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(71) Applicants:
• **Foshan Shunde Midea Electrical Heating Appliances Manufacturing Co. Ltd.**
Foshan, Guangdong 528311 (CN)
• **Midea Group Co., Ltd.**
Foshan, Guangdong 528311 (CN)

(72) Inventors:
• **HUANG, Yuxiong**
Foshan
Guangdong 528311 (CN)
• **LAI, Jian**
Foshan
Guangdong 528311 (CN)

(74) Representative: **Lam, Alvin et al**
Maucher Jenkins
26 Caxton Street
London SW1H 0RJ (GB)

(54) **METHOD AND DEVICE FOR PREVENTING ELECTROCHEMICAL CORROSION OF CLOTHES CARE MACHINE HEATER, STEAM GENERATOR, AND CLOTHES CARE MACHINE**

(57) A method for preventing electrochemical corrosion of a clothes care machine heater (1). A clothes care machine comprises a steam generator (50) and an output power supply (21). The steam generator (50) is used for generating steam. The output power supply (21) is used for providing a protection current to the steam generator (50). The steam generator (50) comprises a heater (1). The method comprises: installing an electric conductor (22) on the steam generator (50), the electric conductor (22) being in electrical insulation with the heater (1), electrically connecting the heater (1) to a cathode of the output power supply (21), electrically connecting an anode of the output power supply (21) to the electric conductor (22), so that the electric conductor (22) contacts with water in the steam generator (50), to form a current loop, and compensating for electrons lost in the heater (1), to prevent the heater (1) from being corroded due to an electron loss. Further disclosed are a device (10) for preventing electrochemical corrosion of a heater (1), a steam generator (50) comprising the device (10) for preventing electrochemical corrosion of a heater (1), and a clothes care machine comprising the steam generator (50).

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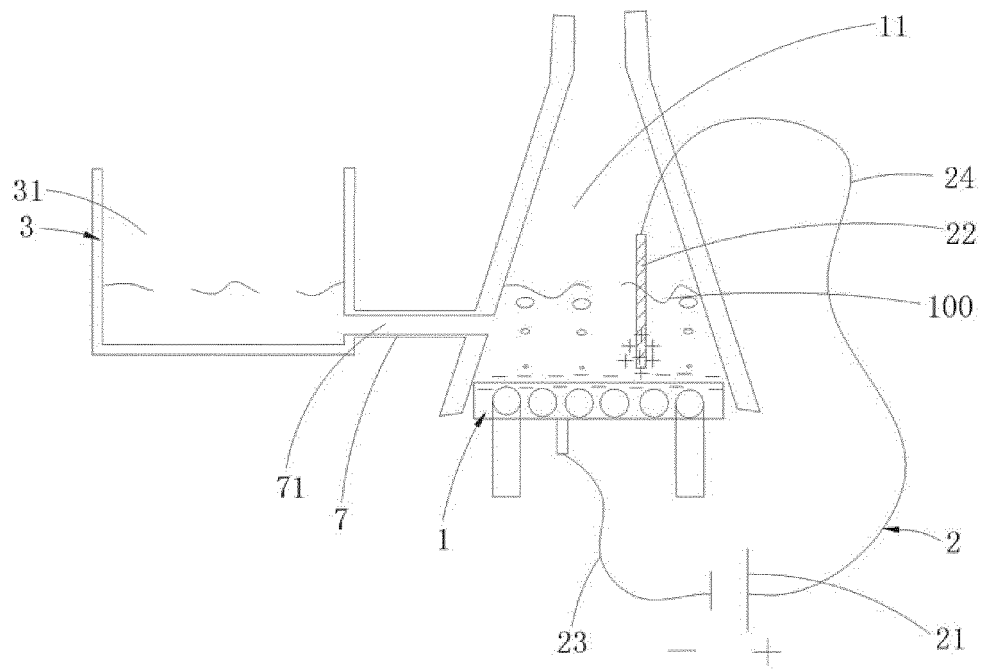


Fig. 1

Description**FIELD**

[0001] The present disclosure relates to the field of household appliances, and more particularly to a method for preventing electrochemical corrosion of a heater for a clothes care machine, a device for preventing electrochemical corrosion of a heater for a clothes care machine, a steam generator and a clothes care machine.

BACKGROUND

[0002] Currently, working principle of a steam generator of a clothes care product is to convert electricity to heat of steam by evaporating water with a metal heater.

[0003] Materials used for the heater for the clothes care product mainly include active metals such as aluminum, iron and copper. No precautions are taken for preventing electrochemical corrosion. The heater stays in a humid environment for a long term during working and suspension, leaving an aqueous membrane attached on the surface of the metal. A plurality of tiny primary cells is formed by the metal of the heater surface and the impurities therein, which results in electrochemical corrosion. Such metal heater may generate large amount of rust deposit within a short term due to electrochemical corrosion, which has a significant impact on the lifetime and usage of the product. The rust deposit mainly includes: hydroxides from aluminum corrosion, rust from iron corrosion and basic copper carbonate from copper corrosion. The principle of rust deposit generation is shown as follows:

(1) The electrochemical corrosion of the heater made of aluminum occurs following chemical equations shown as follows:

negative terminal (Al): $\text{Al}-3\text{e}^{-}=\text{Al}^{3+}$

positive terminal (impurities): $2\text{H}^{+}+2\text{e}^{-}=\text{H}_2\uparrow$

total reaction : $2\text{Al}+6\text{H}_2\text{O}=2\text{Al}(\text{OH})_3+3\text{H}_2\uparrow$

where $\text{Al}(\text{OH})_3$ is white flocculent precipitate.

(2) The electrochemical corrosion of the heater made of iron occurs following chemical equations shown as follows:

i) Hydrogen evolution corrosion (when the aqueous membrane attached on iron has strong acidity):

negative terminal (Fe): $\text{Fe}-2\text{e}^{-}=\text{Fe}^{2+}$

$\text{Fe}^{2+}+2\text{H}_2\text{O}=\text{Fe}(\text{OH})_2+2\text{H}^{+}$

positive terminal (impurities): $2\text{H}^{+}+2\text{e}^{-}=\text{H}_2\uparrow$

cell reaction: $\text{Fe}+2\text{H}_2\text{O}=\text{Fe}(\text{OH})_2+\text{H}_2\uparrow$

It is described as hydrogen evolution corrosion due to hydrogen generation.

ii) Oxygen absorption corrosion (when the aqueous membrane attached on iron has weak acidity):

negative terminal (Fe): $\text{Fe}-2\text{e}^{-}=\text{Fe}^{2+}$

positive terminal: $\text{O}_2+2\text{H}_2\text{O}+4\text{e}^{-}=4\text{OH}^{-}$

total reaction: $2\text{Fe}+\text{O}_2+2\text{H}_2\text{O}=2\text{Fe}(\text{OH})_2$

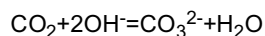
It is described as oxygen absorption corrosion due to oxygen absorption.

$\text{Fe}(\text{OH})_2$ generated by hydrogen evolution corrosion and oxygen absorption corrosion is oxidized by oxygen to $\text{Fe}(\text{OH})_3$, then $\text{Fe}(\text{OH})_3$ is subjected to dehydration, forming a Fe_2O_3 rust. The chemical equation is $4\text{Fe}(\text{OH})_2+\text{O}_2+2\text{H}_2\text{O}=4\text{Fe}(\text{OH})_3$. The predominant electrochemical corrosion of the heater made of iron is oxygen absorption corrosion.

(3) The electrochemical corrosion of the heater made of copper occurs following chemical equations shown as follows:

$2\text{Cu}-4\text{e}^{-}=2\text{Cu}^{2+}$

$2\text{H}_2\text{O}+\text{O}_2+4\text{e}^{-}=4\text{OH}^{-}$



total reaction: $2\text{Cu} + 2\text{H}_2\text{O} + \text{O}_2 + \text{CO}_2 = \text{Cu}_2(\text{OH})_2\text{CO}_3$ (basic copper carbonate, i.e. verdigris).

[0004] Following methods are currently used in the field of household appliances for preventing generation of incrustation:

(1) Ion Exchange

[0005] There are two categories of ion exchange resins: one of which is known as sodium ion exchange resin which reduces the hardness of water to obtain soft water used for cleaning, shower and so forth; another one of which is known as hydrogen ion exchange resin which reduces the hardness to a certain extent so that no incrustation is formed during boiling the water.

(2) Physical Filtration

[0006] The physical filtration is such a membrane separation process that it is driven by a pressure higher than osmotic pressure and allows water rather than a solute to pass through the selectively permeable membrane by taking advantage of selective permeability of the selectively permeable membrane, so that fresh water is extracted from an aqueous system. The reverse osmosis process is also known as a counter osmosis process.

(3) Chemical Treatment

[0007] Chemicals preventing generation of incrustation or inhibiting precipitation and further development of incrustation are used, for example Power-Phos, water softening agent (sodium hydroxide, trisodium phosphate and sodium humate) and so forth.

[0008] No protective measure is currently taken to prevent the electrochemical corrosion of the metal heater in the humid environment. The above methods for preventing generation of incrustation cannot be used to avoid electrochemical corrosion of the heater. In early usage stage of such a metal heater, the rust deposit generated from electrochemical corrosion is more serious than the incrustation generated after water evaporation. Besides, the lifetime of the heater is severely influenced by the serious corrosion.

[0009] Therefore, a method for preventing electrochemical corrosion of a metal heater is required. With this method, the electrochemical corrosion of the metal heater may be efficiently prevented or inhibited, so that the lifetime of the heater is extended.

SUMMARY

[0010] Embodiments of the present disclosure seek to solve at least one of the problems existing in the related art to at least some extent.

[0011] Therefore, embodiments of a first aspect of the present disclosure provide a method for preventing electrochemical corrosion of a heater for a clothes care machine, which solves the technical problems of lifetime reduction and properties deterioration in current metal heaters for the clothes care machine caused by electrochemical corrosion.

[0012] Embodiments of a second aspect of the present disclosure provide a device for preventing electrochemical corrosion of a heater for a clothes care machine.

[0013] Embodiments of a third aspect of the present disclosure provide a steam generator and a clothes care machine each having a device for preventing electrochemical corrosion of a heater for a clothes care machine.

[0014] In an embodiment of the present disclosure, a method for preventing electrochemical corrosion of a heater for a clothes care machine is provided. The clothes care machine includes a steam generator for generating steam and an output power supply for providing a protection current to the steam generator. The steam generator includes the heater. The method includes: installing an electric conductor in the steam generator, where the electric conductor is electrically insulated from the heater, forming a current loop by electrically connecting the heater to a negative terminal of the output power supply, electrically connecting a positive terminal of the output power supply to the electric conductor, and contacting the electric conductor with water in the steam generator, so as to compensate for electrons lost in the heater, and to prevent the heater from being corroded due to an electron loss.

[0015] In the method for preventing electrochemical corrosion of the heater according to an embodiment of the present disclosure, a current loop including the output power supply, the electric conductor, water and the heater is formed by installing the electric conductor in the steam generator of the clothes care machine, the electric conductor being electrically

insulated from the heater, electrically connecting the heater to the negative terminal of the output power supply, electrically connecting the positive terminal of the output power supply to the electric conductor, and contacting the electric conductor with water in the steam generator. Namely, an impressed current is applied on a surface of the heater so that the heater acts as a cathode. Therefore, an electron migration of the metal caused by electrochemical corrosion is efficiently restrained, the electrochemical corrosion of the heater is avoided or restrained, and the lifetime of the heater is thus extended.

[0016] In an embodiment of present disclosure, the steam generator further includes a shell fitted over the heater and a water tank communicated with the shell to form a water supply loop. The method further includes: installing the electric conductor in the heater, at the shell or at the water tank, the electric conductor being electrically insulated from the heater; and forming the current loop by contacting the electric conductor with the water supply loop of the steam generator to compensate for electrons lost in the heater, so as to prevent the heater from being corroded due to the electron loss.

[0017] In the method for preventing electrochemical corrosion of the heater according to an embodiment of the present disclosure, the shell and the water tank are communicated to form the water supply loop. Therefore, the electric conductor can be contacted with the water in the steam generator whether the electric conductor is installed in the heater, at the shell or at the water tank, and thus a current loop including the output power supply, the electric conductor, water and the heater is formed. Namely, an impressed current is applied on the surface of the heater so that the heater acts as the cathode. The electric conductor is ensured to be electrically insulated from the heater. Therefore, the electron migration of the metal caused by electrochemical corrosion is efficiently restrained, the electrochemical corrosion of the heater is avoided or restrained, and the lifetime of the heater is thus extended.

[0018] In the method for preventing electrochemical corrosion of the heater according to an embodiment of the present disclosure, the electric conductor may be arranged in the heater, at the shell or at the water tank by a plurality of ways including but not limited to vertical arrangement, horizontal arrangement or lateral inclined arrangement.

[0019] In an embodiment of the present disclosure, the heater is a metal heater. The metal is selected from a group including aluminum, iron and copper. The electric conductor is an inert electric conductor which is made of a material selected from a group including graphite, platinum, gold, silver or a material plated with platinum, gold or silver.

[0020] In the method for preventing electrochemical corrosion of the heater according to an embodiment of present disclosure, the heater is a metal heater, preferably a heater made of an active metal. The metal includes but not be limited to aluminum, iron and copper. The electric conductor is an inert electric conductor which is made of the material including but not limited to graphite, platinum, gold, silver or a material plated with platinum, gold or silver.

[0021] In an embodiment of the present disclosure, a cathode protecting apparatus is disposed in the clothes care machine. A negative terminal of the cathode protecting apparatus is electrically connected to the metal heater which is used for heating a liquid medium, and a positive terminal of the cathode protecting apparatus is electrically connected to the liquid medium, such that the current loop is formed by connecting the cathode protecting apparatus, the metal heater and the liquid medium, and an electron migration of the metal heater is restrained. Optionally, the cathode protecting apparatus is configured to directly emit electrons to the metal heater of the clothes care machine such that the electron migration of the metal heater is restrained.

[0022] In an embodiment of the present disclosure, the cathode protecting apparatus includes the output power supply, the electric conductor, a first connecting wire and a second connecting wire. The output power supply has the positive terminal and the negative terminal in constant electrical polarity. The negative terminal of the output power supply is electrically connected with a first end of the first connecting wire, and the metal heater is electrically connected with a second end of the first connecting wire. The positive terminal of the output power supply is electrically connected with a first end of the second connecting wire, and the electric conductor is electrically connected with a second end of the second connecting wire. The electric conductor is contacted with the liquid medium.

[0023] In an embodiment of the present disclosure, the output power supply is a DC power supply, or a combination of an AC power supply, a transformer and a rectifier.

[0024] In an embodiment of the present disclosure, the electric conductor is disposed in the metal heater through a top, a bottom or a side of the metal heater, and the electric conductor is contacted with the liquid medium in the metal heater.

[0025] In an embodiment of the present disclosure, a water tank is disposed and connected with the metal heater by a duct. The electric conductor is penetrated through the metal heater and contacted with the liquid medium in the metal heater; optionally, the electric conductor is penetrated through the water tank and contacted with the liquid medium in the water tank; optionally, the electric conductor is penetrated through the duct and contacted with the liquid medium in the duct.

[0026] In an embodiment of the present disclosure, the electric conductor is disposed in the water tank through a top, a bottom or a side of the water tank. The electric conductor is contacted with the liquid medium in the water tank.

[0027] In an embodiment of the present disclosure, the electric conductor is made of an inert metal or graphite, or the electric conductor is a conductive component with its surface coated with the inert metal. The metal heater is made of aluminum, iron or copper.

[0028] In an embodiment of the present disclosure, a cathode protecting apparatus is disposed on the clothes care

machine. A negative terminal of the cathode protecting apparatus is electrically connected to the metal heater which is used for heating a liquid medium, and a positive terminal of the cathode protecting apparatus is electrically connected to the liquid medium in the metal heater, such that the current loop is formed by connecting the cathode protecting apparatus, the metal heater and the liquid medium. Therefore, the electron migration of the metal heater is restrained.

[0029] In an embodiment of the present disclosure, a cathode protecting apparatus is disposed on the clothes care machine. A channel for the flowing of the liquid medium is disposed between a water tank of the clothes care machine and a metal heater used for heating a liquid medium. A negative terminal of the cathode protecting apparatus is electrically connected to the metal heater, and a positive terminal of the cathode protecting apparatus is electrically connected to the liquid medium in the water tank or in the channel, such that the current loop is formed by connecting the cathode protecting apparatus, the metal heater and the liquid medium, and the electron migration of the metal heater is restrained.

[0030] In an embodiment of the present disclosure, the cathode protecting apparatus includes the output power supply, the electric conductor, a first connecting wire and a second connecting wire. The output power supply has the positive terminal and the negative terminal in constant electrical polarity. The negative terminal of the output power supply is electrically connected with a first end of the first connecting wire, and the metal heater is electrically connected with a second end of the first connecting wire. The positive terminal of the output power supply is electrically connected with a first end the second connecting wire, and the electric conductor is electrically connected with a second end of the second connecting wire. The electric conductor is contacted with the liquid medium in the metal heater.

[0031] In an embodiment of the present disclosure, the output power supply is a DC power supply, or a combination of an AC power supply, a transformer and a rectifier.

[0032] In an embodiment of the present disclosure, a main body is disposed. The output power supply is a battery, the metal heater is arranged in the main body, a battery groove is formed in the main body, and the battery is arranged in the battery groove. Optionally, a main body and a control circuit board are disposed, the output power supply is a battery, the metal heater and the control circuit board are arranged in the main body, a battery groove is formed in the main body or the control circuit board, and the battery is arranged in the battery groove.

[0033] In an embodiment of the present disclosure, the main body includes a base and a shell. The shell covers and is fixed on the base to define an accommodating chamber. The metal heater is arranged in the accommodating chamber, and the battery groove is formed in the base or the shell.

[0034] In an embodiment of the present disclosure, a first conducting plate is disposed on the negative terminal and a second conducting plate is disposed on the positive terminal. The first end of the first connecting wire is connected with the first conducting plate, and the first end of the second connecting wire is connected with the second conducting plate.

[0035] In an embodiment of the present disclosure, the electric conductor is made of an inert metal or graphite, or the electric conductor is a conductive component with its surface coated with the inert metal.

[0036] In an embodiment of the present disclosure, a device for preventing electrochemical corrosion of a heater for a clothes care machine is provided. The clothes care machine includes a steam generator for generating steam and an output power supply for providing a protection current to the steam generator. The steam generator includes the heater. The device includes: an electric conductor installed in the steam generator and electrically insulated from the heater; a first connecting wire electrically connected with the heater; a second connecting wire electrically connected with the electric conductor; a first conducting plate by which a negative terminal of the output power supply is connected with the first connecting wire; and a second conducting plate by which a positive terminal of the output power supply is connected with the second connecting wire. The electric conductor contacts with water in the steam generator to form a current loop, so as to compensate for electrons lost in the heater and to prevent the heater from being corroded due to an electron loss.

[0037] In the device for preventing electrochemical corrosion of the heater according to an embodiment of the present disclosure, the current loop including the output power supply, the conducting plates, the electric conductor, water and the heater is formed by installing the electric conductor in the steam generator, the electric conductor being electrically insulated from the heater, electrically connecting the heater to the negative terminal of the output power supply, electrically connecting the positive terminal of the output power supply to the electric conductor, and contacting the electric conductor with water in the steam generator. Namely, an impressed current is applied on the surface of the heater so that the heater acts as a cathode. Therefore, the electron migration of the metal caused by electrochemical corrosion is efficiently restrained, the electrochemical corrosion of the heater is avoided or restrained, and the lifetime of the heater is thus extended.

[0038] In an embodiment of the present disclosure, the steam generator further includes a shell fitted over the heater and a water tank communicated with the shell to form a water supply loop. The electric conductor is arranged in the heater, at the shell or at the water tank.

[0039] In an embodiment of the present disclosure, the electric conductor is installed in the heater, the shell, the water tank, or the water supply loop by means of screwing or interference fitting, in a vertical direction, in a horizontal direction or in a lateral inclined direction.

[0040] In an embodiment of the present disclosure, the steam generator further includes a base defining an installing groove therein for placing the output power supply. The device further includes a battery cover threaded for screwing the battery cover into the base and covering the installing groove.

[0041] In an embodiment of the present disclosure, the second connecting wire is fixed on the heater by screw to electrically connect to the heater. The heater is a metal heater, where the metal is selected from a group including aluminum, iron and copper. The electric conductor is an inert electric conductor made of a material selected from a group including graphite, platinum, gold, silver or a material plated with platinum, gold or silver.

[0042] In the device for preventing electrochemical corrosion of the heater for the clothes care machine according to an embodiment of the present disclosure, the shell and the water tank are communicated to form the water supply loop. Therefore, the electric conductor can be contacted with the water in the steam generator whether the electric conductor is installed in the heater, at the shell or at the water tank, and thus a current loop including the output power supply, the conducting plates, the electric conductor, water and the heater is formed. Namely, an impressed current is applied on the surface of the heater so that the heater acts as a cathode. The electric conductor is ensured to be electrically insulated from the heater. Therefore, the electron migration of the metal caused by electrochemical corrosion is efficiently restrained, the electrochemical corrosion of the heater is avoided or restrained, and the lifetime of the heater is thus extended.

[0043] Certainly, the electric conductor may be installed in the heater, the shell, or the water tank such as on the base of the water tank, in the vertical direction, in the horizontal direction or in the lateral inclined direction, by means of screwing or interference fitting, as long as the electrical connection is efficiently ensured and the electric conductor is contacted with the water in the steam generator.

[0044] In the device for preventing electrochemical corrosion of the heater according to an embodiment of the present disclosure, the steam generator further includes the base defining an installing groove therein for placing the output power supply. The device further includes a battery cover threaded for screwing the battery cover into the base and covering the installing groove. Therefore, the output power supply is fixed on the device for preventing electrochemical corrosion of the heater, thereby preventing the output power supply from being detached from the device, protecting the output power supply, and facilitating the replacement of the output power supply.

[0045] In the device for preventing electrochemical corrosion of the heater according to an embodiment of the present disclosure, the installing groove is defined in the shell, thereby facilitating the electrical connection of the output power supply with the heater and the electric conductor, and saving wires.

[0046] Certainly, the installing groove may be arranged in other places such as the control circuit board of the steam generator, depending on actual requirements.

[0047] In the device for preventing electrochemical corrosion of the heater according to an embodiment of the present disclosure, a way for fixing the wire on the heater includes but is not limited to screw fixation; the heater is a metal heater, preferably a heater made of active metal including but not limited to aluminum, iron or copper; and the electric conductor is an inert electric conductor made of a material including but not limited to graphite, platinum, gold, silver or a material plated with platinum, gold or silver.

[0048] In an embodiment of the present disclosure, a steam generator is provided. The steam generator includes a device for preventing electrochemical corrosion of the heater as described in the above embodiments.

[0049] The steam generator according to an embodiment of the present disclosure includes the device for preventing electrochemical corrosion of the heater. With the device, a current loop including the output power supply, the conducting plates, the electric conductor, water and the heater is formed by installing the electric conductor in the steam generator, the electric conductor being electrically insulated from the heater, electrically connecting the heater to the negative terminal of the output power supply, electrically connecting the positive terminal of the output power supply to the electric conductor, and contacting the electric conductor with water in the steam generator. Namely, an impressed current is applied on the surface of the heater so that the heater acts as a cathode. Therefore, the electron migration of the metal caused by electrochemical corrosion is efficiently restrained, the electrochemical corrosion of the heater is avoided or restrained, and the lifetime of the heater is thus extended.

[0050] In an embodiment of the present disclosure, a clothes care machine is provided. The clothes care machine includes a steam generator as described in above embodiments.

[0051] In the clothes care machine according to an embodiment of the present disclosure, a current loop including the output power supply, the conducting plates, the electric conductor, water and the heater is formed by installing the electric conductor on the steam generator, the electric conductor being electrically insulated from the heater, electrically connecting the heater to the negative terminal of the output power supply, electrically connecting the positive terminal of the output power supply to the electric conductor, and contacting the electric conductor with water in the steam generator. Namely, an impressed current is applied on the surface of the heater so that the heater acts as a cathode. Therefore, the electron migration of the metal caused by electrochemical corrosion is efficiently restrained, the electrochemical corrosion of the heater is avoided or restrained, and the lifetime of the heater is thus extended.

[0052] According to embodiments of the present disclosure, the electron migration of the metal caused by electrochemical corrosion is efficiently restrained, the electrochemical corrosion of the heater is avoided or restrained, and the

lifetime of the heater is thus extended.

[0053] In an embodiment of the present disclosure, a clothes care machine is provided. The clothes care machine includes a metal heater for heating a liquid medium and a cathode protecting apparatus having a positive terminal and a negative terminal. The cathode protecting apparatus, the metal heater and the liquid medium are connected to form a current loop by electrically connecting the negative terminal of the cathode protecting apparatus to the metal heater and electrically connecting the positive terminal of the cathode protecting apparatus to the liquid medium; optionally, the cathode protecting apparatus is an electron emitter configured to emit electrons to the metal heater.

[0054] In an embodiment of the present disclosure, the cathode protecting apparatus includes: an output power supply having a positive terminal and a negative terminal in constant electrical polarity, an electric conductor contacting with the liquid medium, a first connecting wire electrically connected between the metal heater and the negative terminal of the output power supply, and a second connecting wire electrically connected between the electric conductor and the positive terminal of the output power supply.

[0055] In an embodiment of the present disclosure, the output power supply is a DC power supply, or a combination of an AC power supply, a transformer and a rectifier.

[0056] In an embodiment of the present disclosure, the electric conductor is disposed in the metal heater through a top or a bottom or a side of the metal heater. The electric conductor is contacted with the liquid medium in the metal heater.

[0057] In an embodiment of the present disclosure, the clothes care machine further includes a water tank and a duct connected between the water tank and the metal heater. The electric conductor is penetrated through the metal heater and contacted with the liquid medium in the metal heater; or the electric conductor is penetrated through the water tank and contacted with the liquid medium in the water tank; or the electric conductor is penetrated through the duct and contacted with the liquid medium in the duct.

[0058] In an embodiment of the present disclosure, the clothes care machine further includes a main body. The output power supply is a battery, the metal heater is arranged in the main body, a battery groove is formed in the main body, and the battery is arranged in the battery groove. Optionally, the clothes care machine further includes a main body and a control circuit board. The output power supply is a battery, the metal heater and the control circuit board are arranged in the main body, a battery groove is formed in the main body or the control circuit board, and the battery is arranged in the battery groove.

[0059] In an embodiment of the present disclosure, the main body includes a base and a shell. The shell covers and is fixed on the base to define an accommodating chamber. The metal heater is arranged in the accommodating chamber. The battery groove is formed in the base or the shell.

[0060] In an embodiment of the present disclosure, the clothes care machine further includes a main body. The metal heater is arranged in the main body. The water tank is arranged outside of the main body. The conductor is penetrated through the main body or the water tank and extended to contact the liquid medium in the water tank or in the duct. A water outlet is formed in a bottom of the water tank and a control valve having a valve core is disposed at the water outlet. The conductor is penetrated through the main body and extended below the control valve to the valve core. The electric conductor is contacted with the liquid medium in the duct.

[0061] In an embodiment of the present disclosure, the clothes care machine further includes a first conducting plate and a second conducting plate. A first end of the first connecting wire is connected with the negative terminal by the first conducting plate, and a first end of the second connecting wire is connected with the positive terminal by the second conducting plate.

[0062] In an embodiment of the present disclosure, the electric conductor is made of an inert metal or graphite, or the electric conductor is a conductive component with its surface coated with the inert metal. The metal heater is made of aluminum, iron or copper.

[0063] Additional aspects and advantages of embodiments of present disclosure will be given in part in the following descriptions, become apparent in part from the following descriptions, or be learned from the practice of the embodiments of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0064]

Fig. 1 is a schematic view of a device for preventing electrochemical corrosion of a heater according to an embodiment of the present disclosure;

Fig. 2 is a cross-sectional view of a device for preventing electrochemical corrosion of a heater according to another embodiment of the present disclosure;

Fig. 3 is a cross-sectional view of a device for preventing electrochemical corrosion of a heater according to still another embodiment of the present disclosure;

Fig. 4 is a cross-sectional view of a device for preventing electrochemical corrosion of a heater according to yet

another embodiment of the present disclosure;

Fig. 5 is a block diagram of a steam generator according to an embodiment of the present disclosure;

Fig. 6 is a block diagram of a clothes care machine according to an embodiment of the present disclosure.

5 Reference Numerals:

[0065]

10 Liquid medium 100; Channel 200;
Heater 1; Heating chamber 11; Lower cover 101; Upper cover 102
Cathode protecting apparatus 2; Output power supply 21; Electric conductor 22; First connecting wire 23; Second
connecting wire 24; First conducting plate 25; Second conducting plate 26;
Water tank 3; Water storage chamber 31; Main body 4; Base 41; Shell 42;
Battery cover 5;
15 Valve seat 62; Valve core 61; Spring 63; Sealing rubber 64;
Duct 7; Hollow internal path 71;
Device for preventing electrochemical corrosion of a heater 10; Steam generator 50; clothes care machine 60.

DETAILED DESCRIPTION

20 [0066] Reference will be made in detail to embodiments of the present disclosure. The same or similar elements and the elements having same or similar functions are denoted by like reference numerals throughout the descriptions. The embodiments described herein with reference to drawings are explanatory, illustrative, and used to generally understand the present disclosure. The embodiments shall not be construed to limit the present disclosure.

25 [0067] It should be understood that, unless specified or limited otherwise, when one component is "mounted" or "fixed" on another component, the component may be on another component or an element between the two components may exist. When one component is "connected to/with" another component, the component may directly connected to/with the another component or an element between the two components may exist.

30 [0068] In the specification, unless specified or limited otherwise, relative terms such as "right", "left", "below", "above", "top", "bottom", "lower", "upper", as well as derivative thereof (e.g., "horizontally", "downwardly", "upwardly", etc.) should be construed to refer to relative orientation or be construed with reference to a normal working state of a product, and shall not be construed to limit the present disclosure.

35 [0069] In an embodiment of a first aspect of the present disclosure, a method for preventing electrochemical corrosion of a heater for a clothes care machine is provided. The clothes care machine includes a steam generator for generating steam and an output power supply for providing a protection current to the steam generator. The steam generator includes the heater. The method includes: installing an electric conductor in the steam generator, the electric conductor being electrically insulated from the heater, forming a current loop by electrically connecting the heater to a negative terminal of the output power supply, electrically connecting a positive terminal of the output power supply to the electric conductor, and contacting the electric conductor with water in the steam generator, so as to compensate for electrons
40 lost in the heater, and to prevent the heater from being corroded due to an electron loss.

[0070] In the method for preventing electrochemical corrosion of a heater according to an embodiment of the present disclosure, a current loop including the output power supply, the electric conductor, water and the heater is formed by installing the electric conductor in the steam generator, the electric conductor being electrically insulated from the heater, electrically connecting the heater to a negative terminal of the output power supply, electrically connecting a positive
45 terminal of the output power supply to the electric conductor, and contacting the electric conductor with water in the steam generator. Namely, an impressed current is applied on a surface of the heater so that the heater acts as a cathode. Therefore, an electron migration of the metal caused by electrochemical corrosion is efficiently restrained, the electrochemical corrosion of the heater is avoided or restrained, and the lifetime of the heater is thus extended.

[0071] In an embodiment of present disclosure, based on the above technical solution, preferably, the steam generator further includes a shell fitted over the heater and a water tank communicated with the shell to form a water supply loop. The method further includes: installing the electric conductor in the heater, at the shell or at the water tank, the electric conductor being electrically insulated from the heater, contacting the electric conductor with the water in the steam generator to form the current loop and compensate for electrons lost in the heater, thereby preventing the heater from being corroded due to an electron loss.

55 [0072] In the method for preventing electrochemical corrosion of the heater according to an embodiment of the present disclosure, the shell and the water tank are communicated to form the water supply loop. Therefore, the electric conductor can be contacted with the water in the steam generator whether the electric conductor is installed in the heater, at the shell or at the water tank, and thus the current loop including the output power supply, the electric conductor, water and

the heater is formed. Namely, the impressed current is applied on the surface of the heater so that the heater acts as the cathode, and the electric conductor is electrically insulated from the heater. Therefore, the electron migration of the metal caused by electrochemical corrosion is efficiently restrained, the electrochemical corrosion of the heater is avoided or restrained, and the lifetime of the heater is thus extended.

[0073] In an embodiment of present disclosure, based on the above technical solution, preferably, the electric conductor is arranged in the heater, at the shell or at the water tank in a vertical direction, in a horizontal direction or in a lateral inclined direction.

[0074] In the method for preventing electrochemical corrosion of the heater according to an embodiment of present disclosure, the electric conductor is arranged in the heater, at the shell or at the water tank by a plurality of ways including but not limited to vertical arrangement, horizontal arrangement or lateral inclined arrangement.

[0075] In an embodiment of the present disclosure, based on the above technical solution, the heater is preferably a metal heater. The metal is selected from a group including aluminum, iron and copper. The electric conductor is an inert electric conductor which is made of a material selected from a group including graphite, platinum, gold, silver or a material plated with platinum, gold or silver.

[0076] In the method for preventing electrochemical corrosion of the heater according to an embodiment of present disclosure, the heater is a metal heater, preferably a heater made of an active metal. The metal includes but is not limited to aluminum, iron or copper. The electric conductor is an inert electric conductor which is made of a material including but not limited to graphite, platinum, gold, silver or a material plated with platinum, gold or silver.

[0077] Fig. 1 is a schematic view of a device for preventing electrochemical corrosion of a heater according to an embodiment of the present disclosure.

[0078] Fig. 2 is a schematic view of a device for preventing electrochemical corrosion of a heater according to another embodiment of the present disclosure.

[0079] Fig. 3 is a schematic view of a device for preventing electrochemical corrosion of a heater according to still another embodiment of the present disclosure.

[0080] Fig. 4 is a schematic view of a device for preventing electrochemical corrosion of a heater according to yet another embodiment of the present disclosure.

[0081] In an embodiment of a second aspect of the present disclosure, a device 10 for preventing electrochemical corrosion of a heater for a clothes care machine is provided. The clothes care machine includes a steam generator for generating steam and an output power supply 21 for providing a protection current to the steam generator. The steam generator includes a heater 1. The device includes: an electric conductor 22 installed in the steam generator and electrically insulated from the heater 1; a first connecting wire 23 electrically connected with the heater 1; a second connecting wire 24 electrically connected with the electric conductor 22; a first conducting plate 25 by which a negative terminal of the output power supply 21 is connected with the first connecting wire 23; and a second conducting plate 26 by which a positive terminal of the output power supply 21 is connected with the second connecting wire 24. The electric conductor 22 contacts with water in the steam generator to form a current loop, so as to compensate for electrons lost in the heater 1, and to prevent the heater 1 from being corroded due to an electron loss.

[0082] In the device 10 for preventing electrochemical corrosion of the heater according to an embodiment of the present disclosure, the current loop including the output power supply 21, the conducting plates, the electric conductor 22, water and the heater 1 is formed by installing the electric conductor 22 in the steam generator, the electric conductor 22 being electrically insulated from the heater 1, electrically connecting the heater 1 to the negative terminal of the output power supply 21, electrically connecting the positive terminal of the output power supply 21 to the electric conductor 22, and contacting the electric conductor 22 with water in the steam generator. Namely, the impressed current is applied on the surface of the heater 1 so that the heater 1 acts as the cathode. Therefore, the electron migration of the metal caused by electrochemical corrosion is efficiently restrained, the electrochemical corrosion of the heater 1 is avoided or restrained, and the lifetime of the heater 1 is thus extended.

[0083] In an embodiment of the present disclosure, based on the above technical solution, preferably, the output power supply 21 of the device 10 for preventing electrochemical corrosion of the heater is a DC power supply or a power supply with constant electrical polarity.

[0084] In an embodiment of the present disclosure, based on the above technical solution, preferably, the electric conductor 22 may be replaced by any device capable of donating free electrons to the heater 1, such as an electron gun.

[0085] In an embodiment of the present disclosure, based on the above technical solution, preferably, the steam generator further includes a shell 42 fitted over the heater 1 and a water tank 3 communicated with the shell 42 to form a water supply loop.

[0086] In an embodiment of the present disclosure, based on the above technical solution, preferably, the electric conductor 22 is preferably installed in the heater 1, at the shell 42 or at the water tank 3.

[0087] In an embodiment of the present disclosure, based on the above technical solution, preferably, the electric conductor 22 is arranged in the heater 1, at the shell 42, or at the water tank 3, in a vertical direction, in a horizontal direction or in a lateral inclined direction, by means of screwing or interference fitting.

[0088] In the device 10 for preventing electrochemical corrosion of the heater according to an embodiment of the present disclosure, the shell 42 and the water tank 3 are communicated to form the water supply loop. Therefore, the electric conductor 22 can be contacted with the water in the steam generator whether the electric conductor 22 is installed in the heater 1, at the shell 42 or at the water tank 3, and thus the current loop including the output power supply 21, the conducting plates, the electric conductor 22, water and the heater 1 is formed. Namely, the impressed current is applied on the surface of the heater 1 so that the heater 1 acts as the cathode, and the electric conductor 22 is ensured to be electrically insulated from the heater 1. Therefore, the electron migration of the metal caused by electrochemical corrosion is efficiently restrained, the electrochemical corrosion of the heater 1 is avoided or restrained, and the lifetime of the heater 1 is thus extended.

[0089] Certainly, the electric conductor 22 may be installed in the heater 1, at the shell 42, at the water tank 3, such as on a base of the water tank 3, in the vertical direction, in the horizontal direction or in the lateral inclined direction, by means of screwing or interference fitting, as long as the electrical connection is efficiently ensured and the electric conductor 22 is contacted with the water in the steam generator.

[0090] In an embodiment of the present disclosure, based on the above technical solution, preferably, the steam generator further includes a base 41 defining an installing groove therein for placing the output power supply 21. The device further includes a battery cover 5 threaded for screwing the battery cover 5 into the base 41 and covering the installing groove.

[0091] In the device 10 for preventing electrochemical corrosion of the heater according to an embodiment of the present disclosure, by defining the installing groove in the base 41 of the steam generator to place the output power supply 21 and threading the battery cover 5 for screwing the battery cover 5 into the base 41 and thus covering the installing groove, the output power supply 21 is fixed on the device 10 for preventing electrochemical corrosion of the heater, thereby preventing the output power supply 21 from being detached from the device 10, protecting the output power supply 21 in isolation, and facilitating the replacement of the output power supply 21.

[0092] In an embodiment of the present disclosure, based on the above technical solution, the installing groove for placing the output power supply 21 is preferably defined in the shell 42.

[0093] In the device 10 for preventing electrochemical corrosion of the heater according to an embodiment of the present disclosure, the installing groove is defined in the shell 42, thereby facilitating the electrical connection of the output power supply 21 with the heater 1 and the electric conductor 22, and saving wires.

[0094] Certainly, the installing groove may be arranged in other places such as the control circuit board of the steam generator, depending on actual requirements.

[0095] In an embodiment of the present disclosure, based on the above technical solution, the second connecting wire 24 is fixed on the heater 1 for electrically connecting with the heater 1 preferably by screw fixation. The heater 1 is a metal heater and the metal is selected from a group including aluminum, iron and copper. The electric conductor 22 is an inert electric conductor which is made of a material selected from a group including graphite, platinum, gold, silver or a material plated with platinum, gold or silver.

[0096] In the device 10 for preventing electrochemical corrosion of the heater according to an embodiment of the present disclosure, the way for fixing the wire on the heater 1 includes but is not limited to screw fixation. The heater 1 is the metal heater, preferably a heater 1 made of active metal including but not limited to aluminum, iron or copper. The electric conductor 22 is the inert electric conductor made of the material including but not limited to graphite, platinum, gold, silver or the material plated with platinum, gold or silver.

[0097] Fig. 5 is a block diagram of a steam generator according to an embodiment of the present disclosure.

[0098] In an embodiment of the present disclosure, as illustrated in Fig. 5, the steam generator 50 includes a device 10 for preventing electrochemical corrosion of the heater as described in any one of the above embodiments.

[0099] In the steam generator 50 according to an embodiment of the present disclosure, with the device 10 for preventing electrochemical corrosion of the heater, a current loop including the output power supply, the conducting plates, the electric conductor, water and the heater is formed by installing the electric conductor in the steam generator 50, the electric conductor being electrically insulated from the heater 1, electrically connecting the heater of the steam generator 50 to the negative terminal of the output power supply, electrically connecting the positive terminal of the output power supply to the electric conductor, and contacting the electric conductor with water in the steam generator 50. Namely, an impressed current is applied on the surface of the heater so that the heater acts as a cathode, and the electric conductor is ensured to be electrically insulated from the heater 1. Therefore, the electron migration of the metal caused by electrochemical corrosion is efficiently restrained, the electrochemical corrosion of the heater is avoided or restrained, the lifetime of the heater is thus extended, and thereby the lifetime of the steam generator 50 is extended.

[0100] Fig. 6 is a block diagram of a clothes care machine according to an embodiment of the present disclosure.

[0101] In an embodiment of the present disclosure, as illustrated in Fig. 6, the clothes care machine 60 includes a steam generator 50 described above.

[0102] In the clothes care machine 60 according to an embodiment of the present disclosure, a current loop including the output power supply, the conducting plates, the electric conductor, water and the heater is formed by installing the

electric conductor in the steam generator 50, electrically connecting the heater of the steam generator 50 to the negative terminal of the output power supply, electrically connecting the positive terminal of the output power supply to the electric conductor, the electric conductor being electrically insulated from the heater, and contacting the electric conductor with water in the steam generator 50. Namely, an impressed current is applied on the surface of the heater so that the heater acts as a cathode. Therefore, the electron migration of the metal caused by electrochemical corrosion is efficiently restrained, the electrochemical corrosion of the heater is avoided or restrained, the lifetime of the heater is thus extended, and thereby the lifetime of the clothes care machine 60 is extended.

[0103] The technical solutions of the present disclosure are described in detail hereinabove with reference to drawings. With these technical solutions, the electron migration of the metal caused by electrochemical corrosion is efficiently restrained, thereby avoiding or restraining the electrochemical corrosion of the heater, and extending the lifetime of the heater.

[0104] As illustrated in Fig. 1, the method for preventing electrochemical corrosion of the heater for the clothes care machine provided in Example 1 of the present disclosure specifically includes: disposing a cathode protecting apparatus 2 in the clothes care machine, electrically connecting a negative terminal of the cathode protecting apparatus 2 to the heater 1 which is used for heating a liquid medium 100, and electrically connecting a positive terminal of the cathode protecting apparatus 2 to the liquid medium 100, such that a current loop is formed by connecting the cathode protecting apparatus 2, the heater 1 and the liquid medium 100, and thus the electron migration of the heater 1 is restrained. Specifically, the liquid medium 100 may be water or a mixture of water and a solute. In the method for preventing electrochemical corrosion of the heater for the clothes care machine according to this embodiment, the cathode protecting apparatus 2 connects the heater 1 with the liquid medium 100 to form the current loop, in which the heater 1 is at a cathode terminal of the current loop and the liquid medium 100 is at an anode terminal of the current loop. Therefore, the cathode protecting apparatus 2 may supplement electrons to the heater 1, thereby restraining the electron loss of the heater 1 due to electron migration, efficiently preventing the electrochemical corrosion of the heater 1 and greatly reducing the effect of the electrochemical corrosion on the lifetime and properties of the heater 1.

[0105] Preferably, the heater 1 is made of a material selected from a group including aluminum, iron and copper. In other words, the method for preventing electrochemical corrosion of the heater for the clothes care machine provided in Example 1 is preferably applied to an aluminum heater, an iron heater or a copper heater. Although the aluminum heater, the iron heater and the copper heater are easy to be electrochemically corroded under humid environment, the electrochemical corrosions of those heaters are efficiently prevented by the method for preventing electrochemical corrosion of the heater according to the present disclosure, thereby greatly improving the quality reliability and extending the lifetime of those heaters.

[0106] Specifically, the cathode protecting apparatus 2 has an output power supply 21, an electric conductor 22, a first connecting wire 23 and a second connecting wire 24. The output power supply 21 has a positive terminal and a negative terminal in constant electrical polarity. The negative terminal of the output power supply 21 is connected with a first end of the first connecting wire 23, and the heater 1 is connected with a second end of the first connecting wire 23. The positive terminal of the output power supply 21 is connected with a first end of the second connecting wire 24, and the electric conductor 22 is connected with a second end of the second connecting wire 24. The electric conductor 22 is contacted with the liquid medium 100. The "constant electrical polarity" indicates that the electrical polarity of the output power supply 21 does not change, i.e. the positive terminal and the negative terminal of the output power supply 21 may not exchange. In this Example, through the cooperation of the output power supply 21, the electric conductor 22, the first connecting wire 23 and the second connecting wire 24, the cathode protecting apparatus 2 can be effectively connected with the heater 1 and the liquid medium 100 to form the current loop, with the heater 1 at the cathode terminal of the current loop, thereby effectively restraining the electrochemical corrosion of the heater 1 due to the electron migration. Besides electrically connecting the heater 1 and the negative terminal, the first connecting wire 23 may prevent a direct contact of the output power supply 21 and the heater 1. Therefore, by non-contacting arrangement of the output power supply 21 and the heater 1, the massive heat generated from the heater 1 during working may be prevented from being directly transported to the output power supply 21, thereby guaranteeing the lifetime of the output power supply 21.

[0107] Preferably, in a specific embodiment, the output power supply 21 is a DC power supply. Specifically, the DC power supply may be a dry cell, a storage battery, or a DC power generator. The DC power supply has the constant electric polarity, which meets the requirement for the property of the output power supply 21. In a preferred embodiment, the output power supply 21 is the dry cell. The dry cell is known as its small size, low cost and easy installation. By adopting the dry cell, the method for preventing electrochemical corrosion of the heater for the clothes care machine according to this embodiment may be easily achieved with a comparatively low cost.

[0108] Optionally, in another specific embodiment, the output power supply 21 may be a combination of an AC power supply, a transformer and a rectifier. The constant electric polarity of the output power supply 21 may be realized by rectifying of the rectifier, thus meeting the requirement for the property of the output power supply 21. In addition, in this embodiment, an output voltage of the output power supply 21 may be adjusted. Therefore, the output voltage of the output power supply 21 may be flexibly adjusted depending on the specific working conditions, such as the deposit on

the surface of the heater 1 and the deposit on the surface of the electric conductor 22, to guarantee a current value in the current loop. As a result, a reliability of the cathode protecting apparatus 2 to prevent electrochemical corrosion of the heater 1 is ensured.

[0109] Preferably, the electric conductor 22 is disposed in the heater 1 through a top or a bottom or a side of the heater 1. The electric conductor 22 is contacted with the liquid medium 100 in the heater 1. By each arrangement above, an electrical connection between the electric conductor 22 and the liquid medium 100 in the heater 1 can be achieved.

[0110] More preferably, the electric conductor 22 is penetrated through the side of the heater 1. An end of the electric conductor 22 extends to contact with the liquid medium 100 in the heater 1. By disposing the electric conductor 22 through the side of the heater 1, on the one hand, it is beneficial to the installation and fixation of the electric conductor 22, and the installation place of the heater 1 is flexible; on the other hand, it is convenient for an arrangement of the second connecting wire 24. Specifically, in this embodiment, the electric conductor 22 is disposed in the heater 1 through the side of the heater 1 by a horizontal extending way or an inclined extending way, each enables the electric conductor 22 to be arranged in the heater 1 through the side of the heater 1. Optionally, in a specific situation, the electric conductor 22 may be disposed in the heater 1 through the top or the bottom of the heater 1 by a vertically extending way or an inclined extending way.

[0111] Further, in the method for preventing electrochemical corrosion of the heater for the clothes care machine hereinbefore, a water tank 3 may be disposed and a duct 7 may be further disposed between the tank 3 and the heater 1. The electric conductor 22 is penetrated through the heater 1 and contacted with the liquid medium 100 in the heater 1; or the electric conductor 22 is penetrated through the water tank 3 and contacted with the liquid medium 100 in the water tank 3; or the electric conductor 22 is penetrated through the duct 7 and contacted with the liquid medium 100 in the duct 7. The heater 1 defines a heating chamber 11 for accommodating the liquid medium 100 therein. The water tank 3 defines a water storage chamber 31 for accommodating the liquid medium 100 therein. The duct 7 defines a hollow internal path 71 for the flowing of the liquid medium 100. The heating chamber 11 and the water storage chamber 31 are communicated by the hollow internal path 71. Therefore, the current loop can be formed by connecting the cathode protecting apparatus 2, the heater 1 and the liquid medium 100 and contacting the electric conductor 22 with the liquid medium 100 either in the heating chamber 11, in the water storage chamber 31 or in the hollow internal path 71, thereby preventing the heater 1 from being electrochemically corroded.

[0112] Specifically, the electric conductor 22 may be disposed in the water tank 3 through the top or the bottom or the side of the water tank 3 and contacted with the liquid medium 100 in the water tank 3. In each case, an electrical connection between the electric conductor 22 and the liquid medium 100 in the water tank 3 can be achieved. More specifically, the electric conductor 22 may be disposed in the water tank 3 through the side of the water tank 3 by a horizontal extending way or an inclined extending way. Optionally, the electric conductor 22 may be disposed in the water tank 3 through the top or the bottom of the water tank 3 by a vertically extending way or an inclined extending way.

[0113] Additionally, a cut-off valve may be disposed at the duct 7 for controlling the opening or closure of the duct 7, which is beneficial to maintenance of the product.

[0114] Preferably, the electric conductor 22 is made of an inert metal or graphite, or the electric conductor 22 is a conductive component with its surface coated with the inert metal. Therefore, the electrochemical corrosion on the surface of the electric conductor 22 is prevented and the reliability of the electric conductor 22 is ensured, thereby ensuring the lifetime and the electric conductivity of the electric conductor 22. Specifically, the inert metal may be platinum, gold or silver and so forth.

[0115] Further, the Example 1 of the present disclosure further provides a clothes care machine including a cathode protecting apparatus 2 and a heater 1 for heating a liquid medium 100. The cathode protecting apparatus 2 has a positive terminal and a negative terminal. The cathode protecting apparatus 2, the heater 1 and the liquid medium 100 are connected to form a current loop. The negative terminal of the cathode protecting apparatus 2 is electrically connected to the heater 1, and the positive terminal of the cathode protecting apparatus 2 is electrically connected to the liquid medium 100. The clothes care machine according to the instant example may further include a hanger (not shown) for hanging clothes. As the clothes care machine applies the method mentioned above to prevent the electrochemical corrosion of the heater 1, the performance and the lifetime of the clothes care machine are effectively guaranteed, the quality reliability of the clothes care machine is improved, and thus the competitiveness of the product is enhanced.

[0116] Preferably, in the clothes care machine of Example 1 of the present disclosure, the heater 1 is made of a material selected from a group including aluminum, iron and copper. In other words, the method for preventing electrochemical corrosion of the heater for the clothes care machine provided in Example 1 is preferably applied to an aluminum heater, an iron heater or a copper heater.

[0117] Preferably, in the clothes care machine of Example 1 of the present disclosure, the cathode protecting apparatus 2 includes the output power supply 21 having a positive terminal and a negative terminal in the constant electric polarity, the electric conductor 22 contacted with the liquid medium 100, the first connecting wire 23 electrically connecting the heater 1 and the negative terminal, and the second connecting wire 24 electrically connecting the electric conductor 22 and the positive terminal.

[0118] Preferably, the output power supply 21 may be the DC power supply. The DC power supply may be the dry cell, the storage battery, or the DC power generator. More preferably, the output power supply 21 is the dry cell. Optionally, the output power supply 21 may also be the combination of the AC power supply, the transformer and the rectifier.

[0119] Preferably, the electric conductor 22 may be disposed in the heater 1 through the top or the bottom or the side of the heater 1. More preferably, the electric conductor 22 is disposed in the heater 1 through the side of the heater 1 and an end of the electric conductor 22 extends to contact with the liquid medium 100 in the heater 1. Specifically, the electric conductor 22 is penetrated through the side of the heater 1 by the horizontal extending way or the inclined extending way.

[0120] Preferably, the clothes care machine of Example 1 of present disclosure further includes the water tank 3 and the duct 7 connected between the water tank 3 and the heater 1. The electric conductor 22 is penetrated through the heater 1 and contacted with the liquid medium 100 in the heater 1; or the electric conductor 22 is penetrated through the water tank 3 and contacted with the liquid medium 100 in the water tank 3; or the electric conductor 22 is penetrated through the duct 7 and contacted with the liquid medium 100 in the duct 7.

[0121] Specifically, the electric conductor 22 is disposed in the water tank 3 through the top or the bottom or the side of the water tank 3 and contacted with the liquid medium 100 in the water tank 3. More specifically, the electric conductor 22 may be disposed in the water tank 3 through the side of the water tank 3 by the horizontal extending way or inclined extending way. Optionally, the electric conductor 22 may also be disposed in the water tank 3 through the top or the bottom of the water tank 3 by the vertically extending way or inclined extending way.

[0122] Additionally, the cut-off valve may be disposed at the duct 7 for controlling the opening or closure of the duct 7, which is beneficial to maintenance of the product.

[0123] Preferably, the electric conductor 22 is made of the inert metal or graphite, or the electric conductor 22 is the conductive component with its surface coated with the inert metal. The inert metal may be platinum, gold or silver and so forth.

[0124] As a specific embodiment of the present disclosure, the clothes care machine is a garment steamer. By providing the garment steamer with a configuration for realizing the method for preventing electrochemical corrosion of the heater for the clothes care machine mentioned hereinbefore, the electrochemical corrosion of the heater 1 of the garment steamer can be efficiently restrained. As a result, the quality reliability and the lifetime of the garment steamer may be further improved.

Example 2:

[0125] In the method for preventing electrochemical corrosion of the heater for the clothes care machine of Example 2, the cathode protecting apparatus 2 is configured to directly emit electrons to the heater 1 such that the electron migration of the heater 1 is restrained. Accordingly, in the clothes care machine according to this example, the cathode protecting apparatus 2 is an electron emitter, such as an electron gun, which can emit electrons to the heater 1. A major difference between Example 2 and Example 1 is that: the cathode protecting apparatus 2 in Example 1 enables the heater 1 and the liquid medium 100 to be connected to form a current loop; whereas in Example 2, the cathode protecting apparatus 2 does not make the heater 1 and the liquid medium 100 to be connected to form a current loop, but directly and separately emit electrons to the heater 1. In such a case, the objective of supplementing electrons to the heater 1 can also be achieved. Therefore, the electron loss of the heater 1 due to the electron migration can also be restrained, thereby effectively preventing the electrochemical corrosion of the heater 1.

[0126] Specifically, the method for preventing electrochemical corrosion of the heater for the clothes care machine provided in this Example also is preferably applied to the aluminum heater, the iron heater or the copper heater. Therefore, the electrochemical corrosion of the heater 1 can be efficiently prevented, and the quality reliability and the lifetime of the aluminum heater, the iron heater or the copper heater can be greatly improved.

[0127] As illustrated in Fig. 2 and Fig. 3, the method for preventing electrochemical corrosion of the heater for the clothes care machine according to examples of the present disclosure specifically includes: disposing a cathode protecting apparatus 2 on the clothes care machine, electrically connecting a negative terminal of the cathode protecting apparatus 2 to the heater 1 which is used for heating a liquid medium, and electrically connecting a positive terminal of the cathode protecting apparatus 2 to the liquid medium in the heater 1, such that the cathode protecting apparatus 2, the heater 1 and the liquid medium are connected to form a current loop, thereby restraining the electron migration of the heater 1. The liquid medium specifically may be water or a mixture of water and a solute. In the method for preventing electrochemical corrosion of the heater for the clothes care machine according to this example, the cathode protecting apparatus 2 connects the heater 1 with the liquid medium in heater 1 to form the current loop, in which the heater 1 is at the cathode of the current loop and the liquid medium is at the anode of the current loop. Therefore, the cathode protecting apparatus 2 may supplement electrons to the heater 1, thereby restraining the electron loss of the heater 1 due to electron migration, efficiently preventing the heater 1 from being electrochemically corroded, and greatly reducing the effect of the electrochemical corrosion on the lifetime and properties of the heater 1.

[0128] Preferably, the heater 1 is made of a material selected from a group including aluminum, iron and copper. In other words, the method for preventing electrochemical corrosion of the heater for the clothes care machine provided in the instant example is preferably applied to the aluminum heater, the iron heater or the copper heater. Although the aluminum heater, the iron heater or the copper heater is easy to be electrochemically corroded in the humid environment, the electrochemical corrosions of those heaters are efficiently prevented by the method for preventing electrochemical corrosion of the heater, thereby greatly improving the quality reliability and extending the lifetime of those heaters.

[0129] Preferably, as illustrated in Fig. 2 and Fig. 3, the cathode protecting apparatus 2 has an output power supply 21, an electric conductor 22, a first connecting wire 23 and a second connecting wire 24. The output power supply 21 has a positive terminal and a negative terminal in constant electrical polarity. The negative terminal of the output power supply 21 is connected with a first end of the first connecting wire 23, and the heater 1 is connected with a second end of the first connecting wire 23. The positive terminal of the output power supply 21 is connected with a first end of the second connecting wire 24, and the electric conductor 22 is connected with a second end of the second connecting wire 24. The electric conductor 22 is contacted with the liquid medium in the heater 1. The "constant electrical polarity" indicates that the electrical polarity of the output power supply 21 does not change, i.e. the positive terminal and the negative terminal of the output power supply 21 may not exchange. In the instant example, through the cooperation of the output power supply 21, the electric conductor 22, the first connecting wire 23 and the second connecting wire 24, the cathode protecting apparatus 2 can be effectively connected with the heater 1 and the liquid medium to form the current loop, with the heater 1 at the cathode terminal of the current loop, thereby effectively restraining the electrochemical corrosion of the heater 1 due to the electron migration. Besides electrically connecting the heater 1 and the negative terminal, the first connecting wire 23 may prevent the direct contact of the output power supply 21 and the heater 1. Therefore, by non-contacting arrangement of the output power supply 21 and the heater 1, the massive heat generated from the heater 1 during working may be prevented from being directly transported to the output power supply 21, thereby guaranteeing the lifetime of the output power supply 21.

[0130] Preferably, as illustrated in Fig. 2 and Fig. 3, the heater 1 includes a lower cover 101 and an upper cover 102. The upper cover 102 covers the lower cover 101, defining a heating chamber 11 for accommodating the liquid medium. The electric conductor 22 is penetrated through the upper cover 102 or the lower cover 101, and extends to contact with the liquid medium in the heating chamber 11. In the instant example, the heater 1 is designed to include two parts, i.e. the upper cover 102 and the lower cover 101, which facilitates the formation of the heating chamber 11. By disposing the electric conductor 22 through the upper cover 102 or the lower cover 101, on the one hand, the installation and fixation of the electric conductor 22 in the heater 1 may be realized; on the other hand, the electric conductor 22 is contacted with the liquid medium in the heating chamber 11, thereby realizing the electrical connection of the electric conductor 22 and the liquid medium in the heating chamber 11.

[0131] Preferably, the electric conductor 22 may be fixed in the heater 1 by means of threaded connection. Optionally, the electric conductor 22 may be fixed in the heater 1 by means of interference fitting. In order to prevent the direct electrical connection of the electric conductor 22 and the heater 1, an insulating duct (not shown) may be provided between the electric conductor 22 and the heater 1. Specifically, through the insulating duct, the electric conductor 22 is fixed in the heater 1 by means of the threaded connection or the interference fitting. Specifically, an installing hole (not shown) is defined in the heater, and the insulating duct is fixed in the installing hole. The electric conductor 22 is penetrated through the insulating duct by means of threaded connection (the electric conductor 22 is threaded on its outer surface, and the insulating duct is threaded internally to cooperate with the electric conductor 22) or by interference fitting, thereby realizing the installation and fixation of the electric conductor 22 in the heater 1. Despite insulating the electric conductor 22 from the heater 1, the insulating duct may also seal a fitting part where the electric conductor 22 is fitted with the heater 1.

[0132] Specifically, in the method for preventing electrochemical corrosion of the heater for the clothes care machine described above, the electric conductor 22 may be penetrated through the upper cover 102 by a horizontal extending way or inclined extending way. Optionally, the electric conductor 22 may be penetrated through the lower cover 101 by a vertical extending way or inclined extending way. In each case, the electric conductor 22 can be installed through the heater 1 and contacted with the liquid medium in the heater 1. In a preferred embodiment of this example, as illustrated in Fig. 3, the electric conductor 22 is penetrated through the upper cover 102 by inclined extending way, in such an arrangement, on the one hand, an installing place of the electric conductor 22 is flexible as the upper cover 102 has a large installing space, on the other hand, a sealing requirement for installing the electric conductor 22 may be reduced. Furthermore, in this embodiment, in order to ensure the contact reliability of the electric conductor 22 and the liquid medium in the heating chamber 11 in a long term, an end of the electric conductor 22 penetrated through the heating chamber 11 can extend to a position near the bottom of the heating chamber 11. In a preferred embodiment of this example, as illustrated in Fig. 2, the electric conductor 22 is penetrated through a middle of the lower cover 101 vertically, in this case, as the electric conductor 22 is penetrated through the bottom of the heating chamber 11, the contact of the electric conductor 22 and the liquid medium in the heating chamber 11 can still be ensured even if a limited amount of liquid medium is contained in the heating chamber 11. As a result, the contact reliability of the electric conductor 22 and

the liquid medium in the heating chamber 11 can be ensured in a long term.

[0133] Preferably, in a specific embodiment, the output power supply 21 is a DC power supply. Specifically, the DC power supply may be a dry cell, a storage battery, or a DC power generator. The DC power supply has constant electric polarity, which meets the requirement for the property of the output power supply 21. In a preferred embodiment, the output power supply 21 is the dry cell. The dry cell is known as its small size, low cost and easy installation. By adopting the dry cell, the method for preventing electrochemical corrosion of the heater for the clothes care machine may be easily achieved with a comparatively low cost.

[0134] Optionally, in another specific embodiment, the output power supply 21 may be a combination of an AC power supply, a transformer and a rectifier. The constant electric polarity of the output power supply 21 may still be realized by rectifying of the rectifier, thus meeting the requirement for the property of the output power supply 21. In addition, in this embodiment, the output voltage of the output power supply 21 may be adjusted. Therefore, the output voltage of the output power supply 21 may be flexibly adjusted depending on a specific working condition, such as the deposit on the surface of the heater 1 and the deposit on the surface of the electric conductor 22, to ensure the current value in the current loop. As a result, the reliability of the cathode protecting apparatus 2 to prevent electrochemical corrosion of the heater 1 is effectively ensured.

[0135] Preferably, as illustrated in Fig. 2 and Fig. 3, in the method for preventing electrochemical corrosion of the heater for the clothes care machine described above, a main body 4 is additionally disposed. The output power supply 21 is a battery, the heater 1 is arranged in the main body 4, a battery groove is formed in the main body 4, and the battery is arranged in the battery groove. Optionally, in the method for preventing electrochemical corrosion of the heater for the clothes care machine described above, a main body 4 and a control circuit board are additionally disposed, the output power supply 21 is a battery, the heater 1 and the control circuit board are arranged in the main body 4, a battery groove is formed in the main body 4 or the control circuit board, and the battery is arranged in the battery groove. By the arrangement of the main body 4, on the one hand, the installation and fixation of the heater 1 can be realized, on the other hand, the heater 1 can be protected effectively, and the using reliability can be improved. The arrangement of the control circuit board is beneficial to the power control of the clothes care machine. The arrangement of the battery groove is beneficial to the fixation and installation of the output power supply 21.

[0136] Preferably, as illustrated in Fig. 2 and Fig. 3, in the method for preventing electrochemical corrosion of the heater for the clothes care machine described above, a battery cover 5 is disposed. The battery cover 5 covers and is fixed on the battery groove by a threaded connection or a snap connection. The arrangement of the battery cover 5 is beneficial to ensure a seal effect of the output power supply 21 in the battery groove and to protect the output power supply 21. Both the threaded connection and snap connection are characterized by a convenient assembly and disassembly and a reliable fixation. Therefore, it is beneficial to ensure the stability and reliability of the installation of the battery cover 5, to the quick assembly and disassembly of the battery cover 5 and to the replacement of the product.

[0137] Preferably, as illustrated in Fig. 2 and Fig. 3, the battery cover 5 is arranged outside of the main body 4. Therefore, the assembly and disassembly of the battery cover 5 may be performed outside of the main body 4. That is, the assembly and disassembly of the main body 4 is not essential for the assembly and disassembly of the battery cover 5. Therefore, it is beneficial to the assembly and disassembly of the battery cover 5 and to the maintenance of the product.

[0138] Preferably, the main body 4 includes a base 41 and a shell 42. The shell 42 covers and is fixed on the base 41 to define an accommodating chamber. The heater 1 is arranged in the accommodating chamber, and a battery groove is formed in the base 41 or the shell 42. In this example, the main body 4 is designed to include two parts, i.e. the base 41 and the shell 42, which facilitates the formation of the accommodating chamber and further to reduce the difficulty for manufacturing the main body 4.

[0139] Preferably, a first conducting plate 25 is disposed at the negative terminal and a second conducting plate 26 is disposed at the positive terminal. The first end of the first connecting wire 23 is connected to the first conducting plate 25, and the first end of the second connecting wire 24 is connected to the second conducting plate 26. Specifically, the first conducting plate 25 and the second conducting plate 26 may be installed on the main body 4. The arrangement of the first conducting plate 25 and the second conducting plate 26 is beneficial, on the one hand, to a location of the first connecting wire 23 and the second connecting wire 24, ensuring a good contact of the first connecting wire 23, the second connecting wire 24 and the output power supply 21, and ensuring the reliability of the electrical connection of the first connecting wire 23 to the negative terminal and the electrical connection of the second connecting wire 24 to the positive terminal; on the other hand, to the assembly and disassembly of the output power supply 21.

[0140] Preferably, the second end of the first connecting wire 23 is fixed on the heater 1 by a screw (not shown). Therefore, both the electrical connection of the first connecting wire 23 to the heater 1 and the limiting arrangement of the first connecting wire 23 can be realized. Besides, it is convenient for the assembly and disassembly of the screw.

[0141] Further, as illustrated in Fig. 2 and Fig. 3, in the above method for preventing electrochemical corrosion of the heater for the clothes care machine, it is also possible to provide a water tank 3 and a duct (not shown) between the water tank 3 and the heater 1. The heater 1 has a heating chamber 11 for accommodating the liquid medium. The water tank 3 has a water storage chamber 31 for accommodating the liquid medium. The duct has a hollow internal path for

the flowing of the liquid medium, and the hollow internal path can communicate the heating chamber 11 with the water storage chamber 31. The water tank 3 may be configured to store a certain amount of the liquid medium and supplement the liquid medium to the heater 1 through the duct. Preferably, the water tank 3 is arranged outside of the main body 4. Therefore, the real-time observation for the volume of the liquid medium in water tank 3 is realized, thereby preventing

the heater 1 from being parched due to a shortage of water, and ensuring the usage safety and reliability of the product.

[0142] Further, it is also possible to provide a cut-off valve (not shown) at the duct for controlling the opening and closure of the duct, which is beneficial to maintenance of the product.

[0143] Preferably, the electric conductor 22 is made of an inert metal or graphite, or the electric conductor 22 is a conductive component with its surface coated with the inert metal. Therefore, the electrochemical corrosion on the surface of the electric conductor 22 is prevented and the reliability of the electric conductor 22 is ensured, thereby ensuring the lifetime and the electric conductivity of the electric conductor 22. Specifically, the inert metal may be platinum, gold or silver and so forth. In specific applications, the electric conductor 22 may also be made of other metal materials, such as sodium, zinc, iron, aluminum, copper and the like.

[0144] Further, as illustrated in Fig. 2 and Fig. 3, a clothes care machine is further provided in an example of the present disclosure, the clothes care machine includes a cathode protecting apparatus 2 and a heater 1 for heating the liquid medium. The cathode protecting apparatus 2 has a positive terminal and a negative terminal. The cathode protecting apparatus 2, the heater 1 and the liquid medium are connected to form a current loop where the negative terminal is electrically connected to the heater 1, and the positive terminal is electrically connected to the liquid medium in the heater 1. The clothes care machine in the instant example may further include a hanger (not shown) for hanging clothes. As the clothes care machine applies the method mentioned above to prevent the electrochemical corrosion of the heater 1, the performance and the lifetime of the clothes care machine are effectively guaranteed, the quality reliability of the clothes care machine is improved, and thus the competitiveness of the product is enhanced.

[0145] The configuration, configured to perform a method for preventing electrochemical corrosion of a heater of a household appliance, of the clothes care machine according to examples of present disclosure may be designed and optimized with reference to the method as described hereinbefore, and specifically as follows.

[0146] Preferably, in the clothes care machine according to an example of present disclosure, the heater 1 is made of a material selected from a group including aluminum, iron or copper; in other words, the heater 1 of the clothes care machine is preferably an aluminum heater, an iron heater or a copper heater. The specific configuration and design principle may refer to that described in the above corresponding method, and will not be elaborated here.

[0147] Preferably, the cathode protecting apparatus 2 includes an output power supply 21 having a positive terminal and a negative terminal in constant electrical polarity, an electric conductor 22 contacted with the liquid medium in the heater 1, a first connecting wire 23 electrically connected between the heater 1 and the negative terminal, and a second connecting wire 24 electrically connected between the electric conductor 22 and the positive terminal. The specific configuration and design principle may refer to that described in the corresponding method, and will not be elaborated here.

[0148] Preferably, the heater 1 includes a lower cover 101 and an upper cover 102, the upper cover 102 covers the lower cover 101, defining a heating chamber 11 for accommodating the liquid medium, the electric conductor 22 is penetrated through the upper cover 102 or the lower cover 101, and extends to contact with the liquid medium contained in the heating chamber 11. The specific configuration and design principle may refer to that described in the above corresponding method, and will not be elaborated here.

[0149] Preferably, the electric conductor 22 is penetrated through the upper cover 102 by a horizontal extending way or an inclined extending way; optionally, the electric conductor 22 is penetrated through the lower cover 22 by a vertical extending way or an inclined extending way. Preferably, the electric conductor 22 is penetrated through the middle of the lower cover 101 vertically. The specific configuration and design principle may refer to that described in the above corresponding method, and will not be elaborated here.

[0150] Preferably, the electric conductor 22 is fixed in the heater 1 by a screw connection; or the electric conductor 22 is fixed in the heater 1 by an interference fitting. The specific configuration and design principle may refer to that described in the above corresponding method, and will not be elaborated here.

[0151] Preferably, the output power supply 21 is a DC power supply; or the output power supply 21 is a combination of an AC power supply, a transformer and a rectifier. The specific configuration and design principle may refer to that described in the above corresponding method, and will not be elaborated here.

[0152] Preferably, the clothes care machine described above further includes a main body 4, the output power supply 21 is a battery, the heater 1 is arranged in the main body 4, a battery groove is formed in the main body 4, and the battery is arranged in the battery groove; optionally, the clothes care machine described above further includes a main body 4 and a control circuit board, the output power supply 21 is a battery, the heater 1 and the control circuit board are arranged in the main body 4, a battery groove is formed in the main body 4 or the control circuit board, and the battery is arranged in the battery groove. The specific configuration and design principle may refer to that described in the above corresponding method, and will not be elaborated here.

[0153] Preferably, the clothes care machine described above further includes a battery cover 5 covering and fixed on

the battery groove by a threaded connection or a snap connection. The specific configuration and design principle may refer to that described in the above corresponding method, and will not be elaborated here.

[0154] Preferably, the battery cover 5 is arranged outside of the main body 4. The specific configuration and design principle may refer to that described in the above corresponding method, and will not be elaborated here.

[0155] Preferably, the main body 4 includes a base 41 and a shell 42, the shell 42 covers and is fixed on the base 41 to define an accommodating chamber, the heater 1 is arranged in the accommodating chamber, and a battery groove is formed in the base 41 or the shell 42. The specific configuration and design principle may refer to that described in the above corresponding method, and will not be elaborated here.

[0156] Preferably, the clothes care machine described above further includes a first conducting plate 25 and a second conducting plate 26, the negative terminal is connected with the first end of the first connecting wire 23 via the first conducting plate 25, and the positive terminal is connected with the first end of the second connecting wire 24 via the second conducting plate 26. The specific configuration and design principle may refer to that described in the above corresponding method, and will not be elaborated here.

[0157] Preferably, the second end of the first connecting wire 23 is fixed on the heater 1 by a screw. The specific configuration and design principle may refer to that described in the above corresponding method, and will not be elaborated here.

[0158] Additionally, the clothes care machine further includes a water tank 3 and a duct (not shown) connected between the water tank 3 and the heater 1. The heater 1 has a heating chamber 11 for accommodating the liquid medium, the water tank 3 has a water storage chamber 31 for accommodating the liquid medium, the duct has a hollow internal path for the flowing of the liquid medium, the hollow internal path can communicate the heating chamber 11 with the water storage chamber 31. The water tank 3 may be configured to store a certain amount of the liquid medium and supplement the liquid medium to the heater 1 through the duct. Preferably, the water tank 3 is arranged outside of the main body 4. The specific configuration and design principle may refer to that described in the above corresponding method, and will not be elaborated here.

[0159] Additionally, it is also possible to provide a cut-off valve (not shown) at the duct for controlling the opening and closure of the duct, which is beneficial to maintenance of the product.

[0160] Preferably, the electric conductor 22 is made of an inert metal or graphite, or the electric conductor 22 is a conductive component with its surface coated with the inert metal. The inert metal specifically may be platinum, gold or silver and so forth. The specific configuration and design principle may refer to that described in the above corresponding method, and will not be elaborated here.

[0161] In a specific embodiment of the example of the present disclosure, the clothes care machine is a garment steamer and the heater 1 specifically is a heating tank of the garment steamer. By providing the garment steamer with a configuration for realizing the method for preventing electrochemical corrosion of the heater for the clothes care machine mentioned hereinbefore, the electrochemical corrosion of the heating tank of the garment steamer can be efficiently restrained. As a result, the quality reliability and the lifetime of the garment steamer may be further improved.

[0162] As illustrated in Fig. 4, specifically, the method for preventing electrochemical corrosion of the heater for the clothes care machine according to an example of the present disclosure includes:

disposing a cathode protecting apparatus 2 on the clothes care machine;

providing a channel 200 between a water tank 3 and a heater 1 for heating a liquid medium, for flowing of the liquid medium to transport the liquid medium from the water tank 3 to the heater 1;

electrically connecting a negative terminal of the cathode protecting apparatus 2 to the heater 1, and electrically connecting a positive terminal of the cathode protecting apparatus 2 to the liquid medium in the water tank 3 or the channel 200, such that a current loop is formed by connecting the cathode protecting apparatus 2, the heater 1 and the liquid medium, and thus the electron migration of the heater 1 is restrained. Specifically, the liquid medium may be water or a mixture of water and a solute. The water tank 3 may be configured to store a certain amount of the liquid medium and supplement the liquid medium to the heater 1 through the channel 200. The heater 1 has a heating chamber 11 for accommodating the liquid medium. The water tank 3 has a water storage chamber 31 for accommodating the liquid medium. The channel 200 may communicate the heating chamber 11 with the water storage chamber 31. Therefore, the current loop including the cathode protecting apparatus 2, the heater 1 and the liquid medium can be formed whether the electric conductor 22 is contacted with the liquid medium in heating chamber 11, in the water storage chamber 31 or in the channel 200. In the method for preventing electrochemical corrosion of the heater for the clothes care machine according to this example, through the cathode protecting apparatus 2, the heater 1 is connected with the liquid medium in the water tank 3 or in the channel 200 to form the current loop where the heater 1 is at a cathode terminal of the current loop, and the liquid medium is at an anode terminal of the current loop. Therefore, the cathode protecting apparatus 2 may compensate for electrons to heater 1, thereby restraining electron migration of the heater 1, effectively preventing the heater 1 from being electrochemically corroded, and greatly reducing the effect of the electrochemical corrosion on the lifetime and properties of the

heater 1.

[0163] Preferably, the heater 1 is made of a material selected from a group including aluminum, iron or copper. Namely, the method for preventing electrochemical corrosion of the heater for the clothes care machine according to examples of the present disclosure is preferably applied to an aluminum heater, an iron heater or a copper heater. Although the aluminum heater, the iron heater or the copper heater is easy to be electrochemically corroded in the humid environment, the electrochemical corrosion of the heater 1 is efficiently prevented by the method for preventing electrochemical corrosion of the heater, by which the quality reliability and the lifetime of the aluminum heater, the iron heater or the copper heater are greatly improved.

[0164] Preferably, the cathode protecting apparatus 2 has an output power supply 21, an electric conductor 22, a first connecting wire 23 and a second connecting wire 24. The output power supply 21 has a positive terminal and a negative terminal in constant electrical polarity. The negative terminal of the output power supply 21 is electrically connected with a first end of the first connecting wire 23, and the heater 1 is electrically connected with a second end of the first connecting wire 23. The positive terminal of the output power supply 21 is electrically connected with a first end of the second connecting wire 24, and the electric conductor 22 is electrically connected with a second end of the second connecting wire 24. The electric conductor 22 is contacted with the liquid medium in the water tank 3 or the liquid medium in the channel 200. The "constant electrical polarity" indicates that the electrical polarity of the output power supply 21 does not change, i.e. the positive terminal and the negative terminal of the output power supply 21 may not exchange. In present example, through the cooperation of the output power supply 21, the electric conductor 22, the first connecting wire 23 and the second connecting wire 24, the cathode protecting apparatus 2 can be effectively connected with the heater 1 and the liquid medium to form the current loop, with the heater 1 at the cathode terminal of the current loop, thereby effectively restraining the electrochemical corrosion of the heater 1 due to the electron migration. Besides electrically connecting the heater 1 and the negative terminal, the first connecting wire 23 may prevent the direct contact of the output power supply 21 and the heater 1. Therefore, by non-contacting arrangement of the output power supply 21 and the heater 1, the massive heat generated from the heater 1 during working may be prevented from being directly transported to the output power supply 21, thereby guaranteeing the lifetime of the output power supply 21.

[0165] Preferably, in the method for preventing electrochemical corrosion of the heater for the clothes care machine described above, a main body 4 is additionally disposed. The heater 1 is arranged in the main body 4. The water tank 3 is arranged outside of the main body 4. The electric conductor 22 is penetrated through the main body 4 or the water tank 3 and extends to contact the liquid medium in the water tank 3 or in the channel 200. The main body 4, on the one hand, may support and fix the heater 1 and the water tank 3, on the other hand, may effectively protect the heater 1 and thus improve the reliability and safety of the heater 1 during using. The water tank 3 is arranged outside of the main body 4. Therefore, the real-time observation for the volume of the liquid medium in water tank 3 is realized, thereby preventing the heater 1 from being parched due to a shortage of water, and ensuring the usage safety and reliability of the product.

[0166] Preferably, a water outlet is formed in a bottom of the water tank 3 and a control valve 6 is disposed at the water outlet. The electric conductor 22 is penetrated through the main body 4 and extended below the control valve 6 to a valve core 61 of the control valve 6, thereby allowing the electric conductor 22 to contact with the liquid medium in the channel 200. Specifically, the control valve 6 includes a valve seat 62, the valve core 61 slidably arranged in the valve seat 62, a spring 62 fitted over the valve core 61, and a sealing rubber 64 fixed on an end of the valve core 61 for sealing or opening the water outlet. Specifically, the valve seat 62 may be disposed at the bottom of the water tank 3 by a screw. In a specific application, in a case that the valve core 61 is not subjected to an external force, the sealing rubber 64 may attach and seal the water outlet of the water tank 3. In this case, the water outlet is sealed such that the liquid medium in the water tank 3 may not flow out from the water outlet. In a case of arranging the water tank 3 on the main body 4, the valve core 61 may subjected to an upward force from the electric conductor 22. Therefore, the valve core 61 slides upward along the water outlet such that the sealing rubber 64 detaches from the water outlet. As a result, the water outlet is opened such that the liquid medium in the water tank 3 may flow into the channel 200 through the water outlet and further flow into the metal heater. In this case, the electric conductor 22 is contacted with the liquid medium in the channel 200. In this example, the electric conductor 22 is arranged below the valve core 61. Therefore, on the one hand, the water outlet keeps opening after the water tank 3 is arranged on the main body 4, ensuring the communication of the water storage chamber 31 and the heating chamber 11 in the long term, thereby preventing the heater 1 from being parched due to shortage of water; on the other hand, the contact of the electric conductor 22 and the liquid medium in the channel 22 is achieved.

[0167] Preferably, in the method for preventing electrochemical corrosion of the heater for the clothes care machine described above, the electric conductor 22 is fixed in the main body 4 by threaded connection. Optionally, the electric conductor 22 is fixed in the main body 4 by means of interference fitting. In a specific application, an insulating duct (not shown) may be provided between the electric conductor 22 and the main body 4. Specifically, through the insulating duct, the electric conductor 22 may be fixed in the heater 1 by means of threaded connection or interference fitting.

Specifically, an installing hole (not shown) is disposed in the heater 1, and the insulating duct is fixed in the installing hole. The electric conductor 22 is penetrated through the insulating duct by threaded connection (the electric conductor 22 is threaded on its outer surface, and the insulating duct is threaded internally to cooperate with the electric conductor 22) or by interference fitting. Therefore, the installation and fixation of the electric conductor 22 in the main body 4 are realized. The insulating duct seals a fitting part where the electric conductor 22 is fitted with the main body 4.

[0168] Preferably, in a specific embodiment, the output power supply 21 is a DC power supply. Specifically, the DC power supply may be a dry cell, a storage battery, or a DC power generator. The DC power supply has constant electric polarity, which meets the requirement for the property of the output power supply 21. In a preferred embodiment, the DC power supply 21 is the dry cell. The dry cell is known as its small size, low cost and easy installation. By adopting the dry cell, the method for preventing electrochemical corrosion of the heater for the clothes care machine may be easily achieved with a comparatively low cost.

[0169] Optionally, in another specific embodiment, the output power supply 21 may be a combination of an AC power supply, a transformer and a rectifier. The constant electric polarity of the output power supply 21 may still be realized by rectifying of the rectifier, thereby meeting the requirement for the property of the output power supply 21. In addition, in this embodiment, the output voltage of the output power supply 21 may be adjusted. Therefore, the output voltage of the output power supply 21 may be flexibly adjusted depending on a specific working condition, such as the deposit on the surface of the heater 1 and the deposit on the surface of the electric conductor 22, to ensure the current value in the current loop. As a result, a reliability of the cathode protecting apparatus 2 to prevent electrochemical corrosion of the heater 1 is effectively ensured.

[0170] Preferably, the output power supply 21 is a battery, a battery groove is formed in the main body 4, and the battery is arranged in the battery groove. Optionally, in the method for preventing electrochemical corrosion of the heater for the clothes care machine described above, a control circuit board (not shown) is additionally disposed, the output power supply 21 is the battery, the control circuit board is arranged in the main body 4, the battery groove is formed in the main body 4 or the control circuit board, and the battery is arranged in the battery groove. Namely, the battery groove may be arranged in the main body 4 or in the control circuit board. The arrangement of the control circuit board is beneficial to a power control of a household appliance. The arrangement of the battery groove is beneficial to the fixation and installation of the output power supply 21.

[0171] Preferably, in the method for preventing electrochemical corrosion of the heater for the clothes care machine described above, a battery cover 5 is additionally disposed. The battery cover 5 covers and is fixed on the battery groove by a threaded connection or a snap connection. The arrangement of the battery cover 5 is beneficial to the sealing for the output power supply 21 in the battery groove and to the protection for the output power supply 21. Both the threaded connection and snap connection are characterized by a convenient assembly and disassembly and a reliable fixation. Therefore, it is beneficial to ensure the stability and reliability of the installation of the battery cover 5, to the quick assembly and disassembly of the battery cover 5, and to the replacement of the product.

[0172] Preferably, the battery cover 5 is arranged outside of the main body 4. Therefore, the assembly and disassembly of the battery cover 5 may be performed outside of the main body 4. Namely, the assembly and disassembly of the main body 4 is not essential for the assembly and disassembly of the battery cover 5. Therefore, it is beneficial to the assembly and disassembly of the battery cover 5 and to the maintenance of the product.

[0173] Preferably, the main body 4 includes a base 4 and a shell 42. The shell 42 covers and is fixed on the base 41 to define an accommodating chamber. The heater 1 is arranged in the accommodating chamber, and a battery groove is formed in the base 41 or the shell 42. In this example, the main body 4 is designed to include two parts, i.e. the base 41 and the shell 42, which facilitates the formation of the accommodating chamber and further to reduce the difficulty for manufacturing the main body 4.

[0174] Preferably, a first conducting plate 25 is disposed at the negative terminal and a second conducting plate 26 is disposed at the positive terminal. The first end of the first connecting wire 23 is connected to the first conducting plate 25, and the first end of the second connecting wire 24 is connected to the second conducting plate 26. Specifically, the first conducting plate 25 and the second conducting plate 26 may be installed on the main body 4. The arrangement of the first conducting plate 25 and the second conducting plate 26 is beneficial, on the one hand, to the location of the first connecting wire 23 and the second connecting wire 24, ensuring a good contact of the first connecting wire 23, the second connecting wire 24 and the output power supply 21, and ensuring the reliability of the electrical connection of the first connecting wire 23 to the negative terminal and the electrical connection of the second connecting wire 24 to the positive terminal; on the other hand, to the assembly and disassembly of the output power supply 21.

[0175] Preferably, the second end of the first connecting wire 23 is fixed on the heater 1 by a screw (not shown). Therefore, both the electrical connection of the first connecting wire 23 to the heater 1 and the limiting arrangement for the first connecting wire 23 can be realized. Besides, it is convenient for the assembly and disassembly of the screw.

[0176] Preferably, the electric conductor 22 is made of an inert metal or graphite, or the electric conductor 22 is a conductive component with its surface coated with the inert metal. Therefore, the electrochemical corrosion on the surface of the electric conductor 22 is prevented and the reliability of the electric conductor 22 is ensured, thereby

ensuring the lifetime and the electric conductivity of the electric conductor 22. Specifically, the inert metal may be mercury, platinum, gold or silver and so forth. In specific applications, the electric conductor 22 may also be made of other metal materials, such as sodium, zinc, iron, aluminum, copper and the like.

[0177] Preferably, the heater 1 includes a lower cover 101 and an upper cover 102, the upper cover 102 covers the lower cover 101, defining a heating chamber 11 for accommodating the liquid medium. In the instant example, the heater 1 is designed to include two parts, i.e. the upper cover 102 and the lower cover 101, which facilitates the formation of the heating chamber 11.

[0178] Further, a clothes care machine is further provided in an example of the present disclosure, the clothes care machine includes a cathode protecting apparatus 2, a water tank 3 and a heater 1 for heating the liquid medium. A channel 200 for the flowing of the liquid medium is disposed between the water tank 3 and the heater 1. The cathode protecting apparatus 2 has a positive terminal and a negative terminal. The cathode protecting apparatus 2, the heater 1 and the liquid medium are connected to form a current loop. The negative terminal is electrically connected to the heater 1, and the positive terminal is electrically connected to the liquid medium in the water tank 3 or in the channel 200. The clothes care machine according to the instant example further includes a hanger (not shown) for hanging clothes. As the clothes care machine applies the method mentioned above to prevent the electrochemical corrosion of the heater 1, the performance and the lifetime of the clothes care machine are effectively guaranteed, the quality reliability of the clothes care machine is improved, and thus the competitiveness of the product is enhanced.

[0179] The configuration, configured to perform a method for preventing electrochemical corrosion of a heater of a household appliance, of the clothes care machine according to examples of present disclosure may be designed and optimized with reference to the method as described hereinbefore,, and specifically as follows.

[0180] Preferably, in the clothes care machine according to an example of present disclosure, the heater 1 is made of a material selected from a group including aluminum, iron and copper; in other words, the heater 1 of the clothes care machine is preferably an aluminum heater, an iron heater or a copper heater. The specific configuration and design principle may refer to that described in the above corresponding method, and will not be elaborated here.

[0181] Preferably, the cathode protecting apparatus 2 includes an output power supply 21 having a positive terminal and a negative terminal in constant electrical polarity, an electric conductor 22 contacted with the liquid medium in the water tank 3 or the liquid medium in the channel 200, a first connecting wire 23 electrically connected between the heater 1 and the negative terminal, and a second connecting wire 24 electrically connected between the electric conductor 22 and the positive terminal. The specific configuration and design principle may refer to that described in the corresponding method, and will not be elaborated here.

[0182] Preferably, the clothes care machine further includes a main body 4, the heater 1 is arranged in the main body 4, the water tank 3 is arranged outside of the main body 4, the electric conductor 22 is penetrated through the main body 4 or the water tank 3, and extended to contact with the liquid medium in the water tank 3 or in the channel 200. The specific configuration and design principle may refer to that described in the above corresponding method, and will not be elaborated here.

[0183] Preferably, a water outlet is formed in a bottom of the water tank 3 and a control valve 6 having a valve core 61 is disposed at the water outlet, the electric conductor 22 is penetrated through the main body 4 and extended below the control valve 6 to the valve core 61 of the control valve 6, and the electric conductor 22 is contacted with the liquid medium in the channel 200. The specific configuration and design principle may refer to that described in the above corresponding method, and will not be elaborated here.

[0184] Preferably, the electric conductor 22 is fixed on the main body 4 by a screw connection; or the electric conductor 22 is fixed on the main body 4 by an interference fitting. The specific configuration and design principle may refer to that described in the above corresponding method, and will not be elaborated here.

[0185] Preferably, the output power supply 21 is a DC power supply; or the output power supply 21 may be a combination of an AC power supply, a transformer and a rectifier. The specific configuration and design principle may refer to that described in the above corresponding method, and will not be elaborated here.

[0186] Preferably, the output power supply 21 is a battery, a battery groove is formed in the main body 4, and the battery is arranged in the battery groove; optionally, the clothes care machine further includes a control circuit board, the output power supply 21 is a battery, the control circuit board is arranged in the main body 4, a battery groove is formed in the main body 4 or the control circuit board, and the battery is arranged in the battery groove. The specific configuration and design principle may refer to that described in the above corresponding method, and will not be elaborated here.

[0187] Preferably, the clothes care machine described above further includes a battery cover 5 covering and fixed on the battery groove by a threaded connection or a snap connection. The specific configuration and design principle may refer to that described in the corresponding method, and will not be elaborated here.

[0188] Preferably, the battery cover 5 is arranged outside of the main body 4, and the specific configuration and design principle may refer to that described in the above corresponding method, and will not be elaborated here.

[0189] Preferably, the main body 4 includes a base 41 and a shell 42, the shell 42 covers and is fixed on the base 41

to define an accommodating chamber, the heater 1 is arranged in the accommodating chamber, and the battery groove is formed in the base 41 or the shell 42. The specific configuration and design principle may refer to that described in the above corresponding method, and will not be elaborated here.

[0190] Preferably, the cathode protecting apparatus 2 further includes a first conducting plate 25 and a second conducting plate 26, the negative terminal is connected with the first end of the first connecting wire 23 via the first conducting plate 25, and the positive terminal is connected with the first end of the second connecting wire 24 via the second conducting plate 26. The specific configuration and design principle may refer to that described in the above corresponding method, and will not be elaborated here.

[0191] Preferably, the second end of the first connecting wire 23 is fixed on the heater 1 by a screw. The specific configuration and design principle may refer to that described in the corresponding method, and will not be elaborated here.

[0192] Preferably, the electric conductor 22 is made of an inert metal or graphite, or the electric conductor 22 is a conductive component with its surface coated with the inert metal. The inert metal may be mercury, platinum, gold or silver and so forth. The specific configuration and design principle may refer to that described in the above corresponding method, and will not be elaborated here.

[0193] Preferably, as illustrated in Fig. 4, the heater 1 includes a lower cover 101 and an upper cover 102, the upper cover 102 covers the lower cover 101, defining a heating chamber 11 for accommodating the liquid medium. The specific configuration and design principle may refer to that described in the corresponding method, and will not be elaborated here.

[0194] As a specific embodiment of the example of the present disclosure, the clothes care machine is a garment steamer, and specifically, the heater 1 is a heating tank of the garment steamer. By providing the garment steamer with a configuration for realizing the method for preventing electrochemical corrosion of the heater for the clothes care machine mentioned hereinbefore, the electrochemical corrosion of the heating tank of the garment steamer can be efficiently restrained. As a result, the quality reliability and the lifetime of the garment steamer may be further improved.

[0195] In the present disclosure, the terms "install", "arrange", "dispose", "connection" and the like are used broadly, and may be, for example, fixed connections, detachable connections, or integral connections, which can be understood by those skilled in the art according to specific situations.

[0196] In addition, terms such as "first" and "second" are used herein for purposes of description and are not intended to indicate or imply relative importance or significance or to imply the number of indicated technical features, which should be understood by those skilled in the art.

[0197] Reference throughout this specification to "an embodiment", "some embodiments", "one embodiment", "another example", "an example", "a specific example", or "some examples," means that a particular feature, structure, material, or characteristic described in connection with the embodiment or example is included in at least one embodiment or example of the present disclosure. Thus, the appearances of the phrases such as "in some embodiments", "in one embodiment", "in an embodiment", "in another example", "in an example", "in a specific example", or "in some examples," in various places throughout this specification are not necessarily referring to the same embodiment or example of the present disclosure. Furthermore, the particular features, structures, materials, or characteristics may be combined in any suitable manner in one or more embodiments or examples.

[0198] Although explanatory embodiments have been shown and described, it would be appreciated by those skilled in the art that the above embodiments cannot be construed to limit the present disclosure, and changes, alternatives, and modifications can be made in the embodiments without departing from spirit, principles and scope of the present disclosure.

Claims

1. A method for preventing electrochemical corrosion of a heater for a clothes care machine, wherein the clothes care machine comprises a steam generator for generating steam and an output power supply for providing a protection current to the steam generator, the steam generator comprises the heater, and the method comprises:

installing an electric conductor in the steam generator, the electric conductor being electrically insulated from the heater, and

forming a current loop by electrically connecting the heater to a negative terminal of the output power supply, electrically connecting a positive terminal of the output power supply to the electric conductor, and contacting the electric conductor with water in the steam generator, so as to compensate for electrons lost in the heater, and to prevent the heater from being corroded due to an electron loss.

2. The method of claim 1, wherein the steam generator further comprises a shell fitted over the heater and a water tank communicated with the shell to form a water supply loop, and the method further comprises:

installing the electric conductor in the heater, at the shell or at the water tank, the electric conductor being electrically insulated from the heater, and forming the current loop by contacting the electric conductor with the water supply loop of the steam generator to compensate for electrons lost in the heater, and to prevent the heater from being corroded due to the electron loss.

3. The method of claim 1 or 2, wherein the heater is a metal heater, the metal is selected from a group comprising aluminum, iron and copper; and the electric conductor is an inert electric conductor and is made of a material selected from a group comprising graphite, platinum, gold, silver or a material plated with platinum, gold or silver.
4. The method of claim 1, wherein a cathode protecting apparatus is disposed in the clothes care machine, a negative terminal of the cathode protecting apparatus is electrically connected to the metal heater which is used for heating a liquid medium and a positive terminal of the cathode protecting apparatus is electrically connected to the liquid medium, such that the current loop is formed by connecting the cathode protecting apparatus, the metal heater and the liquid medium, and that an electron migration of the metal heater is restrained; or the cathode protecting apparatus is configured to directly emit electrons to the metal heater of the clothes care machine such that the electron migration of the metal heater is restrained.
5. The method of claim 4, wherein the cathode protecting apparatus comprises the output power supply, the electric conductor, a first connecting wire and a second connecting wire, the output power supply has the positive terminal and the negative terminal in constant electrical polarity, the negative terminal of the output power supply is electrically connected with a first end of the first connecting wire, the metal heater is electrically connected with a second end of the first connecting wire, the positive terminal of the output power supply is electrically connected with a first end of the second connecting wire, the electric conductor is electrically connected with a second end of the second connecting wire, and the electric conductor is contacted with the liquid medium.
6. The method of claim 5, wherein the output power supply is a DC power supply, or a combination of an AC power supply, a transformer and a rectifier.
7. The method of claim 5 or 6, wherein the electric conductor is disposed in the metal heater through a top or a bottom or a side of the metal heater and the electric conductor is contacted with the liquid medium in the metal heater.
8. The method of claim 5, wherein a water tank is disposed and connected with the metal heater by a duct, and the electric conductor is penetrated through the metal heater and contacted with the liquid medium in the metal heater; or the electric conductor is penetrated through the water tank and contacted with the liquid medium in the water tank; or the electric conductor is penetrated through the duct and contacted with the liquid medium in the duct.
9. The method of claim 8, wherein the electric conductor is disposed in the water tank through a top or a bottom or a side of the water tank and the electric conductor is contacted with the liquid medium in the water tank.
10. The method of any one of claims 5 to 9, wherein the electric conductor is made of an inert metal or graphite, or the electric conductor is a conductive component with its outer surface coated with the inert metal, the metal heater is made of aluminum, iron or copper.
11. The method of claim 1, wherein a cathode protecting apparatus is disposed in the clothes care machine, a negative terminal of the cathode protecting apparatus is electrically connected to a metal heater used for heating a liquid medium and a positive terminal of the cathode protecting apparatus is electrically connected to the liquid medium in the metal heater, such that the current loop is formed by connecting the cathode protecting apparatus, the metal heater and the liquid medium, and that the electron migration of the metal heater is restrained.
12. The method of claim 1, wherein a cathode protecting apparatus is disposed in the clothes care machine, a channel for liquid medium flow is disposed between a water tank of the clothes care machine and a metal heater used for heating a liquid medium; a negative terminal of the cathode protecting apparatus is electrically connected to the metal heater and a positive terminal of the cathode protecting apparatus is electrically connected to the liquid medium in the water tank or in the channel, such that the current loop is formed by connecting the cathode protecting

apparatus, the metal heater and the liquid medium, and that the electron migration of the metal heater is restrained.

13. The method of claim 11 or 12, wherein the cathode protecting apparatus comprises the output power supply, the electric conductor, a first connecting wire and a second connecting wire,
the output power supply has the positive terminal and the negative terminal in constant electrical polarity,
the negative terminal of the output power supply is electrically connected with a first end of the first connecting wire,
the metal heater is electrically connected with a second end of the first connecting wire,
the positive terminal of the output power supply is electrically connected with a first end the second connecting wire,
the electric conductor is electrically connected with a second end of the second connecting wire, and
the electric conductor is contacted with the liquid medium in the metal heater.

14. The method of claim 13, wherein the output power supply is a DC power supply, or a combination of an AC power supply, a transformer and a rectifier.

15. The method of claim 14, wherein a main body is disposed, the output power supply is a battery, the metal heater is arranged in the main body, a battery groove is formed in the main body, and the battery is arranged in the battery groove; or
a main body and a control circuit board are disposed, the output power supply is a battery, the metal heater and the control circuit board are arranged in the main body, a battery groove is formed in the main body or the control circuit board, and the battery is arranged in the battery groove.

16. The method of claim 15, wherein the main body comprises a base and a shell, the shell covers and is fixed on the base to define an accommodating chamber, the metal heater is arranged in the accommodating chamber, and the battery groove is formed in the base or the shell.

17. The method of claim 13, wherein a first conducting plate is disposed on the negative terminal, a second conducting plate is disposed on the positive terminal, the first end of the first connecting wire is connected with the first conducting plate, and the first end of the second connecting wire is connected with the second conducting plate.

18. The method of any one of claims 13 to 17, wherein the electric conductor is made of an inert metal or graphite, or the electric conductor is a conductive component with its surface coated with the inert metal.

19. A device for preventing electrochemical corrosion of a heater for a clothes care machine, wherein the clothes care machine comprises a steam generator for generating steam and an output power supply for providing a protection current to the steam generator, the steam generator comprises the heater, and the device comprises:

an electric conductor installed in the steam generator and electrically insulated from the heater;
a first connecting wire electrically connected with the heater;
a second connecting wire electrically connected with the electric conductor;
a first conducting plate by which a negative terminal of the output power supply is connected with the first connecting wire; and
a second conducting plate by which a positive terminal of the output power supply is connected with the second connecting wire,
wherein
the electric conductor contacts with water in the steam generator to form a current loop, so as to compensate for electrons lost in the heater and to prevent the heater from being corroded due to an electron loss.

20. The device of claim 19, wherein the steam generator further comprises a shell fitted over the heater and a water tank communicated with the shell to form a water supply loop, wherein the electric conductor is arranged in the heater, at the shell or at the water tank.

21. The device of claim 20, wherein the electric conductor is arranged in the heater, at the shell, at the water tank, or at the water supply loop by means of screwing or interference fitting, in a vertical direction, in a horizontal direction or in a lateral inclined direction.

22. The device of claim 21, wherein:

the steam generator further comprises a base defining an installing groove therein for placing the output power

supply; and
the device further comprises a battery cover threaded for screwing the battery cover into the base and covering the installing groove.

23. The device of any one of claims 19 to 22, wherein the second connecting wire is fixed on the heater by a screw to electrically connect to the heater; and
the heater is a metal heater, where the metal is selected from a group comprising aluminum, iron and copper; and
the electric conductor is an inert electric conductor made of a material selected from a group comprising graphite, platinum, gold, silver or a material plated with platinum, gold or silver.

24. A steam generator, comprising a device for preventing electrochemical corrosion of a heater of any one of claims 19 to 23.

25. A clothes care machine, comprising a steam generator of claim 24.

26. A clothes care machine, comprising a metal heater for heating a liquid medium, wherein the clothes care machine further comprises a cathode protecting apparatus having a positive terminal electrically connected to the liquid medium and a negative terminal electrically connected to the metal heater, and the cathode protecting apparatus, the metal heater and the liquid medium are connected to form a current loop; or
the cathode protecting apparatus is an electron emitter configured to emit electrons to the metal heater.

27. The clothes care machine of claim 26, wherein the cathode protecting apparatus comprises:

an output power supply having a positive terminal and a negative terminal in constant electrical polarity,
an electric conductor contacting with the liquid medium,
a first connecting wire electrically connected between the metal heater and the negative terminal of the output power supply, and
a second connecting wire electrically connected between the electric conductor and the positive terminal of the output power supply.

28. The clothes care machine of claim 27, wherein the output power supply is a DC power supply, or a combination of an AC power supply, a transformer and a rectifier.

29. The clothes care machine of claim 27 or 28, wherein the electric conductor is disposed in the metal heater through a top or a bottom or a side of the metal heater, and the electric conductor is contacted with the liquid medium in the metal heater.

30. The clothes care machine of claim 27, further comprising a water tank and a duct connected between the water tank and the metal heater, wherein
the electric conductor is penetrated through the metal heater and contacted with the liquid medium in the metal heater; or
the electric conductor is penetrated through the water tank and contacted with the liquid medium in the water tank; or
the electric conductor is penetrated through the duct and contacted with the liquid medium in the duct.

31. The clothes care machine of claim 27, further comprising a main body, wherein the output power supply is a battery, the metal heater is arranged in the main body, a battery groove is formed in the main body, and the battery is arranged in the battery groove;
or
further comprising a main body and a control circuit board, wherein the output power supply is a battery, the metal heater and the control circuit board are arranged in the main body, a battery groove is formed in the main body or the control circuit board, and the battery is arranged in the battery groove.

32. The clothes care machine of claim 31, wherein the main body comprises a base and a shell, the shell covers and is fixed on the base to define an accommodating chamber, the metal heater is arranged in the accommodating chamber, and the battery groove is formed in the base or the shell.

33. The clothes care machine of claim 27, further comprising a main body, wherein the metal heater is arranged in the main body, the water tank is arranged outside of the main body, and the electric conductor is penetrated through

the main body or the water tank and extended to contact the liquid medium in the water tank or in the duct,
a water outlet is formed in a bottom of the water tank and a control valve having a valve core is disposed at the
water outlet,

the electric conductor is penetrated through the main body and extended below the control valve to the valve core,
and the electric conductor is contacted with the liquid medium in the duct.

34. The clothes care machine of any one of claims 27 to 33, further comprising a first conducting plate and a second
conducting plate, wherein a first end of the first connecting wire is connected with the negative terminal by the first
conducting plate, and a first end of the second connecting wire is connected with the positive terminal by the second
conducting plate.

35. The clothes care machine of any one of claims 27 to 33, wherein the electric conductor is made of an inert metal
or graphite, or the electric conductor is a conductive component with its surface coated with the inert metal,
the metal heater is made of aluminum, iron or copper.

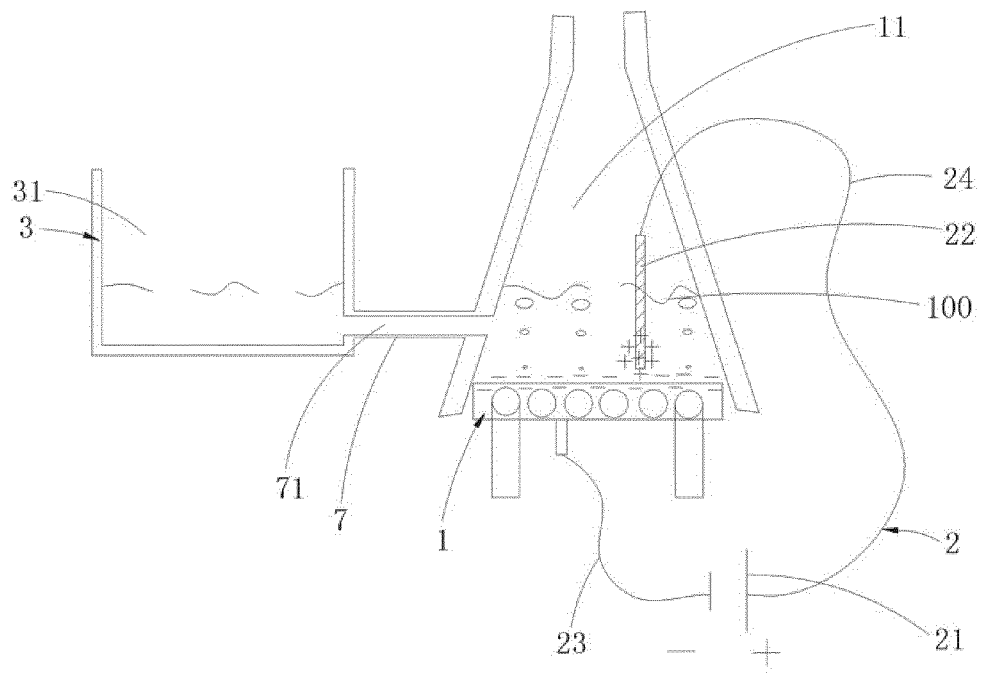


Fig. 1

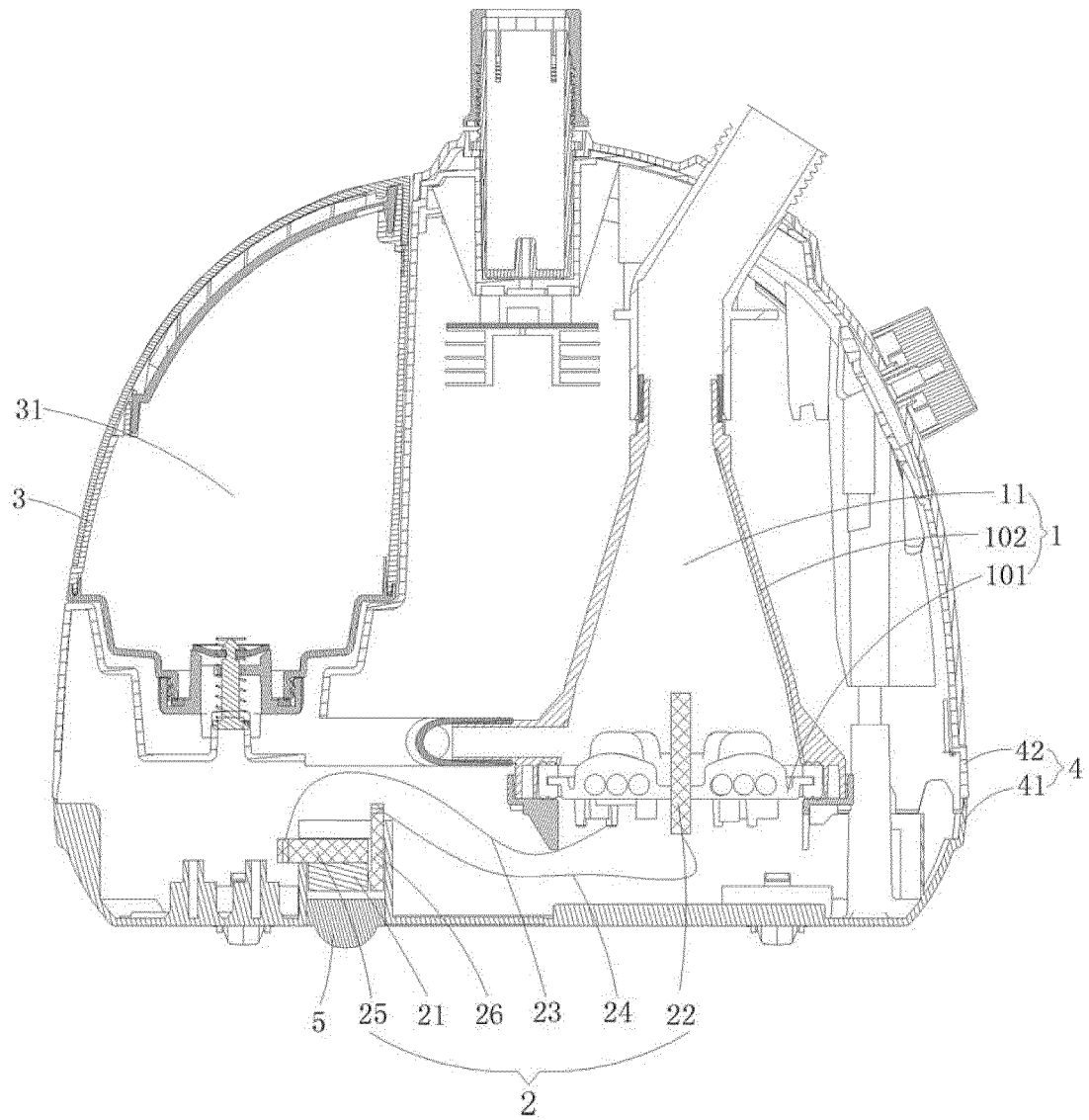


Fig. 2

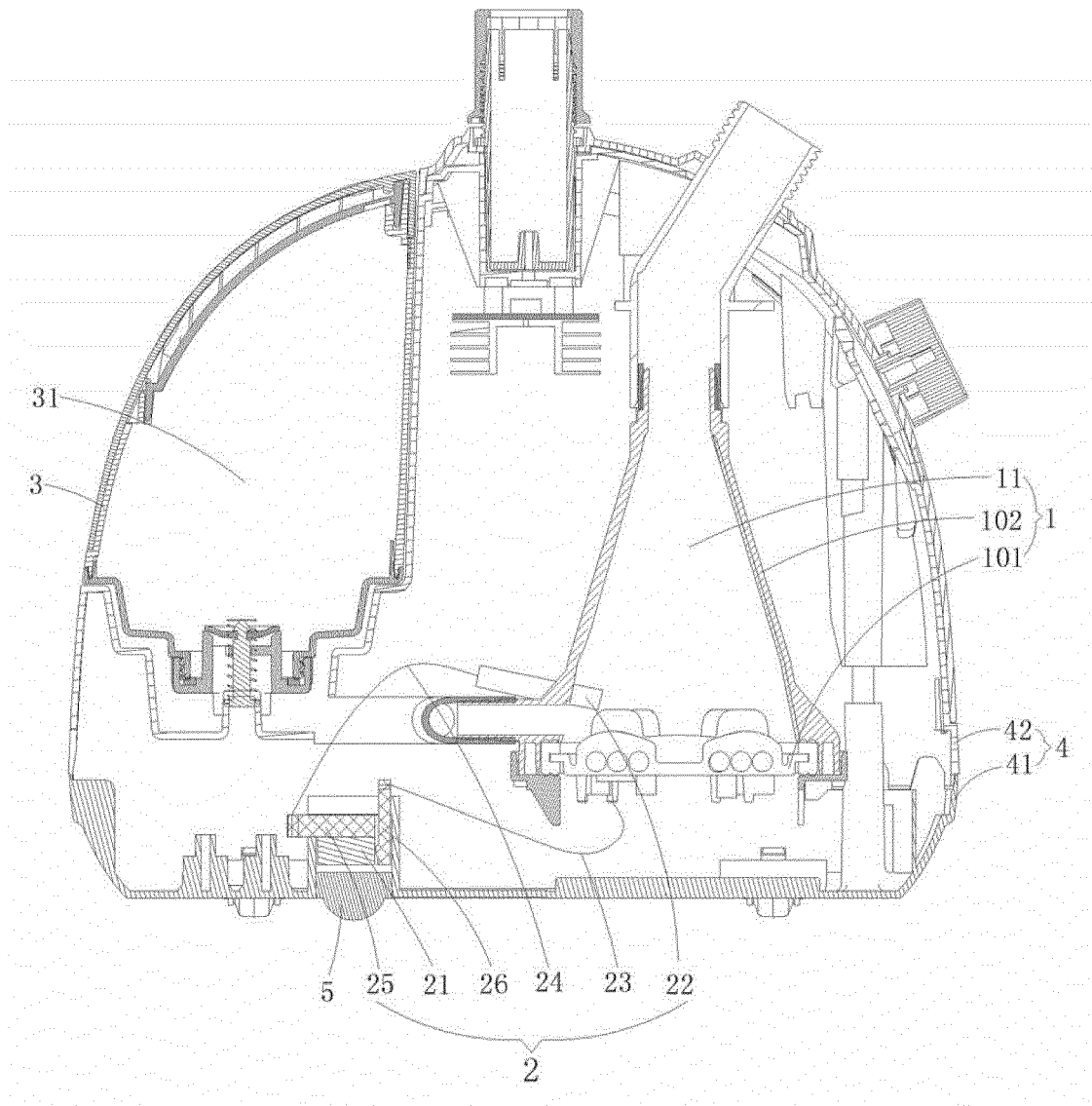


Fig. 3

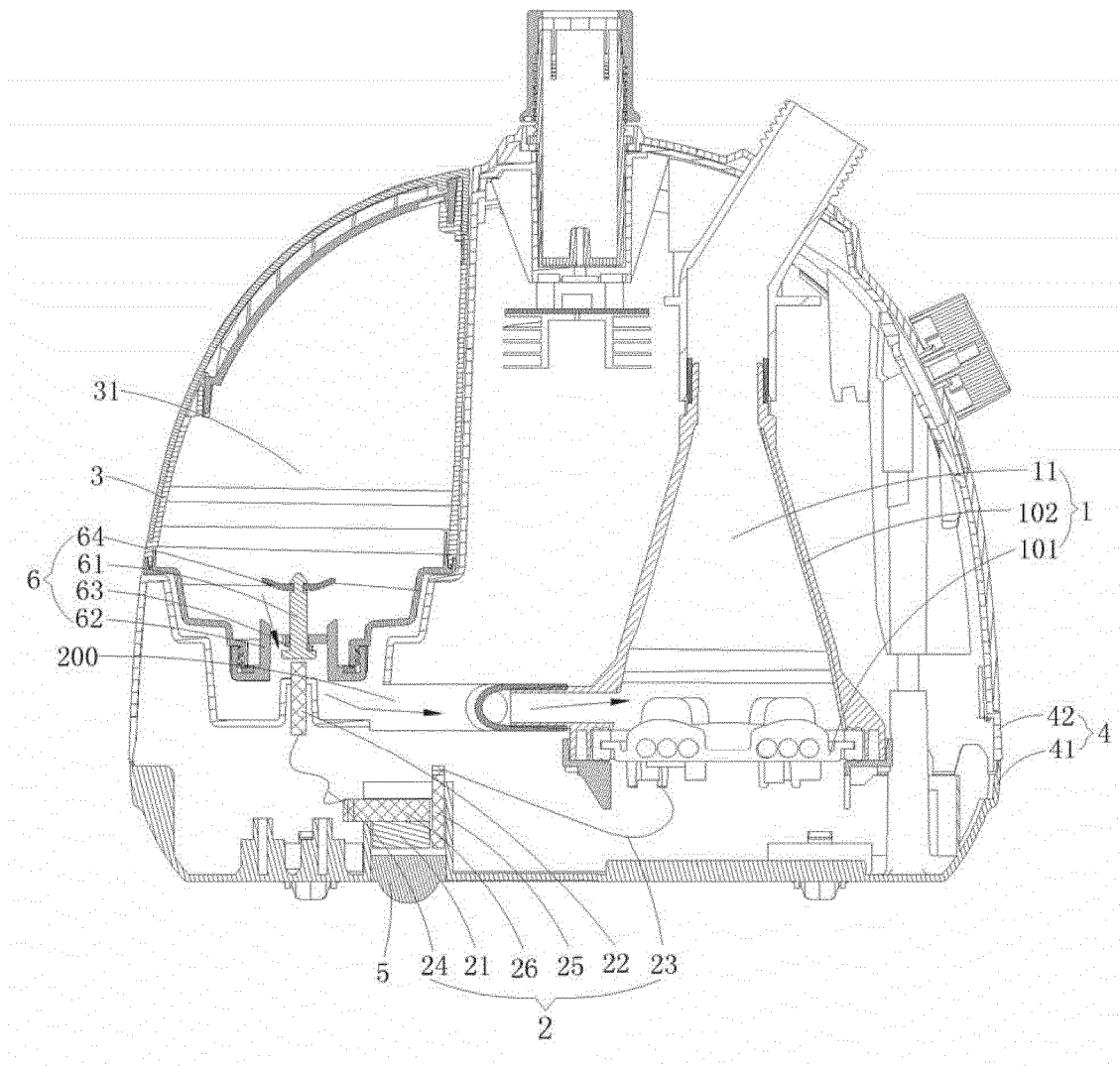


Fig. 4

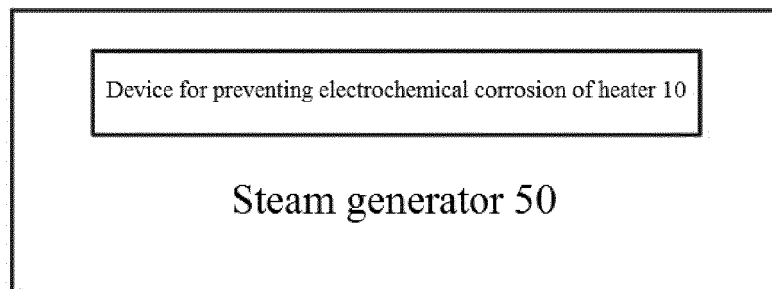


Fig. 5

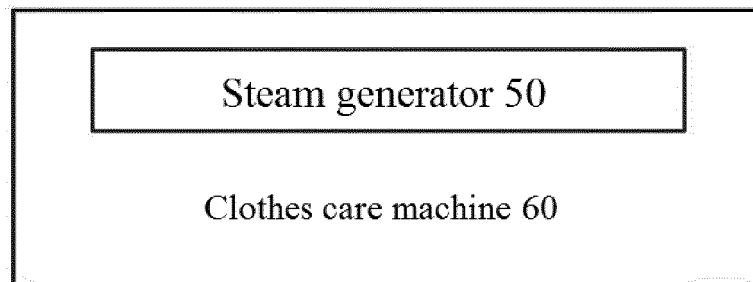


Fig. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2015/092981

A. CLASSIFICATION OF SUBJECT MATTER

C23F 13/06 (2006.01) i; D06F 75/24 (2006.01) i
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

C23F 13/-; D06F 73/-

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

CNPAT, CNKI, WPI, EPODOC: descaling machine, steamer, tank, heater, cathodic protect+, power, supply+, current loop, corros+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 104532261 A (FOSHAN SHUNDE MIDEA ELECTRICAL HEATING APPLIANCES MIDEA GROUP CO., LTD. et al.) 22 April 2015 (22.04.2015) claims 1-18, description, paragraphs [0055]-[0077], and figure 1	1-35
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PX	CN 204455664 U (FOSHAN SHUNDE MIDEA ELECTRICAL HEATING APPLIANCES MIDEA GROUP CO., LTD. et al.) 08 July 2015 (08.07.2015) claims 1-10, description, paragraphs [0073]-[0102], and figures 1-5	1-35
PX	CN 204455292 U (FOSHAN SHUNDE MIDEA ELECTRICAL HEATING APPLIANCES MIDEA GROUP CO., LTD. et al.) 08 July 2015 (08.07.2015) claims 1-15, description, paragraphs [0052]-[0067], and figure 1	1-35

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	
"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	"&" document member of the same patent family

Date of the actual completion of the international search 19 November 2015	Date of mailing of the international search report 19 January 2016
Name and mailing address of the ISA State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No. (86-10) 62019451	Authorized officer WANG, Ziyu Telephone No. (86-10) 62084847

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2015/092981

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 204474764 U (FOSHAN SHUNDE MIDEA ELECTRICAL HEATING APPLIANCES MIDEA GROUP CO., LTD. et al.) 15 July 2015 (15.07.2015) claims 1-15, description, paragraphs [0055]-[0071], and figures 1 and 2	1-35
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INTERNATIONAL SEARCH REPORT
 Information on patent family members

 International application No.
 PCT/CN2015/092981

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US 4975560 A	04 December 1990	None	
CN 201506932 U	16 June 2010	None	