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Electrolytic solution generation device

Abstract

An electrolytic liquid generation device includes a stacked body in which a conductive membrane is interposed between a cathode and an anode constituting electrodes, an electrolytic part that electrolyzes a liquid, and a housing in which the electrolytic part is disposed. The housing includes a flow path in which a liquid flowing direction intersects a stacking direction of the stacked body. The electrolytic part includes a slot open to the flow path in which a part of the interface between the conductive membrane and the electrode is exposed. In the housing, a positioning member is disposed, and the positioning member positions the electrode.

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Background/Summary

CROSS-REFERENCE OF RELATED APPLICATIONS
(1) This application is the U.S. National Phase under 35 U.S.C. § 371 of International Patent Application No. PCT/JP2020/041832, filed on Nov. 10, 2020, which in turn claims the benefit of Japanese Patent Application No. 2020-023377, filed on Feb. 14, 2020, the entire disclosures of which Applications are incorporated by reference herein.
TECHNICAL FIELD
(2) The present disclosure relates to an electrolytic liquid generation device.
BACKGROUND ART
(3) A conventionally known electrolytic liquid generation device includes an electrolytic part that electrolyzes a liquid and a housing in which the electrolytic part is disposed (see, for example, PTL 1). The electrolytic part includes a stacked body including electrodes adjacent to each other and a conductive membrane interposed between the electrodes.
(4) The electrolytic liquid generation device has an inlet port through which a liquid to be supplied to the electrolytic part flows in and an outlet port through which an electrolytic liquid generated in the electrolytic part flows out, the inlet port and the outlet port being provided in the housing. The housing has a flow path in which a liquid flowing direction of the liquid formed inside intersects a stacking direction of the stacked body. The electrolytic part has a slot that is open to the flow path and that is formed in such a manner that at least a part of interfaces between the conductive membrane and the respective electrodes is exposed. The electrodes adjacent to each other constitute a cathode and an anode.
(5) The electrolytic liquid generation device electrolyzes water as the liquid supplied to the electrolytic part with an application of voltage to the electrolytic part to generate ozone as an electrolytic product. The electrolytic liquid generation device dissolves the generated ozone in

water to obtain ozone water as an electrolytic liquid.
(6) In the electrolytic liquid generation device of PTL 1, outer edges of the electrodes constituting the stacked body are in contact with the inner face of the housing. This allows the electrodes to be positioned with respect to the housing.
(7) However, when the electrodes are positioned with respect to the housing as described above, downsized electrodes cannot contact with the inner face of the housing at its outer edge. Therefore, it is not possible to achieve both the downsizing and positioning of the electrodes.
CITATION LIST
Patent Literature
(8) PTL 1: Unexamined Japanese Patent Publication No. 2017-176993
SUMMARY OF THE INVENTION
(9) The present disclosure provides an electrolytic liquid generation device in which electrodes can be downsized and positioned with respect to a housing.
(10) The electrolytic liquid generation device of the present disclosure includes a stacked body, the stacked body including a cathode and an anode constituting electrodes adjacent to each other and a conductive membrane interposed between the cathode and the anode, an electrolytic part that electrolyzes a liquid, and a housing in which the electrolytic part is disposed. The housing includes an inlet port through which a liquid to be supplied to the electrolytic part flows in, an outlet port through which an electrolytic liquid generated in the electrolytic part flows out, and a flow path in which a liquid flowing direction intersects a stacking direction of the stacked body. The electrolytic part includes a slot that is open to the flow path and is formed in such a manner that at least a part of interfaces between the conductive membrane and the respective electrodes is exposed. In the housing, a positioning member is disposed with respect to the housing, and the positioning member is configured to position at least either one electrode of the cathode and the anode.
(11) The present disclosure can provide an electrolytic liquid generation device in which electrodes can be downsized, and the electrodes can be positioned with respect to a housing.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) FIG. **1** is an exploded perspective view of an electrolytic liquid generation device according to a first exemplary embodiment.
(2) FIG. **2** is a cross-sectional view of the electrolytic liquid generation device according to the exemplary embodiment.
(3) FIG. **3** is a cross-sectional view of the electrolytic liquid generation device according to the exemplary embodiment.
(4) FIG. **4** is an enlarged view of a main part of FIG. **3**.
(5) FIG. **5** is a perspective view of a positioning member of the electrolytic liquid generation device according to the exemplary embodiment.
(6) FIG. **6** is an enlarged view of a main part of FIG. **5**.
(7) FIG. **7** is a perspective view of the electrolytic liquid generation device according to the exemplary embodiment when a power feeder is assembled to the positioning member.
(8) FIG. **8** is an enlarged top view of a main part of FIG. **7**.
(9) FIG. **9** is a perspective view of the electrolytic liquid generation device according to the exemplary embodiment when a power feeder and an anode are assembled to the positioning member.
(10) FIG. **10** is a top view of FIG. **9**.
(11) FIG. **11** is an enlarged cross-sectional view of a main part of an electrolytic liquid generation device according to a second exemplary embodiment.

(12) FIG. **12** is an enlarged cross-sectional view of a main part of an electrolytic liquid generation device according to a third exemplary embodiment.

DESCRIPTION OF EMBODIMENT

(13) An exemplary embodiment is described below in detail with reference to the drawings. Unnecessarily detailed descriptions may be omitted. For example, detailed descriptions of already well-known matters and redundant descriptions of substantially the same configurations may be omitted.

(14) The accompanying drawings and the following description are only presented to help those skilled in the art fully understand the present disclosure and are not intended to limit the subject matters described in the claims.

(15) Hereinafter, an ozone water generator is described as an example of the electrolytic liquid generation device. The ozone water generator generates ozone as an electrolytic product and dissolves ozone in water as a liquid to generate ozone water as an electrolytic liquid. The ozone water has advantages such as non-persistence and the generation of no by-product and is effective for sterilization and decomposition of organic substances. Therefore, the ozone water is widely used in water treatment, food, and medical fields.

(16) In the following description, an extending direction of a flow path is referred to as liquid flowing direction (flowing direction of a liquid) X, a width direction of the flow path is referred to as width direction (direction crossing the liquid flowing direction) Y, and a direction in which electrodes and a conductive membrane are stacked is referred to as stacking direction Z. In the present exemplary embodiment, stacking direction Z is defined as a vertical direction, and the side of an electrode case lid of the housing is defined as an upper side.

(17) Further, description is made below while referring, as specific examples, ozone as an electrolytic product, water as a liquid, and ozone water as an electrolytic liquid.

First Exemplary Embodiment

(18) Hereinafter, electrolytic liquid generation device **1** according to a first exemplary embodiment of the present disclosure will be described with reference to FIGS. **1** to **10**.

(19) As illustrated in FIGS. **1** to **10**, electrolytic liquid generation device **1** of the first exemplary embodiment includes electrolytic part **11**, housing **13**, positioning member **27**, and the like.

(20) As illustrated in FIGS. **1** to **4**, electrolytic part **11** includes stacked body **9**. Stacked body **9** includes cathode **3** and anode **5** constituting adjacent electrodes, conductive membrane **7**, power feeder **29**, and the like. Hereinafter, in the case of not distinguishing cathode **3** and anode **5** from each other, these two may be simply described as “electrodes”.

(21) Cathode **3** is formed using, for example, titanium. Cathode **3** is formed in, for example, a rectangular plate shape with liquid flowing direction X as the longer direction, width direction Y as the shorter direction, and stacking direction Z as the thickness direction. Cathode **3** is electrically connected to power-feeding shaft **3***b* for cathode at one end in the longer direction (downstream side in liquid flowing direction X) via spiral spring **3***a*. Power-feeding shaft **3***b* is electrically connected to a negative electrode of a power supply part (not illustrated).

(22) Cathode **3** has a plurality of cathode holes **3***c* formed by penetrating in the thickness direction (stacking direction Z). Each of the plurality of cathode holes **3***c* is formed in a substantially identical (including identical) shape such as a V shape toward the longer direction (liquid flowing direction X). The plurality of cathode holes **3***c* are provided so as to be aligned in a row at a predetermined pitch along the longer direction (liquid flowing direction X). The shape and arrangement of cathode holes **3***c* are not limited to the above form and may be in another form such as a linear shape. It is sufficient that at least one cathode hole **3***c* is formed in cathode **3**.

(23) Anode **5** is formed by, for example, forming a conductive diamond membrane on a conductive substrate formed using silicon. The conductive diamond membrane has conductivity by being doped with boron and is formed on the conductive substrate by a plasma chemical vapor deposition (CVD) method. Anode **5** is formed in, for example, a rectangular plate shape with liquid flowing

direction X as the longer direction, width direction Y as the shorter direction, and stacking direction Z as the thickness direction. Two anodes **5** are aligned along the longer direction (liquid flowing direction X). Anodes **5** are stacked with cathode **3** with conductive membrane **7** interposed between the anodes and the cathode in stacking direction Z.

(24) Conductive membrane **7** of stacked body **9** is formed using, for example, a proton conductive type ion exchange film. Conductive membrane **7** is formed in, for example, a rectangular plate shape with liquid flowing direction X as the longer direction, width direction Y as the shorter direction, and stacking direction Z as the thickness direction. Conductive membrane **7** has a plurality of conductive membrane holes **7***a* formed by penetrating in the thickness direction (stacking direction Z).

(25) Each of the plurality of conductive membrane holes **7***a* is formed in a substantially identical (including identical) shape such as a long hole shape along the shorter direction (width direction Y). That is, the plurality of conductive membrane holes **7***a* are provided so as to be aligned in a row at a predetermined pitch along the longer direction (liquid flowing direction X). The pitch of the plurality of conductive membrane holes **7***a* may be the same as the pitch of cathode holes **3***c*, or may be different from the pitch of cathode holes **3***c*. The shape and arrangement of conductive membrane holes **7***a* are not limited to the above form and may be in another form such as a V shape. It is sufficient that at least one conductive membrane hole **7***a* is formed in conductive membrane **7**.

(26) Power feeder **29** is formed using, for example, titanium. Power feeder **29** is formed in, for example, a rectangular plate shape with liquid flowing direction X as the longer direction, width direction Y as the shorter direction, and stacking direction Z as the thickness direction. Power feeder **29** is electrically connected to power-feeding shaft **29***b* for anode at the other end in the longer direction (upstream side in liquid flowing direction X) via spiral spring **29***a*. Power-feeding shaft **29***b* is electrically connected to a positive electrode of the power supply part (not illustrated). Power feeder **29** is stacked on one face side of anode **5** in stacking direction Z and is disposed in contact with anode **5**. This causes power feeder **29** to be electrically connected to anode **5**.

(27) That is, in stacked body **9** of the present exemplary embodiment, power feeder **29**, anode **5**, conductive membrane **7**, and cathode **3** are stacked in this order from the lower side in stacking direction Z. In stacked body **9**, at a part of conductive membrane **7** stacked between cathode **3** and anode **5**, interface **21** is formed between cathode **3** and conductive membrane **7**, and interface **23** is formed between anode **5** and conductive membrane **7**. In a part of stacked body **9** where cathode **3** and conductive membrane **7** are stacked, cathode holes **3***c* and conductive membrane holes **7***a* communicate with each other in stacking direction Z. Conductive membrane **7**, cathode hole **3***c*, and conductive membrane hole **7***a* form slot **25**. At least a part of interface **21** and interface **23** is exposed to slot **25**. Further, slot **25** is open to flow path **19** described later through which a liquid such as water flows. This causes water to flow through slot **25**.

(28) In electrolytic part **11** having stacked body **9**, first, the water flows through flow path **19**, and then the water flows through slot **25**. When a voltage is applied between cathode **3** and anode **5** by the power supply part in a state where the water is flowing, a potential difference is generated between cathode **3** and anode **5** via conductive membrane **7**. This potential difference energizes cathode **3**, anode **5**, and conductive membrane **7**. This causes electrolysis mainly in the water in slot **25** to generate ozone as an electrolytic product near interface **23** between anode **5** and conductive membrane **7**. The ozone thus generated dissolves in the water while being carried to the downstream side of flow path **19** along the water flow. As a result, an electrolytic liquid such as ozone water is generated. Electrolytic part **11** described above is disposed in housing **13**.

(29) As illustrated in FIGS. **1** to **4**, housing **13** of electrolytic liquid generation device **1** is formed using, for example, a non-conductive resin such as polyphenylene sulfide (PPS). Housing **13** includes electrode case **49**, electrode case lid **51**, and the like.

(30) Electrode case **49** of housing **13** has bottom wall **53** located on the lower side in stacking

direction Z and peripheral wall **55**. Peripheral wall **55** is erected upward from the peripheral edge of bottom wall **53** in stacking direction Z and is formed continuously in the peripheral direction. That is, electrode case **49** is formed in, for example, a rectangular housing shape in which the upper side of peripheral wall **55** is open. Peripheral wall **55** has flange **57** disposed at an upper end. Flange **57** extends outward in a planar direction parallel to liquid flowing direction X and width direction Y and is formed continuously in the peripheral direction of peripheral wall **55**.
(31) Electrode case **49** includes housing recess **59**, a pair of through-holes **61**, fitting projection **63**, inlet port **15**, outlet port **17**, and the like.
(32) Housing recess **59** is formed in an inner space of electrode case **49** which is open on the upper side of peripheral wall **55** and defined by inner face **53***a* of bottom wall **53** and inner face **55***a* of peripheral wall **55**. Housing recess **59** houses electrolytic part **11**, positioning member **27**, and the like from the opening side. Peripheral wall **55** has a plurality of positioning protrusions **65** formed on inner face **55***a*. Positioning protrusions **65** are formed along liquid flowing direction X and positions cathode **3** of stacked body **9** with respect to housing **13**.
(33) The pair of through-holes **61** are respectively provided near ends on the downstream side and the upstream side in liquid flowing direction X of bottom wall **53** of housing recess **59**. The pair of through-holes **61** are formed to penetrate bottom wall **53** in stacking direction Z. Power-feeding shaft **3***b* of cathode **3** and power-feeding shaft **29***b* of power feeder **29** are respectively inserted into the pair of through-holes **61** in a state where electrolytic part **11** is housed in housing recess **59** of electrode case **49**. Below the pair of through-holes **61**, O-ring **67**, washer **69**, spring washer **71**, and hex nut **73** are assembled to each of power-feeding shaft **3***b* and power-feeding shaft **29***b* that are inserted. This fixes power-feeding shaft **3***b* and power-feeding shaft **29***b* to the pair of through-holes **61**. In addition, this assembly stops the water inside housing recess **59**.
(34) Fitting projection **63** is erected upward from the upper face (for example, from flange **57**) of peripheral wall **55** in stacking direction Z and is formed continuously in the peripheral direction. Fitting projection **63** is fitted with fitting recess **79** of electrode case lid **51** described later, and electrode case lid **51** is positioned with respect to electrode case **49**. A plurality of fitting projections **63** may be discontinuously formed in the peripheral direction.
(35) Inlet port **15** is provided in peripheral wall **55** of electrode case **49** at a portion located on the upstream side in liquid flowing direction X, and extends in a tubular shape toward the upstream side in liquid flowing direction X. Inlet port **15** is formed with, at the center thereof, hole **15***a* having a long hole shape penetrating peripheral wall **55** in liquid flowing direction X and communicating with housing recess **59**. Inlet port **15** is connected with a pipe (not illustrated) for supplying water and introduces the water into housing recess **59**.
(36) Outlet port **17** is provided in peripheral wall **55** of electrode case **49** at a portion located on the downstream side in liquid flowing direction X, and extends in a tubular shape toward the downstream side in liquid flowing direction X. Outlet port **17** is formed with, at the center thereof, a hole (not illustrated) with a long hole shape penetrating peripheral wall **55** in liquid flowing direction X and communicating with housing recess **59**. Outlet port **17** is connected with a pipe (not illustrated) for discharging ozone water and leads out the ozone water generated by electrolytic part **11** in housing recess **59**.
(37) As illustrated in FIGS. **2** to **4**, electrode case lid **51** of housing **13** includes lid body **75** in a rectangular shape located on the upper side in stacking direction Z, flow path projection **77** erected downward in a rectangular shape from the lower face of the center of lid body **75** in stacking direction Z, and the like.
(38) Lid body **75** has the outer shape formed to be substantially identical (including identical) to flange **57** of electrode case **49**. That is, lid body **75** is configured to be able to close the opening of housing recess **59** of electrode case **49**. Lid body **75** has fitting recess **79** that is continuously formed in the peripheral direction near the outer edge of the lower face and can be fitted to fitting projection **63** of electrode case **49**. The lower face of lid body **75** is in contact with the upper face

of flange **57** of electrode case **49**, and the contact surfaces thereof are welded in a state where fitting recess **79** is fitted to fitting projection **63**. This welding causes the inside of housing **13** to stop water and fixes electrode case lid **51** to electrode case **49**.
(39) The fixing between electrode case **49** and electrode case lid **51** is not limited to the above welding method. For example, a sealing material may be interposed between electrode case **49** and electrode case lid **51**, and electrode case **49** and electrode case lid **51** may be fixed by a fixing method such as screwing. In the case where the plurality of fitting projections **63** are discontinuously formed in the peripheral direction, the plurality of fitting recesses **79** may be formed discontinuously in the peripheral direction so as to match with the plurality of fitting projections **63**, and the above projections and recesses may be fitted and welded to each other.
(40) Further, lid body **75** has groove **81** formed on the upper face. Groove **81** is used for positioning, catching, reverse insertion prevention, and the like when, for example, electrolytic liquid generation device **1** is assembled to an instrument.
(41) Flow path projection **77** is formed to have an outer shape substantially identical (including identical) to an inner edge of the opening of housing recess **59** of electrode case **49**. The dimension of the outer face of flow path projection **77** is set to have a slight gap with inner face **55***a* of peripheral wall **55**. This facilitates insertion of flow path projection **77** into housing recess **59** of electrode case **49**.
(42) Flow path projection **77** is inserted into housing recess **59** in a state where electrode case lid **51** is assembled to electrode case **49**. This causes the lower face of electrode case lid **51** to contact with the surface of cathode **3** of electrolytic part **11** to press stacked body **9** of electrolytic part **11** downward in stacking direction Z.
(43) Flow path projection **77** includes flow path groove **83** formed at the center of the lower face along liquid flowing direction X.
(44) Flow path groove **83** is defined by a plurality of cylindrical protrusions **83***a* disposed along liquid flowing direction X at the center of flow path projection **77** in width direction Y. This provides two flow path grooves **83** with respect to width direction Y of flow path projection **77**. Flow path grooves **83** are open on the facing cathode **3** side and on both sides in liquid flowing direction X. The width of flow path groove **83** in width direction Y is set substantially equal (including equal) to the width of slot **25** of electrolytic part **11** in width direction Y. With this setting, the water flowing in flow path groove **83** can be stably introduced into slot **25**. In the state where flow path projection **77** is in contact with cathode **3**, flow path groove **83** described above forms, with the surface of cathode **3**, flow path **19** through which the water flows.
(45) That is, the water introduced into housing **13** from inlet port **15** flows into flow path **19**. The water flowing into flow path **19** flows through slot **25** of electrolytic part **11** and is electrolyzed, whereby ozone as an electrolytic product is generated. The generated ozone dissolves in the water flowing through flow path **19**, whereby ozone water is generated. The generated ozone water flows through flow path **19** and is led out of housing **13** from outlet port **17**.
(46) In electrolytic liquid generation device **1** of the first exemplary embodiment, positioning member **27** is disposed in housing **13** in which flow path **19** is formed.
(47) Positioning member **27** illustrated in FIGS. **1** to **10** is constituted using, for example, an elastic body having an elastic force such as rubber, plastic, or a metal spring.
(48) Positioning member **27** is formed in a rectangular parallelepiped shape whose outer face shape is substantially identical (including identical) to the inner face shape of housing recess **59** of electrode case **49** on the side of bottom wall **53** and is configured to be housed in housing recess **59**. In the state of being housed in housing recess **59**, positioning member **27** has electrolytic part **11** stacked on the upper side in stacking direction Z. Electrode case lid **51** is assembled to electrode case **49** with electrolytic part **11** being stacked. At this time, flow path projection **77** of electrode case lid **51** presses cathode **3** of stacked body **9** of electrolytic part **11** downward in stacking direction Z. This causes positioning member **27** to be pressed downward in stacking direction Z.

(49) At this time, since positioning member **27** is formed of an elastic body, a repulsive force to go back toward the upper side in the stacking direction Z is generated with respect to the pressing. The repulsive force of positioning member **27** applies an upward biasing force in stacking direction Z to electrolytic part **11**. This causes stacked body **9** of electrolytic part **11** to be in close contact with flow path projection **77** of electrode case lid **51** in stacking direction Z. Therefore, the contact of stacked body **9** is stabilized, and the energization area is maintained. As a result, the current density supplied to stacked body **9** can be equalized, and the electrolysis performance in electrolytic part **11** can be stabilized. Note that a gap is formed between the outer face of positioning member **27** and the inner face of housing recess **59** in a free state where positioning member **27** is not pressed. This gap allows deformation of positioning member **27** when positioning member **27** is elastically deformed by pressing.
(50) Positioning member **27** further includes a positioning recess **85**. A plurality of positioning recesses **85** are formed to penetrate in stacking direction Z along liquid flowing direction X. A plurality of positioning projections **87** erected from bottom wall **53** of housing recess **59** of electrode case **49** are inserted into positioning recesses **85**. Inserting positioning projections **87** into positioning recesses **85** allows positioning member **27** to be positioned with respect to housing **13** in a planar direction parallel to liquid flowing direction X and width direction Y. At this time, in the free state of positioning member **27**, a gap that allows deformation of positioning member **27** is formed between the inner face of positioning recess **85** and the outer face of positioning projection **87**. This gap allows deformation of positioning member **27** similarly to the gap described above. Positioning recess **85** may be formed in a concave shape instead of the penetrating shape through which positioning member **27** penetrates in stacking direction Z.
(51) As described above, in electrolytic liquid generation device **1** of the first exemplary embodiment, the width of cathode **3** of stacked body **9** of electrolytic part **11** in width direction Y is set to be substantially equal (including equal) to the width of flow path projection **77** of electrode case lid **51** in width direction Y. This setting of the width of cathode **3** allows the openings of slot **25** formed by cathode holes **3***c* of cathode **3**, conductive membrane holes **7***a* of conductive membrane **7**, and anode **5** with respect to flow path **19** formed between cathode **3** and flow path projection **77** to be stably disposed. Further, flow path projection **77** can stably press cathode **3** of electrolytic part **11** downward in stacking direction Z.
(52) The width of anode **5** of stacked body **9** in width direction Y is set to be narrower than the width of cathode **3** in width direction Y and substantially equal (including equal) to the width of conductive membrane **7** in width direction Y. The setting of the widths of anode **5** and conductive membrane **7** as described above can downsize expensive anode **5** and conductive membrane **7**, which can reduce the cost.
(53) The width of power feeder **29** of stacked body **9** in width direction Y is set to be substantially equal (including equal) to the width of anode **5** in width direction Y. This setting of the width of power feeder **29** can secure the energization area for anode **5** while downsizing power feeder **29**. Therefore, energization to anode **5** can be stabilized, and the electrolysis performance in electrolytic part **11** can be maintained.
(54) The width of positioning member **27** in width direction Y is set to be wider than the widths of anode **5** and power feeder **29** of stacked body **9** in width direction Y. This setting of the width of positioning member **27** allows an outer edge of positioning member **27** to be disposed on the outer peripheries of anode **5** and power feeder **29**. In addition, positioning member **27** can stably receive the pressing force applied to power feeder **29** from flow path projection **77** of electrode case lid **51**. Therefore, the biasing force can be stably applied to stacked body **9** of electrolytic part **11**.
(55) In electrolytic liquid generation device **1**, when a minute gap is formed between the outer periphery of electrolytic part **11** and the inner face of housing **13**, there is a case of a liquid such as water entering and remaining in the minute gap. When ozone is generated by electrolyzing water in the state where water remains around electrolytic part **11**, the pH value of the water retaining

around electrolytic part **11** increases. As a result, scale mainly composed of a calcium component is likely to be generated around electrolytic part **11**. When the scale is generated, the scale possibly accumulates in the minute gap. When the scale is accumulated around electrolytic part **11**, there is a risk that electrolytic part **11** and housing **13** are deformed by being compressed by the scale.

(56) Accordingly, as illustrated in FIG. **4**, in electrolytic liquid generation device **1** of the first exemplary embodiment, space **31** for inhibiting water from remaining is formed between the outer periphery of electrolytic part **11** and the inner face of housing **13**.

(57) That is, space **31** is formed between inner face **55***a* of peripheral wall **55** and the side faces of stacked body **9** on both sides in width direction Y. Specifically, space **31** is formed between inner face **55***a* of peripheral wall **55** and each of side face **3***d* of cathode **3**, side face **5***a* of anode **5**, side face **7***b* of conductive membrane **7**, and side face **29***c* of power feeder **29**.

(58) Space **31** is formed inside housing **13** along liquid flowing direction X on both sides of stacked body **9** in width direction Y and communicates with inlet port **15** and outlet port **17**. This causes the water introduced from inlet port **15** to flow through space **31** and to be led out from outlet port **17**. Therefore, the water is inhibited from remaining around electrolytic part **11**. Inhibiting water from remaining around electrolytic part **11** inhibits generation or accumulation of scale around electrolytic part **11**. As a result, deformation of electrolytic part **11** and housing **13** caused by accumulation of scale can be inhibited with increased reliability. Space **31** may be configured to communicate with the middle of flow path **19**. This can inhibit deformation of the electrolytic part and the housing caused by accumulation of scale. As a result, it is possible to equalize the current density to stabilize the capacity of the electrolytic part to generate the electrolytic product.

(59) That is, in electrolytic liquid generation device **1** in which space **31** is formed, the width of anode **5** in width direction Y is formed narrower than the width of cathode **3** in width direction Y in electrolytic part **11**. Narrowing the width of anode **5** can downsize anode **5**. However, downsizing anode **5** may prevent anode **5** from being directly positioned with respect to housing **13**.

(60) Therefore, in electrolytic liquid generation device **1** of the first exemplary embodiment, as described above, positioning member **27** positioned with respect to housing **13** positions at least anode **5** in stacked body **9** of electrolytic part **11**. That is, anode **5** is positioned in electrode case **49** of housing **13** via positioning member **27**. This allows anode **5** to be positioned with respect to housing **13** with increased reliability even when anode **5** is downsized.

(61) Further, as illustrated in FIGS. **1** to **10**, positioning member **27** of the first exemplary embodiment includes, at the peripheral edge of the upper face, the plurality of protrusions **33** erected to project upward from the upper face in stacking direction Z. The height of the plurality of protrusions **33** in stacking direction Z is set to be substantially equal (including equal) to the total thickness of power feeder **29** and anode **5** so as to reach the height position of anode **5** of stacked body **9** stacked on positioning member **27**. This allows anode **5** to be positioned by the plurality of protrusions **33**. The plurality of protrusions **33** include first protrusion **39**, second protrusion **41**, third protrusion **43**, guide part **45**, and the like, which are expressed by different names according to arrangement position, purpose, and the like. When first protrusion **39**, second protrusion **41**, third protrusion **43**, and the guide part **45** are collectively mentioned, they will be simply referred to as “protrusions **33**”.

(62) A plurality of first protrusions **39** are disposed on both sides of the upper face of positioning member **27** in width direction Y (shorter direction) along liquid flowing direction X (longer direction). First protrusions **39** are disposed so as to face side faces **5***a*, **29***c* of anode **5** and power feeder **29** on both sides in width direction Y. Therefore, when anode **5** and power feeder **29** try to move in width direction Y, side faces **5***a*, **29***c* of anode **5** and power feeder **29** come into contact with first protrusions **39**. This restricts movement of anode **5** and power feeder **29** in width direction Y. That is, first protrusions **39** position anode **5** and power feeder **29** with respect to width direction Y.

(63) With first protrusion **39**, the movement of anode **5** and power feeder **29** in width direction Y can be prevented, and the above-described space **31** can be stably maintained. Further, contact between anode **5** and power feeder **29** can be stabilized. Therefore, electrolysis performance of electrolytic part **11** can be stably maintained.
(64) First protrusion **39** is formed in a cylindrical shape. This can reduce the contact surface between side face **5***a* of anode **5** and side face **29***c* of power feeder **29** and first protrusion **39** and can increase space **31**. In addition, contact resistance between first protrusion **39** and anode **5** and power feeder **29** can decrease. Therefore, the assemblability of anode **5** and power feeder **29** to positioning member **27** can improve.
(65) As illustrated in FIGS. **7** and **8**, power feeder **29** includes avoidance part **35** that is provided at a facing part of power feeder **29** where first protrusion **39** is disposed and continuously formed along liquid flowing direction X. Avoidance part **35** avoids contact between first protrusion **39** and power feeder **29** in stacking direction Z. The width of avoidance part **35** in width direction Y is formed to be narrower than the width of power feeder **29** on the power-feeding shaft **29***b* side in width direction Y and substantially equal (including equal) to the width of anode **5** in width direction Y. This allows anode **5** to be positioned in stacking direction Z by first protrusion **39** without interference between power feeder **29** and first protrusion **39**.
(66) Second protrusion **41** is disposed on both sides of the upper face of positioning member **27** in liquid flowing direction X (longer direction). Second protrusion **41** is disposed to face both side faces of anode **5** and power feeder **29** of stacked body **9** in liquid flowing direction X. Therefore, when anode **5** and power feeder **29** try to move in liquid flowing direction X, anode **5** and power feeder **29** come into contact with second protrusion **41**. This restricts movement of anode **5** and power feeder **29** in liquid flowing direction X. That is, second protrusion **41** positions anode **5** and power feeder **29** with respect to liquid flowing direction X.
(67) As described above, second protrusion **41** restricts the movement of anode **5** and power feeder **29** in liquid flowing direction X. This stabilizes contact between anode **5** and power feeder **29** constituting stacked body **9**. As a result, high electrolysis performance can be maintained in electrolytic part **11**. Second protrusion **41** is disposed on both sides in liquid flowing direction X. Therefore, when stacked body **9** is assembled to positioning member **27**, second protrusion **41** can be used as a guide of the assembly position. As a result, assemblability of stacked body **9** to positioning member **27** can improve.
(68) Second protrusion **41** is formed in a rectangular prism shape with width direction Y as a longer direction. The rectangular prismatic shape allows anode **5** and power feeder **29** to be stably positioned with respect to liquid flowing direction X using one second protrusion **41** disposed on both sides in liquid flowing direction X.
(69) As illustrated in FIGS. **7** to **10**, power feeder **29** includes avoidance part **37**. Specifically, avoidance part **37** is provided in a part on the power-feeding shaft **29***b* side where second protrusion **41** is disposed, and avoids contact with second protrusion **41** in stacking direction Z. Avoidance part **37** penetrates power feeder **29** in stacking direction Z (thickness direction) and is formed in a rectangular hole shape having an inner diameter larger than the outer diameter of second protrusion **41**. Second protrusion **41** of positioning member **27** is inserted and disposed in avoidance part **37**. This allows anode **5** to be positioned in stacking direction Z by second protrusion **41** while avoiding interference between power feeder **29** and second protrusion **41**. In addition, avoidance part **37** in a hole shape can maintain the rigidity of power feeder **29** higher than, for example, the case of an avoidance part on one line that connects the centers of power feeder **29** in the shorter direction.
(70) Third protrusion **43** is also used as first protrusion **39**, and as illustrated in FIG. **9**, is disposed near each corner of two rectangular anodes **5** arranged along liquid flowing direction X. Third protrusion **43** positions anode **5** and power feeder **29** with respect to width direction Y. Third protrusion **43** prevents rotation of each anode **5** in a plane formed in liquid flowing direction X and

width direction Y. Third protrusion **43** stably inhibits displacement of anode **5** in the planar direction parallel to liquid flowing direction X and width direction Y. This can stably maintain the energization area between anode **5** and power feeder **29** and equalize the conduction density. As a result, the electrolysis performance in electrolytic part **11** can be stably maintained.
(71) Guide part **45** is disposed near the center between the corners of each of two rectangular anode **5** arranged along liquid flowing direction X. Guide part **45** is also used as first protrusion **39** to position anode **5** and power feeder **29** with respect to width direction Y. Anode **5** and power feeder **29** may be positioned with respect to liquid flowing direction X by guide part **45** also as second protrusion **41**. When stacked body **9** is assembled to positioning member **27**, guide part **45** can be used as a guide for the assembly position. As a result, assemblability of stacked body **9** to positioning member **27** can improve.
(72) In positioning member **27** provided with the plurality of protrusion **33** described above, as illustrated in FIG. **4**, a gap **47** is formed between the plurality of protrusions **33** and the outer edge.
(73) On the upper face of positioning member **27**, gap **47** is configured by a space formed between the plurality of first protrusions **39** and the outer edge on both sides in width direction Y of positioning member **27**, the space extending in width direction Y. Liquid such as water flowing through the above-described space **31** flows through gap **47**. Space **31** can be further widened by gap **47**. As a result, accumulation of scale can be prevented with increased reliability. Further, gap **47** can adjust the interval of gap **47** in width direction Y, that is, the position of first protrusions **39** with respect to width direction Y. This makes it possible to easily cope with a change in the size in width direction Y of anode **5** and power feeder **29** of stacked body **9**.
(74) On the upper face of positioning member **27**, gap **47** may be configured by a space formed at a position between second protrusion **41** of positioning member **27** and the outer edges on both sides of positioning member **27** in liquid flowing direction X, the space extending in liquid flowing direction X. Gap **47** provided in liquid flowing direction X can adjust the interval of gap **47** in liquid flowing direction X, that is, the position of second protrusion **41** with respect to liquid flowing direction X. As a result, it is possible to easily cope with a change in the size in liquid flowing direction X of anode **5** and power feeder **29** of stacked body **9**.
(75) In this manner, electrolytic liquid generation device **1** of the first exemplary embodiment includes stacked body **9** in which conductive membrane **7** is stacked so as to be interposed between cathode **3** and anode **5** constituting the electrodes adjacent to each other. Electrolytic liquid generation device **1** further includes electrolytic part **11** that electrolyzes liquid, and housing **13** in which electrolytic part **11** is disposed.
(76) Housing **13** includes inlet port **15** through which the liquid to be supplied to electrolytic part **11** flows in, outlet port **17** through which the electrolytic liquid generated in electrolytic part **11** flows out, and flow path **19** in which liquid flowing direction X intersects stacking direction Z of stacked body **9**. Electrolytic part **11** includes slot **25** that is open to flow path **19** and is formed such that at least a part of interface **21** and interface **23** between conductive membrane **7** and cathode **3** and anode **5** constituting the electrodes is exposed. Further, positioning member **27** positioned with respect to housing **13** is disposed inside housing **13**, and positioning member **27** is configured to position at least either one electrode of cathode **3** and anode **5**.
(77) This configuration enables the electrodes to be positioned with respect to housing **13** via the positioning member **27** with increased reliability even when the electrodes are downsized. That is, it is possible to inhibit occurrence of displacement of electrolytic part **11** in stacked body **9** and to stably maintain the energization area in electrolytic part **11**. This can equalize the current density in stacked body **9** and stabilize the capacity of the electrolytic part **11** to generate the electrolytic product.
(78) The stacked body **9** includes power feeder **29** in contact with the electrodes, and power feeder **29** is positioned by positioning member **27**. This can inhibit occurrence of displacement of the electrodes and power feeder **29** and stabilize contact between the electrodes and power feeder **29**.

That is, it is possible to stably maintain the energization area between the electrodes and power feeder **29** and equalize the current density. As a result, it is possible to stabilize the capacity of electrolytic part **11** to generate the electrolytic product.

(79) There is provided space **31** inhibiting water from remaining, the space being formed between the outer periphery of at least either one electrode of cathode **3** and anode **5** and the inner face of housing **13**. This can prevent liquid from remaining around electrolytic part **11**. That is, generation of scale between electrolytic part **11** and housing **13** can be inhibited. As a result, it is possible to prevent the deformation of electrolytic part **11** and housing **13** caused by accumulation of scale from occurring.

(80) The width of power feeder **29** in the direction (width direction Y) intersecting liquid flowing direction X is substantially equal (including equal) to the width of the electrodes in contact with power feeder **29**. This can stably maintain the energization area between the electrodes and power feeder **29** while inhibiting an increase in size of power feeder **29**. As a result, it is possible to equalize the current density in electrolytic part **11** and stabilize the capacity of electrolytic part **11** to generate the electrolytic product.

(81) Positioning member **27** includes protrusion **33** that protrudes in stacking direction Z and positions at least one electrode of cathode **3** and anode **5**. Power feeder **29** includes avoidance part **35** and avoidance part **37** that avoid contact with protrusion **33** with respect to stacking direction Z. This prevents interference between protrusion **33** and power feeder **29** in stacking direction Z and allows the electrodes to be positioned by protrusion **33**. Therefore, the electrodes and power feeder **29** can be stably brought into contact with each other. As a result, it is possible to stably maintain the energization area between the electrodes and power feeder **29**, to equalize the current density, and to stabilize the capacity of electrolytic part **11** to produce the electrolytic product.

(82) Avoidance parts **35**, **37** are formed in a hole shape through which protrusion **33** is inserted in stacking direction Z. This can maintain the rigidity of power feeder **29** and inhibit deformation of power feeder **29**. As a result, it is possible to stabilize the contact between the electrodes and power feeder **29**, to stably maintain the energization area between the electrode and power feeder **29**, to equalize the current density, and to stabilize the capacity of electrolytic part **11** to generate the electrolytic product.

(83) An elastic body in contact with one side of stacked body **9** in electrolytic part **11** in stacking direction Z is disposed in housing **13**. Positioning member **27** is the elastic body. That is, the contact of stacked body **9** can be stabilized by bringing stacked body **9** into close contact in stacking direction Z by positioning member **27**. This can stably maintain the energization area in stacked body **9**, equalize the current density, and stabilize the capacity of electrolytic part **11** to generate the electrolytic product. Further, forming positioning member **27** of the elastic body can decrease the number of parts. That is, since the positioning member can be realized by adding a function to the elastic body which is a constituent element, the number of parts can be reduced as compared with the case where the positioning member is configured as a dedicated member.

(84) Positioning member **27** includes a plurality of protrusions **33** protruding in stacking direction Z and positioning at least one electrode of cathode **3** and anode **5** with respect to a planar direction parallel to liquid flowing direction X. This can inhibit displacement of the electrodes in the planar direction parallel to liquid flowing direction X. As a result, it is possible to stably maintain the energization area in electrolytic part **11**, to equalize the current density, and to stabilize the capacity of electrolytic part **11** to generate the electrolytic product.

(85) The plurality of protrusions **33** have first protrusion **39** that positions at least one electrode of cathode **3** and anode **5** with respect to the direction (width direction Y) intersecting liquid flowing direction X. This can inhibit displacement of the electrodes in the direction intersecting liquid flowing direction X. As a result, it is possible to stably maintain the energization area in electrolytic part **11**, to equalize the current density, and to stabilize the capacity of electrolytic part **11** to generate the electrolytic product.

(86) First protrusion **39** has a cylindrical shape. This can reduce the contact surface between the electrodes and first protrusion **39** of positioning member **27**. Therefore, contact resistance at the time of assembling the electrodes decreases. As a result, assemblability of the electrodes to the positioning member **27** can improve.
(87) The plurality of protrusions **33** have second protrusion **41** that positions at least either one electrode of cathode **3** and anode **5** with respect to liquid flowing direction X. This can inhibit displacement of the electrodes in liquid flowing direction X. As a result, it is possible to stably maintain the energization area in electrolytic part **11**, to equalize the current density, and to stabilize the capacity of electrolytic part **11** to generate the electrolytic product.
(88) The second protrusion **41** has a rectangular shape. This can increase the contact surface between the electrodes and second protrusion **41** of positioning member **27**. As a result, the electrodes can be positioned stably in liquid flowing direction X by second protrusion **41**.
(89) Further, at least one electrode of cathode **3** and anode **5** is formed in a polygonal shape. The plurality of protrusions **33** include third protrusion **43** disposed near a corner of at least one electrode of cathode **3** and anode **5**. This allows the corner of the electrodes to be positioned by third protrusion **43** and can prevent the electrodes from rotating. As a result, it is possible to stably maintain the energization area in electrolytic part **11**, to equalize the current density, and to stabilize the capacity of electrolytic part **11** to generate the electrolytic product.
(90) The plurality of protrusions **33** includes guide part **45** that guides at least one electrode of cathode **3** and anode **5** to the assembly position. This allows guide part **45** to easily guide the electrodes when the electrodes are assembled. As a result, the assembly of the electrodes to positioning member **27** is facilitated, which can improve the assemblability.
(91) Further, positioning member **27** has gap **47** formed between the plurality of protrusions **33** and the outer edge. Therefore, the position of protrusions **33** can be easily changed by adjusting the interval of gap **47**. This makes it possible to easily cope with a change in the size of the electrodes. As a result, the degree of freedom in designing the electrodes can further improve.
(92) The height of the plurality of protrusions **33** in stacking direction Z is substantially equal (including equal) to the thickness of the electrodes adjacent to the plurality of protrusions **33**. This allows the electrodes to be positioned stably by protrusions **33**. Further, it is possible to inhibit interference between protrusions **33** and the peripheral members. As a result, it is possible to stably maintain the energization area in electrolytic part **11**, to equalize the current density, and to stabilize the capacity of electrolytic part **11** to generate the electrolytic product.
Second Exemplary Embodiment
(93) Hereinafter, electrolytic liquid generation device **101** according to a second exemplary embodiment of the present disclosure will be described with reference to FIG. **11**.
(94) As illustrated in FIG. **11**, electrolytic liquid generation device **101** according to the second exemplary embodiment is different from electrolytic liquid generation device **1** according to the first exemplary embodiment in that conductive membrane **7** is positioned by positioning member **27**.
(95) Note that the same reference numerals are given to the same configurations as those in the first exemplary embodiment, and the description of the configurations and functions will be omitted by referring to the first exemplary embodiment. Since the configurations are the same as those in the first exemplary embodiment, the effects to be obtained are the same.
(96) As illustrated in FIG. **11**, in electrolytic liquid generation device **101** according to the second exemplary embodiment, power feeder **29**, anode **5**, and conductive membrane **7** are positioned by the plurality of protrusions **33** (in FIG. **11**, only first protrusion **39** is illustrated) of positioning member **27**. The height of the plurality of protrusions **33** in stacking direction Z is set to be substantially equal (including equal) to the total thickness of power feeder **29**, anode **5**, and conductive membrane **7** so as to reach the height position of conductive membrane **7** of stacked body **9** stacked on positioning member **27**. The plurality of protrusions **33** are disposed to face the

side faces **29***c*, **5***a*, and **7***b* of power feeder **29**, anode **5**, and conductive membrane **7** on both sides in liquid flowing direction X and width direction Y.

(97) Therefore, when power feeder **29**, anode **5**, and conductive membrane **7** of stacked body **9** try to move in the planar direction parallel to liquid flowing direction X, power feeder **29**, anode **5**, and conductive membrane **7** come into contact with the plurality of protrusions **33**. This restricts movement of stacked body **9** in the planar direction. That is, the plurality of protrusions **33** position power feeder **29**, anode **5**, and conductive membrane **7** of stacked body **9** with respect to the planar direction parallel to liquid flowing direction X.

(98) In this manner, in electrolytic liquid generation device **101** of the second exemplary embodiment, conductive membrane **7** is positioned by positioning member **27**. Therefore, even when conductive membrane **7** is downsized, conductive membrane **7** can be positioned with respect to housing **13** via positioning member **27**. This can inhibit displacement of electrolytic part **11** in stacked body **9**. As a result, it is possible to stably maintain the energization area in electrolytic part **11**, to equalize the current density, and to stabilize the capacity of electrolytic part **11** to generate the electrolytic product.

Third Exemplary Embodiment

(99) Hereinafter, electrolytic liquid generation device **201** according to a third exemplary embodiment of the present disclosure will be described with reference to FIG. **12**.

(100) As illustrated in FIG. **12**, electrolytic liquid generation device **201** according to the third exemplary embodiment is different from the electrolytic liquid generation devices according to the other exemplary embodiments in that positioning member **27** positions cathode **3** and anode **5**.

(101) Note that the same reference numerals are given to the same configurations as those of the other exemplary embodiments, and the description of the configurations and functions will be omitted by referring to the other exemplary embodiments. Since the configurations are the same as those of the other exemplary embodiments, the same effects are obtained.

(102) As illustrated in FIG. **12**, in electrolytic liquid generation device **201** according to the third exemplary embodiment, the width of cathode **3** in width direction Y is set substantially equal (including equal) to widths of power feeder **29**, anode **5**, and conductive membrane **7** in width direction Y. Therefore, cathode **3** cannot be positioned directly with respect to housing **13**. Accordingly, cathode **3** is positioned with respect to positioning member **27** positioned with respect to housing **13**.

(103) That is, power feeder **29**, anode **5**, conductive membrane **7**, and cathode **3** of stacked body **9** are positioned by the plurality of protrusions **33** (In FIG. **12**, only first protrusion **39** is illustrated) of positioning member **27**. At this time, the height of protrusion **33** in stacking direction Z is set to be substantially equal to the total thickness of power feeder **29**, anode **5**, conductive membrane **7**, and cathode **3** so as to reach the height position of cathode **3** of stacked body **9** stacked on positioning member **27**. The plurality of protrusions **33** are disposed so as to face the side faces **29***c*, **5***a*, **7***b*, and **3***d* on both sides in the liquid flowing direction X and the width direction Y of power feeder **29**, anode **5**, conductive membrane **7**, and cathode **3**.

(104) Therefore, when power feeder **29**, anode **5**, conductive membrane **7**, and cathode **3** of stacked body **9** try to move in a planar direction parallel to liquid flowing direction X, power feeder **29**, anode **5**, conductive membrane **7**, and cathode **3** come into contact with the plurality of protrusions **33**. This restricts movement of stacked body **9** in the planar direction. That is, the plurality of protrusions **33** position power feeder **29**, anode **5**, conductive membrane **7**, and cathode **3** of stacked body **9** with respect to a planar direction parallel to liquid flowing direction X.

(105) At this time, cathode **3** of the third exemplary embodiment includes an avoidance part (not illustrated) that is provided on the power-feeding shaft **3***b* (see FIG. **1**) side and avoids contact with second protrusion **41** (see FIG. **5**) with respect to stacking direction Z. The avoidance part is preferably formed in a hole shape similarly to the avoidance part **37** (see FIG. **8**) provided in power feeder **29** described in the first exemplary embodiment. Forming the avoidance part into a hole

shape can maintain rigidity of cathode **3**.

(106) In this manner, in electrolytic liquid generation device **201** according to the third exemplary embodiment, cathode **3** and anode **5** are positioned by positioning member **27**. Therefore, even when cathode **3** is downsized, cathode **3** can be positioned with respect to housing **13** via positioning member **27**. This can inhibit displacement of electrolytic part **11** in stacked body **9**. As a result, it is possible to stably maintain the energization area in electrolytic part **11**, to equalize the current density, and to stabilize the capacity of electrolytic part **11** to generate the electrolytic product.

(107) Note that, the above exemplary embodiments are to exemplify the techniques in the present disclosure, and therefore, various modifications, replacements, additions, omissions, and the like can be made in the scope of the claims or in an equivalent scope thereof.

(108) For example, in the above exemplary embodiments, the configuration in which the positioning projection of the housing is inserted into the positioning recess to cause the positioning member to be positioned with respect to the housing has been described as an example, but the present disclosure is not limited thereto. For example, the positioning member may be positioned by providing a plurality of projections on the outer face of the positioning member and bringing the projections into contact with the inner face of the housing. Further, the positioning member may be positioned by bringing outer face of the positioning member directly to the inner face of the housing.

(109) In the above exemplary embodiments, an example in which the positioning member is formed of an elastic body has been described, but the present disclosure is not limited thereto. For example, the stacked body may be positioned using a positioning member formed separately from the elastic body.

(110) In the above exemplary embodiments, an example in which the shape of the first protrusion is a cylindrical shape has been described, but the present disclosure is not limited thereto. For example, any shape such as a rectangular prism shape may be used. Similarly, the shape of the second protrusion is not limited to the rectangular shape and may be any shape such as a cylindrical shape.

(111) In the above exemplary embodiments, an example in which the shape of the electrodes is a rectangular polygonal shape has been described, but the present disclosure is not limited to this example. For example, any shape such as a circular shape may be used. Further, the polygonal shape of the electrodes is not limited to a quadrangular shape and may be any shape as long as it has more than or equal to three edges and vertices, for example, a pentagonal shape.

INDUSTRIAL APPLICABILITY

(112) The present disclosure is applicable to an electrolytic liquid generation device in which a stacked body can be downsized and the concentration of an electrolytic product in an electrolytically treated liquid can be increased. The present disclosure can be specifically applicable to water treatment equipment such as water purifiers, washing machines, dish washers, warm water bidet toilet seats, refrigerators, water heaters/servers, sterilizers, medical instruments, air conditioners, and kitchen equipment.

REFERENCE MARKS IN THE DRAWINGS

(113) **1**, **101**, **201**: electrolytic liquid generation device **3**: cathode (electrode) **3***a*, **29***a*: spring **3***b*, **29***b*: power-feeding shaft **3***c*: cathode hole **3***d*, **5***a*, **7***b*, **29***c*: side face **5**: anode (electrode) **7**: conductive membrane **7***a*: conductive membrane hole **9**: stacked body **11**: electrolytic part **13**: housing **15**: inlet port **15***a*: hole **17**: outlet port **19**: flow path **21**, **23**: interface **25**: slot **27**: positioning member (elastic body) **29**: power feeder **31**: space **33**: protrusion **35**, **37**: avoidance part **39**: first protrusion **41**: second protrusion **43**: third protrusion **45**: guide part **47**: gap **49**: electrode case **51**: electrode case lid **53**: bottom wall **53***a*, **55***a*: inner face **55**: peripheral wall **57**: flange **59**: housing recess **61**: through-hole **63**: fitting projection **65**: protrusion **67**: O-ring **69**: washer **71**: spring washer **73**: hex nut **75**: lid body **77**: flow path projection **79**: fitting recess **81**: groove **83**:

flow path groove **83***a*: cylindrical protrusion **85**: positioning recess **87**: positioning projection X: liquid flowing direction Y: width direction Z: stacking direction

Claims

1. An electrolytic liquid generation device comprising: an electrolytic part that electrolyzes a liquid, the electrolytic part including a stacked body, the stacked body including (i) a cathode and an anode constituting electrodes adjacent to each other and (ii) a conductive membrane interposed between the cathode and the anode; and a housing in which the electrolytic part is disposed, wherein: the housing includes: an inlet port through which a liquid to be supplied to the electrolytic part flows in; an outlet port through which an electrolytic liquid generated in the electrolytic part flows out; and a flow path in which a liquid flowing direction intersects a stacking direction of the stacked body, the electrolytic part includes a slot that is open to the flow path and is formed to cause at least a part of interfaces between the conductive membrane and the respective electrodes to be exposed, in the housing, a positioning member is disposed with respect to the housing, the positioning member includes a plurality of first protrusions, each of which protrudes in the stacking direction, two or more of the plurality of first protrusions are provided at each of longitudinal sides of one of the cathode or the anode, the longitudinal sides extending in the liquid flowing direction, and a top surface of each of the plurality of first protrusions faces a bottom face of another of the cathode or the anode.
2. The electrolytic liquid generation device according to claim 1, wherein the stacked body includes a power feeder that is in contact with one of the electrodes, and the power feeder is positioned by the positioning member.
3. The electrolytic liquid generation device according to claim 1, comprising a space disposed between an outer periphery of at least either the cathode or the anode and an inner face of the housing, the space inhibiting the liquid from remaining.
4. The electrolytic liquid generation device according to claim 2, wherein the power feeder has a width in a direction intersecting the liquid flowing direction substantially equal to a width of the electrodes in contact with the power feeder.
5. The electrolytic liquid generation device according to claim 2, wherein the positioning member includes a second protrusion that protrudes in the stacking direction and positions the power feeder, and the power feeder includes an avoidance part that avoids contact with the second protrusion with respect to the stacking direction.
6. The electrolytic liquid generation device according to claim 5, wherein the avoidance part is formed in a hole shape into which the second protrusion is inserted in the stacking direction.
7. The electrolytic liquid generation device according to claim 1, wherein the conductive membrane is positioned by the positioning member.
8. The electrolytic liquid generation device according to claim 1, wherein an elastic body is disposed in the housing, the elastic body being in contact with one side of the electrolytic part in the stacking direction of the stacked body, and the positioning member is the elastic body.
9. The electrolytic liquid generation device according to claim 1, wherein each of the plurality of first protrusions has a cylindrical shape.
10. The electrolytic liquid generation device according to claim 5, wherein a second protrusion positions at least either the cathode or the anode of the electrodes with respect to the liquid flowing direction.
11. The electrolytic liquid generation device according to claim 10, wherein the second protrusion has a rectangular shape when viewed from the stacking direction.
12. The electrolytic liquid generation device according to claim 1, wherein at least either the cathode or the anode of the electrodes is formed in a polygonal shape, and at least one of the plurality of first protrusions is disposed near a corner of at least either the cathode or the anode of

the electrodes.
13. The electrolytic liquid generation device according to claim 1, wherein the plurality of first protrusions include a guide part that guides at least either the cathode or the anode of the electrodes to an assembly position.
14. The electrolytic liquid generation device according to claim 1, wherein the positioning member has a gap disposed between the plurality of first protrusions and an outer edge of the positioning member.
15. The electrolytic liquid generation device according to claim 1, wherein: a width of the another of the cathode or the anode is greater than a width of the one of the cathode or the anode, and the top surface of each of the plurality of first protrusions is in contact with the bottom face of the another of the cathode or the anode.
16. The electrolytic liquid generation device according to claim 1, wherein: a width of the another of the cathode or the anode is greater than a width of the one of the cathode or the anode, and a gap is provided between the top surface of each of the plurality of first protrusions and the bottom face of the another of the cathode or the anode.