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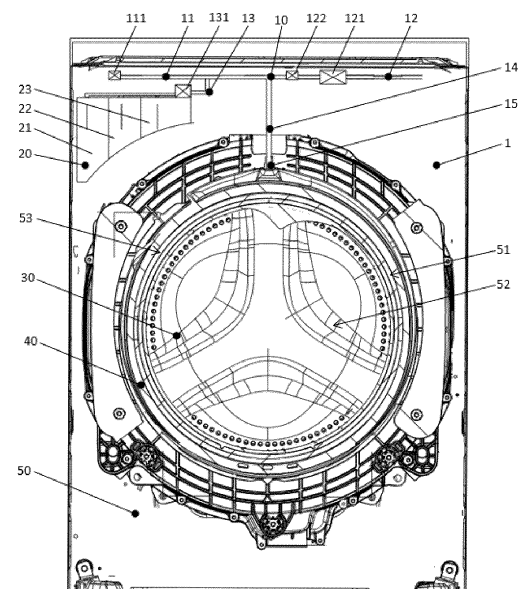
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(54) **WATER INLET SYSTEM AND CONTROL METHOD FOR WASHING DEVICE, AND WASHING DEVICE**

(57) A water inlet system and control method for a washing device, and a washing device. The water inlet system (10) comprises: a first branch (11), wherein a water controller (111) for controlling on or off of the first branch (11) is provided on the first branch (11); a second branch (12), wherein the second branch (12) and the first branch (11) are connected in parallel, and an inflation controller (121) communicated with the atmosphere is provided on the second branch (12); a converging pipeline (14), wherein the upstream end of the converging pipeline (14) is separately communicated with the downstream ends of the first branch (11) and the second branch (12); and a micro-bubble nozzle (15), wherein the micro-bubble nozzle (15) is communicated with the downstream end of the converging pipeline (14). According to the washing device, an inflation branch is increased in the water inlet system (10), so that sufficient gas supply is ensured, the gas-water mixing degree is improved, and a large amount of micro-bubbles are generated in a fluid by means of the micro-bubble nozzle (15), and thus, a better washing effect is achieved.

**FIG. 1****EP 4 516 986 A1**

Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims priority from the following Chinese patent applications for invention: Chinese invention patent application No. 202210470624.4 filed on April 28, 2022, and Chinese invention patent application No. 202210471298.9 filed on April 28, 2022, the entire disclosures of which are both incorporated herein by reference.

FIELD OF THE INVENTION

[0002] The present disclosure relates to the technical field of washing apparatus, and specifically to a water inflow system and control method for a washing apparatus, as well as a washing apparatus.

BACKGROUND OF THE INVENTION

[0003] Micro-bubbles usually refer to tiny bubbles with a diameter below 50 microns (μm) when bubbles are generated. Micro-bubbles can also be divided into micro/nano-bubbles, micron-bubbles, or nano-bubbles based on their diameter range. Micro-bubbles stay in liquid for a longer time due to their low buoyancy in liquid. At the same time, when in liquid, micro-bubbles will contract under the action of water pressure until they finally break, generating smaller nano-bubbles. During this process, the bubbles become smaller, resulting in a slower ascending speed and higher melting efficiency. When micro-bubbles break, they generate high-pressure and high-temperature heat locally, which can destroy foreign objects such as organic matters floating in liquid or attached to objects. In addition, the contraction process of micro-bubbles is accompanied by an increase in negative charge, and a peak state of negative charge usually occurs when the diameter of micro-bubbles is between 1-30 microns. These negative charges have a high oxidation-reduction effect and can effectively decompose pollutants in water. These characteristics enable micro-bubbles to have strong cleaning and purification capabilities. At present, micro-bubbles have been widely used in washing apparatuses such as washing machines.

[0004] In order to improve the washing effect, in existing washing apparatuses, micro-bubbles are generated in the washing water by using various micro-bubble generation devices. However, it is difficult for water inflow pipelines in existing washing apparatuses to ensure sufficient gas supply, which in turn cannot ensure the generation of sufficient micro-bubbles in the fluid.

[0005] Accordingly, there is a need in the art for a new technical solution to solve the above problems.

SUMMARY OF THE INVENTION

First group of solutions

[0006] In order to solve the above problem in the prior art, that is, to solve the technical problem that it is impossible for the water inflow pipelines in the prior art to ensure sufficient gas supply, the present disclosure provides a water inflow system for a washing apparatus, in which the water inflow system includes: a first branch, on which a water controller for controlling on/off of the first branch is provided; a second branch, which is connected in parallel with the first branch, and on which an inflation controller communicated with the atmosphere is provided; a converging pipeline, an upstream end of which is communicated with a downstream end of the first branch and a downstream end of the second branch respectively; and a micro-bubble nozzle, which is communicated with a downstream end of the converging pipeline.

[0007] In the water inflow system for the washing apparatus of the present disclosure, the first branch is connected in parallel with the second branch; water from the first branch and gas from the second branch respectively reach the converging pipeline and then flow together to the micro-bubble nozzle, so that a large number of micro-bubbles are generated through a micro-bubble generation mesh, which are then sprayed toward outer and/or inner cylinders of the washing apparatus. Adding a branch for introducing gas in the water inflow system can ensure sufficient gas supply, improve the degree of gas-water mixing, and generate sufficient micro-bubbles in the water through the micro-bubble nozzle to achieve better washing effect.

[0008] In a preferred technical solution of the water inflow system for the washing apparatus described above, the water inflow system further includes a third branch, which is connected in parallel with both the first branch and the second branch; an upstream end of the third branch is connected to a treatment agent box, and a downstream end of the third branch is communicated with the converging pipeline; and a dispenser is provided on the third branch for pumping a treatment agent from the treatment agent box into the third branch. Through the above arrangement, the treatment agent can reach the micro-bubble nozzle together with water and gas, and a mixed fluid containing a large number of micro-bubbles is formed through the micro-bubble generation mesh, which improves the activity of the treatment agent and enhances the clothing treatment effect.

[0009] In a preferred technical solution of the water inflow system for the washing apparatus described above, a one-way valve is provided on the second branch, and the one-way valve is arranged downstream of the second controller. Through the above arrangement, water or treatment agent can be prevented from entering the second branch and flowing into a housing of the washing apparatus through an air pump.

[0010] In a preferred technical solution of the water inflow system for the washing apparatus described above, the micro-bubble nozzle includes a micro-bubble generation mesh and a nozzle body; the nozzle body has an inlet end, an outlet end, and a cavity extending between the inlet end and the outlet end along a length direction of the nozzle body and having a constant diameter; and the micro-bubble generation mesh covers an end face of the outlet end. Through the above arrangement, the nozzle body of the micro-bubble nozzle of the present disclosure can allow fluid to pass through it and flow toward the micro-bubble generation mesh to form a micro-bubble fluid containing a large number of micro-bubbles, and an interior of the nozzle body has the same inner diameter along its length direction. The structure is simple, and production and manufacturing are easy.

[0011] In a preferred technical solution of the water inflow system for the washing apparatus described above, the micro-bubble nozzle further includes a nozzle cap, which includes a pressing part and a connecting part; the pressing part has an annular wall with a central through hole, and a diameter of the central through hole matches the diameter of the cavity to allow fluid from the cavity to be sprayed through the micro-bubble generation mesh from the central through hole; the connecting part extends outward from the annular wall of the pressing part along a centerline of the central through hole and can be fastened to the outlet end to securely clamp the micro-bubble generation mesh between the end face of the outlet end and the annular wall of the pressing part. Through the above arrangement, by fastening the connecting part to the outlet end, the pressing part can be tightly pressed against the end face of the outlet end, thereby firmly clamping the micro-bubble generation mesh between the pressing part and the outlet end. When high-speed fluid impacts the micro-bubble generation mesh, the micro-bubble generation mesh can maintain its own stability and cut the bubbles in the high-speed water flow, promoting efficient generation of micro-bubbles.

[0012] In a preferred technical solution of the water inflow system for the washing apparatus described above, the micro-bubble generation mesh has multiple mesh layers, and a mesh size of each of the mesh layers is any value between 20 and 300 meshes. Through the above arrangement, a micro-bubble generation mesh is formed by overlapping multiple delicate mesh layers together, which can ensure that the micro-bubble generation mesh sufficiently and effectively cuts bubbles in high-speed water flow, thereby ensuring that the fluid contains a large number of micro-bubbles to improve the treatment effect on clothing.

[0013] In a preferred technical solution of the water inflow system for the washing apparatus described above, the water controller is an electromagnetic valve or a water pump, and the inflation controller is an air pump. Through the above arrangement, the electromagnetic valve or water pump can control on/off of water in the

pipeline and provide high-speed water flow to the pipeline. The air pump can control the inflation in the pipeline, ensure the gas content in the fluid, and guarantee the formation of high-speed fluid.

[0014] In a preferred technical solution of the water inflow system for the washing apparatus described above, the dispenser is a piston pump or a peristaltic pump. Through the above arrangement, the dispensing of treatment agent in the treatment agent branch can be controlled, and the use of piston pump or peristaltic pump is advantageous for improving the efficiency of pumping treatment agent into the pipeline, and facilitates the adjustment of flow rate of the treatment agent in the pipeline.

[0015] In order to solve the above problem in the prior art, that is, to solve the technical problem that it is impossible for the water inflow pipelines in the prior art to ensure sufficient gas supply, the present disclosure also provides a washing apparatus, which includes the water inflow system according to any one of the preceding items. Through the above arrangement, by adding a second branch for introducing gas in the water inflow system, the washing apparatus of the present disclosure can ensure the gas content in the fluid, optimize the mixing effect of gas and liquid, and further enhance the treatment effect on clothing. In addition, when the third branch communicated with the treatment agent box is provided, the washing apparatus of the present disclosure also enables the treatment agent to be mixed with water and gas, and foam water containing a large number of micro-bubbles is formed through the micro-bubble nozzle to enhance the treatment effect on clothing.

[0016] In a preferred technical solution of the washing apparatus described above, the washing apparatus further includes a treatment agent box having a first accommodation chamber, a second accommodation chamber and a third accommodation chamber, each of which can accommodate a treatment agent, and the water inflow system includes a third branch connected in parallel with both the first branch and the second branch thereof; the first accommodation chamber, the second accommodation chamber and the third accommodation chamber are respectively connected with the third branch. Through the above arrangement, treatment agents with different functions can be placed in the three accommodation chambers arranged in the treatment agent box; for example, a detergent, a softener and a disinfectant are placed in the three accommodation chambers respectively, so as to meet various washing needs and therefore improve the user experience.

[0017] In a preferred technical solution of the washing apparatus described above, the washing apparatus further includes a sealing window gasket, on which a fixed tube is provided, and the micro-bubble nozzle of the water inflow system is detachably inserted into the fixed tube. Through the above arrangement, the micro-bubble nozzle is fixed on the sealing window gasket, so that it can spray a fluid containing a large number of micro-bubbles into a washing chamber of the washing apparatus to treat

objects to be cleaned such as the clothing, thereby improving the washing effect of the washing apparatus.

Second group of solutions

[0018] In order to solve the above problem in the prior art, that is, to solve the technical problem that it is impossible for the water inflow pipelines in the prior art to ensure sufficient gas supply, the present disclosure provides a washing apparatus. The washing apparatus has a water inflow system, which includes: a first pipeline, on which a water controller for controlling on/off of the first pipeline is provided; a second pipeline, which is connected in parallel with the first pipeline, and which has a first end and a second end located upstream of the first end, the first end being connected to the first pipeline, the second end being connected to a treatment agent box, and a dispenser and an inflation controller located upstream of the dispenser being provided on the second pipeline; a converging pipeline, an upstream end of which is communicated with the first pipeline and the second pipeline respectively; and a micro-bubble nozzle, which is configured to generate micro-bubbles in a fluid flowing therethrough and which has an inlet end and an outlet end, the inlet end being communicated with a downstream end of the converging pipeline, and the outlet end being communicated with a washing chamber of the washing apparatus.

[0019] In the water inflow system for the washing apparatus of the present disclosure, the first pipeline is connected in parallel with the second pipeline; water from the first pipeline and fluid from the second pipeline reach the converging pipeline and then can flow together to the micro-bubble nozzle, so that a foam water containing a large number of micro-bubbles are generated through the micro-bubble nozzle, which is then sprayed toward outer and/or inner cylinders of the washing apparatus, that is, sprayed into the washing chamber. The inflation controller provided on the second pipeline is used to control the gas that can be introduced into the water inflow pipeline to ensure sufficient gas supply, improve the degree of gas-water mixing, and generate sufficient micro-bubbles in the water through the micro-bubble nozzle to achieve better washing effect.

[0020] In a preferred technical solution of the washing apparatus described above, the second pipeline includes: a main pipeline, which is connected to the first pipeline through the first end; as well as a first branch, a second branch and a third branch connected to the main pipeline at the second end and connected in parallel with each other, the first branch, the second branch and the third branch being respectively connected to the treatment agent box; the main pipeline is provided with the dispenser, the inflation controller located upstream of the dispenser, and a switching valve located upstream of the inflation controller and controlling fluid communication between the main pipeline and each of the first branch, the second branch and the third branch. Through the

above arrangement, the washing apparatus of the present disclosure can use three different clothing treatment agents (such as detergent, softener and disinfectant) to treat the clothing, etc., thereby meeting various washing needs and improving the user experience. The switching valve can control the connection/disconnection of the main pipeline and the three branches, thereby controlling the dispensing of the clothing treatment agents. This pipeline design not only allows water to be mixed with the clothing treatment agents and gas, generating a large number of micro-bubbles through the micro-bubble nozzle to enhance the activity of the clothing treatment agents and thus achieve better treatment effect, but also allows water to be mixed with gas and form a micro-bubble water through the micro-bubble nozzle to rinse the clothing and achieve better washing effect.

[0021] In a preferred technical solution of the washing apparatus described above, the second pipeline includes a first extraction pipeline, a second extraction pipeline and a third extraction pipeline connected in parallel with each other, each of which is connected in parallel with the first pipeline through the first end and connected to the treatment agent box through the second end; the inflation controller and the dispenser located downstream of the inflation controller are arranged on each of the first extraction pipeline, the second extraction pipeline and the third extraction pipeline. Through the above arrangement, the washing apparatus of the present disclosure can use three different clothing treatment agents (such as detergent, softener and disinfectant) to treat the clothing, etc., thereby meeting various washing needs and improving the user experience.

[0022] In a preferred technical solution of the washing apparatus described above, the dispenser is one of a piston pump, a diaphragm pump, or a peristaltic pump, and the inflation controller is an electric three-way valve. Through the above arrangement, the dispensing of treatment agent and the on/off of gas in the second pipeline can be controlled. The use of piston pump or peristaltic pump is advantageous for improving the efficiency of pumping treatment agent into the pipeline, and facilitates the adjustment of flow rate of the treatment agent in the pipeline; the electric three-way valve has the advantages of compact structure, light weight, sensitive action, and precise flow rate characteristics, etc.

[0023] In a preferred technical solution of the washing apparatus described above, the micro-bubble nozzle includes a micro-bubble generation mesh and a nozzle body; the nozzle body has a cavity with a constant diameter along its length direction, and the micro-bubble generation mesh covers an end face of the outlet end. Through the above arrangement, the washing apparatus of the present disclosure can pump water and gas into the pipeline at high pressure, thereby forming a high-speed water flow, without the need to set a Venturi structure inside the micro-bubble nozzle, simplifying the structure of the micro-bubble nozzle and reducing the manufacturing cost of the micro-bubble nozzle.

[0024] In a preferred technical solution of the washing apparatus described above, the micro-bubble generation mesh has multiple mesh layers, and a mesh size of each of the mesh layers is any value between 20 and 300 meshes. Through the above arrangement, a micro-bubble generation mesh is formed by overlapping multiple delicate mesh layers together, which can ensure that the micro-bubble generation mesh sufficiently and effectively cuts bubbles in high-speed water flow, thereby ensuring that the fluid contains a large number of micro-bubbles to improve the treatment effect on clothing.

[0025] In order to solve the above problem in the prior art, that is, to solve the technical problem that it is impossible for the water inflow pipelines in the prior art to ensure sufficient gas supply, the present disclosure also provides a control method for a washing apparatus; the washing apparatus is the washing apparatus according to any one of the preceding items, and the control method includes: turning on a water controller to introduce water into a first pipeline; turning on a dispenser to pump a fluid in a second pipeline toward a converging pipeline; making the water from the first pipeline and the fluid from the second pipeline flow into the converging pipeline and form a fluid water therein; making the fluid water from the converging pipeline flow through a micro-bubble nozzle to generate a micro-bubble fluid; and spraying the micro-bubble fluid into a washing chamber. Through the above arrangement, the washing apparatus of the present disclosure can mix water with the clothing treatment agents and gas, and generate a large number of micro-bubbles through the micro-bubble nozzle to improve the activity of the clothing treatment agents, thereby achieving better treatment effect; it is also possible to mix water with gas and form a micro-bubble water through the micro-bubble nozzle to rinse the clothing and achieve better washing effect.

[0026] In a preferred technical solution of the control method for the washing apparatus described above, the second pipeline of the washing apparatus includes a main pipeline, as well as a first branch, a second branch and a third branch connected to the main pipeline and connected in parallel with each other; the main pipeline is provided with the dispenser, the inflation controller located upstream of the dispenser, and a switching valve located upstream of the inflation controller and controlling fluid communication between the main pipeline and each of the first branch, the second branch and the third branch; and the control method also includes: controlling the switching valve to cut off the communication between the main pipeline and the first branch, the second branch and the third branch; turning on the inflation controller to introduce gas into the main pipeline; making the water from the first pipeline and the gas from the main pipeline flow into the converging pipeline and form a bubble water therein; making the bubble water from the converging pipeline flow through the micro-bubble nozzle to generate a micro-bubble water fluid; and spraying the micro-bubble water fluid into the washing chamber. Through the

above arrangement, when it is necessary to rinse the clothing and the like, the washing apparatus of the present disclosure can mix water with gas and form a bubble water containing a large number of micro-bubbles through the micro-bubble nozzle, which can be sprayed into the outer cylinder or inner cylinder to rinse the clothing and achieve better washing effect.

[0027] In a preferred technical solution of the control method for the washing apparatus described above, the second pipeline of the washing apparatus includes a main pipeline, as well as a first branch, a second branch and a third branch connected to the main pipeline and connected in parallel with each other; the main pipeline is provided with the dispenser, the inflation controller located upstream of the dispenser, and a switching valve located upstream of the inflation controller and controlling fluid communication between the main pipeline and each of the first branch, the second branch and the third branch; and the control method also includes: controlling the switching valve to make the main pipeline communicate with one of the first branch, the second branch and the third branch; using the dispenser to pump the treatment agent from the treatment agent box into the main pipeline through said one branch; making the water from the first pipeline and the treatment agent from the main pipeline flow into the converging pipeline and form a first mixed fluid therein; making the first mixed fluid from the converging pipeline flow through the micro-bubble nozzle to generate a first mixed micro-bubble fluid; and spraying the first mixed micro-bubble fluid into the washing chamber. Through the above arrangement, when it is necessary to treat the clothing and the like by using the clothing treatment agent, the second pipeline of the washing apparatus of the present disclosure can extract the corresponding treatment agent, and make it flow into the converging pipeline to mix with the water from the first pipeline before flowing together to the micro-bubble nozzle to generate foam water containing a large number of micro-bubbles for treating the clothing and the like, thereby enhancing the clothing treatment effect.

[0028] In a preferred technical solution of the control method for the washing apparatus described above, the control method further includes: turning on the inflation controller to introduce gas into the main pipeline; making the water from the first pipeline and the treatment agent and gas from the main pipeline flow into the converging pipeline and form a second mixed fluid therein; making the second mixed fluid from the converging pipeline flow through the micro-bubble nozzle to generate a second mixed micro-bubble fluid; and spraying the second mixed micro-bubble fluid into the washing chamber. Through the above arrangement, when it is necessary to treat the clothing and the like by using the clothing treatment agent, the second pipeline of the washing apparatus of the present disclosure can extract the corresponding treatment agent, and at the same time, gas is introduced into the main pipeline of the second pipeline; the treatment agent and gas flow into the converging pipeline to

mix with the water from the first pipeline, and then they flow together to the micro-bubble nozzle to generate foam water containing a large number of micro-bubbles for treating the clothing and the like. Introducing gas into the pipeline can ensure sufficient gas supply, improve the degree of gas-water mixing, and thus ensure sufficient micro-bubble content in the water to achieve better washing effect.

[0029] In a preferred technical solution of the control method for the washing apparatus described above, the control method further includes: (a) when the communication time between the main pipeline and said one branch reaches a first predetermined time period, controlling the switching valve to cut off the communication between the main pipeline and said one branch, while turning on the inflation controller to introduce gas into the main pipeline; (b) when the duration in which the inflation controller is turned on reaches a second predetermined time period, turning off the inflation controller, while controlling the switching valve to make the main pipeline communicate with said one branch again; and repeating steps (a) and (b) until the dispensing amount of the treatment agent reaches a predetermined dispensing amount. Through the above arrangement, the dispensing of treatment agent into the pipeline and introduction of gas into the pipeline can occur in sequence, that is, a certain amount of treatment agent is first introduced into the main pipeline of the second pipeline, and then a certain amount of gas is introduced into the main pipeline. This arrangement is advantageous for ensuring that the treatment agent and gas mix more sufficiently and evenly with water, thereby achieving better clothing treatment effect.

[0030] In a preferred technical solution of the control method for the washing apparatus described above, the second pipeline includes a first extraction pipeline, a second extraction pipeline and a third extraction pipeline connected in parallel with each other, each of which is provided with the inflation controller and the dispenser located downstream of the inflation controller; and the control method includes: turning on the inflation controller on one of the first extraction pipeline, the second extraction pipeline and the third extraction pipeline to introduce gas into said one extraction pipeline; turning on the dispenser on said one extraction pipeline to pump the treatment agent from the treatment agent box into said one extraction pipeline; making the water from the first pipeline and the gas and treatment agent from said one extraction pipeline flow into the converging pipeline and form a second mixed fluid therein; making the second mixed fluid from the converging pipeline flow through the micro-bubble nozzle to generate a second mixed micro-bubble fluid; and spraying the second mixed micro-bubble fluid into the washing chamber. Through the above arrangement, when it is necessary to treat the clothing and the like by using the clothing treatment agent, the washing apparatus of the present disclosure can extract the corresponding treatment agent, and at the same time,

gas is introduced into the extraction pipeline; the treatment agent and gas flow into the converging pipeline to mix with the water from the first pipeline, and then they flow together to the micro-bubble nozzle to generate foam water containing a large number of micro-bubbles for treating the clothing and the like. Introducing gas into the pipeline can ensure sufficient gas supply, improve the degree of gas-water mixing, and thus ensure sufficient micro-bubble content in the water to achieve better washing effect.

[0031] In a preferred technical solution of the control method for the washing apparatus described above, the control method further includes: intermittently turning on the inflation controller at predetermined time intervals until the dispensing amount of the treatment agent reaches a predetermined dispensing amount. Through the above arrangement, intermittently introducing gas into the pipeline can prevent excessive gas from surging toward the micro-bubble nozzle, thereby ensuring that bubbles can be efficiently and sufficiently cut by the micro-bubble nozzle.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032] Preferred embodiments of the present disclosure will be described below with reference to the accompanying drawings, in which:

FIG. 1 is a schematic structural view of an embodiment of the washing apparatus of the present disclosure;

FIG. 2 is a schematic structural view of an embodiment of a micro-bubble nozzle in the water inflow system for a washing apparatus of the present disclosure;

FIG. 3 is a schematic cross-sectional view of an embodiment of the micro-bubble nozzle of the present disclosure taken along section line A-A in FIG. 2;

FIG. 4 is a schematic structural view of a first embodiment of the washing apparatus of the present disclosure;

FIG. 5 is a schematic structural view of a second embodiment of the washing apparatus of the present disclosure;

FIG. 6 is a schematic structural view of an embodiment of the micro-bubble nozzle of the washing apparatus of the present disclosure;

FIG. 7 is a schematic flowchart of the control method for a washing apparatus of the present disclosure;

FIG. 8 is a schematic flowchart of a first embodiment of the control method for the washing apparatus of

the present disclosure;

FIG. 9 is a schematic flowchart of a second embodiment of the control method for the washing apparatus of the present disclosure;

FIG. 10 is a schematic flowchart of a third embodiment of the control method for the washing apparatus of the present disclosure;

FIG. 11 is a schematic flowchart of a fourth embodiment of the control method for the washing apparatus of the present disclosure; and

FIG. 12 is a schematic flowchart of a fifth embodiment of the control method for the washing apparatus of the present disclosure.

List of reference signs

First group of solutions

[0033] 1: washing apparatus; 10: water inflow system; 11: first branch; 111: water controller; 12: second branch; 121: inflation controller; 122: one-way valve; 13: third branch; 131: dispenser; 14: converging pipeline; 15: micro-bubble nozzle; 151: micro-bubble generation mesh; 152: nozzle body; 521: inlet end; 522: outlet end; 523: cavity; 524: external thread of the outlet end; 153: nozzle cap; 531: pressing part; 5311: annular wall; 532: connecting part; 5321: internal thread of the connecting part; 533: through hole of the nozzle cap; 154: positioning column; 155: fixed installation part; 155a: first fixed installation part; 155b: second fixed installation part; 1551: threaded hole; 156: anti-falling part; 20: treatment agent box; 21: first accommodation chamber; 22: second accommodation chamber; 23: third accommodation chamber; 30: inner cylinder; 40: outer cylinder; 50: housing; 51: door; 52: observation window; 53: sealing window gasket.

Second group of solutions

[0034] 1: washing apparatus; 10: water inflow system; 11: first pipeline; 111: water controller; 12: second pipeline; 121: dispenser; 122: inflation controller; 123: switching valve; 124: main pipeline; 241: first branch; 242: second branch; 243: third branch; 244: first extraction pipeline; 245: second extraction pipeline; 246: third extraction pipeline; 13: converging pipeline; 14: micro-bubble nozzle; 141: inlet end; 142: outlet end; 143: nozzle body; 144: fixed part; 145: positioning part; 146: nozzle cap; 20: treatment agent box; 30: inner cylinder; 40: outer cylinder; 50: housing; 51: door; 52: observation window; 53: sealing window gasket.

DETAILED DESCRIPTION OF THE EMBODIMENT(S) OF THE INVENTION

[0035] Preferred embodiments of the present disclosure will be described below with reference to the accompanying drawings. It should be understood by those skilled in the art that the following embodiments are only used to explain the technical principle of the present disclosure, and are not intended to limit the scope of protection of the present disclosure.

[0036] It should be noted that in the description of the present disclosure, terms indicating directional or positional relationships, such as "upper", "lower", "left", "right", "inner", "outer" and the like, are based on the directional or positional relationships shown in the accompanying drawings. They are only used for ease of description, and do not indicate or imply that the device or element must have a specific orientation, or must be constructed or operated in a specific orientation; therefore, they should not be considered as limitations to the present disclosure. In addition, terms "first", "second" and "third" are only used for descriptive purpose, and should not be understood as indicating or implying relative importance.

[0037] In addition, it should also be noted that in the description of the present disclosure, unless otherwise clearly specified and defined, terms "arrange" and "connection" should be understood in a broad sense; for example, the connection may be a fixed connection, or a detachable connection, or an integral connection; it may be a direct connection, or an indirect connection implemented through an intermediate medium, or internal communication between two elements. For those skilled in the art, the specific meaning of the above terms in the present disclosure can be interpreted according to specific situations.

First group of solutions

[0038] In order to solve the technical problem that it is impossible for the water inflow pipelines in the prior art to ensure sufficient gas supply, the present disclosure provides a water inflow system 10 for a washing apparatus 1. The water inflow system 10 includes: a first branch 11, on which a water controller 111 for controlling on/off of the first branch is provided; a second branch 12, which is connected in parallel with the first branch 11, and on which an inflation controller 121 communicated with the atmosphere is provided; a converging pipeline 14, an upstream end of which is communicated with a downstream end of the first branch 11 and a downstream end of the second branch 12 respectively; and a micro-bubble nozzle 15, which is communicated with a downstream end of the converging pipeline 14.

[0039] FIG. 1 is a schematic structural view of an embodiment of the washing apparatus of the present disclosure. As shown in FIG. 1, in one or more embodiments, the washing apparatus 1 of the present disclosure

is a drum washing machine. Alternatively, the washing apparatus 1 of the present disclosure can also be a pulsator washing machine, a washing-drying integrated machine, or another suitable form of washing machine. The washing apparatus 1 includes a housing 50. A door 51 that allows users to put the clothing and the like into the drum washing machine is provided on a front side (an operation side that faces the users) of the housing 50, and the door 51 is also provided with an observation window 52 that allows users to see the interior of the washing machine. A sealing window gasket 53 is also provided between the observation window 52 and the housing 50, and the sealing window gasket 53 is fixed on the housing 50. An outer cylinder 40 and an inner cylinder 30 are provided inside the housing 50. The outer cylinder 40 and the inner cylinder 30 together form a washing chamber of the washing apparatus 1. The inner cylinder 30 is rotatably positioned inside the outer cylinder 40, and is connected to a motor through a transmission shaft and bearings.

[0040] The washing apparatus 1 of the present disclosure also has a treatment agent box 20. The treatment agent box 20 is arranged at the upper left position of the housing 50 of the washing apparatus 1 as shown in the figure. Alternatively, the treatment agent box 20 can also be arranged at the upper right position of the housing 50 as shown in the figure or at other suitable positions. Users can open the treatment agent box 20 from the outside and add clothing treatment agents into the treatment agent box 20. The clothing treatment agents include but are not limited to a detergent, a softener and a disinfectant. The treatment agent box 20 has a first accommodation chamber 21, a second accommodation chamber 22 and a third accommodation chamber 23. The first accommodation chamber 21 is the leftmost compartment inside the treatment agent box 20 as shown in the figure, and is used to accommodate the detergent; the second accommodation chamber 22 is the middle compartment inside the treatment agent box 20 as shown in the figure, and is used to accommodate the softener; and the third accommodation chamber 23 is the rightmost compartment inside the treatment agent box 20 as shown in the figure, and is used to accommodate the disinfectant. In alternative embodiments, the first accommodation chamber 21 can also be designed to accommodate the softener, the disinfectant, or another suitable clothing treatment agent. The second accommodation chamber 22 and the third accommodation chamber 23 can also be designed to accommodate any suitable clothing treatment agent, as long as the placement of the clothing treatment agents in the treatment agent box 20 is reasonable. Alternatively, the treatment agent box 20 can also be provided with two accommodation chambers or other suitable number of accommodation chambers to accommodate the same or different clothing treatment agents, thereby meeting different washing and care needs.

[0041] As shown in FIG. 1, the washing apparatus 1 of the present disclosure further includes a water inflow

system 10. The water inflow system 10 includes a first branch 11, a second branch 12, a third branch 13, a converging pipeline 14, and a micro-bubble nozzle 15. The first branch 11, the second branch 12 and the third branch 13 are all connected in parallel with each other, and downstream ends of the first branch 11, the second branch 12 and the third branch 13 are all in fluid communication with an upstream end of the converging pipeline 14. The first branch 11 is a water inflow branch, and its upstream end can be directly connected to a joint of external water source, such as a faucet. A water controller 111 is provided on the first branch 11 for controlling on/off of water flow in the first branch 11. The water controller 111 is a water pump that can pump water flow into the first branch 11 at high pressure. In alternative embodiments, the water controller 111 may also be an electromagnetic valve or another suitable controller. The second branch 12 is a branch for introducing gas, on which an inflation controller 121 and a one-way valve 122 are provided. The inflation controller 121 is an air pump that can pump air into the second branch 12 at high pressure. Alternatively, the inflation controller 121 may also be a breather valve or another suitable controller. The one-way valve 122 is arranged downstream of the inflation controller 121, and it can prevent the water in the first branch 11 and the treatment agent in the third branch 13 from flowing into the second branch 12 and into the housing of the washing apparatus 1 through the air pump. The third branch 13 is a treatment agent branch. An upstream end of the third branch 13 is connected to the treatment agent box 20, and the third branch 13 is connected to the first accommodation chamber 21, the second accommodation chamber 22 and the third accommodation chamber 23 of the treatment agent box 20 respectively. A dispenser 131 is provided on the third branch 13. The dispenser 131 is a piston pump and can pump the clothing treatment agents in the treatment agent box 20 into the third branch 13. Alternatively, the dispenser 131 can also be a peristaltic pump.

[0042] As shown in FIG. 1, the upstream end of the converging pipeline 14 is connected to the downstream ends of the first branch 11, the second branch 12 and the third branch 13 respectively, and its downstream end is connected to the micro-bubble nozzle 15. The fluids introduced into the converging pipeline 14 from each branch can be sprayed into the inner cylinder 30 and/or the outer cylinder 40 of the washing apparatus 1 through the micro-bubble nozzle 15. When the washing apparatus 1 needs to use the clothing treatment agent to treat the clothing, the water controller 111 is turned on to introduce water flow into the first branch 11 and make it flow at high speed toward the converging pipeline 14. At the same time, the dispenser 131 pumps the corresponding clothing treatment agent from the treatment agent box 20, pumps the clothing treatment agent into the third branch 13, and makes it flow into the converging pipeline 14. The inflation controller 121 is also turned on at the same time, so that it pumps gas into the second branch 12 at high

pressure and makes the gas flow toward the converging pipeline 14. The water, treatment agent and air coming from the three branches respectively are mixed in the converging pipeline 14 to form a mixed fluid, which flows at high speed toward the micro-bubble nozzle 15 at the downstream end of the converging pipeline 14. After the mixed fluid passes through the micro-bubble nozzle 15, foam water containing a large number of micro-bubbles is formed and sprayed onto the clothing to be treated in the inner cylinder 30 of the washing apparatus 1. When the washing apparatus 1 needs to use micro-bubble water to rinse the clothing, the water controller 111 is turned on to introduce water flow into the first branch 11 and make it flow at high speed toward the converging pipeline 14. At the same time, the inflation controller 121 is also turned on, so that it pumps gas into the second branch 12 at high pressure and makes the gas flow toward the converging pipeline 14. After the water from the first branch 11 and the air from the second branch 12 are mixed in the converging pipeline 14, they flow at high speed toward the micro-bubble nozzle 15, forming bubble water containing a large number of micro-bubbles, which is sprayed by the micro-bubble nozzle 15 onto the clothing to be rinsed in the inner cylinder 30 of the washing apparatus 1.

[0043] As shown in FIG. 1, the micro-bubble nozzle 15 is detachably fixed on a top part of the sealing window gasket 53 as shown in the figure, and is fixedly connected with the sealing window gasket 53. Alternatively, the micro-bubble nozzle 15 can also be fixed on a side part or upper part of the sealing window gasket 53 as shown in the figure. In alternative embodiments, the micro-bubble nozzle 15 can also be fixedly connected with the outer cylinder 40, or fixedly connected with both the outer cylinder 40 and the sealing window gasket 53. In one or more embodiments, a fixed tube (not shown in the figure) is provided on the sealing window gasket 53. The fixed tube extends outward in a radial direction of the sealing window gasket 53 and has a diameter that matches the size of the micro-bubble nozzle 15. In one or more embodiments, a positioning groove (not shown in the figure) is provided on an inner tube wall of the fixed tube, and a positioning column 154 (see FIG. 2) that matches the positioning groove is provided on the micro-bubble nozzle 15. By inserting the micro-bubble nozzle 15 into the fixed tube of the sealing window gasket 53 and tightly fitting the positioning column 154 on the micro-bubble nozzle 15 with the positioning groove on the sealing window gasket 53, pre-positioning between the micro-bubble nozzle 15 and the sealing window gasket 53 can be achieved. In alternative embodiments, a positioning groove can also be provided on the micro-bubble nozzle 15, and a corresponding positioning column can be provided on the sealing window gasket 53 to achieve pre-positioning between the micro-bubble nozzle 15 and the sealing window gasket 53. After completing the pre-positioning of the micro-bubble nozzle 15, a fixed installation part 155 (see FIG. 2) of the micro-bubble

nozzle 15 is fixed together with the sealing window gasket 53 by screws. In alternative embodiments, the micro-bubble nozzle 15 can also be fixedly connected to the sealing window gasket 53 and/or the outer cylinder 40 through a snap-fit structure or other suitable connection means.

[0044] FIG. 2 is a schematic structural view of an embodiment of the micro-bubble nozzle in the water inflow system for the washing apparatus of the present disclosure. FIG. 3 is a schematic cross-sectional view of an embodiment of the micro-bubble nozzle of the present disclosure taken along section line A-A in FIG. 2. As shown in FIGS. 2 and 3, in one or more embodiments, the micro-bubble nozzle 15 includes a micro-bubble generation mesh 151, a nozzle body 152, and a nozzle cap 153.

[0045] The nozzle body 152 has an inlet end 521 and an outlet end 522. As shown in FIG. 2, on the outside of the nozzle body 152, the micro-bubble nozzle 15 also has a positioning column 154, a fixed installation part 155, and an anti-falling part 156. The anti-falling part 156 is arranged at the end of the inlet end 521 of the nozzle body 152 and protrudes radially outward around an outer wall of the inlet end 521. In alternative embodiments, the anti-falling part 156 can also be an annular groove structure recessed inward from the outer wall of the inlet end 521, as long as it can prevent the micro-bubble nozzle 15 from falling off the downstream end of the converging pipeline 14. The positioning column 154 is a long rib structure located in the middle of the nozzle body 152, which protrudes radially outward from the outer wall of the nozzle body 152 and extends in the length direction of the nozzle body 152. The fixed installation part 155 has a first fixed installation part 155a and a second fixed installation part 155b symmetrically positioned on the outer wall of the nozzle body 152. The first fixed installation part 155a and the second fixed installation part 155b are respectively arranged on both sides of the positioning column 154. Alternatively, only the first fixed installation part 155a or only the second fixed installation part 155b is arranged on the outer wall of the nozzle body 152. Threaded holes 1551 are provided on both the first fixed installation part 155a and the second fixed installation part 155b to fix the micro-bubble nozzle 15 to a target position on the washing apparatus 1 by screws. Alternatively, the fixed installation part 155 can also be a snap-fit structure or any other suitable connection structure.

[0046] As shown in FIG. 3, the nozzle body 152 has a cavity 523 therein. The cavity 523 has the same diameter along the length direction of the nozzle body 152 (i.e., the inner diameter of the nozzle body 152). The micro-bubble generation mesh 151 covers an end face of the outlet end 522 of the nozzle body 152, and is fixed to the end face. When the fluid from the converging pipeline 14 rushes toward the micro-bubble generation mesh 151 at high speed, the micro-bubble generation mesh 151 can cut the bubbles in the fluid to form a large number of micro-bubbles in the fluid. In one or more embodiments, the

micro-bubble generation mesh 151 includes four mesh layers. The pore density of each mesh layer is 120 meshes, and each mesh layer is made of polyester fiber material. The four mesh layers are overlapped together to form the micro-bubble generation mesh 151. In alternative embodiments, the pore density of the mesh layer can also be any value between 20 and 300 meshes. Alternatively, the mesh layer can also be made of any other suitable high polymer material (such as cotton fiber, polypropylene fiber, etc.), or made of metal material (such as stainless steel wire, nickel wire, etc.). In alternative embodiments, the number of mesh layers in the micro-bubble generation mesh 151 can be any other value; preferably, the number of mesh layers is 1 to 10. An external thread 524 of the outlet end is also provided at a lower part of the nozzle body 152 at a position near the outlet end 522, so that the nozzle body 152 can be fixed together with the nozzle cap 153 through threaded connection.

[0047] As shown in FIG. 3, the nozzle cap 153 includes a pressing part 531 and a connecting part 532. The pressing part 531 has an annular wall 5311 with a central through hole (i.e., a through hole 533 of the nozzle cap). An inner diameter of the through hole 533 of the nozzle cap matches the diameter of the cavity 523, that is, they are the same as each other, thus allowing the fluid from the cavity 523 to pass through the micro-bubble generation mesh 151 and then be sprayed from the through hole 533 of the nozzle cap without being hindered. In alternative embodiments, the inner diameter of the through hole 533 of the nozzle cap may be slightly smaller than the inner diameter of the cavity 523, so as to more securely fix the micro-bubble generation mesh 151 between the outlet end 522 and the nozzle cap 153. The connecting part 532 extends from the annular wall 5311 of the pressing part 531 along a centerline of the cavity 523 toward the inlet end 521. An inner diameter of the connecting part 532 is slightly larger than the outer diameter of the outlet end 522, so that the connecting part 532 can wrap around the outlet end 522. An internal thread 5321 of the connecting part is provided on an inner peripheral wall of the connecting part 532. The internal thread 5321 of the connecting part matches the external thread 524 of the outlet end of the nozzle body 152 to fix the nozzle cap 153 on the nozzle body 152. In alternative embodiments, the nozzle cap 153 and the nozzle body 152 can also be connected through snap-fit, or through other suitable fastening methods. When the nozzle cap 153 is securely connected to the nozzle body 152 through the connecting part 532, the micro-bubble generation mesh 151 is firmly clamped between the outlet end 522 and the annular wall 5311 of the pressing part 531. At this time, the through hole 533 of the nozzle cap is in center-alignment with the cavity 523, the fluid from the converging pipeline 14 can sequentially pass through the cavity 523, the micro-bubble generation mesh 151 and the through hole 533 of the nozzle cap, and finally is sprayed onto the clothing in the

inner cylinder 30 of the washing apparatus 1.

[0048] In alternative embodiments, the nozzle may be any known suitable nozzle structure. For example, different Venturi structures are provided inside the nozzle body of the nozzle to create a negative pressure environment inside the nozzle body, which can draw in gas from the outside and increase the mixing degree of fluid and gas.

10 Second group of solutions

[0049] In order to solve the technical problem that it is impossible for the water inflow pipelines in the prior art to ensure sufficient gas supply, the present disclosure provides a washing apparatus 1. The washing apparatus 1 has a water inflow system 10, which includes: a first pipeline 11, on which a water controller 111 for controlling on/off of the first pipeline 11 is provided; a second pipeline 12, which is connected in parallel with the first pipeline 11, and which has a first end and a second end located upstream of the first end, the first end being connected to the first pipeline 11, the second end being connected to a treatment agent box 20, and a dispenser 121 and an inflation controller 122 located upstream of the dispenser 121 being provided on the second pipeline 12; a converging pipeline 13, an upstream end of which is communicated with the first pipeline 11 and the second pipeline 12 respectively; and a micro-bubble nozzle 14, which is configured to generate micro-bubbles in a fluid flowing therethrough and which has an inlet end 141 and an outlet end 142, the inlet end 141 being communicated with a downstream end of the converging pipeline 13, and the outlet end 142 being communicated with a washing chamber of the washing apparatus 1.

[0050] FIG. 4 is a schematic structural view of a first embodiment of the washing apparatus of the present disclosure. As shown in FIG. 4, in one or more embodiments, the washing apparatus 1 of the present disclosure is a drum washing machine. Alternatively, the washing apparatus 1 of the present disclosure can also be a pulsator washing machine, a washing-drying integrated machine, or another suitable form of washing machine. The washing apparatus 1 includes a housing 50. A door 51 that allows users to put the clothing and the like into the drum washing machine is provided on a front side (an operation side that faces the users) of the housing 50, and the door 51 is also provided with an observation window 52 that allows users to see the interior of the washing machine. A sealing window gasket 53 is also provided between the observation window 52 and the housing 50, and the sealing window gasket 53 is fixed on the housing 50. An outer cylinder 40 and an inner cylinder 30 are provided inside the housing 50. The inner cylinder 30 is rotatably positioned inside the outer cylinder 40, and is connected to a motor through a transmission shaft and bearings. The outer cylinder 40 and the inner cylinder 30 both belong to the washing chamber mentioned herein.

[0051] The washing apparatus 1 of the present disclosure

sure also has a treatment agent box 20. The treatment agent box 20 is arranged at the upper left position of the housing 50 of the washing apparatus 1 as shown in the figure. Alternatively, the treatment agent box 20 can also be arranged at the upper right position of the housing 50 as shown in the figure or at other suitable positions. Users can open the treatment agent box 20 from the outside and add clothing treatment agents into the treatment agent box 20. The clothing treatment agents include but are not limited to a detergent, a softener and a disinfectant. The treatment agent box 20 has a first accommodation chamber (not shown) located in the leftmost compartment inside the treatment agent box 20 as shown in the figure, a second accommodation chamber (not shown) located in the middle compartment inside the treatment agent box 20 as shown in the figure, and a third accommodation chamber (not shown) located in the rightmost compartment inside the treatment agent box 20 as shown in the figure. The first accommodation chamber is used to accommodate the detergent, the second accommodation chamber is used to accommodate the softener, and the third accommodation chamber is used to accommodate the disinfectant. In alternative embodiments, the first accommodation chamber can also be designed to accommodate the softener, the disinfectant, or another suitable clothing treatment agent. The second accommodation chamber and the third accommodation chamber can also be designed to accommodate any suitable clothing treatment agent, as long as the placement of the clothing treatment agents in the treatment agent box 20 is reasonable. Alternatively, the treatment agent box 20 can also be provided with two accommodation chambers or other suitable number of accommodation chambers to accommodate the same or different clothing treatment agents, thereby meeting different washing and care needs.

[0052] As shown in FIG. 4, the washing apparatus 1 of the present disclosure further includes a water inflow system 10. The water inflow system 10 includes a first pipeline 11, a second pipeline 12, a converging pipeline 13, and a micro-bubble nozzle 14. The first pipeline 11 is a water inflow pipeline, and its upstream end can be directly connected to a joint of external water source, such as a faucet. A water controller 111 is provided on the first pipeline 11 for controlling on/off of water flow in the first pipeline 11. The water controller 111 is a water pump that can pump water flow into the first pipeline 11 at high pressure. In alternative embodiments, the water controller 111 may also be an electromagnetic valve or another suitable controller. The second pipeline 12 includes a main pipeline 124, a first branch 241, a second branch 242, and a third branch 243. The first branch 241, the second branch 242 and the third branch 243 are connected in parallel; upstream ends of the three branches are connected to the treatment agent box 20, while downstream ends of the three branches and an upstream end of the main pipeline 124 are all connected to a switching valve 123. Specifically, the first branch 241 is commu-

nicated with the first accommodation chamber of the treatment agent box 20, the second branch 242 is communicated with the second accommodation chamber of the treatment agent box 20, and the third branch 243 is communicated with the third accommodation chamber of the treatment agent box 20. The switching valve 123 is an electric three-way valve that can control on/off of the connection between the main pipeline 124 and each of the first branch 241, the second branch 242 and the third branch 243. A dispenser 121 and an inflation controller 122 are provided on the main pipeline 124, and the dispenser 121 is arranged downstream of the inflation controller 122. The inflation controller 122 is an electric valve and can introduce gas into the main pipeline 124. The dispenser 122 is a piston pump that can pump the treatment agents from the treatment agent box 20 into the main pipeline 124, and pump the treatment agents and/or the gas introduced by the inflation controller 122 into the main pipeline 124 toward the converging pipeline 13. In alternative embodiments, the dispenser 122 may also be a diaphragm pump, a peristaltic pump, or another suitable dispensing device.

[0053] As shown in FIG. 4, an upstream end of the converging pipeline 13 is connected to downstream ends of the first pipeline 11 and the main pipeline 124 respectively, and its downstream end is connected to the micro-bubble nozzle 14. The fluids introduced into the converging pipeline 13 from the first pipeline 11 and the main pipeline 124 can be sprayed into the inner cylinder 30 and/or the outer cylinder 40 of the washing apparatus 1 through the micro-bubble nozzle 14.

[0054] FIG. 6 is a schematic structural view of an embodiment of the micro-bubble nozzle of the washing apparatus of the present disclosure. As shown in FIGS. 4 and 6, in one or more embodiments, the micro-bubble nozzle 14 is fixed on a top part of the sealing window gasket 53 as shown in the figure, and is fixedly connected with the sealing window gasket 53. Alternatively, the micro-bubble nozzle 14 can also be fixed on a side part or upper part of the sealing window gasket 53 as shown in the figure. In alternative embodiments, the micro-bubble nozzle 14 can also be fixedly connected with the outer cylinder 40, or fixedly connected with both the outer cylinder 40 and the sealing window gasket 53. Specifically, the micro-bubble nozzle 14 has a fixed part 144 and a positioning part 145. In one or more embodiments, a fixed tube (not shown in the figure) is provided on the sealing window gasket 53. The micro-bubble nozzle 14 can be inserted into the fixed tube of the sealing window gasket 53 and enables a positioning column 154 on the micro-bubble nozzle 14 to be tightly fitted with a positioning groove (not shown in the figure) on the fixed tube to complete pre-positioning of the micro-bubble nozzle 14. Then, the fixed part 144 of the micro-bubble nozzle 14 and the sealing window gasket 53 are fixed together by screws. In alternative embodiments, the micro-bubble nozzle 14 can also be fixedly connected with the sealing window gasket 53 and/or the outer cylinder 40 through a

snap-fit structure or other suitable connection means.

[0055] As shown in FIG. 6, in one or more embodiments, the micro-bubble nozzle 14 further includes a nozzle body 143, a micro-bubble generation mesh (not shown in the figure), and a nozzle cap 146. The nozzle body 143 has an inlet end 141 and an outlet end 142, the inlet end 141 is communicated with the converging pipeline 13, and the outlet end 142 is communicated with the inner cylinder 30 or the outer cylinder 40 of the washing apparatus 1. In one or more embodiments, the interior of the nozzle body 143 has the same diameter along the length direction of the nozzle body 143. In alternative embodiments, the interior of the nozzle body 143 may also be a Venturi structure. The micro-bubble generation mesh covers an end face of the outlet end 142 of the nozzle body 143, and is fixed to the end face. The micro-bubble generation mesh can cut the bubbles in the fluid to form a large number of micro-bubbles in the fluid. In one or more embodiments, the micro-bubble generation mesh includes four mesh layers. The pore density of each mesh layer is 120 meshes, and each mesh layer is made of polyester fiber material. The four mesh layers are overlapped together to form the micro-bubble generation mesh. In alternative embodiments, the pore density of the mesh layer can also be any value between 20 and 300 meshes. Alternatively, the mesh layer can also be made of any other suitable high polymer material (such as cotton fiber, polypropylene fiber, etc.), or made of metal material (such as stainless steel wire, nickel wire, etc.). In alternative embodiments, the number of mesh layers in the micro-bubble generation mesh can be any other value; preferably, the number of mesh layers is 1 to 10. The nozzle cap 146 is fixed to a lower part of the nozzle body 143 at a position near the outlet end 142 through threaded connection, and can tightly clamp the micro-bubble generation mesh between the outlet end 142 and the nozzle cap 146.

[0056] FIG. 5 is a schematic structural view of a second embodiment of the washing apparatus of the present disclosure. As shown in FIG. 5, in this embodiment, except for the water inflow system 10, other configurations of the washing apparatus 1 of the present disclosure are the same as those in the first embodiment described above. In one or more embodiments, the water inflow system 10 includes a first pipeline 11, a second pipeline 12, a converging pipeline 13, and a micro-bubble nozzle 14. The first pipeline 11 is a water inflow pipeline, and its upstream end can be directly connected to a joint of external water source, such as a faucet. A water controller 111 is provided on the first pipeline 11 for controlling on/off of water flow in the first pipeline 11. The water controller 111 is a water pump that can pump water flow into the first branch 11 at high pressure. In alternative embodiments, the water controller 111 may also be an electromagnetic valve or another suitable controller. The second pipeline 12 includes a first extraction pipeline 244, a second extraction pipeline 245, and a third extraction pipeline 246, which are connected in parallel with

each other and connected in parallel with the first pipeline 11 respectively. An upstream end of the first extraction pipeline 244 is communicated with the first accommodation chamber of the treatment agent box 20, and a dispenser 121 and an inflation controller 122 are provided on the first extraction pipeline 244. The inflation controller 122 is an electric valve and can introduce gas into the first extraction pipeline 244. The dispenser 121 is arranged downstream of the inflation controller 122. The dispenser 121 is a piston pump that can pump the treatment agent from the first accommodation chamber into the first extraction pipeline 244, and pump the treatment agent and/or the gas introduced by the inflation controller 122 toward the converging pipeline 14. An upstream end of the second extraction pipeline 245 is communicated with the second accommodation chamber of the treatment agent box 20, and is provided with the same dispenser 121 and inflation controller 122 as those on the first extraction pipeline 244. An upstream end of the third extraction pipeline 246 is communicated with the third accommodation chamber of the treatment agent box 20, and is provided with the same dispenser 121 and inflation controller 122 as those on the first extraction pipeline 244.

[0057] As shown in FIG. 5, the upstream end of the converging pipeline 13 is connected to downstream ends of the first pipeline 11, the first extraction pipeline 244, the second extraction pipeline 245 and the third extraction pipeline 246 respectively, and its downstream end is connected to the micro-bubble nozzle 14. The fluids introduced into the converging pipeline 13 from the first pipeline 11, the first extraction pipeline 244, the second extraction pipeline 245 and the third extraction pipeline 246 can be sprayed into the inner cylinder 30 and/or the outer cylinder 40 of the washing apparatus 1 through the micro-bubble nozzle 14.

[0058] In order to solve the technical problem that it is impossible for the water inflow pipelines in the prior art to ensure sufficient gas supply, the present disclosure provides a control method for the washing apparatus 1. The control method includes:

turning on the water controller to introduce water into the first pipeline (step S1);

turning on the dispenser to pump the fluid in the second pipeline toward the converging pipeline (step S2);

making the water from the first pipeline and the fluid from the second pipeline flow into the converging pipeline and form a fluid water therein (step S3);

making the fluid water from the converging pipeline flow through the micro-bubble nozzle to generate a micro-bubble fluid (step S4); and

spraying the micro-bubble fluid into the washing chamber (step S5).

[0059] FIG. 7 is a schematic flowchart of the control method for the washing apparatus of the present disclosure. As shown in FIG. 7, in one or more embodiments, when the control method for the washing apparatus 1 of the present disclosure starts, step S1 is first executed, that is, the water controller 111 is turned on to introduce water into the first pipeline 11. The duration in which the water controller 111 is turned on depends on the washing needs, such as a suitable time period of 2 minutes or 5 minutes, etc. At the same time or next, step S2 is executed, that is, the dispenser 121 is turned on to pump the fluid in the second pipeline 12 toward the converging pipeline 13. Next, step S3 is executed, that is, water from the first pipeline 11 and fluid from the second pipeline 12 flow into the converging pipeline 13 and form a fluid water therein. Then, step S4 is executed, that is, the fluid water from the converging pipeline 13 flows through the micro-bubble nozzle 14 to generate a micro-bubble fluid. Finally, step S5 is executed, that is, the micro-bubble fluid is sprayed into the washing chamber, namely, the micro-bubble fluid is sprayed into the inner cylinder 30 and/or the outer cylinder 40. After completing step S5, the control method ends.

[0060] FIG. 8 is a schematic flowchart of a first embodiment of the control method for the washing apparatus of the present disclosure. As shown in FIG. 8, in one or more embodiments, in the configuration of the water inflow system 10 of the washing apparatus 1 of the present disclosure, the second pipeline 12 includes a main pipeline 124, a first branch 241, a second branch 242, and a third branch 243. When it is necessary to use the detergent to wash the clothing, the control method for the washing apparatus 1 of the present disclosure starts. Firstly, step S11 is executed, that is, the water controller 111 is turned on to introduce water into the first pipeline 11. At the same time or next, step S211 is executed, that is, the switching valve 123 is controlled to make the main pipeline 124 communicate with the first branch 241. In alternative embodiments, the switching valve 123 can also be controlled to make the main pipeline 124 communicate with the second branch 242 or the third branch 243. At the same time or next, step S212 is executed, that is, the inflation controller 122 is turned on to introduce gas into the main pipeline 124. In alternative embodiments, step S212 can also be eliminated. At the same time or next, step S213 is executed, that is, the dispenser 121 is turned on to pump the treatment agent from the treatment agent box 20 into the main pipeline 124 through the first branch 241, and pump the treatment agent together with the gas toward the converging pipeline 13. At this time, water in the first pipeline 11 and the treatment agent and gas in the main pipeline 124 flow into the converging pipeline 13 respectively. The durations in which the water controller 111, the inflation controller 122 and the dispenser 121 are turned on respectively can be the same or different. Then, the control method proceeds to step S31, that is, water from the first pipeline 11 and the treatment agent and gas from the main pipeline 124 flow into the

converging pipeline 13, and form a mixed fluid therein. Next, step S41 is executed, that is, the mixed fluid from the converging pipeline 13 passes through the micro-bubble nozzle 14 to generate a mixed micro-bubble fluid. The mixed fluid contains water, treatment agent, and a large number of bubbles. When the mixed fluid passes through the micro-bubble nozzle 14, the micro-bubble nozzle 14 can sufficiently and effectively cut the bubbles therein, so that the mixed fluid contains a large number of micro-bubbles, thereby improving the activity of the clothing treatment agent and enhancing the washing effect. Finally, step S51 is executed, that is, the mixed micro-bubble fluid is sprayed into the outer cylinder 40 or the inner cylinder 30. After completing step S51, the control method ends, and the washing apparatus 1 uses a foam water containing a large number of micro-bubbles to wash the clothing. In alternative embodiments, the washing apparatus 1 of the present disclosure can also adopt this control method when it is necessary to use the softener to care for the clothing. Alternatively, the washing apparatus 1 of the present disclosure can also adopt this control method when it is necessary to use the clothing disinfectant or other suitable clothing treatment agents to care for the clothing.

[0061] FIG. 9 is a schematic flowchart of a second embodiment of the control method for the washing apparatus of the present disclosure. As shown in FIG. 9, in one or more embodiments, in the configuration of the water inflow system 10 of the washing apparatus 1 of the present disclosure, the second pipeline 12 includes a main pipeline 124, a first branch 241, a second branch 242, and a third branch 243. When it is necessary to rinse the clothing, the control method for the washing apparatus 1 of the present disclosure starts. Firstly, step S12 is executed, that is, the water controller 111 is turned on to introduce water into the first pipeline 11. At the same time or next, step S221 is executed, that is, the switching valve 123 is controlled to cut off the communication between the main pipeline 124 and the first branch 241. At this point, the connection between the main pipeline 124 and the treatment agent box 20 is cut off, and the treatment agent will not be introduced into the main pipeline 124. At the same time or next, step S222 is executed, that is, the inflation controller 122 is turned on to introduce gas into the main pipeline 124. At the same time or next, step S223 is executed, that is, the dispenser 121 is turned on to pump the gas in the main pipeline 124 toward the converging pipeline 13. At this point, water in the first pipeline 11 and gas in the main pipeline 124 of the second pipeline 12 respectively flow toward the converging pipeline 13. The durations in which the water controller 111, the inflation controller 122 and the dispenser 121 are turned on respectively can be the same or different. Then, the control method proceeds to step S32, that is, water from the first pipeline 11 and gas from the main pipeline 124 flow into the converging pipeline 13 and form a bubble water therein. Next, step S42 is executed, that is, the bubble water from the converging pipeline 13 flows

through the micro-bubble nozzle 14 to generate a micro-bubble water fluid. When the water containing a large number of bubbles passes through the micro-bubble nozzle 14, the bubbles in the water are sufficiently and effectively cut by the micro-bubble nozzle 14, forming a large number of micro-bubbles. Finally, step S52 is executed, that is, the micro-bubble water fluid is sprayed into the outer cylinder 40 or the inner cylinder 30. After completing step S52, the control method ends. The washing apparatus 1 uses the bubble water containing a large number of micro-bubbles to wash the clothing, achieving better rinsing effect.

[0062] FIG. 10 is a schematic flowchart of a third embodiment of the control method for the washing apparatus of the present disclosure. As shown in FIG. 10, in one or more embodiments, in the configuration of the water inflow system 10 of the washing apparatus 1 of the present disclosure, the second pipeline 12 includes a main pipeline 124, a first branch 241, a second branch 242, and a third branch 243. After the control method for the washing apparatus 1 of the present disclosure starts, step S13 is first executed, that is, the water controller 111 is turned on to introduce water into the first pipeline 11. At the same time or next, step S231 is executed, that is, the dispenser 121 is turned on to pump the fluid in the main pipeline 124 toward the converging pipeline 13. At the same time or next, step S232 is executed, that is, the switching valve 123 is controlled to make the main pipeline 124 communicate with the first branch 241, which lasts for 2 seconds. In alternative embodiments, the duration in which the switching valve 123 is open can also be 3 seconds or any other suitable duration. At this point, water in the first pipeline 11 and the treatment agent in the main pipeline 124 respectively flow toward the converging pipeline 13. Then, step S233 is executed, that is, the switching valve 123 is controlled to cut off the communication between the main pipeline 124 and the first branch 241. At the same time or next, step S234 is executed, that is, the inflation controller 122 is turned on to introduce gas into the main pipeline 124, which lasts for 2 seconds. In alternative embodiments, the duration in which the inflation controller 122 is turned on can also be 3 seconds or any other suitable duration. At this point, water in the first pipeline 11 and gas in the main pipeline 124 respectively flow toward the converging pipeline 13. Then, step S235 is executed, that is, the inflation controller 122 is turned off to stop introducing gas into the main pipeline 124. Next, step S236 is executed, that is, the above steps S232 to S235 are repeated until the dispensing amount of the treatment agent reaches a predetermined dispensing amount. In one or more embodiments, the predetermined dispensing amount is 20 milliliters, and the switching valve 123 can pump 1 milliliter of treatment agent into the converging pipeline 13 each time it communicates the main pipeline 124 with the first branch 241. After steps S232 to S235 are repeated for 20 times, the dispensing amount of treatment agent reaches the predetermined dispensing amount, and step

S33 is executed, that is, water from the first pipeline 11 and fluid from the main pipeline 124 flow into the converging pipeline 13 and form a mixed fluid therein. Then, step S43 is executed, that is, the mixed fluid from the converging pipeline 13 flows through the micro-bubble nozzle 14 to generate a mixed micro-bubble fluid. Finally, step S53 is executed, that is, the mixed micro-bubble fluid is sprayed into the outer cylinder 40 or the inner cylinder 30. After completing step S53, the control method ends. In alternative embodiments, the predetermined dispensing amount may also be 40 milliliters, or any other suitable amount. Preferably, the predetermined dispensing amount is 15 to 45 milliliters.

[0063] FIG. 11 is a schematic flowchart of a fourth embodiment of the control method for the washing apparatus of the present disclosure. As shown in FIG. 11, in one or more embodiments, in the configuration of the water inflow system 10 of the washing apparatus 1 of the present disclosure, the second pipeline 12 includes a first extraction pipeline 244, a second extraction pipeline 245, and a third extraction pipeline 246. When it is necessary to use the detergent to wash the clothing, the control method for the washing apparatus 1 of the present disclosure starts. Firstly, step S14 is executed, that is, the water controller 111 is turned on to introduce water into the first pipeline 11. At the same time or next, step S241 is executed, that is, the inflation controller 122 on the first extraction pipeline 244 is turned on to introduce gas into the first extraction pipeline 244. At the same time or next, step S242 is executed, that is, the dispenser 121 on the first extraction pipeline 244 is turned on to pump the treatment agent in the treatment agent box 20 into the first extraction pipeline 244, and pump the treatment agent together with the gas toward the converging pipeline 13. At this point, water in the first pipeline 11 and the treatment agent and gas in the first extraction pipeline 244 respectively flow toward the converging pipeline 13. The durations in which the water controller 111, the inflation controller 122, and the dispenser 121 are turned on respectively can be the same or different. Then, the control method proceeds to step S34, that is, water from the first pipeline 11 and the treatment agent and gas from the first extraction pipeline 244 flow into the converging pipeline 13 and form a mixed fluid therein. Next, step S44 is executed, that is, the mixed fluid from the converging pipeline 13 flows through the micro-bubble nozzle 14 to generate a mixed micro-bubble fluid. Finally, step S54 is executed, that is, the mixed micro-bubble fluid is sprayed into the outer cylinder 40 or the inner cylinder 30. After completing step S54, the control method ends. In alternative embodiments, the inflation controller 122 and the dispenser 121 on the second extraction pipeline 245 can also be turned on to pump the treatment agent in the second accommodation chamber of the treatment agent box 20 for treating the clothing. Similarly, the inflation controller 122 and the dispenser 121 on the third extraction pipeline 246 can also be turned on to pump the treatment agent in the third accommodation chamber

of the treatment agent box 20 for treating the clothing.

[0064] FIG. 12 is a schematic flowchart of a fifth embodiment of the control method for the washing apparatus of the present disclosure. In one or more embodiments, in the configuration of the water inflow system 10 of the washing apparatus 1 of the present disclosure, the second pipeline 12 includes a first extraction pipeline 244, a second extraction pipeline 245, and a third extraction pipeline 246. After the control method for the washing apparatus 1 of the present disclosure starts, step S15 is first executed, that is, the water controller 111 is turned on to introduce water into the first pipeline 11. The duration in which the water controller 111 is turned on is 2 minutes, or any other suitable duration. At the same time or next, step S251 is executed, that is, the inflation controller 122 on the first extraction pipeline 244 is intermittently turned on at predetermined time intervals to introduce gas into the first extraction pipeline 244. In one or more embodiments, the inflation controller 122 is turned on once every other 2 seconds, and the duration of each time of turning on the inflation controller 122 for inflation is 1 second. In alternative embodiments, the inflation controller 122 is turned on once every other 1 second, and the duration of each time of turning on the inflation controller 122 for inflation is 1 second. Alternatively, the inflation controller 122 can also be turned on once at any suitable time interval for any suitable duration for inflation. At the same time or next, step S252 is executed, that is, the dispenser 121 on the first extraction pipeline 244 is turned on to pump the treatment agent from the treatment agent box 20 into the first extraction pipeline 244, and pump the treatment agent together with the gas toward the converging pipeline 13. The duration in which the dispenser 121 is turned on is 2 minutes, or any other suitable duration. At this point, water in the first pipeline 11 and the treatment agent and gas in the first extraction pipeline 244 respectively flow into the converging pipeline 13. Then, the control method proceeds to step S35, that is, water from the first pipeline 11 and the treatment agent and gas from the first extraction pipeline 244 flow into the converging pipeline 13 and form a mixed fluid therein. Next, step S45 is executed, that is, the mixed fluid from the converging pipeline 13 flows through the micro-bubble nozzle 14 to generate a mixed micro-bubble fluid. Finally, step S55 is executed, that is, the mixed micro-bubble fluid is sprayed into the outer cylinder 40 or the inner cylinder 30. After completing step S55, the control method ends. In one or more embodiments, the dispenser 121 requires pumping 30 milliliters of treatment agent. When the dispensing amount of the treatment agent reaches 30 milliliters, the dispenser 121 is turned off, and at the same time, the inflation controller 122 also stops intermittently introducing gas into the first extraction pipeline 244. In alternative embodiments, the inflation controller 122 and the dispenser 121 on the second extraction pipeline 245 can also be turned on to pump the treatment agent in the second accommodation chamber of the treatment agent box 20 for treating

the clothing. Similarly, the inflation controller 122 and the dispenser 121 on the third extraction pipeline 246 can also be turned on to pump the treatment agent in the third accommodation chamber of the treatment agent box 20 for treating the clothing.

[0065] Hitherto, the technical solutions of the present disclosure have been described in connection with the preferred embodiments shown in the accompanying drawings, but it is easily understood by those skilled in the art that the scope of protection of the present disclosure is obviously not limited to these specific embodiments. Without departing from the principles of the present disclosure, those skilled in the art can make equivalent changes or replacements to relevant technical features, and all the technical solutions after these changes or replacements will fall within the scope of protection of the present disclosure.

Claims

1. A water inflow system for a washing apparatus, wherein the water inflow system comprises:
 - a first branch, on which a water controller for controlling on/off of the first branch is provided;
 - a second branch, which is connected in parallel with the first branch, and on which an inflation controller communicated with the atmosphere is provided;
 - a converging pipeline, an upstream end of which is communicated with a downstream end of the first branch and a downstream end of the second branch respectively; and
 - a micro-bubble nozzle, which is communicated with a downstream end of the converging pipeline.
2. The water inflow system for a washing apparatus according to claim 1, wherein the water inflow system further comprises:
 - a third branch, which is connected in parallel with both the first branch and the second branch; wherein an upstream end of the third branch is connected to a treatment agent box, and a downstream end of the third branch is communicated with the converging pipeline; and a dispenser is provided on the third branch for pumping a treatment agent from the treatment agent box into the third branch.
3. The water inflow system for a washing apparatus according to claim 1, wherein a one-way valve is provided on the second branch, and the one-way valve is arranged downstream of the second controller.
4. The water inflow system for a washing apparatus according to any one of claims 1 to 3, wherein the

micro-bubble nozzle comprises a micro-bubble generation mesh and a nozzle body; the nozzle body has an inlet end, an outlet end, and a cavity extending between the inlet end and the outlet end along a length direction of the nozzle body and having a constant diameter; and the micro-bubble generation mesh covers an end face of the outlet end.

5. The water inflow system for a washing apparatus according to claim 4, wherein the micro-bubble nozzle further comprises a nozzle cap, which comprises a pressing part and a connecting part; the pressing part has an annular wall with a central through hole, and a diameter of the central through hole matches the diameter of the cavity to allow fluid from the cavity to be sprayed through the micro-bubble generation mesh from the central through hole; the connecting part extends outward from the annular wall of the pressing part along a centerline of the central through hole and can be fastened to the outlet end to securely clamp the micro-bubble generation mesh between the end face of the outlet end and the annular wall of the pressing part. 10
6. The water inflow system for a washing apparatus according to claim 4, wherein the micro-bubble generation mesh has multiple mesh layers, and a mesh size of each of the mesh layers is any value between 20 and 300 meshes. 15
7. The water inflow system for a washing apparatus according to claim 1, wherein the water controller is an electromagnetic valve or a water pump, and the inflation controller is an air pump. 20
8. The water inflow system for a washing apparatus according to claim 2, wherein the dispenser is a piston pump or a peristaltic pump. 25
9. A washing apparatus, comprising the water inflow system according to any one of claims 1 to 8. 30
10. The washing apparatus according to claim 9, wherein the washing apparatus further comprises a treatment agent box having a first accommodation chamber, a second accommodation chamber and a third accommodation chamber, each of which can accommodate a treatment agent, and the water inflow system comprises a third branch connected in parallel with both the first branch and the second branch thereof; the first accommodation chamber, the second accommodation chamber and the third accommodation chamber are respectively connected with the third branch. 35
11. The washing apparatus according to claim 9 or 10, wherein the washing apparatus further comprises a sealing window gasket, on which a fixed tube is 40

provided, and the micro-bubble nozzle of the water inflow system is detachably inserted into the fixed tube.

- 5 12. A washing apparatus, wherein the washing apparatus has a water inflow system that comprises:
 - a first pipeline, on which a water controller for controlling on/off of the first pipeline is provided; 10
 - a second pipeline, which is connected in parallel with the first pipeline, and which has a first end and a second end located upstream of the first end, the first end being connected to the first pipeline, the second end being connected to a treatment agent box, and a dispenser and an inflation controller located upstream of the dispenser being provided on the second pipeline; 15
 - a converging pipeline, an upstream end of which is communicated with the first pipeline and the second pipeline respectively; and
 - a micro-bubble nozzle, which is configured to generate micro-bubbles in a fluid flowing there-through and which has an inlet end and an outlet end, the inlet end being communicated with a downstream end of the converging pipeline, and the outlet end being communicated with a washing chamber of the washing apparatus. 20
13. The washing apparatus according to claim 12, wherein the second pipeline comprises: 25
 - a main pipeline, which is connected to the first pipeline through the first end; and
 - a first branch, a second branch and a third branch connected to the main pipeline at the second end and connected in parallel with each other, the first branch, the second branch and the third branch being respectively connected to the treatment agent box; 30
 wherein the main pipeline is provided with the dispenser, the inflation controller located upstream of the dispenser, and a switching valve located upstream of the inflation controller and controlling fluid communication between the main pipeline and each of the first branch, the second branch and the third branch. 35
14. The washing apparatus according to claim 12, wherein the second pipeline comprises a first extraction pipeline, a second extraction pipeline and a third extraction pipeline connected in parallel with each other, each of which is connected in parallel with the first pipeline through the first end and connected to the treatment agent box through the second end; the inflation controller and the dispenser located downstream of the inflation controller are arranged on each of the first extraction pipeline, the second extraction pipeline and the third extraction pipeline. 40

15. The washing apparatus according to claim 13 or 14, wherein the dispenser is one of a piston pump, a diaphragm pump, or a peristaltic pump, and the inflation controller is an electric three-way valve.

16. The washing apparatus according to claim 12, wherein the micro-bubble nozzle comprises a micro-bubble generation mesh and a nozzle body; the nozzle body has a cavity with a constant diameter along its length direction, and the micro-bubble generation mesh covers an end face of the outlet end.

17. The washing apparatus according to claim 16, wherein the micro-bubble generation mesh has multiple mesh layers, and a mesh size of each of the mesh layers is any value between 20 and 300 meshes.

18. A control method for a washing apparatus, wherein the washing apparatus is the washing apparatus according to any one of claims 12 to 17, and the control method comprises:

turning on a water controller to introduce water into a first pipeline;
turning on a dispenser to pump a fluid in a second pipeline toward a converging pipeline;
making the water from the first pipeline and the fluid from the second pipeline flow into the converging pipeline and form a fluid water therein;
making the fluid water from the converging pipeline flow through a micro-bubble nozzle to generate a micro-bubble fluid; and
spraying the micro-bubble fluid into a washing chamber.

19. The control method for a washing apparatus according to claim 18, wherein the second pipeline of the washing apparatus comprises a main pipeline, as well as a first branch, a second branch and a third branch connected to the main pipeline and connected in parallel with each other; the main pipeline is provided with the dispenser, the inflation controller located upstream of the dispenser, and a switching valve located upstream of the inflation controller and controlling fluid communication between the main pipeline and each of the first branch, the second branch and the third branch; and the control method also comprises:

controlling the switching valve to cut off the communication between the main pipeline and the first branch, the second branch and the third branch;
turning on the inflation controller to introduce gas into the main pipeline;
making the water from the first pipeline and the gas from the main pipeline flow into the conver-

ging pipeline and form a bubble water therein; making the bubble water from the converging pipeline flow through the micro-bubble nozzle to generate a micro-bubble water fluid; and spraying the micro-bubble water fluid into the washing chamber.

20. The control method for a washing apparatus according to claim 18, wherein the second pipeline of the washing apparatus comprises a main pipeline, as well as a first branch, a second branch and a third branch connected to the main pipeline and connected in parallel with each other; the main pipeline is provided with the dispenser, the inflation controller located upstream of the dispenser, and a switching valve located upstream of the inflation controller and controlling fluid communication between the main pipeline and each of the first branch, the second branch and the third branch; and the control method also comprises:

controlling the switching valve to make the main pipeline communicate with one of the first branch, the second branch and the third branch;
using the dispenser to pump the treatment agent from the treatment agent box into the main pipeline through said one branch;
making the water from the first pipeline and the treatment agent from the main pipeline flow into the converging pipeline and form a first mixed fluid therein;
making the first mixed fluid from the converging pipeline flow through the micro-bubble nozzle to generate a first mixed micro-bubble fluid; and
spraying the first mixed micro-bubble fluid into the washing chamber.

21. The control method for a washing apparatus according to claim 20, wherein the control method further comprises:

turning on the inflation controller to introduce gas into the main pipeline;
making the water from the first pipeline and the treatment agent and gas from the main pipeline flow into the converging pipeline and form a second mixed fluid therein;
making the second mixed fluid from the converging pipeline flow through the micro-bubble nozzle to generate a second mixed micro-bubble fluid; and
spraying the second mixed micro-bubble fluid into the washing chamber.

22. The control method for a washing apparatus according to claim 20, wherein the control method further comprises:

(a) when the communication time between the main pipeline and said one branch reaches a first predetermined time period, controlling the switching valve to cut off the communication between the main pipeline and said one branch, while turning on the inflation controller to introduce gas into the main pipeline; 5

(b) when the duration in which the inflation controller is turned on reaches a second predetermined time period, turning off the inflation controller, while controlling the switching valve to make the main pipeline communicate with said one branch again; and 10

repeating steps (a) and (b) until the dispensing amount of the treatment agent reaches a predetermined dispensing amount. 15

- 23.** The control method for a washing apparatus according to claim 18, wherein the second pipeline comprises a first extraction pipeline, a second extraction pipeline and a third extraction pipeline connected in parallel with each other, each of which is provided with the inflation controller and the dispenser located downstream of the inflation controller; and the control method comprises: 20

turning on the inflation controller on one of the first extraction pipeline, the second extraction pipeline and the third extraction pipeline to introduce gas into said one extraction pipeline; 30

turning on the dispenser on said one extraction pipeline to pump the treatment agent from the treatment agent box into said one extraction pipeline; 35

making the water from the first pipeline and the gas and treatment agent from said one extraction pipeline flow into the converging pipeline and form a second mixed fluid therein; 40

making the second mixed fluid from the converging pipeline flow through the micro-bubble nozzle to generate a second mixed micro-bubble fluid; and 45

spraying the second mixed micro-bubble fluid into the washing chamber.

- 24.** The control method for a washing apparatus according to claim 23, wherein the control method further comprises: 50
- intermittently turning on the inflation controller at predetermined time intervals until the dispensing amount of the treatment agent reaches a predetermined dispensing amount.

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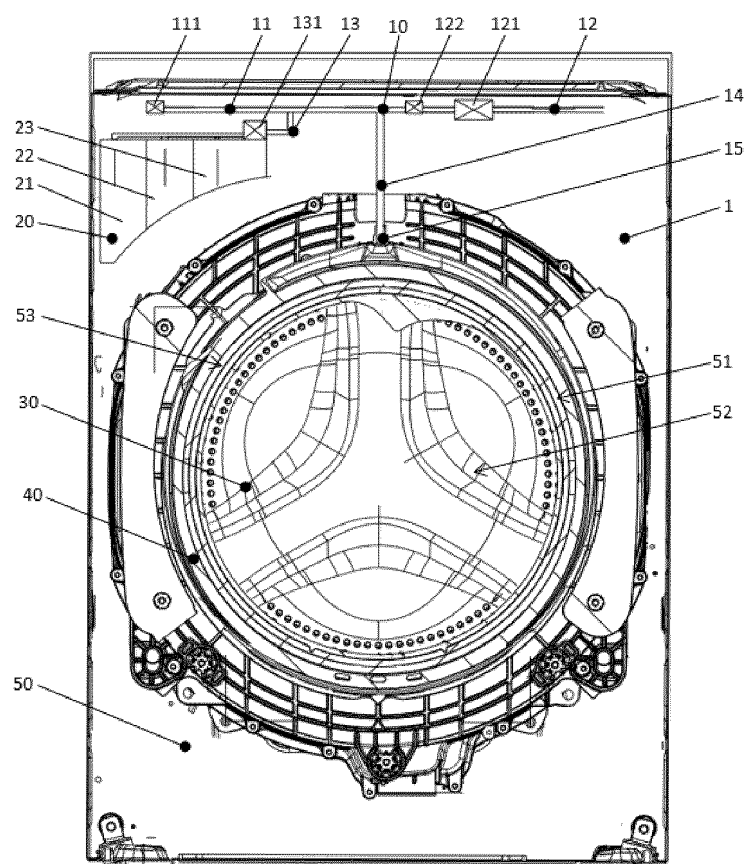


FIG. 1

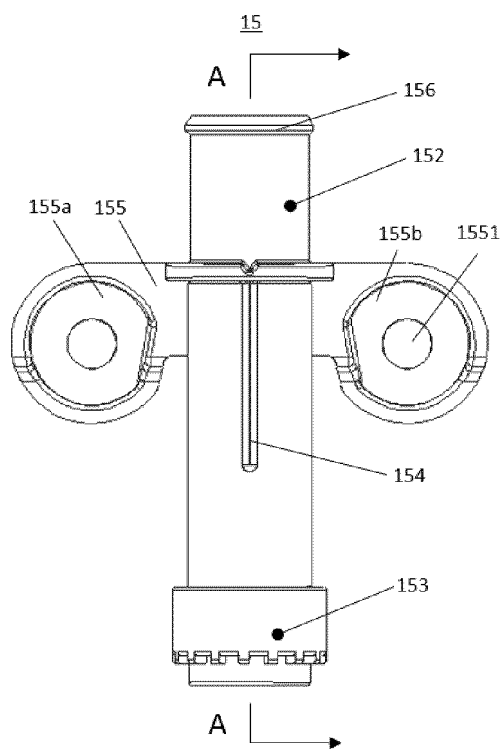


FIG. 2

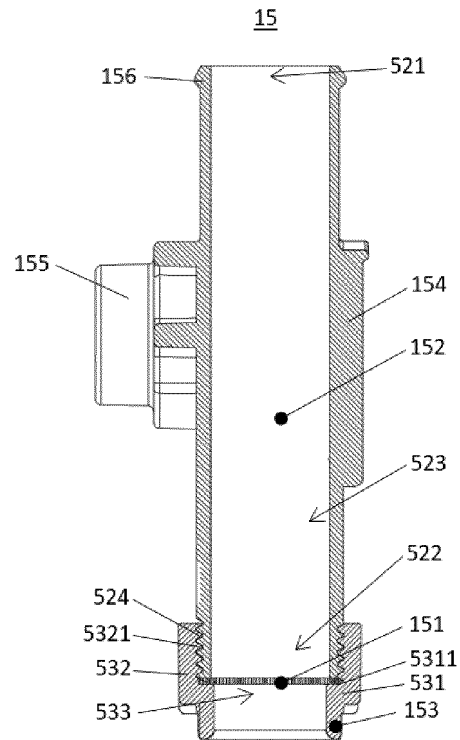


FIG. 3

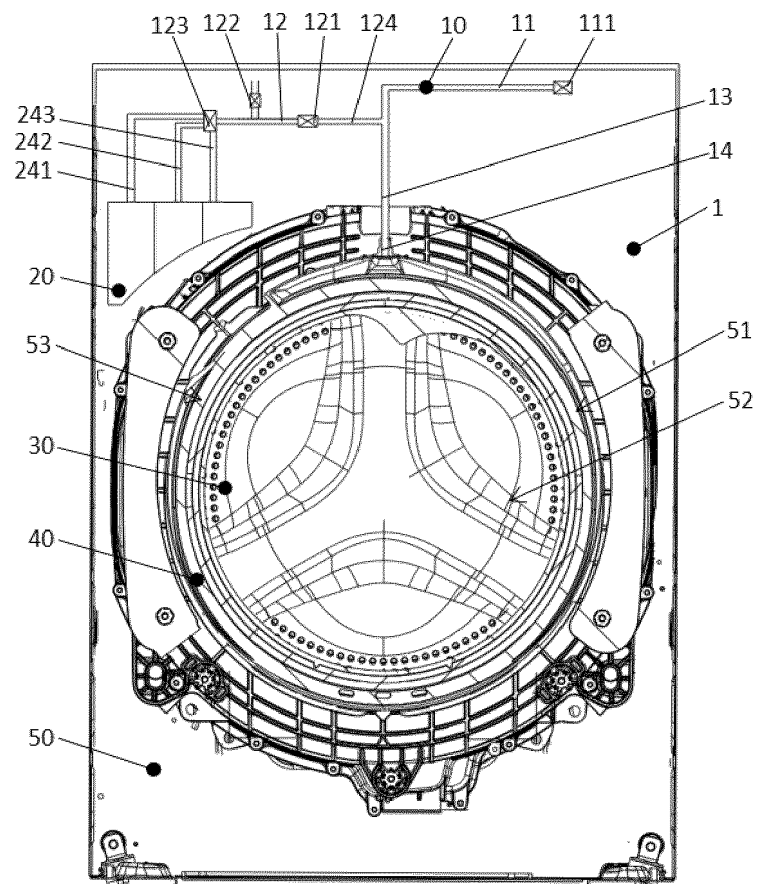


FIG. 4

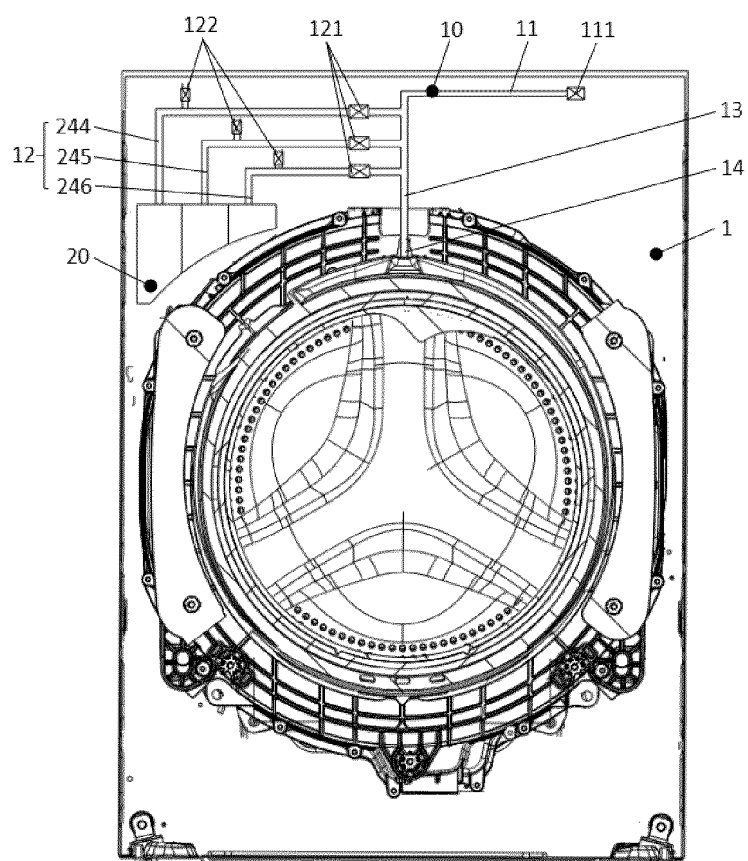


FIG. 5

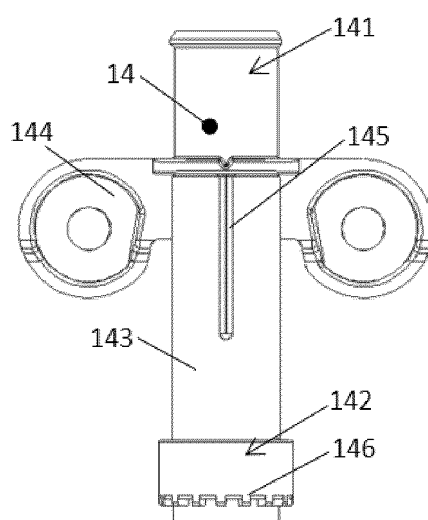


FIG. 6

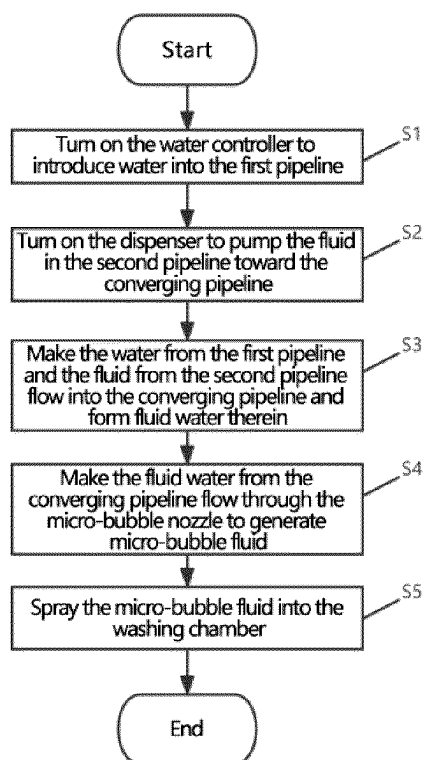


FIG. 7

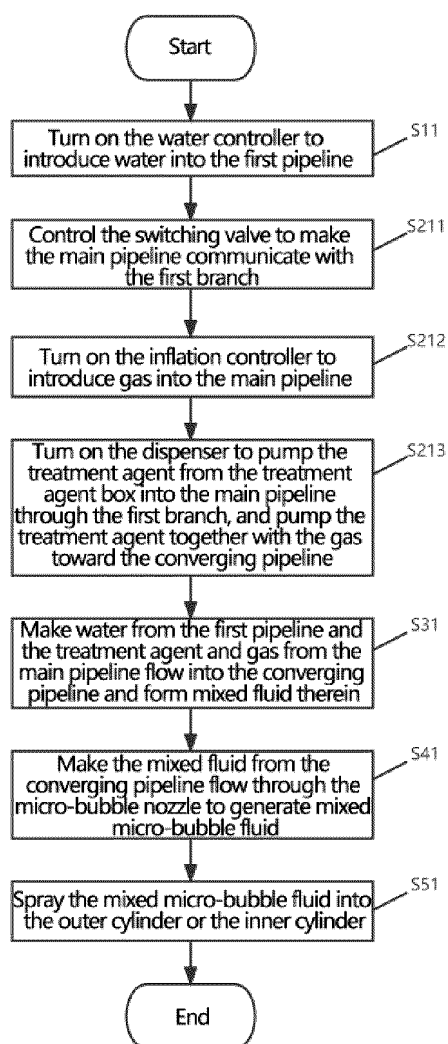


FIG. 8

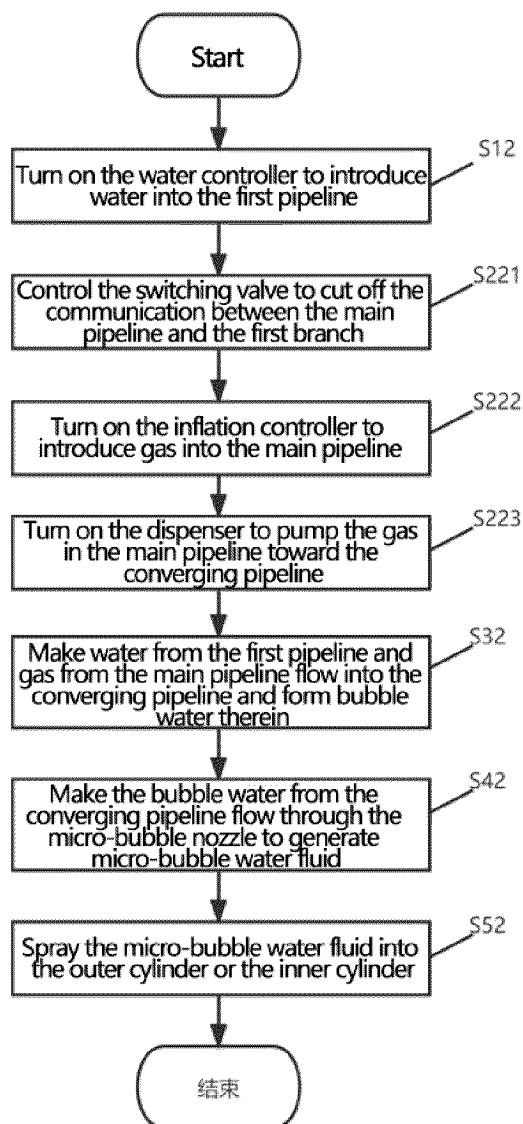


FIG. 9

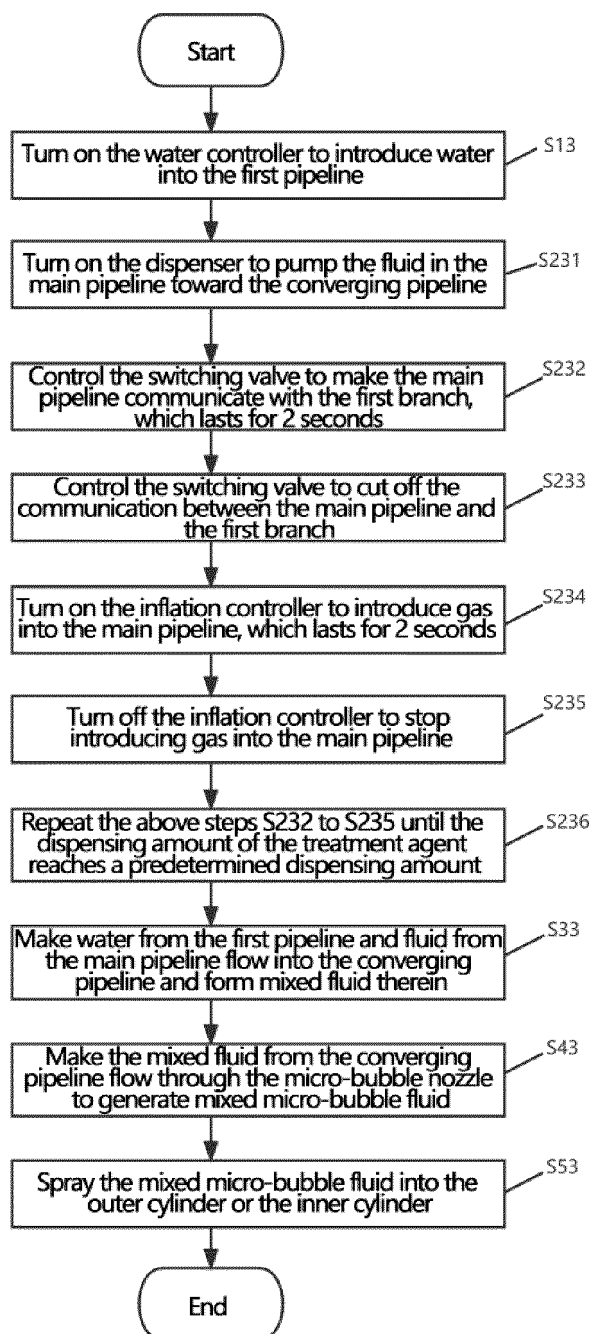


FIG. 10

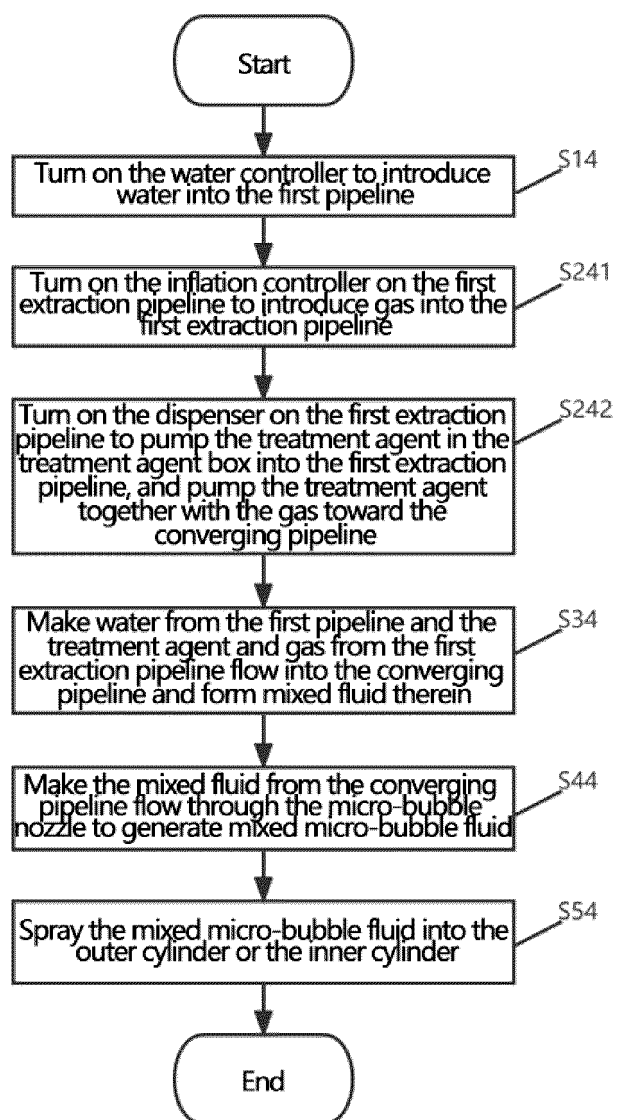


FIG. 11

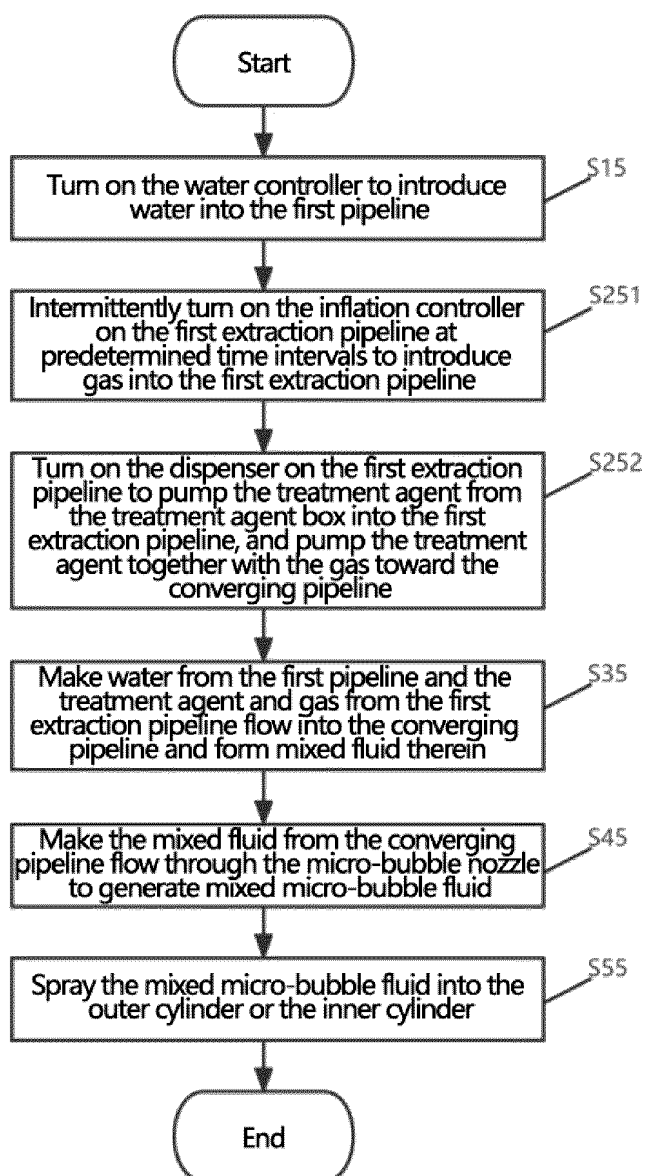


FIG. 12

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2023/084129

5	A. CLASSIFICATION OF SUBJECT MATTER		
	D06F 39/08(2006.01)i		
	According to International Patent Classification (IPC) or to both national classification and IPC		
10	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		
15	Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
	CNTXT, ENTXT, VEN, CNKI: 大气, 风, 空气, 泡沫, 泡泡, 气, 气泡, 水, 微, 微泡, 洗涤液, 喷嘴, 喷射, 喷口, 喷洒, 喷出, 喷溅, air, gas, micro, nano, small, water, wind, bubble?, foam		
20	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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25	Y	CN 111074484 A (QINGDAO HAIER DRUM WASHING MACHINE CO., LTD.) 28 April 2020 (2020-04-28) description, paragraphs 0027-0042, and figures 1-3	1-24
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35			
	☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
40	* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "D" document cited by the applicant in the international application "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed		
45	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
50	Date of the actual completion of the international search		Date of mailing of the international search report
	04 May 2023		18 May 2023
55	Name and mailing address of the ISA/CN		Authorized officer
	China National Intellectual Property Administration (ISA/CN) China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088		
			Telephone No.

Form PCT/ISA/210 (second sheet) (July 2022)

INTERNATIONAL SEARCH REPORT

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PCT/CN2023/084129

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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
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A	CN 112899992 A (QINGDAO HAIER WASHING MACHINE CO., LTD. et al.) 04 June 2021 (2021-06-04) entire document	1-24

INTERNATIONAL SEARCH REPORT
Information on patent family members

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