

TITLE OF INVENTION

SWITCHING VALVE FOR ION WATER GENERATOR

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FIELD OF THE INVENTION

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The present invention relates generally to an ion water generator, and more particularly, to a switching valve for an ion water generator. The present invention presents a switching valve with solenoid that enables the outlet or the faucet to supply the same species of ion water, namely, either alkaline ion water or acid ion water, despite the polar conversion of the chambers comprising the electrolyzer of the ion water generator.

DESCRIPTION OF THE RELATED ART

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It is well known that one of the causes for the modern adult disease like hypertension, diabetes, and heart disease is the acidification of physical constitution due to the excessive intake of acid food.

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As a consequence of the preference for alkaline ion water, an apparatus like an ion water generator has been introduced.

Furthermore, it is understood that the alkaline ion water helps to convert the acid physical constitution into the light-alkaline one.

FIG.1 is a schematic diagram illustrating the principle of the mechanism of an ion water generator in accordance with the prior art.

Traditionally, the ion water generator consists of a purifier 1 for the filtration of water and an electrolyzer 2 that electrolytically dissociates the purified water.

More specifically, the electrolyzer 2, comprising a cation chamber 4 and an anion chamber 5 being separated from each other by a barrier rib 3, produces ion water through the electrolysis process of water with proper voltages applied to those chambers.

When the voltage is applied at the cation chamber 4, the oxygen gas is generated due to the reduction process of hydroxyl ion in the electrolyzed water. During the reduction process, the negative acid ions including chlorine, phosphorus, and sulfur acidifies the water in the cation chamber 4.

In the meanwhile, the hydrogen gas is generated due to the reduction process of hydrogen at the anion chamber 5. Simultaneously,

hydrogen ion pairs are produced by the positive ions such as sodium, magnesium, and calcium.

Consequently, the solution of the anion chamber 5 becomes alkaline. The alkaline ion water produced at the anion chamber can be used for drinking water while the acid ion water can be used for skin care or sterilization.

Furthermore, the structure of the alkaline ion water becomes hexagonal during the electrolysis, which turns out to be an outstanding feature for sound body.

However, the prior art has a shortcoming because the cations like calcium and magnesium are solidified at the negative electrodes of the cation chamber 5 during the electrolysis.

As time passes, the amount of the solidified tartar, as it were, scale at the negative electrodes becomes huge enough to cause the reduction of the electric current during electrolysis. The excessive build-up of scale at the negative electrode will decrease the electric current and thereby prevent the efficient dissociation of water during electrolysis process.

Since the formation of the scale or tartar, whatever, at the negative electrodes is unavoidable if the electrolyzer is used quite a

long period of time without switching the polarity between anion and cation chambers.

Consequently, the state of the art in the field of ion water generator is that the polarity of voltage applied at the electrodes of each chamber is switched from time to time for preventing the formation of scale at the negative electrode.

In this approach, the role of each electrode is periodically commutated in an effort to effectively prevent the formation of scale at the electrode of the anion chamber. In other words, the cation and anion chambers are switched with each other periodically.

Since the role of the cation chamber and the anion chamber is interchanged from time to time in accordance with the prior art, the species of the ion water, namely either alkaline ion water or acid ion water, discharged at the outlets or the faucets, should be alternatively changing accordingly.

However, it is natural that people expect to take the same kind of ion water, for example, alkaline ion water, from the faucet designating "drinking water". It will be undesirable and even more dangerous that the opposite species of ion water, for example, acid

ion water come out of the same faucet designating "drinking water" just because of the polar conversion inside the apparatus.

5 If the same species of ion water need to flow out of an outlet continuously, the waterways from the chambers to the outlet should be re-configured in accordance with the commutation of applied voltage at the electrode of the chambers.

SUMMARY OF THE INVENTION

10 In view of these problems, there is a need in the art to invent a device for alternating the configuration of waterways in accordance with the polarity of the applied voltage at the electrodes.

15 Accordingly, it is an object of the present invention to provide a switching valve, which enables the outlet to discharge the same kind of ion water despite the polar conversion at the electrodes in the electrolyzer for the prevention of the formation of scale at the negative electrodes.

20 In accordance with a broad aspect of the present invention, provided is a switching valve commutating the transfer routes of ion water in

accordance with the polar switching of the applied voltage at the electrodes.

5 The present invention employs the solenoid valve for switching the transfer route for each type of ion water (i.e., alkaline ion water and acid ion water).

10 The present invention comprises a valve housing having an inlet connected to the channel of supply and a couple of outflow openings in the opposite directions wherein those outflow openings are interchangeably switched on and off in a complementary manner.

15 Each of outflow openings is connected either to a discharging channel for alkaline ion water or to a discharging channel for acid ion water. Further, the species of ion water flowing through each discharging channel to the outlet, or the faucet, is fixed in accordance with the invention.

20 The species of ion water flowing through each channel of supply to the inlet of the valve housing is convertible in accordance with the polarity of the applied voltage at the electrodes.

25 Therefore, the waterway from the inlet to the outflow openings inside the valve housing should be re-configured in accordance with the

polarity of the applied voltage at the electrodes.

Inside the valve housing, there is provided a valve body with a shape of a double-headed drum pinched in at the middle. In other words, the valve body comprises upper part and lower part wherein each part has a shape of cylindrical disc. The upper and lower disc-shaped parts are connected with a cylindrical shaft whose radius is smaller than that of those cylindrical discs.

The valve body moves up and down inside the valve housing in order to open and shut off either of the outflow openings. The upward movement of the valve body is propelled with the electromagnetic force exerted on the iron core integrated with the valve body.

The upward movement of the valve body causes the upper part of the valve body shut off the outflow opening, for instance, to the discharging channel for alkaline ion water, while the lower part opens the outflow opening at the bottom.

When the disc-shaped upper part closes an outflow opening located at the upper side of the valve housing, the other disc-shaped lower part of the valve body opens the opposite

outflow opening at the bottom of the valve housing, and vice versa.

Consequently, each of disc-shaped parts of the valve body alternatively switches the outflow openings to the discharging channels for alkaline ion water and acid ion water, respectively.

When the voltage applied to the solenoid housing is removed, the valve body moves downward and thereby converts the transfer route of waterways to the outflow opening at the top, namely, to the discharging channel for alkaline ion water.

As a result, it becomes possible to maintain the species of ion water consistently through a designated outlet/faucet even if the polarity of the ion water flowing in through the channel of supply has been changed over due to the polar switching of the chambers of the electrolyzer.

BRIEF DESCRIPTION OF THE DRAWINGS

Further features of the present invention will become apparent from a description of the present invention in conjunction with the accompanying drawings of

the preferred embodiment of the invention, which, however, should not be taken to be limitative to the invention, but are for explanation and understanding only.

5 In the drawings:

FIG.1 is a schematic diagram illustrating an ion water generator in accordance with the prior art.

10 FIG.2 is a schematic diagram illustrating the constitution of the switching valve in accordance with the present invention.

15 FIG.3 is a schematic diagram illustrating the functional block of the ion water generator in accordance with the present invention.

FIG.4A is a schematic diagram illustrating the transfer route for alkaline ion water through the switching valve in accordance with the present invention.

20 FIG.4B is a schematic diagram illustrating the transfer route for acid ion water through the switching valve when the polarity of ion water has been changes over in accordance with the present invention.

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DETAILED DESCRIPTION OF THE INVENTION

The present invention will be explained in detail with reference to the accompanying drawings.

In FIG.2 is shown a schematic diagram illustrating the constitution of the switching valve in accordance with the present invention.

Referring to FIGS. 2 and 3, the electrolyzer comprises a cation chamber 4 and an anion chamber. The electrolyzer 2 further comprises a couple of valve housing 10 of circular cylindrical shape.

The valve housing 10 has an inlet 12 that is connected to the channel of supply 6 or 7. At the top of the valve housing 10, there is provided an outflow opening connected to the discharging channel 14, for instance, for the alkaline ion water.

At the bottom of the valve housing 10, there is provided an outflow opening connected to the discharging channel 16, for instance, for the acid ion water in the opposite manner.

Preferably, the discharging channel 16 for the acid ion water passes through beneath the solenoid housing 18.

An iron core 20 with a lower spacer 32 on it is then implemented in such a manner that it is inserted in the orifice of the outflow

opening toward the discharging channel 16. The iron core 20 moves up and down in a translational motion by electromagnetic force in accordance with time sequence of the applied voltage at the solenoid housing 18.

Next to the lower spacer 32 there is provided a lower part 24 of the valve body 22 wherein the lower part 24 has a shape of cylindrical disc.

The valve body 22 comprises an upper part 23 and a lower part 24 and has a shape of a double-headed drum pinched in at the middle.

The valve body 22 has symmetry and therefore the upper part 24 also has a shape of cylindrical disc.

The disc-shaped upper part 24 is supposed to switch on and off the outflow opening toward the discharging channel for alkaline ion water, while the lower part 24 is supposed to be responsible for switching the outflow opening toward the discharging channel for acid ion water.

On top of the upper part 23, there is provided an upper spacer 30 that is inserted into the orifice of the outflow opening through to the discharging channel 14 for the alkaline ion water.

As a preferred embodiment in accordance with the present invention, a couple of packing, for instance, rubber packing, 26 can be implemented for the prevention of leakage.

5 More preferably, the valve seat 28 can be prepared for tightly sealing up the packing 26 to the outflow openings.

10 If one of the disc-shaped parts 23 or 24 shuts off either of the outflow openings of the valve housing 10, the other part 24 or 23 will open the corresponding outflow opening due to the motion of the valve body 22.

15 The valve body 22 moves upward and downward when the voltage is applied at the solenoid housing 18 and electromagnetic force is exerted on the iron core 20.

20 Furthermore, the upper spacer 30 is installed such that it can be inserted into the orifice of the discharging channel 14 for guiding the motion of the upper part 23 when the valve body 22 is forced to move upward to block the outflow opening for alkaline ion water.

25 Consequently, a couple solenoid valves 18 are installed for each channel of supply 6 and 7, respectively. Further, each solenoid valve 18 has a couple of discharging channels 14 and 16, one for alkaline ion water and the other

for acid ion water.

Therefore, even when the species of the incoming ion water through the inlet 12 is switched from one to the other (i.e., alkaline to acid), the outflow openings inside the valve housing 10 are changed over correspondingly for reconfiguring the waterways to the faucet.

The present invention therefore comprises a couple of valve housing 10 connected to the channels of supply 6 and 7 and a valve body 22 which opens and closes the outflow openings toward the discharging channels. The present invention further comprises an iron core 20 moving the valve body 22 upward and downward; and a solenoid housing 18 exerting an electromagnetic force on the iron core 20.

Each valve housing 10 has an inlet 12, which is connected to each channel of supply 6 or 7. The species of the ion water entering the inlet 12 of the valve housing 10 is dependent on the polarity of the voltage applied at each electrode of the electrolyzer.

The waterways to the faucets/outlets 34 and 36 are discharging channels 14 for alkaline ion water and 16 for acid ion water, respectively.

Consequently, the selective switching

on/off of the discharging channels is performed by the rise and fall of the valve body 22 with the iron core 20 under the control of the solenoid housing 18.

5 Preferably, the iron core 20 is installed into the orifice of the discharging channel 16 for acid ion water. This is because it is less probable that tartar or scale is contained in the acid ion water and the acid
10 water is usually used for sterilization rather than for drinking.

 The iron core 20 in accordance with the present invention is prolonged by the lower spacer 32 and is inserted into the outflow
15 opening toward the discharging channel 16 for the acid ion water.

 When the voltage is applied at the solenoid housing 18, the iron core 20 is elevated beneath the solenoid housing 18. As a
20 consequence, the valve body 22 together with the iron core 20 moves upward to open the outflow opening at the bottom.

 The valve body 22 in accordance with the present invention comprises a couple of disc-
25 shaped parts, i.e., the upper part 23 and the lower parts 24. The distance between the upper part 23 and the lower part is adjusted in such a

manner that if one of the disc-shaped parts shuts off an outflow opening then the other part opens the other outflow opening.

5 Preferably, a packing rubber 26 can be implemented on each of the upper part 23 and the lower part 24 for tightly sealing up the outflow opening.

10 More preferably, a valve seat can be prepared at the outflow opening in order to launch the valve body 22 with the packing 26 at the openings.

15 As a preferred embodiment in accordance with the present invention, an upper spacer 30 is formed on the upper part 23 of the valve body 22. The upper spacer 30 is well designed such that the upper spacer 30 is still inside the orifice of the discharging channel 14 when the outflow opening is wide open due to the fall of the valve body 22.

20 Furthermore, the upper spacer 30 guides the elevation of the valve body 22 such that the upper part 23 of the valve body 22 is safely launched at the valve seat 28 for shutting off the outflow opening.

25 As a preferred embodiment in accordance with the present invention, the ascent of the iron core 20 is performed by the electromagnetic

force of the solenoid while the descent of the iron core 20 is induced by the gravitational force of the iron core 20 and the valve body 22.

5 However, the mechanism for moving the iron core 20 does not have to be limited only to the above-mentioned embodiment.

Preferably, a spring can be implemented at the valve body 22 such that the urging force of the spring counteracts the gravitational
10 force. As a consequence, it is possible to arrange the solenoid valve in a transversal manner as well as in a longitudinal way.

FIGS.4A and 4B are schematic diagrams illustrating transfer routes through the
15 switching valve for alkaline ion water and for acid ion water, respectively.

Referring to FIGS.4A and 4B, the discharging channel 14 is connected to an outlet 34, i.e. faucet, for alkaline ion water, while
20 the discharging channel 16 is connected to the outlet 36 for acid ion water.

Referring to FIG.4A, when the alkaline ion water is supplied through the inlet 12 to the valve housing 10, the outflow opening to the
25 discharging channel 16 for the acid ion water is shut off because the voltage is not applied at the solenoid housing 18.

In this case, the alkaline ion water flows out through the discharging channel 14 since the lower part 24 of the valve body 22 shuts off the outflow opening at the bottom.

5 Now, when the polarity of the chambers has been reversed, the voltage is applied at the solenoid housing 18. As a consequence, the iron core 20 moves 20 upward due to the electromagnetic force.

10 Then the outflow opening to the alkaline discharging channel 14 is shut off and the incoming ion water is routed to the acid discharging channel 16 due to the elevation of the iron core 20.

15 Preferably, the switching valves in accordance with the present invention are installed for each channel of supply 6 and 7 in order to maintain the species of ion water through a specific faucet.

20 Although the invention has been illustrated and described with respect to exemplary embodiments thereof, it should be understood by those skilled in the art that various other changes, omissions and additions may be made therein and thereto, without
25 departing from the spirit and scope of the present invention.

Therefore, the present invention should not be understood as limited to the specific embodiment set forth above but to include all possible embodiments which can be embodied within a scope encompassed and equivalents thereof with respect to the feature set forth in the appended claims.



WHAT IS CLAIMED IS:

1. A switching valve device for ion water generator, comprising:

5 a valve housing having an inlet for incoming ion water from a channel of supply, a first outflow opening connected to a first discharging channel for a first species of ion water, and a second outflow opening, located at the opposite side to said first outflow opening,
10 connected to a second discharging channel for a second species of ion water;

a valve body with a shape of double-headed drum pinched in at the middle, consisting of a disc-shaped upper part with a symmetric
15 lower part wherein an upper spacer is formed on said upper part such that said upper spacer is inserted in said first outflow opening and a lower spacer is formed on said lower part such that said lower spacer points downward to said
20 second outflow opening;

an iron core formed on top of the lower spacer in such a manner that said iron core stays in the orifice of said second outflow opening toward said second discharging channel;
25 and

a solenoid housing covering the iron core and exerting a electromagnetic force on said



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iron core when voltage is applied so that said
valve body is elevated upward with said iron
core and thereby said second outflow opening is
opened due to the elevation of said lower part
5 of said valve body while said first outflow
opening is shut off by said upper part of the
valve body,

wherein said valve body is descended with
said iron core when the applied voltage is
10 removed at said solenoid housing and thereby
said first outflow opening is opened while said
second outflow opening is shut off.