 is installed on the door 200. Preferably, the door 200 is provided with a protruding portion protruding toward the inside of the housing, at least a portion of the protruding portion extends into the opening of the drum 400, the automatic dispensing de-

vice 100 is installed on the protruding portion, and the dispensing outlet 411 of the dispensing chamber 41 of the automatic dispensing device 100 is provided facing the inside of the drum 400, so that the dispensed washing additives and/or inlet water flow directly flows into the drum 400 of the washing machine.

[0061] In the embodiments of the present invention, a water supply waterway 102 is provided on the housing 300 of the washing machine, a spray head 103 is provided at the outlet of the water supply waterway 102, and the spray head is installed on the housing 300 of the washing machine; the spray head 103 has a water spray port for spraying inlet water flow outward, and the water spray port is provided facing the water inlet 412 of the dispensing chamber 41 of the automatic dispensing device 100 provided on the door 200; preferably, the water inlet 412 of the dispensing chamber 41 is arranged vertically upward; when the door 200 is in the closed position, the spray head 103 is located vertically above the water inlet 412 of the dispensing chamber 41, and the water spray port 41 is located directly below the spray head 103, arranged coaxially with the water inlet 412 of the dispensing chamber 41 and provided vertically downward; further preferably, a control valve 104 for controlling connection and disconnection of the waterway is provided on the water supply waterway 102.

[0062] In the embodiments of the present invention, the protruding portion provided on the door 200 is made of transparent material, and at least a portion of the protruding portion is arranged interleaved with the automatic dispensing device 100, for allowing a user to observe the inside of the drum 400.

[0063] In the embodiments of the present invention, a filling port 112 is provided at the top of the liquid storage chamber 114 for a user to inject washing additives into the liquid storage chamber 114; the liquid outlet 113 of the liquid storage chamber 114 is located at the bottom of the chamber, connected to the dispensing chamber 41 via the automatic dispensing mechanism 101.

[0064] In the embodiments of the present invention, a siphon tube structure 3 is provided at the dispensing outlet 411 of the dispensing chamber 41, for intercepting and mixing washing additives and inlet water flow flowing into the dispensing chamber 41 to form a washing additive mixture, and dispensing the formed washing additive mixture into the drum 400 along with the inlet water flow.

[0065] In the embodiments of the present invention, the siphon tube structure 3 comprises: a siphon tube provided at the dispensing outlet 411 at the bottom of the dispensing chamber 41, extending vertically upward into the dispensing chamber 41; a siphon cap fitted over the top of the siphon tube, having a sleeve portion extending downward and fitted around the periphery of the siphon tube; a first predetermined height difference exists between the bottom end of the sleeve portion of the siphon cap and the bottom wall of the dispensing chamber 41, and a second predetermined height difference

exists between the top of the siphon cap and the top of the siphon tube, for triggering a siphon effect when the liquid level in the liquid storage chamber 114 reaches the height of the top of the siphon tube, such that the washing additive mixture in the liquid storage chamber 114 flows toward the dispensing outlet 411 of the dispensing chamber 41 along the gap between the siphon cap and the siphon tube and the internal flow channel of the siphon tube.

Embodiment 1

[0066] As shown in FIGS. 2-9, the present invention provides an automatic additive dispensing device, wherein a liquid storage chamber 114 and a dispensing chamber 41 are provided inside the automatic dispensing device 100, a liquid outlet 113 communicating with the dispensing chamber 41 is provided on the liquid storage chamber 114, a water inlet 412 is provided on the dispensing chamber 41, and a push-bounce switch 2 for opening and closing the liquid outlet 113 and the water inlet 412 is provided in the dispensing chamber 41.

[0067] In the embodiment of the present invention, by providing a push-bounce switch 2 in the dispensing chamber 412, the push-bounce switch 2 can open the liquid outlet 113 at the same time as opening the water inlet 412 under the action of inlet water pressure, realizing automatic opening of the liquid outlet 113, so that the additive in the liquid storage chamber 114 can automatically flow into the dispensing chamber 412 for dispensing, avoiding additionally providing a suction pump as a power source to extract the additive in the liquid storage chamber 114 into the dispensing chamber 412 for dispensing, thereby reducing energy consumption and saving production and maintenance costs.

[0068] The additive dispensing device 100 can be used for washing machines, dishwashers, and the like. A dispensing outlet 411 is provided on the dispensing chamber 412, and the dispensing outlet 411 is used to dispense the additive in the dispensing chamber 412. The washing machine comprises a housing 300, and a drum 400 for containing water is provided inside the housing 300. The dishwasher comprises an inner liner. The dispensing chamber 412 is connected to the drum 400 or the inner liner via the dispensing outlet 411.

[0069] Taking the liquid storage chamber 114 and the dispensing chamber 412 being distributed vertically, the liquid outlet 113 being provided at the bottom of the liquid storage chamber 114, and the water inlet 412 being provided at the top of the dispensing chamber 412 as an example. Specifically, the additive dispensing device comprises an outer housing 1, the outer housing 1 comprises an upper housing 11 and a lower housing 12 arranged vertically, the dispensing chamber 41 is formed inside the lower housing 12, the upper housing 11 is internally divided into a left chamber and a right chamber, the right chamber forms the liquid storage chamber 114, the left chamber forms a water inlet chamber, a water inlet

111 is provided at the top of the left chamber, the water inlet 412 of the dispensing chamber is connected to the water supply waterway 102 via the water inlet 111, a filling port 112 for adding additives and a liquid outlet 113 for allowing additives to enter the dispensing chamber 41 are provided at the top of the right chamber, realizing vertical distribution of the liquid storage chamber 114 and the dispensing chamber 41, which is beneficial for the additive in the liquid storage chamber 114 to flow into the dispensing chamber 41. By dividing the interior of the outer housing 1 into multiple chambers, while realizing automatic dispensing of additives, the space inside the outer housing 1 can be reasonably utilized, making the structure of the automatic dispensing device compact and reducing occupation of external space; the additives may be detergent for washing, fabric softener for rinsing, disinfectant for disinfection, and the like.

[0070] Furthermore, a dispensing housing 4 is provided inside the lower housing 12, a dispensing chamber 41 is formed inside the dispensing housing 4, the top of the dispensing housing 4 is an open end, a top cover 5 for closing the open end is provided at the open end, the top cover 5 extends in the left-right direction and can cover the bottoms of the left chamber and the right chamber, and the water inlet 412 of the dispensing chamber and the liquid inlet 413 of the dispensing chamber are integrated on the top cover; an outlet is provided at the bottom of the lower housing 12, the dispensing outlet 411 dispenses the additive in the dispensing chamber 41 into the lower housing 12, and then the additive enters the washing machine through the outlet of the lower housing 12, and washing water that has not entered the dispensing chamber can also enter the washing machine from the outlet of the lower housing 12.

[0071] As shown in FIGS. 4 and 9, in the embodiment of the present invention, the push-bounce switch 2 comprises a push-bounce switch 21 and a floating switch 22, the push-bounce switch 21 moves reciprocally relative to the water inlet 412 in the water inlet direction, the floating switch 22 moves reciprocally relative to the liquid outlet 113 in the liquid outlet direction, and the floating switch 22 switches between being linked with the push-bounce switch 21 and moving relative to the push-bounce switch 21.

[0072] In the embodiment of the present invention, the push-bounce switch 21 opens the water inlet 412 under the action of inlet water pressure, and closes the water inlet 412 after the inlet water pressure disappears. The push-bounce switch 21 can be driven by the inlet water pressure to drive the floating switch 22 to move, realizing opening of the liquid outlet 113. The floating switch 22 moves under the action of liquid buoyancy, realizing closing of the liquid outlet 113. Using the push-bounce switch 21 and the floating switch 22, automatic opening and closing of the liquid outlet 113 and automatic opening and closing of the water inlet 412 can be achieved.

[0073] The linkage of the floating switch 22 with the push-bounce switch 21 can realize that the push-bounce

switch 21 is driven by the inlet water pressure to drive the floating switch 22 to move, so that the liquid outlet 113 is opened; the relative movement of the floating switch 22 and the push-bounce switch 21 can realize that the floating switch 22 moves independently under the action of liquid buoyancy, so that the opened liquid outlet 113 is closed; when the water inlet 412 is provided at the top of the dispensing chamber 411 and the liquid outlet 113 is provided at the top of the liquid storage chamber, the liquid outlet direction and the water inlet direction are the vertical direction.

[0074] Furthermore, the push-bounce switch 21 comprises a push-bounce rod 211 and a return spring 212, both ends of the return spring 212 are connected to a first end of the push-bounce rod 211 and a side wall of the dispensing chamber 41 respectively, and a second end of the push-bounce rod 211 is a blocking end for blocking the water inlet. The floating switch 22 is provided on the outer periphery of the push-bounce rod 211 and is slidably connected to the outer periphery of the push-bounce rod 211 in the axial direction of the push-bounce rod 211.

[0075] Taking the push-bounce rod extending vertically as an example, the push-bounce rod 211 moves downward under the thrust of the inlet water pressure to open the water inlet 412, and moves upward to close the water inlet 412 after the inlet water pressure disappears. The return spring 212 provides a return force for the push-bounce rod 211; the bottom of the push-bounce rod 211 is connected to the bottom of the dispensing chamber 41 via the return spring 212.

[0076] The floating switch 22 is linked with the push-bounce rod 211 in the vertical direction, or moves relative to each other.

[0077] Furthermore, the push-bounce switch 21 further comprises a locking rod 215, the locking rod 215 has a locking segment, an axially extending sliding groove 2111 is provided on the outer periphery of the push-bounce rod 211, a locking groove 2112 is provided in the sliding groove 2111, the locking segment 2151 is slidably connected to the sliding groove 2111, and the locking segment 2151 is inserted into the locking groove 2112 to lock the push-bounce rod 211 when the locking segment 2151 slides into position in the sliding groove 2111.

[0078] Taking the locking rod 215 extending vertically, the locking segment 2151 extending left-right, and the sliding groove 2111 extending vertically as an example, the locking segment 2151 extends into the sliding groove 2111 and moves up and down in the sliding groove 2111. The floating switch 22 moves downward along with the push-bounce rod 211 until the locking segment 2151 is inserted into the locking groove 2112, and the push-bounce rod 211 moves upward to return to its original position after the locking segment 2151 disengages from the locking groove 2112.

[0079] The locking rod 215 further comprises a vertically extending connecting segment and a mounting segment. The mounting segment and the locking seg-

ment 2151 are provided at both ends of the connecting segment respectively. A mounting seat 214 is provided on the side wall of the dispensing chamber 41, and the mounting segment is mounted on the mounting seat 214.

[0080] The push-bounce switch 21 further comprises a vertically extending spring plate 216. The top of the spring plate 216 is bent upward to form a groove-shaped first bent portion 2161. The groove opening of the first bent portion 2161 is arranged facing away from the sliding groove 2111. The left groove side wall and the right groove side wall located on both sides of the groove opening of the first bent portion 2161 are respectively provided with open ends. A positioning hole 217 is provided on the lower groove side wall of the first bent portion 2161. The top of the connecting segment and the mounting segment pass through the positioning hole 217. The mounting segment is parallel to the upper groove side wall of the first bent portion 2161. The mounting segment abuts against the upper groove side wall of the first bent portion 2161. The upper groove side wall of the first bent portion 2161 is provided on the mounting seat 214; the positioning hole 217 is used to position the connecting segment to prevent the connecting segment from deviating during movement. The upper groove side wall of the first bent portion 2161 is used to limit the mounting segment to prevent the locking rod 215 from moving excessively upward during movement, and to ensure that the locking rod 215 maintains its original position during movement without deviation.

[0081] The bottom of the spring plate 216 is bent downward to form a groove-shaped second bent portion 2162. The groove opening of the second bent portion 2162 is arranged facing the sliding groove. The groove opening of the second bent portion 2162 is arranged upward. The left groove side wall and the right groove side wall located on both sides of the groove opening of the second bent portion 2162 are respectively provided with open ends. The bottom of the connecting segment abuts against the front groove side wall located at the front side of the groove opening of the second bent portion 2162. The second bent portion 2162 can adjust the position of the locking segment 2151 in the front-rear direction, so that the locking segment 2151 can periodically move sequentially in the first groove segment 2111a, the second groove segment 2111b, the locking groove 2112, and the third groove segment 2111c.

[0082] As shown in FIGS. 5 and 6, the sliding groove 2111 comprises a first groove segment 2111a and a second groove segment 2111b and a third groove segment 2111c formed by bifurcation of the first groove segment 2111a. A switching chamber 2113 is formed at the intersection of the first groove segment 2111a, the second groove segment 2111b, and the third groove segment 2111c. A rib 2114 is provided in the switching chamber 2113. A recessed portion 2115 recessed toward the first groove segment 2111a is provided on the rib 2114. The recessed portion 2115 cooperates with the inner wall of the switching chamber 2113 to form the

locking groove 2112. The locking segment 2151 periodically moves sequentially in the first groove segment 2111a, the second groove segment 2111b, the locking groove 2112, and the third groove segment 2111c.

[0083] Taking the push-bounce rod 211 extending vertically as an example, the second groove segment 2111b and the third groove segment 2111c are located at the upper part of the first groove segment 2111a. The rib 2114 is recessed downward to form the recessed portion 2115. The recessed portion 2115 cooperates with the inner wall of the switching chamber 2113 above the recessed portion 2115 to form the locking groove 2112.

[0084] It should be noted that during the movement of the push-bounce rod 211, the position of the locking segment 2151 itself does not change, but relative to the moving push-bounce rod 211, the relative position of the locking segment 2151 will change.

[0085] After the liquid outlet 113 is opened, liquid continuously enters the dispensing chamber 41. As the floating switch 22 rises along with the liquid level in the dispensing chamber 41 until it closes the liquid outlet 113, based on the time difference between the opening and closing of the liquid outlet 113, the amount of additive fed from the liquid storage chamber 114 into the dispensing chamber 41 can be obtained, so that the dispensing chamber 41 can serve as a fixed-volume chamber, thereby obtaining the amount of additive dispensed by the automatic dispensing device into the washing machine or dishwasher at one time.

[0086] As shown in FIGS. 4 and 9, furthermore, the dispensing chamber 41 is provided with a tubular guide portion 51 protruding outward from the dispensing chamber 41. A water inlet and a water outlet are provided at the top and bottom ends of the guide portion 51 respectively. An annular limiting portion 511 is formed by radially protruding from the inner periphery of the guide portion 51. The second end of the push-bounce rod 211 extends into the guide portion 51 through the water outlet of the guide portion 51 to abut against the annular limiting portion 511 and block an opening surrounded by the inner periphery of the annular limiting portion 511.

[0087] Taking the push-bounce rod extending vertically as an example, specifically, the top cover 5 is extended upward to form a tubular guide portion 51. The water outlet of the guide portion 51 coincides with the water inlet of the dispensing chamber 41. The top of the push-bounce rod 211 extends into the guide portion 51 through the water outlet at the bottom end of the guide portion 51 to abut against the bottom of the annular limiting portion 511 and block the opening of the annular limiting portion 511, thereby realizing blocking of the water inlet 412 of the dispensing chamber.

[0088] The bottom of the annular limiting portion 511 abuts against the top of the push-bounce rod 211 when the liquid outlet 113 is in the closed state, and blocks the opening of the annular limiting portion 511, so that while closing the water inlet, the washing water entering the guide portion 51 can completely contact the push-bounce

rod 211, providing a larger thrust for the push-bounce rod 211.

[0089] External washing water enters the guide portion 51 from the water inlet at the top of the guide portion 51, passes through the annular limiting portion 511 to contact the top of the push-bounce rod 211, and impacts the push-bounce rod 211 downward, causing the push-bounce rod 211 to move downward. The annular limiting portion 511 separates from the push-bounce rod 211, opening the water inlet 412 of the dispensing chamber, and the washing water enters the dispensing chamber 41 from the water outlet at the bottom of the guide portion 51, and the liquid outlet 113 switches from the closed state to the open state.

[0090] When the push-bounce rod 211 moves upward in the guide portion 51 until it abuts against the bottom of the annular limiting portion 511, the annular limiting portion 511 can block the upwardly moving push-bounce rod to prevent the push-bounce rod 211 from moving upward excessively.

[0091] Specifically, the guide portion 51 is provided in the left chamber. The water inlet at the top of the guide portion 51 is arranged directly facing the main water inlet 111 at the top of the left chamber, so that the washing water entering the left chamber can enter the guide portion 51 with a larger impact force, so that the push-bounce rod 211 can drive the floating switch 22 to move downward. The guide portion 51 can collect the washing water entering the left chamber, so that the washing water can accurately impact the push-bounce rod 211. Furthermore, since the top of the push-bounce rod 211 extends into the guide portion 51 through the opening at the bottom end of the guide portion 51, the push-bounce rod 211 can move up and down in the guide portion 51 under the guidance of the guide portion 51, improving the accuracy of opening or closing the liquid outlet 113; the top of the push-bounce rod 211 always moves up and down in the guide portion 51.

[0092] Further specifically, the guide portion 51 above the annular limiting portion 511 gradually narrows from top to bottom, which can increase the impact pressure of the washing water entering the guide portion 51 below the annular limiting portion 511, thereby increasing the impact on the push-bounce rod 211.

[0093] As shown in FIGS. 4 and 7, in the embodiment of the present invention, a radially protruding boss portion 213 is provided on the outer periphery of the push-bounce rod 211. A through-hole 2131 is provided in the boss portion 213. An axis of the through-hole 2131 is parallel to an axis of the push-bounce rod 211. The floating switch 22 is a columnar structure. The floating switch 22 is fitted in the through-hole 2131 and is slidably connected to the inner periphery of the through-hole 2131. A blocking portion 2222 for blocking the liquid outlet 113 is provided on an end wall of the floating switch 22. The blocking portion 2222 is exposed outside the through-hole 2131.

[0094] Taking the push-bounce rod 211 extending ver-

tically as an example, the axis of the through-hole 2 extends vertically. The floating switch 22 slides up and down with the through-hole 2131, realizing relative movement between the floating switch 22 and the through-hole 2131 in the vertical direction. The blocking portion 2222 is provided on the top end wall of the floating switch 22.

[0095] The through-hole 2131 is a circular hole. The floating switch 22 is a cylindrical structure. The floating switch 22 is coaxially fitted in the through-hole 2131. The provision of the through-hole 2131 enables the floating switch 22 to follow the push-bounce rod 211 to move up and down, as well as enables the floating switch 22 to produce relative movement with the push-bounce rod 211 in the vertical direction.

[0096] Specifically, the blocking portion 2222 is a cylindrical structure coaxial with the floating switch 22. The top cover 5 is provided with a dispensing chamber liquid inlet 413 located below and overlapping with the liquid outlet 113 of the liquid storage chamber. The radial dimension of the top end wall of the blocking portion 2222 is larger than the radial dimension of the dispensing chamber liquid inlet 413. The top end wall of the blocking portion 2222 closes or opens the dispensing chamber liquid inlet 413.

[0097] Further specifically, the top of the top cover 5 is provided with an upper protrusion 52. The top cover 5 is provided with a through-hole. The bottom of the top cover 5 is provided with a lower protrusion 53. The inside of the upper protrusion 52 is hollow to form an upper flow channel. The inside of the lower protrusion 53 is hollow to form a lower flow channel. The upper flow channel, the through-hole, and the lower flow channel are sequentially connected to form the dispensing chamber liquid inlet 41. The top end wall of the blocking portion 2222 blocks the bottom end of the dispensing chamber liquid inlet 41.

[0098] The radial dimension of the top end wall of the blocking portion 2222 being larger than the radial dimension of the bottom end of the dispensing chamber liquid inlet 41 can increase the sealing area of the top end wall of the blocking portion 2222 against the bottom end of the dispensing chamber liquid inlet 41, and increase the sealing performance between the blocking portion 2222 and the bottom end of the dispensing chamber liquid inlet 41.

[0099] Furthermore, a radially protruding slider 2211 is formed on the outer periphery of the floating switch 22. A strip-shaped slideway 2132 communicating with the through-hole is provided on a peripheral wall of the through-hole 2131. One end of the strip-shaped slideway 2132 is a closed end and the other end is an open end. The slider 2211 enters the strip-shaped slideway 2132 through the open end of the strip-shaped slideway 2132, and passes through the strip-shaped slideway 2132 to be slidably connected to the strip-shaped slideway 2132.

[0100] Taking the push-bounce rod extending vertically as an example, the top end of the strip-shaped slideway is an open end, and the slider 2211 can slide up and down in the strip-shaped slideway 2132.

[0101] The floating switch 22 comprises an assembly portion 221 and a switch portion 222. The assembly portion 221 is groove-shaped. The groove opening of the assembly portion 221 is arranged upward. Both the assembly portion 221 and the switch portion 222 are circular structures. The blocking portion 2222 is coaxially provided on the top end wall of the switch portion 222. The lower portion of the blocking portion 2222 is fitted into the groove of the assembly portion 221. The top of the switch portion 222 radially protrudes to form a first abutting portion. The free end of the first abutting portion axially protrudes downward to form a second abutting portion. The first abutting portion, the second abutting portion, and the outer periphery of the switch portion 222 form a groove portion 2221. The top of the assembly portion 221 is fitted into the groove portion 2221.

[0102] Both the assembly portion 221 and the switch portion 222 are fitted in the through-hole 2131. The slider 2211 slides up and down on the strip-shaped slideway 2132, which can guide the relative movement between the through-hole 2131 and the assembly portion 221.

[0103] Furthermore, a circumferentially extending torsion spring 23 is provided on an outer peripheral wall of the through-hole 2131. A middle portion of the torsion spring 23 is fitted around the periphery of the slider 2211 passing through the strip-shaped slideway 2132. Protruding portions 2133 are provided on both sides of the strip-shaped slideway 2132 on the outer peripheral wall of the through-hole 2131. Both sides of the torsion spring 23 are respectively fitted around the peripheries of the two protruding portions 2133. The torsion spring 23 provides a torsion force for the blocking portion 2222 to close the liquid outlet 113 and provides a torsion force for returning the push-bounce rod.

[0104] The dispensing method of the automatic dispensing device of the present application is as follows: Taking the push-bounce rod extending vertically as an example, the water supply waterway 102 is connected, and the water supply waterway 102 supplies washing water into the guide portion 51. The water inlet 412 is opened. The inlet water pressure of the washing water impacts the push-bounce rod 211 downward, causing the push-bounce rod 211 to move downward. The return spring 212 is compressed. The downward movement of the push-bounce rod 211 drives the floating switch 22 to move downward, and at the same time causes the locking segment 2151 to move upward from the first groove segment 2111a into the second groove segment 2111b, realizing opening of the liquid outlet 113.

[0105] At the same time as the liquid outlet 113 is opened, washing water stops being supplied into the guide portion, causing the push-bounce rod 211 to move upward. The return spring 212 extends but does not return to its original position. The upward movement of the push-bounce rod 211 drives the floating switch 22 to move upward, and at the same time causes the locking segment 2151 to move downward from the first groove segment 2111a into the locking groove 2112, and is

locked in the locking groove 2112, so that the water inlet 412 and the liquid outlet 113 are in the open state for a period of time.

[0106] During the process when the water inlet 412 and the liquid outlet 113 are in the open state, the additive in the liquid storage chamber 114 automatically flows into the dispensing chamber 41 by its own gravity. As the liquid level in the dispensing chamber 41 rises, the liquid buoyancy continuously increases, causing the floating switch 22 to float. The floating switch 22 moves upward until the floating switch 22 reaches the position of the liquid outlet 113, closing the liquid outlet 113. During this process, the position of the push-bounce rod 211 remains unchanged, the state of the return spring 212 remains unchanged, and the water inlet 412 is in the open state. Because the floating switch 22 moves upward, relative movement is produced between the push-bounce rod 211 and the floating switch 22, and the torsion spring 23 extends.

[0107] After the liquid outlet 113 is closed, washing water enters the guide portion 51. The inlet water pressure of the washing water impacts the push-bounce rod 211 downward, causing the push-bounce rod 211 to move downward. The return spring 212 is compressed. The downward movement of the push-bounce rod 211 causes the locking segment 2151 to disengage from the locking groove 2112. The locking segment 2151 enters the second groove segment 2111b. During this process, the floating switch 22 always closes the liquid outlet 113 under the action of a larger liquid buoyancy. Because the push-bounce rod 211 moves downward, relative movement is again produced between the push-bounce rod 211 and the floating switch 22, and the torsion spring 23 continues to extend.

[0108] Washing water continues to be supplied into the guide portion 51. The washing water continues to impact the push-bounce rod 211 and continues to enter the dispensing chamber 41 to flush the additive. The mixture of washing water and additive is discharged from the dispensing outlet 411 through the siphon structure 3. During the process of continuous water supply, the floating switch 22 always closes the liquid outlet 113, and the torsion spring 23 is always in the extended state. After the washing water flushes for a certain period of time, washing water stops being supplied into the guide portion 51, causing the return spring 212 and the torsion spring 23 to return to their original positions. The return of the return spring 212 and the torsion spring 23 drives the push-bounce rod 211 to move upward to return to its original position. The return of the torsion spring 23 drives the floating switch 22 to return to its original position, so that the liquid outlet 113 is always in the closed state. The liquid in the dispensing chamber 41 is finally emptied by siphon through the siphon structure 3. During this process, the push-bounce rod 211 moves upward to return to its original position, causing the locking segment 2151 to move downward from the second groove segment 2111b into the first groove segment 2111a to return to its original

position.

[0109] The automatic dispensing device 100 described in this embodiment can be installed on the door 200 of the drum washing machine. The dispensing outlet 411 of the automatic dispensing device is connected to the drum 400 of the drum washing machine, so that the washing additive mixture or inlet water is dispensed into the drum 400.

10 Embodiment 2

[0110] As shown in FIGS. 10-14, the present invention provides an automatic dispensing device, wherein a liquid storage chamber 114, a dispensing chamber 41, and a negative pressure generator 6 are provided inside the dispensing device 100, a liquid outlet 113 communicating with the dispensing chamber 41 is provided on the liquid storage chamber 114, a water outlet 64 and a negative pressure port 61 communicating with the dispensing chamber 41 are provided on the negative pressure generator 6, a first control valve that opens and closes the liquid outlet 113 in response to negative pressure changes and a second control valve that opens and closes the negative pressure port 61 in response to liquid level changes are provided in the dispensing chamber 41, and a water storage chamber 81 that can be connected to and disconnected from outside atmosphere is provided at the water outlet 64.

[0111] In the embodiment of the present invention, by providing a water storage chamber 81 that can be connected to and disconnected from outside atmosphere at the water outlet 64 of the negative pressure generator 6, the water storage chamber 81 can be disconnected from outside atmosphere and be filled with water when inlet water flushes the additive in the dispensing chamber 41, so that the inlet water of the negative pressure generator 6 can flow into the dispensing chamber 41 from the negative pressure port 61 to flush the additive, realizing that the inlet water for flushing the additive comes from the inlet water of the negative pressure generator 6, avoiding additionally providing an inlet water pipeline to supply water into the dispensing chamber 41 to flush the additive, improving the compactness of the automatic dispensing device 100 structure while reducing production costs.

[0112] The additive dispensing device can be used for washing machines, dishwashers, and the like. The washing machine comprises a housing 300 and a drum 400 provided inside the housing 300 for containing water. The dishwasher comprises an inner liner. The dispensing chamber 41 is connected to the drum or the inner liner.

[0113] Specifically, the additive dispensing device comprises an outer housing 1. The outer housing 1 comprises an upper housing 11 and a lower housing 12 arranged vertically. The dispensing chamber 41 is formed inside the lower housing. The upper housing 11 is internally divided into a left chamber and a right chamber. The right chamber forms the liquid storage chamber

114. The left chamber forms a water inlet chamber for supplying water to the water inlet 62 of the negative pressure generator 6. A water inlet 111 is provided at the top of the left chamber. The water inlet 62 of the negative pressure generator 6 is connected to the water supply pipe 102 via the water inlet 111. A filling port 112 for adding additives and a liquid outlet 113 for allowing additives to enter the dispensing chamber 41 are provided at the top of the right chamber, realizing vertical distribution of the liquid storage chamber 114 and the dispensing chamber 41, which is beneficial for the additive in the liquid storage chamber 114 to flow into the dispensing chamber 41; by dividing the interior of the outer housing 1 into multiple chambers, while realizing automatic dispensing of additives, the space inside the outer housing 1 can be reasonably utilized, making the structure of the automatic dispensing device compact and reducing occupation of external space; the additives may be detergent for washing, fabric softener for rinsing, disinfectant for disinfection, and the like.

[0114] Furthermore, a dispensing housing 4 is provided inside the lower housing. A dispensing chamber 41 is formed inside the dispensing housing 4. The top of the dispensing housing 4 is an open end, and a top cover 5 for closing the open end is provided at the open end. The top cover 5 is provided with a protruding portion. The protruding portion 54 is cylindrical. The liquid outlet 113 of the liquid storage chamber 114 is connected to the dispensing chamber 41 via the protruding portion 54. A check valve 415 realizes opening and closing of the liquid outlet 113 of the liquid storage chamber 114 by opening and closing the opening at the lower end of the protruding portion 54.

[0115] A siphon structure 3 is also provided in the dispensing chamber 41. The siphon structure 3 has a second float valve 31 that controls the siphon action of the siphon structure 3; a dispensing tube 56 is connected to the liquid outlet end of the siphon structure 3. The liquid outlet of the dispensing tube 56 extends to the bottom of the lower housing 12. The liquid outlet of the dispensing tube 56 forms the dispensing outlet 411 of the dispensing chamber 41. A dispensing outlet 121 is provided at the bottom of the lower housing. Liquid from the dispensing tube 56 enters the washing machine through the dispensing outlet 121 of the lower housing.

[0116] The first control valve provided in the dispensing chamber 41 is the check valve 415, and the second control valve provided in the dispensing chamber 41 is the first float valve 414.

[0117] In the embodiment of the present invention, an overflow chamber 91 is connected to the water storage chamber 81. An overflow port 92 communicating with outside atmosphere is provided on the overflow chamber 91. A water inlet 62 and a water outlet 64 of the negative pressure generator 6 are connected through a constriction port. The negative pressure port 61 is provided on the constriction port. The overflow port 92 is arranged higher than the negative pressure port 61. A connection be-

tween the water storage chamber 81 and the overflow chamber 91 is arranged lower than the negative pressure port 61.

[0118] In the embodiment of the present invention, specifically, the negative pressure generator 6 comprises a linearly extending negative pressure tube 63. The water inlet 62 and the water outlet 64 of the negative pressure generator 6 are provided at both ends of the negative pressure tube 63 respectively. A water storage tube 8 forming the water storage chamber 81 is provided at the water outlet 64 of the negative pressure generator 6. One end of the water storage tube 8 intersects with the water outlet end of the negative pressure tube 63, and the other end is connected to an overflow tube 9 that is parallel to the negative pressure tube 63 and forms the overflow chamber 91. One end of the overflow tube 9 is connected to the water storage tube 8, and the other end is provided with the overflow port 92.

[0119] Taking the negative pressure tube 63 extending linearly in the vertical direction as an example, the water storage tube 8 extends from top to bottom gradually inclined toward the negative pressure tube 63, extending to the outer periphery of the water outlet 64 of the negative pressure generator 6. The overflow tube 9 extends linearly from top to bottom; during the water inlet process of the negative pressure generator 6, water in the water storage tube 8 can enter the overflow tube 9. The provision of the overflow tube 9 can prevent water in the water storage tube 8 from overflowing outward.

[0120] Furthermore, a storage tube 10 is provided at the intersection of the water storage tube 8 and the negative pressure tube 63. An accommodation chamber 103 is formed inside the storage tube 10. A float valve 7 that connects and disconnects the connection between the water storage chamber 81 and the overflow chamber 91 in response to liquid level changes is provided in the accommodation chamber 103. The water outlet 64 of the negative pressure generator 6 is arranged facing the accommodation chamber 103.

[0121] Taking the negative pressure tube 63 extending linearly in the vertical direction as an example, the storage tube 10 extends linearly from top to bottom. The negative pressure tube 63, the storage tube 10, and the water storage tube 8 intersect to form a transition chamber. The connection between the negative pressure tube 63 and the water storage tube 8 is lower than the connection between the water storage tube 8 and the overflow tube 9; the float valve 7 is provided in the accommodation chamber 103. The float valve 7 can float up as the water level in the water storage chamber 81 rises, and block the connection between the water storage chamber 81 and the overflow chamber 91 under the action of water pressure, so that the water storage chamber 81 is disconnected from outside atmosphere and is filled with water. When the float valve 7 is in the accommodation chamber 103, the water storage chamber 81 is connected to the overflow chamber 91, so that the water storage chamber 81 is connected to outside atmosphere.

[0122] Furthermore, the storage tube 10 is arranged coaxially with the negative pressure tube 63. The water outlet 64 of the negative pressure generator 6 is arranged facing the accommodation chamber 103, so that the float valve 7 in the accommodation chamber 103 can be pressed down by the water pressure of the inlet water of the negative pressure generator 6.

[0123] During the first water inlet to the negative pressure generator 6, the inlet water entering the negative pressure generator 6 to generate negative pressure continuously enters the water storage chamber 81 from the water outlet 64 of the negative pressure generator 6, causing the water level in the water storage chamber 81 to continuously rise, so that the water storage chamber 81 is filled with water. During this process, the float valve 7 in the accommodation chamber 103 is pressed down by the water pressure of the inlet water and does not float up.

[0124] Water supply to the negative pressure generator 6 is stopped. Because the water pressure of the inlet water disappears, the float valve 7 floats up to the water surface in the liquid storage chamber 114 under the action of water buoyancy.

[0125] During the second water inlet to the negative pressure generator 6, the float valve 7 tightly blocks the connection between the water storage chamber 81 and the overflow chamber 91 under the action of the water pressure of the inlet water.

[0126] During the floating up process of the float valve 7, it first enters the transition chamber from the accommodation chamber 103, and then enters the water storage chamber 81 from the transition chamber. The storage tube 10 extending linearly from top to bottom can reduce the obstruction to the movement of the float valve 7, and furthermore, when the storage tube 10 has a drain port 105, it is beneficial for discharging water in the water storage tube 8; the water storage tube 8 extends gradually inclined from top to bottom, which is beneficial for the water pressure of the inlet water to push the float valve 7 upward, so that the float valve 7 tightly blocks the connection between the water storage chamber 81 and the overflow chamber 91, and furthermore, when the storage tube 10 has a drain port 105, it has a buffering and guiding effect on the falling of the float valve 7, while preventing water from remaining on the side wall of the storage tube 10.

[0127] Because the extension directions of the water storage tube 8 and the storage tube 10 are different, the transition chamber can convert the moving direction of the float valve 7, so that the float valve 7 can move from the accommodation chamber 103 into the water storage chamber 81 without obstruction, and accurately block the connection between the water storage chamber 81 and the overflow chamber 91.

[0128] Further specifically, the water storage tube 8 is provided with a tapering segment 811 at the connection between the water storage chamber 81 and the overflow chamber 91. The tapering segment gradually narrows

into the overflow chamber 91 and is inclined along with the water storage tube 8. An opening communicating with the overflow chamber 91 is surrounded by the inner periphery of the small-size end of the tapering segment 811. A radial dimension of the float valve 7 is smaller than a radial dimension of the opening.

[0129] Specifically, taking the negative pressure tube 63 extending linearly in the vertical direction as an example, the tapering segment is provided at the top of the water storage tube 8. The opening is a circular opening. The float valve 7 is spherical. Under the action of the water pressure of the inlet water, the outer periphery of the float valve 7 abuts against the inner periphery of the opening, so that the float valve 7 blocks the opening; the provision of the tapering segment 811 can increase the abutting strength between the outer periphery of the float valve 7 and the opening, and increase the sealing performance between the float valve 7 and the opening.

[0130] It should be noted that the inlet water in the negative pressure tube 63 enters the water storage tube 8 from the transition chamber. At the same time as the water storage tube 8 is filled with water, the negative pressure tube 63 is filled with water.

[0131] The liquid inlet 413 of the dispensing chamber 41 is arranged lower than the negative pressure port 61. The top cover 5 is provided with a connecting tube 55. One end of the connecting tube 55 is connected to the negative pressure port 61. The other end of the connecting tube 55 is connected to the liquid inlet 413 of the dispensing chamber 41; when the negative pressure generator 6 supplies flushing water into the dispensing chamber 41, the inlet water of the negative pressure generator 6 can flow into the dispensing chamber 41 sequentially through the negative pressure port 61 and the liquid inlet 413 of the dispensing chamber 41 to flush the additive, so that the liquid inlet 413 of the dispensing chamber 41 serves as the water inlet 412 of the dispensing chamber 41.

[0132] The control valve in the dispensing chamber 41 is the second float valve 31. A guide chamber for guiding the movement of the second float valve 31 is provided in the dispensing chamber 41. The guide chamber is directly facing the liquid inlet 413 of the dispensing chamber 41. By the second float valve 31 floating up under liquid buoyancy to block the liquid inlet 413 of the dispensing chamber 41, blocking of the negative pressure port 61 is thereby achieved.

[0133] When the water storage tube 8 is filled with water, the dispensing chamber 41 is simultaneously filled with additive. Based on the time when the water storage tube 8 is filled with water, the amount of additive fed from the liquid storage chamber 114 into the dispensing chamber 41 can be obtained, so that the dispensing chamber 41 can serve as a fixed-volume chamber, thereby obtaining the amount of additive dispensed by the automatic dispensing device into the washing machine or dishwasher at one time.

[0134] Furthermore, a blocking rib 65 at the water out-

let of the negative pressure tube 63 extends from one end of the water outlet 64 of the negative pressure tube 63 to the other end of the water outlet 64, so that the water outlet 64 of the negative pressure tube 63 is divided into two water outlet regions, preventing the float valve 7 from entering the negative pressure tube 63 from the two water outlet regions. The two water inlet regions can restrict the float valve 7 from entering the negative pressure tube 63, so that the float valve 7 enters the water storage chamber 81 from the accommodation chamber 103.

[0135] The negative pressure tube 63 and the water storage tube 8 are located inside the lower housing. The water inlet 62 of the negative pressure tube 63 extends into the left chamber.

[0136] In addition, the negative pressure tube 63 can be integrally formed with the water storage tube 8, and the storage tube 10 is separately provided from the negative pressure tube 63 and the water storage tube 8.

[0137] In the embodiment of the present invention, the storage tube 10 is arranged coaxially with the negative pressure tube 63. One end of the storage tube 10 is connected to the negative pressure tube 63 and the water storage tube 8, and the other end is provided with a drain port 105. A pressure relief valve 106 that opens and closes the drain port 105 in response to water pressure changes is provided at the drain port 105. The pressure relief valve 106 is provided outside the accommodation chamber 103. A water passage hole 104 communicating with the drain port 105 is provided on the accommodation chamber 103. The float valve 7 opens and closes the water passage hole 104 in response to water pressure changes.

[0138] As shown in FIGS. 11 and 14, in the embodiment of the present invention, the drain port 105 is used to drain the water in the filled water storage tube 8 and negative pressure tube 63 into the washing machine. The purpose of providing the pressure relief valve 106 is, on the one hand, to open the drain port 105 so that the water in the tube can be drained, and on the other hand, to close the drain port 105 to prevent the water in the tube from being drained from the drain port 105 when the float valve 7 blocks the connection between the water storage chamber 81 and the overflow chamber 91.

[0139] Specifically, an annular separating rib 107 coaxial with the storage tube 10 is provided on an inner wall of the storage tube 10. A central opening of the annular separating rib 107 forms the water passage hole 104. The annular separating rib 107 divides the interior of the storage tube 10 into a first chamber segment 101 connected to the water storage tube 8 and the negative pressure tube 63 and a second chamber segment 102 provided with the drain port 105. The annular separating rib 107 and an inner periphery of the first chamber segment 101 form the accommodation chamber 103. The pressure relief valve 106 is provided in the second chamber segment 102.

[0140] Taking the negative pressure tube 63 extending in the vertical direction as an example, the float valve 7 is

provided on the upper part of the annular separating rib 107, and moves downward under the action of water pressure to block the water passage hole 104. The pressure relief valve 106 is provided on the lower part of the annular separating rib 107, and blocks the drain port 105 when the float valve 7 blocks the water passage hole 104.

[0141] The annular separating chamber is inclined gradually from top to bottom toward the inside of the first chamber segment 101 to form an accommodation chamber 103 matching the float valve 7 with the inner wall of the first chamber segment 101.

[0142] The pressure relief valve 106 comprises a valve core 1061 reciprocally moving in an axial direction of the second chamber segment 102 and a return spring 1062 providing a return force for returning the valve core 1061. The return spring 1062 is fitted around an outer periphery of the valve core 1061. One end of the return spring 1062 is connected to the valve core 1061 and the other end is connected to an inner wall of the storage tube 10 at an outer periphery of the drain port 105. A protrusion 1063 is provided at an end of the valve core 1061 facing the water passage hole 104. The protrusion 1063 passes through the water passage hole 104 to abut against the float valve 7 to support the float valve 7.

[0143] Furthermore, the bottom of the valve core 1061 is exposed outside the drain port 105. The storage tube 10 extends out of the lower housing 12 through the dispensing outlet 121, so that the drain port 105 extends out of the lower housing 12.

[0144] Taking the negative pressure tube 63 extending linearly in the vertical direction as an example, the valve core 1061 gradually narrows from top to bottom. The top of the valve core 1061 is the large-size end of the valve core 1061. The bottom of the valve core 1061 is the small-size end of the valve core 1061. The portion of the valve core 1061 between the top and the bottom of the valve core 1061 is used to block the drain port 105, so that when the valve core 1061 blocks the drain port 105, the small-size end of the valve core 1061 is exposed outside the housing, so that an upward force can be applied to the small-size end of the valve core 1061, so that the return spring 1062 extends and the valve core 1061 returns to its original position.

[0145] Furthermore, the drain port 105 is provided at the bottom of the second chamber segment 102. A cylindrical guide rib 108 coaxial with the drain port 105 is provided at the bottom of the second chamber segment 102. The lower portion of the return spring 1062 is fitted around the outer periphery of the cylindrical guide rib 108. The top of the return spring 1062 is connected to the large-size end of the valve core 1061. The bottom of the return spring 1062 abuts against the bottom end face of the second chamber segment 102. The top and bottom of the guide rib 108 are respectively provided with openings. The opening at the top of the guide rib 108 allows the valve core 1061 to be inserted. The opening at the bottom of the guide rib 108 forms the drain port 105. The valve

core 1061 moves up and down in the guide rib 108. When the inner periphery of the valve core 1061 abuts against the outer periphery of the guide rib 108, the guide rib 108 is blocked, thereby blocking the drain port 105.

[0146] Specifically, during the first water inlet to the negative pressure generator 6, the float valve 7 is pressed down by the water pressure of the inlet water in the accommodation chamber 103. The float valve 7 tightly abuts against the inner wall of the accommodation chamber 103, blocking the water passage hole 104. The valve core 1061 drives the float valve 7 to move downward to block the drain port 105. The return spring 1062 is compressed.

[0147] Water supply to the negative pressure generator 6 is stopped. The water pressure of the inlet water disappears. The float valve 7 floats up to the water surface of the water storage chamber 81 under the action of buoyancy. The return spring 1062 extends. The valve core 1061 returns to its original position, opening the drain port 105. During this process, a small portion of the water in the water storage tube 8 enters the washing machine through the drain port 105.

[0148] During the second water inlet to the negative pressure generator 6, the float valve 7 blocks the connection between the water storage chamber 81 and the overflow chamber 91 under the action of the water pressure of the inlet water. The valve core 1061 moves downward under the action of the water pressure of the inlet water to block the drain port 105. The return spring 1062 is compressed.

[0149] Water supply to the negative pressure generator 6 is stopped. The water pressure of the inlet water disappears. The return spring 1062 extends. The valve core 1061 returns to its original position. The valve core 1061 opens the drain port 105. The stored water in the water storage tube 8 and the negative pressure tube 63 is drained from the drain port 105 into the washing machine.

[0150] The dispensing method of the additive dispensing device is as follows:

During the first water inlet to the negative pressure tube 63, the negative pressure tube 63 generates negative pressure. The negative pressure draws the dispensing chamber 41, causing the check valve 415 to automatically open. As water is continuously supplied to the negative pressure tube 63, the additive in the liquid storage chamber 114 is continuously drawn into the dispensing chamber 41. At this time, the float valve 7 moves downward under the action of the water pressure of the inlet water to block the water passage hole 104. The float valve 7 drives the valve core 1061 to move downward. The valve core 1061 blocks the drain port 105. The return spring 1062 is compressed. The inlet water of the negative pressure tube 63 continuously enters the water storage tube 8.

[0151] After water is supplied to the negative pressure tube 63 for a set time, when the water storage tube 8 is filled with water, the dispensing chamber 41 is simultaneously filled with additive. The first float valve 414 blocks

the liquid inlet 413 of the dispensing chamber 41, thereby blocking the negative pressure port 61. The inside of the dispensing chamber 41 is no longer drawn. The check valve 415 automatically closes. The pressure in the dispensing chamber 41 is insufficient to cause the second float valve 31 to open so that the siphon structure 3 produces siphon action.

[0152] After the dispensing chamber 41 is filled with additive, water supply to the negative pressure tube 63 is stopped. Under the action of water buoyancy, the float valve 7 floats up to the water surface in the water storage chamber. The return spring 1062 extends. The valve core 1061 returns to its original position, opening the drain port 105.

[0153] During the second water inlet to the negative pressure tube 63, under the action of the water pressure of the inlet water, the float valve 7 blocks the connection between the water storage chamber 81 and the overflow chamber 91. The return spring 1062 is compressed. The valve core 1061 moves downward to block the drain port 105. At this time, the inlet water is ejected from the negative pressure port 61 and enters the dispensing chamber 41 through the liquid inlet 413 of the dispensing chamber 41, flushing the additive in the dispensing chamber 41. The water pressure causes the second float valve 31 in the siphon structure 3 to open. The water in the dispensing chamber 41 is discharged through the dispensing tube 56 into the lower housing 12 under the siphon action, and then dispensed into the washing machine from the dispensing outlet 121 of the lower housing 12, realizing dispensing of the additive.

[0154] After flushing of the additive is completed, water supply to the negative pressure tube 63 is stopped, the water pressure of the inlet water disappears, and the return spring 1062 extends. The valve core 1061 returns to its original position. The valve core 1061 opens the drain port 105. The stored water in the water storage tube 8 and the negative pressure tube 63 is drained from the drain port 105 into the washing machine.

[0155] The automatic dispensing device 100 described in this embodiment can be installed on the door 200 of the drum washing machine. The dispensing outlet 411 of the automatic dispensing device is connected to the drum 400 of the drum washing machine, so that the washing additive mixture or inlet water is dispensed into the drum 400.

[0156] The above descriptions are only preferred embodiments of the present invention and are not intended to limit the present invention in any form. Although the present invention has been disclosed as above with preferred embodiments, it is not intended to limit the present invention. Any person skilled in the art, without departing from the scope of the technical solutions of the present invention, can make slight changes or modifications to equivalent embodiments using the technical content disclosed above. In the above embodiments, the implementation schemes can also be further combined or replaced. Any simple modifications, equivalent

changes, and modifications made to the above embodiments based on the technical essence of the present invention without departing from the content of the technical solutions of the present invention still fall within the scope of the present invention.

Claims

1. A drum washing machine, comprising a drum, wherein a door capable of being opened and closed is provided at a drum opening;
characterized in that:

an automatic dispensing device is mounted on the door; wherein
the automatic dispensing device comprises:

a liquid storage chamber for storing washing additives;
a water supply waterway for controllably introducing water flow into the drum washing machine; and
an automatic dispensing mechanism for extracting the washing additives stored in the liquid storage chamber and dispensing the washing additives into the drum of the drum washing machine along with the water flow introduced by the water supply waterway.

2. The drum washing machine according to claim 1, wherein,

a dispensing chamber is provided on the door; the dispensing chamber has a water inlet, and an outlet of the water supply waterway is connected to the water inlet of the dispensing chamber;
the dispensing chamber has a liquid inlet, and a liquid outlet of the liquid storage chamber is connected to the dispensing chamber via the automatic dispensing mechanism, utilizing the automatic dispensing mechanism to controllably extract the washing additives stored in the liquid storage chamber into the dispensing chamber;
the dispensing chamber has a dispensing outlet, and the dispensing outlet is connected to the drum for dispensing the washing additives and/or the inlet water flow in the dispensing chamber into the drum.

3. The drum washing machine according to claim 2, wherein,

the automatic dispensing mechanism comprises a pump,

wherein an inlet of the pump is connected to the liquid outlet of the liquid storage chamber, and an outlet of the pump is connected to the liquid inlet of the dispensing chamber, for pumping the washing additives contained in the liquid storage chamber into the dispensing chamber by a suction force generated when the pump operates;

and/or;

the automatic dispensing mechanism comprises a negative pressure suction structure, wherein a negative pressure flow channel is formed inside the negative pressure suction structure, the negative pressure flow channel has a negative pressure port, the negative pressure port is connected to the liquid outlet of the liquid storage chamber, and the negative pressure flow channel is connected in the water supply waterway, for forming negative pressure at the negative pressure port using inlet water flow flowing through the negative pressure flow channel, and then using the negative pressure to draw the washing additives contained in the liquid storage chamber into the dispensing chamber.

4. The drum washing machine according to claim 2, wherein,

the automatic dispensing mechanism comprises a control valve waterway, wherein the liquid outlet of the liquid storage chamber is controllably connected to the liquid inlet of the dispensing chamber via the control valve waterway, for dispensing the washing additives in the liquid storage chamber into the dispensing chamber by gravity when connected;
preferably, a control valve for controlling connection and disconnection is installed on the control valve waterway, and the control valve is any one or combination of an electrically controlled valve, a float valve, and a push-bounce valve.

5. The drum washing machine according to any one of claims 1 to 4, wherein,

the drum washing machine comprises a housing, the drum is installed inside the housing, and a laundry loading opening is provided on the housing corresponding to a drum opening, for forming a passage for loading and unloading laundry in the drum;
a door capable of opening and closing the laundry loading opening is installed on the housing, and the automatic dispensing device is installed on the door.

6. The drum washing machine according to claim 5, wherein,
the door is provided with a protruding portion protruding toward an inside of the housing, at least a portion of the protruding portion is extended into the drum opening, the automatic dispensing device is installed in a hollow chamber provided on the protruding portion, and the dispensing outlet of the dispensing chamber of the automatic dispensing device is configured to face an inside of the drum.
7. The drum washing machine according to claim 5, wherein,
the water supply waterway is provided on the housing of the drum washing machine, a spray head is provided at an outlet of the water supply waterway, the spray head has a water spray port for spraying water flow outward, and the water spray port is configured to face the water inlet of the dispensing chamber of the automatic dispensing device provided on the door.
8. The drum washing machine according to claim 7, wherein,
the water inlet of the dispensing chamber is arranged vertically upward; when the door is in a closed position, the spray head is located vertically above the water inlet of the dispensing chamber, and the water spray port is located directly below the spray head, arranged coaxially with the water inlet of the dispensing chamber and provided vertically downward.
9. The drum washing machine according to claim 5, wherein,
the protruding portion provided on the door is made of transparent material, and at least a portion of the protruding portion is arranged in a staggered manner with the automatic dispensing device, for allowing user to observe the inside of the drum through the drum opening from the staggered portion.
10. The drum washing machine according to claim 5, wherein,
a filling port is provided at a top of the liquid storage chamber for user to inject the washing additives into the liquid storage chamber;
the liquid outlet of the liquid storage chamber is located at a bottom of the liquid storage chamber, connected to the dispensing chamber via the automatic dispensing mechanism;
preferably, an openable and closable cover is installed at the filling port of the liquid storage chamber.
11. The drum washing machine according to any one of claims 2 to 10, wherein,
a siphon tube structure is provided at the dispensing outlet of the dispensing chamber, for intercepting and mixing the washing additives and inlet water flow flowing into the dispensing chamber to form a washing additive mixture, and dispensing the washing additive mixture into the drum along with the inlet water flow.
12. The drum washing machine according to claim 11, wherein,
the siphon tube structure comprises:
a siphon tube provided at the dispensing outlet at a bottom of the dispensing chamber, extending vertically upward into the dispensing chamber;
a siphon cap fitted over a top of the siphon tube, having a sleeve portion extending downward and fitted around a periphery of the siphon tube;
a first predetermined height difference exists between a bottom end of the sleeve portion of the siphon cap and a bottom wall of the dispensing chamber, and a second predetermined height difference exists between a top of the siphon cap and the top of the siphon tube, for triggering a siphon effect when a liquid level in the liquid storage chamber reaches the top of the siphon tube, such that the washing additive mixture in the liquid storage chamber flows toward the dispensing outlet of the dispensing chamber along a gap between the siphon cap and the siphon tube and a flow channel inside the siphon tube.
13. An automatic dispensing device, wherein a liquid storage chamber and a dispensing chamber are provided inside the automatic dispensing device, a liquid outlet communicating with the dispensing chamber is provided on the liquid storage chamber, a water inlet is provided on the dispensing chamber, **characterized in that**, a switch structure is provided in the dispensing chamber for opening and closing the water inlet, and for opening and closing the liquid outlet as a liquid level in the dispensing chamber changes.
14. The automatic dispensing device according to claim 13, wherein, the switch structure comprises a push-bounce switch provided at the water inlet and a floating switch provided at the liquid outlet, the push-bounce switch is configured to move reciprocally relative to the water inlet in a water inflowing direction to open and close the water inlet, and the floating switch is configured to move reciprocally relative to the liquid outlet in a liquid outflowing direction to open and close the liquid outlet;
the push-bounce switch is configured to open and close the water inlet in response to changes in inlet water pressure, the floating switch is linked with the

push-bounce switch to open the liquid outlet when the water inlet is opened, and disengages from the push-bounce switch to close the liquid outlet as the liquid level in the dispensing chamber rises.

15. The automatic dispensing device according to claim 14, wherein, the push-bounce switch comprises a push-bounce rod and a return spring, both ends of the return spring are connected to a first end of the push-bounce rod and a side wall of the dispensing chamber respectively, a second end of the push-bounce rod is a blocking end for blocking the water inlet, and
the floating switch is provided on an outer periphery of the push-bounce rod and is slidably connected to the outer periphery of the push-bounce rod in an axial direction of the push-bounce rod.
16. The automatic dispensing device according to claim 15, wherein, a boss portion radially protruding is provided on the outer periphery of the push-bounce rod, a through-hole is provided in the boss portion, an axis of the through-hole is parallel to an axis of the push-bounce rod,

the floating switch is a columnar structure, the floating switch is fitted in the through-hole and is slidably connected to an inner periphery of the through-hole, and
a blocking portion for blocking the liquid outlet is provided on an end wall of the floating switch, and the blocking portion is exposed outside the through-hole.
17. The automatic dispensing device according to claim 16, wherein, a slider radially protruding is provided on an outer periphery of the floating switch, a strip-shaped slideway communicating with the through-hole is provided on a peripheral wall of the through-hole,
one end of the strip-shaped slideway is a blocking end and an other end is an open end, the slider is inserted in the strip-shaped slideway through the open end of the strip-shaped slideway, and passes through the strip-shaped slideway to be slidable in the strip-shaped slideway.
18. The automatic dispensing device according to claim 17, wherein, a torsion spring circumferentially extending is provided on an outer peripheral wall of the through-hole, a middle portion of the torsion spring is fitted around a periphery of the slider passing through the strip-shaped slideway, protruding portions are provided on both sides of the strip-shaped slideway on the outer peripheral wall of the through-hole, both sides of the torsion spring are respectively fitted around peripheries of the two protruding portions, and the torsion spring is used to provide a

return force for returning the floating switch and the push-bounce rod.

19. The automatic dispensing device according to claim 15, wherein, the push-bounce switch further comprises a locking rod, the locking rod has a locking segment, a sliding groove axially extending is provided on the outer periphery of the push-bounce rod, a locking groove is provided in the sliding groove, the locking segment is slidable in the sliding groove, and the locking segment is inserted into the locking groove to lock the push-bounce rod when the locking segment slides into a locking position in the sliding groove.
20. The automatic dispensing device according to claim 19, wherein, the sliding groove comprises a first groove segment, and a second groove segment and a third groove segment formed by bifurcation of the first groove segment, a switching chamber is formed at an intersection of the first groove segment, the second groove segment, and the third groove segment, a rib is provided in the switching chamber, and a recessed portion recessed toward the first groove segment is provided on the rib,
the recessed portion is configured to cooperate with an inner wall of the switching chamber to form the locking groove, and the locking segment is configured to periodically move sequentially in the first groove segment, the second groove segment, the locking groove, and the third groove segment.
21. The automatic dispensing device according to claim 15, wherein, the dispensing chamber is provided with a guide portion being in tubular shape and protruding outward from the dispensing chamber, a water inlet and a water outlet communicating with the water inlet of the dispensing chamber are provided at top and bottom ends of the guide portion respectively, an annular limiting portion is radially protruded on an inner periphery of the guide portion, and the second end of the push-bounce rod is extended into the guide portion through a water outlet of the guide portion to abut against the annular limiting portion and block an opening surrounded by an inner periphery of the annular limiting portion.
22. The automatic dispensing device according to any one of claims 13-21, wherein, the liquid storage chamber and the dispensing chamber are distributed vertically, the liquid outlet is provided at a bottom of the liquid storage chamber, and the water inlet is provided at a top of the dispensing chamber.
23. An automatic dispensing device, wherein a liquid storage chamber, a dispensing chamber, and a negative pressure generator are provided inside the automatic dispensing device, a liquid outlet commu-

nicating with the dispensing chamber is provided on the liquid storage chamber, a water outlet and a negative pressure port communicating with the dispensing chamber are provided on the negative pressure generator,

a first control valve that opens and closes the liquid outlet in response to negative pressure changes and a second control valve that opens and closes the negative pressure port in response to liquid level changes are provided in the dispensing chamber,

characterized in that, a water storage chamber capable of being connected to and disconnected from outside atmosphere is provided at the water outlet.

24. The automatic dispensing device according to claim 23, wherein, an overflow chamber is connected to the water storage chamber, an overflow port communicating with outside atmosphere is provided on the overflow chamber, a water inlet and a water outlet of the negative pressure generator are connected with each other through a constriction tube, the negative pressure port is provided on the constriction tube, the overflow port is higher than the negative pressure port, and a connection between the water storage chamber and the overflow chamber is lower than the negative pressure port.

25. The automatic dispensing device according to claim 24, wherein, the negative pressure generator comprises a negative pressure tube linearly extending, the water inlet and the water outlet of the negative pressure generator are provided at both ends of the negative pressure tube respectively,

a water storage tube forming the water storage chamber is provided at the water outlet of the negative pressure generator, the water storage tube is arranged inclined relative to the negative pressure tube, one end of the water storage tube is in communication with a water outlet end of the negative pressure tube, and an other end is connected to an overflow tube that is parallel to the negative pressure tube and forms the overflow chamber,

one end of the overflow tube is connected to the water storage tube, and an other end is provided with the overflow port.

26. The automatic dispensing device according to claim 25, wherein, a storage tube is provided at an intersection of the water storage tube and the negative pressure tube, an accommodation chamber is formed inside the storage tube, a float valve that connects and disconnects a connection between the water storage chamber and the overflow cham-

ber in response to liquid level changes is provided in the accommodation chamber, and the water outlet of the negative pressure generator is configured to face the accommodation chamber.

27. The automatic dispensing device according to claim 26, wherein, the water storage tube is provided with a tapering segment at the connection between the water storage chamber and the overflow chamber, the tapering segment is configured to gradually narrow into the overflow chamber and is inclined along with the water storage tube, an opening communicating with the overflow chamber is surrounded by an inner periphery of a small-size end of the tapering segment, and a radial dimension of the float valve is smaller than a radial dimension of the opening.

28. The automatic dispensing device according to claim 27, wherein, a blocking rib is provided at the water outlet of the negative pressure generator, the blocking rib is configured to divide the water outlet of the negative pressure generator into a plurality of water outlet regions for restricting the float valve from entering the negative pressure tube.

29. The automatic dispensing device according to claim 26, wherein, the storage tube is arranged coaxially with the negative pressure tube, one end of the storage tube is connected to the negative pressure tube and the water storage tube, and an other end is provided with a drain port, a pressure relief valve that opens and closes the drain port in response to water pressure changes is provided at the drain port, the pressure relief valve is provided outside the accommodation chamber, a water passage hole communicating with the drain port is provided on the accommodation chamber, and the water passage hole is opened or closed by the float valve in response to water pressure changes.

30. The automatic dispensing device according to claim 29, wherein, an annular separating rib coaxial with the storage tube is provided on an inner wall of the storage tube, the water passage hole is formed by a central opening of the annular separating rib, the annular separating rib is configured to divide an interior of the storage tube into a first chamber segment connected to the water storage tube and the negative pressure tube and a second chamber segment provided with the drain port, the accommodation chamber is formed by the annular separating rib and an inner periphery of the first chamber segment, and the pressure relief valve is provided in the second chamber segment.

31. The automatic dispensing device according to claim 30, wherein, the pressure relief valve comprises a valve core reciprocally moving in an axial direction of

the second chamber segment and a return spring providing a return force for returning the valve core, the return spring is fitted around an outer periphery of the valve core, one end of the return spring is connected to the valve core and an other end is connected to an inner wall of the storage tube at an outer periphery of the drain port, a protrusion is provided at an end of the valve core facing the water passage hole, and the protrusion is configured to pass through the water passage hole to abut against the float valve.

- 32.** The automatic dispensing device according to any one of claims 23-31, wherein, the liquid storage chamber and the dispensing chamber are distributed vertically, the liquid outlet is provided at a bottom of the liquid storage chamber, and a liquid inlet communicating with the negative pressure port is provided at a top of the dispensing chamber.

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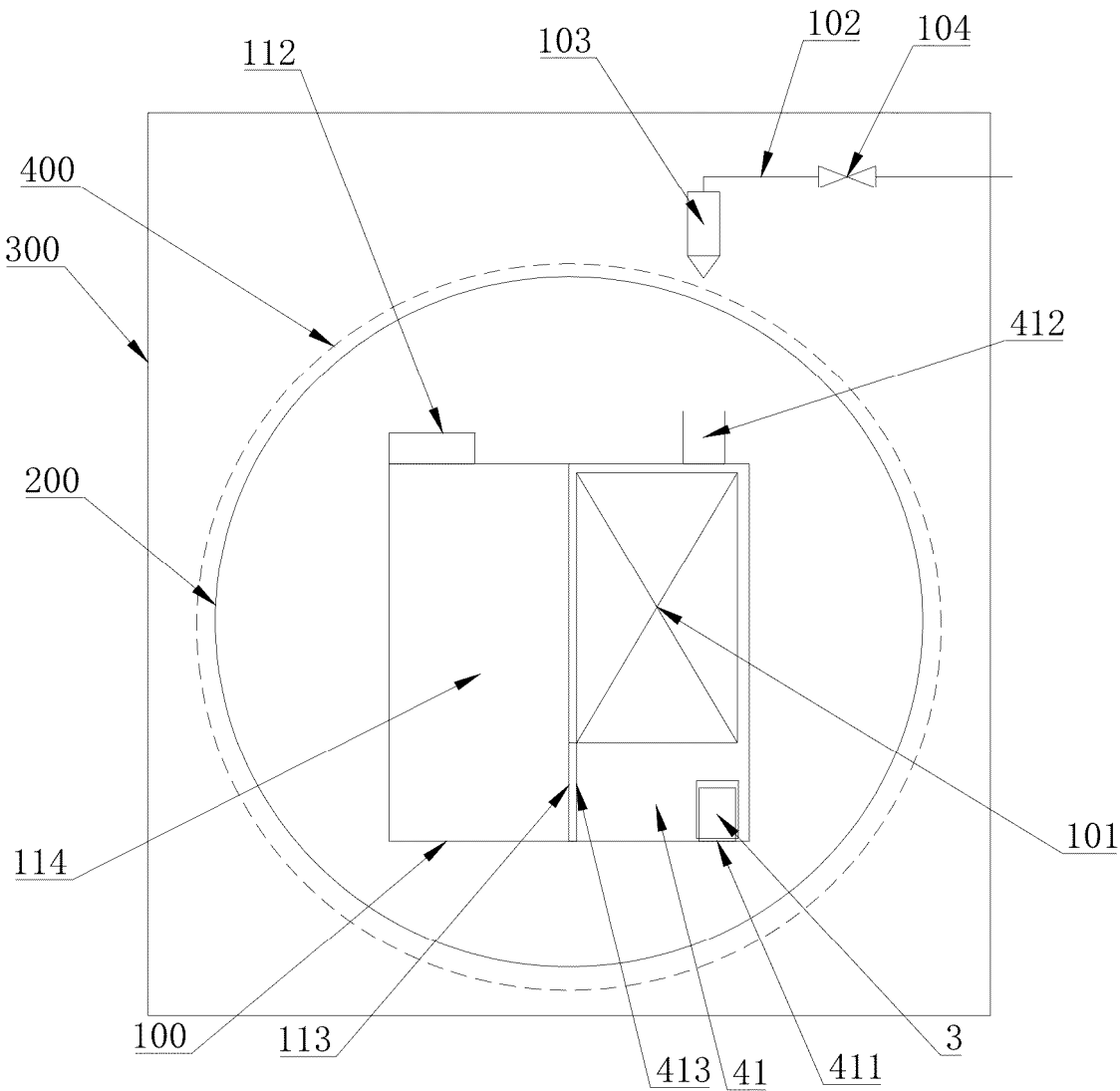


FIG. 1

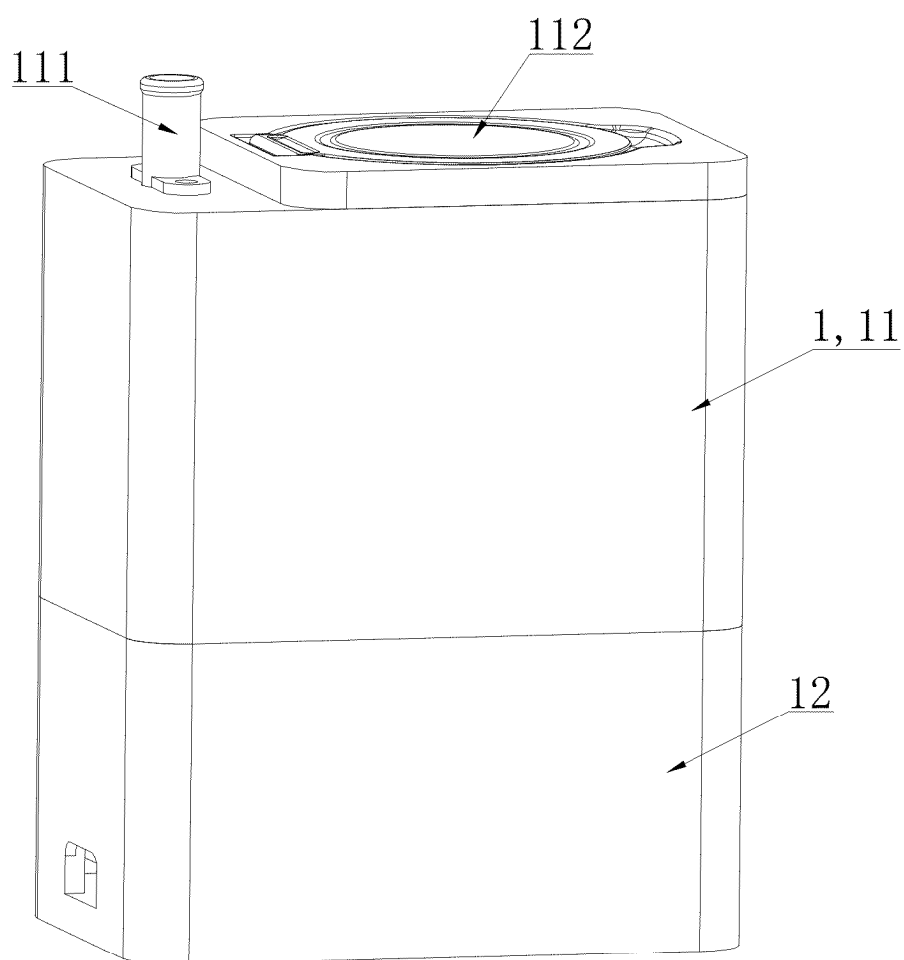


FIG. 2

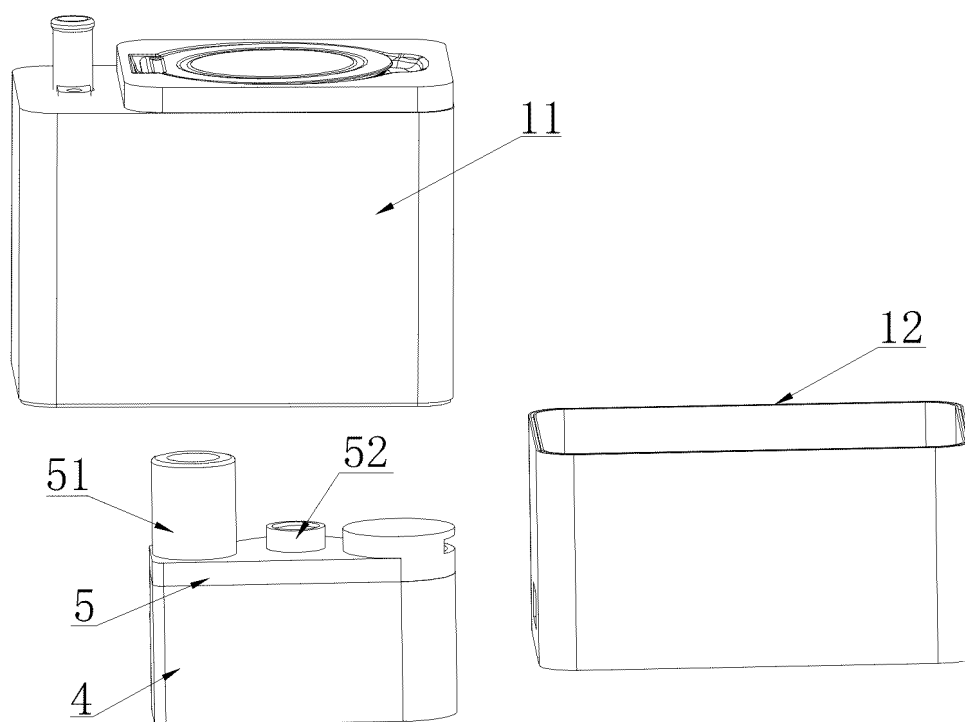


FIG. 3

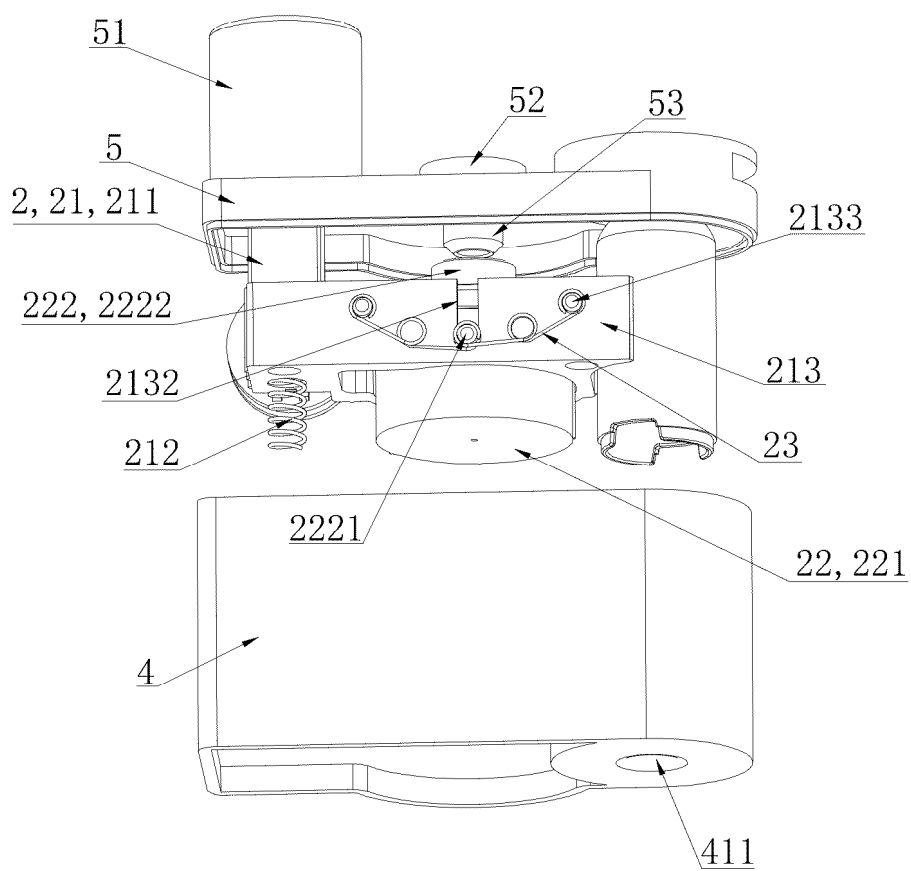


FIG. 4

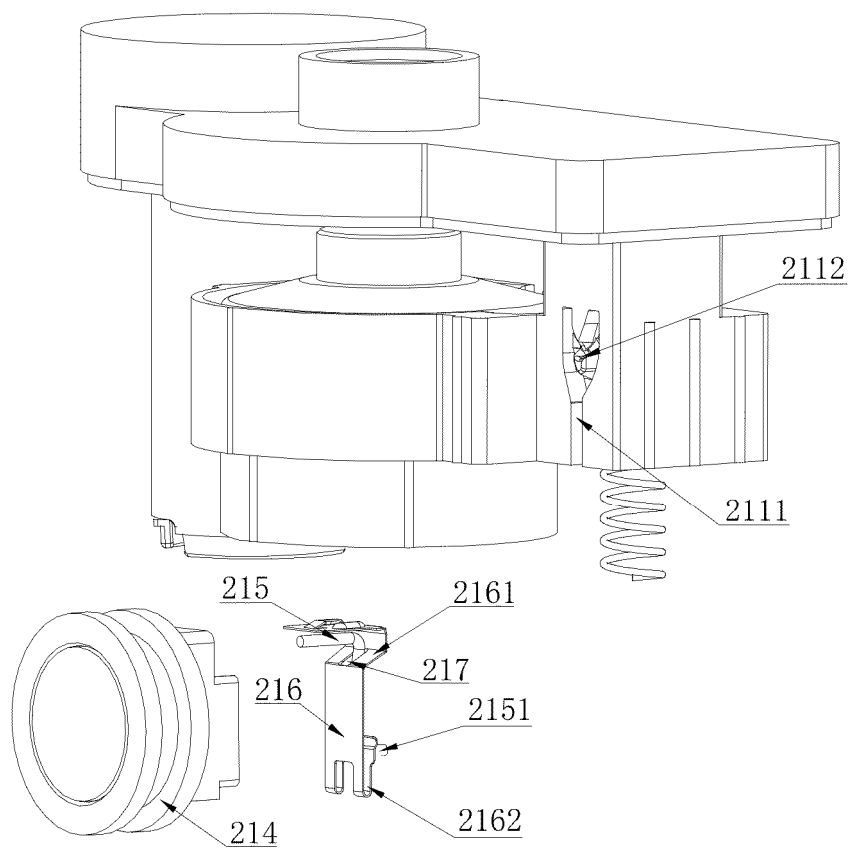


FIG. 5

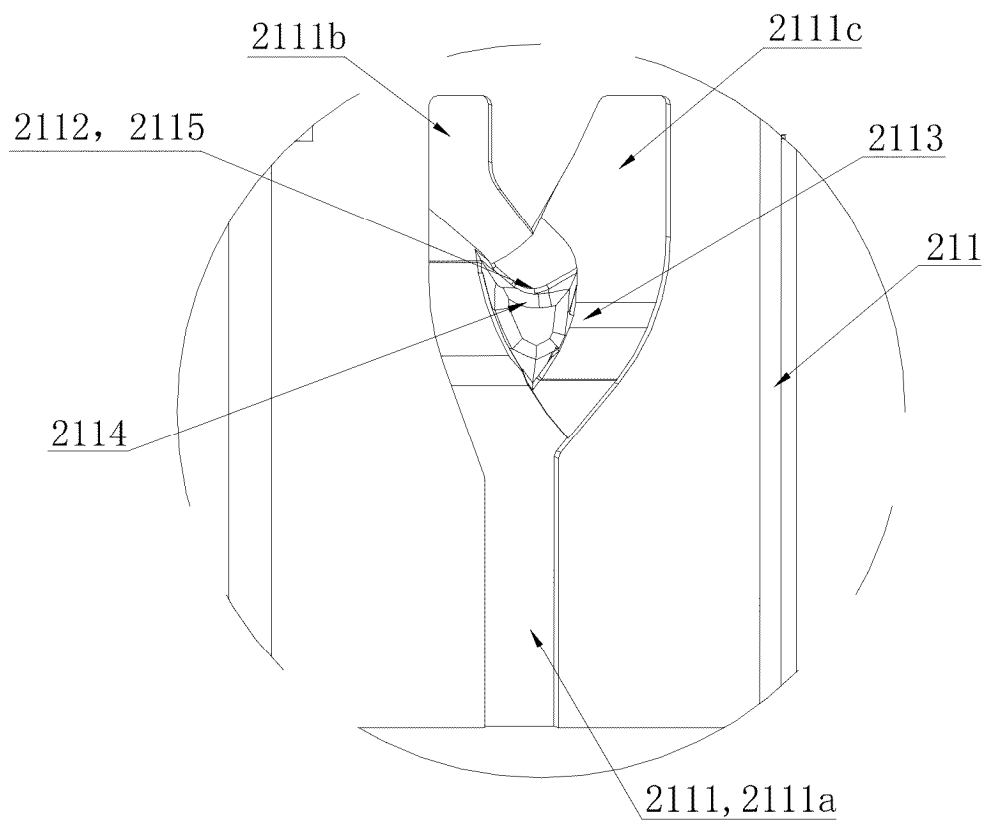


FIG. 6

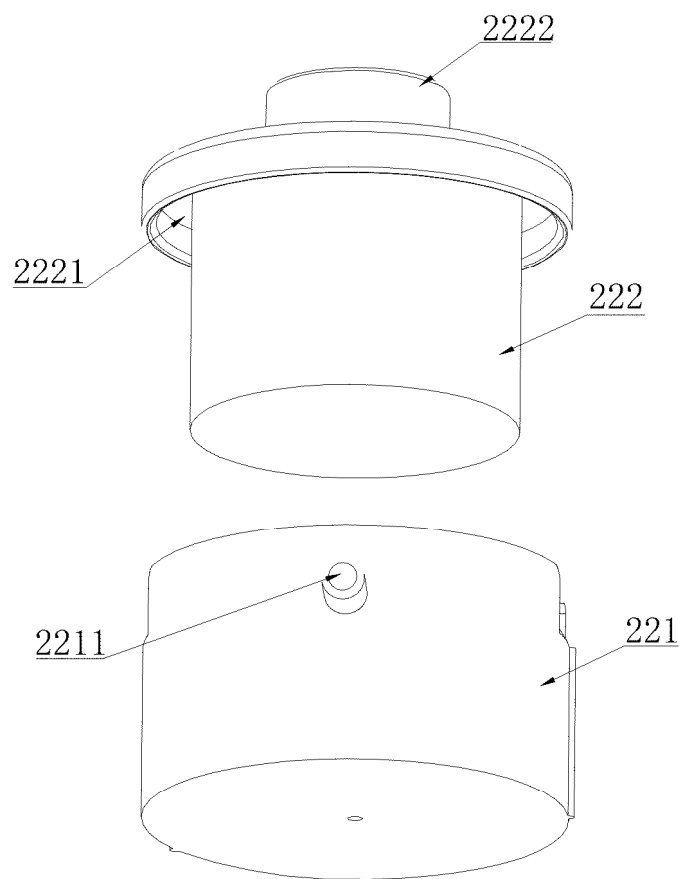


FIG. 7

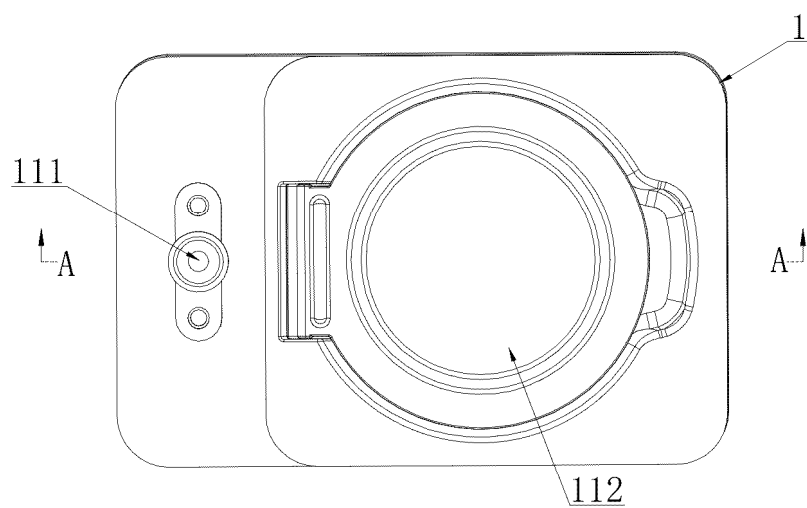


FIG. 8

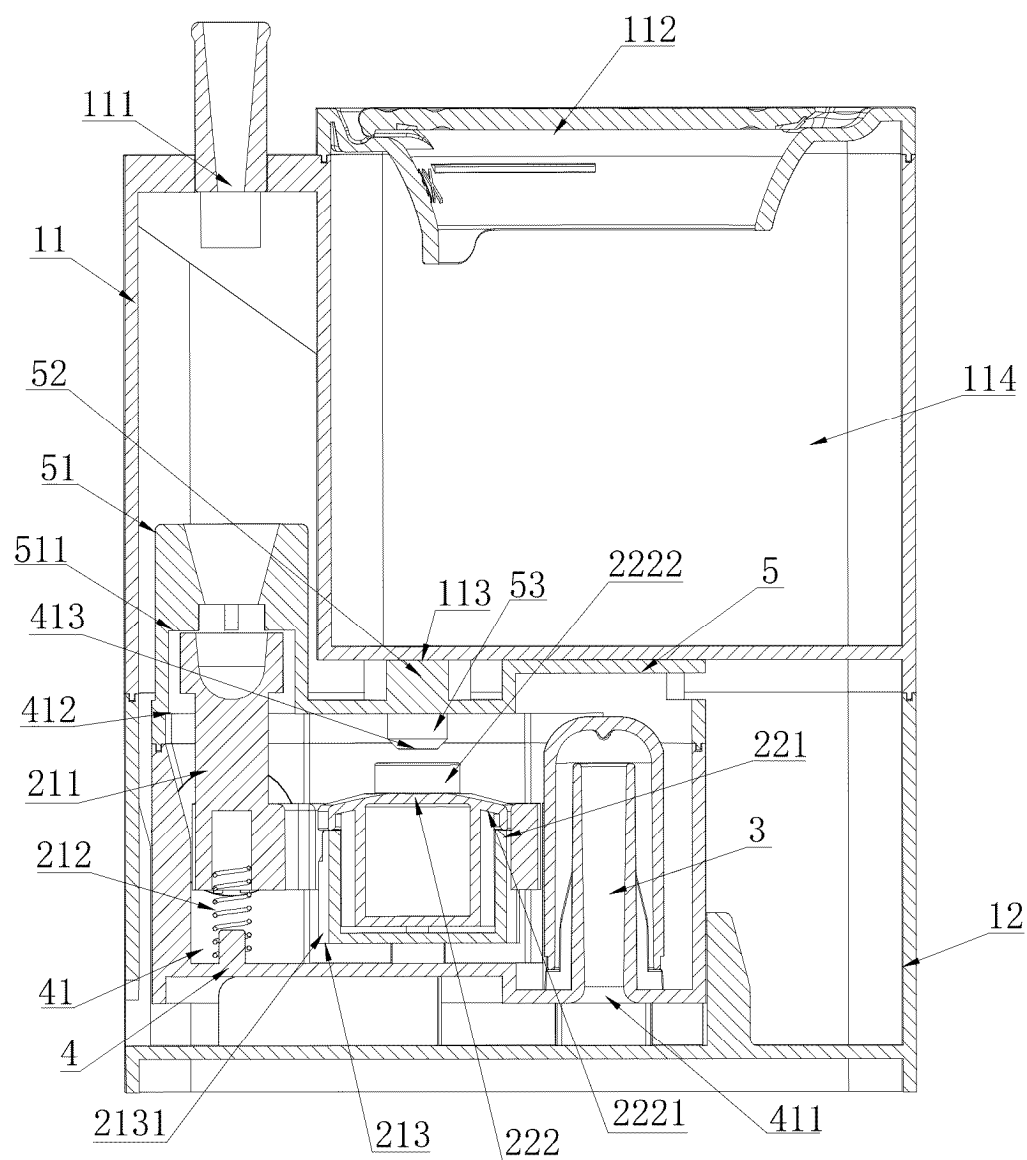


FIG. 9

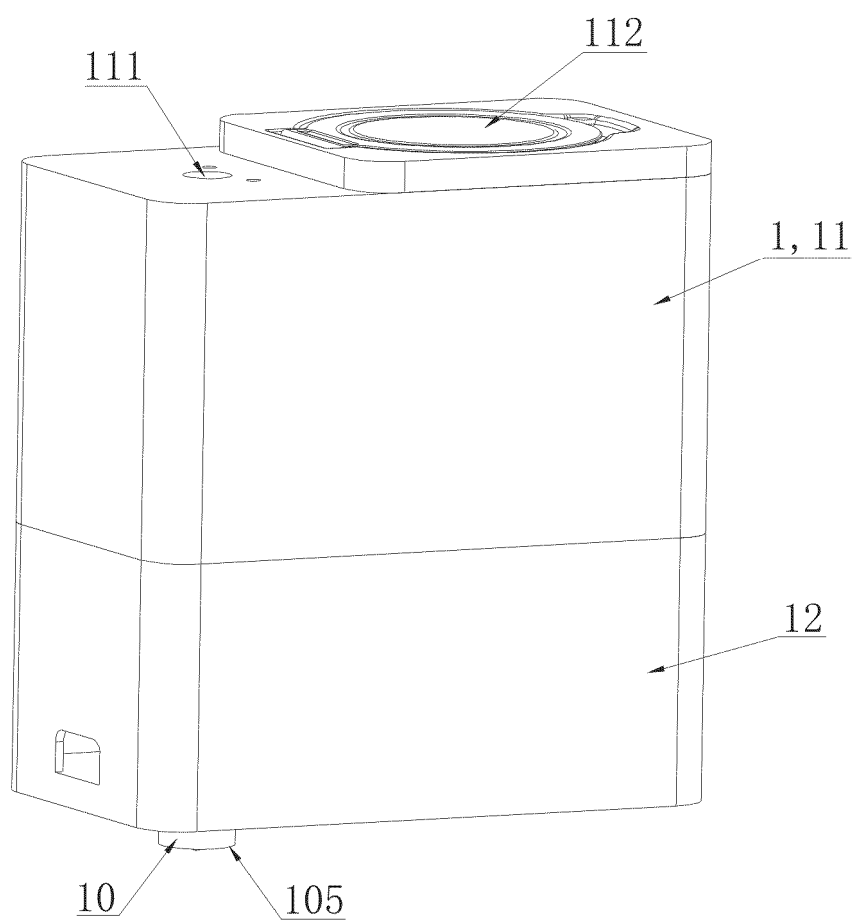


FIG. 10

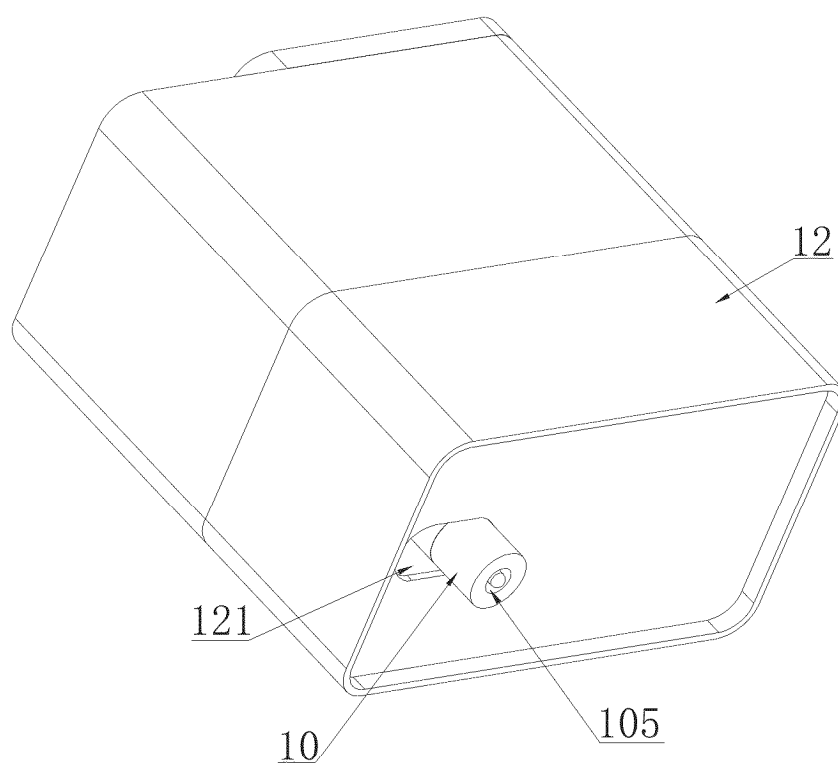


FIG. 11

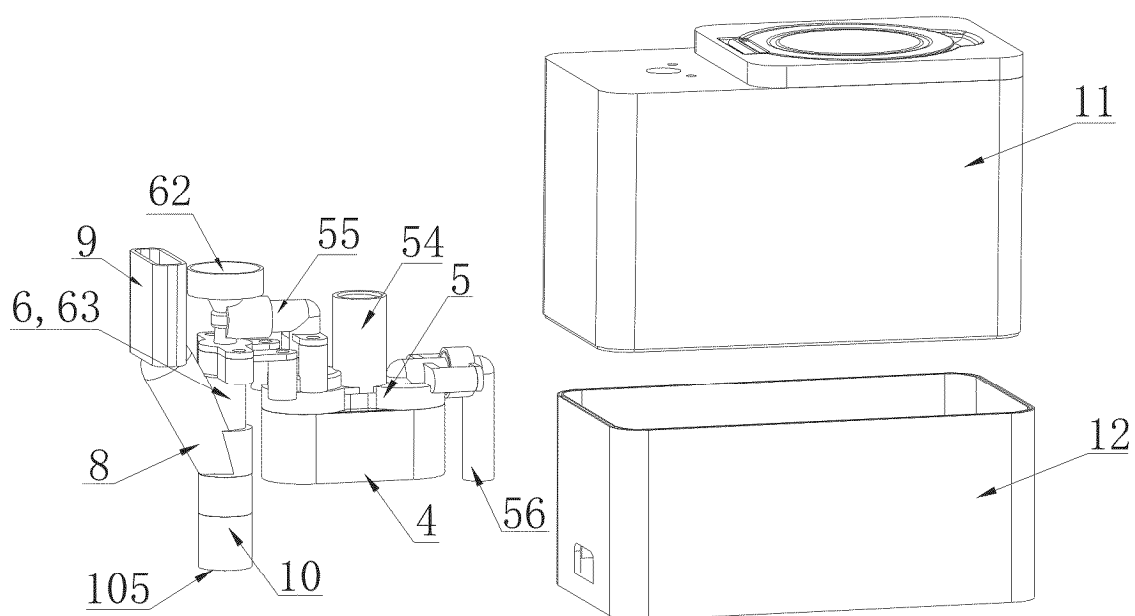


FIG. 12

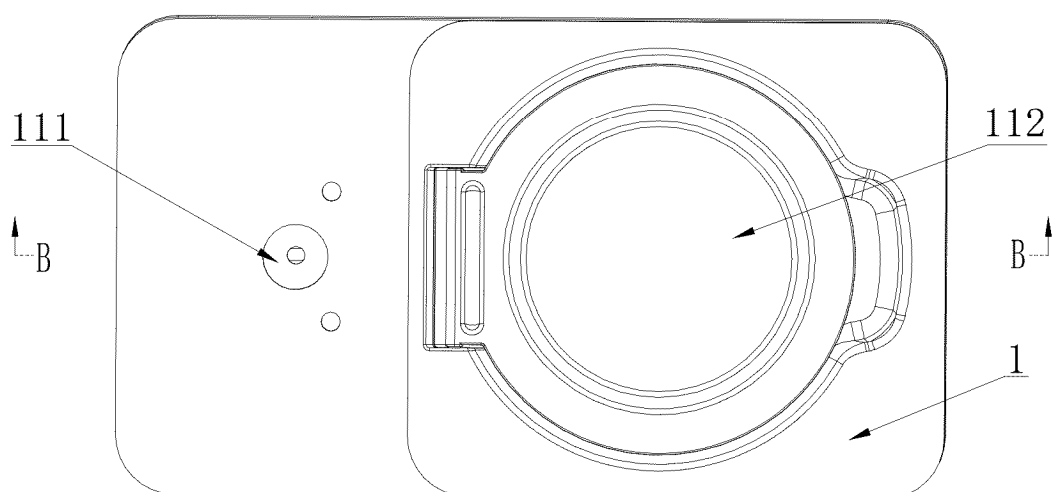


FIG. 13

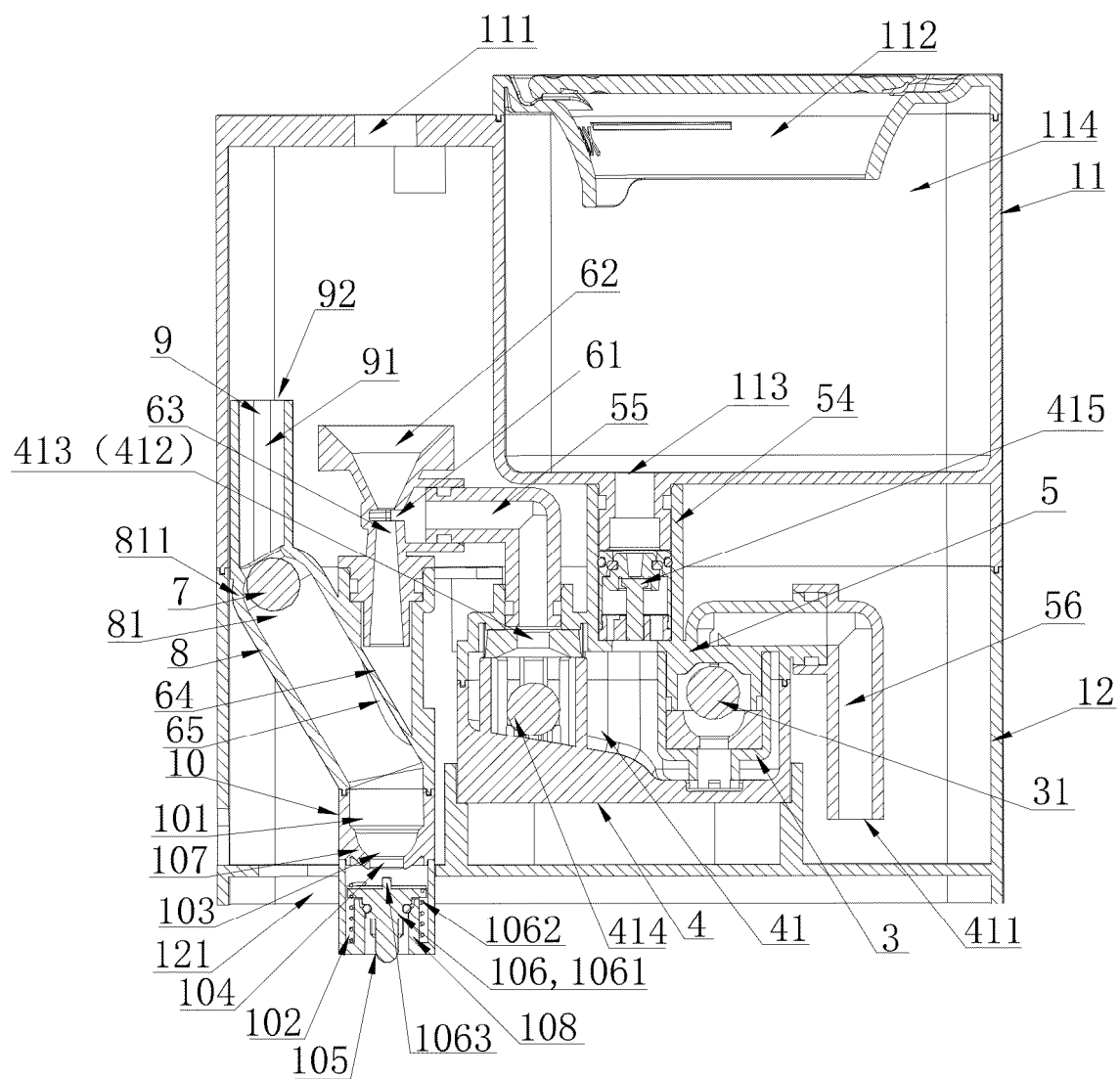


FIG. 14

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2024/100416

A. CLASSIFICATION OF SUBJECT MATTER

D06F 39/02(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)

CNXTX, ENTXTX, VEN, DWPI, CNKI: 储存, 储液, 处理剂, 存储, 存放, 浮动, 浮阀, 浮力, 浮球, 浮子, 盖, 供给, 供应, 海尔, 加注, 门, 清洁剂, 清洗剂, 水, 水面, 水位, 提供, 添加, 添加剂, 添入, 投放, 投入, 洗涤剂, 洗涤液, 洗衣粉, 洗衣剂, 洗衣液, 液面, 液位, 皂液, 助剂, 贮存, 阀, 开关, 负压, 欠压, 压力, 抽吸, 文丘里, 泵, 马达, detergent, aid, agent, powder, wash+, suppl+, provid+, add+, fill+, furnish+, dispenser, serv+, auto+, water, venturi, negative, pressure, motor, pump, door, lid, valve, level, liquid, water, storag+, container

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 110699929 A (QINGDAO HAIER DRUM WASHING MACHINE CO., LTD.) 17 January 2020 (2020-01-17) description, paragraphs 0042-0076, and figures 1-3	1-12
X	CN 110699926 A (QINGDAO HAIER DRUM WASHING MACHINE CO., LTD.) 17 January 2020 (2020-01-17) description, paragraphs 0041-0074, and figures 1-2	1-12
X	CN 208328468 U (NINGBO JIDE ELECTRICAL APPLIANCE CO., LTD.) 04 January 2019 (2019-01-04) description, paragraphs 0048-0083, and figures 1-14	1-12
X	CN 218492037 U (QINGDAO HAIER WASHING MACHINE CO., LTD. et al.) 17 February 2023 (2023-02-17) description, paragraphs 0029-0061, and figures 1-6	1-12

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

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"D" document cited by the applicant in the international application	"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
"E" earlier application or patent but published on or after the international filing date	"&" document member of the same patent family
"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	

Date of the actual completion of the international search 24 September 2024	Date of mailing of the international search report 06 October 2024
Name and mailing address of the ISA/CN China National Intellectual Property Administration (ISA/CN) China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088	Authorized officer Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	CN 110629464 A (QINGDAO HAIER DRUM WASHING MACHINE CO., LTD.) 31 December 2019 (2019-12-31) entire document	1-32

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2024/100416

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