

LAUNDRY TREATMENT DEVICE

CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present application claims priority to the Chinese Patent Application No. 202410898426.7 filed on July 04, 2024, Chinese Patent Application No. 202421574848.0 filed on July 04, 2024, and Chinese Patent Application No. 202422819091.3 filed on November 18, 2024. The disclosures of these applications are incorporated herein by reference in their entirety.

TECHNICAL FIELD

[0002] The present application relates to the technical field of laundry treatment, and in particular, relates to a laundry treatment apparatus.

BACKGROUND

[0003] This section is intended to introduce background or context for the embodiments of the present application. The descriptions contained herein are not admitted to be prior art merely by virtue of their inclusion in this section.

[0004] The laundry treatment apparatus is equipped with an electrolysis device. The electrolysis device electrolyzes the water via electrode plates to generate substances such as hydroxyl radicals ($\bullet\text{OH}$) and/or ozone, both of which have strong oxidizing capacity and excellent sterilization and disinfection effects.

[0005] In the related art, the cathode and anode of the electrolysis device are arranged at intervals; that is to say, a spacing must be reserved between the cathode and the anode. During the process of electrolyzing the water by the cathode and anode, the electrolysis relies on the conduction of ions in the water. There are significant differences in water quality across different regions. For example, the TDS of water in Wuxi is about 150, while that in northern regions such as Xinjiang is as high as 500; the TDS of water in Japan is about 80, whereas that in Europe and North America is over 500. TDS (Total Dissolved Solids) refers to the concentration of total dissolved substances in water, which mainly reflects the concentration of ions such as calcium ions and magnesium ions in water, and has a good corresponding relationship with water hardness and conductivity. For example, the lower the TDS value, the lower the concentration of ions such as calcium ions and magnesium ions in water, and the smaller the electrical conductivity. Differences in water

quality will lead to two extreme cases. The first case: the TDS of the water is too low, close to TDS of pure water, and the ion content in the water is insufficient to conduct electricity, thus making the electrolysis device unable to carry out electrolysis. The second case: the TDS of the water is too high, resulting in excessively hard water; the power of the anode and cathode rises sharply, which triggers short-circuit protection, and the anode and cathode rapidly deteriorate due to rapid formation of scale. Therefore, the difference in TDS of water quality leads to unstable effects of water electrolysis.

SUMMARY

- [0006] In view of this, the present application aims to provide a laundry treatment apparatus so as to reduce the impact of water quality on the power of the electrode plates.
- [0007] The embodiments of the present application provide a laundry treatment apparatus, comprising:
 - [0008] an electrolysis device comprising an electrode assembly, the electrode assembly comprises electrode plates and a solid electrolyte, at least one of the electrode plates is a cathode, at least one of the electrode plates is an anode, the cathode and the anode are stacked in a first direction, the solid electrolyte is disposed between the cathode and the anode;
 - [0009] a laundry treatment chamber;
 - [0010] a water valve;
 - [0011] a first liquid path, the first liquid path connects the water valve with the laundry treatment chamber, the electrolysis device is disposed in the first liquid path.
- [0012] In some embodiments, the laundry treatment apparatus further comprises a detergent box disposed in the first liquid path, the detergent box is located downstream of the electrolysis device.
- [0013] In some embodiments, the laundry treatment apparatus further comprises a detergent box and a second liquid path, the second liquid path connects the water valve with the laundry treatment chamber, the detergent box is disposed in the second liquid path.
- [0014] In some embodiments, the laundry treatment apparatus further comprises a detergent box, the electrolysis device is located on a rear side of the detergent box.
- [0015] In some embodiments, the laundry treatment apparatus further comprises a barrel assembly, the electrolysis device is located above the barrel assembly.
- [0016] In some embodiments, the electrolysis device comprises a housing formed with a

liquid inlet, a liquid outlet and a flow chamber, the liquid inlet and the liquid outlet are in communication with the flow chamber, at least a portion of the electrode assembly is located in the flow chamber, fluid in the first liquid path flows through the liquid inlet, the flow chamber and the liquid outlet in sequence.

[0017] In some embodiments, the liquid inlet is formed in one side surface of the housing in a second direction, the liquid outlet is formed in a lower surface of the housing, and the first direction, the second direction and a vertical direction are perpendicular to each other.

[0018] In some embodiments, the electrode assembly comprises a support frame, the solid electrolyte is disposed on the support frame.

[0019] In some embodiments, the support frame is located between the cathode and the anode, the solid electrolyte at least covers one side surface of the support frame in the first direction.

[0020] In some embodiments, a plane perpendicular to the first direction is defined as a projection plane, the projection of each of the electrode plates projection plane is located within a projection range of the solid electrolyte.

[0021] In some embodiments, each of the electrode plates is formed with a through hole extending through two side surfaces of the electrode plate in the first direction.

[0022] In some embodiments, the electrolysis device comprises two clamping members, the electrode assembly is clamped between the two clamping members.

[0023] In some embodiments, each clamping member comprises a clamping plate, the clamping plates of the two clamping members are located on two sides of the electrode assembly in the first direction, the clamping plate is formed with a liquid passage notch, the liquid passage notch extends through two side surfaces of the clamping plate in the first direction.

[0024] In some embodiments, each clamping member comprises an electric connection portion connected to the clamping plate, a plane perpendicular to the first direction is defined as a projection plane, projections of the electric connection portions of the two clamping members on the projection plane are spaced apart from each other.

[0025] In some embodiments, the laundry treatment apparatus further comprises:

[0026] a barrel assembly having the laundry treatment chamber and provided with a washing water discharge port in communication with the laundry treatment chamber; and

[0027] a circulation waterway system connected to the washing water discharge port and configured to guide the washing water discharged from the washing water discharge port to

the laundry treatment chamber;

[0028] the electrolysis device is disposed in the circulation waterway system and configured to electrolyze the washing water flowing through the circulation waterway system.

[0029] In some embodiments, the circulation waterway system comprises a circulation waterway and a circulation pump connected to the circulation waterway, the electrolysis device is disposed in the circulation waterway.

[0030] In some embodiments, the electrolysis device comprises a housing formed with a liquid inlet, a liquid outlet and a flow chamber, the liquid inlet and the liquid outlet are in communication with the flow chamber, at least a portion of the electrode assembly is located in the flow chamber, fluid in the circulation waterway flows through the liquid inlet, the flow chamber and the liquid outlet in sequence.

[0031] In some embodiments, the circulation waterway system comprises a circulation waterway and a circulation pump connected to the circulation waterway, the electrolysis device is disposed within the circulation pump.

[0032] In some embodiments, the electrolysis device comprises a housing formed with a liquid inlet, a liquid outlet and a flow chamber, the liquid inlet and the liquid outlet are in communication with the flow chamber, at least a portion of the electrode assembly is located in the flow chamber, fluid in the circulation pump flows through the liquid inlet, the flow chamber and the liquid outlet in sequence; or

[0033] at least a portion of the electrode assembly is disposed within the circulation pump and exposed within the circulation pump, the fluid in the circulation pump is in contact with the electrode assembly.

[0034] In some embodiments, the circulation waterway system comprises at least one nozzle in communication with the circulation waterway, the circulation pump pumps the washing water flowing through the circulation waterway to the nozzle, an injection orifice of the nozzle is in communication with the laundry treatment chamber.

[0035] In some embodiments, at least one of the cathode and the anode abuts against the solid electrolyte.

[0036] In some embodiments, the cathode is connected with a cathode terminal part for connecting to an external power wire, and the anode is connected with an anode terminal part for connecting to an external power wire.

[0037] In the laundry treatment apparatus of the embodiment of the present application,

on the one hand, the solid electrolyte is disposed between the anode and the cathode, which can prevent contact short circuit between the anode and the cathode. The solid electrolyte is capable of ion transport and the electric conduction does not rely on ions in water, thereby avoiding the impact of water quality on the power of the electrode plates. On the other hand, the water valve can supply water to the electrolysis device, and the water can flow through the electrolysis device via the first liquid path. In this way, the electrolysis device has little or even no contact with the washing water from the laundry treatment chamber, which can prevent impurities such as lint from adhering to the electrode assembly, reduce the risk of the electrode plates coming into contact with lint, and improve the electrolysis efficiency of the electrode plates. The substances such as hydroxyl radicals and/or ozone are generated after the water is electrolyzed by the electrolysis device. The electrolyzed water enters the laundry treatment chamber, and the substances with strong oxidative activity comprising hydroxyl radicals and/or ozone exert the effects of sterilization, disinfection on the laundry and avoid color cross-contamination. In addition, the hydrogen microbubbles can assist the detergent in removing dirt such as sebum, grease and microscopic dust accumulated inside the laundry fibers, so as to improve the cleaning ratio.

BRIEF DESCRIPTION OF THE DRAWINGS

- [0038] FIG. 1 is a schematic view of the partial structure of a laundry treatment apparatus in an embodiment of the present application;
- [0039] FIG. 2 is a schematic view of the structure of a first type of electrolysis device in an embodiment of the present application;
- [0040] FIG. 3 is an exploded schematic view of the first type of electrolysis device shown in FIG. 2;
- [0041] FIG. 4 is an exploded schematic view of the housing in an embodiment of the present application;
- [0042] FIG. 5 is an assembly schematic view of the electrode assembly, the clamping member and the insulating member of the first type of electrolysis device in FIG. 2;
- [0043] FIG. 6 is an exploded schematic view of the partial structure shown in FIG. 5;
- [0044] FIG. 7 is a schematic view of the structure of the electrode assembly in FIG. 5;
- [0045] FIG. 8 is a schematic view of the structure of a second type of electrolysis device in an embodiment of the present application;
- [0046] FIG. 9 is a cross-sectional schematic view taken in direction A-A of FIG. 8;

- [0047] FIG. 10 is a schematic front view of the structure of a laundry treatment apparatus in an embodiment of the present application;
- [0048] FIG. 11 is a schematic side view of the structure of a laundry treatment apparatus in an embodiment of the present application;
- [0049] FIG. 12 is an assembly schematic view of the electrolysis device of the laundry treatment apparatus on the circulation waterway in an embodiment of the present application;
- [0050] FIG. 13 is a partial schematic view at the circulation pump shown in FIG. 12.

DETAILED DESCRIPTION

- [0051] In the absence of conflicts, the embodiments and the technical features thereof in the present application may be combined with each other. The detailed description in the Detailed Description section shall be construed as an explanation of the purpose of the present application, and shall not be regarded as an improper limitation on the present application.
- [0052] It should be noted that in the embodiments of the present application, the term "downward" refers to the direction toward the ground, and "upward" is opposite to downward; the term "frontward" refers to the direction facing the user, and "backward" is opposite to frontward; the term "leftward" refers to the side corresponding to the user's left hand when the user is positioned on the front side of the laundry treatment apparatus 1000, and "rightward" is opposite to leftward. The up-down direction, left-right direction and front-back direction are perpendicular to each other. In the embodiments of the present application, the orientation or positional relationship indicated by the terms "upward", "downward", "frontward", "backward", "leftward", "rightward", "first direction" and "second direction" is based on the orientation or positional relationship shown in the accompanying drawings. It should be understood that these directional terms are only used to facilitate the description of the present application and simplify the description, and do not indicate or imply that the referred device or element must have a specific orientation, be constructed and operated in a specific orientation, and thus cannot be construed as a limitation on the present application. A further detailed description of the present application will be given below with reference to the accompanying drawings and specific embodiments.
- [0053] With reference to FIG. 1, an embodiment of the present application provides a

laundry treatment apparatus 1000, which comprises an electrolysis device 100, a laundry treatment chamber, a water valve and a first liquid path 230.

[0054] The laundry treatment chamber is configured to hold laundry.

[0055] The water valve is configured to connect to a water source. The water source comprises but is not limited to a tap water pipe and the like. In one embodiment, the water valve is configured to connect to a tap water pipe, and the water valve may serve as a water inlet control valve for the entire laundry treatment apparatus 1000. That is to say, the water valve is configured to supply water for processes (such as washing and rinsing) of the entire device.

[0056] The first liquid path 230 connects the water valve with the laundry treatment chamber, and the electrolysis device 100 is disposed in the first liquid path 230. The water valve is configured to allow or shut off the entry of the water from the water source into the first liquid path 230. The first liquid path 230 delivers the water from the water valve to the laundry treatment chamber after the water is electrolyzed by the electrolysis device 100.

[0057] With reference to FIG. 2, FIG. 5 and FIG. 6, the electrolysis device 100 comprises an electrode assembly 10. The electrode assembly 10 comprises electrode plates 11 and a solid electrolyte 12. At least one of the electrode plates 11 serves as the cathode 111, and at least one of the electrode plates 11 serves as the anode 112. The cathode 111 and the anode 112 are stacked in the first direction, and the solid electrolyte 12 is disposed between the cathode 111 and the anode 112. The solid electrolyte 12 is in solid state and has an ion transport function. Herein, the solid electrolyte 12 is used to separate the cathode 111 from the anode 112. On the one hand, it can separate the cathode 111 from the anode 112 to prevent contact short circuit between the cathode and the anode. On the other hand, it enables the electrolysis device 100 to operate without relying on ion conduction in water, thereby avoiding the impact of water quality on the power of the electrolysis device 100. In other words, the provision of the solid electrolyte 12 ensures the normal implementation of the electrolysis process.

[0058] The electrode assembly 10 is configured to electrolyze water to generate substances with strong oxidative activity, such as hydroxyl radicals ($\bullet\text{OH}$) and/or ozone. The substances with strong oxidative activity, such as hydroxyl radicals ($\bullet\text{OH}$) and/or ozone, can enter the laundry treatment chamber and conduct sterilization and disinfection on the laundry.

[0059] Water electrolysis principle of the electrode assembly 10 is as follows. A solid

electrolyte 12 is disposed between the cathode 111 and the anode 112, the solid electrolyte separates the cathode 111 from the anode 112 and is capable of transporting ion. In the process of water electrolysis by the electrode assembly 10, water molecules are ionized to generate cations and anions, and at least one of the cations and anions can migrate through the solid electrolyte 12. For example, hydrogen ions can migrate through the solid electrolyte 12. High-concentration cation regions and anion regions are formed on two sides of the solid electrolyte 12 in the first direction. Substances with strong oxidative activity such as hydroxyl radicals ($\bullet\text{OH}$) and/or ozone are generated on the surface of the anode 112, whereas hydrogen gas is generated on the surface of the cathode 111.

[0060] Ozone can exert sterilization and bacteriostasis effects on laundry and the like. In addition, ozone can oxidatively destroy the chromophoric groups of dye molecules dissolved in water to decolorize the dyes, thereby preventing the dissolved dyes from contaminating light-colored laundry and causing color cross-contamination. Ozone can further react with the decolorized dye molecules to decompose them into harmless substances comprising carbon dioxide, water and/or inorganic salts, without causing secondary pollution, and thus avoiding color cross-contamination.

[0061] Hydroxyl radicals ($\bullet\text{OH}$), due to their extremely high oxidation potential (2.80 eV) and thus strong oxidation capacity, can exert sterilization and bacteriostasis effects on laundry and the like. Hydroxyl radicals may cause rapid chain reactions with most organic pollutants, non-selectively oxidizing harmful substances into carbon dioxide, water or inorganic salts without causing secondary pollution. They can also oxidatively destroy dissolved dyes to decolorize them, thereby avoiding color cross-contamination.

[0062] The cathode 111 may generate hydrogen microbubbles, which have a very small diameter generally not greater than 50 μm . During the washing process, the hydrogen microbubbles can enter into the interior of laundry fibers. Through the actions of microbubble implosion, adsorption and flotation, the microbubbles can continuously scour the laundry, assist the detergent in removing dirt such as sebum, grease and microscopic dust accumulated inside the laundry fibers, and thus improve the cleaning ratio.

[0063] In the laundry treatment apparatus 1000 of the embodiment of the present application, on the one hand, the solid electrolyte 12 is disposed between the anode 112 and the cathode 111, which can prevent contact short circuit between the anode 112 and the cathode 111. The solid electrolyte 12 is capable of ion transport and the electric conduction does not rely on ions in water, thereby avoiding the impact of water quality on the power of

the electrode plates 11. On the other hand, the water valve can supply water to the electrolysis device 100, and the water can flow through the electrolysis device 100 via the first liquid path 230. In this way, the electrolysis device 100 has little or even no contact with the washing water from the laundry treatment chamber, which can prevent impurities such as lint from adhering to the electrode assembly 10, reduce the risk of the electrode plates 11 coming into contact with lint, and improve the electrolysis efficiency of the electrode plates 11. The substances such as hydroxyl radicals ($\bullet\text{OH}$) and/or ozone are generated after the water is electrolyzed by the electrolysis device 100. The electrolyzed water enters the laundry treatment chamber, and the substances with strong oxidative activity comprising hydroxyl radicals ($\bullet\text{OH}$) and/or ozone exert the effects of sterilization, disinfection on the laundry and avoid color cross-contamination. In addition, the hydrogen microbubbles can assist the detergent in removing dirt such as sebum, grease and microscopic dust accumulated inside the laundry fibers, so as to improve the cleaning ratio.

[0064] The statement "the cathode 111 and the anode 112 are stacked in the first direction" refers to that the anode 112 and the cathode 111 are arranged approximately in face-to-face manner. For example, as shown in Figures 5 and 6, each of the cathode 111, the anode 112 and the solid electrolyte 12 is a generally plate-like structure. The anode 112, the solid electrolyte 12, and the cathode 111 are sequentially stacked in the first direction, meaning they are arranged approximately parallel and face-to-face. This configuration minimizes the spacing between the two electrodes while preventing contact short circuit, thereby reducing energy consumption, improving the electrolysis efficiency of the electrolysis device 100, and facilitating a miniaturization of the electrolysis device 100. Such miniaturization of the electrolysis device also facilitates the installation of the electrolysis device in the laundry treatment apparatus 1000.

[0065] The functions of the laundry treatment apparatus 1000 are not limited. For example, in addition to the washing function, the laundry treatment apparatus 1000 may also have a drying function, which can be used to dry the laundry.

[0066] The laundry treatment apparatus 1000 may be a washing machine, a washer-dryer or the like. A washer-dryer is a type of laundry treatment apparatus 1000 that has both the washing function and the drying function.

[0067] The laundry treatment apparatus 1000 may comprise a barrel assembly 200, an axis of which may extend in the horizontal direction. The laundry treatment apparatus 1000 in this embodiment is also referred to as a drum-type laundry treatment apparatus 1000. For

example, the drum-type laundry treatment apparatus 1000 may be a drum-type washing machine, a drum-type washer-dryer, or the like.

[0068] In some embodiments, the barrel assembly 200 comprises a rotatable inner drum 201. The inner drum 201 is provided with an access opening, which may face forward. The space inside the inner drum 201 constitutes at least a part of the laundry treatment chamber, and the inner drum 201 may be configured for placing and treating the laundry. A user can load or unload the laundry into or out of the inner drum 201 from the front side through the access opening. The inner drum 201 is rotatable; for example, the laundry, water, detergent and the like rotate with the inner drum 201. In this way, the posture of the laundry continuously changes in the inner drum 201, and flow directions of the fluids such as water and detergent changes along with the rotation of the inner drum 201.

[0069] In some embodiments, the inner drum 201 may be generally in the shape of a hollow cylinder.

[0070] In some embodiments, the barrel assembly 200 comprises an outer tub 202, and the inner drum 201 may be disposed inside the outer tub 202. The outer tub 202 may be configured to hold water, and the inner drum 201 is configured to hold the laundry. In this embodiment, since water is held in the outer tub 202, the inner drum 201 may also be referred to as a perforated inner drum 201. Fluid may circulate between the interstitial space between the outer tub 202 and the inner drum 201 and the inner space of the inner drum 201 via the flow holes of the inner drum 201.

[0071] In some embodiments, the outer tub 202 may be generally in the shape of a hollow cylinder.

[0072] In some embodiments, the inner drum 201 can hold water by itself and may also be referred to as a non-perforated inner drum 201. An outer tub 202 may or may not be disposed outside the non-perforated inner drum 201.

[0073] It can be understood that, in some embodiments, the barrel assembly 200 may comprise only the inner drum 201 and does not have the aforementioned outer tub 202. In such embodiments, the inner drum 201 is a non-perforated inner drum 201 and can hold water by itself. The inner drum 201 may be of a single-drum structure. That is to say, the laundry treatment apparatus 1000 has only one drum, i.e., the inner drum 201.

[0074] In an example where the outer tub 202 serves as the water-holding member, the inner cavity of the inner drum 201 may form the laundry treatment chamber. A washing water discharge port 2021 may be provided at the bottom of the outer tub 202, so that the

washing water can be discharged out of the outer tub 202 through the washing water discharge port 2021, and flows into the laundry treatment chamber via the circulation waterway system 300. In an example where the inner drum 201 serves as the water-holding member, the inner cavity of the inner drum 201 may form the laundry treatment chamber. A washing water discharge port may be provided at the bottom of the inner drum 201, so that the washing water can be discharged out of the inner drum 201 through the washing water discharge port, and flows into the laundry treatment chamber via the circulation waterway system 300.

[0075] In some embodiments, the laundry treatment apparatus 1000 comprises a cabinet, and the barrel assembly 200 is disposed inside the cabinet. The cabinet is provided with an opening in communication with the interior of the barrel assembly 200. For example, the front closure door 700 of the cabinet is provided with said opening.

[0076] In some embodiments, the cabinet may be generally in the shape of a hexahedron, for example, a cube or a rectangular prism.

[0077] In some embodiments, as shown in FIGS. 1 and 11, the laundry treatment apparatus 1000 comprises a door body 400 and a door gasket 500. The door body 400 is configured to selectively open or close the opening of the cabinet. The axis of the barrel assembly 200 extends in the horizontal direction. The door gasket 500 may be configured to seal the gap between the barrel assembly 200 and the opening of the front closure door 700. The space surrounded by the door gasket 500 and the space inside the inner drum 201 may constitute the laundry treatment chamber.

[0078] It should be noted that the extension direction of the axis of the door gasket 500 is consistent with that of the axis of the barrel assembly 200, and the axis of the door gasket 500 may extend in the horizontal direction.

[0079] In one embodiment, as shown in FIGS. 5 to 7, at least one of the electrode plates 11 is in contact with the solid electrolyte 12. In some embodiments, the cathode 111 is in contact with the solid electrolyte 12. In some embodiments, the anode 112 is in contact with the solid electrolyte 12. In some embodiments, both the cathode 111 and the anode 112 are in contact with the solid electrolyte 12.

[0080] In one example, both the electrode plates 11 and the solid electrolyte 12 are in a flat plate structure, and at least one of the electrode plates 11 may abut against the solid electrolyte 12.

[0081] In this embodiment, at least one of the electrode plates 11 is in contact with the

solid electrolyte 12, which can reduce the distance between the cathode 111 and the anode 112, improve the working efficiency of the electrode assembly 10, and reduce energy consumption.

[0082] In one embodiment, as shown in FIGS. 1 and 5, the laundry treatment apparatus 1000 comprises a detergent box 600. The detergent box 600 is disposed in the first liquid path 230 and located downstream of the electrolysis device 100. A part of the cavity of the detergent box 600 constitutes a part of the first liquid path 230. The water electrolyzed by the electrolysis device 100 may first flow through the detergent box 600 and then enter the laundry treatment chamber. The use of the cavity of the detergent box 600 as a part of the first liquid path 230 can save pipe fittings and reduce costs. Since the detergent box 600 is located downstream of the electrolysis device 100, the detergent can be prevented from contacting the electrode assembly 10, which avoids contamination and scaling of the electrode plates 11 caused by the contact between the electrode assembly 10 and the detergent, and reduce the impact of the detergent in the detergent box 600 on the electrolysis device 100.

[0083] The detergent box 600 is configured to dispense detergent into the laundry treatment chamber.

[0084] The type of detergent is not limited, and the detergent comprises but is not limited to cleaning agents, fabric softeners, fragrance enhancers, and the like. A cleaning agent is used for cleaning laundry. A fabric softener functions to soften the laundry, fluff up the laundry and eliminate static electricity from the laundry. A fragrance enhancer is used for adding fragrance to the laundry. The cleaning agent may be a liquid laundry detergent or a granular laundry powder.

[0085] In one embodiment, the detergent box 600 is formed with a liquid flow channel, and the first liquid path 230 may flow through the liquid flow channel. That is to say, the liquid flow channel constitutes a part of the first liquid path 230.

[0086] In one embodiment, the detergent box 600 comprises a box cover and a box body. The box cover covers the upper opening of the box body to define a placement cavity. The liquid flow channel may be formed in the box cover.

[0087] In one embodiment, the laundry treatment apparatus 1000 comprises a detergent box 600 and a second liquid path. The second liquid path connects the water valve with the laundry treatment chamber, and the detergent box 600 is disposed in the second liquid path. The water from the water valve enters the electrolysis device 100 through the first liquid

path 230, and the water from the water valve enters the detergent box 600 through the second liquid path. The electrolyzed water from the electrolysis device 100 and the water flowing through the detergent box 600 do not affect each other. In this way, it facilitates the flexible arrangement of the electrolysis device 100 and can shorten the fluid path between the electrolysis device 100 and the laundry treatment chamber.

[0088] In one embodiment, as shown in FIG. 1, the laundry treatment apparatus 1000 comprises a detergent box 600, and the electrolysis device 100 is located on the rear side of the detergent box 600. The electrolysis device 100 and the detergent box 600 are reasonably arranged, which enables to make full use of the space inside the cabinet.

[0089] In one embodiment, the water valve is located on the rear side of the electrolysis device 100. The electrolysis device 100 is located between the water valve and the detergent box 600. If both the electrolysis device 100 and the detergent box 600 are disposed in the first liquid path 230, a relatively short distance between the electrolysis device 100 and the water valve can be ensured, which facilitates the piping arrangement of the first liquid path 230.

[0090] In one embodiment, the laundry treatment apparatus 1000 comprises a barrel assembly 200, and the electrolysis device 100 is located above the barrel assembly 200. The space above the barrel assembly 200 is utilized for arranging the electrolysis device 100. The space inside the barrel assembly 200 constitutes a part of the laundry treatment chamber.

[0091] In one embodiment, as shown in FIGS. 2 to 9, the electrolysis device 100 comprises a housing 40. The housing 40 is formed with a liquid inlet 40a, a liquid outlet 40b, and a flow chamber 40c. Both the liquid inlet 40a and the liquid outlet 40b are in communication with the flow chamber 40c. At least a part of the electrode assembly 10 is located in the flow chamber 40c. The fluid of the first liquid path 230 flows through the liquid inlet 40a, the flow chamber 40c, and the liquid outlet 40b in sequence. For example, the water from the water valve enters the flow chamber 40c through the liquid inlet 40a, the electrode assembly 10 electrolyzes the water flowing through the flow chamber 40c, and the electrolyzed water flows out through the liquid outlet 40b. As the electrode assembly 10 is exposed in the flow chamber 40c, the housing 40 facilitates the concentrated flow of water through the electrode assembly 10 and improves electrolysis efficiency, and also protects the electrode assembly 10.

[0092] In one embodiment, the laundry treatment apparatus 1000 comprises a dispenser

box. The dispenser box is provided with a detergent dispensing cavity and is slidably disposed in the detergent box 600. For example, the dispenser box is slidably disposed in the placement cavity. The detergent dispensing cavity is configured for dispensing detergent. When the dispenser box is at least partially pulled out to the outside of the detergent box 600, the user can pour detergent into the detergent dispensing cavity. The detergent box 600 may be provided with a mixing cavity in which detergent and water can be mixed. For example, the area of the placement cavity located below the dispenser box may serve as the mixing cavity.

[0093] In one embodiment, the detergent box 600 is formed with a discharge port in communication with the mixing cavity. The discharge port is configured to discharge the detergent mixture solution in the mixing cavity into the laundry treatment chamber.

[0094] In one embodiment, the liquid flow channel may be located above the mixing cavity, and the liquid flow channel and the mixing cavity are independent of each other. That is to say, the electrolyzed water in the liquid flow channel will not enter the mixing cavity, and the detergent mixture solution in the mixing cavity will not enter the liquid flow channel.

[0095] In one embodiment, the first liquid path 230 comprises a first pipe, which connects the water valve with the liquid inlet 40a. The water from the water valve enters the flow chamber 40c through the first pipe and the liquid inlet 40a. The first pipe constitutes a part of the first liquid path 230.

[0096] In one embodiment, as shown in FIGS. 1 to 4, the first liquid path 230 comprises a second pipe 210 and a third pipe 220. The second pipe 210 connects the liquid outlet 40b with the inlet of the liquid flow channel, and the third pipe 220 connects the outlet of the liquid flow channel with the laundry treatment chamber. The electrolyzed water in the flow chamber 40c flows through the second pipe 210, the liquid flow channel and the third pipe 220 in sequence and enters the laundry treatment chamber. The first pipe, the flow chamber 40c, the second pipe 210, the liquid flow channel and the third pipe 220 may constitute the first liquid path 230.

[0097] In one embodiment, as shown in FIG. 1, the water outlet end of the third pipe 220 is connected to the door gasket 500. For example, the water outlet end of the third pipe 220 may extend into the radially inner side of the door gasket 500. In this way, the electrolyzed water can directly enter the laundry treatment chamber through the space surrounded by the door gasket 500, without the need for intermediate pipes to direct the liquid again.

- [0098] In some embodiments, the fourth pipe connects the liquid outlet 40b and the laundry treatment chamber. In this way, the first pipe, the flow chamber 40c and the fourth pipe may form the first liquid path 230. The first liquid path 230 may not pass through the detergent box 600.
- [0099] It should be understood that a part of the fourth pipe may be fixed to the detergent box 600. For example, the fourth pipe is fixed to the detergent box 600 by means of a clamping connection.
- [00100] In one embodiment, referring to FIGS. 2 to 4, the liquid inlet 40a is formed in one side surface of the housing 40 in the second direction, and the liquid outlet 40b is formed in the lower surface of the housing 40. The first direction, the second direction and the vertical direction are perpendicular to one another.
- [00101] In one embodiment, referring to FIGS. 1, 2 and 6, the cathode 111 and the anode 112 are stacked in the leftward-rightward direction, and the liquid inlet 40a may be formed in the backward side of the housing 40.
- [00102] In this embodiment, the water from the water valve flows into the flow chamber 40c generally in the second direction through the liquid inlet 40a, and the electrolyzed water in the flow chamber 40c flows out through the liquid outlet 40b. Inside the flow chamber 40c, the water flows in the second direction relative to the electrode assembly 10, so that the water flows continuously through the electrode assembly 10 and carries away products such as ozone, hydroxyl radicals ($\bullet\text{OH}$) and hydrogen. The liquid outlet 40b is formed in the lower surface of the housing 40, facilitating the smooth discharge of the electrolyzed water from the flow chamber 40c.
- [00103] In one embodiment, referring to FIGS. 2 and 3, the axis of the liquid outlet 40b intersects the vertical direction. The axis of the liquid outlet 40b refers to the line connecting the center points of the flow cross-sections of the liquid outlet 40b. In the case where the flow cross-section of the liquid outlet 40b is circular, the axis of the liquid outlet 40b is the line connecting the circle centers. The axis of the liquid outlet 40b intersects the vertical direction, that is to say, the liquid outlet 40b extends obliquely relative to the vertical direction.
- [00104] In one embodiment, the liquid outlet 40b may be located on the side of the electrode plate 11 away from the liquid inlet 40a in the second direction. In this design, the fluid from the liquid inlet 40a can flow completely through the electrode plate 11 generally in the second direction, and the water may flow out through the liquid outlet 40b after being

in full contact with the electrode plate 11.

[00105] In one embodiment, the electrode assembly 10 comprises a support frame, and the solid electrolyte 12 is disposed on the support frame. The support frame can provide a supporting for the solid electrolyte 12, enhance the structural strength of the solid electrolyte 12, and reduce the probability of wrinkling and deformation of the solid electrolyte 12.

[00106] In one embodiment, the support frame is located between the cathode 111 and the anode 112, and the solid electrolyte 12 covers at least one side surface of the support frame in the first direction.

[00107] In some embodiments, the solid electrolyte 12 covers one side surface of the support frame in the first direction. In another embodiment, the solid electrolyte 12 covers two side surfaces of the support frame in the first direction. In further embodiments, the solid electrolyte 12 covers all outer surfaces of the support frame.

[00108] In this embodiment, the solid electrolyte 12 is configured to allow the migration of at least one of anion and cation. The support frame is used to enhance the mechanical strength of the solid electrolyte 12, such that the solid electrolyte 12 is not prone to being pierced, which helps to reduce the risk of internal short circuit and prevents the solid electrolyte 12 from being damaged during the assembly process of the electrolysis device 100.

[00109] It should be understood that the solid electrolyte 12 may comprise one layer or multiple layers. The term "multiple layers" as used herein comprises two layers and more than two layers, for example, two layers, three layers, etc.

[00110] In some embodiments, the solid electrolyte 12 and the support frame may be formed as an integral structure. That is to say, the solid electrolyte 12 may adhere to the support frame by virtue of its own force.

[00111] In some embodiments, the solid electrolyte 12 may be connected to the support frame by a fastener.

[00112] The manner in which the solid electrolyte 12 is attached to the support frame is not limited. For example, the solid electrolyte 12 may be attached to the support frame by means of coating, deposition and the like.

[00113] The type of the solid electrolyte 12 is not limited. The solid electrolyte 12 may be a proton membrane for the migration of hydrogen ions, or alternatively, it may be a solid membrane of another type. For example, the solid electrolyte 12 comprises, but is not limited to, a solid polymer solid electrolyte (Solid Polymer Electrolyte Membrane, SPEM).

- [00114] The structure of the support frame is not limited. For example, the support frame may be in the form of a mesh structure. The support frame in a mesh structure is easy to machine and form, and is conducive to the structural stability of itself, thus enhancing the structural stability of the electrode assembly 10.
- [00115] The shape of the mesh openings of the mesh structure is not limited. The shape of the mesh openings may be circular, elliptical or polygonal and the like.
- [00116] The material of the support frame is not limited, and the support frame may be made of an insulating material.
- [00117] In some embodiments, the cathode 111 and the anode 112 may abut against the solid electrolyte 12. In this way, the distance between the cathode 111 and the anode 112 is small, which improves the electrolysis efficiency.
- [00118] In one embodiment, referring to FIGS. 5 to 7 and 9, a plane perpendicular to the first direction is the projection plane, and the projection of each electrode plate 11 on the projection plane is located within the projection range of the solid electrolyte 12. That is to say, the projections of the cathode 111 and the anode 112 are both located within the projection range of the solid electrolyte 12. The size of the solid electrolyte 12 is greater than or equal to that of the electrode plates 11, which not only minimizes the probability of contact between the cathode 111 and the anode 112 as much as possible and improves reliability and safety, but also facilitates the rapid and effective ion transfer by the solid electrolyte 12.
- [00119] In one embodiment, referring to FIGS. 5 to 9, the electrode plate 11 is formed with at least one through-hole 11a extending through two side surfaces in the first direction. For example, the cathode 111 is formed with at least one through-hole 11a extending through two side surfaces in the first direction, and the anode 112 is formed with at least one through-hole 11a extending through two side surfaces in the first direction. On the one hand, water can contact and wet the solid electrolyte 12 through the through-hole 11a. On the other hand, ozone, hydroxyl radicals ($\bullet\text{OH}$), and hydrogen generated by the electrode plate 11 can be rapidly released through the through-hole 11a.
- [00120] The shape of the through-hole 11a is not limited. The shape of the through-hole 11a comprises, but is not limited to, circular, elliptical, waist-shaped or polygonal.
- [00121] In some embodiments, the through-hole 11a is an elongated hole. The through-hole 11a may extend in a direction intersecting with the second direction to form the elongated hole.

- [00122] In one embodiment, referring to FIGS. 3 and 5, the electrolysis device 100 comprises two clamping members 20, and the electrode assembly 10 is clamped between the two clamping members 20. The clamping members 20 may limit and fix the position of the electrode assembly 10. For example, with the electrode assembly 10 clamped between the two clamping members 20, the assembly method is simplified, and the electrode assembly 10 can be prevented from loosening and falling off, thereby enhancing the connection stability between the electrode assembly 10 and the two clamping members 20.
- [00123] In one embodiment, referring to FIGS. 5, 6 and 9, each clamping member 20 comprises a clamping plate 21. The clamping plates 21 of the two clamping members 20 are located on two sides of the electrode assembly 10 in the first direction respectively, and each clamping plate 21 is formed with at least one liquid passage notch 21a which extends through the two side surfaces of the clamping plate 21 in the first direction. The two clamping plates 21 clamp the electrode assembly 10. Each clamping plate 21 is of a plate-like structure and has a large contact area with the electrode assembly 10, and thus the clamping plates can effectively clamp the electrode assembly 10 and reduce the risk of displacement of the electrode assembly 10 during the assembly process. The liquid passage notch 21a is configured for the circulation of fluid, such as water, which can flow through the liquid passing notch 21a to contact the electrode plate 11.
- [00124] The plate-like structure may be a flat plate structure or a curved plate structure.
- [00125] In some embodiments, referring to FIGS. 5, 6 and 9, a plane perpendicular to the first direction is the projection plane, and the projection of the through-hole 11a on the projection plane is located within the projection range of the liquid passage notch 21a. That is to say, the through-hole 11a is in communication with the liquid passage notch 21a. In this way, the clamping plates 21 do not block the flow of water toward the electrode plate 11 and the solid electrolyte 12, thereby enabling the fluid to contact the electrode assembly 10 smoothly.
- [00126] In some embodiments, referring to FIGS. 5, 6 and 9, the clamping plate 21 comprises a rim 211 and at least one reinforcing rib 212. The rim 211 surrounds and defines an avoidance space. The reinforcing rib 212 is disposed in the avoidance space and connected to the rim 211. The reinforcing rib 212 divides the avoidance space into a plurality of liquid passage notches 21a. The rim 211 and the reinforcing rib 212 may contact the electrode plate 11 to clamp the electrode assembly 10. The avoidance space is configured for the circulation of water, allowing the water to pass through the avoidance

space to contact the electrode plate 11.

[00127] In this embodiment, the rim 211 may abut against the perimeter of the electrode plate 11, such that all the perimeter of the electrode plate 11 is subjected to a clamping force. The reinforcing rib 212 is configured to optimize stress distribution and transmission, and function to enhance the strength of the rim 211. The reinforcing rib may also abut against the middle portion of the electrode plate 11 to improve the clamping effect.

[00128] For example, referring to FIGS. 5 and 6, each clamping plate 21 comprises at least two reinforcing ribs 212 intersecting with each other. The at least two reinforcing ribs 212 divide the avoidance space into a plurality of liquid passage notches 21a with approximately the same area. In this way, the fluid passing through each liquid passage notch 21a at the same flow rate and flow velocity, thereby enabling the fluid to circulate stably and uniformly.

[00129] It should be noted that the term "plurality" in the embodiments of the present application means two or more.

[00130] In some embodiments, referring to FIGS. 5, 6 and 9, each clamping member 20 comprises a fastener 22 and a fixing lug 23 connected to the clamping plate 21, and the fastener 22 is inserted through the fixing lugs 23 of two clamping members 20. Assembling and fixing the two clamping members 20 by means of the fixing lugs 23 and the fastener 22 is easy to operate, which improves the assembly efficiency.

[00131] The type of the fastener 22 is not limited. For example, the fastener 22 may be a bolt. In the example where the fastener 22 is a bolt, the distance between two fixing lugs 23 can be adjusted by adjusting the bolt and the nut, thereby adjusting the clamping force of the clamping member 20.

[00132] In some embodiments, referring to FIGS. 5, 6 and 9, the fixing lug 23 is connected to the perimeter of the clamping plate 21. In an example, the fixing lug 23 is connected to the perimeter of the rim 211. In this way, the fixing lug 23 does not block the liquid passage notches 21a, and the fluid can flow smoothly through the liquid passage notches 21a to contact the electrode assembly 10, thereby improving the electrolysis efficiency of the electrolysis device 100. Furthermore, the perimeter of the rim 211 has a relatively large installation space, which facilitates the assembly of the two clamping members 20 and improves the assembly efficiency.

[00133] In one embodiment, with reference to FIGS. 5, 6 and 9, a plurality of fixing lugs 23 are spaced apart from one another in the circumferential direction of the clamping plate

21, and the fixing lugs 23 of the two clamping members 20 are in one-to-one correspondence. In this way, the connection stability of the two clamping members 20 can be further enhanced, and the two clamping members 20 can be prevented from offset and misalignment.

[00134] In some embodiments, the electrolysis device 100 comprises at least one insulating member 30 disposed between the fixing lugs 23 of the two clamping members 20. For example, referring to FIGS. 5 and 6, the insulating member 30 is arranged around the portion of the fastener 22 located between the two fixing lugs 23. On the one hand, the insulating member 30 can prevent the two clamping members 20 from contacting or colliding with each other, exert an insulating protection effect on the electrolysis device 100, and prevent the occurrence of a contact short circuit between the two clamping members 20. On the other hand, the fastener 22 may limit the position of the insulating member 30, which prevents the insulating member 30 from loosening and falling off, and enhances the stability of the insulating member 30.

[00135] In some embodiments, each of the electrode plates 11 is in electrical contact with the clamping member 20. That is to say, the clamping members 20 are conductive, and the electric current is transmitted to the electrode plates 11 through the clamping members 20, achieving the energization of the electrode plates 11. On one hand, there is a large contact area between the electrode plates 11 and the clamping members 20, which can reduce power loss and improve conductive efficiency. On the other hand, it can also reduce the additional components required for energizing the electrode plates 11, thus cutting down the production cost.

[00136] The clamping members 20 comprise but are not limited to metal element, which has low electrical resistance and excellent electrical conductivity.

[00137] In one embodiment, referring to FIGS. 5, 6 and 9, each clamping member 20 comprises an electric connection portion 24 connected to the clamping plate 21. A plane perpendicular to the first direction is the projection plane, and the projections of the electric connection portions 24 of the two clamping members 20 on the projection plane are spaced apart from each other. Each electric connection portion 24 is configured to be connected to a power supply circuit, and transmit electrical energy to the electrode plate 11 through the clamping plate 21. Electrical energy from the power supply circuit is transmitted to the electrode plates 11 through the clamping members 20, such that the electrode plates 11 are electrically connected to the power supply circuit via the clamping members 20. The electric

connection portions 24 of the two clamping members 20 are electrically connected to the positive terminal and the negative terminal of the power supply circuit respectively, so as to form an electric circuit. A plane perpendicular to the first direction is the projection plane, and the projections of the electric connection portions 24 of the two clamping members 20 on the projection plane are spaced apart from each other. That is to say, the projections of the electric connection portions 24 of the two clamping members 20 do not overlap with each other. In this way, a relatively large distance is kept between the two electric connection portions 24, which avoids the risk of contact short circuit between them in the case where the connection portion are impacted by water flow or other acting forces.

[00138] In some embodiments, the clamping plate 21 and the electric connection portion 24 are formed as an integral structure. That is to say, the clamping members 20 may be of an integral structure. In this way, the processes for separately fabricating the electric connection portion 24 can be omitted, thereby improving the production efficiency.

[00139] In some embodiments, referring to FIGS. 5, 6 and 9, the electric connection portion 24 is connected to the perimeter of the clamping plate 21. In an example, the electric connection portion 24 is connected to the perimeter of the rim 211. In this way, the electric connection portion 24 does not block the liquid passage notch 21a, and the fluid can flow smoothly through the liquid passage notch 21a to contact the electrode assembly 10, thereby improving the electrolysis efficiency of the electrolysis device 100.

[00140] In some embodiments, referring to FIGS. 2 and 9, a portion of the electric connection portion 24 extends out of the housing 40. For example, a portion of the electric connection portion 24 extends beyond the upper surface of the housing 40. In this way, the electrical connection terminal of the power supply circuit can be connected to the electric connection portion 24, and contact between the water in the flow chamber 40c and the electrical connection terminal can also be avoided.

[00141] It can be understood that the housing 40 is provided with mounting holes 40d for passage of the electric connection portions 24, and a seal is provided between each mounting hole 40d and each electric connection portion 24. In this way, contact between the water in the flow chamber 40c and the electrical connection terminal is prevented, thereby improving the safety.

[00142] In some embodiments, referring to FIGS. 5, 6 and 9, one end of the electric connection portion 24 is connected to one side of the clamping plate 21 in the second direction, and the other end of the electric connection portion 24 is bent upward. A plane

perpendicular to the first direction is the projection plane, and the projection of the electric connection portion 24 on the projection plane is approximately L-shaped.

[00143] The material of the clamping members 20 comprises but is not limited to metal, which has low electrical resistance and excellent electrical conductivity.

[00144] The cathode 111 and the anode 112 may be made of materials well-known in the art that are suitable for water electrolysis.

[00145] There are at least two electrode plates 11. That is to say, the number of the electrode plates 11 is two or more.

[00146] In some embodiments, the electrode assembly 10 comprises two electrode plates 11, one of which is a cathode 111 and the other is an anode 112.

[00147] In some embodiments, the electrode assembly 10 comprises more than two electrode plates 11. One cathode 111 and one anode 112 form an electrolysis unit, and a solid electrolyte 12 may be disposed between the cathode 111 and the anode 112 of each electrolysis unit. One or more electrolysis units may be provided. For example, a plurality of electrolysis units may be stacked in the first direction. For another example, a plurality of electrolysis units may be arranged in a plane perpendicular to the first direction.

[00148] In other embodiments, the electrode assembly 10 comprises more than two electrode plates 11. A plurality of electrode plates 11 are stacked in the first direction, and the plurality of electrode plates 11 serve as the cathode 111 and the anode 112 alternately. A solid electrolyte 12 is disposed between every two adjacent electrode plates 11. That is to say, a solid electrolyte 12 is disposed between every two adjacent cathode 111 and anode 112.

[00149] In some embodiments, referring to FIG. 4, the housing 40 comprises a housing body 41 and a housing cover 42. The housing cover 42 is covered on the top of the housing body 41 to define the flow chamber 40c together with the housing body. For example, both the liquid inlet 40a and the liquid outlet 40b may be formed in the housing body 41. The mounting hole 40d may be formed in the housing cover 42.

[00150] The housing body 41 may be detachably or non-detachably connected to the housing cover 42. In an example, the housing body 41 and the housing cover 42 may be welded, connected by screws or clamped to one another. The joint between the housing body 41 and the housing cover 42 may be sealed, thereby preventing the leakage of water from the flow chamber 40c.

[00151] Referring to FIGS. 10 to 13, in some embodiments, the laundry treatment

apparatus 1000 comprises a circulation waterway system 300.

[00152] The barrel assembly 200 is provided with a laundry treatment chamber, and a washing water discharge port 2021 in communication with the laundry treatment chamber. The circulation waterway system 300 is connected to the washing water discharge port 2021, to guide the washing water discharged from the washing water discharge port 2021 to the laundry treatment chamber.

[00153] The electrolysis device 100 is disposed in the circulation waterway system 300 and is configured to electrolyze the washing water flowing through the circulation waterway system 300, to generate active substances such as hydroxyl radicals/ozone via electrolysis. The active substances flow to the laundry treatment chamber along with the washing water and come into contact with the laundry in the laundry treatment chamber, thereby disinfecting and sterilizing the laundry and preventing color cross-contamination.

[00154] It can be understood that a plurality of electrolysis devices 100 may be provided. One of the plurality of electrolysis devices 100 is disposed in the first liquid path 230, and another is disposed in the circulation waterway system 300.

[00155] In this embodiment, the electrolysis device 100 is disposed in the circulation waterway system 300 and is capable of continuously electrolyzing the washing water flowing through the circulation waterway system 300, to generate active substances such as hydroxyl radicals/ozone. The electrolyzed washing water enters the laundry treatment chamber to disinfect and sterilize the laundry and prevent color cross-contamination. Hydrogen microbubbles generated during the electrolysis process may assist the detergent in removing soil such as sebum, grease and micro dust accumulated inside the laundry fibers, thereby enhancing the cleaning effect on the laundry.

[00156] In some embodiments, referring to FIGS. 10 and 11, the circulation waterway system 300 comprises a circulation waterway 301 and a circulation pump 302 connected to the circulation waterway 301. One end of the circulation waterway 301 is in communication with the washing water discharge port 2021, and the other end is in communication with the laundry treatment chamber. The circulation pump 302 is configured to pump the washing water in the barrel assembly 200 to the circulation waterway 301, and the washing water is then guided through the circulation waterway 301 to the laundry treatment chamber.

[00157] To guide the washing water in the circulation waterway 301 to the laundry treatment chamber, in some embodiments as shown in FIG. 11, the circulation waterway system 300 comprises at least one nozzle 303 in communication with the circulation

waterway 301. Specifically, the nozzle 303 may be disposed downstream of the circulation pump 302 in the flow direction of the washing water, to utilize the circulation pump 302 to pump the washing water flowing through the circulation waterway 301 to the nozzle 303. The injection orifice of the nozzle 303 may be in communication with the laundry treatment chamber.

[00158] Specifically, the injection orifice of the nozzle 303 may face towards the laundry treatment chamber, to utilize the nozzle 303 to spray the electrolyzed washing water into the laundry treatment chamber, thereby disinfecting and sterilizing the laundry. Of course, the injection orifice of the nozzle 303 may also face towards the door body 400 or the door gasket 500. Specifically, the door body 400 openably covers the access opening of the inner drum 201, and the door gasket 500 is disposed at the access opening. When the door body 400 is covered on the access opening, it abuts against the door gasket 500 and forms a seal therewith. The injection orifice of the nozzle 303 faces towards the door body 400 or the door gasket 500, to utilize the nozzle 303 to spray the electrolyzed washing water towards the door body 400 or the door gasket 500 for rinsing the door body 400 or the door gasket 500, thereby disinfecting and sterilizing the door body 400 or the door gasket 500. The washing water after rinsing flows into the laundry treatment chamber, and is finally discharged from the laundry treatment apparatus 1000 during the drainage process.

[00159] It should be noted that one or more nozzles 303 may be provided. A plurality of nozzles 303 may be disposed at the drum opening of the inner drum 201 at intervals in the circumferential direction of the inner drum 201. All of the nozzles 303 may spray the washing water toward the inside of the inner drum 201, or some of nozzles may spray the washing water toward the inside of the inner drum 201 while the others spray the washing water toward the door body 400 or the door gasket 500.

[00160] Furthermore, the manner in which the circulation waterway system 300 sprays the washing water into the laundry treatment chamber is not limited to the use of nozzles. A washing water return port may also be disposed at the upper part of the outer tub 202, so that the washing water in the circulation waterway 301 flows to the upper part of the outer tub 202 and enters the laundry treatment chamber of the inner drum 201 through the flow holes on the inner drum 201. In this way, the purpose of guiding the washing water into the laundry treatment chamber by the circulation waterway system 300 can also be achieved.

[00161] In some embodiments, referring to FIGS. 10 and 11, the electrolysis device 100 is disposed in the circulation waterway 301, so as to electrolyze the washing water flowing

through the circulation waterway 301 via the electrolysis device 100 to generate active substances such as hydroxyl radicals/ozone.

[00162] In specific implementation, the electrolysis device 100 may be disposed downstream of the circulation pump 302 in the flow direction of the washing water, or disposed upstream of the circulation pump 302 in the flow direction of the washing water. The position of the electrolysis device may be reasonably set according to actual conditions.

[00163] In some embodiments, referring to FIGS. 2 to 9, the fluid in the circulation waterway 301 flows through the liquid inlet 40a, the flow chamber 40c and the liquid outlet 40b in sequence.

[00164] In specific implementation, the liquid inlet 40a and the liquid outlet 40b on the housing 40 may be connected to the circulation waterway 301, thus connecting the electrolysis device 100 to the circulation waterway 301 so that the washing water in the circulation waterway 301 can flow through the electrolysis device 100. Specifically, the washing water discharged from the washing water discharge port 2021 can enter the flow chamber 40c through the liquid inlet 40a and come into contact with the electrode assembly 10 disposed in the flow chamber 40c. The electrode assembly 10 electrolyzes the washing water flowing through the flow chamber 40c, and the electrolyzed washing water flows out through the liquid outlet 40b. The electrode assembly 10 is exposed in the flow chamber 40c. The housing 40 facilitates the concentrated flow of the washing water through the electrode assembly 10, thereby improving the electrolysis efficiency, and can also protect the electrode assembly 10.

[00165] In other embodiments, the electrolysis device 100 is provided in the circulation pump 302, to electrolyze the washing water flowing through the circulation pump 302 via the electrolysis device 100 and generate active substances such as hydroxyl radicals/ozone.

[00166] In specific implementation, the circulation pump 302 may comprise a pump housing 3024 and a pump cover 3025. The pump housing 3024 is formed with a water inlet 3021, a circulation water outlet 3022 and a communication chamber that connects the water inlet 3021 with the circulation water outlet 3022. The communication chamber is provided with a mounting opening, through which the electrolysis device 100 may be installed inside the circulation pump 302, and the mounting opening is covered by the pump cover 3025. The pump cover 3025 may be fixed to the pump housing 3024 by means of connection manner such as threaded connection or screw connection. Such an arrangement for arranging the electrolysis device 100 in the circulation pump 302 can avoid occupying

additional space of the laundry treatment apparatus 1000.

[00167] In some embodiments, referring to FIGS. 2 to 9, the fluid in the circulation pump 302 flows through the liquid inlet 40a, the flow chamber 40c and the liquid outlet 40b in sequence.

[00168] In specific implementation, the liquid inlet 40a and the liquid outlet 40b on the housing 40 may be in communication with the inner chamber of the circulation pump 302, thus allowing the washing water in the circulation pump 302 to flow through the electrolysis device 100. Specifically, the washing water discharged from the washing water discharge port 2021 may enter the flow chamber 40c through the liquid inlet 40a and come into contact with the electrode assembly 10 disposed in the flow chamber 40c. The electrode assembly 10 electrolyzes the washing water flowing through the flow chamber 40c, and the electrolyzed washing water flows out through the liquid outlet 40b. The electrode assembly 10 is exposed in the flow chamber 40c. The housing 40 facilitates the concentrated flow of the washing water through the electrode assembly 10 to improve the electrolysis efficiency, and also can protect the electrode assembly 10.

[00169] In other embodiments, at least a portion of the electrode assembly 10 is disposed within the circulation pump 302 and exposed inside the circulation pump 302. The fluid in the circulation pump 302 comes into contact with the electrode assembly 10. That is to say, in this embodiment, the electrolysis device 100 may omit the housing 40, and instead, the electrode assembly 10 of the electrolysis device 100 is directly disposed within the circulation pump 302, with the circulation pump 302 utilized to protect the electrode assembly 10 disposed therein. This arrangement facilitates more sufficient contact between the electrode assembly 10 and the fluid in the circulation pump 302, thereby improving the electrolysis efficiency. This arrangement also helps to simplify the structure of the electrolysis device 100, achieve further miniaturization of the electrolysis device 100, and facilitate the installation of the electrolysis device 100 inside the circulation pump 302.

[00170] It should be noted that, referring to FIGS. 12 and 13, the circulation pump 302 may be a water pump with one inlet and two outlets. Specifically, the circulation pump 302 is provided with a water inlet 3021 in communication with the washing water discharge port 2021, a circulation water outlet 3022 in communication with the laundry treatment chamber, and a discharge port 3023 in communication with the outside. When recirculated water is required, the washing water discharged from the washing water discharge port 2021 may be allowed to enter the circulation pump 302 through the water inlet 3021 of the circulation

pump 302, and then be pumped into the laundry treatment chamber through the circulation water outlet 3022 of the circulation pump 302. When it is required to discharge the washing water in the laundry treatment chamber to the outside, the washing water discharged from the washing water discharge port 2021 may be allowed to enter the circulation pump 302 through the water inlet 3021 of the circulation pump 302, and then be pumped to the outside of the laundry treatment apparatus 1000 through the discharge port 3023 of the circulation pump 302. Specifically, an impeller is disposed inside the pump housing 3024, and the outlets of the circulation pump 302 may be switched by controlling the rotation direction of the impeller. For the specific structure of the circulation pump 302, it may be configured with reference to the existing circulation pump 302, which will not be described in detail herein.

[00171] Of course, in specific implementation, the circulation pump 302 may also be a water pump with one inlet and one outlet. In this case, the water discharge of the laundry treatment apparatus 1000 may be achieved by an additional water pump.

[00172] In some embodiments, referring to FIGS. 2 to 4, the cathode 111 and the anode 112 are stacked in the first direction, the liquid inlet 40a is formed in one side surface of the housing 40 in the second direction, and the liquid outlet 40b is formed in the lower surface of the housing 40.

[00173] In one example, referring to FIGS. 2 and 3, the cathode 111 and the anode 112 are stacked in the left-right direction. The liquid inlet 40a may be formed in the rear side surface of the housing 40. In this embodiment, the washing water in the circulation waterway 301 flows through the liquid inlet 40a toward the flow chamber 40c generally in the second direction, and the electrolyzed washing water in the flow chamber 40c flows out through the liquid outlet 40b. In the flow chamber 40c, the washing water flows in the second direction relative to the electrode assembly 10, so that it continuously flows through the electrode assembly 10 and carries away products such as ozone, hydroxyl radicals and hydrogen. The liquid outlet 40b is formed in the lower surface of the housing 40, which facilitates the smooth discharge of the electrolyzed washing water from the flow chamber 40c.

[00174] In some embodiments, at least one of the cathode 111 and the anode 112 abuts against the solid electrolyte 12. In specific embodiments, the cathode 111 may abut against the solid electrolyte 12, or the anode 112 may abut against the solid electrolyte 12, or both the cathode 111 and the anode 112 may abut against the solid electrolyte 12.

[00175] In some embodiments, a cathode terminal part for connecting to an external

power wire is connected to the cathode 111, and an anode terminal part for connecting to an external power wire is connected to the anode 112.

[00176] In specific embodiments, the anode terminal part and the cathode terminal part may be terminals for easy wire insertion. In this way, the external power supply wires may be electrically connected to the anode terminal part and the cathode terminal part respectively to achieve connection with a power supply, which improves the convenience of electrical wiring connection. Of course, it is to be understood that, in other embodiments, the external power supply wires may also be directly connected to the anode terminal part and the cathode terminal part respectively, on the premise that the electrolysis of the washing water can be achieved and the actual operation is not interfered.

[00177] In the description of the present application, the terms "one embodiment", "some embodiments", "other embodiments" or "one example" means that the specific features, structures, materials or characteristics described in connection with the embodiment or example are comprised in at least one embodiment or example of the present application. In the present application, the schematic descriptions of the above terms do not necessarily refer to the same embodiment or example. Moreover, the specific features, structures, materials or characteristics described may be combined in any suitable manner in any one or more embodiments or examples. Furthermore, those skilled in the art may combine the different embodiments or examples described in the present application with the features of the different embodiments or examples without contradiction.

[00178] The above description is merely a preferred embodiment of the present application and is not intended to limit the present application. For those skilled in the art, various changes and modifications may be made to the present application. Any modification, equivalent replacement, improvement or the like made within the spirit and principles of the present application shall fall within the protection scope of the present application.

CLAIMS

1. A laundry treatment apparatus, comprising:

an electrolysis device comprising an electrode assembly, the electrode assembly comprising electrode plates and a solid electrolyte, at least one of the electrode plates being a cathode, at least one of the electrode plates being an anode, the cathode and the anode being stacked in a first direction, the solid electrolyte being disposed between the cathode and the anode;

a laundry treatment chamber;

a water valve;

a first liquid path, the first liquid path connecting the water valve with the laundry treatment chamber, the electrolysis device being disposed in the first liquid path.

2. The laundry treatment apparatus of claim 1, further comprising a detergent box disposed in the first liquid path, the detergent box being located downstream of the electrolysis device.

3. The laundry treatment apparatus of claim 1, further comprising a detergent box and a second liquid path, the second liquid path connecting the water valve with the laundry treatment chamber, the detergent box being disposed in the second liquid path.

4. The laundry treatment apparatus of claim 1, further comprising a detergent box, the electrolysis device being located on a rear side of the detergent box.

5. The laundry treatment apparatus of claim 1, further comprising a barrel assembly, the electrolysis device being located above the barrel assembly.

6. The laundry treatment apparatus of claim 1, wherein the electrolysis device comprises a housing formed with a liquid inlet, a liquid outlet and a flow chamber, the liquid inlet and the liquid outlet being in communication with the flow chamber, at least a portion of the electrode assembly being located in the flow chamber, fluid in the first liquid path flowing through the liquid inlet, the flow chamber and the liquid outlet in sequence.

7. The laundry treatment apparatus of claim 6, wherein the liquid inlet is formed in one side

surface of the housing in a second direction, the liquid outlet being formed in a lower surface of the housing, and the first direction, the second direction and a vertical direction being perpendicular to each other.

8. The laundry treatment apparatus of claim 1, wherein the electrode assembly comprises a support frame, the solid electrolyte being disposed on the support frame.

9. The laundry treatment apparatus of claim 8, wherein the support frame is located between the cathode and the anode, the solid electrolyte at least covering one side surface of the support frame in the first direction.

10. The laundry treatment apparatus of claim 1, wherein a plane perpendicular to the first direction is defined as a projection plane, a projection of each of the electrode plates on the projection plane being located within a projection range of the solid electrolyte.

11. The laundry treatment apparatus of claim 1, wherein each of the electrode plates is formed with a through hole extending through two side surfaces of the electrode plate in the first direction.

12. The laundry treatment apparatus of any one of claims 1 to 11, wherein the electrolysis device comprises two clamping members, the electrode assembly being clamped between the two clamping members.

13. The laundry treatment apparatus of claim 12, wherein each clamping member comprises a clamping plate, the clamping plates of the two clamping members being located on two sides of the electrode assembly in the first direction, the clamping plate being formed with a liquid passage notch, the liquid passage notch extending through two side surfaces of the clamping plate in the first direction.

14. The laundry treatment apparatus of claim 13, wherein each clamping member comprises an electric connection portion connected to the clamping plate, a plane perpendicular to the first direction being defined as a projection plane, projections of the electric connection portions of the two clamping members on the projection plane being spaced apart from each other.

15. The laundry treatment apparatus of claim 1, further comprising:

a barrel assembly having the laundry treatment chamber and provided with a washing water discharge port in communication with the laundry treatment chamber; and

a circulation waterway system connected to the washing water discharge port and configured to guide the washing water discharged from the washing water discharge port to the laundry treatment chamber;

wherein the electrolysis device is disposed in the circulation waterway system and configured to electrolyze the washing water flowing through the circulation waterway system.

16. The laundry treatment apparatus of claim 15, wherein the circulation waterway system comprises a circulation waterway and a circulation pump connected to the circulation waterway, the electrolysis device being disposed in the circulation waterway.

17. The laundry treatment apparatus of claim 16, wherein the electrolysis device comprises a housing formed with a liquid inlet, a liquid outlet and a flow chamber, the liquid inlet and the liquid outlet being in communication with the flow chamber, at least a portion of the electrode assembly being located in the flow chamber, fluid in the circulation waterway flowing through the liquid inlet, the flow chamber and the liquid outlet in sequence.

18. The laundry treatment apparatus of claim 15, wherein the circulation waterway system comprises a circulation waterway and a circulation pump connected to the circulation waterway, the electrolysis device being disposed within the circulation pump.

19. The laundry treatment apparatus of claim 18, wherein the electrolysis device comprises a housing formed with a liquid inlet, a liquid outlet and a flow chamber, the liquid inlet and the liquid outlet being in communication with the flow chamber, at least a portion of the electrode assembly being located in the flow chamber, fluid in the circulation pump flowing through the liquid inlet, the flow chamber and the liquid outlet in sequence; or

at least a portion of the electrode assembly is disposed within the circulation pump and exposed within the circulation pump, the fluid in the circulation pump being in contact with the electrode assembly.

20. The laundry treatment apparatus of claim 16 or 18, wherein the circulation waterway system comprises at least one nozzle in communication with the circulation waterway, the circulation pump pumping the washing water flowing through the circulation waterway to the nozzle, an injection orifice of the nozzle being in communication with the laundry treatment chamber.

21. The laundry treatment apparatus of any one of claims 1 to 20, wherein at least one of the cathode and the anode abuts against the solid electrolyte.

22. The laundry treatment apparatus of any one of claims 1 to 20, wherein the cathode is connected with a cathode terminal part for connecting to an external power wire, and the anode is connected with an anode terminal part for connecting to an external power wire.