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(54) AEROSOL GENERATING APPARATUS AND HEATING ASSEMBLY THEREFOR

(57) The present invention relates to an aerosol-generating apparatus and a heating assembly thereof. The heating assembly includes a base, a heating element arranged on the outer surface of the base, and two conductive elastic sheets electrically connected to the two poles of the heating element, respectively. Each of the conductive elastic sheets includes a sleeve portion sleeved on the base, at least one elastic arm connected to the sleeve portion and elastically contacting and conducting with the heating element, and an electrode portion extending away from the base from one of the at least one elastic arm. The electrode portion extends to a position far away from the base and the heating element to facilitate welding a lead wire. The pad can be flexibly arranged on the electrode portion, and be better attached to a surface of the electrode portion, thereby improving the stability of welding. Additionally, due to that a certain distance is formed between the welding spot and the heating element, the welding spot can be prevented from being melted due to too high temperature during the heating of the heating element, thereby the welding reliability is improved.

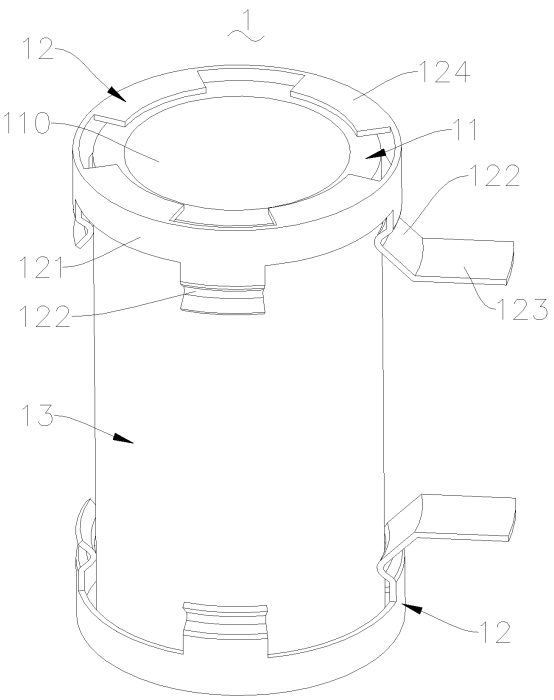

FIG. 1

EP 4 353 098 A1

Description

FIELD

[0001] The present invention relates to the field of atomization, and more specifically, to an aerosol-generating apparatus and a heating assembly thereof.

BACKGROUND

[0002] A heat-not-burn atomization apparatus is an aerosol-generating apparatus that heats an atomizable material in a low temperature heat-not-burn manner to form an inhalable aerosol. Currently, the heating manner of the heat-not-burn atomization apparatus is usually tubular peripheral heating or center embedded heating. Wherein, the tubular peripheral heating refers to that the aerosol-forming substrate is surrounded by a heating assembly. Currently, the heating assembly of the aerosol-generating apparatus using the tubular peripheral heating manner typically includes a heating tube for accommodating the aerosol-forming substrate and a heating element disposed on a surface of the heating tube. The two ends of the heating element are usually screen printed with pads, and then lead wires are welded on the pads to connect to the power supply. On one hand, due to the fact that the thickness of the screen printed pad is small, the welding with the lead wire is unstable. On the other hand, the adhesion strength between the pad and the surface of the heating tube also affects the stability of the lead wire welding. Moreover, the welding operation is inconvenient and the efficiency is low.

SUMMARY

[0003] A technical problem to be solved in the present invention is, for the foregoing defect in the prior art, to provide an improved heating assembly and an aerosol-generating apparatus having the heating assembly.

[0004] A technical solution adopted by the present invention to solve the technical problem is to provide a heating assembly for an aerosol-generating apparatus, including a base, a heating element arranged on the outer surface of the base, and two conductive elastic sheets electrically connected to the two poles of the heating element, respectively, wherein each of the conductive elastic sheets includes a sleeve portion sleeved on the base, at least one elastic arm connected to the sleeve portion and elastically contacting and conducting with the heating element, and an electrode portion extending away from the base from one of the at least one elastic arm.

[0005] In some embodiments, the base is tubular, and a containing cavity is formed in the base configured for accommodating an aerosol-forming substrate.

[0006] In some embodiments, the heating element includes an infrared radiation heating film.

[0007] In some embodiments, the two conductive elastic sheets are respectively arranged at the two ends of the base.

[0008] In some embodiments, the number of the elastic arms is multiple, and the multiple elastic arms are uniformly spaced along the circumferential direction of the sleeve portion.

[0009] In some embodiments, each of the conductive elastic sheets includes at least one limiting portion connected to the sleeve portion and abutting against an end surface of the base.

[0010] In some embodiments, the number of the limiting portions is multiple, and the multiple limiting portions are uniformly spaced along the circumferential direction of the sleeve portion.

[0011] In some embodiments, the number of the elastic arms is multiple, and the multiple elastic arms are staggered with the multiple limiting portions along the circumferential direction of the sleeve portion.

[0012] In some embodiments, the number of the elastic arms is the same as the number of the limiting portions.

[0013] In some embodiments, the number of the elastic arms is 3 to 8.

[0014] In some embodiments, the conductive elastic sheet is integrally formed using a metal material.

[0015] In some embodiments, the electrode portion includes a first extension portion extending from the edge, away from the sleeve portion, of one elastic arm of the at least one elastic arm in the direction away from the base and the heating element.

[0016] In some embodiments, the electrode portion includes a second extension portion extending from the edge, away from the sleeve portion, of the first extension portion in the direction away from the base and the heating element.

[0017] In some embodiments, the first extension portion extends transversely, and the second extension portion extends longitudinally.

[0018] In some embodiments, an angle is presented between the second extension portion and the first extension portion.

[0019] In some embodiments, each of the elastic arm includes a conducting portion configured for elastically contacting and conducting with the heating element and a connecting portion connected between the conducting portion and the sleeve portion.

[0020] In some embodiments, the connecting portion extends from the edge of the sleeve portion adjacent to the heating element.

[0021] In some embodiments, the conducting portion is V-shaped, and the V-shaped bottom of the conducting portion abuts against the heating element.

[0022] In some embodiments, the V-shaped bottom of the conducting portion is an arc surface.

[0023] The present invention further provides an aerosol-generating apparatus, including the heating member according to any one of the foregoing.

[0024] Implementation of the present invention has at least the following beneficial effects: the electrode portion extends to a position far away from the base and the

heating element to facilitate welding a lead wire; the pad can be flexibly arranged on the electrode portion, and be better attached to a surface of the electrode portion, thereby improving the stability of welding; additionally, due to that a certain distance is formed between the welding spot and the heating element, the welding spot can be prevented from being melted due to too high temperature during the heating of the heating element, thereby the welding reliability is improved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] The present invention will be further described below with reference to the accompanying drawings and embodiments. In the accompanying drawings:

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

FIG. 2 is a three-dimensional structural schematic diagram of a conductive elastic sheet in FIG. 1;

FIG. 3 is three-dimensional structural schematic diagram of a heating assembly according to a second embodiment of the present invention; and

FIG. 4 is a three-dimensional structural schematic diagram of an aerosol-generating apparatus according to some embodiments of the present invention.

DETAILED DESCRIPTION

[0026] To have a clearer understanding of the technical features, objectives, and effects of the present invention, specific implementations of the present invention are described in detail with reference to the accompanying drawings.

[0027] In the description of the present invention, it should be understood that, orientation or position relationships indicated by terms such as "front", "rear", "upper", "lower", "left", "right", "top", "bottom", "inner", and "outer" are orientation or position relationship shown based on the accompanying drawings or orientation or position relationship that the product of the present invention is usually placed in use, and are merely used for describing the present invention and simplifying the description, rather than indicating or implying that the mentioned apparatus or element should have a particular orientation or be constructed and operated in a particular orientation, and therefore, should not be construed as a limitation to the present invention. In addition, the terms such as "vertical", "horizontal", "longitudinal", "transverse" and the like used in the present invention are for descriptive purposes only and do not imply that they are the only implementations.

[0028] It should also be noted that, unless otherwise explicitly specified and defined, terms such as "mounted", "connected", "connection", "fixation", and "disposed" should be understood in a broad sense. For example, the connection may be a fixed connection, a detachable connection, or an integral connection; or the connection may be a mechanical connection or an electrical connection; or the connection may be a direct connection, an indirect connection through an intermediate medium, or internal communication between two elements or a mutual action relationship between two elements. When one element is described as "above" or "below" another element, it means that they may be in direct contact, or they may be in indirect contact through one or more intermediaries.

[0029] In addition, the terms "first", "second" and the like are used for descriptive purposes only and should not be construed as indicating or implying relative importance or implying the number of indicated technical features. Therefore, features defined by "first", "second", etc. may explicitly or implicitly include one or more of these features. In the description of the present invention, "a plurality of" means at least two, such as two, three, etc., unless otherwise specified. For ordinary technical personnel in this field, the specific meanings of the above terms in the present invention can be understood based on specific circumstances.

[0030] As shown in FIGS. 1-2, a heating assembly 1 in a first embodiment of the present invention may include a base 11, a heating element 13 disposed on a surface of the base 11, and two conductive elastic sheets 12 that are electrically connected to the two poles of the heating element 13, respectively.

[0031] The heating element 13 may be an infrared radiation heating film and may be coated on the outer surface of base 11. The infrared radiation heating film may be made of a material with a relatively large infrared emissivity, such as one or more of Fe_2O_3, MnO_2, Co_2O_3, ZrO_2, SiO_2, SiC, TiO_2, Al_2O_3, CeO_2, La_2O_3, MgO, TiC, CrC, TiCN, cordierite, and perovskite. The infrared radiation heating film can be connected to the positive and negative poles of the power supply through the two conductive elastic sheets 12, and can generate heat after being electrified, and transfers the generated heat from the outer surface of the base 11 to the aerosol-forming substrate accommodated in the base 11 in an infrared radiation mode to heat the aerosol-forming substrate. The infrared radiation heating mode has a relatively high penetrating power and radiation power, which can achieve synchronous heating inside and outside the aerosol-forming substrate, making the heating more uniform. In some other embodiments, the heating element 13 may also be a resistive conduction heating film, or may be a composite heating film of resistive conduction and infrared radiation.

[0032] The base 11 is in a tubular shape, and a containing cavity 110 is formed inside it to accommodate the aerosol-forming substrate. The base 11 may be made of a material with a high temperature resistance, a low thermal conductivity coefficient and a high infrared transmittance, such as ceramic, quartz glass, and the like. In this

embodiment, the base 11 is a circular-tube-shaped quartz glass tube, and the containing cavity 110 may penetrate the base 11 in the axial direction and may be coaxial with the base 11. In other embodiments, the base 11 may also in other shape such as an elliptical tubular shape or a square tubular shape.

[0033] The conductive elastic sheet 12 may be integrally formed by adopting a metal material, such as a low-impedance material such as phosphor copper or 316 stainless steel, and its surface may further be coated with a metal coating such as a gold or silver plating. The two conductive elastic sheets 12 may be disposed at the two ends of the base 11 in the axial direction, respectively. Each conductive elastic sheet 12 may include a sleeve portion 121 sleeved on the base 11, at least one elastic arm 122 connected to the sleeve portion 121, and an electrode portion 123 connected to one of the at least one elastic arm 122.

[0034] The sleeve portion 121 may be in a circular shape and sleeved outside one end of the base 11. The elastic arm 122 may extend towards the heating element 13 from one edge of the sleeve portion 121 facing the heating element 13, and elastically contact with the heating element 13 for electrical conduction. In this embodiment, a plurality of elastic arms 122 are provided, for example 3 to 8 elastic arms 122 are provided, and the plurality of elastic arms 122 are elastically clamped outside the base 11 and mechanically and electrically connected to the heating element 13. Furthermore, the plurality of elastic arms 122 may be uniformly spaced along the circumferential direction of the sleeve portion 121, facilitating a stable connection with the heating element 13.

[0035] In this embodiment, four elastic arms 122 are provided. Preferably, in other embodiments, the number of the elastic arms 122 may also be three or five. Each elastic arm 122 may include a conducting portion 1222 configured for elastically contacting with the heating element 13 for electrical conduction, and a connecting portion 1221 connected between the conducting portion 1222 and the sleeve portion 121. The connecting portion 1221 may extend along the axial direction of the base 11. The conducting portion 1222 may extend from the edge, away from the sleeve portion 121, of the connecting portion 1221 and then formed by pre-bending deformation, so that the conducting portion 1222 can generate elastic force to elastically contact the heating element 13, thereby achieving a stable electrical connection with the heating element 13. The conducting portion 1222 may be roughly V-shaped, with its V-shaped bottom abutting against the heating element 13. Furthermore, the V-shaped bottom of the conducting portion 1222 may be in an arc shape to avoid scratching the heating element 13 by a sharp structure. In other embodiments, the connecting portion 1221 may also be perpendicularly connected to the sleeve portion 121, and may extend outward in the radial direction from the edge of the sleeve portion 121 adjacent to the heating element 13. In other embodiments, the connecting portion 1221 may also present a certain angle with the sleeve portion 121.

[0036] The electrode portion 123 may be formed by extending outward from the edge, away from the sleeve portion 121, of one of the elastic arms 122, specifically, it may be formed by extending and bending the one of the elastic arms 122. The electrode portion 123 may extend to a position far away from the base 11 and the heating element 13 to facilitate welding a lead wire, making the welding operation more convenient. Since the electrode portion 123 is in the shape of a metal sheet and has a certain thickness and cross-sectional area, the pad can be flexibly arranged on the electrode portion 123, and can have a greater thickness than the screen printed pad, and the pad has a good connection tightness with the metal sheet and can be better attached to the surface of the metal sheet, thereby improving the stability of welding. In addition, due to the fact that a certain distance is formed between the welding spot and the heating element 13, the welding spot can be prevented from being melted due to too high temperature during the heating of the heating element 13, thereby the welding reliability is improved. In this embodiment, the electrode portion 123 extends outward transversely and away from base 11 and heating element 13. In other embodiments, the electrode portion 123 may also be in other structural forms.

[0037] In some embodiments, each conductive elastic sheet 12 may further include a limiting portion 124 connected to the sleeve portion 121 and abutting against an end surface of the base 11. The limiting portion 124 may be in an arc-shaped sheet shape, and a plurality of limiting portions 124 may be provided, and may be uniformly spaced in the circumferential direction of the sleeve portion 121. The limiting portions 124 are arranged in a segmented manner, so as to facilitate punch forming. In addition, the plurality of limiting portions 124 can provide a certain elastic deformation, and can be well abutted against the base 11 to be in good contact with the base 11 even when the end surface of the base 11 is uneven. Specifically, in this embodiment, four limiting portions 124 are provided. The four limiting portions 124 may be staggered with the four elastic arms 122 along the circumferential direction of the sleeve portion 121, that is, each limiting portion 124 is located between every two adjacent elastic arms 122 in the circumferential direction. With this structure, the stamping jig can be conveniently arranged, the limiting portions 124 and the elastic arms 122 can be one-time stamped and formed, and the good contact between the conductive elastic sheet 12 and the base 11 can be further improved. It can be understood that in other embodiments, the number of the limiting portion 124 may also be only one, and the one limiting portion 124 may be in a circular sheet shape.

[0038] As shown in FIG. 3, the heating assembly 1 in the second embodiment of the present invention mainly differs from that in the first embodiment in that, in this embodiment, the electrode portion 123 may include a

first extension portion 1231 connected to one of the at least one elastic arm 122 and a second extension portion 1232 connected to the first extension portion 1231, with a certain angle presented between the first extension portion 1231 and the second extension portion 1232. Specifically, the first extension portion 1231 may extend outward along the radial direction of the base 11 from the edge, away from the sleeve portion 121, of one of the elastic arm 122 to be away from the base 11 and the heating element 13. The second extension portion 1232 may extend in a direction away from the base 11 and the heating element 13 along the axial direction of the base 11, and may be formed by bending the first extension portion 1231.

[0039] As shown in FIG. 4, an aerosol-generating apparatus 100 in some embodiments of the present invention may be roughly in a rectangular column shape and may include a housing 2 and a heating assembly 1 disposed in the housing 2. Wherein, the heating assembly 1 may adopt the structure in any one of the foregoing embodiments. It can be understood that in other embodiments, the aerosol-generating apparatus 100 is not limited to being in the rectangular column shape, and may also be in a square column shape, a cylindrical shape, an elliptical cylindrical shape, or other shapes.

[0040] The top of the housing 2 is provided with an insertion opening 20 for inserting the aerosol-forming substrate 200. The cross-sectional shape and size of the insertion opening 20 may be adapted to the cross-sectional shape and size of the aerosol-forming substrate 200, and the aerosol-forming substrate 200 can be inserted into the base 11 of the heating assembly 1 via the insertion opening 20 to be in contact with the inner wall of the base 11. The heating assembly 1 can transfer heat to the aerosol-forming substrate 200 when electrified, thereby baking and heating the aerosol-forming substrate 200. The top of the housing 2 may further be provided with a dustproof cover 3 configured for shielding or exposing the insertion opening 20. The dustproof cover 3 can slide back and forth on the top wall of the housing 2 under an external force. When the aerosol-generating apparatus 100 does not need to be used, the dustproof cover 3 can be pushed to cover the insertion opening 20 to prevent dust from entering the insertion opening 20. When the aerosol-generating apparatus 100 needs to be used, the dustproof cover 3 can be pushed to expose the insertion opening 20, so that the aerosol-forming substrate 200 can be inserted from the insertion opening 20.

[0041] The aerosol-forming substrate 200 may be cylindrical, and may be a solid sheet or filamentous plant material such as a plant root, a plant stem, a plant leave, etc. The aerosol-generating apparatus 100 can bake and heat the aerosol-forming substrate 200 inserted therein in a low temperature to release the aerosol extract from the aerosol-forming substrate 200 in a non-combustible state. In other embodiments, the cross-sectional shape of the aerosol-forming substrate 200 is not limited to being circular, but may also be elliptical, square, polygonal, or other shapes.

[0042] It may be understood that, the above technical features may be used in any combination without limitation.

[0043] The foregoing embodiments only describe specific implementations of the present invention, and the description is specific and detailed, but cannot therefore be understood as a limitation to the patent scope of the present invention. It should be noted that, for a person of ordinary skill in the art, the foregoing technical features may be combined freely, and several transformations and improvements may be further made without departing from the idea of the present invention. These transformations and improvements all fall within the protection scope of the present invention. Therefore, any equivalent change or modification made according to the scope of the claims of the present invention shall fall within the scope of the claims of the present invention.

Claims

1. A heating assembly for an aerosol-generating apparatus, comprising:

   a base (11);
   a heating element (13) arranged on the outer surface of the base (11); and
   two conductive elastic sheets (12) electrically connected to the two poles of the heating element (13), respectively,
   wherein each of the conductive elastic sheets (12) comprises a sleeve portion (121) sleeved on the base (11), at least one elastic arm (122) connected to the sleeve portion (121) and elastically contacting and conducting with the heating element (13), and an electrode portion (123) extending away from the base (11) from one of the at least one elastic arm (122).

2. The heating assembly of claim 1, wherein the base (11) is tubular, and a containing cavity (110) is formed in the base (11) configured for accommodating an aerosol-forming substrate.

3. The heating assembly of claim 1, wherein the heating element (13) comprises an infrared radiation heating film.

4. The heating assembly of claim 1, wherein the two conductive elastic sheets (12) are respectively arranged at the two ends of the base (11).

5. The heating assembly of claim 1, wherein the number of the elastic arms (122) is multiple, and the multiple elastic arms (122) are uniformly spaced along the circumferential direction of the sleeve portion (121).

6. The heating assembly of claim 1, wherein each of the conductive elastic sheets (12) comprises at least one limiting portion (124) connected to the sleeve portion (121) and abutting against an end surface of the base (11).

7. The heating assembly of claim 6, wherein the number of the limiting portions (124) is multiple, and the multiple limiting portions (124) are uniformly spaced along the circumferential direction of the sleeve portion (121).

8. The heating assembly of claim 7, wherein the number of the elastic arms (122) is multiple, and wherein the multiple elastic arms (122) are staggered with the multiple limiting portions (124) along the circumferential direction of the sleeve portion (121).

9. The heating assembly of claim 8, wherein the number of the elastic arms (122) is the same as the number of the limiting portions (124).

10. The heating assembly of claim 1, wherein the number of the elastic arms (122) is 3 to 8.

11. The heating assembly of claim 1, wherein the conductive elastic sheet (12) is integrally formed using a metal material.

12. The heating assembly of any one of claims 1 to 11, wherein the electrode portion (123) comprises a first extension portion (1231) extending from the edge, away from the sleeve portion (121), of one elastic arm (122) of the at least one elastic arm (122) in the direction away from the base (11) and the heating element (13).

13. The heating assembly of claim 12, wherein the electrode portion (123) comprises a second extension portion (1232) extending from the edge, away from the sleeve portion (121), of the first extension portion (1231) in the direction away from the base (11) and the heating element (13).

14. The heating assembly of claim 13, wherein the first extension portion (1231) extends transversely, and the second extension portion (1232) extends longitudinally.

15. The heating assembly of claim 13, wherein an angle is presented between the second extension portion (1232) and the first extension portion (1231).

16. The heating assembly of any one of claims 1 to 11, wherein each of the elastic arm (122) comprises a conducting portion (1222) configured for elastically contacting and conducting with the heating element (13) and a connecting portion (1221) connected between the conducting portion (1222) and the sleeve portion (121).

17. The heating assembly of claim 16, wherein the connecting portion (1221) extends from the edge of the sleeve portion (121) adjacent to the heating element (13).

18. The heating assembly of claim 16, wherein the conducting portion (1222) is V-shaped, and the V-shaped bottom of the conducting portion (1222) abuts against the heating element (13).

19. The heating assembly of claim 18, wherein the V-shaped bottom of the conducting portion (1222) is an arc surface.

20. An aerosol-generating apparatus, comprising: the heating assembly of any one of claims 1 to 19.

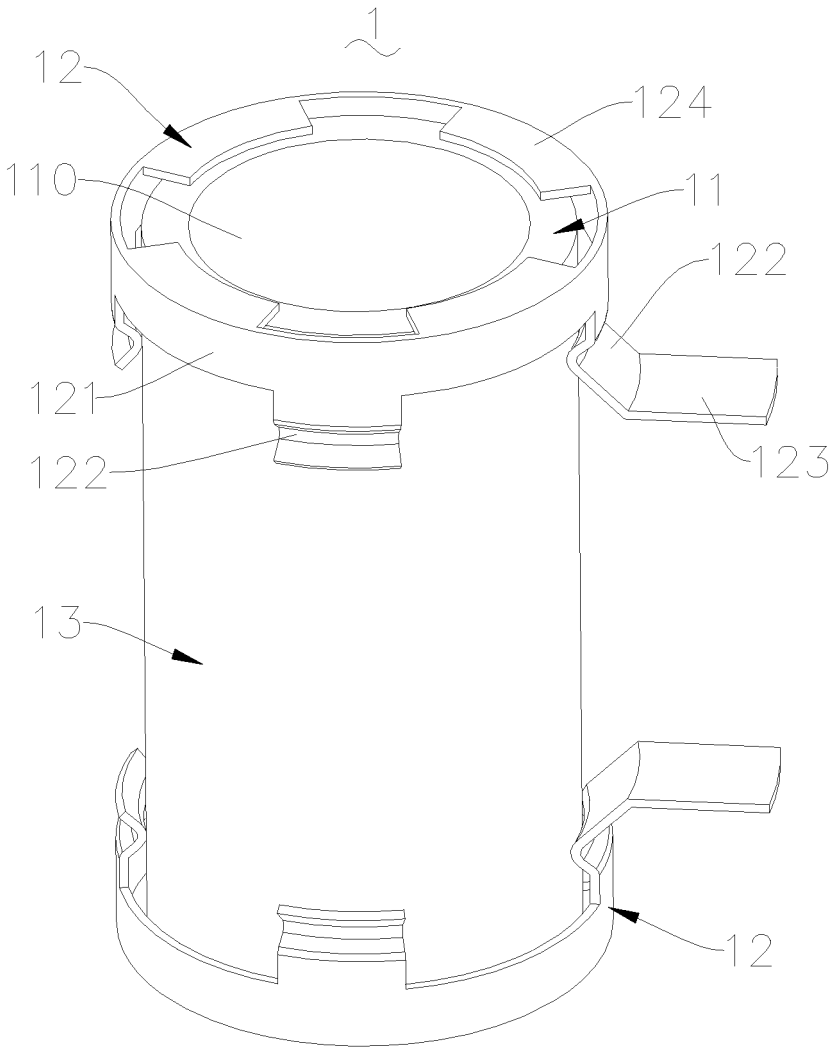
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FIG. 1

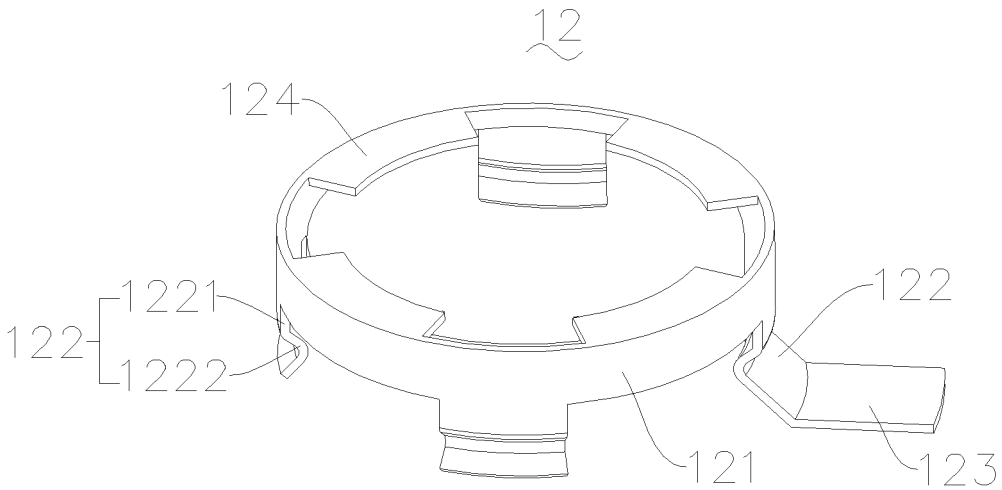
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FIG. 2

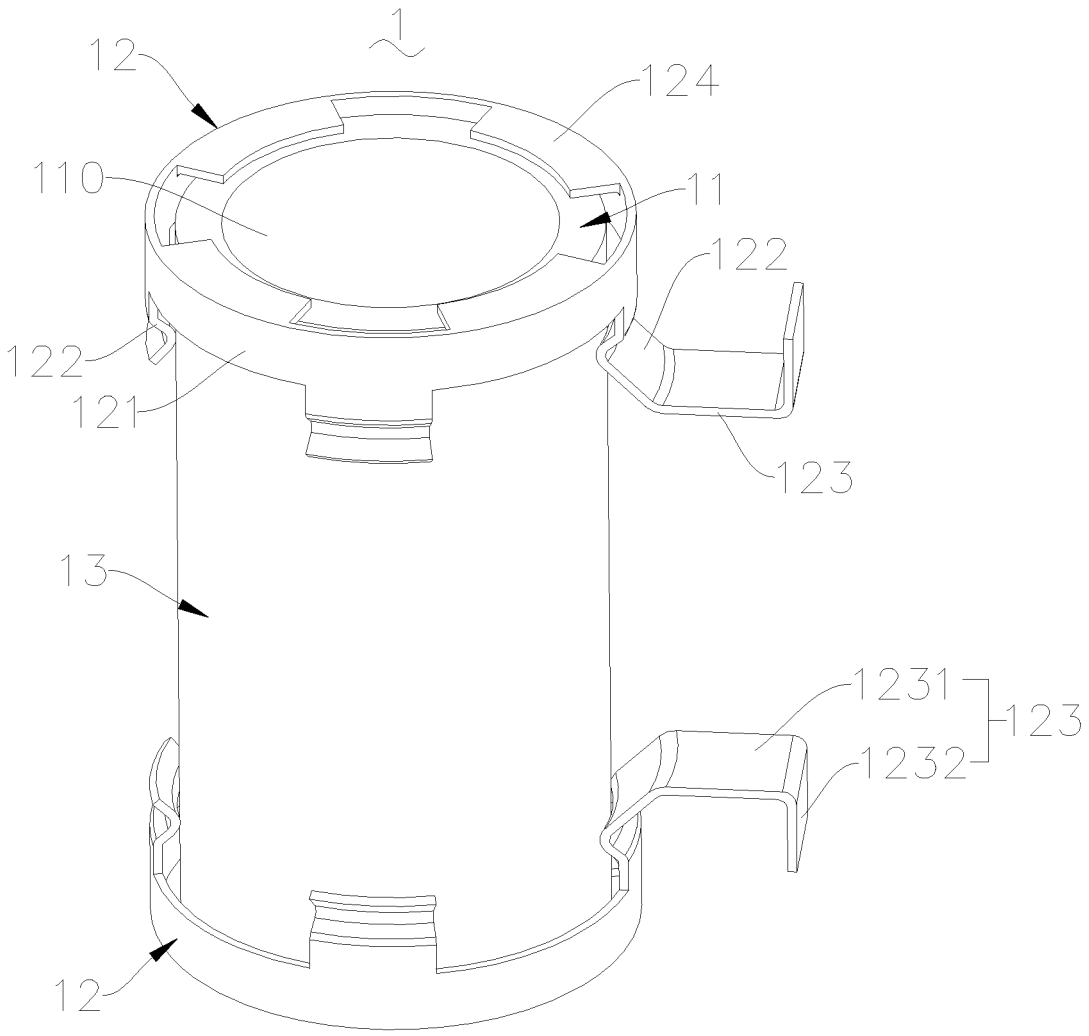

FIG. 3

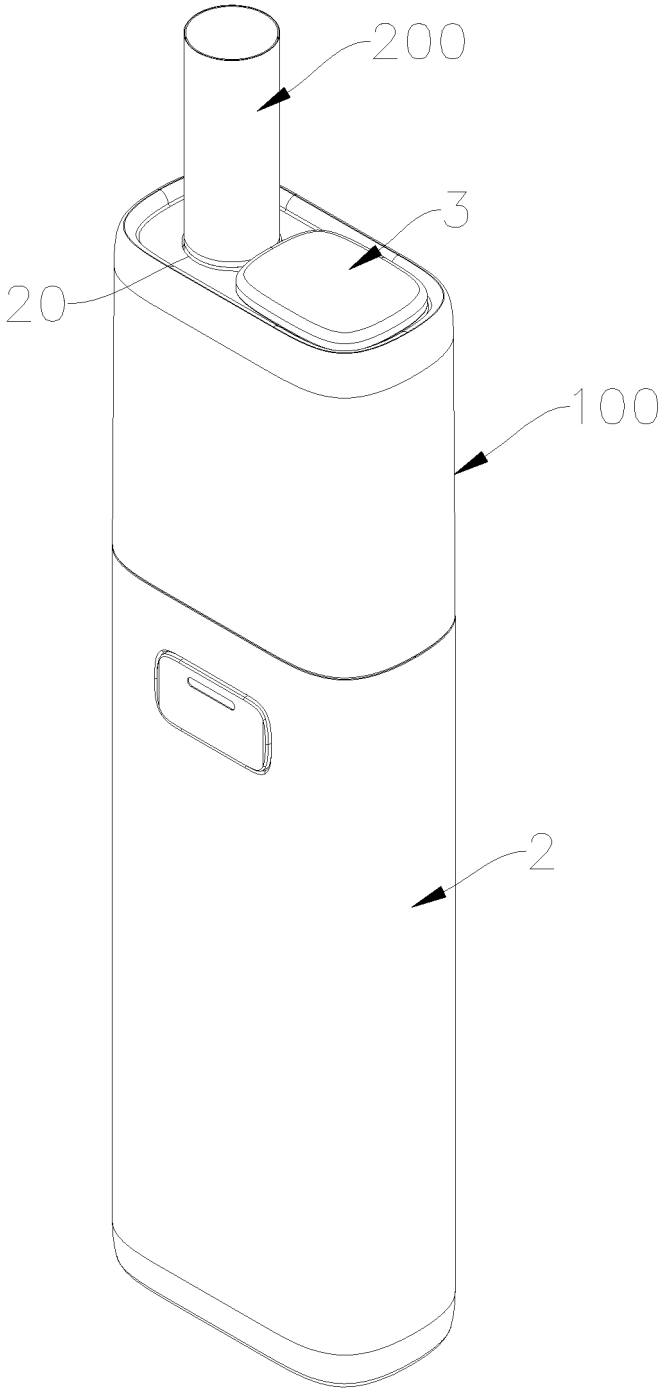

FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2022/116235

A. CLASSIFICATION OF SUBJECT MATTER

A24F 40/40(2020.01)i; A24F 40/46(2020.01)i; A24F 40/20(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,B01J

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: 深圳麦时科技有限公司, 气溶胶, 电连接, 电性连接, 导电弹片, 弹性接触, aerosol, conductive elastic piece, electrically connect, conductive elastic sheet, elastic arm

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 216147242 U (SHENZHEN MAISHI TECHNOLOGY CO., LTD.) 01 April 2022 (2022-04-01) claims 1-20	1-20
X	CN 113080520 A (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 09 July 2021 (2021-07-09) figures 1-14, and claims 1-17, and description, pages 3-7	1-20
X	CN 212279891 U (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 05 January 2021 (2021-01-05) description, pages 2-7, and figures 1-14	1-20
A	CN 109846093 A (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 07 June 2019 (2019-06-07) entire document	1-20
A	US 2015181935 A1 (BRITISH AMERICAN TOBACCO (INVESTMENTS) LIMITED) 02 July 2015 (2015-07-02) 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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"P" document published prior to the international filing date but later than the priority date claimed
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"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
02 November 2022	**28 November 2022**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088, China** Facsimile No. **(86-10)62019451**	Authorized officer Telephone No.

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2022/116235

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	IL 246532 D0 (PHILIP MORRIS PRODUCTS SA) 31 August 2016 (2016-08-31) entire document	1-20

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2022/116235

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