beauty health effect, and even eliminating chronic diseases. Furthermore, there are also clinical experiments showing that patients who need to inhale a high concentration of oxygen for an extended period of time would experience lung damage and the lung damage could be ameliorated by inhaling hydrogen. In conclusion, hydrogen-containing gas can be regarded as a kind of health gas, and be generated by liquid water.

Please refer to FIG. 7, FIG. 7 shows a schematic diagram of the structure of the traditional hydrogen-oxygen electrolytic device 700. The electrolytic device 700 comprises an electrolytic tank 702. The electrolytic tank 702 comprises electrodes 706A and 706B. The electrodes 706A and 706B are a negative electrode and a positive electrode respectively, coupled to a power source (not shown in FIG. 7) for supplying power to electrolyze water. The electrolytic water 704 in the electrolytic tank 702 is going to be electrolyzed when going through the electrified electrodes 706A and 706B. And then the negative pole will generate hydrogen and the positive pole will generate oxygen. The generated hydrogen and oxygen will be released on the top of the electrolytic tank 702 and then forms a hydrogen-oxygen mixed gas 708. The hydrogen-oxygen mixed gas 708 is outputted from the outputting tube of the electrolytic tank 702 for consequent use. However, the quantity of the hydrogen-oxygen gas generated from this kind of electrolytic device is normally limited by the shape and structure of the electrolytic tank.

SUMMARY OF THE INVENTION

The invention is defined in the independent claims. Some optional features of the invention are defined in the dependent claims.

In one arrangement, there is provided an electrolytic device which includes an electrolytic tank and a plurality of electrodes. The electrolytic tank comprises a case. The case is used for accommodating liquid water. An inner wall of the case has a plurality of engagement structures. A plurality of electrodes are set in the engagement structures respectively to be arranged at intervals in the case. The case is

connected to the plurality of electrodes by injection molding.

The electrolytic tank can selectively comprise an upper plate, configured on each top of the electrodes, and the upper plate comprises a plurality of protrusions, configured in a gap between the two corresponding electrodes, wherein the upper plate is made of insulated material.

The upper plate can selectively comprise a plurality of holes, corresponded to the gap between the two electrodes. The insulated material can selectively be rubber.

The electrolytic tank can selectively comprise a lower plate, configured on each bottom of the electrodes, and the lower plate is made of insulated material.

An interval between the bottom of the case and the electrodes is equal to or greater than 1cm.

The interval between the bottom of the case and the electrodes can selectively be between 3cm to 4cm.

The electrolytic tank can selectively comprise a plurality of upper holes, and an electrode channel is formed between the two adjacent electrodes, wherein the electrode channel is corresponded to at least one of the upper holes respectively, and the electrode channel is connected to the outside through corresponding upper holes respectively.

The electrolytic tank can selectively comprise a plurality of lower holes, and an electrode channel is formed between the two adjacent electrodes, wherein the electrode channel is corresponded to at least one of the lower holes respectively, and the electrode channel is connected to the outside through the corresponding lower holes respectively.

The plurality of electrodes can selectively comprise a negative pole, a positive

pole, and a plurality of bipolar electrodes. The plurality of bipolar electrodes are configured between the negative pole and the positive pole at intervals.

The voltage difference of a set of electrolytic electrodes constituted by the two adjacent bipolar electrodes is between 1.5V to 3V.

The negative pole and the positive pole have a rough surface respectively.

The negative pole and the positive pole can comprise a gold-plated bulge respectively, and the negative pole and the positive pole are connected to a power source through the bulge respectively.

The distance between the two adjacent electrodes can selectively be between 2mm to 4mm.

The distance between the two adjacent electrodes can selectively be 3mm.

In conclusion, there is disclosed an electrolytic device. The disclosed electrolytic device can reduce power consumption and the volume of the case through setting the plurality of electrodes in the engagement structures respectively to be arranged at intervals in the case, and the distance between the two adjacent electrodes is between 2mm to 4mm. The interval between the bottom of the case and the electrodes may be equal to or greater than 1cm to avoid the electrodes point discharging within the electrolytic tank. The case can be combined closely with the plurality of electrodes to reduce the volume of the case through configuring the plurality of electrodes in the mold and then forming the case by injection molding.

BRIEF DESCRIPTION OF THE APPENDED DRAWINGS

Some of the embodiments will be described in detail, with reference to the following figures, wherein like designations denote like members, wherein:

FIG. 1A and FIG. 1B show a schematic diagram of the electrolytic device in an embodiment with different visual angles of the present invention.

FIG. 2A and FIG. 2B show a top view diagram and a cross-section diagram

crossing along to the A-A line in the top view diagram of the electrolytic device in the embodiment in FIG. 1A of the present invention.

FIG. 3A and FIG. 3B show a schematic diagram of the case with engagement structures of the electrolytic device in an embodiment with different visual angles of

present invention, the plurality of electrodes **6** can be set between the two grooves at the both sides of the inner wall of the case respectively by being arranged at intervals in the case to form a plurality of electrode channels **S1**. The distance between the two grooves is between 2mm to 4mm; namely, the interval between the two adjacent electrodes is between 2mm to 4mm. In a better embodiment of the present invention, the distance between the two grooves is 3mm; namely, the interval between the two adjacent electrodes is 3mm.

Please refer to FIG. 3A, FIG. 3B, FIG. 5A and FIG. 5B. FIG. 5A and FIG. 5B show a schematic diagram of the electrolytic tank with the upper plate **24** of the electrolytic device in an embodiment with different visual angles of the present invention. As FIG. 3A and FIG. 3B show, in an embodiment of the present invention, the top of the case **20** comprises an opening, and the electrode channels can be connected to the outside through the opening. Please refer to FIG. 5A and FIG. 5B in an embodiment of the present invention, the electrolytic tank further comprises an upper plate **24**. The upper plate can be configured on the top of the electrolytic tank above the each upper surface **F1** of the electrodes to close the opening. In an embodiment of the present invention, the upper plate comprises a plurality of protrusions, and the plurality of protrusions can be formed on the surface of the upper plate relatively to the electrode channels. When the upper plate is configured above the each upper surface **F1** of the electrodes, the protrusions can be configured between the gap of the two electrodes to isolate the two adjacent electrodes. In an embodiment of the present invention, the gap between the two electrodes is the electrode channels **S1**. The upper plate can be, but not limited to, a rubber mat; in application, the upper plate can be anything that is made of insulated material. The upper plate **24** further comprises a plurality of upper holes **240** corresponded to the gap between the two electrodes. In an embodiment of the present invention, the gap between the two electrodes is the electrode channels **S1**. But the exterior and the number of the upper holes **240** is not limited to FIG. 5A and FIG. 5B. The electrode channels **S1** are corresponded to at least one of the upper holes **240**, and the electrode channels **S1** are connected to the corresponding upper holes **240** independently. The

upper holes **240** of the upper plate **24** are connected to the outside, so each electrode channel **S1** can be connected to the outside independently. Therefore, the upper holes can output the hydrogen-oxygen gas generated by electrolyzing the liquid water from the case, but not limited to this. The upper holes **240** can even allow the liquid water from the outside to get inside the case and then flow into the electrode channels **S1**. Besides, the upper holes **240** can be penetrated by the negative pole and the positive pole, so that the negative pole and the positive pole can be connected to the power source (not shown in the figure).

In an embodiment of the present invention, the bottom of the case **20** comprises an opening (not shown in FIG. 3A and FIG. 3B, and the exterior is the same as the opening on the top in FIG. 3A and FIG. 3B), and the electrode channels can be connected to the outside through the opening. In an embodiment of the present invention, the electrolytic tank further comprises a lower plate (not shown in FIG. 5A and FIG. 5B, and the exterior and the setting way are the same as the upper plate in FIG. 5A and FIG. 5B). The lower plate can be configured on the bottom of the electrolytic tank below the each lower surface of the electrodes (relative to the lower surface of the electrodes) to close the opening. In an embodiment of the present invention, the lower plate comprises a plurality of protrusions, and the plurality of protrusions can be formed on the surface of the lower plate relatively to the electrode channels. When the lower plate is configured below the each lower surface of the electrodes, the protrusions can be configured between the gap of the two electrodes to isolate the two adjacent electrodes. In an embodiment of the present invention, the gap between the two electrodes is the electrode channels **S1**. The lower plate can be, but not limited to, a rubber mat; in application, the lower plate can be anything that is made of insulated material. The lower plate further comprises a plurality of lower holes corresponded to the gap between the two electrodes. In an embodiment of the present invention, the gap between the two electrodes is the electrode channels **S1**. The electrode channels **S1** are corresponded to at least one of the lower holes, and the electrode channels S1 are connected to the corresponding lower holes independently. The lower holes of the lower plate are connected to the outside, so

output voltage difference of the power source is between 17V to 27V, and the output electric current of the power source is between 30A to 40A; namely, the electrolytic device generates air output between 1.5L to 4.0L per minute. The voltage difference of a set of electrolytic electrodes (between the cathode and the anode) in use is between 1.5V to 3V; for example, the voltage difference of eight sets of electrolytic electrodes in use is between 12V to 24V. But it is not limited to the above mentioned description. In application, when the electrolytic device is connected to the outside power source, the output voltage difference of the power source is between 5V to 27V, and the output electric current of the power source is between 2A to 150A; namely, the power of the power source is between 10W (5V*2A) and 3600W (24V*150A), and the electrolytic device generates air output between 0.01L and 12L per minute.

In conclusion, an electrolytic device is provided. The electrolytic device of the present invention can reduce power consumption and reduce the volume of the case and increase overall efficiency through setting the plurality of electrodes in the engagement structures respectively to be arranged at intervals in the case, and the distance between the two adjacent electrodes may be between 2mm to 4mm. The interval between the bottom of the case and the electrodes may be equal to or greater than 1cm to avoid the electrodes point discharging within the electrolytic tank.

The case combined closely with the plurality of electrodes through configuring the plurality of electrodes in the mold and then forming the case by injection molding can solve the problem of time-consuming and labour-consuming due to inserting the electrodes piece by piece into the accommodating space of the case. Therefore, the assembly and production of the electrolytic device are more convenient, the low-cost mass production is easier, and the even electrode interval is provided so that the electrode arrangement is easier to be in the precise position.

With the examples and explanations mentioned above, the features and spirits of the invention are hopefully well described. More importantly, the present

What is claimed is:

1. An electrolytic device comprising:

an electrolytic tank comprising a case for accommodating water and an inner wall of the case having a plurality of engagement structures; and

a plurality of electrodes coupled to the plurality of engagement structures and arranged separately;

wherein the plurality of electrodes are fixed to the case by injection molding.

2. The electrolytic device of claim 1, wherein the electrolytic tank further comprises an upper plate disposed on the plurality of electrodes, the upper plate is made of insulation material and comprises a plurality of protrusions disposed in a set of gaps formed within the plurality of electrodes, and the upper plate further comprises a plurality of holes penetrating through the upper plate.

3. The electrolytic device of claim 2, wherein the plurality of holes are corresponding to the set of gaps within the plurality of electrodes.

4. The electrolytic device of claim 1, wherein the electrolytic tank further comprises a lower plate made of insulation material and disposed below the plurality of electrodes, and an interval between the bottom of the case and the electrodes is equal to or greater than 1cm.

5. The electrolytic device of claim 1, wherein the electrolytic tank further comprises a cover with a plurality of upper holes, and an electrode channel is formed between the two adjacent electrodes such that a set of electrode channels are formed within the plurality of electrodes, and the set of electrode channels are corresponding to the plurality of upper holes.

6. The electrolytic device of claim 5, wherein the electrolytic tank further comprises an upper plate made of insulation material and disposed between the cover and the plurality of electrodes, the upper plate comprises a plurality of protrusions disposed in the set of electrode channels, and the upper plate comprises a plurality of holes corresponding to the set of electrode channels.

7. The electrolytic device of claim 1, wherein the plurality of electrodes comprise a negative pole, a positive pole, and a plurality of bipolar electrodes configured between the negative pole and the positive pole, and the negative pole and the positive pole have a rough surface respectively, the negative pole and the positive pole comprise a gold-plated bulge respectively, and the negative pole and the positive pole are connected to a power source through the bulge respectively.

8. The electrolytic device of claim 7, wherein the voltage difference of a set of electrolytic electrodes constituted by the two adjacent bipolar electrodes is between 1.5V to 3V, and the distance between the two adjacent electrodes is between 2mm to 4mm.

9. An electrolytic device comprising:

a water tank comprising a hollow space for accommodating water;

an electrolytic tank with a casing disposed in the hollow space of the water tank, the case of the electrolytic tank is configured for accommodating the water and an inner wall of the case having a plurality of engagement structures; and

a plurality of electrodes coupled to the plurality of engagement structures and arranged separately;

wherein the plurality of electrodes are fixed to the case by injection molding.

10. The electrolytic device of claim 9, a bottom of the electrolytic tank comprising a plurality of lower holes fluidly coupled to the hollow space of the water tank.

11. The electrolytic device of claim 10, an electrode channel is formed between the two adjacent electrodes such that a set of electrode channels are formed within the plurality of electrodes, and the set of electrode channels are fluidly coupled the plurality of lower holes.

12. The electrolytic device of claim 9, wherein the electrolytic tank further comprises an upper plate disposed on the plurality of electrodes, the upper plate is made of insulation material and comprises a plurality of protrusions disposed in a set of gaps formed within the plurality of electrodes.

13. The electrolytic device of claim 12, wherein the upper plate further comprises a plurality of holes penetrating through the upper plate, and the plurality of holes are corresponding to the set of gaps within the plurality of electrodes.

14. The electrolytic device of claim 13, wherein the electrolytic tank further comprises a cover above the upper plate, and the cover comprises a plurality of upper holes corresponding to the plurality of holes of the upper plate.

15. The electrolytic device of claim 14, wherein the electrolytic tank further comprises a separator extended from a side surface of the case, the separator splits the hollow space of the water tank into an upper part and a lower part, and the upper part of the hollow space of the water tank is fluidly coupled to the upper holes of the cover.