Claims

[Claim 1] A water treatment device configured to perform a deionization treatment for water to be treated to obtain treated water, the water treatment device comprising:

a pressing member;

a treatment container configured to store the water to be treated;

a first electrode, which has a powdery shape, a granular shape, or a fibrous shape, and is accommodated in the treatment container;

a second electrode, which has a powdery shape, a granular shape, or a fibrous shape, and is accommodated in the treatment container;

an inlet port, which is arranged through the treatment container, and is configured to introduce the water to be treated;

an outlet port, which is arranged through the treatment container, and is configured to discharge the water to be treated or the treated water;

an outflow prevention member configured to prevent the first electrode and the second electrode from flowing out through the outlet port;

a separator arranged between the first electrode and the second electrode; and

a pair of collectors, which are accommodated in the treatment container, and are configured to apply a voltage to the first electrode and the second electrode,

wherein the pressing member is configured to press the first electrode and the second electrode in the treatment container.

[Claim 2] The water treatment device according to claim 1,

wherein the inlet port and the outlet port are arranged at such positions as to be opposed to each other through the first electrode and the second electrode therebetween.

[Claim 3] The water treatment device according to claim 1 or 2, further comprising a lid,

wherein the pressing member is arranged on the lid.

[Claim 4] The water treatment device according to claim 3, wherein the pressing member is formed integrally with the lid.

[Claim 5] The water treatment device according to claim 3 or 4, wherein the lid has a regulating portion configured to regulate

a distance between the pressing member and the treatment container.

[Claim 6] The water treatment device according to any one of claims 3 to 5,

wherein the pressing member has a projecting portion projecting toward an inside of the treatment container, and

wherein, when the lid is mounted onto the treatment container, the pressing member presses the first electrode and the second electrode with the projecting portion.

[Claim 7] The water treatment device according to any one of claims 3 to 6, wherein the lid has a separator groove and a pair of collector grooves, which are configured to specify a positional relationship between the separator and the pair of collectors.

[Claim 8] The water treatment device according to any one of claims 3 to 7,

wherein the pair of collectors have terminals configured to apply the voltage to the pair of collectors, respectively, and

wherein, when the pair of collectors are placed in the treatment container, the terminals project from the lid.

[Claim 9] The water treatment device according to any one of claims 3 to 8,

wherein the lid has a press machine configured to reciprocate the pressing member toward and from the first electrode and the second electrode, and

wherein the press machine is configured to control a pressing force of the pressing member on the first electrode and the second electrode.

[Claim 10] The water treatment device according to any one of claims 1 to 9,

wherein the pair of collectors have terminals configured to apply the voltage to the pair of collectors, respectively, and

wherein, when the pair of collectors are placed in the treatment container, the terminals project from the treatment container.

[Claim 11] The water treatment device according to any one of claims 1 to 9,

wherein the pair of collectors have terminal ports, respectively, and

wherein, when the pair of collectors are arranged in the treatment container, the terminal ports of the pair of

collectors are arranged to be oriented so as not to be opposed to each other through the separator interposed therebetween.

[Claim 12] The water treatment device according to any one of claims 1 to 11, wherein the treatment container has a pair of collector grooves configured to specify a positional relationship between the pair of collectors.

[Claim 13] The water treatment device according to any one of claims 1 to 12, further comprising a partition plate provided across at least any one of the first electrode and the second electrode to divide at least one of the first electrode and the second electrode.

[Claim 14] A water treatment system, comprising:
a water treatment device of any one of claims 1 to 13;
a power supply unit configured to supply a voltage to the water treatment device;
a pump configured to feed the water to be treated to the water treatment device;
a plurality of detection units configured to detect characteristics of the water to be treated or the treated water; and
a control unit,
wherein the control unit is configured to control the power supply unit, the pump, and the plurality of detection units.

[Claim 15] A water treatment system, comprising:
a plurality of water treatment units, each comprising:
a water treatment device of any one of claims 1 to 13;
a power supply unit configured to supply a voltage to the water treatment device; and
a detection unit configured to detect characteristics of the water to be treated or the treated water;
a pump configured to feed the water to be treated to the plurality of water treatment units, and
a control unit configured to control the power supply units and the detection units of the plurality of water treatment units, and the pump.

[Claim 16] The water treatment system according to claim 15, wherein the plurality of water treatment units are connected in series.

[Claim 17] The water treatment system according to claim 15, wherein the plurality of water treatment units are connected in parallel.

[Claim 18] The water treatment system according to claim 15, wherein the plurality of water treatment units are formed by connecting sets, each including the plurality of water treatment units connected in series, in parallel.

[Claim 19] A method of assembling a water treatment device, comprising:

arranging a pair of collectors through a separator interposed therebetween in a treatment container;

arranging a first electrode between one of the pair of collectors and the separator;

arranging a second electrode between another one of the pair of collectors and the separator;

arranging an outflow prevention member configured to prevent the first electrode and the second electrode from flowing out through an outlet port, which is arranged through the treatment container, and is configured to discharge water to be treated or treated water obtained through a deionization treatment for the water to be treated;

pressing the first electrode and the second electrode with a pressing member formed on a lid for the treatment container; and

fixing the lid onto the treatment container after a pressed state of the first electrode and the second electrode becomes a predetermined pressed state.

[Claim 20] The method of assembling a water treatment device according to claim 19, wherein, in the step of pressing the first electrode and the second electrode with the pressing member formed on the lid for the treatment container, the first electrode and the second electrode are pressed with the pressing member under a state in which a partition plate is arranged across at least any one of the first electrode and the second electrode.

[Claim 21] The method of assembling a water treatment device according to claim 19 or 20, wherein the predetermined pressed state is determined based on a compression ratio of the first electrode and the second electrode.

[Claim 22] The method of assembling a water treatment device according to claim 19 or 20, wherein the predetermined pressed state is determined based on an electric resistance between the pair of collectors.

[Claim 23] The method of assembling a water treatment device according to claim 19 or 20, wherein the predetermined pressed state is determined based on a pressure loss before injection of the water to be treated into the treatment container and after the injection of the water to be treated into the treatment container.

[Claim 24] A water treatment method, comprising:

arranging a pair of collectors through a separator interposed therebetween in a treatment container;

arranging a first electrode, which has a powdery shape, a granular shape, or a fibrous shape, between one of the pair of collectors and the separator;

arranging a second electrode, which has a powdery shape, a granular shape, or a fibrous shape, between another one of the pair of collectors and the separator;

arranging an outflow prevention member configured to prevent the first electrode and the second electrode from flowing out through an outlet port, which is arranged through the treatment container, and is configured to discharge water to be treated or treated water obtained through a deionization treatment for the water to be treated; and

performing a treatment for water to be treated under a state in which the first electrode and the second electrode are pressed by a pressing member formed on a lid for the treatment container in the treatment container.

[Claim 25] The water treatment method according to claim 24, wherein the state in which the first electrode and the second electrode are pressed by the pressing member formed on the lid for the treatment container in the treatment container comprises a state in which the first electrode and the second electrode are pressed by the pressing member in the treatment container under a state in which a partition plate is arranged across at least any one of the first electrode and the second electrode.