



(51) International Patent Classification:

C02F 1/467 (2006.01) **B01D 35/14** (2006.01)
C02F 1/44 (2006.01) **B01D 35/16** (2006.01)

(21) International Application Number:

PCT/KR2011/004812

(22) International Filing Date:

30 June 2011 (30.06.2011)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

10-2011-0053494 2 June 2011 (02.06.2011) KR

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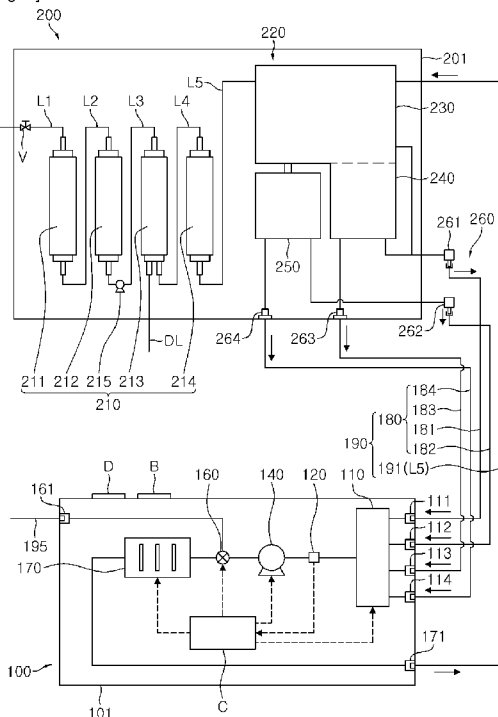
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(81) **Designated States** (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO,
DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,

[Continued on next page]

(54) Title: STERILIZING APPARATUS AND METHOD FOR WATER TREATMENT APPARATUS

[Fig. 2]



(57) **Abstract:** A sterilizing apparatus for a water treatment apparatus in-
cludes: an electrode sterilizing module configured to apply a voltage to an
electrode to produce sterilizing/washing water containing a sterilizing ma-
terial or a washing material; and a connecting member configured to con-
nect the electrode sterilizing module to a passage of the water treatment
apparatus to supply the sterilizing/washing water to the water treatment
apparatus.



HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG,

Published:

— *with international search report (Art. 21(3))*

Description

Title of Invention: STERILIZING APPARATUS AND METHOD FOR WATER TREATMENT APPARATUS

Technical Field

- [1] The present invention relates to a sterilizing apparatus and method for a water treatment apparatus, which can sterilize and/or wash a storage tank of a water treatment apparatus and a passage connected thereto, and more particularly, to a sterilizing apparatus and method for a water treatment apparatus, which generates sterilizing/washing water containing a sterilizing material and/or a washing material by applying power to an electrode, and supplies the sterilizing/washing water to a passage, a storage tank or a water outlet cock provided inside the water treatment apparatus, whereby the passage, the storage tank or the water outlet cock may be sterilized and/or washed. In this specification, the term "sterilizing/washing water" refers to water containing a sterilizing material and/or a washing material generated by an electrode to which power is applied.
- [2] Meanwhile, while the water treatment apparatus (water treatment device) may be used for various purposes, for example, for industrial or home (business) uses, to treat wastewater or typical water or produce ultrapure water, the present invention relates to a water treatment apparatus used for drinking purposes and a sterilizing method thereof. The water treatment apparatus for drinking purposes filters raw water and generates purified water for drinking purposes. Thus, the water treatment apparatus is called a water purifier in a narrow sense. Such a water purifier may be configured to receive raw water and supply a user with room-temperature purified water filtered by a filtering unit, or may be configured to heat/cool room-temperature purified water and supply a user with hot or cold water.
- [3] In addition, one of water treatment apparatuses for drinking purposes is a functional water generator that supplies a variety of functional water, such as deionized water, carbonated water, and oxygenated water, as well as purified water. Furthermore, there is a water heater, a water cooler or an ice maker that heats or cools water, supplied from a water supply unit such as a water bottle, or makes ice. In this specification, the term "water treatment apparatus" is used as a generic term to refer to a multifunctional apparatus having the functions of a water purifier, a functional water generator, a water heater, a water cooler, and an ice maker. For convenience, the water purifier will be taken as an example, but it should be understood that the water purifier is merely an example of the water treatment apparatus of the present invention.

Background Art

- [4] In general, water purifiers are classified into ultra-filtration water purifiers and reverse osmosis water purifiers, depending on a purifying method.
- [5] It is known that reverse osmosis water purifiers are superior in terms of the removal of contaminants, as compared to other purifying methods that have been developed to date.
- [6] A reverse osmosis water purifier may be provided with a filter unit, including a sediment filter, a pre-carbon filter, a reverse osmosis membrane filter, and a post-carbon filter. The sediment filter receives raw water from a raw water supply and removes dust particles, sediment or various floating matter through a fine filter of about 5 microns. The pre-carbon filter removes a harmful chemical such as a carcinogenic material (THM), a synthetic detergent, or an insecticide, and residual chloride, through an absorption method using activated carbon. The reverse osmosis membrane filter is provided with a 0.0001-micron reverse osmosis membrane. The reverse osmosis membrane filter filters a heavy metal (e.g., lead, arsenic, etc.), sodium, and germs, and discharges condensed water through a drain pipe. The post-carbon filter removes unpleasant tastes, smells, and pigments from the water filtered by the reverse osmosis membrane filter.
- [7] In addition, an ultra-filtration water purifier uses an ultra-filtration filter instead of the reverse osmosis membrane filter. The ultra-filtration filter is a porous filter having pores of several tens to hundreds of nanometers in size, and removes contaminants from water through numerous fine pores distributed on the surface of the membrane.
- [8] In such a water purifier, however, microorganisms or germs remaining in pores of the post-carbon filter may be introduced to a storage tank of the water purifier. Thus, microorganisms may re-proliferate inside the storage tank. Furthermore, external germs or microorganisms may penetrate into water stored in the storage tank, or slime may be created on the inner walls of the storage tank.
- [9] It has been proposed that a storage tank may be sterilized through the addition of a separate sterilizing substance to the storage tank in order to sterilize bacteria or microorganisms proliferating in the storage tank.
- [10] However, there arises a problem in terms of a method of adding a sterilizing medicine supply that, since a user or a manager of a water purifier has to supply a separate sterilizing substance, sterilizing process may be difficult, and sterilizing management inconvenient. That is, in case of adding the sterilizing substance, since an automatic injection of the sterilizing substance is impossible, and even in case of that it was possible, the sterilizing substance would have to be filled periodically, making the sterilizing process inconvenient.
- [11] Furthermore, when the sterilizing substance is added to the storage tank, there arises another problem in that in some cases a concentration of the sterilizing substance

becomes higher than necessary, and further, an added amount of the sterilizing substance may be different depending on a user or a manager, and thus, an amount of the sterilizing substance may remain in the water purifier after cleansing process. Therefore, a plurality of rinsing processes is indispensable after a washing process, and when the rinsing processes are not fully performed, it damage to human body may be caused, further dissatisfying persons due to sterilizing substance smell in purified water.

- [12] Meanwhile, a manager of a water purifier has to supply the sterilizing substance, and the cost of sterilizing the water purifier is added, to increase service costs, making a user potentially reluctant to use it.
- [13] In particular, since in most cases, the water purifier itself is not to be sterilized and washed and a service manager has to perform the sterilizing/washing processes, it makes it onerous to perform sterilizing/washing processes, decreasing the reliability of the water purifier.
- [14] Additionally, the condition of the sterilizing substance being dissolved or eluted is different depending on the operating conditions of the water purifier (for example, a raw water pressure, flow amount, etc.). As one example, in case of a flow amount being small, a sterilizing substance concentration may be relatively high, and on the contrary, in a case of the flow amount being excessive, the sterilizing substance concentration becomes lower, thereby causing difficulties in controlling the sterilizing process. Here also, in the case of the sterilizing substance concentration being high, it may smell unpleasant.
- [15] In addition, since a sterilizing material produced from the sterilizing substance consists mainly of material having a low pH or a very high level of OCl^- , it may smells unpleasant, and a sterilizing performance may be 1/7, comparing to that of HOCl , and thus, a much larger amount of OCl^- sterilizing material may be required in order to sterilize a tank having the same capacity.
- [16] Meanwhile, referring to Korean Patent Application No. 2009-0047174, filed by the same applicant as that of the present invention, a washing apparatus and a washing method of a water treatment has been disclosed.
- [17] However, even in case of the patent application by the present applicant, there arises a problem in that a neutralizing process for a sterilizing substance is necessary due to toxicity of the sterilizing substance in the case of a manual sterilizing process using a sterilizing substance and, as a result, it may take an excessive amount of time for a sterilizing of a water treatment apparatus, a neutralizing process for a sterilizing substance, and subsequent rinsing. In addition, there are difficulties in the above-referenced patent application in that a sterilizing substance and a neutralizing material must be supplied directly to a water purifier.

- [18] Accordingly, a novel sterilizing and washing method is called for, different from those disclosed in the prior art.

Disclosure of Invention

Technical Problem

- [19] An aspect of the present invention provides a sterilizing apparatus and method for a water treatment apparatus, which can simply sterilize the water treatment apparatus.
- [20] An aspect of the present invention also provides a sterilizing apparatus and method for a water treatment apparatus, which can generate sterilizing water even without using separate sterilizing chemicals.
- [21] An aspect of the present invention also provides a sterilizing apparatus and method for a water treatment apparatus, which can stably generate high-concentration sterilizing water in a short time.
- [22] An aspect of the present invention also provides a sterilizing apparatus and method for a water treatment apparatus, which can perform not only a sterilizing operation but also a rinsing operation.
- [23] An aspect of the present invention also provides a sterilizing apparatus and method for a water treatment apparatus, which can sterilize not only a storage tank provided at the water treatment apparatus, but also a water outlet cock and a passage communicated with the storage tank.

Solution to Problem

- [24] According to an aspect of the present invention, there is provided a sterilizing apparatus for a water treatment apparatus including: an electrode sterilizing module configured to apply a voltage to an electrode to produce sterilizing/washing water containing a sterilizing material or a washing material; and a connecting member configured to connect the electrode sterilizing module to a passage of the water treatment apparatus to supply the sterilizing/washing water to the water treatment apparatus.
- [25] Preferably, the connecting member may include at least one connecting pipe connected to a water outlet of the water treatment apparatus, and a circulation pipe connected to a filter passage pipe of the water treatment apparatus, a tank water inlet passage pipe, and a storage tank. Then, the connecting pipe may be detachably connected to at least one of a water outlet cock and a drain pipe constituting the water outlet, and the circulation pipe may be detachably connected to the filter passage pipe, the tank water inlet passage pipe, or the storage tank.
- [26] Preferably, the electrode sterilizing module may include an electrode part configured to apply a voltage to an electrode to produce sterilizing/washing water containing a sterilizing material or a washing material, and a pump configured to provide to supply

the sterilizing/washing water produced in the electrode part to the passage of the water treatment apparatus. Then, the electrode part may produce sterilizing/washing water containing a mixed oxidant through electrolysis.

- [27] The electrode sterilizing module may further include a passage converting unit configured to sequentially open some passages communicated with the connecting pipe. As an alternative, the electrode sterilizing module may further include a manifold configured to supply water introduced through a plurality of introduction openings communicated with the connecting pipe to the electrode part.
- [28] The electrode sterilizing module may further include a concentration sensor configured to detect a concentration of a sterilizing material or a washing material contained in water introduced to the electrode part.
- [29] Preferably, the electrode sterilizing module may further include a water outlet passage converting valve configured to convert a passage to a discharge opening to discharge water introduced to the electrode sterilizing module to the outside.
- [30] The electrode sterilizing module may further include an electrolyte supply unit configured to supply an electrolyte or a salt to the electrode part. Then, the electrolyte supply unit may be installed to be spaced apart from a water inlet side of the electrode part or installed on a discharge side of the electrode part.
- [31] The electrode sterilizing module may further include a water inlet opening for receiving water from a filter passage pipe or a tank water inlet passage pipe of the water treatment apparatus, a water inlet passage converting valve configured to convert a passage to selectively supply water introduced to the water inlet opening and water introduced through the connecting member to the electrode part, and a control unit configured to control driving of the electrode part, a pump, and a water inlet passage converting valve. Here, the filter part of the water treatment apparatus may include a reverse osmosis membrane filter, the electrode sterilizing module includes a water inlet opening for receiving water from the filter passage pipe of the water treatment apparatus, and the filter passage pipe of the water treatment apparatus connected to the water inlet opening is a passage pipe through which clean water flows after passing through at least one of the filters installed in the filter part and before being introduced to the reverse osmosis membrane filter.
- [32] Preferably, the electrode sterilizing module may include an auxiliary tank for accommodating water provided by a user, and the water accommodating in the auxiliary tank is introduced to the electrode part. Then, the water accommodated in the auxiliary tank may be introduced to the electrode part through the water inlet passage converting valve.
- [33] The electrode sterilizing module may further include a display unit configured to display a state of an operation of the electrode sterilizing module, and may further

include a manipulation unit for manipulating an operation of the electrode sterilizing module.

- [34] According to another aspect of the present invention, there is provided a method of sterilizing a water treatment apparatus through an electrode sterilizing module including an electrode part configured to apply a voltage to an electrode to produce sterilizing/washing water containing a sterilizing material or a washing material, the method including the operations of: installing a connecting member for connecting a passage of the water treatment apparatus and a passage of the electrode sterilizing module of sterilizing apparatus; and producing sterilizing/washing water in the electrode sterilizing module and supplying the sterilizing/washing water to the water treatment apparatus.
- [35] Preferably, the operation of installing a connecting member may include the operations of connecting at least one connecting pipe to a water outlet of the water treatment apparatus, and connecting a circulation pipe to a filter passage pipe, a tank water inlet passage pipe, and a storage tank of the water treatment apparatus.
- [36] Preferably, the connecting pipe may be detachably connected at least one of a water outlet cock and a drain pipe of the water outlet, and a water outlet cock and a drain pipe are maintained in an open state after the connecting pipe is connected in the operation of connecting the connecting pipe.
- [37] Preferably, the operation of producing sterilizing/washing water may include the operations of introducing water from the connecting pipe into the electrode sterilizing module, applying a voltage to the electrode part to produce sterilizing/washing water, and circulating the sterilizing water to the filter passage pipe, the tank water inlet passage pipe, or the storage tank through the circulation pipe.
- [38] Preferably, in the operation of introducing water, some of the passages communicated with the connecting pipe may be sequentially opened.
- [39] In the operation of producing sterilizing/washing water, the electrode part may be driven until a concentration detected by a concentration sensor for detecting a concentration of a sterilizing material or a washing material contained in the water introduced to the electrode part reaches a predetermined value.
- [40] Preferably, in the operation of producing sterilizing/washing water, the sterilizing/washing water may be produced by supplying an electrolyte or a salt to the electrode part.
- [41] Preferably, in the operation of producing sterilizing/washing water, water may be initially supplied from the filter passage pipe or the tank water inlet passage pipe of the water treatment apparatus to produce sterilizing/washing water, and water is supplied from the connecting pipe to produce sterilizing/washing water after a lapse of a period of time. Then, the filter part of the water treatment apparatus may include a reverse

osmosis membrane filter, and the filter passage pipe is a passage pipe through which clean water flows before being introduced to the reverse osmosis membrane filter and after passing through at least one filter.

[42] As an alternative, in the operation of producing the sterilizing/washing water, water may be initially supplied from an auxiliary tank accommodating the water provided by the user, and water may be supplied from the connecting pipe to produce the sterilizing/washing water after a lapse of a period of time.

[43] Preferably, in the circulation operation, the sterilizing/washing water may be pressurized to be supplied to the filter passage pipe, the tank water inlet passage pipe, or the storage tank.

[44] Meanwhile, the method may further include the operation of stopping driving of the electrode part for a predetermined time, after a period of time lapses after the operation of producing the sterilizing/washing water is performed or a concentration of the sterilizing material or the washing material contained in the water introduced to the electrode part is above a predetermined value. Then, in the stopping operation, there may be no flow of water between the water treatment apparatus and the sterilizing/washing apparatus.

[45] The method may further include the operation of discharging the sterilizing/washing water through a discharge opening of the electrode sterilizing module.

[46] The method may further include the operations of stopping driving of the electrode part for a predetermined time, after a period of time lapses after the operation of producing the sterilizing/washing water is performed or a concentration of the sterilizing material or the washing material contained in the water introduced to the electrode part is above a predetermined value; discharging the sterilizing/washing water through the discharge opening of the electrode sterilizing module; and supplying rinsing water into the filter passage pipe, the tank water inlet passage pipe, or the storage tank after the sterilizing/washing water discharging operation.

[47] Then, in the rinsing water supplying operation, the water introduced from the filter passage pipe installed in the filter part may be supplied to the tank water inlet passage pipe or the storage tank of the water treatment apparatus with the electrode part not being driven. The rinsing water supplying operation may be performed for a predetermined time or until the storage tank is full.

[48] The method may further include the operation of discharging rinsing water through a discharge opening of the electrode sterilizing module after the rinsing water supplying operation.

[49] The method may further include the operation of separating the passage of the water treatment apparatus and the connecting member connected to a passage of the electrode sterilizing module.

Advantageous Effects of Invention

- [50] As set forth above, according to the exemplary embodiments of the invention, when the connecting member such as the connection pipe or the circulation pipe is connected to the water treatment apparatus to operate the electrode part of the sterilizing apparatus, the sterilizing water is generated by the electrode, thus making it possible to simply sterilize the water treatment apparatus. Also, not only the storage tank but also the water outlet cock and the passage connected with the storage tank can be sterilized through a plurality of connection pipes. In particular, the circulation pipe is connected to the passage pipe provided at the filter part of the front end of the storage tank, thereby making it possible to also sterilize the passage pipe provided at the filter part.
- [51] Also, according to the exemplary embodiments of the invention, using not only the water contained in the storage tank of the water treatment apparatus but also the water supplied from the outside or the water (raw water or purified water) supplied to the filter part of the water treatment apparatus, it is supplied to the electrode part, thus making it possible to generate high-concentration sterilizing water even in the reverse osmosis membrane filter type water purifier. Also, the electrolyte supply unit is provided, thereby making it possible to increase the sterilizing efficiency even in the reverse osmosis membrane filter type water purifier and complete the sterilizing operation in a short time. Also, a desired concentration of the sterilizing water is achieved through the concentration sensor, thereby making it possible to provide a stable sterilizing operation even without using unnecessary power or electrolyte.
- [52] Also, according to the exemplary embodiments of the invention, since the sterilizing water is generated by the electrode part without using separate sterilizing chemicals, it is not necessary to perform a neutralizing operation for reduction of the toxicity of the sterilizing chemicals, thus making it possible to greatly reduce the sterilizing time.
- [53] Also, according to the exemplary embodiments of the invention, the sterilizing apparatus is connected to the passage provided at the filter part of the water treatment apparatus, thereby making it possible to supply water suitable for generation of high-concentration sterilizing water. Also, the supplied water can be used for the rinsing operation, thus facilitating the sterilizing operation and the rinsing operation.
- [54] Also, according to the exemplary embodiments of the invention, it is possible to sterilize not only the storage tank but also the filter passage pipe provided at the filter part, the water outlet cock and/or the tank water inlet passage pipe for flowing water into the storage tank.

Brief Description of Drawings

- [55] The above and other aspects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in con-

junction with the accompanying drawings, in which:

- [56] FIG. 1 is a schematic view illustrating an internal structure of a sterilizing apparatus for a water treatment apparatus according to an embodiment of the present invention;
- [57] FIGS. 2 through 4 are schematic views illustrating various connection states of the sterilizing apparatus of FIG. 1 to a water treatment apparatus;
- [58] FIGS. 5 through 9 are schematic views illustrating various embodiments of a sterilizing apparatus for a water treatment apparatus according to the present invention;
- [59] FIG. 10 is a schematic view illustrating a connection state of the sterilizing apparatus of FIG. 8 to a water treatment apparatus;
- [60] FIGS. 11 and 12 are schematic views illustrating another embodiment of a sterilizing apparatus for a water treatment apparatus according to the present invention;
- [61] FIG. 13 is a schematic view illustrating a connection state of the sterilizing apparatus of FIG. 11 to a water treatment apparatus;
- [62] FIG. 14 is a schematic view illustrating a connection state of the sterilizing apparatus of FIG. 9 to another type of water treatment apparatus;
- [63] FIG. 15 is a schematic view illustrating a connection state of a sterilizing apparatus according to another embodiment of the present invention to a water treatment apparatus; and
- [64] FIGS. 16 and 17 are flowcharts illustrating a sterilizing method for a water treatment apparatus according to an embodiment of the present invention.

Best Mode for Carrying out the Invention

- [65] The terminology used herein is for the purpose of describing particular embodiments only and is not intended to limit of embodiment examples.
- [66] As used herein, the singular forms "a," "an" and "the" are intended to include the plural forms as well, unless otherwise specified. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.
- [67] Exemplary embodiments of the present invention will be described below in detail with reference to the accompanying drawings. The invention may, however, be embodied in many different forms and should not be construed as being limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the concept of the invention to those skilled in the art. Like reference numerals in the drawings denote like elements, and thus a description thereof will be omitted.
- [68] First Embodiment of Sterilizing Apparatus

- [69] First, a sterilizing apparatus for a water treatment apparatus according to the first embodiment of the present invention will be described with reference to FIGS. 1 through 4.
- [70] As illustrated in FIGS. 1 through 4, the sterilizing apparatus 100 according to the first embodiment of the present invention includes an electrode sterilizing module 100a and a connecting member 190.
- [71] The electrode sterilizing module 100a applies a voltage to an electrode, and produces sterilizing/washing water containing a sterilizing material or a washing material, and the connecting member 190 connects the electrode sterilizing module 100a and a passage of the water treatment apparatus 200, and supplies the sterilizing/washing water to the water treatment apparatus 200.
- [72] The connecting member 190 includes at least one connecting pipe 180 connected to a water outlet 260 of the water treatment apparatus 200, and a circulation pipe 191 connected to filter passage pipes L1, L2, L3, and L4, a tank water inlet passage pipe L5, or a storage tank 220 of the water treatment apparatus 200. Meanwhile, in the specification (including the claims), the filter passage pipes L1, L2, L3, and L4 refer to passage pipes introduced to filters 210, 220, 230, and 240, in which case raw water (tap water) flows through the first passage pipe L1 and clean water filtered by a sediment filter 211 flows through the second passage pipe L2. In the specification, the filter passage pipes L1, L2, L3, and L4 and a tank water inlet passage pipe L5 are generally referred to as passage pipes.
- [73] Then, the connection pipe 180 is detachably connected to at least one of water outlet cocks 261 and 262 and drain pipes 263 and 264 of the water outlet 260 of the water treatment apparatus 200, and the circulation pipe 191 is detachably connected to the filter passage pipes L1, L2, L3, and L4, the tank water inlet passage pipe L5, or the storage tank 220.
- [74] For example, referring to FIGS. 2 through 4, the storage tank 220 includes a clean water tank 230, a cold water tank 240, and a hot water tank 250, a first connection pipe 181 may be connected to a cold/clean water outlet cock 161 for discharging the water contained in the clean water tank 230 and the cold water tank 240 and a second connection pipe 182 may be connected to the hot water outlet cock 262 for discharging the water contained in the hot water tank 240. A third connection pipe 183 may be connected to a cold/clean water drain pipe 263 for discharging the water contained in the clean water tank 230 and the cold water tank 240 and a fourth connection pipe 184 may be connected to a hot water drain pipe 264 for discharging the water contained in the hot water tank 250. The number of connection pipes and the types of passages connected to the connection pipes may be different according to the configuration of the water treatment apparatus 200. For example, if a hot water tank 240 does not exist,

or if there is no need to sterilize a hot water tank 240, the hot water outlet cock 262 or the hot water drain pipe 264 is unnecessary, eliminating the necessity of the second and fourth connection pipes 182 and 184, but when a passage of the water treatment apparatus 200 is added, a connection pipe 180 may additionally be installed.

[75] The circulation pipe 191 may be connected to the filter passage pipes L1, L2, L3, and L4, the tank water inlet passage pipe L5, or the storage tank 220 to sterilize the storage tank 220 of the water treatment apparatus 200 and passages (including water outlet cocks) connected to it.

[76] The electrode sterilizing module 100a may include a housing 101, and an electrode part 170 and a pump 140 installed within the housing 101, and may optionally include a passage converting unit 110, a concentration sensor 120, a water outlet passage converting valve 160, and a control unit C in addition.

[77] The electrode part 170 produces sterilizing/washing water (sterilizing/washing water refers to water capable of performing at least one of a sterilizing function and a washing function in the specification) containing a sterilizing material or a washing material when a voltage is applied to an electrode within the electrode part 170.

[78] For example, the electrode part 170 may be configured to produce sterilizing/washing water containing a sterilizing and/or a washing material such as a mixed oxidant (MO) by electrolysis (the term 'electrolysis' includes a oxidation-reduction reaction in the specification) of introduced water.

[79] In the electrode part 170, water passes between electrodes of opposite polarities to sterilize or destroy microorganisms or germs remaining in the water. In general, the sterilization of clean water through electrolysis is complexly performed by a direct oxidation reaction in which microorganisms are directly oxidized in a positive electrode and an indirect oxidation reaction in which various mixed oxidants (MOs), such as residual chloride, ozone, OH radicals, oxygen radicals, which can be produced by a positive electrode to oxidize microorganisms.

[80] As illustrated in FIG. 1, according to an embodiment of the present invention, ruthenium (Ru) may be preferably coated on an electrode body of a positive electrode so that a sterilizing material may be produced without adding a separate electrolyte (including both a salt and a chloride in specification). Ruthenium (Ru) serves as a catalyst which reduces a potential difference when Cl^- is reduced to Cl_2 , and Cl_2 produced in water by ruthenium is immediately dissolved by water to become hypochlorous acid (HOCl). The flow rate of water and voltage condition may be set to maximize the activity of the ruthenium (Ru) catalyst.

[81] In the electrode part 170 according to the embodiment of the present invention, ruthenium (Ru) is coated on an electrode body of a positive electrode (more particularly, it is ruthenium oxide (RuOx) that is present on a surface of the electrode

because, after ruthenium is coated on the electrode, ruthenium oxide is created by heating and oxidizing the ruthenium-coated electrode at a high temperature (since ruthenium is coated in the initial stage of production of the electrode, the expression "ruthenium is coated" includes a state of changing ruthenium into ruthenium oxide in the specification). Thus, in order to prevent the activity of the ruthenium (Ru) and damage to coating, it is desirable that a maximum voltage is set to 30 V, and more preferably to 24 V while power is set below 12 W.

- [82] When ruthenium (Ru) is used in the electrode body, the life of the electrode generally may become shorter but can be prevented from being shorter as the electrode can be driven at a low current. It is preferable to make current lower to further increase the life of the ruthenium coated electrode, and accordingly it is preferable to form a negative electrode, i.e. a counterpart electrode of titanium (Ti) without separate coating.
- [83] That is, when titanium (Ti) is used as the negative electrode, current can be lowered at the same voltage, making it possible to lengthen the lives of the negative and positive electrodes due to the low current and low power.
- [84] As discussed above, in the electrode part 170 according to the embodiment of the present invention, a ruthenium (Ru) coated electrode and titanium (Ti) are respectively used as a positive electrode and a negative electrode and the interval between the electrodes is adjusted without adding a chloride (an electrolyte) separately, making it possible to produce a sterilizing material with a desired concentration at the low current and low power. However, the materials of the electrodes of the electrode part 170 according to the present invention are not limited to the above-listed material, but may be modified according to various embodiments.
- [85] Meanwhile, the electrode part 170 according to the embodiment of the present invention preferably includes one positive electrode, and two negative electrodes disposed on opposite sides of the positive electrode.
- [86] Although it is apparent that two sheets of positive electrodes and one sheet of negative electrodes or one sheet of positive electrodes and one sheet of negative electrodes may be used, it is more preferable that one sheet of positive electrodes and two sheets of negative electrodes are used to be disposed in the sequence of a negative electrode, a positive electrode, and a negative electrode in order to minimize current value while realizing the concentration of a sterilizing material.
- [87] As described above, the electrode part 170 according to the embodiment of the present invention can be driven at a low current and a low power, for example, at a maximum current of 0.5 A or less, and preferably, at 0.35 A or less, and at a maximum voltage of 50 V or less, and preferably 24 V or less. It is apparent that the electrode part 170 may be managed at a power consumption of below 12 W.
- [88] Meanwhile, sterilizing/washing water (electrolytic sterilizing water) that can be

obtained by using an electrode to which a voltage is applied has different types of chlorides existing in water according to their pH levels and has different sterilizing forces, and may be classified into various types such as strongly acidic electrolytic water, weakly acidic electrolytic water, strongly alkaline electrolytic water, and electrolytic sodium hypochlorite (NaOCl) water.

- [89] In this way, the materials and intervals of electrodes, the magnitude of power applied (voltage or current) applied thereto, an addition of an electrolyte or a salt (including a chloride), and the type of added electrolyte or a salt (including a chloride) may be different to produce various types of sterilizing/washing water (electrolytic sterilizing water), and all electrode parts that can produce sterilizing/washing water (electrolytic sterilizing water) through electrodes pertain to the category of the electrode part 170 according to the present invention.
- [90] That is, as described below, an electrode part that can produce sterilizing/washing water using an electrolyte or a salt (including a chloride) supplied from an electrolyte supply unit 130 also pertains to the electrode part 170 according to the present invention.
- [91] The pump 140 provides pressure so that the sterilizing/washing water produced in the electric part 170 can be supplied to the passages of the water treatment apparatus 200. The water introduced to the sterilizing apparatus 100 through the pump 140 may be changed to sterilizing/washing water and may be supplied into the passages of the water treatment apparatus 200, e.g. the filter passage pipes L1, L2, L3, and L4, the tank water inlet passage pipe L5 or the storage tank 220 through the pump 140.
- [92] The passage converting unit 110 may be configured to sequentially open some of the passages communicated with one or more connection pipes 180 connected to the water outlet 260 of the water treatment apparatus 200.
- [93] The passage converting unit 110 may be configured to sequentially open a plurality of introduction openings 111, 112, 113, and 114 one by one and block the remaining introduction openings, or sequentially open some introduction openings in batches and maintain the remaining introduction openings in a closed state.
- [94] For example, although the first introduction opening 111, to which the first connection pipe 181 is connected, the second introduction opening 112, to which the second connection pipe 182 is connected, etc. may be sequentially opened, the first introduction opening 111 and the third introduction opening 183 connected to the first connection pipe 181 and the third connection pipe 183 may be simultaneously opened so that the passages of the first connection pipe 181 and the third connection pipe 183 connected to the cold water tank 240 can be opened simultaneously and the remaining introduction openings 112 and 114 can be blocked, and then the second introduction opening 112 and the fourth introduction opening 114 can be opened simultaneously

and the remaining introduction openings 111 and 113 can be blocked.

- [95] In this way, the storage tank 220 of the water treatment apparatus 200 and the passages connected to the storage tank 220 corresponding to the opened introduction openings may be sequentially sterilized and washed by sequentially opening some passages of the passage converting unit 110. The passage converting unit 110 may employ various known valves or an opening/closing unit such as a plurality of solenoids or disk valves.
- [96] The concentration sensor 120 detects a concentration of a sterilizing material or a washing material contained in water introduced to the electrode part 170. The concentration sensor 120 may be a sensor configured to measure an ion concentration, but is not limited thereto only if it can detect a concentration of a sterilizing material or a washing material.
- [97] The water outlet passage converting valve 160 converts a passage to a discharge opening 161 to discharge the water introduced to the electrode sterilizing module 100a to the outside. That is, as illustrated in FIG. 1, the water outlet passage converting valve 160 converts a passage between a passage for sending the water introduced through the water inlets 111, 112, 113, and 114 through the electrode part 170 and a passage for discharging the water through a discharge pipe 195 connected to the discharge opening 161. After the water treatment apparatus 200 completes a sterilizing/washing operation, the water outlet passage converting valve 160 discharges sterilizing/washing water to the outside or converts a passage to a water outlet side 171 when rinsing water is discharged to the outside.
- [98] Meanwhile, as illustrated in FIG. 1, a control unit C may be installed to control driving of the passage converting unit 110, the concentration sensor 120, the pump 140, the water outlet passage converting valve 160, and the electrode part 170. The control unit C drives the pump 140 and the electrode part 170 in the initial stage of a sterilizing/washing operation, controls a passage opening/closing operation of the passage converting unit 110 to sequentially sterilize and wash various passages of the water treatment apparatus 200, and stops driving of the pump 140 and the electrode part 170 if a concentration detected by the concentration sensor 120 is equal to or greater than a preset value.
- [99] The control unit C controls driving of the water outlet passage converting valve 160, the pump 140, and the electrode part 170 so that it may convert a passage of the water outlet passage converting valve 160 and drive only the pump 140 with the electrode part 170 not being driven to discharge sterilizing/washing water to the outside through the discharge opening 161 when a sterilizing/washing operation is completed.
- [100] Meanwhile, the electrode sterilizing module 100a according to the present invention may further include a display D for displaying a state of an operation of the electrode

sterilizing module 100a and a manipulation unit B for manipulating an operation of the electrode sterilizing module 100a, and the displayed and manipulated contents by them may be variously modified and changed.

[101] For example, the manipulation unit B may include various selection buttons such as a sterilization starting button, a sterilization stopping button, and an inlet selecting button, and the display D may be configured to display a sterilization state, a waiting state, a rinsing state, a completion state, and an error state using an illumination and an alarm.

[102] Next, the water purifier 200 of FIGS. 2 through 4 will be described as an example of the water treatment apparatus 200 in which the sterilizing apparatus 100 of FIG. 1 can be used.

[103] As illustrated in FIGS. 2 through 4, a general water purifier 200 includes a filter part 210, a storage tank 220, and a water outlet 260.

[104] The filter part 210 is adapted to sequentially filter and purify raw water, and may include a sediment filter 211, a pre-carbon filter 212, a reverse osmosis membrane filter (ultra filtration filter) 213, and a post-carbon filter 214. However, the types, number, and sequence of the filters may be changed according to a filtering method of the water treatment apparatus (water purifier) and a filtering performance required by the water treatment apparatus (water purifier). For example, an ultra filtration filter may be installed instead of the reverse osmosis membrane filter 213. Such an ultra filtration filter is a porous filter having pores of several tens to hundreds of nanometers in size, and contaminants in water are removed through numerous fine pores distributed on a surface of the membrane.

[105] In this case, each filter 211, 212, 213, and 214 includes a filter case having a filter element therein, and an outer case for receiving the filter case. Each filter 211, 212, 213, and 214 has a cartridge structure in which after the raw water introduced to the outer case is filtered by the filter element in the filter case, it is discharged to the outside of the outer case.

[106] As mentioned above, according to the present invention, the filter part 210 having the filters 211, 212, 213, and 214 is not specifically limited to an independent cartridge form, but may be a complex filter having two or more filter functions. For example, the sediment filter 211 and the pre-carbon filter 212 may constitute a single pre-processing complex filter.

[107] The sediment filter 211 serves to receive raw water from a raw water supply and absorb and remove relatively large particles of floating matter and solid materials such as sand particles contained in the raw water. In this case, a raw water blocking valve V for selectively blocking the raw water supplied from the raw water supply unit may be installed at a front end of the sediment filter 211; however, the installation location of

the raw water blocking valve V is not limited thereto, and the raw water blocking valve V only need to block supply of raw water.

- [108] The pre-carbon filter 212 serves to receive the water which has passed through the sediment filter 211 and remove harmful chemicals such as a volatile organic composition, a carcinogenic material, a synthetic detergent, and an insecticide, and a residual chloride (for example, HOCL or ClO) contained in the water through an absorption method using activated carbon.
- [109] The reverse osmosis membrane filter 213 receives the water filtered by the pre-carbon filter 212, and removes heavy metals and fine organic/inorganic materials such as a metal ions and germs through a membrane having fine pores. A drain pipe DL for discharging water generated by filtering raw water, i.e. waste water (generally referred to "condensed water" in the art) is connected to the reverse osmosis membrane filter 213.
- [110] The post-carbon filter 214 serves to absorb and remove unpleasant tastes, smells, and pigments from the water filtered by the reverse osmosis membrane filter 213, and the clean water filtered by the post-carbon filter 214 is received in the storage tank 220 through a clean water line.
- [111] Meanwhile, since the reverse osmosis membrane filter 213 can purify water through a membrane having fine pores, the filter part 210 may include a pressurizing pump 215 for supplying water to the reverse osmosis membrane filter 213 with a pumping pressure.
- [112] The passage pipes L1, L2, L3, L4, and L5 are connected to the filter part 210, the final filter 214 of the filter part 210 and the storage tank 220 are connected to each other through a tank water inlet passage pipe L5. Meanwhile, although other members such as sensors or valves may be installed between the tank water inlet passage pipe L5 and the storage tank 220, an entire passage pipe connecting the final filter 214 of the filter part 210 and the storage tank 220 will be referred to as "a tank water inlet passage pipe L5" even when other members are installed.
- [113] Meanwhile, the storage tank 220 stores the clean water purified by the filter part 210, and the clean water is discharged through the water outlet cocks 261 and 262.
- [114] In more detail, the storage tank 220 stores the clean water which has passed through the filter part 210, and may include at least one of a clean water tank 230 for storing clean water at a normal temperature, a cold water tank 240 for cooling and storing clean water, and a hot water tank 250 for heating and storing clean water. Then, the clean water tank 230 and the cold water tank 240 may be installed separately, but may be divided within a single space through a partition wall (separator) in which water can be circulated.
- [115] Meanwhile, the water outlet cocks 261 and 262 may be installed as a water outlet

part 260 for supplying the water accommodated within the storage tank 220 to the user. Then, the cold/clean water outlet cock 261 may be configured to supply the user with clean water or cold water according to selection of the user, and the hot water outlet cock 262 may be configured to supply hot water by the user. Although FIGS. 2 through 4 illustrate that clean water and cold water can be supplied to the user through one of the cold/clean water outlet cocks 261, water outlet cocks for respectively supplying clean water and cold water may be installed separately.

[116] Drain pipes 263 and 264 may be installed as the water outlet part 260 connected to the storage tank 220. The drain pipes 263 and 264 are used to evacuate the storage tank 220 when the storage tank 220 is washed or when sterilizing/washing water or rinsing water is discharged from the storage tank 220. Then, the cold/clean water drain pipe 263 is connected to the cold water tank 240 to discharge clean water and cold water, and the hot water drain pipe 264 is connected to the hot water tank 250 to discharge hot water.

[117] Meanwhile, the process of connecting the sterilizing apparatus 100 to the water treatment apparatus 200 of FIGS. 2 through 4 is performed by connecting the connection pipe 180 and the circulation pipe 191 of the sterilizing apparatus 100 to the water treatment apparatus 200.

[118] In more detail, as illustrated in FIGS. 2 through 4, the cold/clean water outlet cock 261 and the first introduction opening 111 are connected through the first connection pipe 181, and the hot water outlet cock 262 and the second introduction opening 112 are connected through the second connection pipe 182. The cold/clean water drain pipe 263 and the third introduction opening 113 are connected through the third connection pipe 183 and the hot water drain pipe 264 and the fourth introduction opening 114 are connected through the fourth connection pipe 184.

[119] As illustrated in FIG. 2, the storage tank 220 (or the clean water tank 230) and the water outlet opening 171 are connected through the circulation pipe 191. However, as illustrated in FIG. 3, the circulation pipe 191 may be connected to the tank water inlet passage pipe L5 through a connector 265, etc.

[120] As illustrated in FIG. 4, all or some of the filters of the filter part 210 may be removed, and the filter passage pipes L1, L2, L3, and L4 may be connected to each other by a connecting mechanism such as a tube or a connector and the circulation pipe 191 may be connected to the filter passage pipes L1, L2, L3, and L4 through the connector 265.

[121] Meanwhile, although FIG. 4 illustrates that the circulation pipe 191 is connected through the connector 265 at a front end of the sediment filter 210 after all the filters are removed, the filters 220, 230, and 240 other than the sediment filter 210 may be removed and after the filter passage pipes L2, L3, and L4 between the separated filters

are connected to each other by connecting mechanisms C2, C3, and C4, the circulation pipe 191 may be connected to the passage pipe L2. Likewise, the method of connecting the circulation pipe 191 to the filter passage pipes L1, L2, L3, and L4 may be modified in various ways.

- [122] Meanwhile, although a connection structure of the circulation pipe 191 corresponding to FIG. 4 is omitted in the following second through seventh embodiments, the circulation pipe 191 may be connected to the filter passage pipes L1, L2, L3, and L4 in the same or a similar manner to FIG. 4, even in the second through seventh embodiments.
- [123] Connection of the passages is completed by connecting the discharge pipe 195 to the discharge opening 161.
- [124] In this state, if the pump 140 is operated with the water outlet cocks 261 and 262 and the drain pipes 263 and 264 open, water can flow between the water treatment apparatus 200 and the sterilizing apparatus 100 immediately.
- [125] Then, the control unit C controls the passage converting unit 110 to open one or some of the introduction openings 111, 112, 113, and 114 and drives the pump 140 and the electrode part 170 so that sterilizing/washing water produced in the electrode part 170 may flow to the storage tank 220 (see FIG. 2), the tank water inlet passage pipe L5 (see FIG. 3) or the filter passage pipes L1, L2, L3, and L4 (see FIG. 4) through the circulation pipe 191 and may be introduced to the electrode sterilizing module 100a through the water outlet 260.
- [126] If such a process is performed for a predetermined time and the concentration of a sterilizing material or a washing material in the sterilizing/washing water detected by the concentration sensor 120 reaches a predetermined value, driving of the pump 140 and the electrode part 170 is stopped and the pump 140 and the electrode part 170 remain in a stand-by state for a predetermined time. The stand-by state is performed to allow for time for the sterilizing/washing water to sterilize or wash the storage tank 220, and a wall surface on the passages (including water outlet cocks) connected to it.
- [127] Then, another tank may be sterilized and washed by changing a passage of the passage converting unit 110. For example, if the first introduction opening 111 and the third introduction opening 113 are opened primarily and the clean water tank 230, the cold water tank 240, and the cold/clean water outlet cock 261 are sterilized and washed, the hot water tank 250 and the hot water outlet cock 262 are sterilized and washed by opening the second introduction opening 112 and the fourth introduction opening 114. Then, if a concentration detected by the concentration sensor 120 is equal to or greater than a preset value, the electrode part 170 does not need to be driven to sterilize and wash the hot water tank 250, in which case only the pump 140 may be driven.

- [128] However, unlike the operation discussed above, the introduction openings 111, 112, 113, and 114 may be sequentially opened one by one to wash the passages connected to them.
- [129] Meanwhile, as mentioned above, if the sterilizing/washing operation is completed, the sterilizing/washing water should be discharged to the outside. To achieve this, the control unit C converts the passage of the water outlet passage converting valve 160 to the discharge opening 161 to allow the sterilizing/washing water to be discharged to the outside.
- [130] The completion of the water discharging operation may be determined by using detection of a low-level sensor installed in the storage tank 220 or driving the pump 140 for a predetermined time, considering the capacity of the storage tank 220, or may be determined by detecting an overload generated when water is not introduced to the pump 140.
- [131] In this way, if the sterilizing/washing operation is completed, a rinsing operation of the storage tank 220 may be performed manually or by using the water which has passed through the filter part 110, and the sterilizing apparatus 100 may be separated from the water treatment apparatus 200 before or after the rinsing operation.
- [132] Second Embodiment of Sterilizing Apparatus
- [133] Next, a sterilizing apparatus 100 according to the second embodiment of the present invention will be described with reference to FIG. 5.
- [134] The sterilizing apparatus 100 of FIG. 5 is the same as the sterilizing apparatus 100 shown in FIGS. 1 through 4 except that a manifold 111' is installed instead of the passage converting unit 110. Thus, a description of the same or similar configurations will be omitted to avoid unnecessary repetition, and only unique configurations will be described.
- [135] The manifold 110' of FIG. 5 is connected to a plurality of introduction openings 111, 112, 113, and 114 connected to a connection pipe 180 to merge the introduced water and provide the merged water to the electrode part 170.
- [136] In this way, since all the passages of the water treatment apparatus 200 to which connection pipes 180 are connected may be washed simultaneously, using the manifold 110', sterilizing/washing time can be shortened.
- [137] The connection structure between the sterilizing apparatus 100 of FIG. 5 and the water treatment apparatus is the same as that of FIG. 2 except that passages for the introduction openings 111, 112, 113, and 114 are not converted, and a detailed description thereof will be omitted.
- [138] Third Embodiment of Sterilizing Apparatus
- [139] Next, a sterilizing apparatus 100 according to the third embodiment of the present invention will be described with reference to FIGS. 6 and 7.

- [140] The sterilizing apparatus 100 of FIGS. 6 and 7 is the same as the sterilizing apparatus 100 of FIGS. 1 through 4 except that an electrolyte supply unit 130 is additionally installed. Thus, a description of the same or similar configurations will be omitted to avoid unnecessary repetition, and only unique configurations will be described.
- [141] The electrolyte supply unit 130 serves to smoothly produce a sterilizing material or a washing material and supply an electrolyte or a salt (including a chloride) to the electrode part 170 to obtain highly concentrated sterilizing/washing water.
- [142] Since electrolysis (oxidation-reduction reaction) is smoothly performed if an electrolyte is added to a general electrode unit, a highly concentrated sterilizing material or washing material may be produced even when the same current or voltage is applied.
- [143] Then, although the type of electrolyte or salt supplied from the electrolyte supply unit 130 is not limited, it is preferable that chlorides such as NaCl, KCl, and NaOCl are supplied to help produce a sterilizing material. However, a salt or an electrolyte other than a chloride may also be supplied.
- [144] The electrolyte supply unit 130 may be constituted by a system for dosing an electrolyte in a liquid state, but may be configured to dissolve a solid electrolyte or a salt while water is flowing into the electrolyte supply unit 130 with the solid electrolyte or the salt (including a chloride) being accommodated within the electrolyte supply unit 130 for the sake of convenience. To achieve this, a plurality of communication holes may be formed in the electrolyte supply unit 130 and a cover may be installed at an upper end of the electrolyte supply unit 130 to supply an electrolyte or a salt.
- [145] Meanwhile, as illustrated in FIG. 6, the electrolyte supply unit 130 is preferably spaced apart from a water inlet side of the electrode part 170. That is, as the electrolyte supply unit 130 is spaced apart from the electrode part 170 (for example, an electrolyte is supplied through a pump), a highly concentrated electrolyte or a salt (including a chloride) which has not been dissolved is prevented from directly contacting an electrode, making it possible to prevent damage to the electrode installed in the electrode part 170.
- [146] As illustrated in FIG. 7, the electrolyte supply unit 130 may be installed at a discharge side of the electrode part 170 so that after the electrolyte or the salt (including a chloride) supplied from the electrolyte supply unit 130 is introduced to the storage tank 220 through the circulation pipe 191 and is dissolved and mixed sufficiently, it can be supplied to the electrode unit 170.
- [147] The connection structure of the sterilizing apparatus 100 illustrated in FIGS. 6 and 7 and the water treatment apparatus 200 is the same as those of FIG. 2, and a detailed description thereof will be omitted.
- [148] Fourth Embodiment of Sterilizing Apparatus

[149] Next, a sterilizing apparatus 100 according to the fourth embodiment of the present invention will be described with reference to FIGS. 8 through 10.

[150] The sterilizing apparatus 100 of FIGS. 8 through 10 is the same as the sterilizing apparatus of FIGS. 1 through 4 according to the first embodiment of the present invention except that a water inlet opening 151 and a water inlet passage converting valve 150 are installed, and is the same as the sterilizing apparatus 100 of FIG. 6 according to the third embodiment of the present invention except that the sterilizing apparatus 100 of FIG. 9 employs a water inlet opening 151 and a water inlet passage converting valve 150. Thus, a description of the same or similar configurations will be omitted to avoid unnecessary repetition, and only unique configurations will be described.

[151] The sterilizing apparatus 100 of FIGS. 8 through 10 according to the fourth embodiment of the present invention includes a water inlet opening 151 for receiving water from the passage pipes L1, L2, L3, L4, and L5 of the water treatment apparatus 200, and a water inlet passage converting valve 150 for converting a passage to selectively supply the water introduced through the water inlet opening 151 and the water introduced through the connection pipe 180 to the electrode part 170.

[152] Then, as illustrated in FIG. 10, when a reverse osmosis membrane filter 213 is installed in the water treatment apparatus 200, the passage pipes L1, L2, L3, L4, and L5 of the water treatment apparatus 200 connected to the water inlet pipe 151 are preferably passage pipes L1, L2, and L3.

[153] In more detail, the total dissolved solids (TDS) of the water passing through the reverse osmosis membrane filter 313 is reduced, and when water is introduced to the electrode part 170 to produce sterilizing/washing water, the amount of a sterilizing material or a washing material may not be sufficient. Since the water which has not passed through the reverse osmosis membrane filter 213 is discharged as living water (waste water, condensed water) through a drain pipe DL, water may be wasted.

[154] However, as mentioned above, when the filter passage pipes L1, L2, and L3 installed at a front end of the reverse osmosis membrane filter 213 is connected to the water inlet opening 151 and the water flowing through the filter passage pipes L1, L2, and L3 is used as the water initially introduced to the electrode part 170, the total dissolved solids (TDS) introduced to the electrode part increases, making it possible to improve the amount of a produced sterilizing material or a washing material, to reach a concentration of the sterilizing/washing water necessary for a sterilizing/washing operation in a short time (for example, the concentration may be set to 0.05 ppm or more, i.e. 0.07 to several ppm, considering a stable value for the sterilizing/washing operation), to prevent a waste of water, and to prevent the life of the reverse osmosis membrane filter 213 from being shortened. Then, when the first passage pipe L1 is

connected to the water inlet opening 151, raw water is directly supplied to the electrode part 170, and when the second passage pipe L2 and the third passage pipe L3 are connected to the water inlet pipe 151, the clean water filtered by the sediment filter 211 and the pre-carbon filter 212 is introduced to the electrode part 170.

- [155] Meanwhile, in a purifier using an ultra-filtration filter instead of the reverse osmosis membrane filter 213, since the amount of total dissolved solids (TDS) is not significantly changed even when water passes through the ultra-filtration filter, the amount of a sterilizing material or a washing material produced is not significantly changed even if any one of the passage pipes L1, L2, L3, L4, and L5 is connected to the water inlet pipe 151.
- [156] Meanwhile, when an electrode of the electrode part 170 directly contacts raw water, since the life of the electrode can be shortened, the clean water which has passed through at least one filter is preferably introduced to the electrode part 170. Thus, the reverse osmosis membrane filter 213 is installed in the filter part 210 of the water treatment apparatus, the filter passage pipes L1, L2, L3, and L4 connected to the water inlet opening 161 may preferably be the second passage pipe L2 and the third passage pipe L3 through which the clean water flows before being introduced to the reverse osmosis membrane filter after it passes through at least one filter installed in the filter part.
- [157] Further, as illustrated in FIG. 9, although raw water (in the case of L1) or clean water (in the cases of L2 and L3) having much of the total dissolved solids (TDS) through passage pipes L1, L2, L3, L4, and L5 is supplied, when the sterilizing apparatus 100 includes the electrolyte supply unit 130, it may increase a concentration of sterilizing/washing water at faster speed.
- [158] For example, when connecting a first passage pipe L1 of the filter passage pipes to the inlet opening 151, the sterilizing/washing water may be created in the electrode part 170 using raw water introduced from the first passage pipe L1 and an electrolyte supplied from the electrolyte supply unit 130. Further, when connecting the second or third passage pipe L2 or L3 of the filter passage pipes to the inlet opening 151, the sterilizing/washing water may be created in the electrode part 170 using the clean water filtered by the sediment filter 211 and the pre-carbon filter 212 and the electrolyte supplied from the electrolyte supply unit 130. When an ultra filtration filter is used instead of a reverse osmosis membrane filter 213, because an increased amount of total dissolved solids (TDS) are included in water introduced from a fourth passage pipe L4 or a tank inlet passage pipe L5 of the filter passage pipes, the sterilizing/washing water may be created in the electrode part 170 using the water introduced to the inlet opening 151 from the fourth passage pipe L4 or the tank inlet passage pipe L5 and the electrolyte supplied from the electrolyte supply unit 130. As illustrated above,

although a great deal of total dissolved solids (TDS) are included in the water introduced to the inlet opening 151, if the electrolyte supply unit 130 is provided, it may rapidly create highly concentrated sterilizing/washing water with low power.

Meanwhile, since the concentration of the sterilizing/washing water is measured by a concentration sensor 120 and a controller C controls driving of the electrode part 170 based on the measured concentration of the sterilizing/washing water, sterilization of the concentration may stably achieved.

- [159] In the meantime, referring to FIG. 10, a connection structure of the sterilizing apparatus 100 and the water treatment apparatus 200 shown in FIG. 8 and FIG. 9 are the same as that of FIG. 2 except for an additional connection of the inlet opening 151, and thus only a different construction will be described so as to avoid unnecessary repetition.
- [160] As illustrated in FIG. 10, the inlet opening 151 of the sterilizing apparatus 100 may connect with passage pipes L1, L2, L3, L4, and L5 of the water treatment apparatus 200 (passage pipes L1, L2, and L3 provided at a front end of the reverse osmosis membrane filter 213 when the sediment filter 210 includes the reverse osmosis membrane filter 213) through a connection pipe 185. At this time, the connection pipe 185 may use one of the passage pipes L1, L2, and L3 provided at a front end of the reverse osmosis membrane filter 213 or may connect with the passage pipes L1, L2, and L3 through a separate connector to be used. However, when an ultra filtration filter is used instead of a reverse osmosis membrane filter 213, one of the filter passage pipes L1, L2, L3, L4 and the tank inlet passage pipe L5 may be used as the connection pipe 185. Meanwhile, the connection pipe 185 may connect with the passage pipes L1, L2, L3, L4, and L5 through a connector to be used. In the meantime, when the tank inlet passage pipe L5 connects with the inlet opening 151, the circulation pipe 191 may be connected to the storage tank 220.
- [161] As described previously, in a state in which the passage pipes L1, L2, and L3 connect with the inlet opening 151, sterilizing operation is performed in the same manner as in FIG. 2.
- [162] However, in a case of the sterilizing apparatus 100 shown in FIG. 10, water (raw water or clean water) having much total dissolved solids (TDS) is introduced to passage pipes L1, L2, and L3 (including L4 and L5 in a case of the ultra filtration filter, FIG. 10 shows reverse osmosis membrane filter by way of example) in an electrode part 170 in an early sterilizing operation to create sterilizing/washing water of relatively higher concentration and to supply it to a storage tank 220 of the water treatment apparatus 200. After a predetermined time elapses, a passage of a passage converting valve 150 may be converted to introduce water introduced through the connection pipe 180 to the electrode part 170. Through this, an operation creating the

sterilizing/washing water may continue. That is, when the sterilizing/washing water is created using water introduced through the passage pipes L1, L2, L3, L4, and L5 and the sterilizing/washing water created thereby is supplied to the storage tank 220, a water level of the storage tank 220 may be significantly increased to cause an overflow. Accordingly, water is supplied through the passage pipes L1, L2, L3, L4, and L5 for only a predetermined time, considering a capacity of the storage tank 220. Afterwards, water in the storage tank 220 may be circulated to create the sterilizing/washing water.

[163] Next, if a concentration of the sterilizing/washing water sensed by the concentration sensor 120 is equal to or greater than a preset value, the concentration sensor 120 stops driving of the pump 140 and the electrode part 170 and maintains an idle state for a predetermined time. Subsequently, a passage of the water outlet passage converting valve 160 is converted to an outlet opening 161 side to provide the sterilizing/washing water to an exterior.

[164] Meanwhile, in a case of the sterilizing apparatus 100 shown in FIG. 10, because water from passage pipes L1, L2, and L3 (including L4 and L5 in a case of the ultra filtration filter) may be supplied to the inlet opening 151, it may be used as washing water. That is, for washing, in a state in which a passage of the passage converting valve 150 is converted to a connected state of the inlet opening 151 and the electrode part 170 and the electrode part 170 is not driven, when driving the pump 140, water introduced through the passage pipes L1, L2, L3, L4, and L5 may be introduced to the storage tank 220 through the sterilizing apparatus 100. Accordingly, if the storage tank 220 is filled with washing water, a passage of the water outlet passage converting valve 160 may be converted to again charge the washing water, thereby charging the washing water to the exterior.

[165] In this case, when water introduced through the first to third passage pipes L1, L2, and L3 is used as the washing water, the reverse osmosis membrane filter 213 or the ultra filtration filter of a high cost is not used, a consumption of water charged as living water may be prevented and a lifespan of the reverse osmosis membrane filter may be increased.

[166] Meanwhile, the sterilizing apparatus 100 shown in FIG. 10 includes a control unit C. The control unit C controls driving of a passage converting unit 110, the electrode part 170, the pump 140, the passage converting valve 150, and the outlet passage converting value 160.

[167] Fifth Embodiment of Sterilizing Apparatus

[168] Next, a sterilizing apparatus 100 according to the fifth embodiment of the present invention will be described with reference to FIGS. 11 through 13.

[169] The sterilizing apparatus 100 of FIGS. 11 through 13 is the same as the sterilizing

apparatus of FIGS. 1 through 4 according to the first embodiment of the present invention except that an auxiliary tank 155 and a water inlet passage converting valve 150 are installed, and the sterilizing apparatus 100 of FIG. 12 is the same as the sterilizing apparatus of FIGS. 1 through 4 according to the first embodiment of the present invention except that the auxiliary tank 155 is added. Thus, a description of the same or similar configurations will be omitted to avoid unnecessary repetition, and only unique configurations will be described.

[170] The sterilizing apparatus 100 of FIGS. 11 through 13 according to the fifth embodiment of the present invention includes an auxiliary tank 155.

[171] The auxiliary tank 155 stores water fed therein by a user and the water accommodated in the auxiliary tank 155 is fed to the electrode part 170. In this case, the water accommodated in the auxiliary tank 155, as illustrated in FIG. 11, may be fed to the electrode part 170 through the water inlet passage converting valve 150 or due to head difference as illustrated in FIG. 12.

[172] In the fifth embodiment, similar to the fourth embodiment, a user may feed water containing a large amount of the total dissolved solids (TDS) such as drinking water to the auxiliary tank 155 and the electrode part 170 produces the sterilizing/washing water using the fed water so that the sterilizing/washing water may be obtained in the early stage.

[173] Particularly, when a user starts the sterilizing/washing through the manipulation unit B, the sterilizing/washing water may be obtained by keeping the water introduced to the auxiliary tank 155 within the electrode part 170 to which electric power is applied for a predetermined time. Then, after a predetermined period of time has elapsed, the pump 140 is driven such that the water in the water treatment apparatus 200 may be introduced to the sterilizing apparatus 100.

[174] However, when a user drives the manipulation unit B, different from as described above, the electrode part 170 and the pump 140 may be driven at the same time.

[175] Although not depicted, even in the fifth embodiment, the electrolyte supply unit 130 may be added and electrolyte or salt may be directly inserted into the auxiliary tank 155.

[176] Since passage structure and the sterilizing/washing except for the above-mentioned are the same as the fourth embodiment, its description will be omitted.

[177] Sixth Embodiment of Sterilizing Apparatus

[178] Next, a sterilizing apparatus 100 according to the sixth embodiment of the present invention will be described with reference to FIG. 14.

[179] The sterilizing apparatus 100 of FIG. 14 according to the sixth embodiment of the present invention is the same as the sterilizing apparatus 100 of FIG. 9 according to the fourth embodiment, except that the water treatment apparatus 200 connected thereto is

modified.

[180] The water treatment apparatus 200 of FIG. 14 is different from the water treatment apparatus 200 of FIGS. 4, 10, and 13 in view of including a temperature variation unit 220' instead of the storage tank 220.

[181] That is, the water treatment apparatus 200 as illustrated in FIGS. 2 through 4, 10, and 13 includes a storage tank 220 storing water but the water treatment apparatus 200 of FIG. 14 does not include the storage tank 220.

[182] In more detail, the temperature variation unit 220' of the water treatment apparatus 200 of FIG. 14 may include a room temperature feeding unit 270 feeding the water passing through the filter part 210 at room temperature, a cold water feeding unit 280 having an instant cooler cooling and feeding the water, and a hot water feeding unit 290 having an instant heater heating and feeding the water. In this case, the room temperature feeding unit 270, water feeding forward the cold water feeding unit 280, and the hot water feeding unit 290 may be performed by switching passages with a water passage switching valve V1 according to user's choice.

[183] Thus, since the water treatment apparatus 200 of FIG. 14 does not include a tank, the water treatment apparatus 200 does not include a drain so that the connection pipes 183 and 184 connected to the drain pipes 263 and 264 of FIG. 2 are not connected thereto. Moreover, the circulation pipe 191 may be connected to the tank water inlet passage pipe L5 or the tank water inlet passage pipe L5 may be directly connected to the water outlet side 171 when the tank water inlet passage pipe L5 is sufficiently long.

[184] Since the introduction openings 113 and 114 are not connected yet, the sterilizing apparatus 100 connected to the water treatment apparatus 200 must be operated such that a passage corresponding to the unconnected introduction openings 113 and 114 when a passage is selected using the passage converting unit 110. To this end, the manipulation unit B of the sterilizing apparatus 100 may include an inlet selecting button (not shown).

[185] Moreover, the water inlet passage converting valve 150 of FIG. 14, similar as the fourth embodiment of FIG. 10, connects a passage between the water inlet opening 151 and the electrode part 170 for the production of the sterilizing/washing water to be fed to the water treatment apparatus 200 in the early stage of the sterilizing/washing, and connects a passage between the introduction openings 111, 112, 113, and 114 and the electrode part 170 after an amount of water sufficient to circulate the sterilizing/washing water between the sterilizing apparatus 100 and the water treatment apparatus 200 is fed thereinto.

[186] Since the connection of a passage between the sterilizing apparatus 100 and the water treatment apparatus 200 is the same as the case of FIG. 10 except for the unconnected connection pipes 183 and 184, description for sterilizing/washing and rinsing will be

omitted.

[187] Seventh Embodiment of Sterilizing Apparatus

[188] Next, a sterilizing apparatus 100 according to the seventh embodiment of the present invention will be described with reference to FIG. 15.

[189] The sterilizing apparatus 100 of FIG. 15 according to the seventh embodiment of the present invention is similar as the fifth embodiment of FIGS. 11 through 13 in view of including the auxiliary tank 155, but has some differences such as the installing position and function of the auxiliary tank 155.

[190] Moreover, the water treatment apparatus 200 of FIG. 15 is the same as the water treatment apparatus 200 of FIG. 14. In order to avoid repetition, a description of identical or similar parts will be omitted and only parts different from the above-mentioned embodiments will be described.

[191] The auxiliary tank 155 provided in the sterilizing apparatus 100 of FIG. 15 is configured to feed water to the water treatment apparatus 200 for the sterilizing/washing of the water treatment apparatus 200.

[192] That is, the auxiliary tank 155 provided in the water treatment apparatus 200 of FIG. 15 accommodates the amount of water enabling circulation of the sterilizing/washing water between the sterilizing apparatus 100 and the water treatment apparatus 200.

[193] Thus, the sterilizing apparatus 100 of FIG. 15 includes a tank performing the function of the storage tank 220 in the water treatment apparatus 200 of FIGS. 2 through 4, 10, and 13 as an auxiliary tank 155.

[194] Since the sterilizing apparatus 100 according to the seventh embodiment is substantially similar as other embodiments in view of the sterilizing/washing except for the auxiliary tank 155, a detailed description thereof will be omitted.

[195] Next, a sterilizing/washing method S100 performed by the water treatment apparatus 200 according to another aspect of the present invention will be described with reference to FIGS. 16 and 17.

[196] In the sterilizing/washing method S100, the water treatment apparatus 200 is sterilized and washed with the electrode sterilizing module 100a including the electrode part 170 producing the sterilizing/washing water containing the sterilizing material or the washing material by applying electric power to the electrodes. The sterilizing/washing method S100 may be performed by the above-mentioned sterilizing apparatus 100 but the present invention is not limited thereto.

[197] First Embodiment of Sterilizing Method

[198] First, a sterilizing method S100 of a water treatment apparatus 200 according to the first embodiment of the present invention will be described with reference to FIGS. 2 to 4, 10, and 13 to 16.

[199] As illustrated in FIG. 16, the method S100 of sterilizing a water treatment apparatus

200 according to the first embodiment of the present invention includes the operations of: installing a connecting member 190 for connecting a passage of the water treatment apparatus 200 and a passage of the electrode sterilizing module 100a (S110); and producing sterilizing/washing water in the electrode sterilizing module 100a and supplying the sterilizing/washing water to the water treatment apparatus 200 (S120). The method S100 further includes an operation of stopping driving of the electrode part 170 for a predetermined time, after a period of time lapses after the operation of producing the sterilizing/washing water is performed or a concentration of the sterilizing material or the washing material contained in the water introduced to the electrode part 170 is above a predetermined value (S130), the operation of discharging the sterilizing/washing water through a discharge opening 161 of the sterilizing apparatus 100 (S140), and the operation of separating the passage of the water treatment apparatus 200 and the connecting member 190 connected to a passage of the electrode sterilizing module 100a (S170).

[200] First, the operation S110 of installing a connecting member includes the operations of connecting at least one connecting pipe 180 to a water outlet 260 of the water treatment apparatus 200, and connecting a circulation pipe 191 to filter passage pipes (L1, L2, L3, and L4), a tank water inlet passage pipe (L5), and a storage tank 220 of the water treatment apparatus 200. Then, the connecting pipe 180 is detachably connected at least one of water outlet cocks 261 and 262 and drain pipes 263 and 264 of the water outlet 260.

[201] In the sterilizing apparatus installed in operation S110, the water outlet cocks 261 and 262 are required to be opened so that water can be introduced when the sterilizing apparatus 100 is operated. Then, when the water outlet cocks 261 and 262 are mechanical valves, the water outlet cocks 261 and 262 are opened, and when the water outlet cocks 261 and 262 are electronic valves, an electronic valve opening button installed in the water treatment apparatus 200 is pressurized or a valve can be maintained in an opened state by installing a separate cable to apply an opening signal to the electronic valve. The drain pipes 263 and 264 and the raw water blocking valve V are preferably opened.

[202] Next, operation S120 of producing sterilizing/washing water includes the operations of introducing water from the connecting pipe 180 into the electrode sterilizing module 100a, applying a voltage to the electrode part 170 to produce sterilizing/washing water, and supplying the sterilizing water to the filter passage pipes L1, L2, L3, and L4, the tank water inlet passage pipe L5, or the storage tank 220 through the circulation pipe 191.

[203] Then, the water introducing operation, the sterilizing/washing water producing operation, and the circulation operation may be performed simultaneously, but their

order may be varied according to the details of the sterilizing apparatus 100.

- [204] For example, in FIG. 2, the circulation operation and the water introducing operation may be performed simultaneously by driving the pump 140, and the sterilizing/washing water producing operation by driving the electrode part 170 may be performed in a state in which water is introduced into the electrode part 170. In FIG. 10, the electrode part 170 may be operated in a state in which water is introduced to the electrode part 170 through the water inlet opening 151, and then the pump 140 may be driven, or the two operations may be performed simultaneously.
- [205] Meanwhile, in the water introducing operation, some of the passages communicated with the connecting pipe 180 may be sequentially opened through the passage converting unit 110. For example, although the first to fourth introducing openings may be sequentially opened, the cold/clean water outlet cocks 161 connected to the clean water tank 230 and the cold water tank 240 and the first to third introducing openings 111 to 113 connected to the cold/clean water drain pipe 263 may be opened first, and the second introducing opening 112 and the fourth introducing opening 114 connected to the hot water tank 250 may be opened after the sterilizing operation.
- [206] The operation of producing sterilizing/washing water, the electrode part 170 is driven until a concentration detected by a concentration sensor 120 for detecting a concentration of a sterilizing material or a washing material contained in the water introduced to the electrode part 170 reaches a predetermined value.
- [207] In the operation of producing sterilizing/washing water, the sterilizing/washing water is produced by supplying an electrolyte or a salt to the electrode part 170 (See FIGS. 6, 7, 9, 14, and 15).
- [208] Meanwhile, when raw water (L1) or clean water (L2 and L3) whose TDS is large is supplied through the passage pipes L1, L2, L3, L4, and L5, or even when the water whose TDS is large is supplied through the auxiliary tank 155, a concentration of the sterilizing/washing water can be increased at a rapid speed if the electrolyte supply unit 130 is installed. In this way, both when the water accommodated in the storage tank 220 is introduced to the electrode part 170 (see FIGS. 6 and 7) and when water of a large TDS is introduced to the electrode part 170, highly concentrated sterilizing/washing water may be produced rapidly with low power if the electrolyte supply unit 130 is additionally installed. Meanwhile, since a concentration of the sterilizing/washing water is measured by the concentration sensor 120 and the electrode part 170 is controlled by the control unit C, water can be sterilized at a stable concentration.
- [209] As illustrated in FIGS. 10 and 14, the operation of producing sterilizing/washing water, water is initially supplied from the filter passage pipe or the tank water inlet passage pipe of the water treatment apparatus to produce sterilizing/washing water, and a passage of the water inlet passage converting valve 150 may be converted after a

lapse of a predetermined time to produce sterilizing/washing water from the water supplied from the connecting pipe 180.

[210] In this way, since the water which has passed through the water inlet opening 151 and supplied from the passage pipes (L1, L2, and L3; L4 and L5 in the case of an ultra filtration filter) installed in the water treatment apparatus 200 has a large TDS, it is advantageous to produce highly concentrated sterilizing/washing water.

[211] To achieve this, when a reverse osmosis membrane filter 213 is installed in the filter part 210 of the water treatment apparatus 200, the passage pipes L1, L2, and L3 installed at a front end of the reverse osmosis membrane filter 213 are preferably connected to the water inlet opening 151.

[212] Unlike them, as illustrated in FIGS. 13 and 15, the sterilizing/washing water producing operation, water is initially supplied from an auxiliary tank 155 accommodating the water provided by the user, and water is supplied from the connecting pipe 180 to produce the sterilizing/washing water after a lapse of a period of time.

[213] In the circulation operation, the sterilizing/washing water is pressurized to be supplied to the filter passage pipes L1, L2, L3, and L4, the tank water inlet passage pipe L5, or the storage tank 220.

[214] Next, the operation S130 of stopping driving of the electrode part 170 for a predetermined time, after a period of time lapses after the operation of producing the sterilizing/washing water is performed or a concentration of the sterilizing material or the washing material contained in the water introduced to the electrode part 170 is above a predetermined value. However, if a concentration of the sterilizing/washing water is high, the operation 130 may not be performed. In the operation S130, the produced sterilizing/washing water is maintained in the storage tank 220 and the passages and the water outlet cocks 261 and 262 connected to it for a predetermined time to perform a sterilizing operation. To achieve this, as driving of the pump 140 is stopped, there is no water flow between the water treatment apparatus 200 and the sterilizing apparatus, stopping driving of the electrode part 170 for a predetermined time.

[215] In this way, after the sterilizing/washing water producing/supplying operation S120, or the completion of the sterilizing/washing water producing/supplying operation S120 and the operation S130, the sterilizing/washing water is discharged through the discharge opening 161 of the electrode sterilizing unit 100.

[216] In the sterilizing/washing water discharging operation S140, the pump 140 is driven with a passage of the water outlet passage converting valve 160 being converted toward the discharge opening 161. Then, the electrode part 170 is not operated.

[217] Meanwhile, the sterilizing/washing water discharging operation S140 may be completed by driving the pump 140 for a predetermined time, or preventing an

overload by preventing water from being introduced to the pump 140.

[218] When the sterilizing/washing water discharging operation S140 is completed, in the case of FIGS. 2, 13, and 15, the rinsing operation may be performed manually, or the sterilizing apparatus 100 may be separated from the water treatment apparatus 200 after the completion of the manual rinsing operation (S170).

[219] Unlike the operation, after the sterilizing/washing water discharging operation S140 is completed, the operation S170 of separating the sterilizing apparatus 100 from the water treatment apparatus 200 may be performed, in which case the clean water may be supplied into the storage tank 220 through the filter part 2109 to perform a rinsing operation.

[220] Second Embodiment of Sterilizing Method

[221] Next, a sterilizing method S100 of a water treatment apparatus 200 according to the second embodiment of the present invention will be described with reference to FIGS. 10, 14, and 17.

[222] In the sterilizing method S100 of the water treatment apparatus 200 according to the second embodiment of the present invention, unlike the first embodiment of FIG. 16, the rinsing water supplying operation S150 and the rinsing water discharging operation S160 are performed after the sterilizing/washing water discharging operation S140, and then the sterilizing apparatus separating operation S170 is performed.

[223] A description of the same or similar configurations will be omitted to avoid unnecessary repetition, and only unique configurations will be described.

[224] First, in the rinsing water supplying operation S150, rinsing water is supplied to the tank water inlet passage pipe L5 or the storage tank 220 of the water treatment apparatus 200.

[225] Referring to FIGS. 10 and 14, in the sterilizing apparatus 100 of FIGS. 10 and 14, since the passage pipes (L1, L2, L3; L4 and L5 in the case of an ultra filtration filter) of the water treatment apparatus 200 is connected to the water inlet opening 151, the sterilizing apparatus 100 can be receive water from the water treatment apparatus 200.

[226] Thus, a passage is converted through the water inlet passage converting valve 150 with the water inlet opening 151 and the electrode part 170 being connected and the pump 140 is driven with the electrode part 170 not being driven, the water introduced from the passage pipes (L1, L2, L3; L4 and L5 in the case of an ultra filtration filter) through the water inlet opening 151 can be supplied to the storage tank 220 via the water outlet opening 171, and the water serves as rinsing water.

[227] In the rinsing water supplying operation S150, the water level of the storage tank 220 can be maintained for a predetermined time and the water level of the storage tank 220 may be full. Then, the full water level can be detected by confirmation of the user or a full level sensor of the storage tank 220.

- [228] Meanwhile, after the rinsing water supplying operation S150 is completed, a waiting operation may be performed in a similar manner to the sterilizing/washing water producing/supplying operation S120, and then the rinsing water discharging operation S160 may be performed.
- [229] The rinsing water discharging operation S160 may be performed by driving the pump 140 with a passage of the water outlet passage converting valve 160 being converted to the discharge opening.
- [230] The rinsing water discharging operation S160 may be completed by driving the pump 140 for a predetermined time or preventing an overload by preventing water from being introduced to the pump 140.
- [231] While the present invention has been shown and described in connection with the exemplary embodiments, it will be apparent to those skilled in the art that modifications and variations can be made without departing from the spirit and scope of the invention as defined by the appended claims.

Claims

- [Claim 1] A sterilizing apparatus for a water treatment apparatus comprising:
an electrode sterilizing module configured to apply a voltage to an electrode to produce sterilizing/washing water containing a sterilizing material or a washing material; and
a connecting member configured to connect the electrode sterilizing module to a passage of the water treatment apparatus to supply the sterilizing/washing water to the water treatment apparatus.
- [Claim 2] The sterilizing apparatus of claim 1, wherein the connecting member includes at least one connecting pipe connected to a water outlet of the water treatment apparatus, and a circulation pipe connected to a filter passage pipe of the water treatment apparatus, a tank water inlet passage pipe, and a storage tank.
- [Claim 3] The sterilizing apparatus of claim 2, wherein the connecting pipe is detachably connected to at least one of a water outlet cock and a drain pipe constituting the water outlet, and the circulation pipe is detachably connected to the filter passage pipe, the tank water inlet passage pipe, or the storage tank.
- [Claim 4] The sterilizing apparatus of claim 1, wherein the electrode sterilizing module includes an electrode part configured to apply a voltage to an electrode to produce sterilizing/washing water containing a sterilizing material or a washing material, and a pump configured to provide pressure to supply the sterilizing/washing water produced in the electrode part to the passage of the water treatment apparatus.
- [Claim 5] The sterilizing apparatus of claim 4, wherein the electrode part produces sterilizing/washing water containing a mixed oxidant through electrolysis.
- [Claim 6] The sterilizing apparatus of claim 4, wherein the connecting member includes at least one connecting pipe connected to a water outlet of the water treatment apparatus, and a circulation pipe connected to a filter passage pipe of the water treatment apparatus, a tank water inlet passage pipe, and the storage tank, and the electrode sterilizing module further includes a passage converting unit configured to sequentially open some passages communicated with the connecting pipe.
- [Claim 7] The sterilizing apparatus of claim 4, wherein the connecting member includes at least one connecting pipe connected to a water outlet of the water treatment apparatus, and a circulation pipe connected to a filter

passage pipe of the water treatment apparatus, a tank water inlet passage pipe, and the storage tank, and the electrode sterilizing module further includes a manifold configured to supply water introduced through a plurality of introduction openings communicated with the connecting pipe to the electrode part.

[Claim 8] The sterilizing apparatus of any one of claims 4 through 7, wherein the electrode sterilizing module further includes a concentration sensor configured to detect a concentration of a sterilizing material or a washing material contained in water introduced to the electrode part.

[Claim 9] The sterilizing apparatus of any one of claims 4 through 7, wherein the electrode sterilizing module further includes a water outlet passage converting valve configured to convert a passage to a discharge opening to discharge water introduced to the electrode sterilizing module to the outside.

[Claim 10] The sterilizing apparatus of any one of claims 4 through 7, wherein the electrode sterilizing module further includes an electrolyte supply unit configured to supply an electrolyte or a salt to the electrode part.

[Claim 11] The sterilizing apparatus of claim 10, wherein the electrolyte supply unit is installed to be spaced apart from a water inlet side of the electrode part or installed on a discharge side of the electrode part.

[Claim 12] The sterilizing apparatus of any one of claims 4 through 7, wherein the electrode sterilizing module further includes a water inlet opening for receiving water from a filter passage pipe or a tank water inlet passage pipe of the water treatment apparatus, a water inlet passage converting valve configured to convert a passage to selectively supply water introduced to the water inlet opening and water introduced through the connecting member to the electrode part, and a control unit configured to control driving of the electrode part, a pump, and a water inlet passage converting valve.

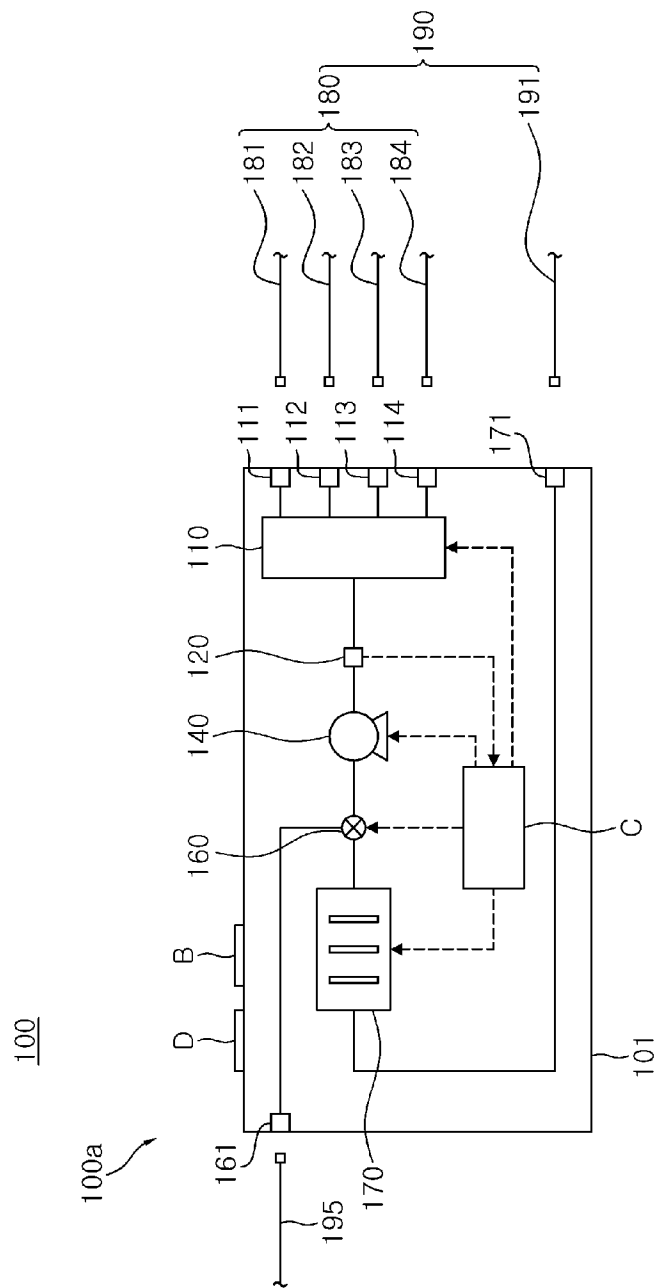
[Claim 13] The sterilizing apparatus of any one of claims 4 through 7, wherein the filter part of the water treatment apparatus includes a reverse osmosis membrane filter, the electrode sterilizing module includes a water inlet opening for receiving water from the filter passage pipe of the water treatment apparatus, and the filter passage pipe of the water treatment apparatus connected to the water inlet opening is a passage pipe through which clean water flows after passing through at least one of the filters installed in the filter part and before being introduced to the reverse osmosis membrane filter.

- [Claim 14] The sterilizing apparatus of any one of claims 4 through 7, wherein the electrode sterilizing module includes an auxiliary tank for accommodating water provided by a user, and the water accommodating in the auxiliary tank is introduced to the electrode part.
- [Claim 15] The sterilizing apparatus of claim 14, wherein the water accommodated in the auxiliary tank is introduced to the electrode part through the water inlet passage converting valve.
- [Claim 16] The sterilizing apparatus of any one of claims 4 through 7, wherein the electrode sterilizing module further includes a display unit configured to display a state of an operation of the electrode sterilizing module.
- [Claim 17] The sterilizing apparatus of any one of claims 4 through 7, wherein the electrode sterilizing module further includes a manipulation unit for manipulating an operation of the electrode sterilizing module.
- [Claim 18] A method of sterilizing a water treatment apparatus through an electrode sterilizing module including an electrode part configured to apply a voltage to an electrode to produce sterilizing/washing water containing a sterilizing material or a washing material, the method comprising the operations of:
installing a connecting member for connecting a passage of the water treatment apparatus and a passage of the electrode sterilizing module of a sterilizing apparatus; and
producing sterilizing/washing water in the electrode sterilizing module and supplying the sterilizing/washing water to the water treatment apparatus.
- [Claim 19] The method of claim 18, wherein the operation of installing a connecting member comprises the operations of connecting at least one connecting pipe to a water outlet of the water treatment apparatus, and connecting a circulation pipe to a filter passage pipe, a tank water inlet passage pipe, and a storage tank of the water treatment apparatus.
- [Claim 20] The method of claim 18, wherein the connecting pipe is detachably connected at least one of a water outlet cock and a drain pipe of the water outlet, and a water outlet cock and a drain pipe are maintained in an open state after the connecting pipe is connected in the operation of connecting the connecting pipe.
- [Claim 21] The method of claim 19, wherein the operation of producing sterilizing/washing water comprises the operations of introducing water from the connecting pipe into the electrode sterilizing module, applying a voltage to the electrode part to produce sterilizing/washing water, and

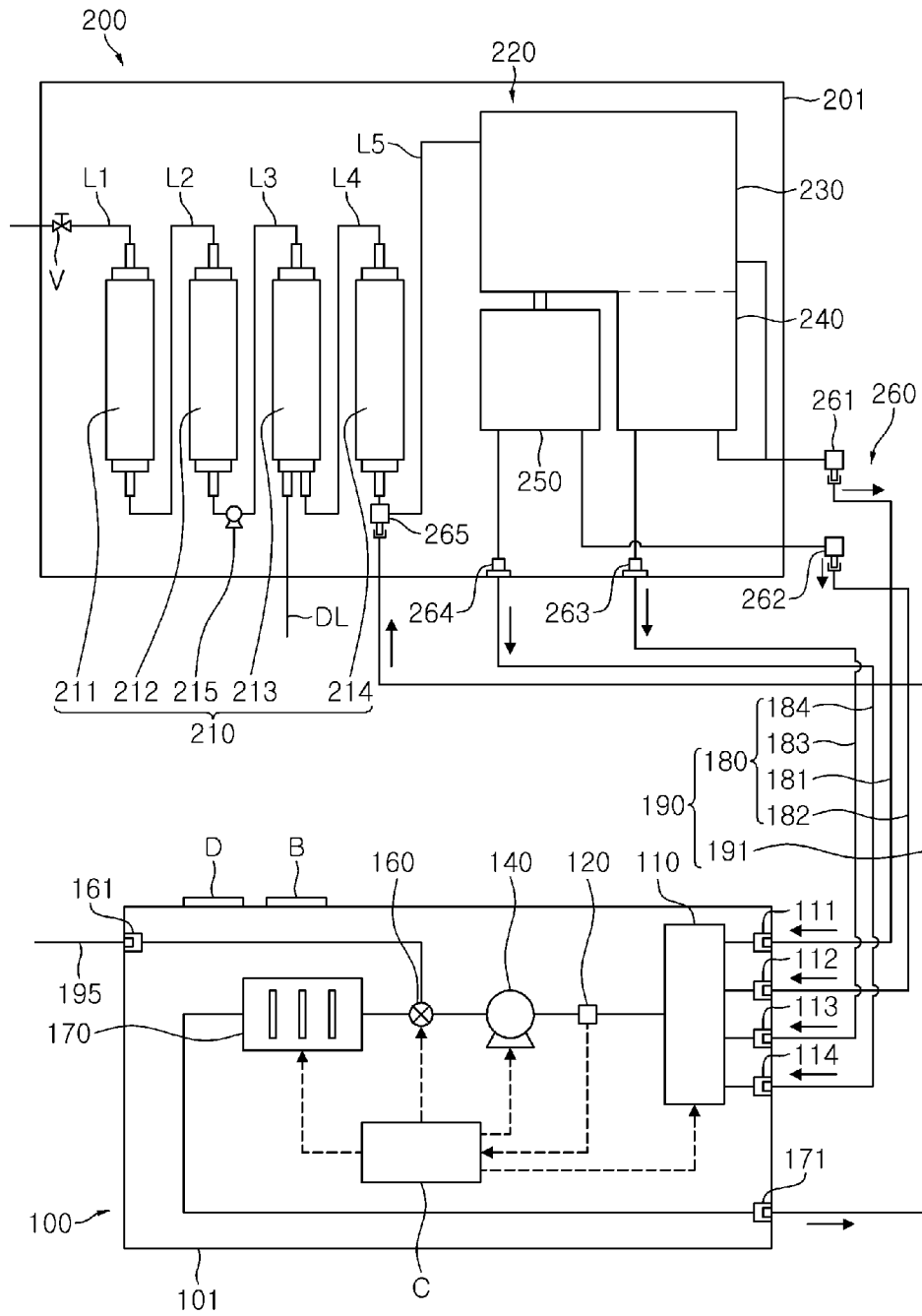
- circulating the sterilizing water to the filter passage pipe, the tank water inlet passage pipe, or the storage tank through the circulation pipe.
- [Claim 22] The method of claim 21, wherein, in the operation of introducing water, some of the passages communicated with the connecting pipe are sequentially opened.
- [Claim 23] The method of claim 21, wherein in the operation of producing sterilizing/washing water, the electrode part is driven until a concentration detected by a concentration sensor for detecting a concentration of a sterilizing material or a washing material contained in the water introduced to the electrode part reaches a predetermined value.
- [Claim 24] The method of claim 21, wherein in the operation of producing sterilizing/washing water, the sterilizing/washing water is produced by supplying an electrolyte or a salt to the electrode part.
- [Claim 25] The method of claim 21, wherein in the operation of producing sterilizing/washing water, water is initially supplied from the filter passage pipe or the tank water inlet passage pipe of the water treatment apparatus to produce sterilizing/washing water, and water is supplied from the connecting pipe to produce sterilizing/water water after a lapse of a period of time.
- [Claim 26] The method of claim 25, wherein the filter part of the water treatment apparatus includes a reverse osmosis membrane filter, and the filter passage pipe is a passage pipe through which clean water flows before being introduced to the reverse osmosis membrane filter and after passing through at least one filter.
- [Claim 27] The method of claim 21, wherein in the operation of producing the sterilizing/washing water, water is initially supplied from an auxiliary tank accommodating the water provided by the user, and water is supplied from the connecting pipe to produce the sterilizing/washing water after a lapse of a period of time.
- [Claim 28] The method of claim 21, wherein in the circulation operations, the sterilizing/washing water is pressurized to be supplied to the filter passage pipe, the tank water inlet passage pipe, or the storage tank.
- [Claim 29] The method of any one of claims 18 to 28, further comprising the operation of stopping driving of the electrode part for a predetermined time, after a period of time lapses after the operation of producing the sterilizing/washing water is performed or a concentration of the sterilizing material or the washing material contained in the water in-

- roduced to the electrode part is above a predetermined value.
- [Claim 30] The method of claim 29, wherein in the stopping operation, there is no flow of water between the water treatment apparatus and the electrode sterilizing module.
- [Claim 31] The method of claim 29, further comprising the operation of discharging the sterilizing/washing water through a discharge opening of the electrode sterilizing module.
- [Claim 32] The method of claim 25 or 26, further comprising the operations of stopping driving of the electrode part for a predetermined time, after a period of time lapses after the operation of producing the sterilizing/washing water is performed or a concentration of the sterilizing material or the washing material contained in the water introduced to the electrode part is above a predetermined value; discharging the sterilizing/washing water through the discharge opening of the electrode sterilizing module; and supplying rinsing water to the filter passage pipe, the tank water inlet passage pipe, or the storage tank after the sterilizing/washing water discharging operation.
- [Claim 33] The method of claim 32, wherein in the rinsing water supplying operation, the water introduced from the filter passage pipe installed in the filter part is supplied to the tank water inlet passage pipe or the storage tank of the water treatment apparatus with the electrode part not being driven.
- [Claim 34] The method of claim 33, wherein the rinsing water supplying operation is performed for a predetermined time or until the storage tank is full.
- [Claim 35] The method of claim 33, further comprising the operation of discharging rinsing water through a discharge opening of the electrode sterilizing module after the rinsing water supplying operation.
- [Claim 36] The method of claim 31, further comprising the operation of separating the passage of the water treatment apparatus and the connecting member connected to a passage of the electrode sterilizing module.
- [Claim 37] The method of claim 18, wherein the sterilizing apparatus is a sterilizing apparatus for a water treatment of any one of claims 1 to 7.

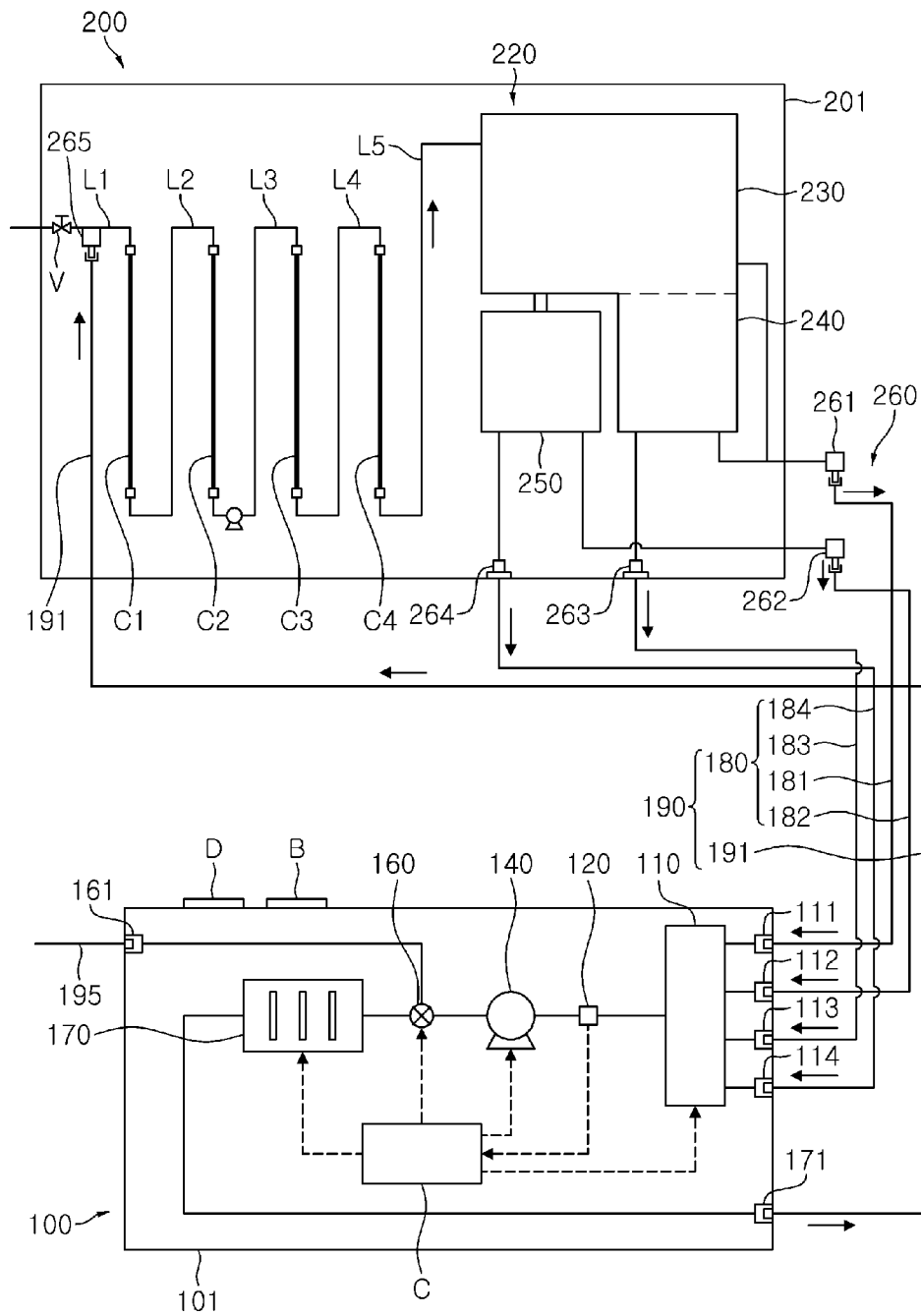
[Fig. 1]



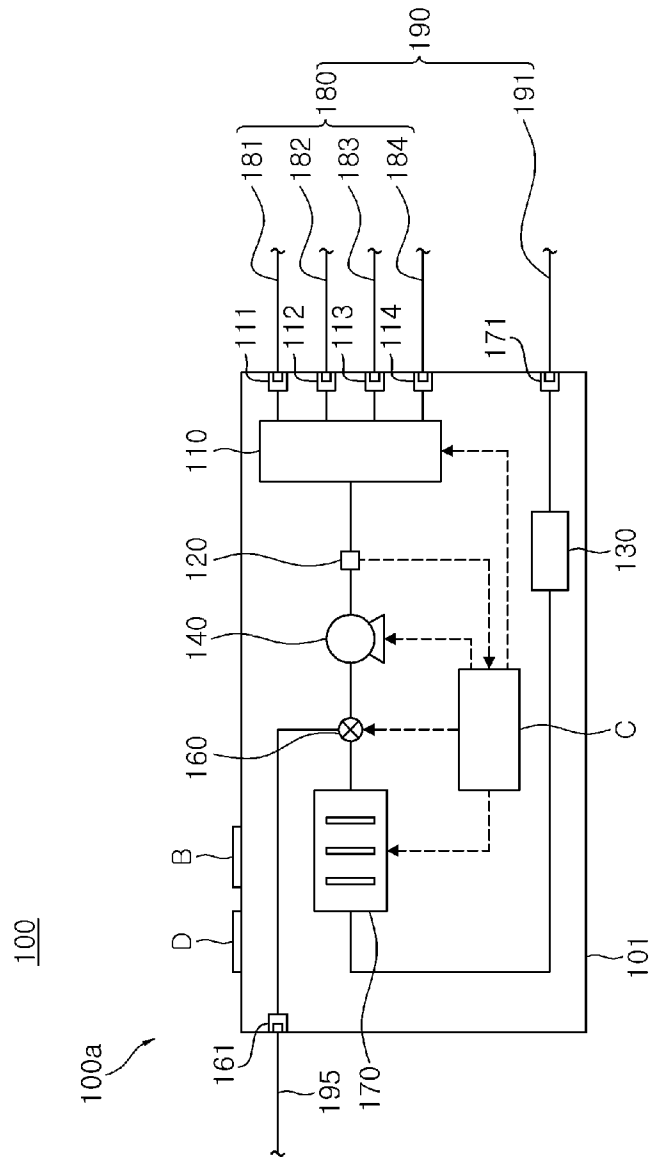
[Fig. 3]



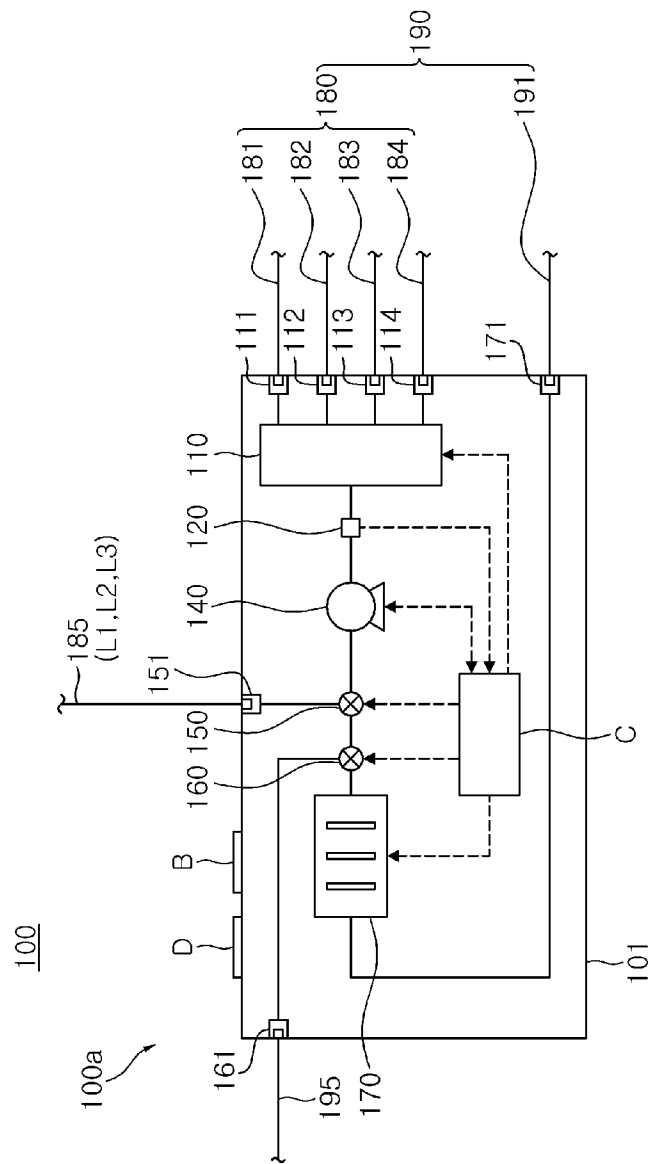
[Fig. 4]



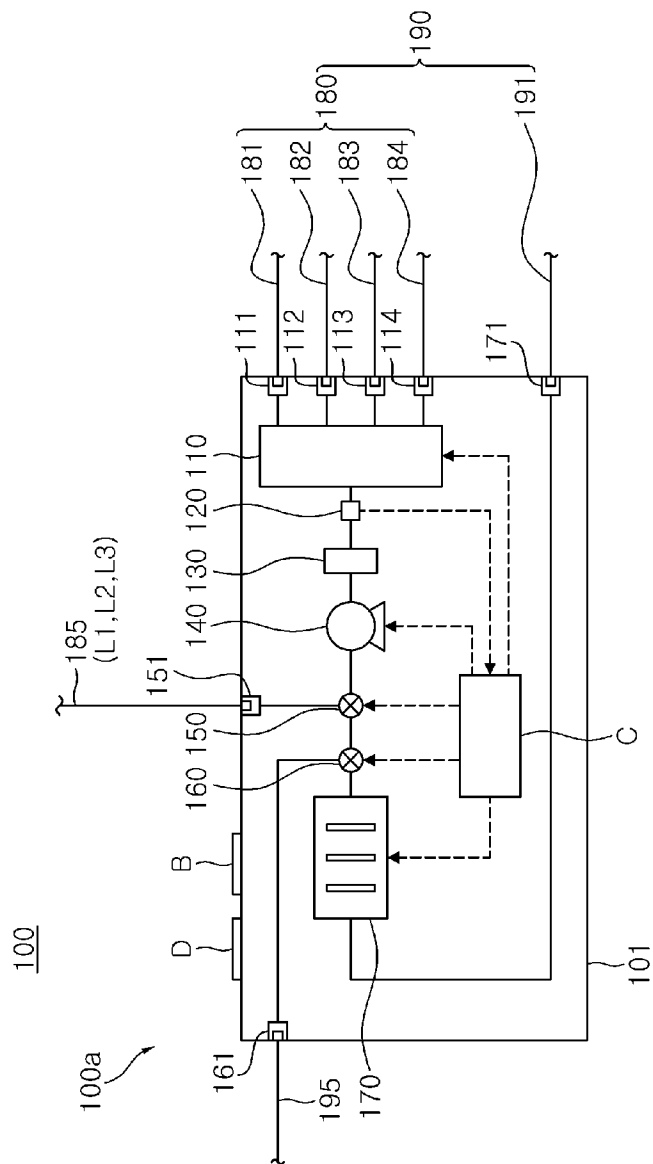
[Fig. 7]



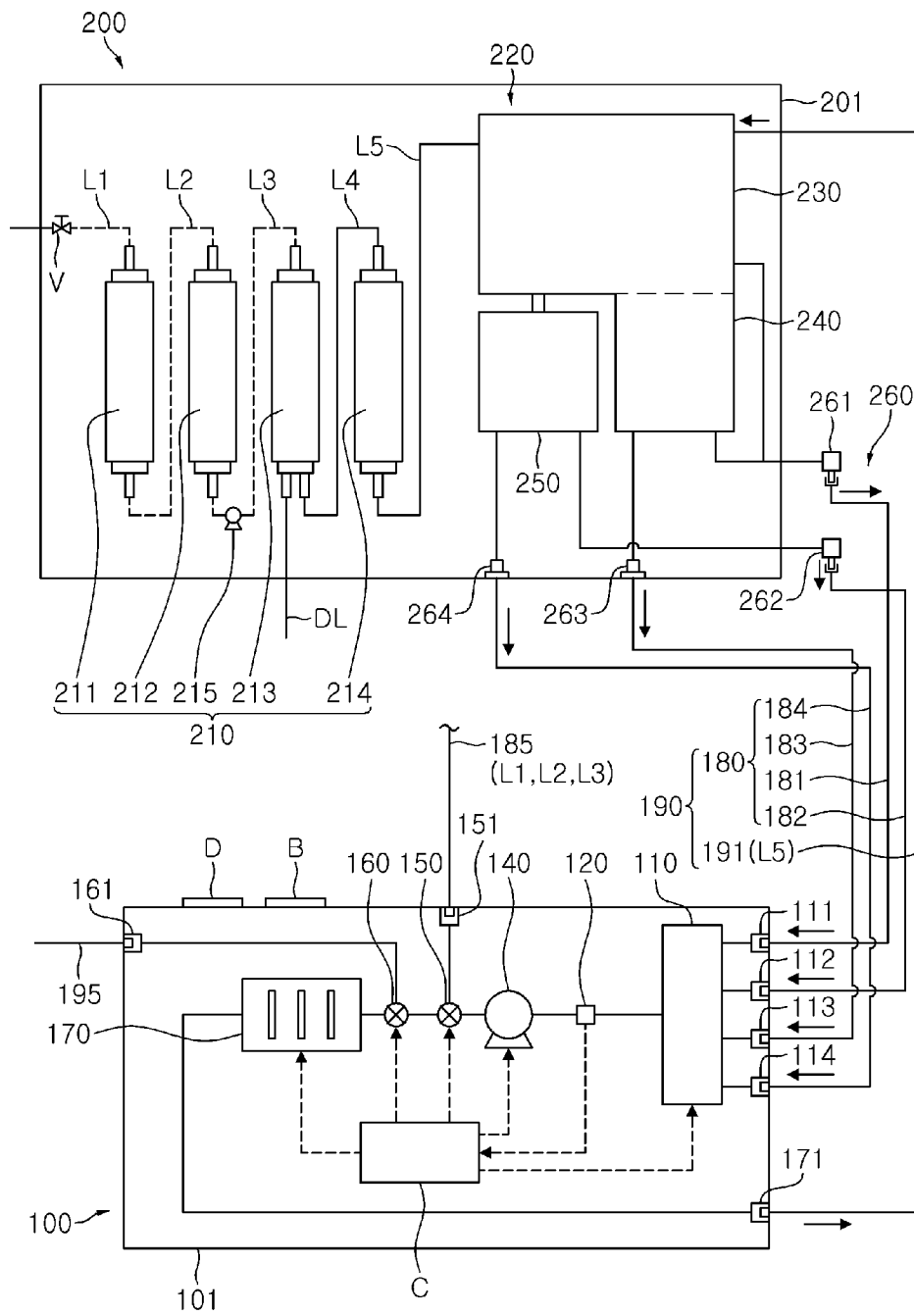
[Fig. 8]



[Fig. 9]

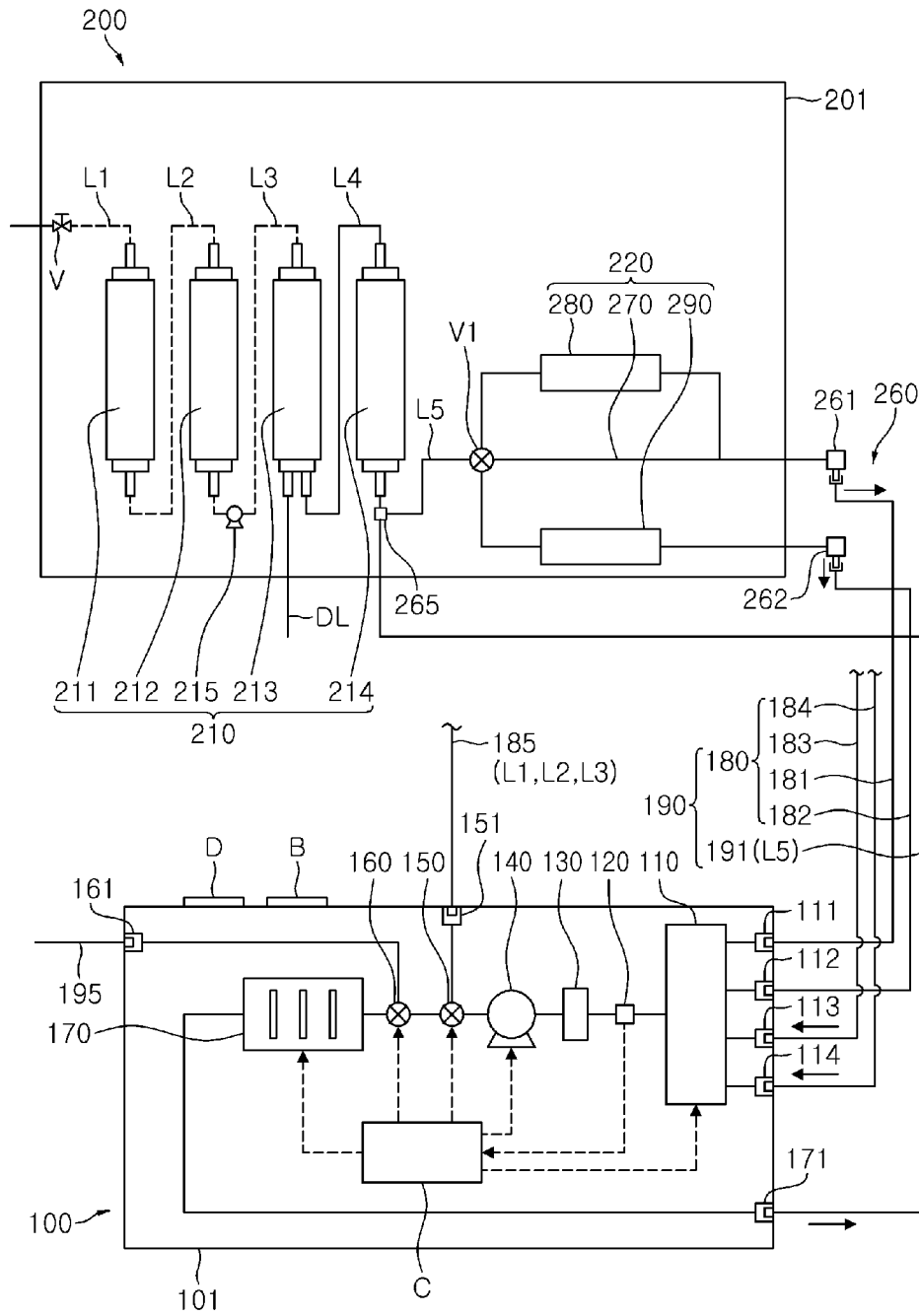


[Fig. 10]

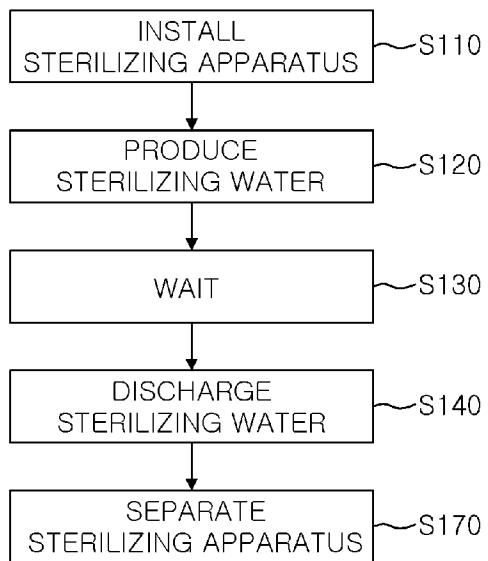


[illegible]

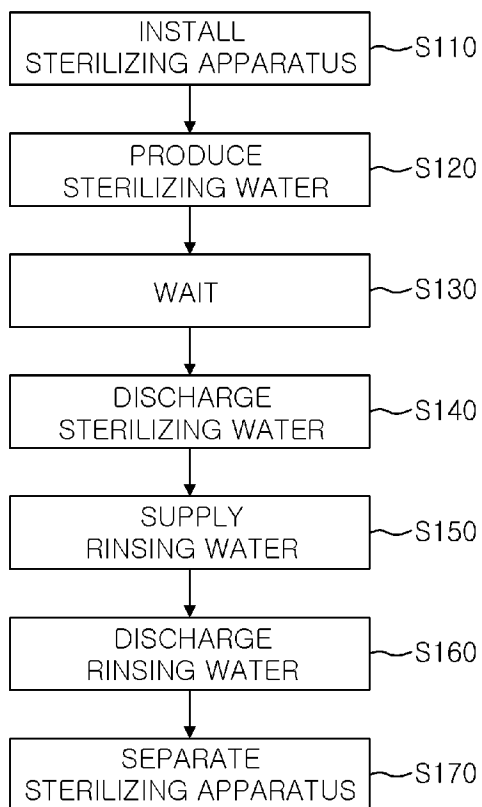
[Fig. 14]



[Fig. 16]

S100

[Fig. 17]

S100

A. CLASSIFICATION OF SUBJECT MATTER*C02F 1/467(2006.01)i, C02F 1/44(2006.01)i, B01D 35/14(2006.01)i, B01D 35/16(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)

C02F 1/467; B08B 9/093; B01D 35/00; B01D 35/16; B08B 9/032

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

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & Keywords: water, steriliz*, filt*, electro*

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR 10-2009-0047585 A (WELL TECHNOLOGY CO., LTD.) 13 May 2009	1
Y	See abstract, figure 2, pages 5-9 and claim 1.	2-37
Y	KR 10-2010-0131241 A (WOOJIN COWAY CO., LTD.) 15 December 2010	2-37
	See abstract, figure 2, page 5 and claim 1.	
Y	KR 10-2010-0062596 A (WOOJIN COWAY CO., LTD.) 10 June 2010	29-31
	See abstract, figure 3 and claim 1.	
A	KR 10-0531667 B1 (LEE, G. S.) 29 November 2005	1-37
	See abstract, figure 2, pages 4-8 and claim 2.	
A	KR 10-2011-0001969 A (WOOJIN COWAY CO., LTD.) 06 January 2011	1-37
	See abstract, figure 2 and claim 1.	



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"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

29 MAY 2012 (29.05.2012)

Date of mailing of the international search report

30 MAY 2012 (30.05.2012)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
189 Cheongsu-ro, Seo-gu, Daejeon Metropolitan
City, 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

KIM Dae Young

Telephone No. 82-42-481-8651



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2011/004812**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

- I. Claims 1-17 are directed to a sterilizing apparatus for a water treatment apparatus comprising: an electrode sterilizing module configured to apply a voltage to an electrode; and a connecting member configured to connect the electrode sterilizing module to a passage of the water treatment apparatus to supply the sterilizing/washing water to the water treatment apparatus..
- II. Claims 18-37 are directed to a method of sterilizing a water treatment apparatus through an electrode sterilizing module including an electrode part configured to apply a voltage to an electrode, the method comprising the operations of: installing a connecting member for connecting a passage of the water treatment apparatus and a passage of the electrode sterilizing module of a sterilizing apparatus; and producing sterilizing/washing water in the electrode sterilizing module and supplying the sterilizing/washing water to the water treatment apparatus.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR2011/004812Patent document
cited in search reportPublication
datePatent family
member(s)Publication
date

KR 10-2009-0047585 A

13.05.2009

None

KR 10-2010-0131241 A

15.12.2010

None

KR 10-2010-0062596 A

10.06.2010

None

KR 10-0531667 B1

29.11.2005

None

KR 10-2011-0001969 A

06.01.2011

None