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(71) Applicant and
(72) Inventor: **PYO, Soo-Kil** [KR/KR]; 805-702, Pyoksan-Hansung Apt., Kyonsun-Dong, Kyonsun-Ku, Suwon-city, Kyonggi-do 441-714 (KR).

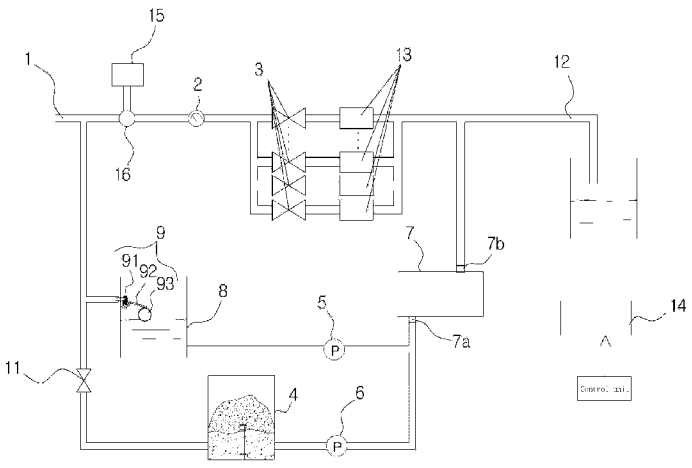
(74) Agents: **CHANG, Soon-Boo** et al.; B-812 Woolim Lion's Valley, 371-28, Gasan-dong, Geumcheon-gu, Seoul 153-803 (KR).

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(54) **Title:** APPARATUS FOR PRODUCING ANTISEPTIC SOLUTION INCLUDING CHLORINE



(57) **Abstract:** Provided is an apparatus for producing producing a chlorine-containing antiseptic solution which can continuously produce chlorine-containing antiseptic solutions having low con¬ centrations, medium concentrations and high concentrations, or different stepwise concentrations suitable for desired places depending on the use thereof, and supply them to the desired places, in which diluted brine having a concentration of 2.8 ~ 3.0%, which is obtained by pumping saturated brine having a concentration of 28 ~ 30% stored in a brine storage tank, and water, stored in a feed water supply tank, through a saturated brine supply pump and a feed water supply pump, respectively, and then mixing them in a tube body, is continuously supplied to an electrolyzer, and the diluted brine supplied to the electrolyzer is electrolyzed, thus producing sodium hypochlorite having an effective chlorine concentration of 7000 ~ 8000 ppm, and then the produced sodium hypochlorite is continuously discharged by the pressure of the pipe, wherein two or more solenoid valves, comprising respective flow control valves which can control the flow rate of feed water depending on the effective chlorine concentration of the sodium chlorite, are provided in parallel between an antiseptic solution discharge pipe connected to a sodium hypochlorite discharge port and a water supply pipe.

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Description

APPARATUS FOR PRODUCING ANTISEPTIC SOLUTION INCLUDING CHLORINE

Technical Field

[1] The present invention relates to an apparatus for producing a chlorine-containing antiseptic solution, and, more particularly, to an apparatus for producing a chlorine-containing antiseptic solution which can continuously produce chlorine-containing antiseptic solutions having low concentrations (for example, water for cleaning or disinfecting hands, dusters, dish towels, cutting boards, and the like), medium concentrations (for example, water for cleaning meat and fish) and high concentrations (for example, water for cleaning vegetables and fruit), or different stepwise concentrations suitable for desired places depending on the use thereof and supply them to the desired places, in which diluted brine having a concentration of 2.8 ~ 3.0%, which is obtained by pumping saturated brine having a concentration of 28 ~ 30% stored in a brine storage tank, and water, stored in a feed water supply tank, through a saturated brine supply pump and a feed water supply pump, respectively, and then mixing them in a pipe, is continuously supplied to an electrolyzer, and the diluted brine supplied to the electrolyzer is electrolyzed, thus producing sodium hypochlorite having an effective chlorine concentration of 7000 ~ 8000 ppm, and then the produced sodium hypochlorite is continuously discharged by the pressure of the pipe, wherein two or more solenoid valves, comprising respective flow control valves which can control the flow rate of feed water depending on the effective chlorine concentration of the sodium chlorite, are provided in parallel between an antiseptic solution discharge pipe connected to a sodium hypochlorite discharge port and a water supply pipe, thus obtaining a chlorine-containing antiseptic solution in which the sodium hypochlorite is diluted with the feed water in accordance with the opening and closing values of the previously set flow control valves and the number of times that the solenoid valves are opened and closed.

[2] Generally, food materials, such as vegetables, etc., dishes, kitchen utensils, and the like, which are required to be sterilized and sanitized, can be properly sterilized and sanitized only when materials which are to be cleaned can be conveniently sterilized.

[3] Conventional sterilization and disinfection methods include methods of cleaning materials using chemicals containing chlouine and using ozone.

[4] However, the method of cheaning materials using chemicals containing chlorine is problematic in that it is difficult for the user to control the necessary density of chemicals correctly, and chemical residues remain after using and costs are high.

[5] Further, the method of using ozone is problematic in that the sterilizing and dis-infecting effects are decreased due to ozone dissolution in water, and in that ozone residues are discharged into the atmosphere and therefore harmful to user's health due to the use of ozone in high concentrations.

[6] Meanwhile, sodium hypochlorite (NaOCl) is a colorless and transparent liquid type of chlorine disinfectant having a strong chlorine odor, which is used for a sterilizer in a water purification plant or a sewage disposal plant, in a boiler for cooling water in a general chemical factory, with water in a desalting process, cooling water treatment in a power plant, treatment of drinking water, plants and vegetables, meat processing, cleaning of swimming pools, and paper making, and is used as a bleaching agent for home use.

[7] In a non-diaphragm type sodium hypochlorite producing apparatus used for producing such sodium hypochlorite, saturated brine of a predetermined amount and pressure, in which 28 ~ 30% of sodium chloride is dissolved by immersing a large amount of sodium chloride in water mixed with feed water, having a predetermined amount and a predetermined pressure, and then leaving it for 8 ~ 24 hours, is mixed with water while it passes through a pump, thus obtaining diluted brine having a constant salinity of 2.8 ~ 3.0%. The diluted brine passes through an electrolyzer having a series of electrodes (anodes and cathodes) and having no diaphragm (ion exchange membrane), and thus the sodium chloride included in the diluted brine is electrolyzed by direct current applied to both sides of the electrodes.

[8] Within the electrolyzer, the diluted brine solution?which is a good conductor of electricity-supports a current applied between the positive and negative electrodes, thus electrolyzing the sodium chloride solution. This results in chlorine(Cl_2) gas being produced at the positive electrode (anode), while sodium hydroxide (NaOH) and hydrogen (H_2) gas are produced at the negative electrode (cathode). The chlorine further reacts with the hydroxide to form sodium hypochlorite (NaOCl). This reaction can be simplified as follows:

[9] $NaCl + H_20 + Electricity \rightarrow NaOCl + H_2$

[10] Salt Water Sodium Hypochlorite Hydrogen

[11]

[12] The sodium hypochlorite produced as above is a safe form of chlorine and is used as a chlorine disinfectant or an oxidant in a place which is required to be disinfected or oxidized, the production and concentration of the sodium hypochlorite depend on Faraday's law, and the production and concentration thereof is determined by the diluted brine, in which feed water and saturated brine are mixed.

[13] Meanwhile, as shown in FIG. 1, in a conventional apparatus for producing a chlorine-containing antiseptic solution, an outlet of a feed water supply pump 5,

connected to a water supply pipe 1, is connected to a diluted brine inlet 7a of an electrolyzer 7 through a flow meter 2 and a flow control valve 3 and is connected to a feed water supply port of a brine storage tank 4 through an electric valve 10, the outlet of the feed water supply pump 5 is connected to an antiseptic solution supply pipe 12 through a flow control valve 3a and a solenoid valve 10, a saturated brine outlet of the brine storage tank 4 is connected to the diluted brine inlet 7a of the electrolyzer 7 through a saturated brine supply pump 6, and a sodium hypochlorite discharge port 7b of the electrolyzer 7, as shown by the imaginary line of FIG. 1, is directly connected to the antiseptic solution supply pipe 12, or is connected to an additional sodium hypochlorite storage tank 7c. Here, when the sodium hypochlorite discharge port 7b of the electrolyzer 7 is connected to the additional sodium hypochlorite storage tank 7c, a sodium hypochlorite supply pump 7d is provided between the sodium hypochlorite storage tank 7c and the antiseptic solution supply pipe 12.

[14]

Background Art

[15] The above conventional apparatus for producing a chlorine-containing antiseptic solution is configured such that the flow rate and pressure of feed water are controlled by mounting an electric switching valve, a pressure reducing valve or a flow control valve in a pipe which diverges from a faucet or a water supply pipe, in which hydraulic pressure is previously created, and is introduced into an electrolyzer. However, the conventional apparatus for producing a chlorine-containing antiseptic solution is problematic in that when the pressure in the pipe changes, the flow rate and pressure of the feed water introduced into the electrolyzer also changes, and thus the production and concentration of sodium hypochlorite, produced in the electrolyzer, are varied, in that when the amount of feed water is rapidly decreased, the electrolyzer is excessively heated and is thus damaged, and in that when the electric current is turned off during the operation of the electrolyzer, the opened electric switching valve is not closed, so that feed water is continuously supplied to the electrolyzer, which is not being ope rated, thereby decreasing the concentration of the sodium hypochlorite which is previously produced and stored in a sodium hypochlorite storage tank or causing the sodium hypochlorite storage tank to overflow.

[16] Further, the conventional apparatus for producing a chlorine-containing antiseptic solution is inconvenient in that, since the flow control valve and solenoid valve, which is provided between the feed water supply pump and the antiseptic solution supply pipe in order to obtain a chlorine-containing antiseptic solution having a desired con-centration in accordance with materials which are to be cleaned by diluting sodium hypochlorite discharged from the electrolyzer with a predetermined amount of feed

water, are serially mounted in sequence, the flow control valve must be controlled in every case corresponding to the use of disinfectant.

[17] Furthermore, the conventional apparatus for producing a chlorine-containing antiseptic solution is inconvenient in that when a sodium hypochlorite discharge port of the electrolyzer is connected to an additional sodium hypochlorite storage tank, a sodium hypochlorite supply pump must be additionally provided between the sodium hypochlorite storage tank and the antiseptic solution supply pipe, and thus the amount of sodium hypochlorite supply must be controlled depending on the amount and pressure of feed water, and is problematic in that since the sodium hypochlorite storage tank and sodium hypochlorite supply pump must be additionally provided, the production cost of the chlorine-containing antiseptic solution is increased.

[18] Therefore, recently, Korean Patent Registration No. 10-0443894 disclosed an apparatus for producing an antiseptic solution, comprising an electrolyzer for producing and discharging a sodium hypochlorite-containing antiseptic by electrolyzing faucet water and 20% brine using a plurality of anodes/cathodes, which are alternately disposed and are formed of platinum group metals; a brine supply pump for supplying brine to the electrolyzer; a solenoid valve for automatically controlling and supplying the faucet water introduced into the electrolyzer; a pressure reducing valve for maintaining a constant concentration of the antiseptic solution produced in the electrolyzer by maintaining the faucet water introduced into the electrolyzer at a constant pressure; a control unit for controlling a series of antiseptic solution-producing processes occurring in the electrolyzer; a power supply circuit for supplying electrolytic current to the electrodes of the electrolyzer; a cooling fan for radiating the heat generated from the power supply circuit; and a case for housing the above constituent units therein, wherein the electrodes are provided in the electrolyzer in the form of a double watertight structure formed of silicon packing and epoxy resin in order to prevent a water leakage phenomenon, the brine supply pump is configured to pump brine from a brine tank and supply the brine to the electrolyzer, a micronozzle for filtering impurities present in the brine tank is provided at the end of a brine supply hose connected between the brine supply pump and the brine tank, the diameter of an antiseptic solution discharge port formed in the electrolyzer is larger than the diameter of a faucet water inlet formed in the electrolyzer, the pressure reducing valve is configured to protrude out of the case, and a reset switch, which can be manipulated to cut off power supply and simultaneously initialize control states when abnormal phenomena occur, is provided outside the case.

[19] However, the above apparatus for producing an antiseptic solution is inconvenient in that users must prepare 20% diluted brine every time by stirring and dissolving sodium chloride in water by hand and then putting the sodium chloride solution into

the additional brine tank, and is troublesome in that whenever the 20% diluted brine charged in the brine tank is completely exhausted, 20% diluted brine must be prepared and then charged into the brine tank every time.

[20] Further, in order to accurately prepare 20% diluted brine, the amount of sodium chloride must be accurately measured using an additional measuring balance or measuring cup, and must then be put into the brine tank. Therefore, this method is problematic in that it is difficult to use because it is a quantitative dilution method, and in that the consumption of sodium chloride is increased several times because highly-concentrated diluted brine having a concentration of 20% is used, whereas economically-concentrated diluted brine, having a concentration of 2.8 ~ 3.0%, is used worldwide.

[21] Further, in the apparatus for producing an antiseptic solution, there is a problem in that sodium chloride is not easily dissolved in 20% diluted brine itself, so that the salinity of diluted brine varies with the passage of time when the diluted brine remaining in the brine tank is continuously used, with the result that the effective chlorine concentration of the sodium hypochlorite, produced through electrolysis in the electrolyzer, also varies, whereby a chlorine-containing antiseptic solution having a constant concentration is not continuously produced.

[22] Moreover, in the apparatus for producing an antiseptic solution, there is a problem in that a large amount of unreacted sodium chloride, which is not dissolved in water, is necessarily included in an antiseptic solution, so that a large amount of unreacted sodium ion remains in antiseptic solution and on objects which are to be disinfected, with the result that spots(salt stain) occur on the objects, thereby damaging the human body.

[23] Meanwhile, in the apparatus for producing an antiseptic solution, there are problems in that the production cost of antiseptic solution is increased and the life span thereof is very short because the electrodes of the electrolyzer are formed of expensive platinum group metals, and, since the case of the electrolyzer is not transparent, the time to change the electrodes cannot be accurately observed because users cannot observe with the naked eye whether or not electrolysis occurs and whether or not each of the electrodes is worn or scaled to some extent. Further, there is a problem in that since silicon packing and epoxy resin, which are chemically harmful to the human body, are used for the electrodes in order to prevent a water leakage phenomenon, chemical components partially discharged from the silicon packing and epoxy resin enter solution with the sodium hypochlorite through electrolysis in the electrolyzer, thus damaging the human body.

[24]

Disclosure of Invention

Technical Problem

[25] Accordingly, the present invention has been made keeping in mind the above problems occurring in the prior art, and an object of the present invention is to provide an apparatus for producing a chlorine-containing antiseptic solution which can continuously produce chlorine-containing antiseptic solutions having low concentrations, medium concentrations and high concentrations, or different stepwise concentrations suitable for desired places depending on the use thereof, and supply them to the desired places, in which diluted brine having a concentration of 2.8 ~ 3.0%, which is obtained by pumping saturated brine having a concentration of 28 ~ 30% stored in a brine storage tank, and water, stored in a feed water supply tank, through a saturated brine supply pump and a feed water supply pump, respectively, and then mixing them in a tube body, is continuously supplied to an electrolyzer, and the diluted brine supplied to the electrolyzer is electrolyzed, thus producing sodium hypochlorite having an effective chlorine concentration of 7000 ~ 8000 ppm, and then the produced sodium hypochlorite is continuously discharged by the pressure of the pipe, wherein two or more solenoid valves, comprising respective flow control valves which can control the flow rate of feed water depending on the effective chlorine concentration of the sodium chlorite, are provided in parallel between an antiseptic solution discharge pipe connected to a sodium hypochlorite discharge port and a water supply pipe, thus obtaining a chlorine-containing antiseptic solution in which the sodium hypochlorite is diluted with the feed water in accordance with the opening and closing values of the previously set flow control valves and the number of times that the solenoid valves are opened and closed.

[26] Another object of the present invention is to provide an apparatus for producing a chlorine-containing antiseptic solution, which can maintain the amount and concentration of produced sodium hypochlorite constant regardless of the amount and pressure of supplied water because the amount and pressure of feed water supplied to an electrolyzer used to produce sodium hypochlorite can be maintained constant regardless of any change in pressure of the feed water supplied through a water supply pipe by putting a predetermined amount of feed water into a feed water supply tank provided with a float valve and then discharging the feed water at a predetermined pressure, and which can greatly improve the reliability of the product by minimizing interruptions in the production of sodium hypochlorite using a protective device which is additionally provided in the apparatus for producing a chlorine-containing antiseptic solution, depending on the changes in the amount and pressure of feed water.

[27] A further object of the present invention is to provide an apparatus for producing a

chlorine-containing antiseptic solution, which can decrease the production cost of an antiseptic solution using cheap and long-lasting electrodes in which ruthenium is plated on titanium plates as the electrodes of an electrolyzer and can increase the life span thereof, which can observe whether or not electrolysis occurs and whether or not each of the electrodes is worn or scaled to some extent with the naked eye, and thus can accurately observe the time to change the electrodes, by forming part or all of the case of the electrolyzer from acrylic resin, and which can preemptively prevent chemical components discharged from packings from damaging the human body by forming the packings, which are provided to prevent a water leakage phenomenon occurring in the frame, front and rear plates, and electrode connection parts, with fluorine-containing rubber having resistance to chlorine.

[28]

Technical Solution

[29] In order to accomplish the above objects, the present invention provides an apparatus for producing a chlorine-containing antiseptic solution, in which diluted brine is produced by mixing saturated brine stored in a brine storage tank with feed water at a predetermined ratio, sodium hypochlorite is produced by passing the produced diluted brine through an electrolyzer, and then a chlorine-containing antiseptic solution is produced by mixing the produced sodium hypochlorite with feed water at a desired ratio, including a feed water supply tank that is provided with a float valve and constantly stores feed water supplied from a water supply pipe; a brine storage tank that stores saturated brine having a concentration of 28 ~ 30% produced by immersing sodium chloride in a predetermined amount of water for 8 ~ 24 hours; a feed water supply pump and a saturated brine supply pump that pump feed water stored in the feed water supply tank and saturated brine stored in the brine storage tank, respectively, form diluted brine having a concentration of 2.8 ~ 3.0% by mixing the feed water and the saturated brine in a tube body provided between each of the pumps and a diluted brine inlet of an electrolyzer, and then supply the diluted brine to the electrolyzer; the electrolyzer that produces sodium hypochlorite by continuously electrolyzing the diluted brine introduced thereinto through the diluted brine inlet by the feed water supply pump and saturated brine supply pump, and then discharges the produced sodium hypochlorite to an antiseptic solution supply pipe through a sodium hypochlorite discharge port using pumping pressure of the two pumps; flow control valves that are connected in parallel between a flow meter connected to the water supply pipe and the antiseptic solution supply pipe connected to the sodium hypochlorite discharge port of the electrolyzer, and allow a desired amount of feed water to pass therethrough; solenoid valves that are connected in parallel to the

antiseptic solution supply pipe while being connected in series to the flow control valves, and are opened and closed in response to output signals transmitted from a control unit, thereby allowing the feed water of an amount corresponding to the set opening and closing values of the respective flow control valves connected to the respective solenoid valves and thus diluting sodium hypochlorite discharged from the electrolyzer with the feed water, thus providing a chlorine-containing antiseptic solution at a consuming site in which sodium hypochlorite is diluted to a ppm level; and the control unit that drives the feed water supply pump and the saturated brine supply pump and opens only a solenoid valve selected by a user among the solenoid valves when a power supply switch is switched to "ON" by a user.

[30] If necessary, the apparatus for producing a chlorine-containing antiseptic solution may further include a flow sensor which is provided at a front end of the flow meter and includes a flow rate indicator for digitally indicating a flow rate of feed water. Therefore, when users set the amount of water passing through the solenoid valves, connected in series to the flow control valves, they can observe the flow rate indicated in the flow rate indicator and the quantity of flow indicated in the flow meter, and thus they can accurately set the amount of water.

[31] Here, the float valve provided in the feed water supply tank may include a valve for controlling the supply of water through the water supply pipe, a float ball, moving up and down depending on the water level in the feed water supply tank, and an actuation rod, which is provided between the valve and float ball and an angle of which changes depending on the change in the location of the float ball caused by the change in the water level of the feed water supply tank, thus controlling the opening and closing values of the valve.

[32] Further, each of the feed water supply pump and the saturated brine supply pump may be any one selected from among a pump including a separate corrugated tube(bellows) and a pump including two corrugated tubes(bellows) integrally formed.

[33] Further, the electrolyzer includes a quadrangular frame that has a space in which anodes and cathodes are provided and has an inlet port and an outlet port formed at upper and lower portions thereof; the anodes and cathodes that are alternately disposed in both sides of the space of the frame at regular intervals while being horizontally aligned with each other with gaps defined therebetween, the gaps being positioned at one end of the frame; front and rear plates that hold the anodes and the cathodes while covering front and rear sides of the frame; and packings formed of fluorine-containing rubber that are provided between the frame and the front and rear plates to form seals therebetween. Here, the frame and the front and rear plates may be partially or entirely formed of transparent acrylic resin.

[34] In this case, the cathode may be a titanium plate without change, and the anode may

be a titanium plate plated with ruthenium. Here, the packings, which are formed of fluorine-containing rubber, are provided between a bolt-type fastener for fastening the anode and the cathode into any one of the front and rear plates and a fastener insert hole formed in the one of the front and rear plates.

[35] As described above, first, the apparatus for producing a chlorine-containing antiseptic solution according to the present invention can continuously produce chlorine-containing antiseptic solutions having low concentrations, medium concentrations and high concentrations, or different stepwise concentrations suitable for desired places depending on the use thereof, and can supply them to the desired places, in which diluted brine having a concentration of 2.8 ~ 3.0%, which is obtained by pumping saturated brine having a concentration of 28 ~ 30%, stored in a brine storage tank, and water, stored in a feed water supply tank, through a saturated brine supply pump and a feed water supply pump, respectively, and then mixing them in a tube body, is continuously supplied to an electrolyzer, and the diluted brine, supplied to the electrolyzer, is electrolyzed, thus producing sodium hypochlorite having an effective chlorine concentration of 7000 ~ 8000 ppm, and then the produced sodium hypochlorite is continuously discharged by the pressure of the pipe, wherein two or more solenoid valves, comprising respective flow control valves which can control the flow rate of feed water depending on the effective chlorine concentration of the sodium chlorite, are provided in parallel between an antiseptic solution discharge pipe, connected to a sodium hypochlorite discharge port, and a water supply pipe, thus obtaining a chlorine-containing antiseptic solution in which the sodium hypochlorite is diluted with the feed water in accordance with the opening and closing values of the previously set flow control valves and the number of times that the solenoid valves are opened and closed.

[36] Second, the apparatus for producing a chlorine-containing antiseptic solution according to the present invention can maintain the amount and concentration of produced sodium hypochlorite constant regardless of the amount and pressure of supplied water because the amount and pressure of feed water supplied to an electrolyzer used to produce sodium hypochlorite can be maintained constant regardless of any change in the pressure of feed water supplied through a water supply pipe by putting a predetermined amount of feed water into a feed water supply tank provided with a float valve and then discharging the feed water at a predetermined pressure, and can greatly improve the reliability of the product by minimizing interruptions in the production of sodium hypochlorite using a protective device which is additionally provided in the apparatus for producing a chlorine-containing antiseptic solution depending on the changes in the amount and pressure of feed water.

[37] Third, the apparatus for producing a chlorine-containing antiseptic solution

according to the present invention can decrease the production cost of the antiseptic solution using cheap and long-lasting electrodes in which ruthenium is plated on titanium plates to form the electrodes of an electrolyzer, and can increase the life span thereof, can observe whether or not electrolysis occurs and whether or not each of the electrodes is worn or scaled to some extent, with the naked eye and thus enables accurate determination of the time to change the electrodes, by forming part or all of the case of the electrolyzer from transparent acrylic resin, and can preemptively prevent chemical components discharged from packings from damaging the human body by forming the packings, which are provided to prevent a water leakage phenomenon occurring in a frame, front and rear plates, and electrode connection parts, with fluorine-containing rubber having resistance to chlorine.

[38]

Brief Description of the Drawings

[39] FIG. 1 is a schematic view showing a conventional apparatus for producing a chlorine-containing antiseptic solution;

[40] FIG. 2 is a schematic view showing an apparatus for producing a chlorine-containing antiseptic solution according to the present invention;

[41] FIG. 3 is an exploded perspective view showing an electrolyzer in the apparatus for producing a chlorine-containing antiseptic solution according to the present invention; and

[42] FIG. 4 is a top cross-sectional view showing an assembled electrolyzer in the apparatus for producing a chlorine-containing antiseptic solution according to the present invention.

[43] * Description of the elements in the drawings *

[44] 1 : water supply pipe 2 : flow meter

[45] 3 : flow control valve 4 : brine storage tank

[46] 5 : feed water supply pump

[47] 6 : saturated brine supply pump

[48] 7 : electrolyzer 8 : feed water supply tank

[49] 9 : float valve 11 : electric valve

[50] 12 : antiseptic solution supply pipe 13 : solenoid valve

[51] 14 : control unit 7a : diluted brine inlet

[52] 7b : sodium hypochlorite discharge port 70 : frame

[53] 71, 72 : front plate and rear plate

[54] 73, 74 : anode and cathode

[55] 75 : gap 76 : bolt-type fastener

[56] 77 : fastener insert hole 78,79 : packing

[57] 91 : valve 92 : actuation rod

[58] 93 : float ball

[59]

Best Mode for Carrying Out the Invention

[60] Hereinafter, preferred embodiments of the present invention will be described in detail with the attached drawings.

[61] FIG. 2 is a schematic view showing an apparatus for producing a chlorine-containing antiseptic solution according to the present invention, FIG. 3 is an exploded perspective view showing an electrolyzer in the apparatus for producing a chlorine-containing antiseptic solution according to the present invention, and FIG. 4 is a top cross-sectional view showing an assembled electrolyzer in the apparatus for producing a chlorine-containing antiseptic solution according to the present invention.

[62] According to the present invention, the apparatus for producing a chlorine-containing antiseptic solution, in which diluted brine is produced by mixing saturated brine stored in a brine storage tank 4 with feed water at a predetermined ratio, sodium hypochlorite is produced by passing the produced diluted brine through an electrolyzer 7, and then a chlorine-containing antiseptic solution is produced by mixing the produced sodium hypochlorite with feed water at a desired ratio, includes a feed water supply tank 8 that is provided with a float valve 9, constantly stores feed water supplied from a water supply pipe 1, and provides water necessary for diluted brine; a brine storage tank 4 that stores saturated brine having a concentration of 28 ~ 30% produced by immersing sodium chloride in a predetermined amount of water constantly supplied depending on the discharge amount of saturated brine for 8 ~ 24 hours, and constantly supplies the saturated brine in an amount thereof necessary for diluted brine; a feed water supply pump and a saturated brine supply pump 5 and 6 that pump feed water stored in the feed water supply tank 8 and saturated brine stored in the brine storage tank 4, respectively, form diluted brine having a concentration of 2.8 ~ 3.0% by mixing the feed water and saturated brine in a tube body provided between each of the pumps 5 and 6 and a diluted brine inlet 7a of an electrolyzer 7, and then supply the diluted brine to the electrolyzer 7; the electrolyzer 7 that produces sodium hypochlorite by continuously electrolyzing the diluted brine introduced thereinto through the diluted brine inlet by the feed water supply pump 5 and saturated brine supply pump 6, and then discharges the produced sodium hypochlorite to an antiseptic solution supply pipe 12 through a sodium hypochlorite discharge port 7b using the pumping pressure of the two pumps 5 and 6; flow control valves 3 that are connected in parallel between a flow meter 2 connected to the water supply pipe 1 and an antiseptic solution supply pipe 12 connected to the sodium hypochlorite discharge port

7b of the electrolyzer 7, and allow a desired amount of feed water to pass therethrough; solenoid valves 13 that are connected in parallel to the antiseptic solution supply pipe 12 while being connected in series to the flow control valves 3, and are opened and closed in response to output signals transmitted from a control unit 14, thereby allowing the feed water of an amount corresponding to the set opening and closing values of the respective flow control valves 3 connected to the respective solenoid valves 13 and thus diluting sodium hypochlorite discharged from the electrolyzer 7 with the feed water, thus providing a chlorine-containing antiseptic solution at a consuming site in which sodium hypochlorite is diluted to a ppm level; and the control unit 14 that drives the feed water supply pump 5 and saturated brine supply pump and opens only a solenoid valve selected by a user among the solenoid valves 13 when a power supply switch is switched to "ON" by a user.

[63] If necessary, the apparatus for producing a chlorine-containing antiseptic solution may further include a flow sensor 16 which is provided at a front end of the flow meter 2 and includes a flow rate indicator 15 for digitally indicating a flow rate of feed water. Therefore, when users set the amount of water passing through the solenoid valves 13, connected in series to the flow control valves 3, they can observe the flow rate indicated in the flow rate indicator 15 and the quantity of flow indicated in the flow meter 2, and thus they can accurately set the amount of water.

[64] Here, the float valve 9 provided in the feed water supply tank 8 may include a valve 91 for controlling the supply of water through the water supply pipe 1, a float ball 93 moving up and down depending on the water level in the feed water supply tank 8, and an actuation rod 92, which is provided between the valve 91 and float ball 93 and an angle of which changes depending on the change in the location of the float ball 93 caused by the change in the water level of the feed water supply tank 8, thus controlling the opening and closing values of the valve 91.

[65] Further, each of the feed water supply pump 5 and saturated brine supply pump 6 may be any one selected from among a pump including a separate corrugated tube and a pump including two corrugated tubes integrally formed.

[66] Further, the electrolyzer 7 includes a quadrangular frame 70 that has a space in which anodes 73 and cathodes 74 are provided and has an inlet port 7a and an outlet port 7b formed at upper and lower portions thereof; the anodes 73 and cathodes 74 that are alternately disposed on both sides of the space of the frame 70 at regular intervals while being horizontally aligned with each other with gaps 75 defined therebetween, the gaps 75 being positioned at one end of the frame 70; front and rear plates 71 and 72 that hold the anodes 73 and cathodes 74 while covering front and rear sides of the frame 70; and packings 79 formed of fluorine-containing rubber that are provided between the frame 70 and the front and rear plates 71 and 72 to form seals

therebetween. Here, the frame 70 and the front and rear plates 71 and 72 may be partially or entirely formed of transparent acrylic resin.

[67] In this case, a packing 78, which is formed of fluorine-containing rubber, is provided between a bolt-type fastener 76 for fastening the anode 73 and cathode 74 into any one of the front and rear plates 71 and 72 and a fastener insert hole 77 formed in the one of the front and rear plates.

[68] Hereinafter, the operation and effect of the apparatus for producing a chlorine-containing antiseptic solution according to the present invention will be described.

[69] First, the apparatus for producing a chlorine-containing antiseptic solution according to the present invention includes a feed water supply tank 8 provided with a float valve 9, a brine storage tank 4 for storing saturated brine having a concentration of 28 ~ 30%, a feed water supply pump 5, a saturated brine supply pump 6, an electrolyzer 7, flow control valves 3, solenoid valves 13, and a control unit 13.

[70] Here, since the feed water supply tank 8 is provided with the float valve including a valve 91, a float ball 93 and an actuation rod 92, the feed water supply tank 8 stores a predetermined amount of feed water supplied from the water supply pipe 1 and continuously supplies water necessary for diluted brine in response to the actuation of the feed water supply pump 5.

[71] Namely, since the feed water supply tank 8 is continuously supplied with water through the float valve 9 in an amount corresponding to the amount of feed water discharged from the feed water supply 8, the water level in the feed water supply tank 8 is maintained constant, and feed water is supplied in a predetermined amount and at a predetermined pressure.

[72] That is, since feed water is discharged through the feed water supply pump 5, the float ball 93 of the float valve 9 provided in the feed water supply tank 8 connected to the water supply pipe 1 descends depending on the change in the water level in the feed water supply tank 8, and thus the actuation rod 92 also descends and rotates around the valve 91 depending on the descent of the float ball 93, so that the valve 91 is opened depending on the change in the angle of the actuation rod, and a water conduit is opened, and thus water is supplied from the water supply pipe 1 to the feed water supply tank 8, with the result that when the water level in the feed water supply tank 8 rises and reaches a predetermined level due to the supply of water, the valve 91 is closed depending on the ascent of the float ball 93, thereby maintaining the water level in the feed water supply tank 8 constant.

[73] Therefore, the apparatus for producing a chlorine-containing antiseptic solution according to the present invention can maintain the amount and concentration of produced sodium hypochlorite through the feed water supply pump 5 constant regardless of the amount and pressure of supplied water, and can greatly improve the

reliability of a product by minimizing interruptions in the production of sodium hypochlorite using a protective device which is additionally provided in the apparatus for producing a chlorine-containing antiseptic solution depending on changes in the amount and pressure of feed water.

[74] Further, the brine storage tank 4 serves to store and continuously supply saturated brine having a concentration of 28 ~ 30% by immersing sodium chloride in a pre-determined amount of water and then leaving it therein for 8 ~ 24 hours. The brine storage tank 4 includes a water level sensor (not shown) and an electric valve 91 mounted on a tube body located between the water supply pipe 1 and an inlet. Therefore, when the water level sensor detects the fact that the amount of the saturated brine, discharged depending on the driving torque of the saturated brine supply pump 6, drops below a predetermined amount, the control unit 14 repeatedly conducts the operation of opening the electric valve 11 and replenishing water in the brine storage tank 4, thus allowing the brine storage tank 4 to store a predetermined amount of saturated brine.

[75] Meanwhile, the feed water supply pump 5 is provided between the feed water supply tank 8 and the electrolyzer, and the saturated brine supply pump 6 is provided between the brine storage tank 4 and the electrolyzer. The feed water supply pump 5 and the saturated brine supply pump 6 pump the feed water stored in the feed water supply tank and the saturated brine at a predetermined ratio (for example, at a ratio of 9:1), the mixture of the feed water and saturated brine is changed into diluted brine having a concentration of 2.8 ~ 3.0% in a tube body provided between the outlets of the feed water supply pump 5, the saturated brine supply pump 6 and the diluted brine inlet 7a of the electrolyzer 7, and then the diluted brine is supplied to the electrolyzer 7.

[76] In this case, each of the feed water supply pump 5 and the saturated brine supply pump 6 may be any one selected from among a pump including a separate corrugated tube and a pump including two corrugated tubes integrally formed.

[77] Further, the electrolyzer 7, which produces sodium hypochlorite by continuously electrolyzing the diluted brine supplied into the electrolyzer through the diluted brine inlet 7a using the pumping operation of the feed water supply pump 5 and the saturated brine supply pump 6, may be a commonly-used electrolyzer. However, in the present invention, the electrolyzer includes a quadrangular frame 70 partially or entirely formed of acrylic resin; front and rear plates 71 and 72 partially or entirely formed of acrylic resin; anodes 73 and cathodes 74; and a packing 79 having resistance to chlorine, which is formed of fluorine-containing rubber.

[78] That is, in the electrolyzer 7, the anodes 73 and cathodes 74 are alternately disposed in both sides of the space of the quadrangular frame 70 at regular intervals while they are maintained horizontal between gaps 75 provided at one end of the frame 70, and

the front and rear plates 71 and 72, formed of transparent acrylic resin, are disposed between the front and rear openings of the frame 70, and are thus fixed to each other. Here, the frame 70 and the front and rear plates 71 and 72 are sealed by providing a packing 79 having resistance to chlorine, which is formed of fluorine-containing rubber, therebetween, and the anode and cathode 73 and 74 are fixed to either one of the front and rear plates 71 and 72 using a bolt-type fastener 76.

[79] Moreover, the cathode 74 may be a titanium plate without change, and the anode 73 may be a titanium plate plated with ruthenium. Here, a packing 78, which is formed of fluorine-containing rubber, is provided between the bolt-type fastener 76 for fastening the anode and cathode into any one of the front and rear plates 71 and 72 and a fastener insert hole 77 formed in the front and rear plates.

[80] As described above, the apparatus for producing a chlorine-containing antiseptic solution according to the present invention can decrease the production cost of the electrolyzer 7 because the anode and cathode 73 and 74 of the electrolyzer 7 are cheap and long-lasting titanium plates without change, or are titanium plates on which ruthenium is plated, and can increase the life span thereof, can observe whether or not electrolysis occurs and whether or not each of the electrodes is worn or scaled to some extent, with the naked eye, and thus accurately observe the time to change the electrodes, because the frame 70 and front and rear plates 71 and 72 of the electrolyzer 7 are partially or entirely formed of acrylic resin, and can preemptively prevent chemical components discharged from packings from damaging the human body because the packings 78 and 79, which are provided between the bolt type fastener 76 for fixing the frame 70, front and rear plates 71 and 72 and electrodes and the fastener insert hole 77 in order to prevent a water leakage phenomenon, are formed of fluorine-containing rubber having resistance to chlorine.

[81] The above packing 79 is not limited to that form, and an O-ring may be used as the packing 79.

[82] Further, sodium hypochlorite electrolyzed in the electrolyzer 7 can be smoothly discharged to an antiseptic solution supply pipe 12 using the pumping pressure of the feed water supply pump 5 and saturated brine supply pump 6, without using additional pumps.

[83] Meanwhile, flow control valves 3, which are provided between a flow meter 2 connected to the water supply pipe 1 and an antiseptic solution supply pipe 12 connected to the sodium hypochlorite discharge port 7b of the electrolyzer 7 and control the desired amount of feed water, are connected in parallel to each other. Further, solenoid valves 13, which are connected to the flow control valves 3, are opened and closed depending on the output signals transmitted from the control unit 14, and thus determine whether or not the feed water supplied to the antiseptic solution

supply pipe 12 is supplied thereto, are connected in series to the respective flow control valves 3 by selecting the number thereof corresponding to the number of the flow control valves, and are connected in parallel to the antiseptic solution supply pipe.

[84] Therefore, users control the respective flow control valves 3 depending on the kind of objects which are to be disinfected or cleaned, and thus set the amount of the feed water that can pass through the respective flow control valves. Thereafter, the users turn on an electric valve selection switch corresponding to the desired solenoid valve among the electric valve selection switches provided on a key switch unit (not shown) in response to the solenoid valves 13 connected in series to the respective flow control valves 3.

[85] In the above condition, when users turn on a power supply switch, since the control unit 14 drives the feed water supply pump 6 and the saturated brine supply pump 6 and simultaneously opens only a user-desired solenoid valve, among several solenoid valves 13, feed water is transferred to the antiseptic solution supply pipe 12 through the solenoid valve connected in series to the flow control valve, is diluted with sodium hypochlorite discharged from the electrolyzer 7, and is then automatically discharged to places of use through the antiseptic solution supply pipe 12.

[86] Therefore, since the feed water supplied through the water supply pipe 1 is transferred to the antiseptic solution supply pipe 12 through only a currently opened solenoid valve 13, among several flow control valves 3 connected in parallel to each other depending on the opening and closing values of the flow control valves 3 connected in series to the solenoid valves, and is diluted with sodium hypochlorite discharged from the electrolyzer 7, chlorine-containing antiseptic solutions formed by diluting sodium hypochlorite with feed water at a predetermined ratio can be freely provided to users such that the antiseptic solutions have concentrations suitable for the kinds of user-desired objects which are to be cleaned.

[87] That is, in the case where the flow control valves 3 are connected in series and in parallel to solenoid valves 12 by twos, when users properly set two flow control valves 3 for the purpose of the use of chlorine-containing antiseptic solution, chlorine-containing antiseptic solutions having low concentrations (for example, water in which chlorine is diluted to 100 ppm in order to clean or disinfect hands, dusters, dish towels, cutting boards, and the like), medium concentrations (for example, water in which chlorine is diluted to 50 ppm in order to clean meat and fish) and high concentrations (for example, water in which chlorine is diluted to 30 ppm in order to clean vegetables and fruit) can be provided to the users. Further, in the case where the flow control valves 3 are connected in series and in parallel to solenoid valves 12 in twos or more, when users properly set two or more flow control valves 3 and properly select the operation number of two or more solenoid valves 13 connected in series to the

respective flow control valves 3, chlorine-containing antiseptic solutions having different stepwise concentrations can be produced and provided to the users.

[88] Meanwhile, in the present invention, if necessary, since a flow sensor 16 including a flow rate indicator 15 for indicating the flow rate of feed water may be additionally provided at the front end of the flow meter 2, when users set the amount of water passing through the solenoid valves 13 connected in series to the flow control valves 3, they can observe the flow rate indicated in the flow rate indicator 15 and the quantity of flow indicated in the flow meter 2, and thus they can accurately set the amount of water.

[89] Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

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Claims

[1] An apparatus for producing a chlorine-containing antiseptic solution, in which diluted brine is produced by mixing saturated brine stored in a brine storage tank with feed water at a predetermined ratio, sodium hypochlorite is produced by passing the produced diluted brine through an electrolyzer, and then a chlorine-containing antiseptic solution is produced by mixing the produced sodium hypochlorite with feed water at a desired ratio, comprising:

a feed water supply tank that is provided with a float valve and constantly stores feed water supplied from a water supply pipe;

a brine storage tank that stores saturated brine having a concentration of 28 ~30%, produced by immersing sodium chloride in a predetermined amount of water for 8 ~ 24 hours;

a feed water supply pump and a saturated brine supply pump that pump feed water stored in the feed water supply tank and saturated brine stored in the brine storage tank, respectively, form diluted brine having a concentration of 2.8 ~ 3.0% by mixing the feed water and the saturated brine in a tube body provided between each of the pumps and a diluted brine inlet of an electrolyzer, and then supply the diluted brine to the electrolyzer;

the electrolyzer that produces sodium hypochlorite by continuously electrolyzing the diluted brine introduced thereinto through the diluted brine inlet by the feed water supply pump and saturated brine supply pump, and then discharges the produced sodium hypochlorite to an antiseptic solution supply pipe through a sodium hypochlorite discharge port using pumping pressure of the two pumps;

flow control valves that are connected in parallel between a flow meter connected to the water supply pipe and the antiseptic solution supply pipe connected to the sodium hypochlorite discharge port of the electrolyzer, and allow a desired amount of feed water to pass therethrough;

solenoid valves that are connected in parallel to the antiseptic solution supply pipe while being connected in series to the flow control valves, and are opened and closed in response to output signals transmitted from a control unit, thereby allowing the feed water of an amount corresponding to the set opening and closing values of the respective flow control valves connected to the respective solenoid valves and thus diluting sodium hypochlorite discharged from the electrolyzer with the feed water, thus providing a chlorine-containing antiseptic solution at a consuming site in which sodium hypochlorite is diluted to a ppm level; and

the control unit that drives the feed water supply pump and the saturated brine

supply pump and opens only a solenoid valve selected by a user among the solenoid valves when a power supply switch is switched to "ON" by a user.

[2] The apparatus for producing a chlorine-containing antiseptic solution according to claim 1, further comprising a flow sensor which is provided at a front end of the flow meter and includes a flow rate indicator for digitally indicating a flow rate of feed water.

[3] The apparatus for producing a chlorine-containing antiseptic solution according to claim 1, wherein each of the feed water supply pump and the saturated brine supply pump is any one selected from among a pump comprising a separate corrugated tube(bellows) and a pump comprising two corrugated tubes(bellows) integrally formed.

[4] The apparatus for producing a chlorine-containing antiseptic solution according to claim 1, wherein the electrolyzer comprises:

a quadrangular frame that has a space in which anodes and cathodes are provided and has an inlet port and an outlet port formed at upper and lower portions thereof;

the anodes and cathodes that are alternately disposed in both sides of the space of the frame at regular intervals while being horizontally aligned with each other with gaps defined therebetween, the gaps being positioned at one end of the frame;

front and rear plates that hold the anodes and the cathodes while covering front and rear sides of the frame; and

packings formed of fluorine-containing rubber that are provided between the frame and the front and rear plates to form seals therebetween.

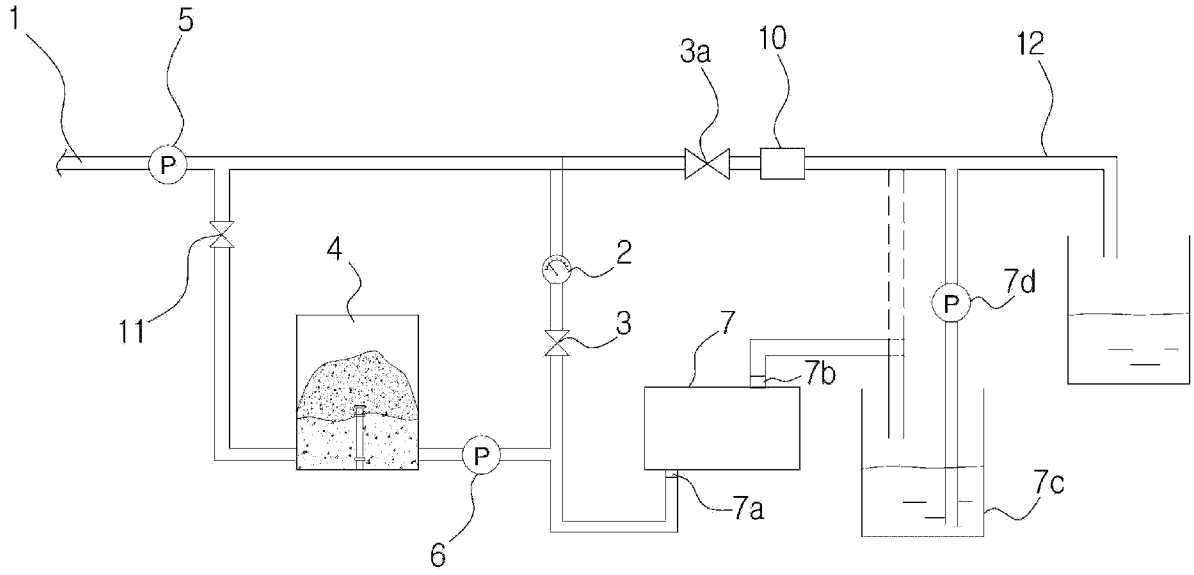
[5] The apparatus for producing a chlorine-containing antiseptic solution according to claim 4, wherein the frame and the front and rear plates are partially or entirely formed of transparent acrylic resin.

[6] The apparatus for producing a chlorine-containing antiseptic solution according to claim 4, wherein the cathode is a titanium plate without change, and the anode is a titanium plate plated with ruthenium

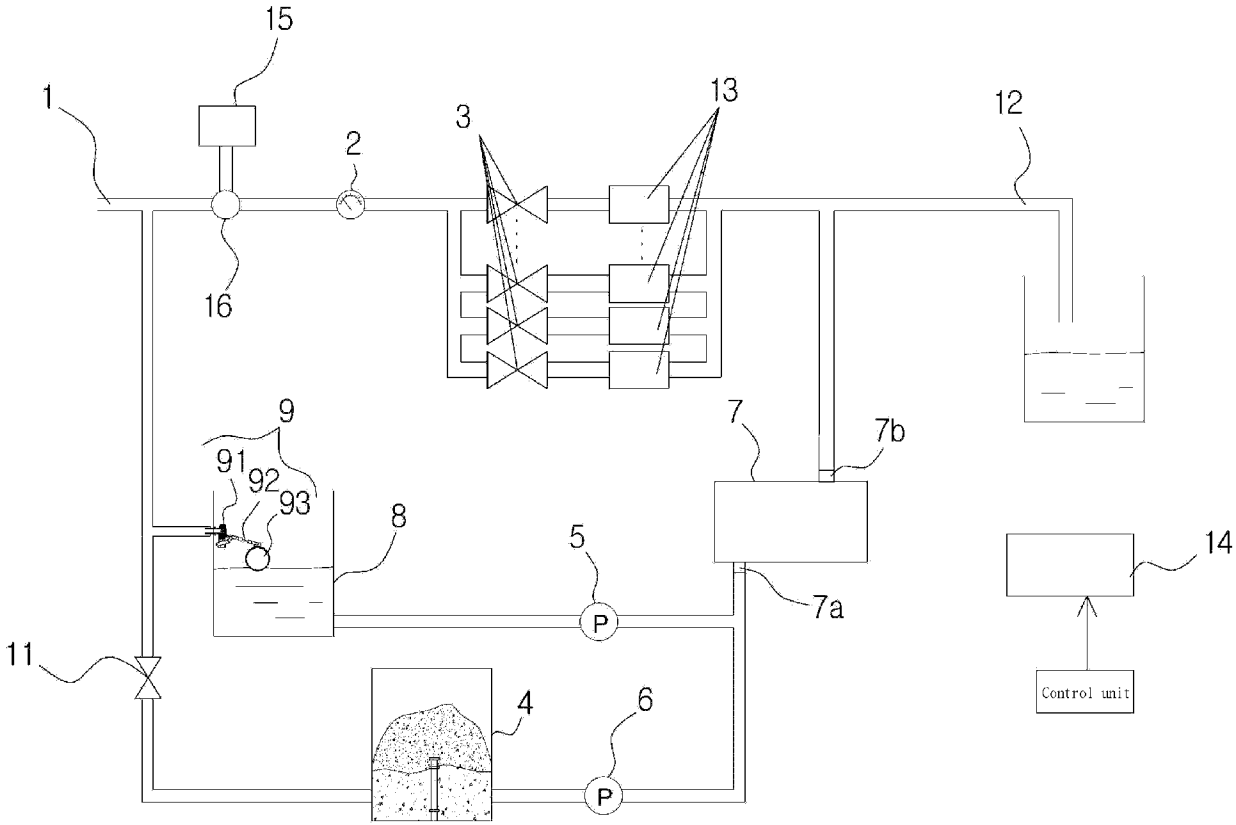
[7] The apparatus for producing a chlorine-containing antiseptic solution according to claim 4, wherein the packings formed of fluorine-containing rubber are provided between a bolt-type fastener for fastening the anode and the cathode into any one of the front and rear plates and a fastener insert hole formed in the one of the front and rear plates.

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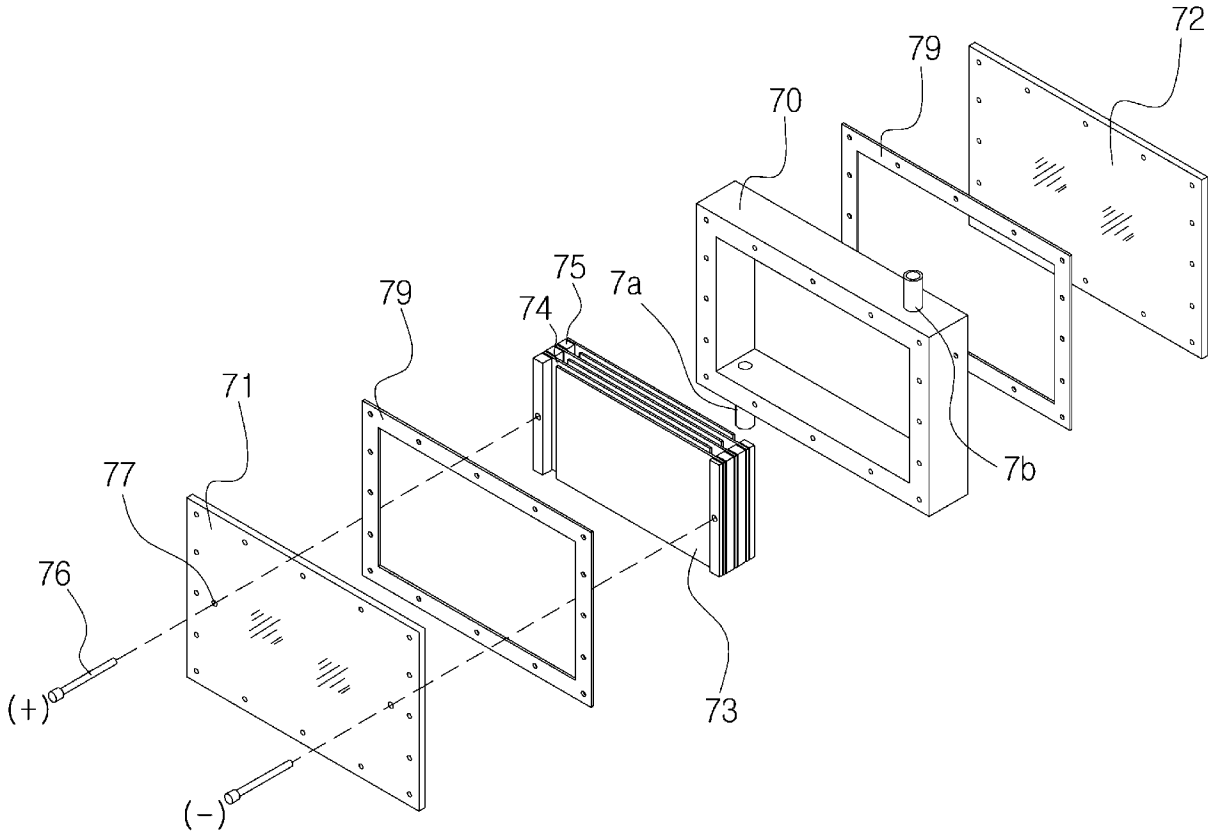
[Fig. 1]



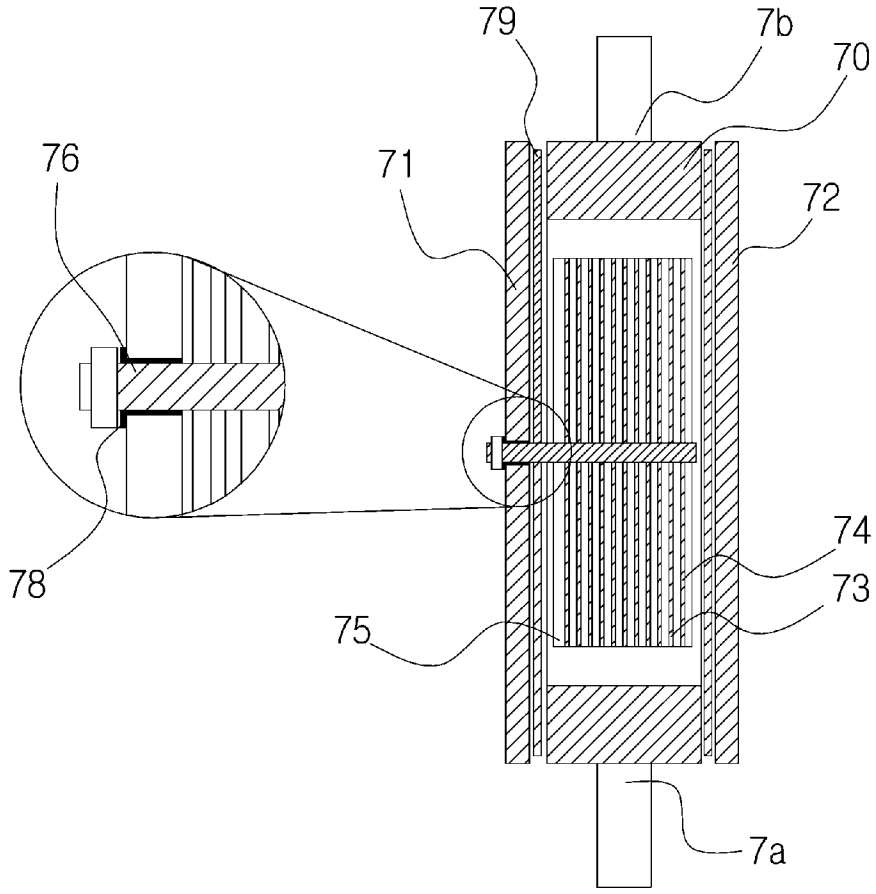
[Fig. 2]



[Fig. 3]



[Fig. 4]



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2007/004266

A. CLASSIFICATION OF SUBJECT MATTER

C02F 1/50(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 8 C02F, B01D

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

Korean Utility Models and applications for Utility Models since 1975
Japanese Utility Models and applications for Utility Models since 1975

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

eKIPSS(KIPO internal) "keyword : electrolytic, brine, water, pump, control, solenoid, hypochlorite"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4,329,215 A (FRANK SCOVILLE) 11 MAY 1982 See abstract, columns 3 and 4, claims 1-3, fig 1	1-7
A	KR 20-0283206 Y1 (SEO, SUN GI) 26 JULY 2002 See abstract, claim 1, fig 2	1-7
A	KR 20-0303854 Y1 (PYO, SOO KIL) 12 FEBRUARY 2003 See abstract, page 3, claim 1, fig 2	1-7
A	US 4,693,806 A (DANIEL M. TUCKER) 15 SEPTEMBER 1987 See abstract, columns 2 and 3, claims 1-3, fig 1	1-7

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

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"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

"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

Date of the actual completion of the international search	Date of mailing of the international search report
12 DECEMBER 2007 (12.12.2007)	**12 DECEMBER 2007 (12.12.2007)**

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
920 Dunsan-dong, Seo-gu, Daejeon 302-701,
Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

PARK, JAE WOO

Telephone No. 82-42-481-5619

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR2007/004266

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4,329,215 A	11.05.1982	NONE	
KR 20-0283206 Y1	26.07.2002	NONE	
KR 20-0303854 Y1	12.02.2003	NONE	
US 4,693,806 A	15.09.1987	NONE	