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# (54) AEROSOL FORMING DEVICE AND HEATING ASSEMBLY THEREOF

(57) An aerosol generating device (100) and a heating assembly (10). The heating assembly (10) comprises: a heating element (11), the heating element (11) being a conductive ceramic, and the heating element (11) having a first end (111) and a second end (112) arranged opposite to each other, a first electrode (14) connected to the first end (111) of the heating element (11); and a second electrode (15) connected to the second end (112) of the heating element (11). When the heating element (11) of the conductive ceramic is energized, the entire heating element (11) generates heat; the temperature field is uniform and the stability is good; and the heating element (11) is of an integrated structure, and thus has high mechanical strength and good resistance stability.

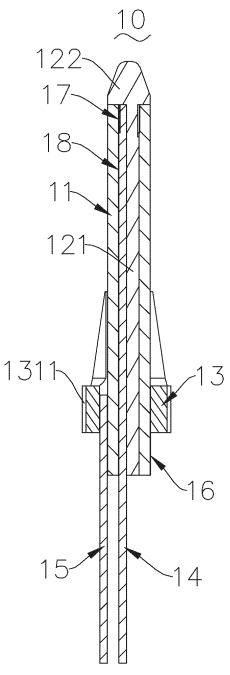


FIG. 8

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## Description

### TECHNICAL FIELD

**[0001]** The present invention relates to the field of atomization, and more particularly to an aerosol generating device and a heating assembly thereof.

### THE RELATED ART

**[0002]** A heat-not-burning type aerosol generating device is an aerosol generating device that adopts a process of heating at a low temperature and not causing burning to heat and atomize a material to generate aerosol. The heating methods of the existing heat-not-burning type aerosol generating devices are often tubular circumference heating or central penetration heating. The tubular circumference heating refers to a heating tube surrounds outside an aerosol generating substance to carry out heating on the aerosol generating substance, and the central penetration heating is inserting a heating assembly into an aerosol generating substance to carry out heating on the aerosol generating substance. The heating assembly of a known central penetration heating type device is generally of a plate type or a needle type, of which a manufacturing method is to form, through screen printing, a resistance heating circuit on a metallic or ceramic substrate, which is then covered with a glaze layer and then sintered. When electrical power is supplied to the resistance heating circuit of the heating assembly, the heating assembly generates heat to bake the aerosol generating substance, so as to generate aerosol to be vaped by a user.

**[0003]** The known heating assembly suffers the following problems:

(1) When electrical power is supplied, heat is only generated in the resistance heating circuit, and the uniformity of the heat field is poor, making baking of the aerosol generating substance insufficient.

(2) Due to limitation of the manufacturing method, the heating assembly has a multiple-layered structure, and the strength is not high and may suffer the risk of fracture failure

(3) To ensure the stability of the resistance during the course of use, the material used for the printed resistance heating circuit is a noble metal paste, which has a high cost and is easy to cause pollution to the environment if not properly recycled at the termination of the product life.

### SUMMARY OF THE INVENTION

#### Technical Problems

**[0004]** The technical issue that the present invention aims to resolve is to provide, in view of the deficiency of the prior art described above, an improved heating assembly and an aerosol generating device including the heating assembly.

#### Solution for Problems

#### Technical Solution

**[0005]** The technical solution that the present invention adopts to resolve the technical issue is to construct a heating assembly for use in an aerosol generating device, the heating assembly comprising:

a heating element, the heating element being a conductive ceramic, the heating element having a first end and a second end that are arranged opposite to each other;

a first electrode connected to the first end of the heating element; and

a second electrode connected to a second end of the heating element.

**[0006]** In some embodiments, the heating element has an outside configuration that is of a columnar form, the heating element being formed, in an interior thereof, with a through-hole, the heating assembly further comprising a support rod extending through the through-hole.

**[0007]** In some embodiments, the support rod comprises a rod portion received in the through-hole and a head portion connected to an end of the rod portion; the head portion is located outside of the through-hole, and the heating assembly is arranged to insert into the aerosol generating substance by means of the head portion.

**[0008]** In some embodiments, the head portion is in the form of a cone or a circular truncated cone, and the heating element is of a circular tubular form.

**[0009]** In some embodiments, the support rod is of an insulation material, and the support rod is further formed with a wiring passage for receiving and fixing the first electrode.

**[0010]** In some embodiments, the wiring passage is formed in an outside surface of the support rod; the heating assembly further comprises an insulation sheath for enclosing the first electrode in the wiring passage.

**[0011]** In some embodiments, the support rod is of an electrically conductive material, one end of the support rod facing the second end of the heating element being conducting with the first electrode, one end of the support rod facing the first end of the heating element being conducting with the first end of the heating element.

**[0012]** In some embodiments, a portion of the support rod that is not in contact with and conducting with the heating element is provided with an insulation layer.

**[0013]** In some embodiments, the heating assembly further comprises a first electrically conductive ring

sleeved on the support rod, the first electrode being conducting with the first end of the heating element by means of the first conductive ring.

**[0014]** In some embodiments, an inside wall surface of the heating element is in contact with and conducting with an outside wall surface of the first conductive ring.

**[0015]** In some embodiments, an end surface of the first end of the heating element is in contact with and conducting with the first conductive ring.

**[0016]** In some embodiments, the heating assembly further comprises a second conductive ring, the second electrode being conducting with the second end of the heating element by means of the second conductive ring.

**[0017]** In some embodiments, the second conductive ring is sleeved on the second end of the heating element, an inside wall surface of the second conductive ring being in contact with and conducting with an outside wall surface of the heating element.

**[0018]** In some embodiments, the first electrode is directly connected to and conducting with the first end of the heating element.

**[0019]** In some embodiments, the second electrode is directly connected to and conducting with the second end of the heating element.

**[0020]** In some embodiments, the heating assembly further comprises a retention seat, the retention seat being formed, in an interior thereof, with a fixing hole through which the heating element extends.

**[0021]** In some embodiments, the retention seat is formed with a plurality of airflow channels.

**[0022]** In some embodiments, the retention seat comprises a seat body and an extension portion extending from the seat body toward the first end of the heating element, the fixing hole longitudinally extending through the seat body and the extension portion.

**[0023]** In some embodiments, a protective layer is arranged on the outside surface of the heating element.

**[0024]** The present invention also provides an aerosol generating device, comprising the heating assembly according to any one of the above-described items.

## Advantageous Effect of the Invention

### Advantageous Effect

**[0025]** Implementation of the present invention at least includes the following advantageous effects. The heating element is of a conductive ceramic, and when energized, the entire heating element generates heat, and the temperature field is uniform and the stability is good; and the heating element is of an integrated structure, and thus has high mechanical strength and good resistance stability.

## BRIEF DESCRIPTION OF THE ATTACHED DRAINGS

### Description of the Drawings

**[0026]** Further description of the present invention will be provided below with reference to the attached drawings and embodiments, and in the drawings:

FIG 1 is a schematic three-dimensional structure diagram of a heating assembly according to a first embodiment of the present invention;

FIG 2 is a schematic cross-sectional diagram of the heating assembly shown in FIG 1;

FIG 3 is a schematic exploded view of the heating assembly shown in FIG 1;

FIG 4 is a schematic three-dimensional structure diagram of a heating assembly according to a second embodiment of the present invention;

FIG 5 is a schematic cross-sectional diagram of the heating assembly shown in FIG 4;

FIG 6 is a schematic exploded view of the heating assembly shown in FIG 4;

FIG 7 is a schematic three-dimensional structure diagram of a heating assembly according to a third embodiment of the present invention;

FIG 8 is a schematic cross-sectional diagram of the heating assembly shown in FIG 7;

FIG 9 is a schematic exploded view of the heating assembly shown in FIG 7;

FIG 10 is a schematic three-dimensional structure diagram of an aerosol generating device according to some embodiments of the present invention in a state of use; and

FIG 11 is a schematic cross-sectional diagram of the aerosol generating device shown in FIG 10.

## BEST EMBODIMENTS FOR IMPLEMENTING THE INVENTION

### Best Embodiments of the Invention

**[0027]** For clearer understanding of the technical features, objectives, and advantages of the present invention, embodiments of the present invention will be described in further detail with reference to the attached drawings. The following description expounds numerous specific details for full understanding of the present invention. However, the present invention can be imple-

mented in various ways other than what illustrated herein. Those having ordinary skill in the art may contemplate similar improvement without departing from the content of the present invention, and accordingly, the present invention is not limited to the specific embodiments disclosed hereinafter.

**[0028]** In the description of the present invention, it is appreciated that the terms "center", "longitudinal", "transverse", "length", "width", "up" "down", "top", "bottom", "inside", and "outside" as used herein to indicate directional or positional relationships are based on the directional or positional relationships depicted in the attached drawings, or the directional or positional relationships that a product of the present invention is commonly placed in regular uses thereof, and are adopted for the purposes of easy description of the present invention and for simplifying the description, rather than suggesting or implying a device or component so indicated must take a specific direction, or be constructed or operated in a specific direction, and thus should not be construed as limiting to the present invention.

**[0029]** Further, the terms "first" and "second" are used solely for the purposes of description and should not be construed as suggesting or implying relative importance or implicitly indicating the quantity of the technical feature so indicated. Thus, features that are defined as "first" and "second" explicitly or implicitly include at least one of such features. In the description of the present invention, "multiple" refers to at least two, such as two or three, unless a clear limitation is explicitly given otherwise.

**[0030]** In the present invention, unless being specifically defined or constrained, the terms "mounting", "interconnecting", "connecting", and "fixing" should be interpreted in a broad sense, for example, as being fixedly connected, or being detachably connected, or being combined as a one piece; or being mechanically connected or being electrically connected; or being directly connected or indirectly connected by means of an intervening medium, or being in communication between interiors of two elements or an interacting relationship between two elements, unless otherwise specified. For those having ordinary skill in the art, the specific meaning of such terms as used in the present invention can be appreciated according to any specific situation that they are applied.

**[0031]** FIGS. 1-3 depict a heating assembly 10 according to a first embodiment of the present invention. The heating assembly 10 is in the form of a needle, comprising heating element 11 and a first electrode 14 and a second electrode 15 respectively connected to two ends of the heating element 11.

**[0032]** The heating element 11 is provided for inserting into an aerosol generating substance to heat the aerosol generating substance, and can be made of a conductive ceramic and has a columnar outside configuration. Ceramic materials are environment friendly and pollution free, and the heating element 11 may directly contact the aerosol generating substance. By using the conductive ceramic to make the heating element 11, the heating element 11 is of an integrated structure, and the structure strength is high, and when energized, the entire heating element 11 generates heat, in which the high temperature section occupies a high ratio of the heat field so as to quickly bake the aerosol generating substance, and aerosol can be formed efficiently and the fragrance of the aerosol is strong. Further, when energized, the conductive ceramic shows uniform body heating, and the temperature field is uniform and the stability is good, not readily affected by external factors, ensuring better consistency of vaping experience for each replacement of the aerosol generating substance. The heating element 11 adopts a columnar design, and the heating field is consistent in the circumference of the columnar heating element 11, making baking of the aerosol generating substance homogeneous and completely no dead zone for baking, and there is no hot spot in the heating field of the circumference of the columnar heating element 11, ensuring mellow aroma of the aerosol, free of foreign and burnt smells.

**[0033]** The heating element 11 can be made through high temperature sintering. The heating element 11 made through high temperature sintering has a structure that is compact and is not easy to break, showing excellent stability of resistance. In some embodiments, the heating element 11 can be metallic ceramics, and the metallic ceramics is composite oxides of metals and ceramics, comprising a ceramic phase and metallic phase. The metallic phase can be one of Ni, Fe, Cu, Co, and stainless steel, or any combination thereof (including alloys). The metallic phase does not contain noble metal materials and thus has a low cost. In other embodiments, without taking cost into consideration, the metallic phase may also comprise noble metal materials. There are two purposes for including the ceramic phase: the first one being regulating the electrical resistivity of the metallic ceramics, and the second one being improving the mechanical behavior of the metallic ceramics. The ceramic phase can be one of aluminum oxide, zirconium oxide, cerium oxide, titanium oxide, manganese oxide, chromium oxide, iron oxide, nickel oxide, yttrium oxide, lanthanum oxide, samarium oxide, niobium oxide, molybdenum oxide, and zinc oxide, or any combination thereof. The electrical resistivity of the metallic ceramics relates to parameters with respect to material compositions of the metallic and ceramic phases and their respective powder morphology, ratio between the metallic phase and the ceramic phase, and sintering density. Regulation of the electrical resistivity of the metallic ceramics can be realized through controlling of the related parameters.

**[0034]** Further, it is also feasible to select proper kinds of elements and doping amount to do doping substitution in the ceramic body material of the ceramic phase to doping substation for the purposes of enhancing structural stability of the ceramic phase and improving the mechanical behavior thereof. For example, doping zirco-

nium oxide with yttrium will enhance the phase structure stability of zirconium oxide; doping aluminum oxide with zirconium will enhance toughness of aluminum oxide. It is noted that no matter what element is used and how much doping amount is used to dope and substitute the ceramic body material, it is considered within the protection scope of the present invention.

**[0035]** The heating element 11 has a first end 111 and a second end 112 arranged opposite to each other in an axial direction. In the instant embodiment, the first end 111 is an upper end of the heating element 11, and the second end 112 is a lower end of the heating element 11. According to requirements for uses, electrical resistivity of the heating element 11 can be consistent or in consistent from the second end 112 to the first end 111. For example, the electrical resistivity of the heating element 11 is the same from the second end 112 to the first end 111, in order to make heating uniform. In another example, the electrical resistivity of the heating element 11 at the first end 111 is greater than the electrical resistivity of the heating element 11 at the second end 112 to suit the need for a relatively high temperature at the first end 111, while a relatively low temperature at the second end 112. As a further example, the electrical resistivity of the heating element 11 is gradually decreased from the first end 111 to the second end 112, in order to suit the need for temperature dropping from the first end 111 to the second end 112.

**[0036]** The first electrode 14 and the second electrode 15 are provided for connecting with an external power supply, and are respectively in connection with the first end 111 and the second end 112 of the heating element 11. The first electrode 14, the second electrode 15 can be made directly conducting with the heating element 11 by means of coating with electrically conductive pastes or soldering, and can also be made indirectly conducting with the heating element 11 through an intermediate conductive member. When a voltage is applied to the two, upper and lower, ends of the heating element 11 through the first electrode 14 and the second electrode 15, an electrical current flows through the heating element 11 to generate heat, fulfilling baking and heating of the aerosol generating substance. Such an input form through the upper and lower electrodes ensures there is no need to take a design of opening slits in the heating element 11, thereby enhancing heating uniformity, uniformity of baking of the aerosol generating substance being good. The first electrode 14 and the second electrode 15 have low electrical resistivity, and they can be, in some embodiments, electrode filaments, such as aluminum filaments or silver filaments.

**[0037]** Further, the heating element 11 can be made in an interior-hollowed tubular form, of which the interior is formed with a through-hole 110 penetrating therethrough in a longitudinal direction (namely an axial direction of the heating element 11). The heating assembly 10 may further comprise a support rod 12 extending through the through-hole 110. The support rod 12 enhances the overall strength of the heating assembly 10 to prevent the heating assembly 10 from breaking during the course of use.

**[0038]** The support rod 12 may comprise a rod portion 121 received in the through-hole 110 and a head portion 122 connected to an upper end of the rod portion 121 and located outside of the through-hole 110. The heating assembly 10 is insertable into the aerosol generating substance by means of the head portion 122. The head portion 122 may include a cap structure, and during the course of insertion of the heating assembly 10 into the aerosol generating substance, the cap structure protects the tubular heating element 11 to prevent the frictional force between the tubular heating element 11 and the aerosol generating substance from becoming excessively large to damage the heating element 11. Further, the head portion 122 can be processed for smoothening, such as being processed for tip sharpening, for the purposes of reducing the frictional force between the head portion 122 and the aerosol generating substance to ease the insertion of the head portion 122 into the aerosol generating substance. Specifically, in the instant embodiment, the heating element 11 is of a circular tubular form, and the head portion 122 is in the form of a cone or a circular truncated cone. A lower end face of the head portion 122 is supported on an upper end face of the heating element 11. An outside diameter of a lower end of the head portion 122 is equal to an outside diameter of the heating element 11. The rod portion 121 is in the form of a cylinder, and a lower end face of the rod portion 121 is flush with a lower end face of the heating element 11.

**[0039]** The support rod 12 can be an electrically conductive material, and can also be an insulation material. Specifically, in the instant embodiment, the support rod 12 is made of an insulation material, such as ceramics, for example zirconia ceramic. The first electrode 14 can be extended with the rod portion 121 to be conducting with the upper end of the heating element 11. Further, the rod portion 121 may also be formed with a wiring passage 1210. The wiring passage 1210 is provided for wiring arrangement of the first electrode 14 and fixing the first electrode 14. Specifically, the wiring passage 1210 can be formed in an outside surface of the rod portion 121, and extending longitudinally from a lower end face of the rod portion 121 to an upper end face of the rod portion 121. The support rod 12 carrying the first electrode 14 is received through the through-hole 110 of the heating element 11, and glass glaze or ceramic coating may be applied for adhesive bonding between the support rod 12 and the heating element 11, and also, circuit conducting between the first electrode 14 and the upper end of the heating element 11 is fulfilling through coating electrically conductive paste or soldering.

**[0040]** Further, the heating assembly 10 may further comprise an insulation sheath 18. The insulation sheath 18 can be made of an insulation material, such as glass glaze or ceramic materials. The insulation sheath 18

encloses the first electrode 14 in the wiring passage 1210 to isolate the first electrode 14 from an inside surface of the heating element 11, preventing shorting caused by contact of the first electrode 14 with the heating element 11 in the interior of tube. Understandably, in other embodiments, measures of making an insulation coating layer on the first electrode 14 can be taken to achieve the purposes of preventing shorting caused by contact of the first electrode 14 with the heating element 11 in the interior of tube. In some other embodiments, the wiring passage 1210 can be made in a hole structure formed in interior of the rod portion 121, and under such a condition, there is no need to provide the insulation sheath 18, and the rod portion 121 may fulfill the purposes of preventing shorting caused by contact of the first electrode 14 with the heating element 11 in the interior of tube.

**[0041]** A contact site of connection of the first electrode 14 with the upper end of the heating element 11 can be selected to be on the upper end face of the heating element 11, or can also be selected to be on an upper end inside wall surface of the heating element 11. The heating assembly 10 may further comprise a first electrically conductive ring 17 that is made in an annular form. The first electrode 14 is connected to the upper end of the heating element 11 by means of the first electrically conductive ring 17. The first electrically conductive ring 17, compared to the heating element 11, possesses lower electrical resistivity, so that an electrical current in the first electrode 14 first flows through the annular first electrically conductive ring 17, to thereby increase a contact area of the first electrode 14 and the heating element 11, enhancing stability of connection between the first electrode 14 and the heating element 11. Specifically, in the instant embodiment, the first electrode 14 is connected to the upper end inside wall surface of the heating element 1, and the first electrically conductive ring 17 can be a metallic collar that is fitted around the upper end of the rod portion 121, and the first electrode 14 is conducting with the first electrically conductive ring 17, and an outside wall surface of the first electrically conductive ring 17 is in contact with and conducting with an upper end inside wall surface of the heating element 11, to thereby increase the contact area of the first electrode 14 and an upper end inside wall surface of the heating element 11, enhancing stability of connection of the first electrode 14 with the heating element 11.

**[0042]** In other embodiments, the first electrode 14 can be connected to the upper end face of the heating element 11. The first electrically conductive ring 17 can be a metal plate in an annular form and interposed between the lower end face of the head portion 122 and the upper end face of the heating element 11. The first electrode 14 is conducting with the first electrically conductive ring 17, and the lower end face of the annular first electrically conductive ring 17 is in contact with and conducting with the annular upper end face of the heating element 11, to thereby increase the contact area of the first electrode 14 and the upper end face of the heating element 11, enhancing stability of connection of the first electrode 14 with the heating element 11.

**[0043]** A contact site of connection of the second electrode 15 with the lower end of the heating element 11 can be selected to be on a lower end outside wall surface, a lower end inside wall surface, or the lower end face of the heating element 11. Further, the heating assembly 10 may further comprise a second conductive ring 16 that is made in an annular form. The second electrode 15 is connected to the lower end of the heating element 11 by means of the second conductive ring 16. The second conductive ring 16, compared to the heating element 11, possesses lower electrical resistivity, so that an electrical current in the second electrode 15 first flows through the annular second conductive ring 16, to thereby increase a contact area of the second electrode 15 and the heating element 11, enhancing stability of connection between the second electrode 15 and the heating element 11. Specifically, in the instant embodiment, the second conductive ring 16 can be a metallic collar that is fitted around the lower end of the heating element 11, and the second electrode 15 is conducting with an outside wall surface of the second conductive ring 16, and an inside wall surface of the second conductive ring 16 is in contact with and conducting with the lower end outside wall surface of the heating element 11. In other embodiments, the second electrode 15 is made connected to the lower end inside wall surface or the lower end face of the heating element 11, and the shape and position of the second conductive ring 16 can be adjusted accordingly.

**[0044]** Further, the heating assembly 10 may further comprise a retention seat 13. The retention seat 13 is formed longitudinally with a fixing hole 130 in the interior thereof to receive the heating element 11 to extend therethrough. The lower end of the heating element 11 can be fixed in the fixing hole 130 of the retention seat 13 by means of for example adhering. The retention seat 13 is provided for contact with other external components to thereby fulfill fixing and positioning of the entirety of the heating assembly 10. In some embodiments, the retention seat 13 can be made of a temperature-resistance material, such as ceramics or polyetheretherketone (PEEK).

**[0045]** Further, in some embodiments, the heating assembly 10 may further comprise a protective layer. The protective layer can be arranged on an outside surface of the heating element 11 and the head portion 122, and can be made of high thermal conductivity material, such as a glass glaze layer or a ceramic coating layer. A thickness of the protective layer is generally less than 0.1mm. While not affecting heat transfer from the heating element 11 to the aerosol generating substance, the protective layer offers protection to the heating element 11 enclosed therein to reduce corrosion of the heating element 11 by oxygen and impurities, preventing reaction occurring between the heating element 11 and the aerosol generating substance during heating, extending the service life of the heating assembly 10, and also improving surface

smoothness of the heating assembly 10 to reduce sticking of the aerosol generating substance to the heating assembly 10 after heating.

**[0046]** FIGS. 4-6 depict a heating assembly 10 according to a second embodiment of the present invention, of which a main difference from the first embodiment is that in the instant embodiment, the support rod 12 of the heating assembly 10 uses an electrically conductive material, such as being made of a metallic electrically conductive material. Under this condition, the first electrode 14 is connected to the upper end of the heating element 11 by means of the support rod 12.

**[0047]** Specifically, in the instant embodiment, the support rod 12 is directly conducting with the upper end of the heating element 11. A contact site of connection of the support rod 12 with the upper end of the heating element 11 can be selected to be on the upper end face and/or the upper end inside wall surface of the heating element 11. Remaining positions of the support rod 12 that are not conducting with the heating element 11 require arrangement of an insulation layer thereon to prevent said remaining positions of the support rod 12, which are not conducting with the heating element 11, from contacting and thus becoming shorting, with the heating element 11. The first electrode 14 can be connected to and conducting with the lower end of the support rod 12 by means of coating of an electrically conductive paste or soldering. A contact site of connection of the first electrode 14 with the lower end of the support rod 12 can be selected to be on the lower end face or the lower end outside wall surface of the rod portion 121, so that there is no need to form a wiring passage in the rod portion 121 for wiring arrangement of the first electrode 14. Further, similar to the above-described first embodiment, the heating assembly 10 may also comprise a first electrically conductive ring made in an annular form, and the support rod 12 can be connected to the upper end of the heating element 11 by means of the first conductive ring, to thereby increase a contact area between the support rod 12 and the upper end of the heating element 11, fulfilling stable connection of the support rod 12 with the upper end of the heating element 11.

**[0048]** Connection arrangement and connection position between the second electrode 15 and the lower end of the heating element 11 are similar to the above-described first embodiment. For example, the second electrode 15 may be directly conducting with the lower end of the heating element 11 by means of electrically conductive paste or soldering; or, the second electrode 15 may be conducting with the second conductive ring 16 by means of electrically conductive paste or soldering, and may then be conducting with the lower end of the heating element 11 by way of the second conductive ring 16.

**[0049]** FIGS. 7-9 illustrate a heating assembly 10 according to a third embodiment of the present invention, of which a main difference from the first embodiment is that in the instant embodiment, the retention seat 13 of the heating assembly 10 is further formed with a plurality of airflow channels 131, and during vaping, airflows inwardly flows, from bottom to top, from the plurality of airflow channels 131, the airflows can be pre-heated to thereby reduce loss of heat and enhance utilization of heat. The structure of the airflow channels 131 may comprise a trough structure formed in an outside wall surface of the retention seat 13, or a trough structure formed in a hole wall surface of the fixing hole 130, or a hole structure penetrating, upwards and downwards, through the retention seat 13 and separated from the fixing hole 130, or a trough structure communicating between inside and outside walls of the retention seat 13.

**[0050]** Specifically, in the instant embodiment, the retention seat 13 may comprise a seat body 131 and an extension portion 132 extending upwards from an upper end face of the seat body 131. The fixing hole 130 longitudinally extend through the seat body 131 and the extension portion 132. , Each of the airflow channels 131 may comprise a first channel 1311 formed in the seat body 131 and a second channel 132 formed in the extension portion 132 and in communication with the first channel 1311.

**[0051]** The seat body 131 can be made, in a cross section thereof, in a plate form, which is non-circular or circular, and the outside surface of the seat body 131 is made to match an external component for setting a position of the heating assembly 10 in the external component. The first channel 1311 can be formed in the outside surface of the seat body 131, and extends from the lower end outside surface of the seat body 131 to the upper end outside surface of the seat body 131.

**[0052]** The extension portion 132 extends upwards from the upper end face of the seat body 131 to enhance the effect of fixing the heating element 11 by the retention seat 13. A cross-sectional outside shape of the extension portion 132 can be the same as or different from a cross-sectional outside shape of the seat body 131. In the instant embodiment, the cross-sectional outside shape of the seat body 131 is generally a closed U-shape, and the cross-sectional outside size of the seat body 131 is constant from the lower end to the upper end. There are four first channels 1311, and the four first channels 1311 are respectively formed in four outside surfaces of the seat body 131. The outside shape of the extension portion 132 can be a circular truncated cone of which an outside diameter gradually reduces from bottom to top. An outside diameter of the lower end of the extension portion 132 can be smaller than the length and/or width of the cross section of the seat body 131, so that a stepped surface is formed between the extension portion 132 and the seat body 131. The stepped surface can be used for purposes of positioning of the retention seat 13 in the external component.

**[0053]** There are four second channels 132, and the four second channels 132 are respectively corresponding to and communicating with the four first channels 1311 to form four airflow channels 131. Each of the

second channels 132 longitudinally extends upwards from the lower end face of the extension portion 132 to the upper end face of the extension portion 132, and each of the second channels 132 extends through inside and outside walls of the extension portion 132 to thereby split the extension portion 132 four extension arms 1322 that are arranged at intervals circumferentially. Understandably, in other embodiments, the quantities of the first channels 1311, the second channels 132, and the airflow channels 131 are not necessarily four, and they can also be one, two, three, or more than four.

**[0054]** Connection arrangement and connection position between the first electrode 14 and the upper end of the heating element 11 are similar to the above-described first embodiment. For example, the first electrode 14 may be conducting with an inside wall surface of the first electrically conductive ring 17, and may then be conducting with the upper end of the heating element 11 by means of the first electrically conductive ring 17. A difference of the instant embodiment from the above-described first embodiment is that in the instant embodiment, the first electrically conductive ring 17 is made in the form of an open ring having a narrow opening in one side. The first electrically conductive ring 17 made in the form of an open ring possesses certain elasticity to ease mounting of the first electrically conductive ring 17, and to allow the first electrically conductive ring 17 to be elastically clamped on an upper end of the rod portion 121 and the first electrode 14, making the connection more secure. In other embodiments, the first electrode 14 can be directly conducting with the upper end of the heating element 11 by means of electrically conductive paste or soldering.

**[0055]** Connection arrangement and connection position between the second electrode 15 and the lower end of the heating element 11 are similar to the above-described first embodiment. For example, the second electrode 15 may be directly conducting with the lower end of the heating element 11 by means of electrically conductive paste or soldering; or, the second electrode 15 may be conducting with the outside wall surface of the second conductive ring 16, and may then be conducting with the lower end of the heating element 11 by way of the second conductive ring 16. Understandably, in other embodiments, the second conductive ring 16 can be made in the form of an open ring having a narrow opening in one side.

**[0056]** Understandably, the above embodiments are only simplified models of the present invention. Without departing from the technical principles of the present invention, the structural form can also be improved and components be added or omitted, which are all within the scope of protection of the present invention.

**[0057]** FIGS. 10-11 depict an aerosol generating device 100 according to some embodiments of the present invention. The aerosol generating device 100 is operable to heat, for low temperature baking, an aerosol generating substance 200 inserted therein, in order to release, under a not-burning condition, an aerosol extract from the aerosol generating substance 200. The aerosol generating substance 200 can be of a cylindrical form, and the aerosol generating device 100 is generally in the form of a square column. Understandably, in other embodiments, the aerosol generating device 100 is not limited to a square column, and can alternatively be in other forms, such as a circular column and an elliptic column.

**[0058]** The aerosol generating device 100 comprises a housing 30 and a heating assembly 10, an accommodation tube 20, a battery 40, and a main body 50 received in the housing 30. The heating assembly 10 can be the heating assembly of any of the above-described embodiments.

**[0059]** An inside wall surface of the accommodation tube 20 defines an accommodation space 21, in which the aerosol generating substance 200 can be received and accommodated. A top wall of the housing 30 is formed with an insertion opening 31 for receiving insertion of the aerosol generating substance 200 therethrough. The aerosol generating substance 200 is insertable through the insertion opening 31 into the accommodation space 21. An upper end of the heating assembly 10 is extendable into the accommodation space 21 to insert into interior of the aerosol generating substance 200 for being supplied with electricity to generate heat for subjecting the aerosol generating substance 200 to baking and heating. The main body 50 is electrically connected to respectively the battery 40, the heating assembly 10. The main body 50 is provided with a related control circuit arranged thereon, and a switch arranged on the housing 30 is operable to control connection/disconnection between the battery 40 and the heating assembly 10.

**[0060]** Understandably, each of the technical features described above can be arbitrability combined without being constrained in any way.

**[0061]** The above embodiments are provided solely for illustrating the preferred ways of implementation of the present invention, and the descriptions thereof are made specific and in detail, but should not be construed as limiting to the scope of patent protection of the present invention. It is noted that for those having ordinary skill in the art, unconstrained combinations of the above-described features can be contemplated to make various variations and improvements, without departing from the inventive idea of the present invention, and these all belong to the protection scope of the present invention. Thus, alterations and modifications of equivalency to the claims of the present invention all belong to the scope of coverage of the claims of the present invention.

## Claims

**1.** A heating assembly, for heating an aerosol generating substance (200), **characterized in that** the heating assembly comprises:

a heating element (11) made of a conductive ceramic, the heating element (11) having a first end (111) and a second end (112) that are arranged opposite to each other;
a first electrode (14) connected to the first end (111) of the heating element (11); and
a second electrode (15) connected to a second end (112) of the heating element (11).

**2.** The heating assembly according to claim 1, **characterized in that** the heating element (11) has a configuration that is of a columnar form, the heating element (11) being formed, in an interior thereof, with a through-hole (110), the heating assembly further comprising a support rod (12) extending through the through-hole (110).

**3.** The heating assembly according to claim 2, **characterized in that** the support rod (12) comprises a rod portion (121) received in the through-hole (110) and a head portion (122) connected to an end of the rod portion (121); the head portion (122) is located outside of the through-hole (110), and the heating assembly is configured to insert into the aerosol generating substance (200) by means of the head portion (122).

**4.** The heating assembly according to claim 3, **characterized in that** the head portion (122) is in the form of a cone or a circular truncated cone, and the heating element (11) is of a circular tubular form.

**5.** The heating assembly according to claim 2, **characterized in that** the support rod (12) is made of an insulation material, and the support rod (12) is further formed with a wiring passage (1210) for receiving and fixing the first electrode (14).

**6.** The heating assembly according to claim 5, **characterized in that** the wiring passage (1210) is formed in an outside surface of the support rod (12); the heating assembly further comprises an insulation sheath (18) for enclosing the first electrode (14) in the wiring passage (1210).

**7.** The heating assembly according to claim 2, **characterized in that** the support rod (12) is made of an electrically conductive material, one end of the support rod (12) facing the second end (112) of the heating element (11) being conducting with the first electrode (14), one end of the support rod (12) facing the first end (111) of the heating element (11) being conducting with the first end (111) of the heating element (11).

**8.** The heating assembly according to claim 7, **characterized in that** a portion of the support rod (12) that is not in contact with and conducting with the heating element (11) is provided with an insulation layer.

**9.** The heating assembly according to any one of claims 2-8, **characterized in that** the heating assembly further comprises a first electrically conductive ring (17) sleeved on the support rod (12), the first electrode (14) being conducting with the first end (111) of the heating element (11) by means of the first electrically conductive ring (17).

**10.** The heating assembly according to claim 9, **characterized in that** an inside wall surface of the heating element (11) is in contact with and conducting with an outside wall surface of the first electrically conductive ring (17).

**11.** The heating assembly according to claim 9, **characterized in that** an end surface of the first end (111) of the heating element (11) is in contact with and conducting with the first electrically conductive ring (17).

**12.** The heating assembly according to any one of claims 1-8, **characterized in that** the heating assembly further comprises a second conductive ring (16), the second electrode (15) being conducting with the second end (112) of the heating element (11) by means of the second conductive ring (16).

**13.** The heating assembly according to claim 12, **characterized in that** the second conductive ring (16) is sleeved on the second end (112) of the heating element (11), an inside wall surface of the second conductive ring (16) being in contact with and conducting with an outside wall surface of the heating element (11).

**14.** The heating assembly according to any one of claims 1-8, **characterized in that** the first electrode (14) is directly connected to and conducting with the first end (111) of the heating element (11).

**15.** The heating assembly according to any one of claims 1-8, **characterized in that** the second electrode (15) is directly connected to and conducting with the second end (112) of the heating element (11).

**16.** The heating assembly according to any one of claims 1-8, **characterized in that** the heating assembly further comprises a retention seat (13), the retention seat (13) being formed, in an interior thereof, with a fixing hole (130) through which the heating element (11) extends.
The heating assembly according to claim 16, **characterized in that** the retention seat (13) is formed with a plurality of airflow channels (133).

**18.** The heating assembly according to claim 16, **characterized in that** the retention seat (13) comprises a seat body (131) and an extension portion (132) extending from the seat body (131) toward the first end (111) of the heating element (11), the fixing hole (130) longitudinally extending through the seat body (131) and the extension portion (132).

**19.** The heating assembly according to any one of claims 1-8, **characterized in that** a protective layer is arranged on the outside surface of the heating element (11).

**20.** An aerosol generating device, **characterized by** comprising the heating assembly according to any one of claims 1-19.

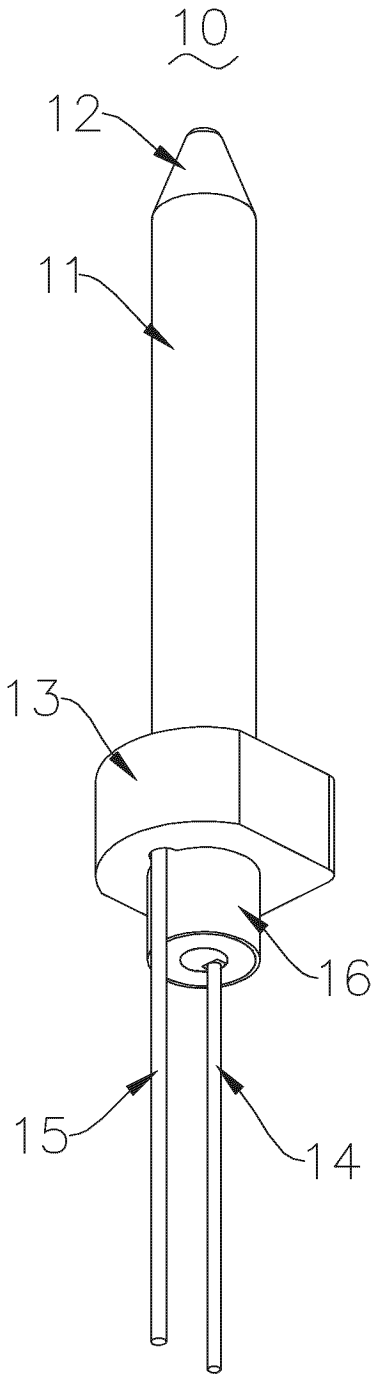


FIG. 1

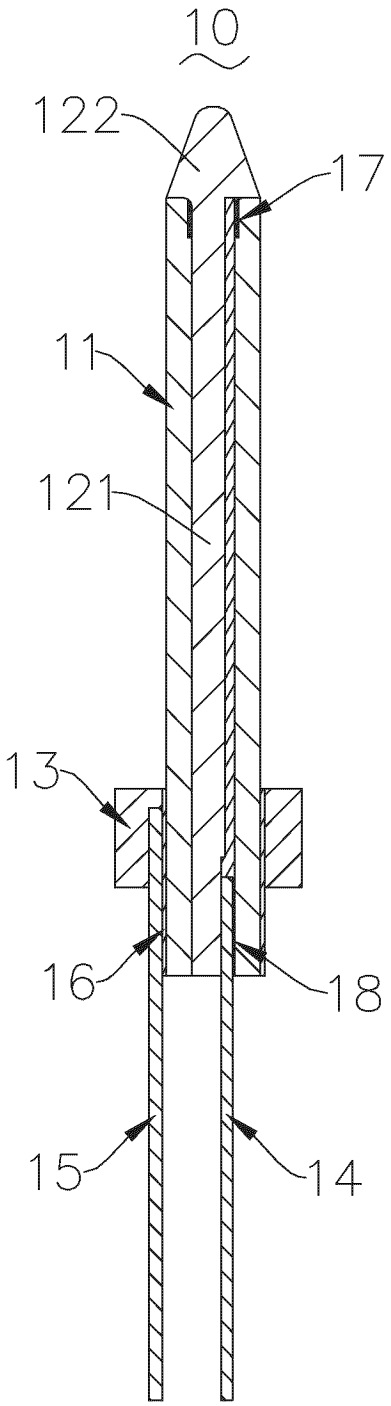


FIG. 2

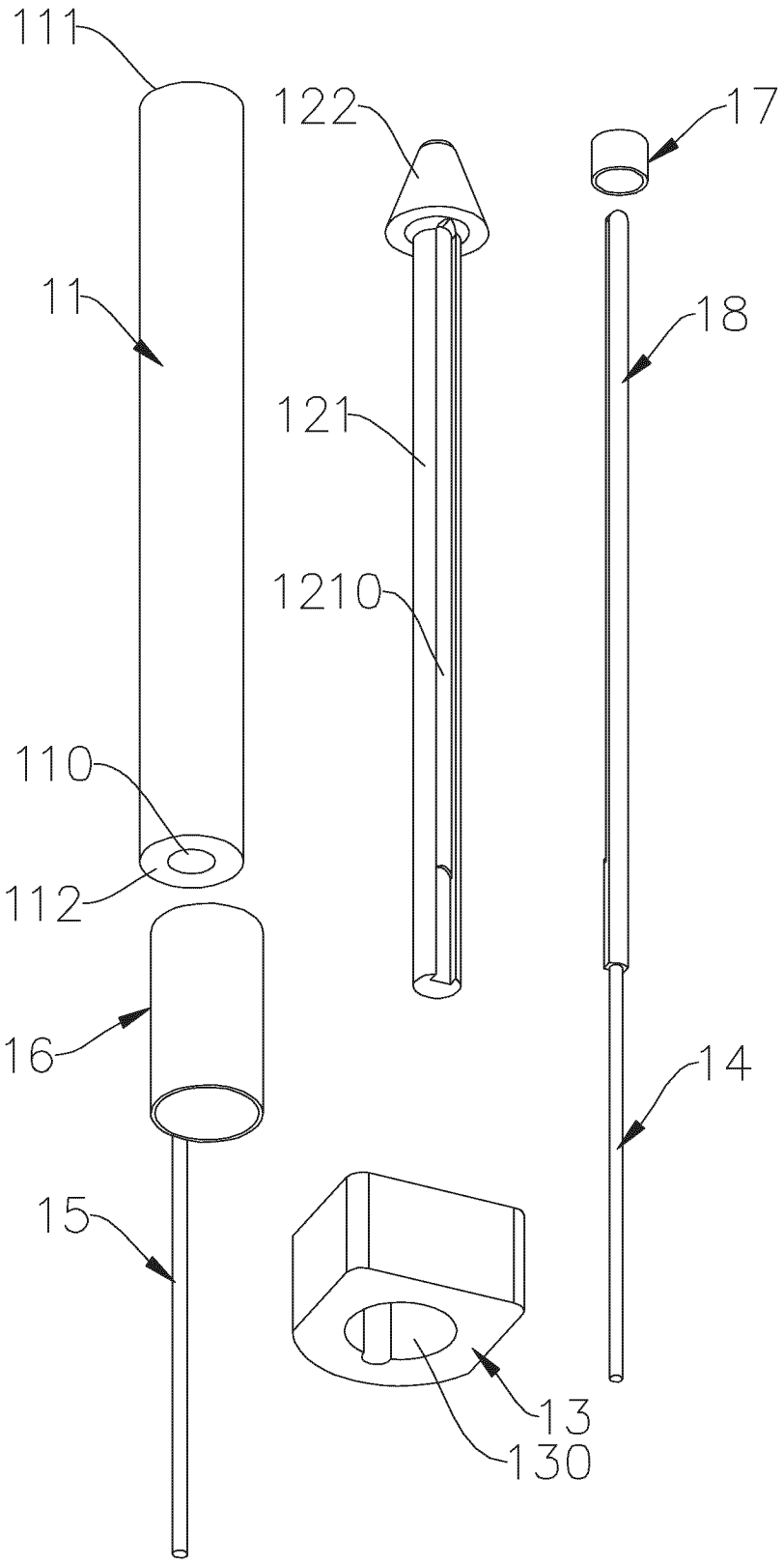


FIG. 3

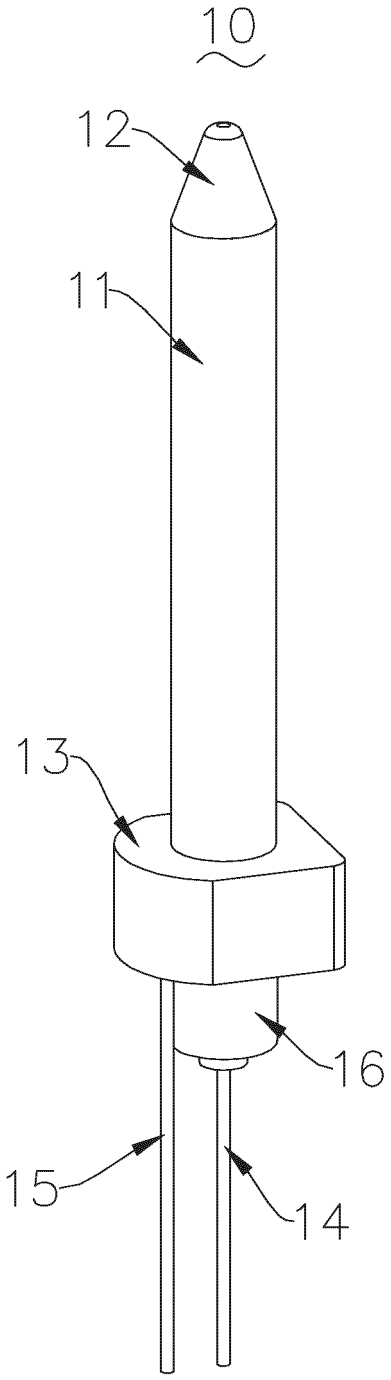


FIG. 4

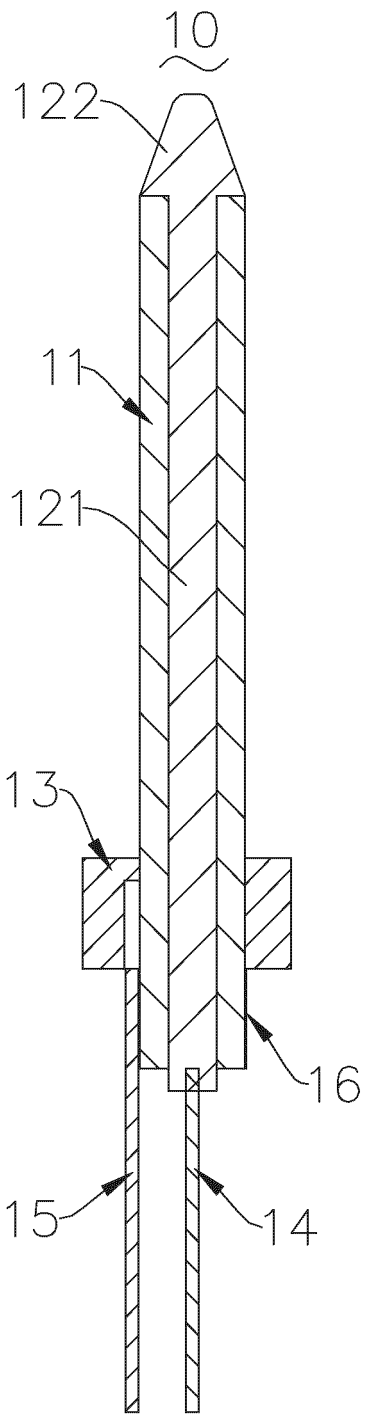


FIG. 5

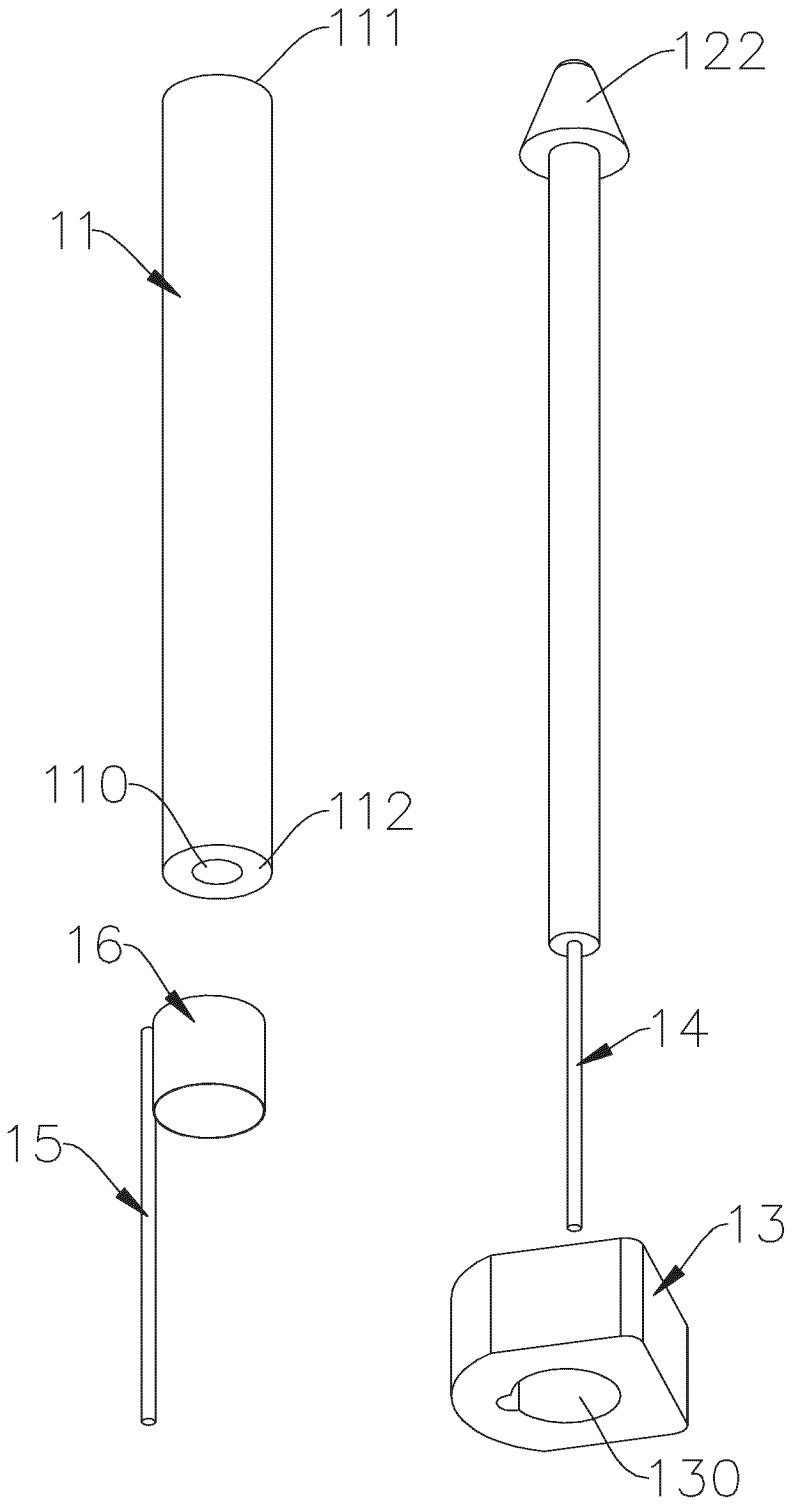


FIG. 6

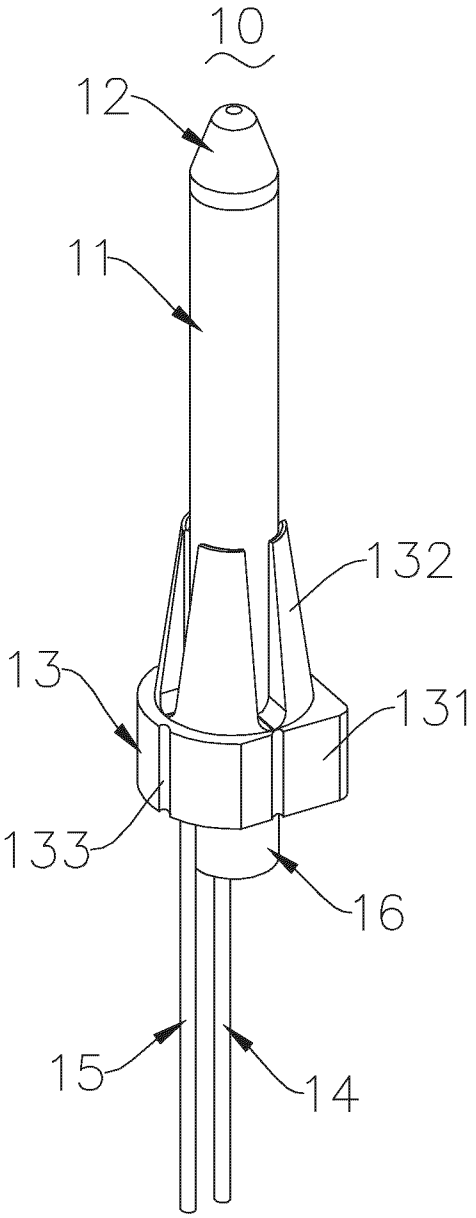


FIG. 7

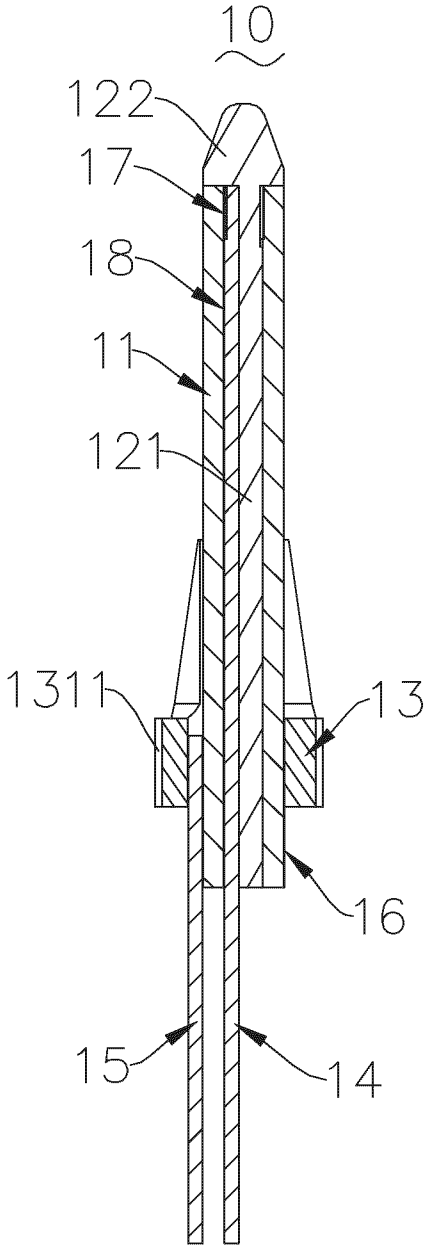


FIG. 8

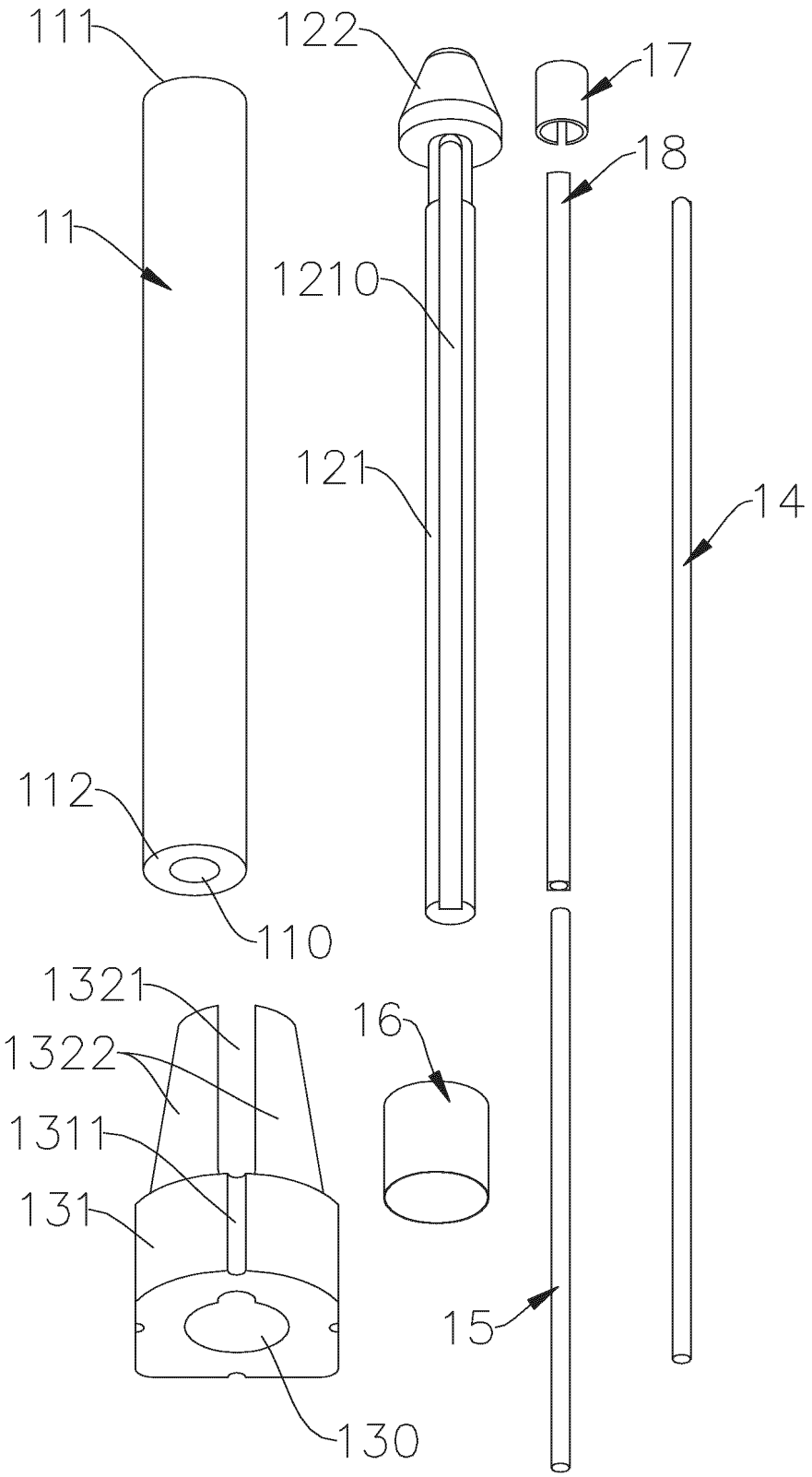


FIG. 9

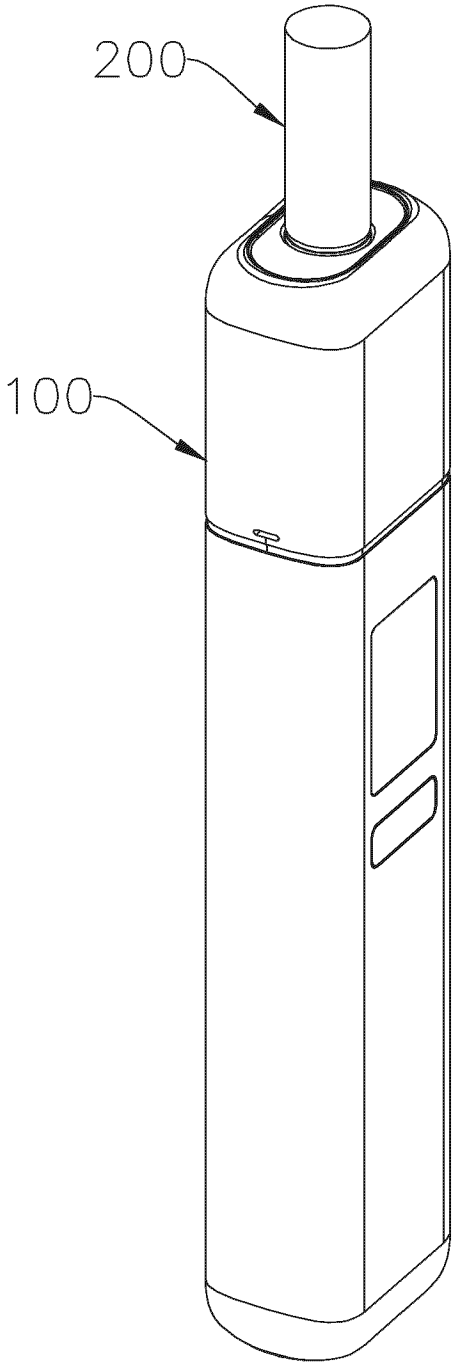


FIG. 10

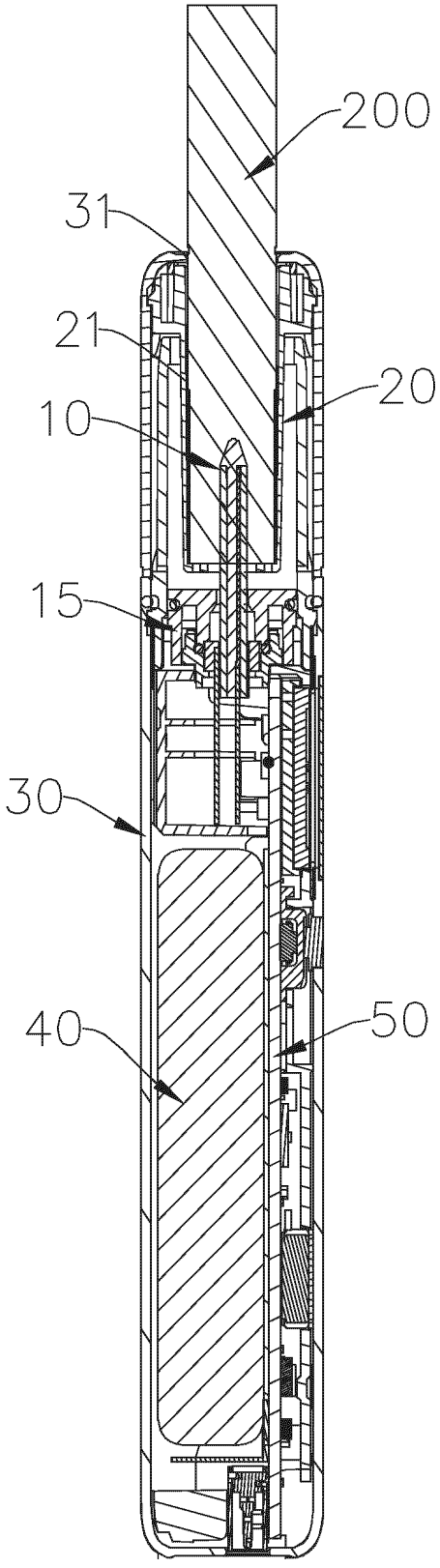


FIG. 11

## INTERNATIONAL SEARCH REPORT

International application No.
**PCT/CN2022/131759**

**A. CLASSIFICATION OF SUBJECT MATTER**

A24F 40/46(2020.01)i; A24F 40/40(2020.01)i; A24F 40/50(2020.01)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)

A24F,A61M

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)

CNKI, GOOGLE, CNABS, JPABS, VEN, WPABS, ENTXTC, WPABSC, WOTXT, USTXT, EPTXT, CNTXT, ISI Web of Knowledge: 海南摩尔兄弟科技有限公司, 发热体, 陶瓷, 通孔, 电极, heating body, conductive ceramic, electrode, channel

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| PX | CN 114587023 A (HAINAN MOROBROTHER SCIENCE AND TECHNOLOGY CO., LTD.) 07 June 2022 (2022-06-07) claims 1-20 | 1-20 |
| PX | CN 217309181 U (HAINAN MOROBROTHER SCIENCE AND TECHNOLOGY CO., LTD.) 30 August 2022 (2022-08-30) claims 1-20 | 1-20 |
| X | CN 113080527 A (SHENZHEN SMOORE TECHNOLOGY LTD.) 09 July 2021 (2021-07-09) claims 1-20, description, pages 3-6, and figures 3-11 | 1-20 |
| X | CN 111035070 A (SHENZHEN MAISHI TECHNOLOGY CO., LTD.) 21 April 2020 (2020-04-21) claims 1-20, and figures 1-6 | 1, 16, 20 |
| A | EP 3711569 A1 (NERUDIA LTD.) 23 September 2020 (2020-09-23) entire document | 1-20 |
| A | KR 20190016907 A (KT & G CORP.) 19 February 2019 (2019-02-19) entire document | 1-20 |

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

* Special categories of cited documents:
"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
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"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
"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
"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
"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
"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| **04 January 2023** | **28 January 2023** |

| Name and mailing address of the ISA/CN | Authorized officer |
|---|---|
| **China National Intellectual Property Administration (ISA/CN)**<br>**No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088, China** | |
| Facsimile No. **(86-10)62019451** | Telephone No. |

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2022/131759

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | WO 2020193217 A1 (NERUDIA LTD.) 01 October 2020 (2020-10-01)<br>entire document | 1-20 |

Form PCT/ISA/210 (second sheet) (January 2015)

**INTERNATIONAL SEARCH REPORT**
**Information on patent family members**

International application No.
**PCT/CN2022/131759**

| Patent document cited in search report | | | Publication date (day/month/year) | Patent family member(s) | | | Publication date (day/month/year) |
|---|---|---|---|---|---|---|---|
| CN | 114587023 | A | 07 June 2022 | None | | | |
| CN | 217309181 | U | 30 August 2022 | None | | | |
| CN | 113080527 | A | 09 July 2021 | None | | | |
| CN | 111035070 | A | 21 April 2020 | EP | 4088590 | A1 | 16 November 2022 |
| | | | | WO | 2021139491 | A1 | 15 July 2021 |
| | | | | KR | 20220124738 | A | 14 September 2022 |
| EP | 3711569 | A1 | 23 September 2020 | EP | 3942900 | A1 | 26 January 2022 |
| | | | | WO | 2020193220 | A1 | 01 October 2020 |
| KR | 20190016907 | A | 19 February 2019 | None | | | |
| WO | 2020193217 | A1 | 01 October 2020 | TW | 202038759 | A | 01 November 2020 |
| | | | | EP | 3941233 | A1 | 26 January 2022 |
| | | | | EP | 3711562 | A1 | 23 September 2020 |

Form PCT/ISA/210 (patent family annex) (January 2015)