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(54) **HEATING ASSEMBLY, ATOMIZER AND ELECTRONIC CIGARETTE HAVING SAME**

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A24F 47/00	(2006.01)
H05B 1/02	(2006.01)

(52) **U.S. Cl.**

CPC ***A24F 47/008*** (2013.01); ***H05B 1/0244*** (2013.01); *H05B 2203/021* (2013.01)

(58) **Field of Classification Search**

CPC A24F 25/02; A24F 11/00
USPC 131/329, 328
See application file for complete search history.

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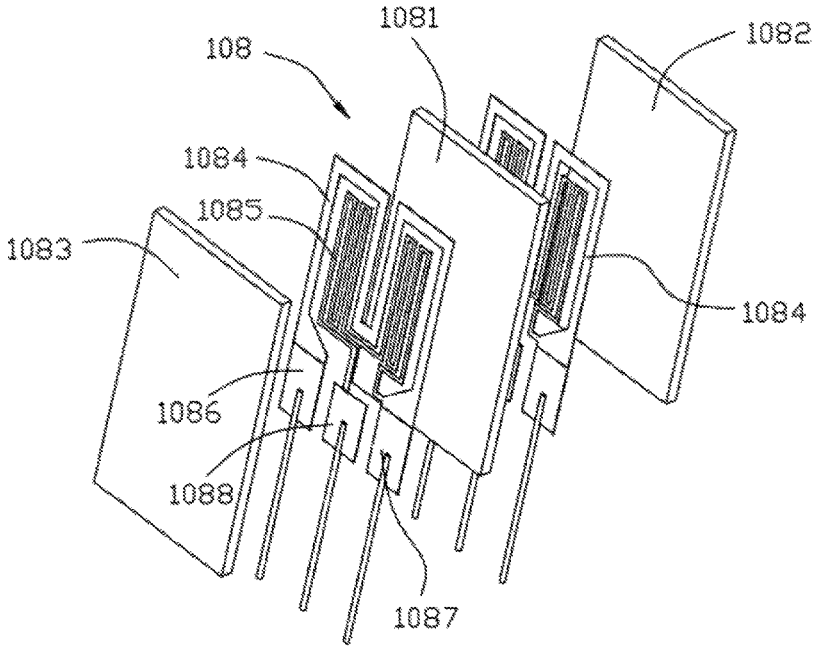
(57) **ABSTRACT**

An exemplary heating assembly includes a substrate, a heating part formed on the substrate, an electrode part connected with the heating part, and a liquid conducting body configured for absorbing tobacco liquid. The liquid conducting body is in tight contact with the substrate. The liquid conducting body is capable of conveying the tobacco liquid to the substrate.

8 Claims, 5 Drawing Sheets



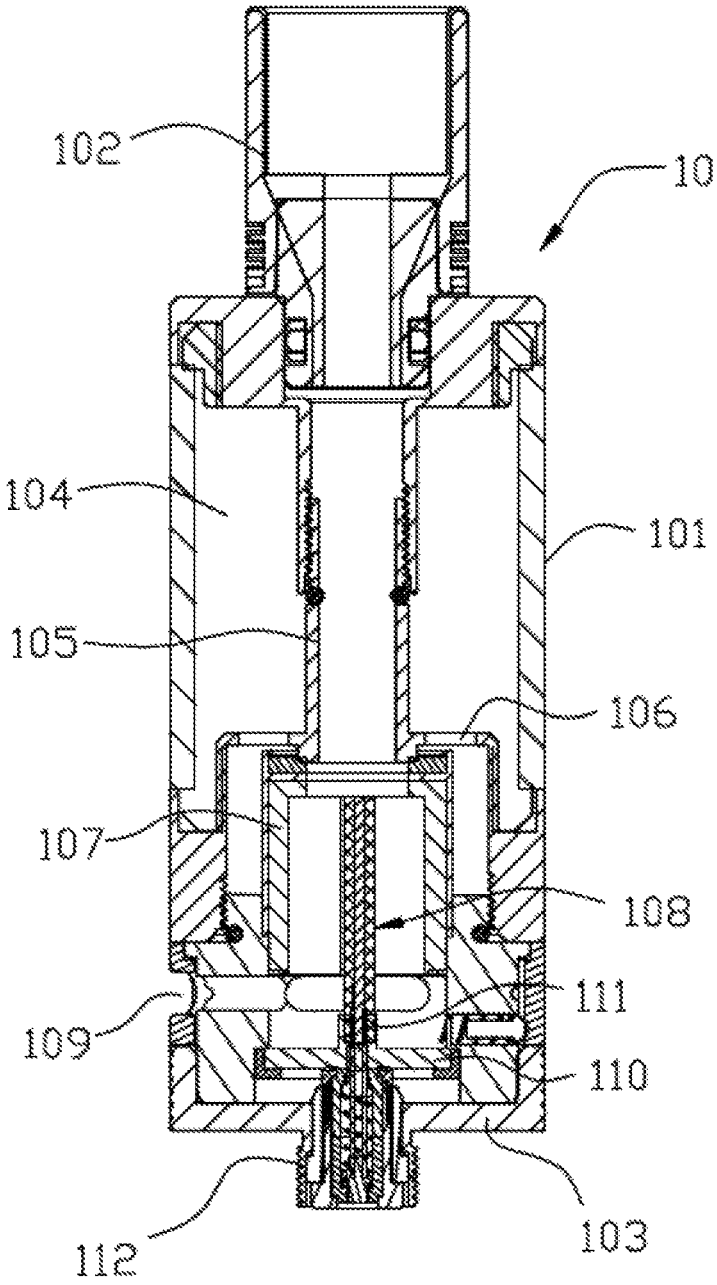


FIG. 1

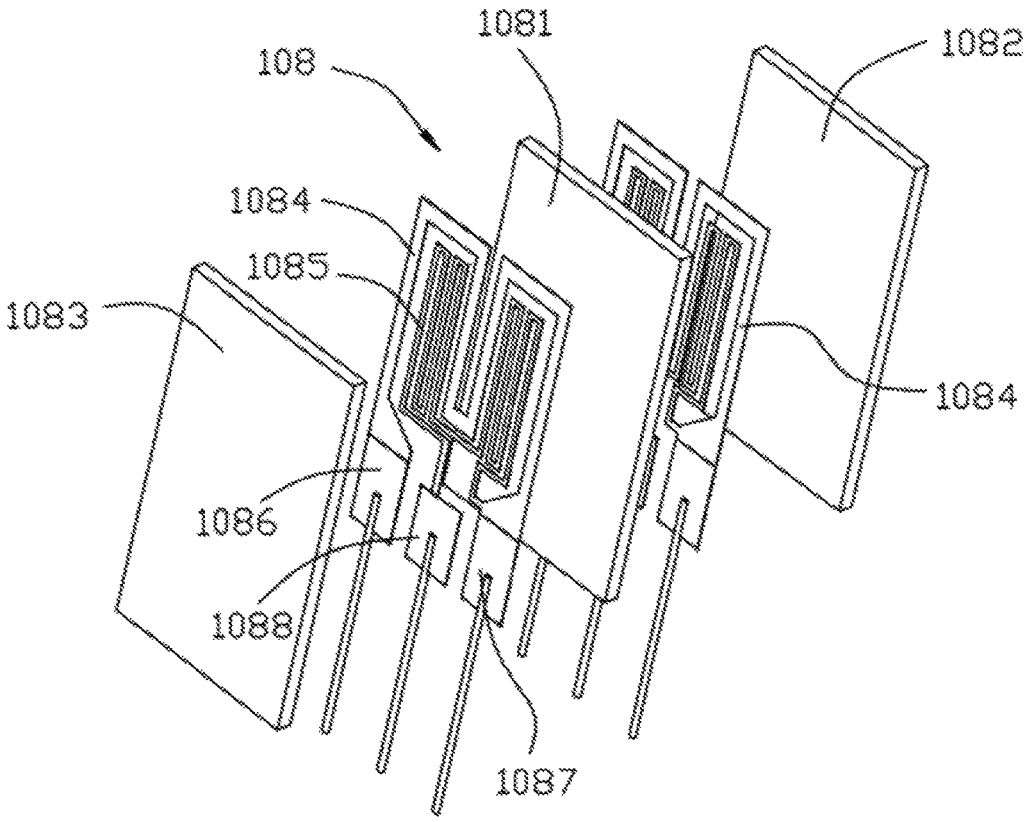


FIG. 2

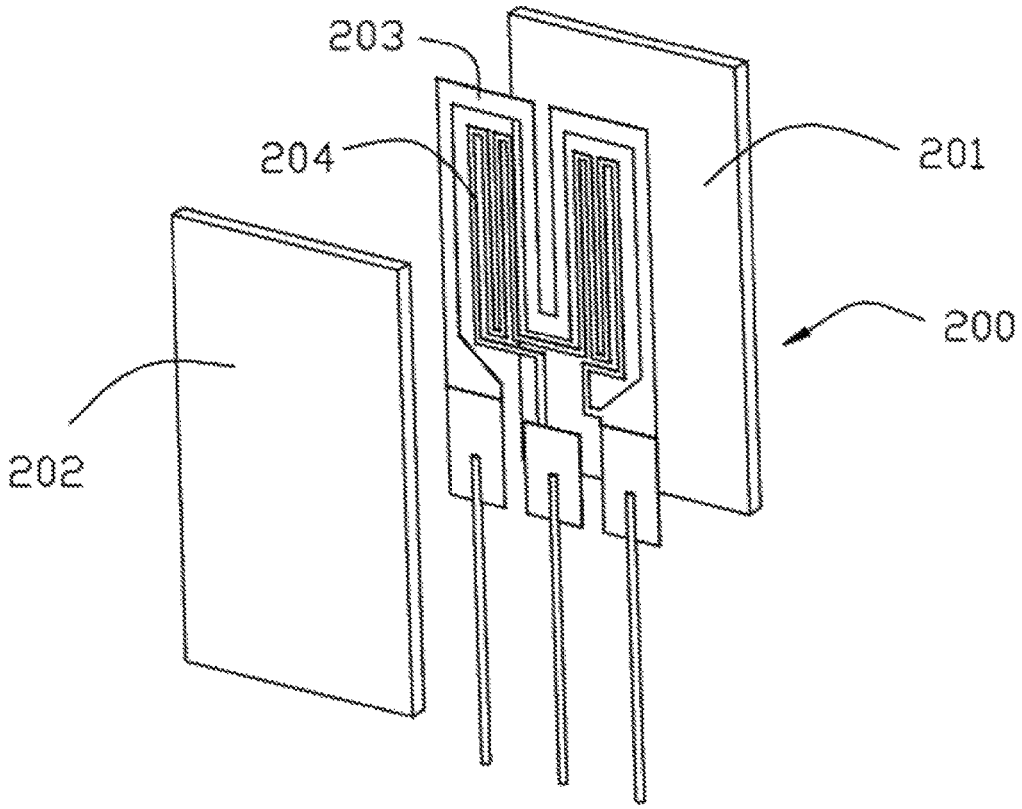


FIG. 3

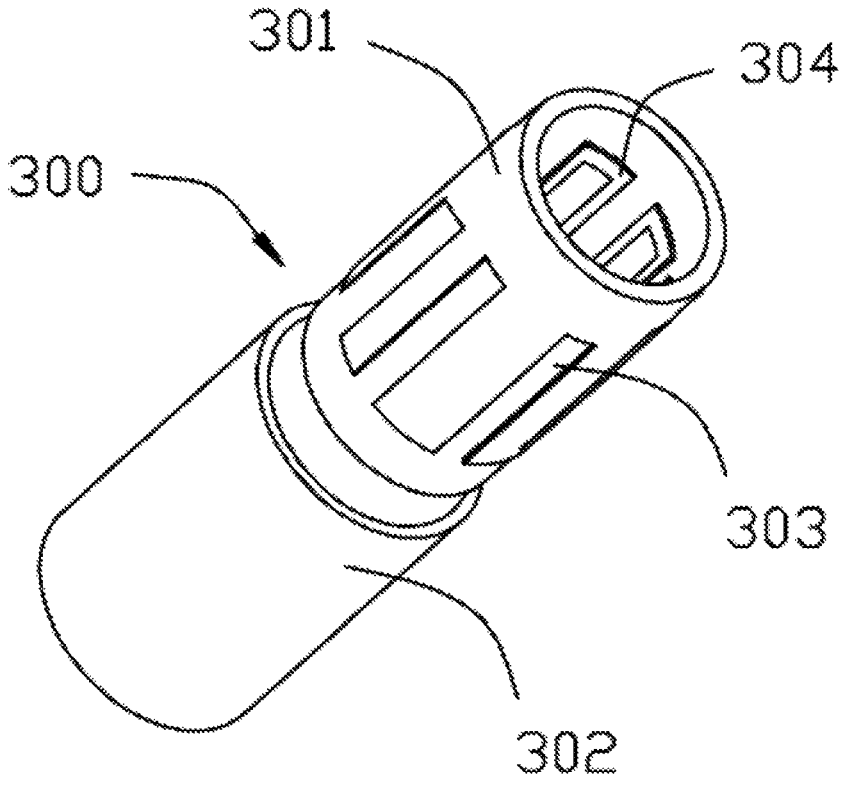


FIG. 4

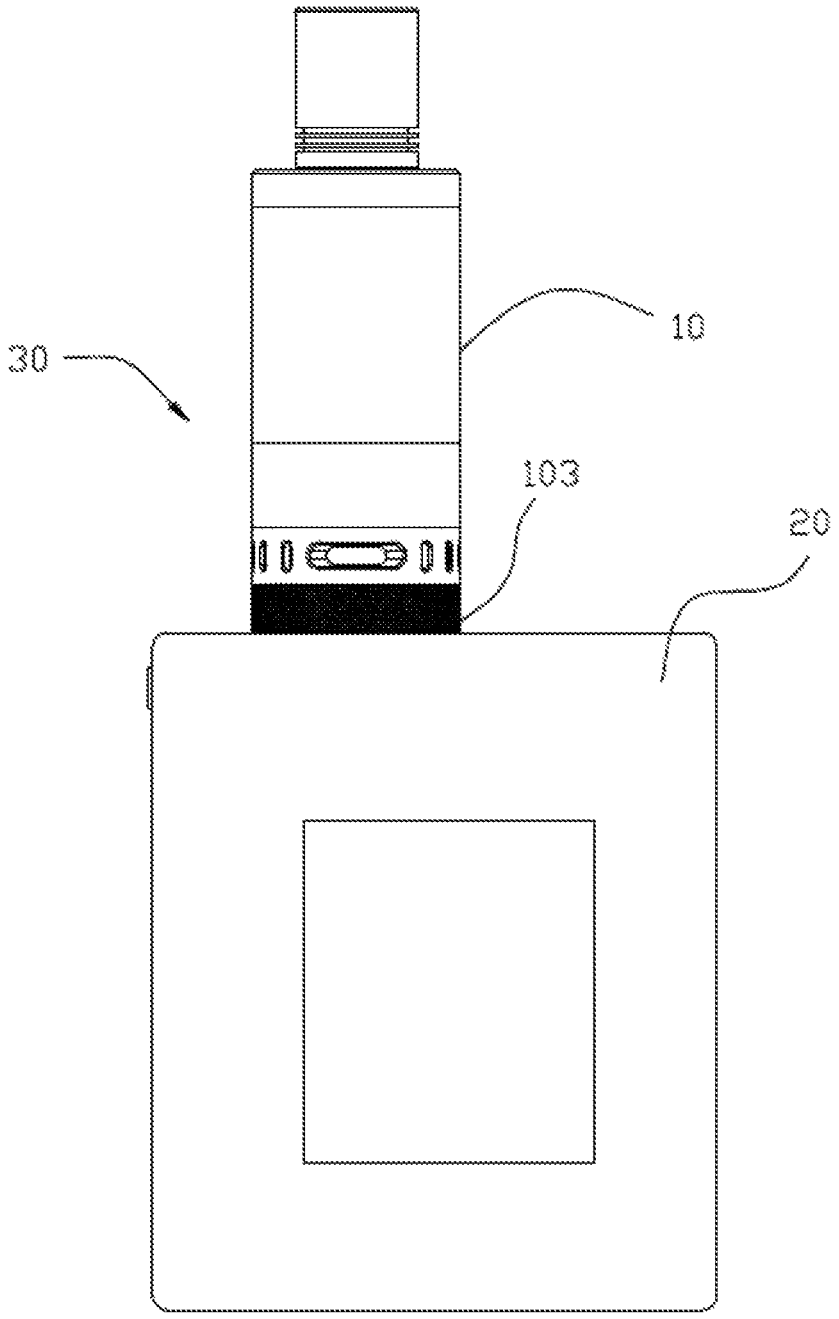


FIG. 5

HEATING ASSEMBLY, ATOMIZER AND ELECTRONIC CIGARETTE HAVING SAME

TECHNICAL FIELD

The present invention relates to electronic cigarettes, and particularly to a heating assembly, an atomizer and an electronic cigarette using same.

BACKGROUND ART

A typical heating assembly in an atomizer includes a liquid conducting body and a heating wire wrapped around the liquid conducting body. The liquid conducting body is usually made of glass fiber core. However, this kind of heating assembly may be unsuitable for atomizers of large wattage. For example, after assembling, a gap between the heating wire and a surface of the glass fiber core may be uneven. When the heating wire heats in large wattage, the glass fiber core may be burnt due to high temperature, thus rendering user experience unsatisfactory.

What are needed, therefore, are a heating assembly, an atomizer and an electronic cigarette using same, which can overcome the above shortcomings.

SUMMARY

An exemplary heating assembly includes a substrate, a heating part formed on the substrate, an electrode part connected with the heating part, and a liquid conducting body configured for absorbing tobacco liquid. The liquid conducting body is in tight contact with the substrate. The liquid conducting body is capable of conveying the tobacco liquid to the substrate.

BRIEF DESCRIPTION OF THE DRAWINGS

Many aspects of the present disclosure can be better understood with reference to the following drawings. The components in the drawings are not necessarily drawn to scale, the emphasis instead being placed upon clearly illustrating the principles of the present disclosure. Moreover, in the drawings, like reference numerals designate corresponding parts throughout the several views.

FIG. **1** is a cross-sectional view of an atomizer according to a first embodiment, including a heating assembly.

FIG. **2** is an exploded perspective view of the heating assembly in the atomizer of FIG. **1**.

FIG. **3** is an exploded perspective view of a heating assembly according to a second embodiment.

FIG. **4** is an exploded perspective view of a heating assembly according to a third embodiment.

FIG. **5** is a side view of an electronic cigarette according to a fourth embodiment.

DETAILED DESCRIPTION

It will be appreciated that for simplicity and clarity of illustration, where appropriate, reference numerals have been repeated among the different figures to indicate corresponding or analogous elements. In addition, numerous specific details are set forth in order to provide a thorough understanding of the embodiments described herein. However, it will be understood by those of ordinary skill in the art that the embodiments described herein can be practiced without these specific details. In other instances, methods, procedures and components have not been described in detail so as not to obscure the related relevant feature being described. Also, the description is not to be considered as limiting the scope of the embodiments described herein. The drawings are not necessarily to scale and the proportions of certain parts have been exaggerated to better illustrate details and features of the present disclosure.

The disclosure is illustrated by way of example and not by way of limitation in the figures of the accompanying drawings in which like references indicate similar elements. It should be noted that references to "an" or "one" embodiment in this disclosure are not necessarily to the same embodiment, and such references mean at least one.

Several definitions that apply throughout this disclosure will now be presented.

The term "outside" refers to a region that is beyond the outermost confines of a physical object. The term "inside" indicates that at least a portion of a region is partially contained within a boundary formed by the object. The term "substantially" is defined to be essentially conforming to the particular dimension, shape or other word that substantially modifies, such that the component need not be exact. For example, substantially cylindrical means that the object resembles a cylinder, but can have one or more deviations from a true cylinder. The term "comprising," when utilized, means "including, but not necessarily limited to"; it specifically indicates open-ended inclusion or membership in the so-described combination, group, series and the like.

Referring to FIG. **1**, an atomizer **10** for an electronic cigarette is shown. The atomizer **10** includes a housing **101**, a mouthpiece **102** at an end of the housing **101**, a holder **103** configured (i.e., structured and arranged) for connecting to a power supply. The holder **103** includes a plurality of screw threads **112** at a bottom end. The screw threads **112** are configured for connecting with the power supply. The housing **101** is cylindrical, and defines an air inlet **109** at a bottom part. A liquid chamber **104** and a heating assembly **108** are provided in the housing **101**. An air pipe **105** is provided between the heating assembly **108** and the mouthpiece **102**. The liquid chamber **104** is defined between the air pipe **105** and the housing **101**. Tobacco liquid in the liquid chamber **104** can flow down through the liquid hole **106**. The atomizer **10** further includes a bracket **107** configured for fixing the heating assembly **108**. The bracket **107** defines at least one gap (not shown). The heating assembly **108** absorbs the tobacco liquid flowed out of the liquid chamber via the at least one gap, and heats the tobacco liquid. In the present embodiment, the heating assembly **108** is a flat sheet, and is vertically fixed in the bracket **107**. A front side and a rear side of the heating assembly **108** are positioned in the at least one gap, so that the heating assembly **108** can absorb tobacco liquid. A structure of the heating assembly **108** will be described in detail below. When the user inhales from the mouthpiece **102**, external air enters the atomizer **10** via the air inlet **109**, and brings aerosol (generated by the heating assembly **108**) to pass through the air passage **105**, and is then sucked through the mouthpiece **102**.

Quite usefully, the holder **103** defines a slot **111** configured for coupling with the heating assembly **108**. The heating assembly **108** includes an electrode part engaged in the slot **111** to form an electrical connection. The holder **103** is detachably at a bottom part of the housing **101**. A printed circuit board is arranged in the holder **103**, and the slot **111** is formed on the circuit board. The slot **111** is similar to a slot in a personal computer, which is configured for coupling with connecting fingers of a memory bank. The heating assembly **108** can be assembled or detached very easily.

Referring to FIG. **2**, a heating assembly **108** is shown. The heating assembly **108** includes at least one substrate **1081**, a heating part **1084** formed on the substrate **1081**, and an electrode part connected with the heating part **1084**. The heating assembly **108** further includes liquid conducting bodies **1082**, **1083**. The substrate **1081** is sandwiched between the liquid conducting bodies **1082**, **1083**. The liquid conducting bodies **1082**, **1083** are in tight contact with the heating substrate **1081**, and capable of conveying tobacco liquid to the heating substrate **1081**. The electrode part includes electrodes **1086**, **1087** configured for connecting with a positive electrode and a negative electrode of a power supply. In the present embodiment, the heating assembly **108** includes three layers, the substrate **1081** is sandwiched between the liquid conducting bodies **1082**, **1083**, and the substrate **1081** includes heating parts **1084** on two opposite surfaces. It is to be understood that in other embodiments, the heating assembly **108** may include more layers arranged in an alternate fashion.

As seen in FIG. **2**, the substrate **1081**, the liquid conducting bodies **1082**, **1083** are each in the form of a flat sheet. The heating parts **1084** are metallic twists and turns patterns printed or sintered on the substrate **1081**, thus increasing a heating surface. The heating parts **1084** may be made of a material selecting from a group consisting of nickel, chromium, titanium, manganese, tungsten, molybdenum and alloy thereof. The heating parts **1084** are integrally formed with the substrate **1081** by printing or sintering, so that the heating parts **1084** can heat as a whole. The heating parts **1084** heat tobacco liquid in the liquid conducting bodies **1082**, **1083** on two side surfaces thereof.

Quite usefully, the substrate **1081** is made of ceramic, and the liquid conducting bodies **1082**, **1083** are made of micro porous ceramic. The substrate **1081** and the liquid conducting bodies **1082**, **1083** are sintered to form an integral structure. The liquid conducting bodies **1082**, **1083** can absorbs tobacco liquid slowly. The heating assembly can be assembled into the atomizer **10** conveniently. It is to be understood that, the liquid conducting bodies may be made of porous metal, sponge durable of high temperature, fiber cotton, or glass fiber. Alternatively, the substrate **1081** is made of ceramic, and the liquid conducting bodies **1082**, **1083** are cotton fiber layer pressed on surfaces of the substrate **1081**.

Quite usefully, to detect a temperature of the heating assembly **108**, a thermistor layer **1085** is formed on the substrate **1081**. The thermistor layer **1085** is insulated from the heating part **1084**. The thermistor layer **1085** is a metallic pattern in a form of twists and turns. The thermistor layer **1085** is made of metal resistance paste of positive temperature coefficient or negative temperature coefficient, and is printed on the substrate **1081**. The thermistor layer **1085** includes the common electrode **1087** (also the electrode of the heating part **1084**) and an electrode **1088**. In use of the electronic cigarette, a temperature controlling circuit of in a power supply can detect a temperature of heating assembly via the thermistor layer **1085**, and adjust an output wattage of the heating assembly, so that the temperature of the heating assembly is kept in a stable range. In the present embodiment, the thermistor layer **1085** and the heating part **1084** are formed on an identical side surface of the substrate **1081**.

Referring to FIG. **3**, the heating assembly **200** in accordance with a second embodiment is shown. The heating assembly **200** includes a substrate **201** and a liquid conducting body **202**. The liquid conducting body **202** is integrated with the substrate **201** to form of a flat sheet. The thermistor layer **204** and the heating part **203** are formed on an identical side surface of the substrate **201**, which contacts with the liquid conducting body **202**.

Referring to FIG. **4**, a cylindrical heating assembly **300** is shown. The heating assembly **300** includes a cylindrical substrate **301** and a cylindrical liquid conducting body **302**. The liquid conducting body **302** nests the substrate **301**. The heating part **303** and the thermistor layer **304** are formed on an external side surface and an internal side surface of the substrate **301**, respectively. Similar to the above embodiments, the liquid conducting body **302** may be made of micro porous ceramic, and is sintered with the substrate **301** to form an integral structure. Tobacco liquid permeates from the external side surface to the internal side surface, and is heated to form aerosol. The aerosol is then expelled via an internal cavity of the substrate **301**. The substrate **301** may further define a plurality of air outlets (not shown), thus facilitating flow of the aerosol.

Referring to FIG. **5**, an electronic cigarette **30** is shown. The electronic cigarette **30** includes the above atomizer **10** and a power supply **20**. The power supply **20** is detachably connected with the holder **103**, and configured for feeding the atomizer **10** power.

It is understood that the above-described embodiments are intended to illustrate rather than limit the disclosure. Variations may be made to the embodiments and methods without departing from the spirit of the disclosure. Accordingly, it is appropriate that the appended claims be construed broadly and in a manner consistent with the scope of the disclosure.

What is claimed is:

1. A heating assembly, comprising: a substrate; a heating part formed on the substrate; an electrode part connected with the heating part; and a liquid conducting body configured for absorbing tobacco liquid, the liquid conducting body being in tight contact with the substrate, the liquid conducting body being capable of conveying the tobacco liquid to the substrate; wherein

the heating part is a metallic pattern in twists and turns, and is formed on a side surface of the substrate in contact with the liquid conducting body; wherein

the substrate and the liquid conducting body are each in a form of a flat sheet, or cylindrical.

2. The heating assembly according to claim **1**, wherein the substrate is made of ceramic, the liquid conducting body is made of micro porous ceramic, and the substrate and the liquid conducting body are sintered to form an integral structure.

3. The heating assembly according to claim **1**, wherein the substrate is made of ceramic, the liquid conducting body is a fiber cotton layer on a surface of the substrate, and the fiber cotton layer is durable of high temperature.

4. The heating assembly according to claim **1**, further comprising a thermistor layer formed on the substrate, wherein the thermistor layer is configured for sensing a temperature of the substrate, and insulated from the heating part.

5. The heating assembly according to claim **4**, wherein the thermistor layer and the heating part are formed on an identical side surface of the substrate, or the thermistor layer and the heating part are formed on two opposite side surfaces of the substrate, respectively.

6. An atomizer comprising: a housing; a mouthpiece arranged at an end of the housing; a holder configured for connecting a power supply; a liquid chamber in the housing, the liquid chamber being configured for storing tobacco liquid; a heating assembly in the housing;

the heating assembly, comprising: a substrate; a heating part formed on the substrate; an electrode part connected with the heating part; and a liquid conducting body configured for absorbing tobacco liquid, the liquid conducting body being in tight contact with the substrate, the liquid conducting body being capable of conveying the tobacco liquid to the substrate; wherein

the heating part is a metallic pattern in twists and turns, and is formed on a side surface of the substrate in contact with the liquid conducting body; wherein

the substrate and the liquid conducting body are each in a form of a flat sheet, or cylindrical;

the heating assembly being configured for absorbing the tobacco liquid in the liquid chamber, and heating the tobacco liquid to atomize.

7. The atomizer according to claim **6**, wherein the holder defines a slot configured for coupling with the heating assembly, the electrode part is electrically connected to the holder via the slot.

8. An electronic cigarette, comprising:

an atomizer comprising: a housing; a mouthpiece arranged at an end of the housing; a holder configured for connecting a power supply; a liquid chamber in the housing, the liquid chamber being configured for storing tobacco liquid; a heating assembly in the housing;

the heating assembly, comprising: a substrate; a heating part formed on the substrate; an electrode part connected with the heating part; and a liquid conducting body configured for absorbing tobacco liquid, the liquid conducting body being in tight contact with the substrate, the liquid conducting body being capable of conveying the tobacco liquid to the substrate; wherein

the heating part is a metallic pattern in twists and turns, and is formed on a side surface of the substrate in contact with the liquid conducting body; wherein

the substrate and the liquid conducting body are each in a form of a flat sheet, or cylindrical;

the heating assembly being configured for absorbing the tobacco liquid in the liquid chamber, and heating the tobacco liquid to atomize;

a power supply detachably connected with the atomizer, the power supply being configured for feeding the atomizer power.

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