(19) Europäisches Patentamt / European Patent Office / Office européen des brevets

(11) **EP 4 501 153 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
05.02.2025 Bulletin 2025/06

(21) Application number: **23806610.4**

(22) Date of filing: **27.03.2023**

(51) International Patent Classification (IPC):
A24F 40/46 *(2020.01)* ***A24F 40/40*** *(2020.01)*

(52) Cooperative Patent Classification (CPC):
H05B 7/06; A24F 40/40; A24F 40/46; H05B 7/18

(86) International application number:
PCT/CN2023/083995

(87) International publication number:
WO 2023/221652 (23.11.2023 Gazette 2023/47)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(30) Priority: **19.05.2022 CN 202221202267 U**

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(54) HEATING BODY AND HEATING ATOMIZATION DEVICE

(57) A heating body (10), comprising a first electrode (100) and a second electrode (200) used for generating a plasma arc. The first electrode (100) is spaced apart from the second electrode (200) and is adapted to be in direct contact with a medium to be atomized, the plasma arc is located between the first electrode (100) and the second electrode (200), and heat generated by the plasma arc is transmitted, by means of the first electrode (100), to the medium to be atomized.

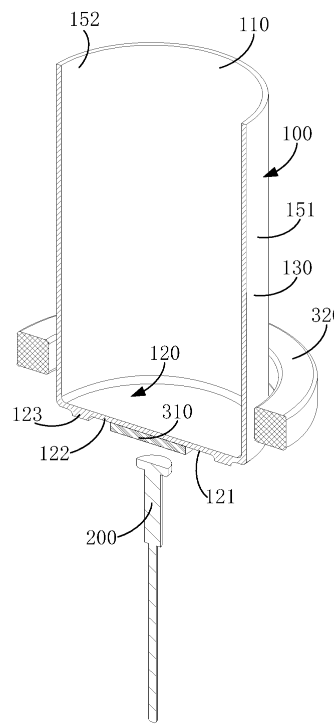

FIG. 3

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Description

TECHNICAL FIELD

[0001] The present application relates to the field of heating atomization technologies, and in particular, to a heating body and a heating atomization device including the heating body.

BACKGROUND

[0002] Heating atomization devices are usually used to heat solid atomization media so that the atomization media is atomized by heating without burning to form an aerosol that can be inhaled by the user. The heating body of a conventional heating atomization device usually adopts a resistance heating or electromagnetic induction heating mode to heat and atomize the atomization media. However, the above heating mode usually has defect of a long preheating waiting time, which affects a heating speed of the atomization media.

SUMMARY

[0003] A technical problem solved by the present application is how to increase a heating speed of the heating body.

[0004] A heating body includes a first electrode and a second electrode that are configured to generate a plasma arc. The first electrode is spaced apart from the second electrode and is configured to be in direct contact with an atomization medium, the plasma arc is located between the first electrode and the second electrode, and heat generated by the plasma arc is transmitted to the atomization medium through the first electrode.

[0005] A heating atomization device includes the heating body described in any one of the above.

[0006] The details of one or more embodiments of the present application are set forth in the accompanying drawings and the description below. Other features, objects, and advantages of the present application will become apparent from the description, drawings, and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] In order to better describe and illustrate the embodiments and/or examples of the inventions disclosed herein, reference may be made to one or more of the accompanying drawings. The additional details or examples used to describe the accompanying drawings should not be considered as limiting the scope of any of the present application, the embodiments and/or examples currently described, and the best modes of the present application currently understood.

FIG. 1 is a schematic perspective view of a heating body provided in a first embodiment.

FIG. 2 is an another schematic perspective view of the heating body shown in FIG. 1.

FIG. 3 is a schematic perspective sectional view of the heating body shown in FIG. 1.

FIG. 4 is a schematic perspective view of a heating body provided in a second embodiment.

FIG. 5 is a schematic sectional view of the heating body shown in FIG. 4.

FIG. 6 is a schematic perspective sectional view of the heating body shown in FIG. 4.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0008] In order to facilitate the understanding of the present application, the present application will be described more fully below with reference to the relevant drawings. The preferred embodiments of the present application are given in the drawings. However, the present application can be implemented in many different forms and is not limited to the embodiments described herein. On the contrary, the purpose of providing these embodiments is to make the application of the present application more thoroughly and comprehensively understood.

[0009] It should be noted that when an element is referred to as being "fixed to" another element, it may be directly on another element or centered elements may also be present. When an element is referred to be "connected to" another element, it may be directly connected to another element or centered elements may also be present. The terms "inside", "outside", "left", "right" and similar expressions used herein are for illustrative purposes only and are not meant to be the only implementations.

[0010] Referring to FIG. 1, FIG. 2 and FIG. 3, a heating atomization device provided in an embodiment of the present application includes a heating body 10 and a power supply. The heating body 10 includes a first electrode 100 and a second electrode 200. The first electrode 100 is connected to a negative electrode of the power supply, so the first electrode 100 is used as a cathode. The second electrode 200 is connected to a positive electrode of the power supply, so the second electrode 200 is used as an anode. Of course, the first electrode 100 can also be used as an anode, and the second electrode 200 can also be used as a cathode. In a case of direct current, a temperature of the cathode is higher, which is more conducive for atomization. The first electrode 100 and the second electrode 200 are not in contact with each other and are spaced apart from each other. Both the first electrode 100 and the second electrode 200 are configured to generate a plasma arc. When the power supply supplies power to the first electrode 100 and the second electrode 200, the plasma arc is located between the first electrode 100 and the second electrode 200. The voltage loaded on the first electrode 100 and the second electrode 200 can be 10kV to 20kV. The first electrode 100 is in direct contact with an atomization medium, which may be in a solid state in the form of powder or paste, or in a liquid state. Heat generated by the plasma arc is transmitted to the atomization medium through the first electrode 100, so that the atomization medium is heated and atomized to form an aerosol that can be inhaled by the user.

[0011] Referring to FIG. 1, FIG. 2 and FIG. 3, in some embodiments, the first electrode 100 is a pot-shaped structure provided with an accommodating cavity 110. The accommodating cavity 110 is used to accommodate the atomization medium, and the plasma arc is located outside the accommodating cavity 110.

[0012] The first electrode 100 of the pot-shaped structure includes a bottom plate 120 and a side tube 130. The bottom plate 120 can be disc-shaped and extend in a horizontal direction, and the side tube 130 is annular and extends in a vertical direction. The bottom plate 120 is located at an end of the side tube 130. The side tube 130 is connected to a periphery of the bottom plate 120, so that the side tube 130 surrounds the bottom plate 120. The side tube 130 and the bottom plate 120 together enclose the accommodating cavity 110, and the accommodating cavity 110 is an open cavity with one end closed and another end open. The second electrode 200 is a columnar structure. The second electrode 200 is located outside the accommodating cavity 110 and is directly below the bottom plate 120, so that the second electrode 200 and the bottom plate 120 are spaced apart along an axial direction of the entire heating body 10. The second electrode 200 can also be a sheet-shaped structure. When power is supplied to the first electrode 100 and the second electrode 200, a plasma arc will be generated between the second electrode 200 and the bottom plate 120, and the bottom plate 120 and the side tube 130 will absorb the heat generated by the plasma arc and conduct it to an atomization medium in the accommodating cavity 110, so that the atomization medium absorbs the heat of the bottom plate 120 and atomizes. The first electrode 100 can be made of a metal or ceramic conductive material, such as stainless steel. The first electrode 100 also has high thermal conductivity and low heat capacity, so that the first electrode 100 quickly heats up after absorbing heat, ensuring that the atomization medium reaches the atomizing temperature in a short time, thereby increasing an atomizing speed of the atomization medium and a heating speed of the heating body 10.

[0013] A temperature of the plasma arc is relatively high, and when the first electrode 100 absorbs the heat generated by the plasma arc, a temperature of the first electrode 100 can reach 200°C to 450°C. This greatly shortens a preheating time of the atomization medium to within 20 seconds, for example, within 10 seconds, etc., ensuring that the atomization medium can be atomized to form an aerosol within a short time when the user inhales, and ultimately improving the heating speed of the entire heating body 10.

[0014] In fact, the heat of the first electrode 100 of the pot-shaped structure comes from three aspects. The first is the heat generated by the plasma arc. The second is heat generated by a resistance of the first electrode 100 itself. The third is heat generated by an impact between the plasma arc and the bottom plate 120. In view of three heat sources of the first electrode 100, the temperature of the first electrode 100 can be raised to an atomization temperature of the atomization medium in a short time, ensuring that the atomization medium is quickly atomized to increase the heating speed of the heating body 10.

[0015] The heating body 10 may further include an insulating member 310. The bottom plate 120 has a bottom surface 121, which is located outside the accommodating cavity 110 and spaced apart from the second electrode 200. The insulating member 310 is attached to the bottom surface 121. The insulating member 310 has a certain thickness. A value range of the thickness of the insulating member 310 may range from 0.3mm to 1mm. For example, the thickness of the insulating member 310 may be 0.3mm, 0.8mm or 1mm. In view of the thickness of the insulating member 310, the insulating member 310 is protruded from the bottom surface 121. The insulating member 310 is located within a coverage range of the bottom surface 121, so that a certain distance is maintained between a periphery of the insulating member 310 and a periphery of the bottom surface 121. In a case where both the bottom plate 120 and the insulating member 310 are disk-shaped, in order to ensure that the insulating member 310 is within the coverage range of the bottom surface 121, the bottom plate 120 and the insulating member 310 can be coaxially arranged, and a diameter of the bottom plate 120 will be larger than a diameter of the insulating member 310, for example, the diameter of the bottom plate 120 ranges from 6mm to 12mm, and the diameter of the insulating member 310 ranges from 4mm to 10mm. The second electrode 200 can be directly fixed and attached to a surface of the insulating member 310 that is arranged away from the bottom plate 120, and the insulating member 310 can effectively prevent the first electrode 100 and the second electrode 200 from being electrically connected to each other. Alternatively, the second electrode 200 is located directly below the insulating member 310, so that the second electrode 200 and the insulating member 310 are spaced apart along an axial direction of the heating body 10.

[0016] By providing the insulating member 310, the plasma arc is roughly an annular planar arc, and the annular planar arc is set around the insulating member 310. In this way, the coverage area of the plasma arc can be reasonably expanded, thereby increasing a heating area of the plasma arc on the bottom plate 120, making heating of the bottom plate 120 more uniform, and minimizing or eliminating temperature gradient on the bottom plate 120, to achieve uniform heating of the atomization medium by the first electrode 100.

[0017] The heating body 10 may further include an annular magnetic member 320, which may be a permanent magnet. The annular magnetic member 320 is in a closed loop shape and is arranged around a central axis of the side tube 130. The annular magnetic member 320 and the bottom surface 121 of the bottom plate 120 are spaced apart along an axial direction of the heating body 10. A distance in the axial direction may range from 0mm to 4mm, and its specific value may be 0mm, 1mm or 4mm, etc. The annular magnetic member 320 may be located above the bottom surface 121 or below the bottom surface 121, and the annular magnetic member 320 may be a samarium cobalt magnet. By providing the annular magnetic member 320, the annular magnetic member 320 will generate an annular magnetic field in up-and-down directions, making the plasma arc more planar, ensuring that the plasma arc is arranged around the insulating member 310 and is more evenly distributed around the insulating member 310, and further improving heating uniformity of the bottom plate 120, so that the first electrode 100 uniformly heats the atomization medium.

[0018] The bottom plate 120 includes a flat plate portion 122 and an annular protruding portion 123. The flat plate portion 122 is directly connected to an end of the side tube 130. The bottom surface 121 is located on the flat plate portion 122. The annular protruding portion 123 protrudes from and is connected to the bottom surface 121, that is, the annular protruding portion 123 protrudes a certain height relative to the bottom surface 121. At the same time, the annular protruding portion 123 can be arranged around the above-mentioned insulating member 310. By providing the annular protruding portion 123, it can also play a role in enhancing the uniform heating of the bottom plate 120, and further ensure that the first electrode 100 heats the atomization medium uniformly. In other embodiments, the annular protruding portion 123 can also be replaced by a silver layer or a graphite layer with higher thermal conductivity, which can also improve the heating uniformity of the bottom plate 120. In other embodiments, the bottom plate 120 can only include the flat plate portion 122, and no longer include the annular protruding portion 123, and the bottom surface 121 of the flat plate portion 122 is a plane.

[0019] The first electrode 100 has an inner surface 152, which defines a boundary of the accommodating cavity 110. An infrared film layer can be attached to the inner surface 152, so that part of heat of the first electrode 100 is radiated to the atomization medium through infrared rays. Since infrared rays have strong penetration into the atomization medium, an inner layer and an outer layer of the atomization medium are heated at the same time, which can further shorten time for the atomization medium to rise to the atomization temperature, thereby increasing the heating speed of the heating body 10. A relatively smooth glass layer or glaze layer can also be attached to the infrared film layer, and the glass layer or glaze layer is in direct contact with the atomization medium, which is conducive to quickly removing adherents on the glass layer or glaze layer, thereby improving cleaning effect of the first electrode 100. The glass layer or glaze layer can also play a protective role to prevent the first electrode 100 from rusting. The glass layer or glaze layer can also be arranged on an outer surface 151 of the first electrode 100. Apparently, the outer surface 151 is located outside the accommodating cavity 110. The side tube 130 of the first electrode 100 can be electrically connected to the power supply through a movable spring pin or spring sheet, so that the first electrode 100 can be easily disassembled.

[0020] Referring to FIG. 4, FIG.5 and FIG.6, in some embodiments, the first electrode 100 is a tubular structure provided with an accommodating cavity 110, and the accommodating cavity 110 is not used to accommodate the atomization medium, so that the atomization medium is located outside the accommodating cavity 110 and covers the first electrode 100. It can also be understood that the first electrode 100 is inserted into the atomization medium, and the plasma arc is located inside the accommodating cavity 110.

[0021] For example, the heating body 10 further includes a central tube 330, which is made of an insulating material, and the insulating material may be a dense ceramic with high strength and high insulation performance including materials such as sodium oxide or zirconium oxide. The central tube 330 is provided with a tube cavity 331, and the diameter of the tube cavity 331 may range from 0.3mm to 0.6mm, and a wall thickness of the central tube 330 may range from 0.4mm to 0.6mm. Since the central tube 330 has a sufficiently large wall thickness, the plasma arc in the central tube 330 can be effectively prevented from breaking through the entire central tube 330.

[0022] The first electrode 100 of the tubular structure includes a side tube 130 and a top plate 140. The top plate 140 may be tapered, and the side tube 130 may be annular. The bottom plate 120 is connected to one end of the side tube 130, so that the side tube 130 surrounds the top plate 140. The side tube 130 and the top plate 140 together enclose an accommodating cavity 110, which is an open cavity with one end closed and the other end open. The central tube 330 is inserted into the accommodating cavity 110, so that the side tube 130 is sleeved outside the central tube 330, and the side tube 130 and the central tube 330 form a tight fit relationship, which can eliminate a distance between the side tube 130 and the central tube 330 along a radial direction of the heating body 10, ensuring that heat is directly transmitted from the central tube 330 to the first electrode 100, and one end of the central tube 330 located in the accommodating cavity 110 can be spaced a certain distance from the top plate 140 along the axial direction of the heating body 10. The second electrode 200 extends through the tube cavity 331 of the central tube 330, and an end of the second electrode 200 located in the tube cavity 331 is spaced apart from an end of the central tube 330 located in the accommodating cavity 110. When a plasma arc is generated, the plasma arc is located between the second electrode 200 and the top plate 140, so that at least part of the plasma arc is located in the tube cavity 331 of the central tube 330. For example, a part of the plasma arc is located in the tube cavity 331, and another part thereof is located in the accommodating cavity 110 between the central tube 330 and the top plate 140. In order to prevent the plasma arc from breaking through the first electrode 100, a part of the top plate 140 and the side tube 130 corresponding to the plasma arc can be thickened. Heat generated by plasma is also transmitted to the atomization medium through the first electrode 100, which is also conducive to improving the atomizing speed of the heating body 10.

[0023] The first electrode 100 further includes a conductive member 340, which is located in the accommodating cavity 110. The conductive member 340 can be in contact with the side tube 130 and/or the top plate 140, so that the conductive member 340 forms an electrical connection relationship with the side tube 130 and/or the top plate 140. The conductive member 340 covers an end opening of the tube cavity 331, so that the plasma arc will be located between the conductive member 340 and the second electrode 200, that is, the plasma arc is completely located in the tube cavity 331 of the central tube 330. The conductive member 340 does not occupy an installation space outside the accommodating cavity 110, so that compact and miniaturized design of the heating body 10 can be achieved.

[0024] The first electrode 100 of the tubular structure has an outer surface 151 located outside the accommodating cavity 110, and the outer surface 151 can be covered with an infrared film layer, so that a part of the heat of the first electrode 100 is radiated to the atomization medium through infrared rays, thereby increasing the heating speed of the heating body 10.

[0025] The technical features of the above embodiments can be randomly combined. To simplify the description, not all possible combinations of the technical features in the above embodiments are described. However, as long as there is no contradiction in the combination of these technical features, all the combinations should be considered to be included within the scope of this specification.

[0026] The above-described embodiments only illustrate several embodiments of the present application, and the descriptions of which are relatively specific and detailed, but should not be construed as limiting the scope of the patent application. It should be noted that, for those of ordinary skill in the art, several modifications and improvements can be made without departing from the concept of the present application, and these all fall within the protection scope of the present application. Therefore, the protection scope of the present application should be determined by the appended claims.

Claims

1. A heating body, comprising a first electrode and a second electrode that are configured to generate a plasma arc, wherein the first electrode is spaced apart from the second electrode and is configured to be in direct contact with an atomization medium, the plasma arc is located between the first electrode and the second electrode, and heat generated by the plasma arc is transmitted to the atomization medium through the first electrode.

2. The heating body according to claim 1, wherein the first electrode encloses an accommodating cavity, and the plasma arc is located outside the accommodating cavity, or the plasma arc is located inside the accommodating cavity.

3. The heating body according to claim 2, wherein the first electrode comprises a bottom plate and a side tube, the side tube is annular and surrounds the bottom plate, the bottom plate and the side tube form the accommodating cavity to accommodate the atomization medium, the second electrode is located outside the accommodating cavity and is spaced apart from the bottom plate along an axial direction of the heating body, and the plasma arc is located between the second electrode and the bottom plate.

4. The heating body according to claim 3, further comprising an insulating member, wherein the bottom plate has a bottom surface located outside the accommodating cavity and spaced apart from the second electrode, the insulating member is attached to the bottom surface and located within a coverage range of the bottom surface, a periphery of the insulating member maintains a set distance from a periphery of the bottom surface, a thickness of the insulating member ranges from 0.3mm to 1mm, and the second electrode is fixed on the insulating member, or the second electrode is spaced apart from the insulating member.

5. The heating body according to claim 4, further comprising an annular magnetic member, wherein the annular magnetic member is arranged around a central axis of the side tube, and a distance between the annular magnetic member and the bottom surface in an axial direction ranges from 0mm to 4mm.

6. The heating body according to claim 5, further comprising an annular magnetic member, wherein the annular magnetic member is a permanent magnet.

7. The heating body according to claim 4, wherein the bottom plate comprises a flat plate portion and an annular protruding portion, the flat plate portion is connected to the side tube and has the bottom surface, and the annular protruding portion protrudes from and is connected to the bottom surface and is arranged around a central axis of the heating body.

8. The heating body according to claim 7, wherein the annular protruding portion is arranged around the insulating member.

9. The heating body according to claim 4, wherein the bottom plate and the insulating member are coaxially arranged.

10. The heating body according to claim 2, further comprising a central tube, wherein the central tube is made of an insulating material and is provided with a tube cavity, the central tube is fitted with the accommodating cavity, the second electrode extends through the tube cavity, and at least part of the plasma arc is located in the tube cavity.

11. The heating body according to claim 10, wherein the first electrode comprises a top plate that is tapered and a side tube that is annular, the side tube is arranged around the top plate, the top plate and the side tube enclose the accommodating cavity, and an end of the central tube is spaced apart from the top plate.

12. The heating body according to claim 11, wherein the first electrode further comprises a conductive member, the conductive member is located in the accommodating cavity and is in contact with the side tube and/or the top plate, the conductive member covers an end opening of the tube cavity, and the plasma arc is located between the conductive member and the second electrode.

13. The heating body according to claim 11, wherein a distance between the central tube and the side tube along a radial direction of the heating body is zero.

14. The heating body according to claim 10, wherein a diameter of the tube cavity of the central tube ranges from 0.3mm to 0.6mm, a wall thickness of the central tube ranges from 0.4mm to 0.6mm, and the central tube is made of a dense ceramic material containing sodium oxide or zirconium oxide.

15. The heating body according to claim 2, further comprising an infrared film layer, wherein when the plasma arc is located outside the accommodating cavity, the infrared film layer is attached to an inner surface defining a boundary of the accommodating cavity; when the plasma arc is located inside the accommodating cavity, the infrared film layer is attached to an outer surface outside the accommodating cavity.

16. The heating body according to claim 15, further comprising a glass layer or a glaze layer attached to the infrared film layer.

17. The heating body according to claim 2, wherein a voltage applied to the first electrode and the second electrode is 10kV to 20kV.

18. The heating body according to claim 2, wherein the second electrode is in a columnar or sheet shape.

19. The heating body according to claim 2, wherein the first electrode is a cathode and is made of a metal or ceramic conductive material, and the second electrode is an anode.

20. A heating atomization device, comprising the heating body of any one of claims 1 to 19.

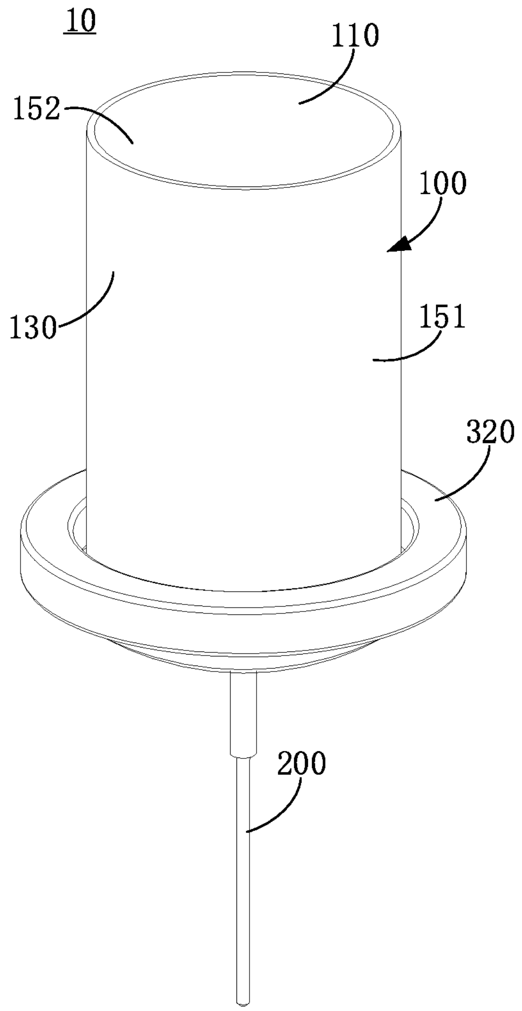

FIG. 1

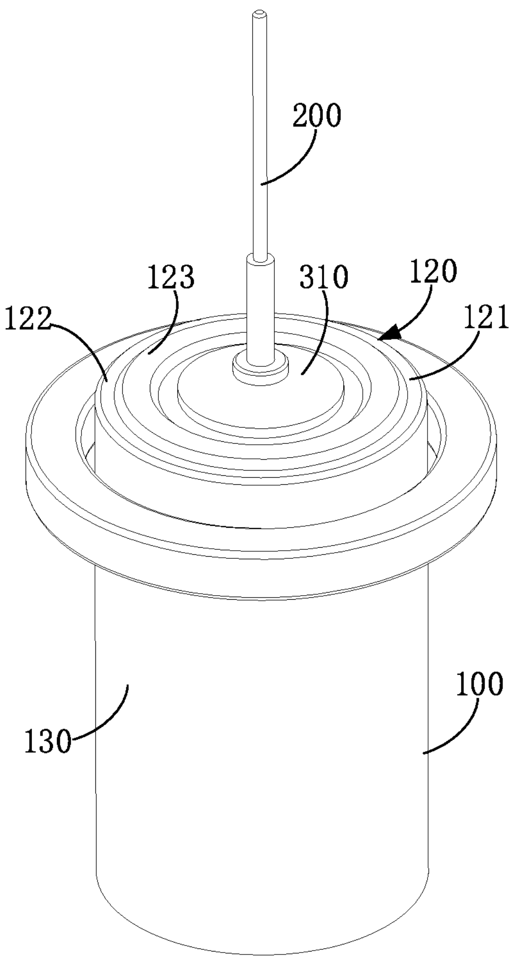

FIG. 2

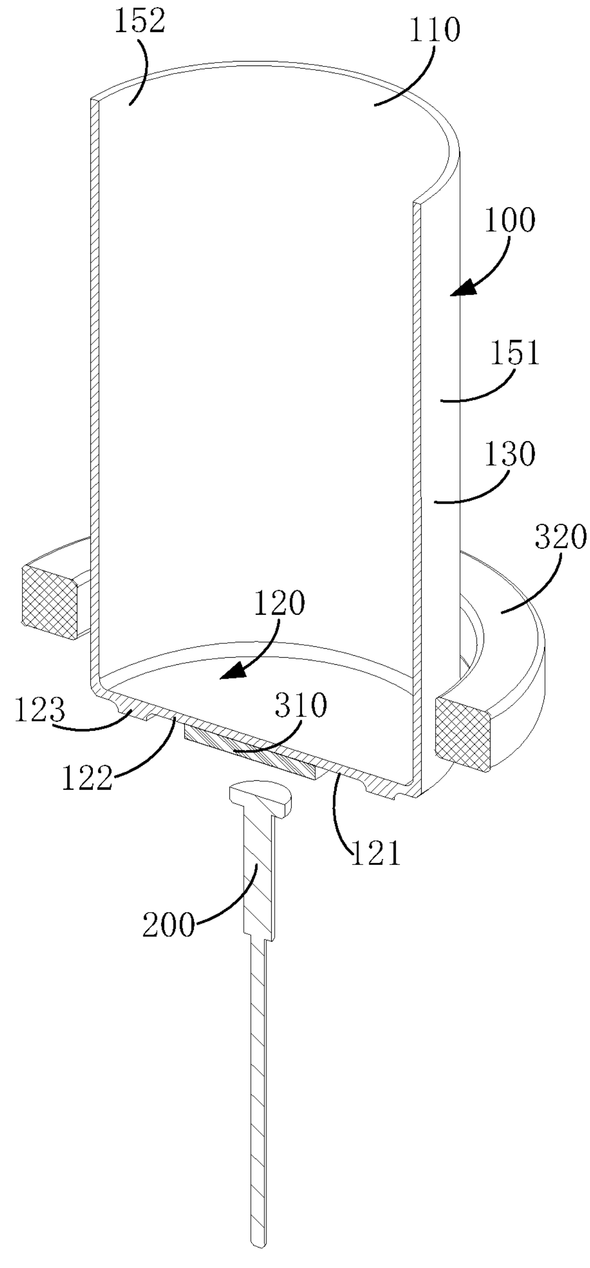

FIG. 3

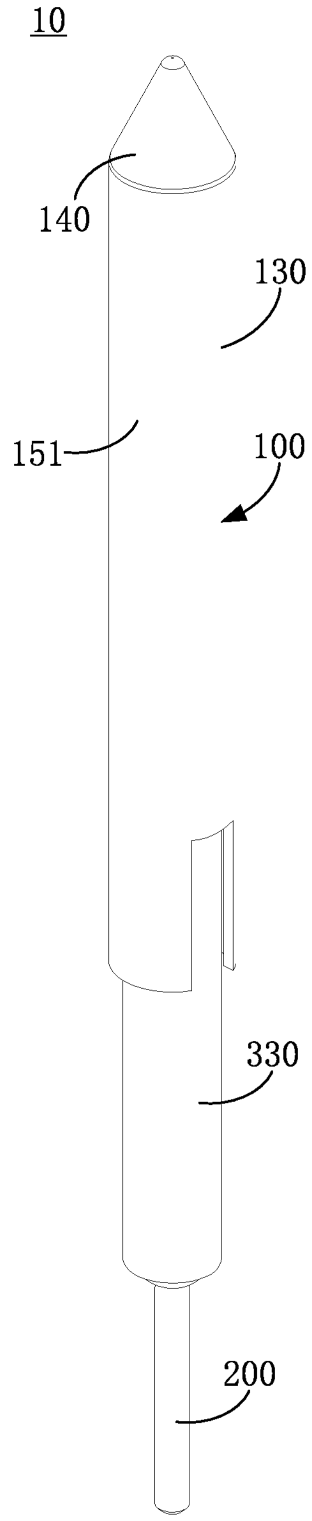

FIG. 4

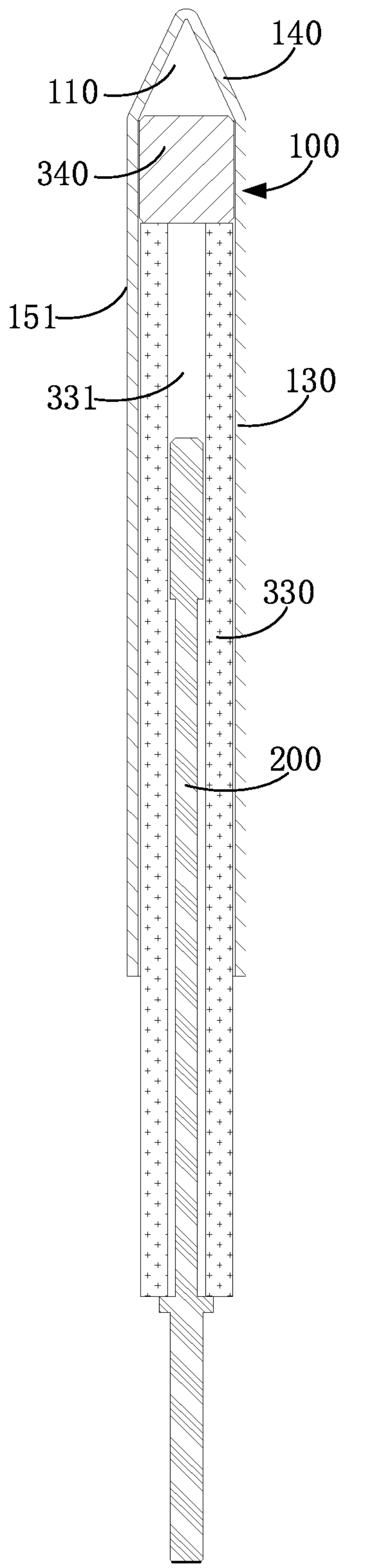

FIG. 5

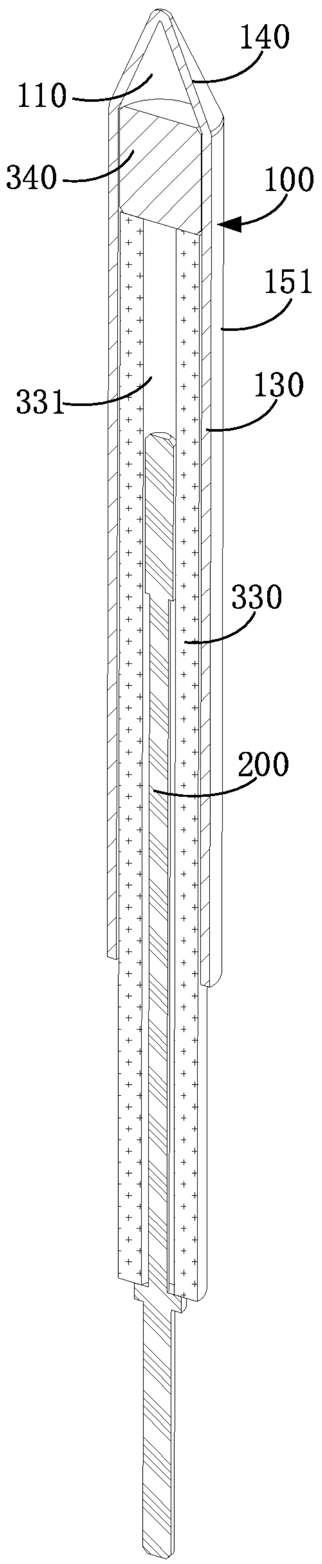

FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/083995

A. CLASSIFICATION OF SUBJECT MATTER

A24F40/46(2020.01)i;A24F40/40(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)

IPC:A24F40/-

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, CNTXT, ENTXTC: 加热, 电极, 正极, 负极, 等离子, 电弧, 腔, 空间, 圆柱, heat+, electrode?, positive, negative, plasma, arc, cavity, space, cylind+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 217826780 U (HAINAN MOER BROTHERS TECHNOLOGY CO., LTD.) 18 November 2022 (2022-11-18) description, paragraphs [0028]-[0042], and figures 1-6	1-20
PX	CN 217851365 U (HAINAN MOER BROTHERS TECHNOLOGY CO., LTD.) 22 November 2022 (2022-11-22) description, paragraphs [0028]-[0037], and figures 1-4	1, 20
X	CN 203952435 U (LI SHUYAN) 26 November 2014 (2014-11-26) description, paragraphs [0028]-[0043], and figures 1-5	1, 20
A	CN 108308725 A (SHENGHAI ELECTRONIC (SHENZHEN) CO., LTD.) 24 July 2018 (2018-07-24) entire document	1-20
A	CN 108741230 A (SHENGHAI ELECTRONIC (SHENZHEN) CO., LTD.) 06 November 2018 (2018-11-06) 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
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- "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
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Date of the actual completion of the international search	Date of mailing of the international search report
11 May 2023	**22 May 2023**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088**	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2022)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/083995

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	CN 211910526 U (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 13 November 2020 (2020-11-13) entire document	1-20
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Form PCT/ISA/210 (second sheet) (July 2022)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2023/083995

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