

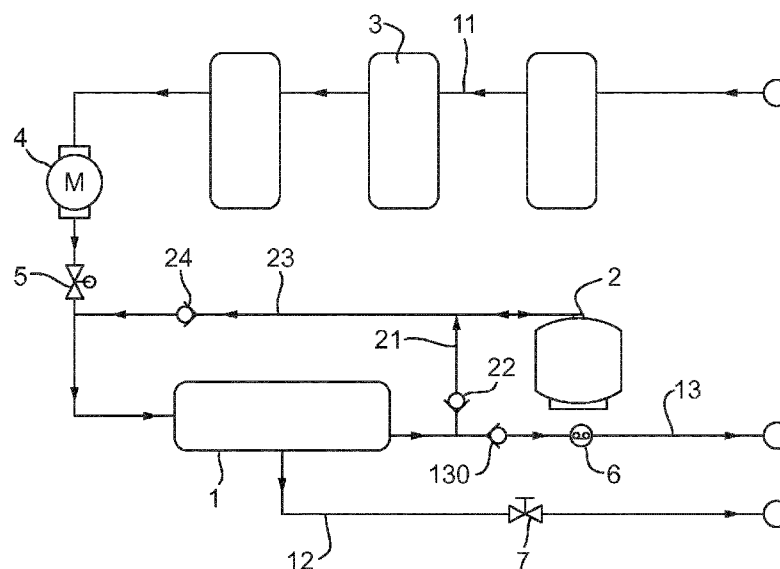


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(54) Title: REVERSE OSMOSIS WATER PURIFIER

Fig. 1



(57) Abstract: The present invention relates to a household water purifier, and discloses a reverse osmosis water purifier, comprising a feed water inlet in fluid connection with a reverse osmosis unit (1), the reverse osmosis unit having a reject water outlet and a pure water outlet through a reject water output pipe (12) and a pure water output pipe (13) respectively, wherein, the pure water output pipe (13) is connected to a pressurizable tank (2) through a water storage pipe (21) having a first valve (22) disposed on the water storage pipe (21), between the pure water outlet and the pressure tank (2); the pressurizable tank (2) is connected to the feed water inlet of the reverse osmosis unit (1) via a backflow pipe (23) having a second valve (24), between the pressurizable tank (2) and the reverse osmosis unit (1); and a third valve (130) is disposed on the pure water output pipe (13). At the end of the normal water-producing state, the pure water outlet is closed and the water purifier continues to produce pure water, which is stored in the pressurizable tank



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(2) until a high pressure switch (6) is triggered to act, stopping water production, the pure water then flowing from the pressurizable tank (2) through the backflow pipe (23) to the feed water inlet of the reverse osmosis unit (1), thereby removing reject water at the reverse osmosis membrane surface.

REVERSE OSMOSIS WATER PURIFIER

Field of the invention

The present invention relates to a household water purifier, in particular to a reverse osmosis water purifier.

Background of the invention

Household water treatment products are becoming ever more popular, and have considerably improved people's quality of life.

In this series of products, the core treatment technology is a unit that is referred to as a reverse osmosis membrane, which performs ultimate purification of source water, to meet the objective of filtering various impurities out of water.

In this series of products, a common treatment process flow of a high-flow-rate reverse osmosis water purifier is as follows: it consists of "incoming water ball valve, upstream filter, incoming water solenoid valve, booster pump, reverse osmosis membrane, non-return valve, combined solenoid valve with wastewater ratio, high-pressure switch, water output tap" etc.

A water purifier is generally in a fully automatic operating state. The water purifier is directly connected to a tap water pipeline, and since the amount of water passing through the reverse osmosis membrane is directly related to the water pressure upstream of the membrane, a booster pump must be specially configured upstream of the reverse osmosis membrane of the water purifier. A combined solenoid valve with wastewater ratio is configured at a wastewater port of the reverse osmosis membrane. Pure water can only be produced when the source water pressure is increased to 0.42 MPa or more. Under the control of a high-pressure switch, the booster pump and incoming water solenoid valve stop operating, and the entire machine is in a standby state.

At present, many barrel-free high-flow-rate reverse osmosis water purifiers are appearing on the market; the average flow rate can reach 1 L/min or more, which can satisfy consumer uses.

In particular, the problem with high-flow-rate barrel-free reverse osmosis water purifiers is that when they have been shut down or not used for a long period of time, when switched on again they will exhibit the deficiency of a low desalination rate. Specifically, the reason for this is that when the water purifier has been shut down, the incoming water solenoid valve is closed, the booster pump stops operating, and some pure water and wastewater remains in the reverse osmosis membrane shell. With no external pressure applied, a process of bidirectional osmosis will arise inside the reverse osmosis membrane shell due to osmotic pressure between reject water and pure water, i.e. pure water seeps to the reject water side, and reject water seeps to the pure water side. As the duration of this bidirectional seepage lengthens, the concentration of pure water in the membrane will gradually increase; the longer the duration of the shutdown, the greater the TDS of the pure water in the membrane.

Summary of the invention

One aspect of the present invention provides a reverse osmosis water purifier comprising,

a feed water inlet in fluid connection with a reverse osmosis unit, the reverse osmosis unit having a reject water outlet and a pure water outlet through a reject water output pipe and a pure water output pipe respectively,

wherein, the pure water output pipe is connected to a pressurizable tank through a water storage pipe having a first valve disposed on the water storage pipe, between the pure water outlet and the pressure tank; the pressurizable tank is connected to the feed water inlet of the reverse osmosis unit via a backflow pipe having a second valve, between the pressurizable tank and the reverse osmosis unit; and a third valve is disposed on the pure water output pipe.

Brief Description of the Accompanying Drawings

Fig. 1 is a structural schematic diagram of water purifier of the present invention.

The names of the parts represented by numerals in the drawing are as follows: 1 – reverse osmosis unit; 2 – pressurizable tank; 3 – pre-filter; 4 – booster pump; 5 – incoming water solenoid valve; 6 – high-pressure switch; 7 – flushing solenoid valve; 11 – feed water intake pipe; 12 – reject water output pipe; 13 – pure water output pipe; 21 – water storage pipe; 22 – first valve; 23 – backflow pipe; 24 – second valve; 130 – third valve.

Detailed Description

In response to the problem of bidirectional seepage which affects reverse osmosis water purifiers in the prior art, the present invention provides a reverse osmosis water purifier with a high flow rate and a high desalination rate.

To solve the abovementioned technical problem, the present invention employs the following technical solution:

The present invention provides a reverse osmosis water purifier comprising,

a feed water inlet in fluid connection with a reverse osmosis unit, the reverse osmosis unit having a reject water outlet and a pure water outlet through a reject water output pipe and a pure water output pipe respectively,

wherein, the pure water output pipe is connected to a pressurizable tank through a water storage pipe having a first valve disposed on the water storage pipe, between the pure water outlet and the pressure tank; the pressurizable tank is connected to the feed water inlet of the reverse osmosis unit via a backflow pipe having a second valve, between the pressurizable tank and the reverse osmosis unit; and a third valve is disposed on the pure water output pipe. It is preferred that the first, second and third valves are non-return valves. The first non-return valve, preferably establishes a communication in the direction from the pure water outlet to the pressurizable tank, is provided on the water storage pipe; the pressurizable tank is connected to the feed water inlet of the reverse

osmosis unit via a backflow pipe; the second non-return valve, which preferably establishes communication in the direction from the pressurizable tank to the reverse osmosis unit, is provided on the backflow pipe.

It is preferred that a pre-filter, a pump and an incoming water valve are disposed in sequence on the feed water intake pipe.

It is preferred that the purifier further comprises a control module and a high-pressure switch; the pump, the incoming water valve and the high-pressure switch are all connected to the control module; the high-pressure switch is configured for sensing a pressure signal in the pressurizable tank and transmitting to the control module; the control module controls the pump and incoming water valve to operably open and close on the basis of the pressure signal received.

It is preferred that the high-pressure switch is disposed on the pure water output pipe.

It is preferred that the reject water output pipe has a flushing valve, the flushing valve configured to perform wastewater ratio and connected to the control module.

It is preferred that connections of various components of the device including but not limited to the pump, the incoming water valve and the high-pressure switch, flushing valve to the control module are preferably through a wired connection, preferably through electrical or electronic connection.

The present invention preferably provides a reverse osmosis water purifier, comprising a reverse osmosis unit, with an feed water inlet, a reject water outlet and a pure water outlet being provided on the reverse osmosis unit; the feed water inlet, reject water outlet and pure water outlet are connected to an feed water intake pipe, a reject water output pipe and a pure water output pipe respectively; the pure water output pipe is connected to a pressurizable tank via a water storage pipe; a first non-return valve, which establishes communication in the direction from the pure water outlet to the pressurizable tank, is provided on the water storage pipe; the pressurizable tank is connected to the feed water inlet of the reverse osmosis unit via a backflow pipe; a second non-return

valve, which establishes communication in the direction from the pressurizable tank to the reverse osmosis unit, is provided on the backflow pipe.

Preferably, a pre-filter, a booster pump and an incoming water solenoid valve are disposed in sequence on the feed water intake pipe, starting from a water inlet. Pre-treatment via the pre-filter on the one hand improves the water purification result, and on the other hand also avoids damage to the reverse osmosis unit by particulate impurities etc., thereby increasing the service life of the reverse osmosis unit.

Preferably, also included are a control module and a high-pressure switch; the booster pump, incoming water solenoid valve and high-pressure switch are all connected to the control module; the high-pressure switch is used for sensing a pressure signal in the pressurizable tank and transmitting this to the control module; the control module controls the booster pump and incoming water solenoid valve to close on the basis of the pressure signal received. Intelligent control of the water purifier is realized by means of the control module, making the operation of the entire water purifier more convenient and rational.

Preferably, the high-pressure switch is disposed on the pure water output pipe. The pure water output pipe is in communication with the pressurizable tank, and the placement of the high-pressure switch on the pure water output pipe enables the pressure in the pressurizable tank to be detected accurately, as well as facilitating installation of the high-pressure switch.

Preferably, a flushing solenoid valve, which is equipped with a wastewater ratio and connected to the control module, is disposed on the reject water output pipe. Through the provision of a flushing solenoid valve equipped with a wastewater ratio on the reject water output pipe, the discharged reject water can be utilized rationally, being used to back-flush the reverse osmosis unit, thereby increasing the water utilization rate.

Preferably, a third non-return valve is disposed on the pure water output pipe. The provision of a third non-return valve on the pure water output pipe can avoid a situation where water residing in the pure water output pipe flows back into the reverse osmosis

unit and causes a change in water pressure inside the reverse osmosis unit. Thus, seepage between reject water and pure water in the reverse osmosis unit is reduced.

Due to the adoption of the technical solution described above, the present invention has the following significant technical effects:

In the present invention, a pressurizable tank storing pure water is provided in the reverse osmosis water purifier, and reject water at the membrane shell surface is flushed by means of pure water from the pressurizable tank, so that there is no osmotic pressure in the reverse osmosis membrane shell. Thus, a high desalination rate is attained, effectively reducing the TDS value of pure water in the reverse osmosis membrane.

The present invention is described in further detail below in conjunction with the accompanying drawings and embodiments.

The present invention provides a reverse osmosis water purifier, as shown in Fig. 1, comprising an pre-filter 3, a booster pump 4, an incoming water solenoid valve 5 and a reverse osmosis unit 1, which are disposed in sequence starting from a water inlet, wherein the pre-filter 3, booster pump 4 and incoming water solenoid valve 5 are all disposed on an feed water intake pipe 11. Pre-treatment via the pre-filter 3 on the one hand improves the water purification result, and on the other hand also avoids damage to the reverse osmosis unit 1 by particulate impurities etc., thereby increasing the service life of the reverse osmosis unit 1.

An feed water inlet, a reject water outlet and a pure water outlet are provided on the reverse osmosis unit 1. The feed water inlet, reject water outlet and pure water outlet are connected to the feed water intake pipe 11, a reject water output pipe 12 and a pure water output pipe 13 respectively. The pure water output pipe 13 is connected to a pressurizable tank 2 via a water storage pipe 21. A first non-return valve 22, which establishes communication in the direction from the pure water outlet to the pressurizable tank 2, is provided on the water storage pipe 21. Pure water produced via the reverse osmosis unit 1 can be stored in the pressurizable tank 2 via the water storage pipe 21. At the same time, due to the presence of the first non-return valve 22, pure water in the pressurizable tank 2 can be prevented from flowing back into the pure water output pipe

13. The pressurizable tank 2 is connected to the feed water inlet of the reverse osmosis unit 1 via a backflow pipe 23. A second non-return valve 24, which establishes communication in the direction from the pressurizable tank 2 to the reverse osmosis unit 1, is provided on the backflow pipe 23, causing water in the pressurizable tank 2 to flow back to the feed water inlet of the reverse osmosis unit 1, and to flow out through a reverse osmosis membrane shell surface, removing reject water at the reverse osmosis membrane surface, and in turn ensuring that there is no osmotic pressure in the membrane shell, so that the next time that water is drawn, pure water with a high desalination rate can be obtained. At the same time, under the action of the second non-return valve 24, water that has not been treated in the reverse osmosis unit 1 can be effectively prevented from flowing into the pressurizable tank 2. A third non-return valve 130 is disposed on the pure water output pipe 13; this can avoid a situation where water residing in the pure water output pipe 13 flows back into the reverse osmosis unit 1 and causes a change in water pressure inside the reverse osmosis unit 1. Thus, seepage between reject water and pure water in the reverse osmosis unit 1 is reduced.

Also included are a control module and a high-pressure switch 6, as well as a flushing solenoid valve 7 that is equipped with a wastewater ratio and provided on the reject water output pipe 12. The booster pump 4, incoming water solenoid valve 5, high-pressure switch 6 and flushing solenoid valve 7 are all connected to the control module. The high-pressure switch 6 is disposed on the pure water output pipe 13 and used for sensing a pressure signal in the pressurizable tank 2 and transmitting this to the control module. The control module controls the booster pump 4 and incoming water solenoid valve 5 to close on the basis of the pressure signal received.

The operating principles of the water purification system of the present invention are explained in conjunction with Fig. 1. When pure water is used, a pure water outlet at an end of the pure water output pipe 13 is opened, at which time the control module controls the incoming water solenoid valve 5 and booster pump 4 to open, and water production begins; at the same time, the flushing solenoid valve 7 equipped with a wastewater ratio closes, at which time the water purifier is in a normal water-producing state.

When the pure water outlet is closed, the water purifier continues to produce water, and the pure water produced is stored in the pressurizable tank 2. As the water level in the

pressurizable tank 2 rises, the pressure in the pressurizable tank 2 increases steadily, and since the pressurizable tank 2 is in a state of communication with the pure water output pipe 13, the pressure in the pure water output pipe 13 will steadily increase, until the high-pressure switch 6 is triggered to act, transmitting a signal to the control module. At this time, the pressurizable tank 2 is in a pure water full storage state, and the control module controls the booster pump 4 and incoming water solenoid valve 5 to close on the basis of the signal received, stopping water production. At this time, since the interior of the pressurizable tank 2 is still in a high-pressure state, the pure water in the pressurizable tank 2 flows through the backflow pipe 23 to the feed water inlet of the reverse osmosis unit 1, and enters the surface of the reverse osmosis unit 1, removing reject water at the reverse osmosis membrane surface, so that there is no osmotic pressure in the membrane shell. Thus, the next time that water is drawn, pure water with a high desalination rate can be obtained, and the TDS value of pure water in the reverse osmosis membrane is significantly reduced.

In summary, the embodiments above are merely preferred embodiments of the present invention. All equivalent changes and modifications made within the patent application scope of the present invention shall be included in the scope of the present invention patent.

Claims

1. A reverse osmosis water purifier, comprising

a feed water inlet in fluid connection with a reverse osmosis unit (1), the reverse osmosis unit having a reject water outlet and a pure water outlet through a reject water output pipe (12) and a pure water output pipe (13) respectively,

wherein, the pure water output pipe (13) is connected to a pressurizable tank (2) through a water storage pipe (21) having a first valve (22) disposed on the water storage pipe (21), between the pure water outlet and the pressure tank (2); the pressurizable tank (2) is connected to the feed water inlet of the reverse osmosis unit (1) via a backflow pipe (23) having a second valve (24), between the pressurizable tank (2) and the reverse osmosis unit (1); and a third valve (130) is disposed on the pure water output pipe (13).

2. The reverse osmosis water purifier according to claim 1, wherein a pre-filter (3), a pump (4) and an incoming water valve (5) are disposed in sequence on the feed water intake pipe (11).

3. The reverse osmosis water purifier according to claims 1 or 2, wherein, the purifier further comprises a control module and a high-pressure switch (6); the pump (4), the incoming water valve (5) and the high-pressure switch (6) are all connected to the control module; the high-pressure switch (6) is configured for sensing a pressure signal in the pressurizable tank (2) and transmitting to the control module; the control module controls the pump (4) and incoming water valve (5) to operably open and close on the basis of the pressure signal received.

4. The reverse osmosis water purifier according to anyone of preceding claims 1 to 3, wherein the high-pressure switch (6) is disposed on the pure water output pipe (13).

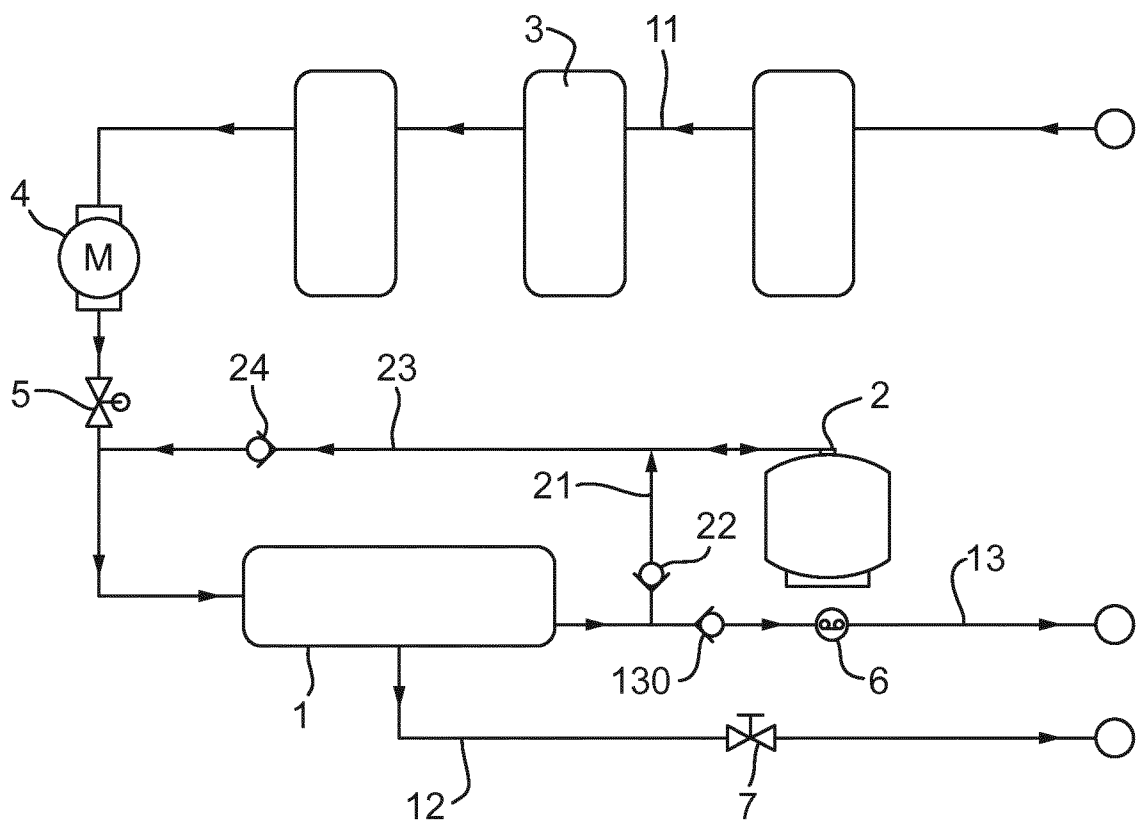
5. The reverse osmosis water purifier according to anyone of preceding claims 1 to 4, wherein the reject water output pipe (12) has a flushing valve (7), the flushing valve (7) configured to perform wastewater ratio and connected to the control module.

6. Use of device according to claims 1 to 5 for preventing bidirectional seepage in reverse osmosis water purifiers.

7. Use of device according to claims 1 to 5 for providing a high desalination rate in reverse osmosis water purifiers.

8. Use of device according to claims 1 to 5 for a high flow rate in reverse osmosis water purifiers.

Fig. 1



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/069311

A. CLASSIFICATION OF SUBJECT MATTER
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ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B01D C02F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 105 753 193 A (GREE ELECTRIC APPLIANCES INC ZHUHAI) 13 July 2016 (2016-07-13) the whole document	1-8
X	FR 2 979 628 A1 (DUFLOS MICHEL [FR]) 8 March 2013 (2013-03-08) figure 1 page 1, line 14 - line 18 page 1, line 36 - page 2, line 31	1-8
X	CN 204 529 392 U (KORTECH ENVIRONMENT EQUIPMENT CO LTD) 5 August 2015 (2015-08-05) the whole document	1-8
X	US 2011/180465 A1 (RICHETTI THOMAS E [US]) 28 July 2011 (2011-07-28) figure 1 paragraph [0023] - paragraph [0045]	1-8



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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
CN 105753193	A	13-07-2016	NONE	
FR 2979628	A1	08-03-2013	NONE	
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