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(72) Inventors:

- **WU, Jian**
Shenzhen, Guangdong 518000 (CN)
- **XU, Zhongli**
Shenzhen, Guangdong 518000 (CN)
- **LI, Yonghai**
Shenzhen, Guangdong 518000 (CN)

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(74) Representative: **Ran, Handong et al**

Maucher Jenkins
Seventh Floor Offices
Artillery House
11-19 Artillery Row
London SW1P 1RT (GB)

(71) Applicant: **Shenzhen First Union Technology Co., Ltd.**
Shenzhen, Guangdong 518000 (CN)

(54) VAPOR GENERATING DEVICE, AND HEATER FOR VAPOR GENERATING DEVICE

(57) Provided in the present application are a vapor generating device, and a heater for a vapor generating device. The vapor generating device comprises at least one resistance heating element formed by winding or bending a resistive metal or alloy sheet, wherein the at least one resistance heating element comprises at least two wound or bent resistance heating layers; and during vaping, the air at least partially passes between the at least two resistance heating layers, and same is heated between the at least two resistance heating layers and is then output to an aerosol generating article. In the vapor generating device, the air is heated when passing between the heating layers of the wound and bent heating element, and is then output to an aerosol generating article, such that the aerosol generating article is heated in the form of hot air heating.

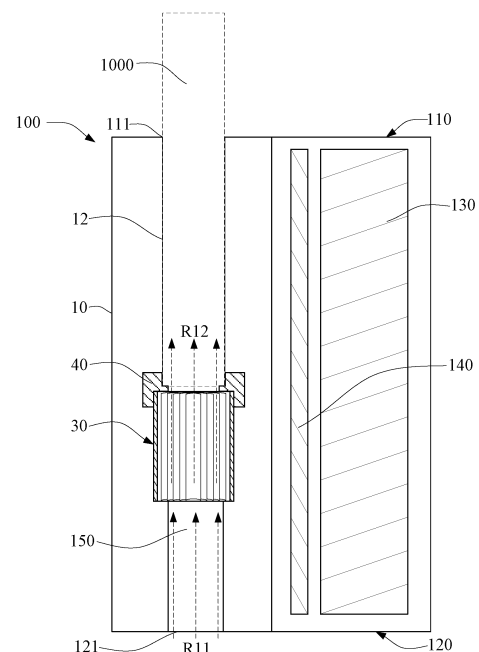


FIG. 1

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Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to Chinese Application No. 202210657284.6, filed with the China National Intellectual Property Administration on June 10, 2022 and entitled "VAPOR GENERATING DEVICE, AND HEATER FOR VAPOR GENERATING DEVICE", which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] Embodiments of this application relate to the field of heat-not-burn vapor generating technologies, and in particular, to a vapor generating device and a heater for a vapor generating device.

BACKGROUND

[0003] Tobacco products (for example, cigarettes and cigars) burn tobacco during use to produce tobacco smoke. Attempts are made to replace these tobacco-burning products by manufacturing products that release compounds without burning.

[0004] An example of the products is a heating device that releases compounds by heating rather than burning a material. For example, the material may be an aerosol generating product including tobacco or other non-tobacco products, and these non-tobacco products may or may not include nicotine. In an existing heating device, a heating element is arranged around a heat dissipation component of a honeycomb structure, and the heat dissipation component of the honeycomb structure is heated by the heating element, so that air is heated to form a hot airflow when passing through a honeycomb hole in the heat dissipation component. Then, the tobacco or the other non-tobacco products are heated through the hot airflow.

SUMMARY

[0005] An embodiment of this application provides a vapor generating device, configured to heat an aerosol generating product to generate an aerosol. The vapor generating device includes:

at least one resistance heating element formed by winding or bending a sheet made of a resistive metal or alloy, where the at least one resistance heating element includes at least two wound or bent resistance heating layers; and during inhalation, air at least partially passes between the at least two resistance heating layers, and is heated between the at least two resistance heating layers and then outputted to the aerosol generating product.

[0006] In some embodiments, the vapor generating device further includes:

a holding element, at least partially surrounding or holding the at least one resistance heating element.

[0007] In some embodiments, the at least one resistance heating element is accommodated in the holding element; and the holding element includes:

an air inlet for air to enter; and
an air outlet for outputting the heated air to the aerosol generating product.

[0008] In some embodiments, the vapor generating device further includes:

a temperature sensor, combined with the at least one resistance heating element to sense a temperature of the at least one resistance heating element; and/or
a temperature sensor, located at the air outlet to sense a temperature of the air outputted by the air outlet.

[0009] In some embodiments, the vapor generating device further includes:

a first wire and a second wire, configured to supply power to the resistance heating element.

[0010] In some embodiments, the resistance heating element is in a cylindrical shape formed by winding the sheet; and

the first wire is at least partially arranged inside the resistance heating element, and the second wire is arranged outside the resistance heating element.

[0011] In some embodiments, the resistance heating element is formed by winding the sheet around the first wire as an axis; and a diameter of the first wire is greater than a diameter of the second wire.

[0012] In some embodiments, the resistance heating element is formed by winding the sheet around the first wire as an axis; and a diameter of the first wire ranges from 0.1 mm to 1.5 mm.

[0013] In some embodiments, the vapor generating device further includes:

a conductive base body, where the resistance heating element is formed by winding the sheet around the conductive base body as an axis; the conductive base body is electrically conductive to the resistance heating element;
the first wire is indirectly conducted with the resistance heating element by being connected to the conductive base body; and
the second wire is directly connected to and conducted with the resistance heating element.

[0014] In some embodiments, the vapor generating device further includes:

a base body, where the resistance heating element is formed by winding the sheet around the base body as an axis; the base body includes an exposed part extending out of the resistance heating element; and the holding element at least partially holds the re-

sistance heating element by holding the exposed part.

[0015] In some embodiments, the vapor generating device further includes:

a chamber, configured to receive at least part of the aerosol generating product; and
an air-permeable blocking element, located between the chamber and the at least one resistance heating element, and configured to prevent an aerosol condensate or residues from the aerosol generating product from falling into or entering the at least one resistance heating element.

[0016] In some embodiments, the vapor generating device further includes:

a porous body material, located between adjacent resistance heating layers.

[0017] In some embodiments, the sheet is continuous.

[0018] In some embodiments, the at least two resistance heating layers are connected in series.

[0019] In some embodiments, the resistance heating element is constructed by spirally winding the sheet.

[0020] In some embodiments, the resistance heating element is constructed by reciprocally bending the sheet.

[0021] In some embodiments, the resistance heating element has a central axis along a longitudinal direction; and

the resistance heating element has symmetry about the central axis, and the resistance heating element is rotationally symmetrical by 180 degrees around the central axis.

[0022] In some embodiments, the resistance heating element includes a plurality of conductive units formed on the at least two resistance heating layers.

[0023] In some embodiments, the plurality of conductive units are connected in series or in parallel.

[0024] In some embodiments, the plurality of conductive units are sequentially connected end to end.

[0025] In some embodiments, the sheet is provided with several holes, hollows, or slits, to enable the sheet to form a grid pattern.

[0026] In some embodiments, the sheet includes a foil layer made of a resistive metal or alloy.

[0027] Another embodiment of this application further provides a heater of a vapor generating device, including:

a holding element, including an inner cavity; and
at least one heating element, located in the inner cavity to heat air passing through the inner cavity, where the at least one heating element includes: at least two resistance heating layers formed by winding or bending a sheet made of a resistive metal or alloy; and during use, the air at least partially passes between the at least two resistance heating layers and is heated between the at least two resistance heating layers.

[0028] Another embodiment of this application further provides a vapor generating device, configured to heat an aerosol generating product to generate an aerosol. The vapor generating device includes:

at least one induction heating element, including at least two induction heating layers formed by winding or bending a sheet made of an inductive metal or alloy, where during inhalation, air at least partially passes between the at least two induction heating layers, and is heated between the at least two induction heating layers and then outputted to the aerosol generating product; and
a magnetic field generator, configured to generate a changing magnetic field, where the induction heating element is penetrated by the changing magnetic field to generate heat.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] One or more embodiments are exemplarily described with reference to the corresponding figures in the accompanying drawings, and the exemplary descriptions are not to be construed as limiting the embodiments. Elements in the accompanying drawings that have same reference numerals are represented as similar elements, and unless otherwise particularly stated, the figures in the accompanying drawings are not drawn to scale.

FIG. 1 is a schematic diagram of a vapor generating device according to an embodiment;

FIG. 2 is a schematic structural diagram of a heater in FIG. 1;

FIG. 3 is a schematic exploded view of parts of the heater in FIG. 2;

FIG. 4 is a schematic diagram of a sheet of a heating element in FIG. 3 before winding;

FIG. 5 is a schematic structural diagram of a heater according to another embodiment;

FIG. 6 is a schematic diagram of winding a sheet on a rod-shaped conductive base body in FIG. 5;

FIG. 7 is a top view or a cross-sectional view of a heater according to another embodiment;

FIG. 8 is a schematic diagram of a sheet according to another embodiment;

FIG. 9 is a schematic diagram of a sheet according to another embodiment;

FIG. 10 is a schematic diagram of a sheet according to another embodiment;

FIG. 11 is a schematic diagram of a heating element according to another embodiment;

FIG. 12 is a schematic diagram of a sheet before folding according to another embodiment;

FIG. 13 is a schematic diagram of a sheet according to an embodiment;

FIG. 14 is a schematic diagram of a vapor generating device according to another embodiment; and

FIG. 15 is a schematic diagram of a vapor generating

device according to another embodiment.

DETAILED DESCRIPTION

[0030] For ease of understanding this application, this application is described below in more detail with reference to accompanying drawings and specific implementations.

[0031] An embodiment of this application provides a vapor generating device 100 heating rather than burning an aerosol generating product 1000, such as a cigarette, to volatilize or release at least one component of the aerosol generating product 1000 to form an aerosol for inhalation, as shown in FIG. 1.

[0032] Further, in some embodiments, the aerosol generating product 1000 is preferably a tobacco-containing material with volatile compounds released from a substrate during heating; or may be a non-tobacco material that can be suitable for electric heating smoke production after being heated. The aerosol generating product 1000 is preferably a solid substrate, which may include one or more of powders, particles, shreds, strips, or flakes of one or more of a vanilla leaf, a tobacco leaf, homogenized tobacco, and expanded tobacco. Alternatively, the solid substrate may include additional tobacco or non-tobacco volatile flavor compounds, so as to be released when the substrate is heated.

[0033] In addition, as shown in FIG. 1, after the aerosol generating product 1000 is received in the vapor generating device 100, a part of the aerosol generating product 1000 is exposed outside the vapor generating device 100, for example, a filter, which is advantageous for inhalation by a user.

[0034] For a structure of the vapor generating device 100 according to an embodiment of this application, reference may be made to FIG. 1. An overall shape of the device is generally constructed as a flat cylinder. External components of the vapor generating device 100 include:

a housing 10, where an interior of the housing is of a hollow structure, to form assembly space that can be used for necessary functional components such as an electronic component and a heating component; and the housing 10 includes a proximal end 110 and a distal end 120 opposite to each other along a length direction.

[0035] As shown in FIG. 1, the vapor generating device 100 further includes:

a receiving port 111, located at the proximal end 110, where during use, the aerosol generating product 1000 can be at least partially received in the housing 10 through the receiving port 111, or can be removed from the housing 10 through the receiving port 111; a wall 12, at least partially surrounding or defining a chamber, where the chamber is used for receiving at least part of the aerosol generating product 1000 extending into the housing 10 through the receiving port 111; and

an air channel 150, located between the chamber and an air inlet 121, where during use, the air channel 150 provides a channel path from the air inlet 121 into the chamber/aerosol generating product 1000, as shown by an arrow R11 in FIG. 1.

[0036] In some embodiments, the wall 12 is in a tubular shape. In addition, the wall 12 is non-detachable or fixed and non-movable in the housing 10.

[0037] Further, as shown in FIG. 1, the vapor generating device 100 further includes:

a battery core 130, configured to supply power, where preferably, the battery core 130 is a rechargeable direct current battery core 130, and can be charged after being connected to an external power supply; and
a circuit board 140, arranged with a circuit.

[0038] Further, as shown in FIG. 1, the vapor generating device 100 further includes:

a heater 30, at least partially heating air passing through the heater 30 during inhalation, and heating the aerosol generating product 1000 by heated hot air.

[0039] Specifically, as shown in FIG. 1, the heater 30 is positioned between the air channel 150 and the chamber; and the heater 30 is positioned between the wall 12 and the air channel 150. In this way, the heater 30 heats air entering the chamber through the air channel 150 during inhalation, and then outputs the heated hot air to the aerosol generating product 1000.

[0040] For assembly or airflow output, in the embodiment of FIG. 1, at least one support element 40 is arranged between the heater 30 and the wall 12. The at least one support element 40 is configured to provide support between the wall 12 and the heater 30; and the at least one support element 40 is further configured to provide holding between the wall 12 and the heater 30, so that a spacing greater than 1 mm is held between the heater 30 and the chamber defined by the wall 12. In this way, the heater 30 is not in contact with the aerosol generating product 1000 received in the chamber, and the aerosol generating product 1000 can be heated only by the hot air.

[0041] In the embodiment of FIG. 1, at least one flexible sealing element 40 is arranged between the heater 30 and the wall 12. The flexible sealing element 40 is made of a flexible material such as silicone or a thermoplastic elastomer. Alternatively, the at least one sealing element 40 is configured to provide hermetic sealing between the heater 30 and the wall 12, to maximally prevent the hot air outputted by the heater 30 from escaping between the heater 30 and the wall 12.

[0042] In the foregoing embodiments, the support element 40 or the sealing element 40 is in an annular shape at least partially surrounding the heater 30/the wall 12.

[0043] Further, as shown in FIG. 2, the heater 30 includes:

a first end 311 and a second end 312 that face away from each other, where the first end 311 is close to and faces the chamber/the aerosol generating product 1000, and the second end 312 is close to and faces the air channel 150. During use, the air enters the heater 30 from the second end 312 to be heated, and then is outputted from the first end 311 to the chamber/the aerosol generating product 1000, as shown by arrows R12 in FIG. 2 and FIG. 3.

[0044] In addition, the heater 30 includes at least one or more airflow channels located between the first end 311 and the second end 312, so that the air passes from the second end 312 to the first end 311.

[0045] Specifically, the heater 30 includes: a holding element 310 and a heating element 320.

[0046] The holding element 310 is substantially in a tubular shape; and defining the first end 311 and the second end 312 of the heater 30, where the holding element 310 includes an inner cavity, and the inner cavity extends between the first end 311 and the second end 312. The inner cavity has an opening at the first end 311, to output heated air in the inner cavity to the chamber/the aerosol generating product 1000; and the inner cavity has an opening at the second end 312 for air to enter the inner cavity.

[0047] In addition, in some embodiments, an inner diameter of the holding element 310 ranges from 5.0 mm to 8.0 mm; a distance between an inner surface and an outer surface of the tubular holding element 310 (or a wall thickness of the holding element 310) ranges from 1 mm to 3 mm; and the holding element 310 is preferably made of a rigid insulation material, such as ceramic, glass, PEEK, organic polymer resin, or surface insulation metal.

[0048] The heating element 320 is located in the holding element 310, and at least partially held by the holding element 310. The heating element 320 is configured to heat the air passing from the second end 312 to the first end 311 during inhalation. As shown in FIG. 1 and FIG. 2, the heating element 320 is accommodated and held in the inner cavity of the holding element 310.

[0049] In addition, in some other variant embodiments, the heater 30 includes:

a first air-permeable blocking element (not shown in the figure), located at the first end 311 of the holding element 310, wherein a first end portion element is configured to cover or seal the first end 311, or further configured to prevent the heating element 320 from leaving the holding element 310 from the first end 311; and

a second air-permeable blocking element (not shown in the figure), located at the second end 312 of the holding element 310, wherein a second end portion element is configured to cover or seal the second end 312, or further configured to prevent the heating element 320 from leaving the holding element 310 from the second end 312.

[0050] The first air-permeable blocking element and/or the second air-permeable blocking element are constructed as screen plates or mesh-shaped components with several holes, so that the first air-permeable blocking element and/or the second air-permeable blocking element do not affect air flow while covering. In addition, the first end portion element further helps prevent an aerosol condensate or residues from the aerosol generating product 1000 from falling into the holding element 310.

[0051] In addition, in some embodiments, the holding element 310 is made of a thermal insulation material, to minimally prevent heat of the heater 30 from being transferred outward. The holding element 310 is preferably made of a thermal insulation material such as ceramic with a low thermal conductivity like zirconia ceramic or Teflon. In addition, in some embodiments, a thermal conductivity of the holding element 310 is less than 10 W/mK. More preferably, the thermal conductivity of the holding element 310 is less than 5 W/mK.

[0052] Alternatively, in some embodiments, a hollow region is further provided between the inner surface and the outer surface of the holding element 310, and a pressure of the hollow region is lower than a pressure of the external atmosphere, so that the hollow region of the holding element 310 forms thermal insulation vacuum space. In some embodiments, the pressure of the hollow region between the inner surface and the outer surface of the holding element 310 ranges from 0.1 mbar to 0.001 mbar.

[0053] In some embodiments, the heating element 320 is supported and fixed in the holding element 310 through some support components or structures located in the holding element 310. In this case, the heating element 320 is not in contact with the inner surface of the holding element 310, which is advantageous to prevent heat of the heating element 320 from being dissipated through the holding element 310.

[0054] Further, referring to the embodiments shown in FIG. 2 to FIG. 4, the heating element 320 is a resistance heating element. The heating element 320 in this embodiment is in a cylindrical or tubular shape obtained by winding a sheet 3210 including a resistive metal or alloy. The wound heating element 320 includes at least two wound heating layers 321. The resistive metal or alloy includes at least one of nickel, cobalt, zirconium, titanium, nickel alloy, cobalt alloy, zirconium alloy, titanium alloy, nickel-chromium alloy, nickel-iron alloy, iron-chromium alloy, iron-chromium-aluminum alloy, titanium alloy, iron-manganese-aluminum-based alloy, or stainless steel.

[0055] Alternatively, in some other embodiments, the heating element 320 obtained by spirally winding the sheet 3210 is arranged to have an extension length approximately ranging from 10 mm to 40 mm; and the heating element 320 obtained by spirally winding the sheet 3210 has an outer diameter approximately ranging from 5 mm to 8 mm.

[0056] In addition, in some embodiments, at least one side surface of the sheet 3210 made of the resistive metal

or alloy has an insulation layer or an insulation material, to provide insulation to prevent a contact short circuit between adjacent wound heating layers 321 during winding. The insulation layer or the insulation material is, for example, a surface oxidation layer formed by oxidizing a surface of the sheet 3210 made of the resistive metal or alloy, or a coated high-temperature-resistant inorganic glue/glaze.

[0057] In this embodiment, the heating element 320 is configured to generate heat by generating Joule heat when a direct current flows through the heating element 320.

[0058] Alternatively, in some other variant embodiments, the heating element 320 formed by winding is formed by winding the sheet 3210 made of an inductive metal or alloy. In addition, the sheet 3210 made of the inductive metal or alloy includes foil made of an inductive metal or alloy such as nickel-iron alloy or iron-aluminum alloy. In this case, the heating element 320 can be penetrated by a changing magnetic field to generate heat. Correspondingly, an induction coil (not shown in the figure) may be arranged on the outer surface of the holding element 310, and the induction coil surrounds and is held outside the holding element 310; and the induction coil is configured to generally generate the changing magnetic field to induce the heating element 320 wound by the sheet 3210 made of the inductive metal or alloy to generate heat, thereby heating the air.

[0059] In addition, further, as shown in FIG. 2 to FIG. 4, a spacing or channel 322 exists between adjacent heating layers 321 of the heating element 320. In some embodiments, an airflow channel passing through the heating element 320/the heater 30 is at least partially defined by the spacing or channel 322. During inhalation, when passing through the spacing or channel 322, the air is heated by the heating layer 321 to form the hot air, and then outputted. In the embodiments in FIG. 2 to FIG. 4, the wound heating element 320 is obtained by spirally winding the sheet 3210. In this case, the spacing or channel 322 between adjacent heating layers 321 ranges from 0.5 mm to 3 mm in some embodiments.

[0060] In addition, in some other variant embodiments, the heating element 320 further includes:

a porous body material, located in the spacing or channel 322; or a porous body material, located between adjacent heating layers 321. The porous body material is, for example, a porous ceramic body, porous diatomite, or porous glass. During inhalation, the air can pass through the porous body material to be heated and outputted. In addition, the porous body material may be further configured to store heat, to absorb and store heat dissipated by the heating layer 321 during non-inhalation. A porosity of the porous body material is greater than 60%; and an average microporous pore size of the porous body material is greater than 100 μm , for example, ranges from 150 μm to 500 μm .

[0061] In some embodiments, the sheet 3210 wound to form the heating element 320 is foil made of a resistive

metal or alloy. The foil made of a resistive metal or alloy has a thickness approximately ranging from 0.5 μm to 200 μm ; and more preferably, has a thickness approximately ranging from 10 μm to 30 μm .

[0062] In some other embodiments, the sheet 3210 wound to form the heating element 320 is a composite sheet including at least two layers. In some embodiments, for example, as shown in FIG. 13, the sheet 3210 wound to form the heating element 320 includes:

a foil layer 3220 made of a resistive metal or alloy; and

a stress compensation layer 3230, and a side surface combined with the foil layer 3220 made of a resistive metal or alloy, where the stress compensation layer 3230 provides stress compensation for bending or twisting during winding, to prevent the foil layer 3220 made of a brittle metal or alloy from being cracked or broken during winding.

[0063] In some embodiments, the stress compensation layer 3230 is hard, such as glaze, glass, or ceramic, to improve the strength or toughness of the sheet, to prevent the sheet 3210 from being cracked or broken during winding.

[0064] In some embodiments, the stress compensation layer 3230 is a flexible layer. Specifically, the stress compensation layer 3230 is made of a flexible polymer material such as polyimide, free polypropylene, or polyethylene.

[0065] The stress compensation layer 3230 has a same thickness as a metal or alloy layer; and the stress compensation layer 3230 is formed on at least one side surface of the foil layer 3220 made of a metal or alloy by coating, deposition, or the like.

[0066] Alternatively, in another variant embodiment shown in FIG. 13, the sheet 3210 wound to form the heating element 320 further includes:

a porous body material layer 3240. By pre-combining or preparing the foregoing porous body material in a form of a layer on the foil layer 3220 made of a metal or alloy, the porous body material layer 3240 may be filled between the heating layers 321 in the heating element 320 formed through winding. It is more convenient compared with filling the porous body material in the spacing or channel 322 after winding.

[0067] Alternatively, in another variant embodiment shown in FIG. 13, the sheet 3210 wound to form the heating element 320 further includes:

a transition layer 3240, for example, a waxy layer, an organic slurry, or a resin. The transition layer can provide insulation before the adjacent foil layers 3220 made of a metal or alloy of the sheet 3210 during winding. In addition, the transition layer 3240 may be volatilized, pyrolyzed, or melted by causing the heating element 320 to generate heat after winding. In this way, a position originally occupied by the transition layer 3240 forms space of the spacing or channel 322 after winding. This is more

convenient in preparation.

[0068] In the embodiment in FIG. 13, the stress compensation layer 3230 and the transition layer 3240/the porous body material layer 3240 are respectively arranged on two sides of the foil layer 3220 made of a metal or alloy. Alternatively, in some other variant embodiments, the compensation layer 3230 and the transition layer 3240/the porous body material layer 3240 are located on a same side of the foil layer 3220 made of a metal or alloy.

[0069] In addition, in the embodiments of FIG. 2 to FIG. 4, the heating element 320 further includes:

a first wire 341 and a second wire 342, connected to the heating element 320 to supply power to the heating element 320. In addition, before winding, the first wire 341 is located on one side of the sheet 3210, and the second wire 342 is located on the other side of the sheet 3210; and after winding, the first wire 341 is wound inside the heating element 320, and the second wire 342 is substantially located outside the heating element 320. In addition, after winding, the first wire 341 is connected to an innermost heating layer 321 of the heating element 320, and the second wire 342 is connected to an outermost heating layer 321 of the heating element 320.

[0070] In some embodiments, a diameter of the first wire 341 and a diameter of the second wire 342 may approximately range from 0.1 mm to 0.3 mm. In addition, the first wire 341 and the second wire 342 are both made of a material with low resistivity, such as gold, silver, copper, nickel, or an alloy containing the same.

[0071] Alternatively, in the embodiment shown in FIG. 4, a diameter of the first wire 341 is greater than a diameter of the second wire 342. In some embodiments, the diameter of the second wire 342 may approximately range from 0.1 mm to 0.3 mm; and the diameter of the first wire 341 ranges from 0.5 mm to 1.5 mm, so that the strength of the first wire 341 is greater than the strength of a conventional copper wire and silver-plated nickel wire. In this case, the heating element 320 obtained by winding the sheet 3210 around the first wire 341 as an axis is supported by the thicker first wire 341, and has greater strength.

[0072] In some embodiments, the heating element 320 approximately includes 2 to 20 windings. For example, in FIG. 3, the heating element 320 is obtained by spirally winding the sheet 3210 from inside to outside. Counting from the innermost first wire 341, each winding of 360 degrees of the sheet around the first wire 341 is considered as one winding, and one heating layer 321 is formed. For example, in the embodiment shown in FIG. 3, the resistance heating element 320 includes five wound resistance heating layers 321.

[0073] Further, FIG. 5 and FIG. 6 are schematic diagrams of a heater 30 according to another variant embodiment. In this embodiment, the heater 30 includes:

- a holding element 310a;
- a heating element 320a, located in the holding ele-

ment 310a, where similarly, the heating element 320a is obtained by winding a sheet 3210a; and the heating element 320a includes at least two or more wound heating layers 321a and a spacing or channel 322a located between the heating layers 321a, where an airflow channel is at least partially formed between adjacent heating layers 321a, and during inhalation, air passes through adjacent heating layers 321a as shown by an arrow R12 in FIG. 5 to be heated and outputted; and

a rod-shaped conductive base body 35a, located in the heating element 320a, and electrically connected to the heating element 320a. In addition, as shown in FIG. 5 and FIG. 6, in this embodiment, the sheet 3210a is formed by winding around the rod-shaped conductive base body 35a, as shown by an arrow R13 in FIG. 6; and during implementation, the rod-shaped conductive base body 35a is welded to one end of the sheet 3210a before winding to be in conduction with the sheet 3210a. In addition, after winding, an extension length of the rod-shaped conductive base body 35a is greater than a length of the heating element 320a, so that the conductive base body 35a is at least partially exposed outside the heating element 320a at a second end, to form an exposed part 351a located outside the heating element 320a.

[0074] Therefore, in some embodiments, the holding element 310a at least partially provides mounting and holding for the heating element 320a by holding the exposed part 351a. In addition, after winding, a first wire 341a is welded to the exposed part 351a, and then is indirectly conducted with an end of the heating element 320a; and a second wire 342a is welded to the other side of an outermost surface of the wound heating element 320a, and then serves as a positive/negative electrode together with the first wire 341a to guide a current on the heating element 320a.

[0075] Alternatively, FIG. 7 is a top view or a schematic cross-sectional view of a heater 30 according to another variant embodiment. The heater 30 includes:

- a holding element 310b; and
- a heating element 320b, formed by reciprocally bending a sheet. Further, the heating element 320b includes a plurality of heating layers 321b formed by reciprocally bending the sheet, and a spacing or channel 322b located between adjacent heating layers 321b along a radial direction.

[0076] Further, as shown in FIG. 7, the heating element 320b formed by reciprocally bending the sheet is substantially in a cylindrical or tubular shape. In addition, the heating element 320b is symmetrical along a central axis passing through a center point O. In other words, a cross-sectional shape of the heating element 320b obtained by reciprocally bending the sheet is symmetrical about the

central axis passing through the center point O by rotating by 180 degrees. In addition, the heating element 320b obtained by reciprocally bending the sheet includes a first end portion and a second end portion opposite to each other along the radial direction. A first wire 341b is welded to or connected to the first end portion, and a second wire 342b is welded to or connected to the second end portion. Compared with the heating element 320/320a that is spirally wound, in the heating element 320b obtained by reciprocally bending the sheet in this embodiment, both the first end portion and the second end portion are located or exposed outside the heating element 320b, which is very convenient for welding or connecting a power supply wire during preparation.

[0077] Alternatively, in some other variant embodiments, for example, as shown in FIG. 8, a sheet 3210c configured to be wound or bent to form the heating element 320/320a/320b is provided with several holes or hollows 3211c, to increase a resistance value of the heating element 320/320a/320b. In FIG. 8, the holes or hollows 3211c are arranged in a regular matrix; and the holes or hollows 3211c are formed by etching or the like to be in a circular shape. Alternatively, in some other variant embodiments, the holes or hollows 3211c may be square, polygonal, or in other shapes, so that the sheet 3210c presents a grid pattern.

[0078] Alternatively, FIG. 9 is a schematic diagram of a sheet 3210d before winding or bending according to another variant embodiment. In this embodiment, a first wire 341b and a second wire 342b are arranged on two side ends of the sheet 3210d along a length direction; and the sheet 3210d is sequentially arranged with a first side portion 3211d, a central portion 3213d, and a second side portion 3212d along the length direction. In terms of shape configuration, an extension length of the central portion 3213d is greater than an extension length of the first side portion 3211d and an extension length of the second side portion 3212d, and a width d2 of the central portion 3213d is less than a width d1 of the first side portion 3211d and the second side portion 3212d. Further, through the foregoing shape arrangement, the resistance of the sheet 3210d is increased, and heat generation is concentrated as much as possible in the central portion 3213d. The first side portion 3211d and the second side portion 3212d are configured to be wound and connected to wires for power supply.

[0079] Further, FIG. 10 is a schematic diagram of a sheet 3210e before winding or bending according to another variant embodiment. The sheet 3210e is substantially in a rectangular shape, and several slits or hollows 3211e and several slits or hollows 3212e are formed on the sheet 3210e by etching or cutting, to reduce an area of the sheet 3210e during power supply, thereby improving the resistance of the heating element 320/320a/320b formed after winding or bending. In FIG. 10, the slits or hollows 3211e and/or the slits or hollows 3212e are in an elongated strip shape extending along a width direction of the sheet 3210e. In addition, the several

slits or hollows 3211e and the several slits or hollows 3212e are provided alternately/at intervals along a length direction of the sheet 3210g. In addition, the slits or hollows 3211e and the slits or hollows 3212e are staggered along the length direction of the sheet 3210e. Specifically, in FIG. 10, the slit or hollow 3211e is located at a central position along the width direction of the sheet 3210e, and the slit or hollow 3212e is located at an edge position along the width direction of the sheet 3210e.

[0080] In addition, a first wire 341e and a second wire 342e are further arranged on two sides of the sheet 3210e along the length direction to supply power. In addition, a circuitous current i flowing through the heating element 320/320a/320b in FIG. 10 is formed by combining the first wire 341e and the second wire 342e with the slits or hollows 3211e and the slits or hollows 3212e that are arranged in a staggered manner.

[0081] Certainly, in some embodiments, a surface of at least one side of the sheet 3210e is coated with an insulation and support material such as glaze or ceramic, to provide insulation or support between folded resistance heating layers.

[0082] Alternatively, in another variant embodiment, a folded heating element is obtained by folding the sheet 3210e along a broken line n1 and/or a broken line n2 defined by the slit or hollow 3211e and/or the slit or hollow 3212e. For example, FIG. 11 is a schematic diagram of a heating element 320f formed by reciprocally folding a sheet. In this embodiment, the heating element 320f is formed by reciprocally folding the sheet 3210e or a similar material. A length L1 of the heating element 320f formed by folding approximately ranges from 10 mm to 40 mm; a width L2 of the heating element 320f formed by folding approximately ranges from 5 mm to 8 mm; and a thickness L3 of the heating element 320f formed by folding approximately ranges from 5 mm to 8 mm.

[0083] In addition, in some other variant embodiments, a cross-sectional shape of the heating element 320f formed by reciprocally folding the sheet may be substantially rectangular. The reciprocally folded heating element 320f includes two or more heating layers 321f; and a spacing or channel 322f for air to pass through is formed between adjacent heating layers 321f. Alternatively, a porous body material is filled in the spacing or channel 322f.

[0084] In addition, in the embodiment according to FIG. 11, the spacing or channel 322f formed in the reciprocally folded heating element 320f includes:

a first spacing or channel 3221f, closed at a first side end (a left side end in FIG. 11) and open at a second side end (a right side end in FIG. 11) of the heating element 320f along a width direction; and a second spacing or channel 3222f, open at the first side end (the left side end in FIG. 11) and closed at the second side end (the right side end in FIG. 11) of the heating element 320f along the width direction.

[0085] The first spacing or channel 3221f and the second spacing or channel 3222f are alternately provided along the thickness direction.

[0086] Alternatively, in another variant embodiment, for example, as shown in FIG. 12, a sheet 3210g is shaped or constructed with a plurality of conductive units 3212g connected in series. Specifically, the conductive unit 3212g extends along a width direction of the sheet 3210g; the sheet 3210g is provided with a slit or hollow 3211g and a slit or hollow 3214g extending along the width direction of the sheet 3210g; and a width of the slit or hollow 3214g is greater than a width of the slit or hollow 3211g. During implementation, the width of the slit or hollow 3211g/the slit or hollow 3214g approximately ranges from 0.2 mm to 1.0 mm, and a length of the slit or hollow 3211g/the slit or hollow 3214g approximately ranges from 8 mm to 35 mm. In addition, the slit or hollow 3211g terminates at a lower end portion of the sheet 3210g along the width direction, and the slit or hollow 3214g avoids an upper end portion of the sheet 3210g along the width direction. The slit or hollow 3211g and the slit or hollow 3214g are alternately provided at intervals along the length direction of the sheet 3110g. Further, the slit or hollow 3211g and the slit or hollow 3214g define the plurality of conductive elements 3212g connected in series.

[0087] As shown in FIG. 12, the plurality of conductive units 3212g connected in series and jointly defined by the slit or hollow 3211g and the slit or hollow 3214g are sequentially connected end to end.

[0088] Alternatively, in some other embodiments, the sheet 3210 configured to be wound or folded to form the heating element 320 includes:

a substrate, made of a flexible material, where the substrate is windable, foldable, or bendable; the substrate is electrically insulated; and the substrate is in a form of foil or sheet; and several heating coatings or tracks formed on the substrate through methods such as printing, depositing, or the like.

[0089] In some embodiments, the heating coating or track is formed by a paste of a metal or alloy. In addition, in some embodiments, the heating coating or track is in a shape that is circuitous or bends and extends on the substrate.

[0090] Further, the heater 30 further includes: a first temperature sensor, for example, a PT1000 or a J-type thermocouple. In some embodiments, the first temperature sensor is arranged close to the first end 311 of the holding element 310. In addition, the first temperature sensor is configured to sense a temperature outputted by the heater 30 to the chamber or the aerosol generating product 1000. The circuit board 140 controls, based on a sensing result of the first temperature sensor, a power provided to the heater 30, so that the temperature of the hot air outputted to the aerosol generating product 1000

is maintained at a target temperature.

[0091] Alternatively, in some other embodiments, the heater 30 further includes:

a second temperature sensor, combined on the heating element 320/320a/320b, to sense a temperature of the heating element 320/320a/320b. Further, the circuit board 140 controls, based on a sensing result of the second temperature sensor, the power provided to the heater 30, so that the temperature of the hot air outputted to the aerosol generating product 1000 is maintained at the target temperature.

[0092] Further, FIG. 14 is a schematic diagram of a vapor generating device 100 according to another embodiment. The vapor generating device 100 includes a first heater 30k and a second heater 60k that are sequentially arranged at intervals.

[0093] The second heater 60k is closer to the chamber/the aerosol generating product 1000 than the first heater 30k. In addition, the air sequentially passes through the first heater 30k and the second heater 60k and is heated to a predetermined temperature, and then is outputted to the chamber/the aerosol generating product 1000.

[0094] The second heater 60k and the first heater 30k are separated by an isolator 50k; and the isolator 50k is further configured to provide sealing at edges of the second heater 60k and the first heater 30k.

[0095] The first heater 30k is located upstream of the second heater 60k, and the second heater 60k is not in contact with the first heater 30k.

[0096] In addition, the first heater 30k is configured to heat the air to a first predetermined temperature and then output the air to the second heater 60k, and the second heater 60 further heats the air to a second predetermined temperature and then outputs the air to the chamber/the aerosol generating product 1000. In addition, the second predetermined temperature is higher than the first predetermined temperature.

[0097] An extension length of the first heater 30k is greater than an extension length of the second heater 60. In addition, the vapor generating device 100 includes only two heaters. Alternatively, in some other embodiments, the vapor generating device 100 may include more, for example, three, four, or five heaters.

[0098] In some other embodiments, during inhalation, a cross-sectional area of a channel through which the air passes in the first heater 30k is greater than a cross-sectional area of a channel through which the air passes in the second heater 60. Specifically, a spacing between heating layers of a heating element in the first heater 30k may be greater than a spacing between heating layers of a heating element in the second heater 60.

[0099] Further, FIG. 15 is a schematic diagram of a vapor generating device 100 according to another embodiment. The vapor generating device 100 includes a heater 30i. The heater 30i includes:

a holding element 310i, and a first heating element 330i and a second heating element 320i sequentially ar-

ranged at an interval in the holding element 310i.

[0100] The second heating element 320i is closer to the chamber/the aerosol generating product 1000 than the first heating element 330i. In addition, the air sequentially passes through the first heating element 330i and the second heating element 320i and is heated to a predetermined temperature, and then is outputted to the chamber/the aerosol generating product 1000.

[0101] The first heating element 330i and the second heating element 320i are separated from each other.

[0102] The first heating element 330i is located upstream of the second heating element 320i, and the second heating element 320i is not in contact with the first heating element 330i.

[0103] In addition, the first heating element 330i is configured to heat the air to a first predetermined temperature and then output the air to the second heating element 320i, and the second heating element 320i further heats the air to a second predetermined temperature and then outputs the air to the chamber/the aerosol generating product 1000. In addition, the second predetermined temperature is higher than the first predetermined temperature.

[0104] In addition, the vapor generating device 100 includes only two heating elements. Alternatively, in some other embodiments, the vapor generating device 100 may include more, for example, three, four, or five heating elements.

[0105] In addition, in some other embodiments, the first heating element 330i and the second heating element 320i are independently connected to a circuit board 140i, and then are independently driven by the circuit board 140i to perform heating. In addition, in some other embodiments, the first heating element 330i and the second heating element 320i perform heating simultaneously. In addition, in some other embodiments, the first heating element 330i and the second heating element 320i do not perform heating simultaneously.

[0106] In addition, the first heating element 330i and the second heating element 320i may be alternately activated.

[0107] It should be noted that, the specification of this application and the accompanying drawings thereof illustrate preferred embodiments of this application, but this application is not limited to the embodiments described in the specification. Further, a person of ordinary skill in the art may make improvements or variations according to the foregoing descriptions, and such improvements and variations shall all fall within the protection scope of the appended claims of this application.

Claims

1. A vapor generating device, configured to heat an aerosol generating product to generate an aerosol, **characterized in that** the vapor generating device comprises:

at least one resistance heating element formed by winding or bending a sheet made of a resistive metal or alloy, wherein the at least one resistance heating element comprises at least two wound or bent resistance heating layers; and during inhalation, air at least partially passes between the at least two resistance heating layers, and is heated between the at least two resistance heating layers and then outputted to the aerosol generating product.

2. The vapor generating device according to claim 1, further comprising:
a holding element, at least partially surrounding or holding the at least one resistance heating element.

3. The vapor generating device according to claim 2, wherein the at least one resistance heating element is accommodated in the holding element; and the holding element is defined with:

an air inlet for air to enter; and
an air outlet for outputting heated air to the aerosol generating product.

4. The vapor generating device according to claim 3, further comprising:

a temperature sensor, combined with the at least one resistance heating element to sense a temperature of the at least one resistance heating element; and/or
a temperature sensor, located at the air outlet to sense a temperature of the air outputted from the air outlet.

5. The vapor generating device according to any one of claims 1 to 4, further comprising:
a first wire and a second wire, configured to supply power to the resistance heating element.

6. The vapor generating device according to claim 5, wherein the resistance heating element is in a cylindrical shape formed by winding the sheet; and the first wire is at least partially arranged inside the resistance heating element, and the second wire is arranged outside the resistance heating element.

7. The vapor generating device according to claim 5, wherein the resistance heating element is formed by winding the sheet around the first wire as an axis; and a diameter of the first wire is greater than a diameter of the second wire.

8. The vapor generating device according to claim 5, wherein the resistance heating element is formed by winding the sheet around the first wire as an axis; and a diameter of the first wire ranges from 0.1 mm to 1.5 mm.

9. The vapor generating device according to claim 5, further comprising:

a conductive base body, wherein the resistance heating element is formed by winding the sheet around the conductive base body as an axis; the conductive base body is electrically conductive to the resistance heating element; the first wire is indirectly conducted with the resistance heating element by connecting to the conductive base body; and the second wire is directly connected to and conducted with the resistance heating element.

10. The vapor generating device according to any one of claims 2 to 4, further comprising:

a base body, wherein the resistance heating element is formed by winding the sheet around the base body as an axis; the base body comprises an exposed part extending out of the resistance heating element; and the holding element at least partially holds the resistance heating element by holding the exposed part.

11. The vapor generating device according to any one of claims 1 to 4, further comprising:

a chamber, configured to receive at least part of the aerosol generating product; and an air-permeable blocking element, located between the chamber and the at least one resistance heating element, and configured to prevent an aerosol condensate or residues from the aerosol generating product from falling into or entering the at least one resistance heating element.

12. The vapor generating device according to any one of claims 1 to 4, further comprising:
a porous body material, located between adjacent resistance heating layers.

13. The vapor generating device according to any one of claims 1 to 4, wherein the sheet is continuous.

14. The vapor generating device according to any one of claims 1 to 4, wherein the at least two resistance heating layers are connected in series.

15. The vapor generating device according to any one of claims 1 to 4, wherein the resistance heating element is constructed by spirally winding the sheet.

16. The vapor generating device according to any one of claims 1 to 4, wherein the resistance heating element is constructed by reciprocally bending the sheet.

17. The vapor generating device according to any one of claims 1 to 4, wherein the resistance heating element has a central axis along a longitudinal direction; and the resistance heating element is symmetrical about the central axis, and the resistance heating element is rotationally symmetrical by 180 degrees around the central axis.

18. The vapor generating device according to any one of claims 1 to 4, wherein the resistance heating element comprises a plurality of conductive units formed on the at least two resistance heating layers.

19. The vapor generating device according to claim 18, wherein the plurality of conductive units are connected in series or in parallel.

20. The vapor generating device according to claim 18, wherein the plurality of conductive units are sequentially connected end to end.

21. The vapor generating device according to any one of claims 1 to 4, wherein the sheet is provided with several holes, hollows, or slits, to enable the sheet to form a grid pattern.

22. The vapor generating device according to any one of claims 1 to 4, wherein the sheet comprises a foil layer made of a resistive metal or alloy.

23. A heater for a vapor generating device, **characterized by:**

a holding element, comprising an inner cavity; and
at least one heating element, located in the inner cavity to heat air passing through the inner cavity, wherein the at least one heating element comprises: at least two resistance heating layers formed by winding or bending a sheet made of a resistive metal or alloy; and during use, the air at least partially passes between the at least two resistance heating layers and is heated between the at least two resistance heating layers.

24. A vapor generating device, configured to heat an aerosol generating product to generate an aerosol, **characterized in that** the vapor generating device comprises:

at least one induction heating element, comprising at least two induction heating layers formed by winding or bending a sheet made of an inductive metal or alloy, wherein during inhalation, air at least partially passes between the at least two induction heating layers, and is heated between the at least two induction heating layers

and then outputted to the aerosol generating product; and
a magnetic field generator, configured to generate a changing magnetic field, wherein the induction heating element is penetrated by the 5
changing magnetic field to generate heat.

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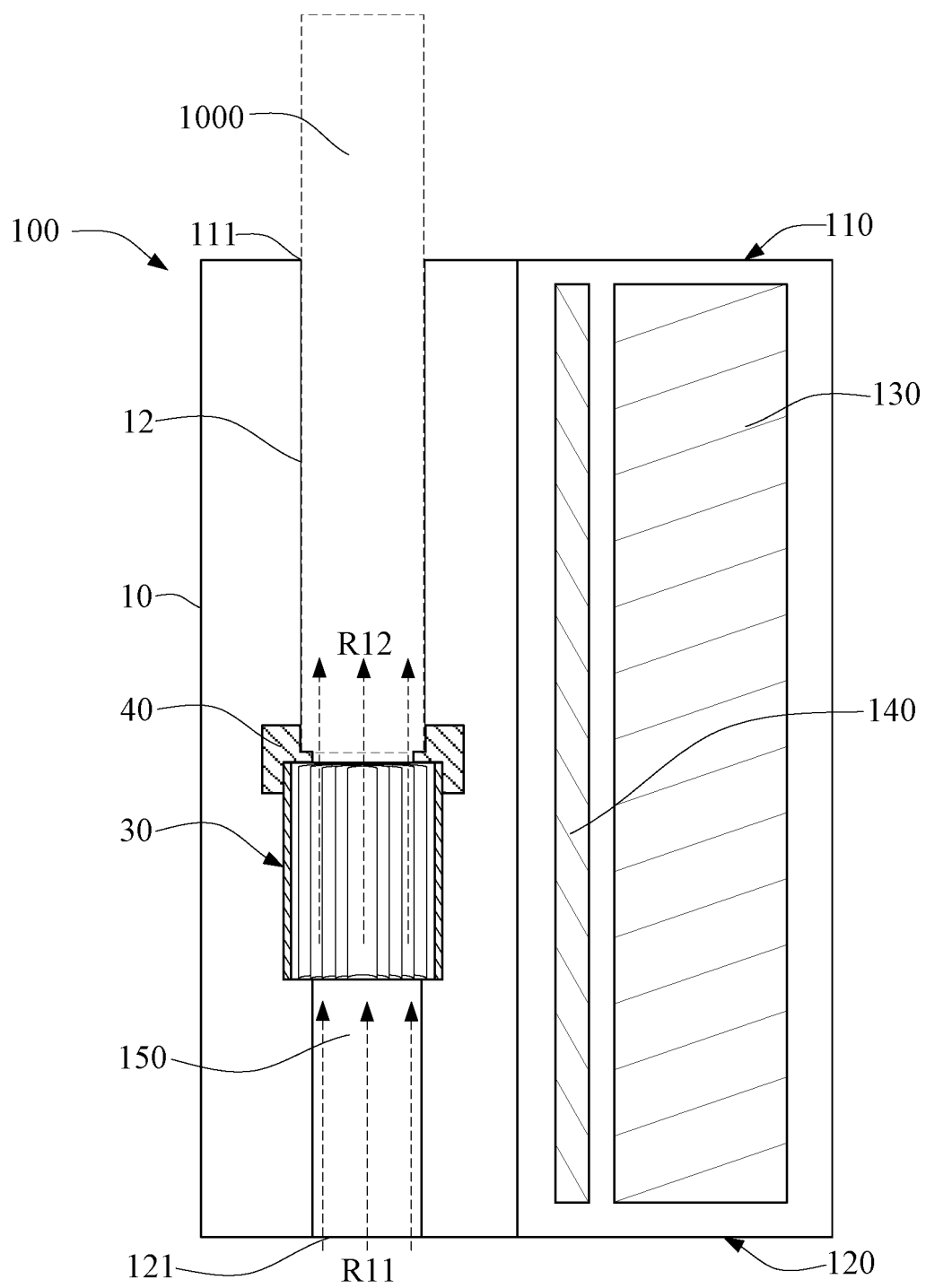


FIG. 1

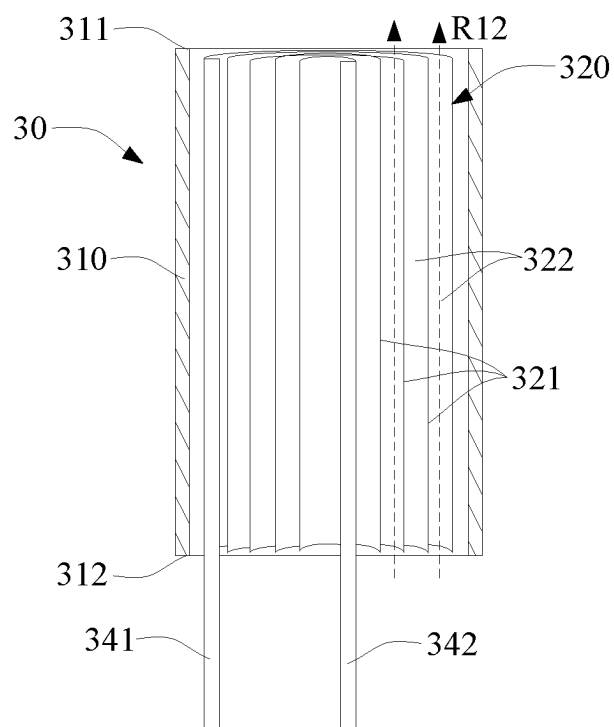


FIG. 2

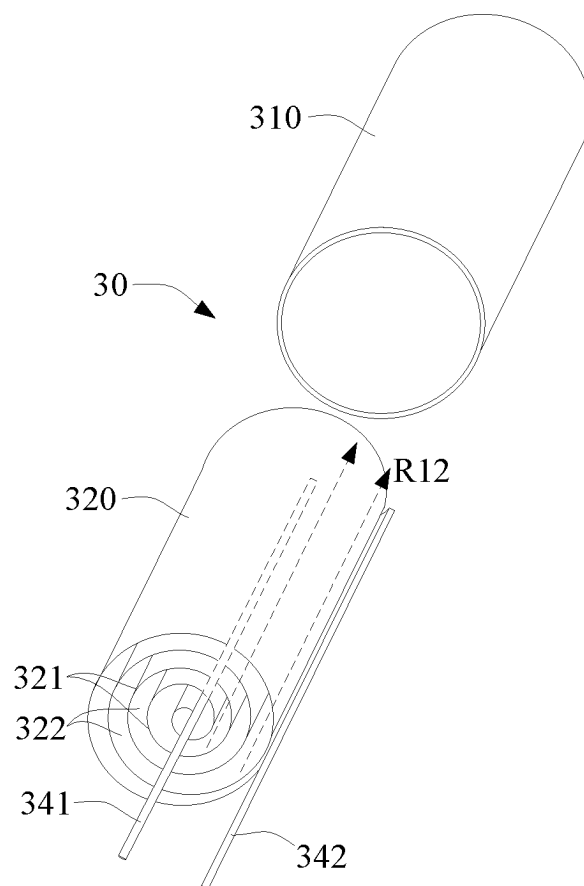


FIG. 3

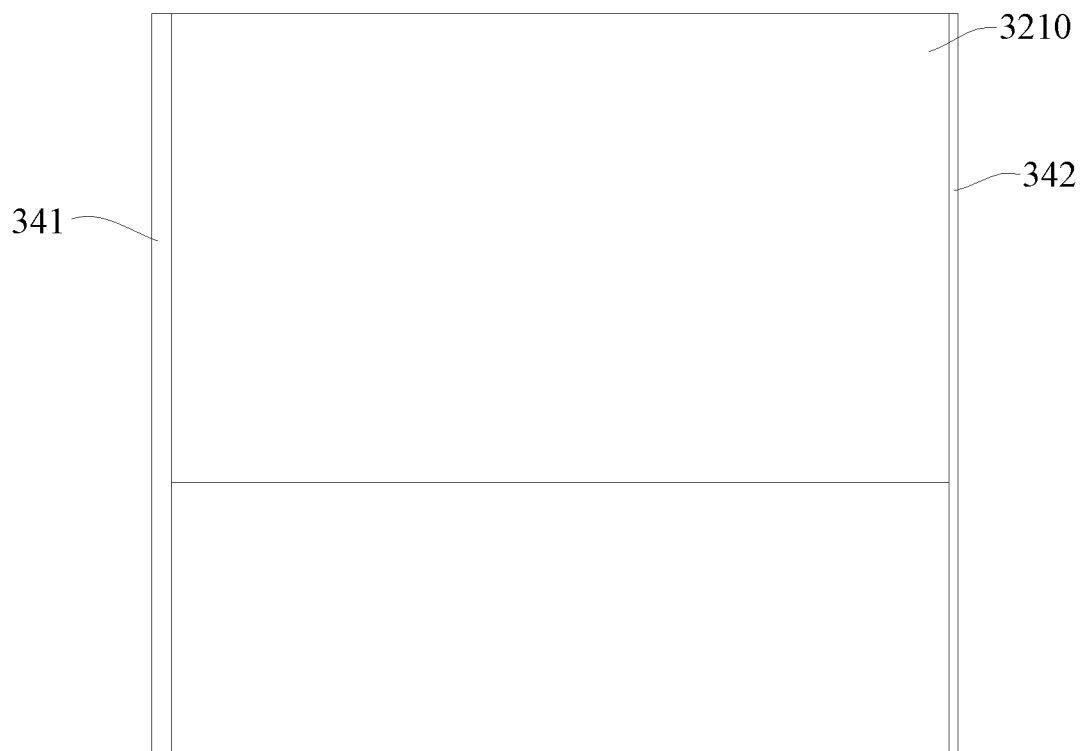


FIG. 4

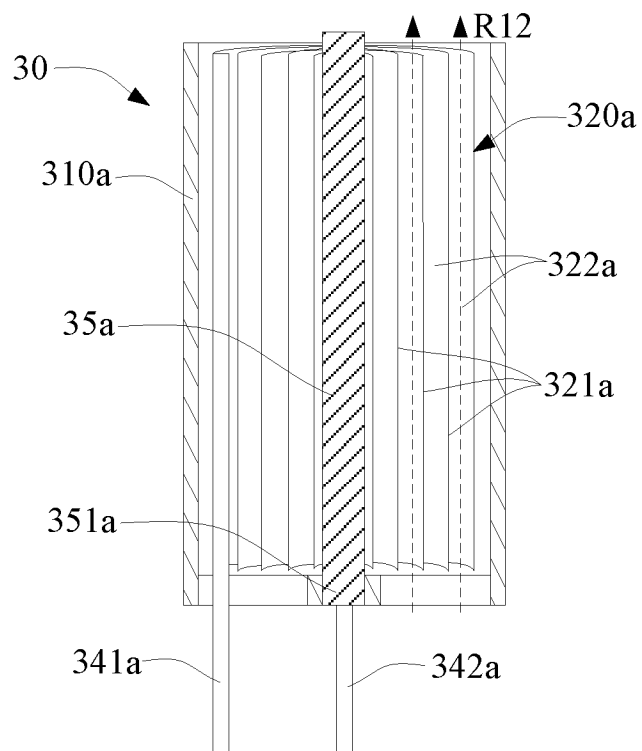


FIG. 5

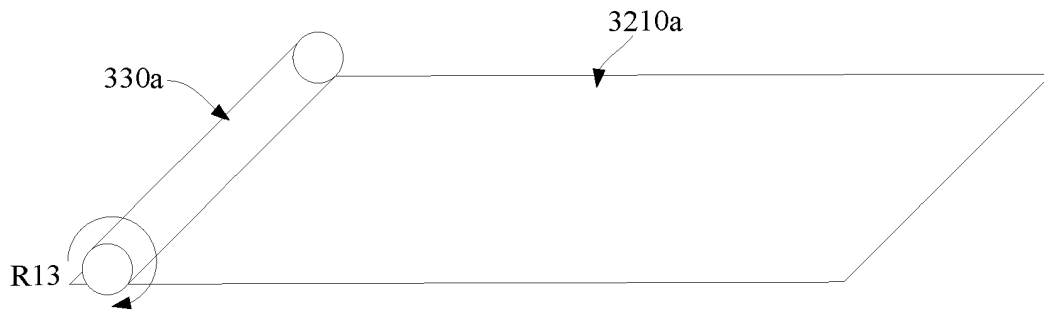


FIG. 6

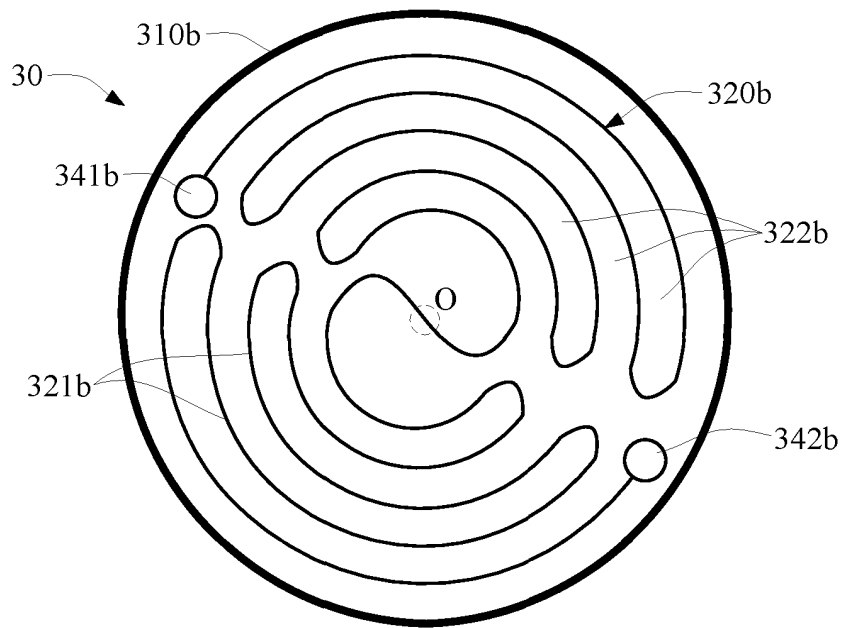


FIG. 7

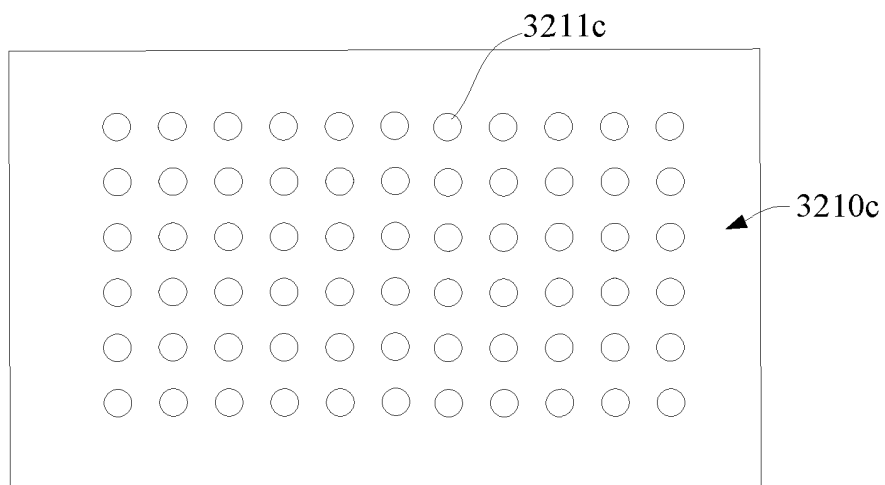


FIG. 8

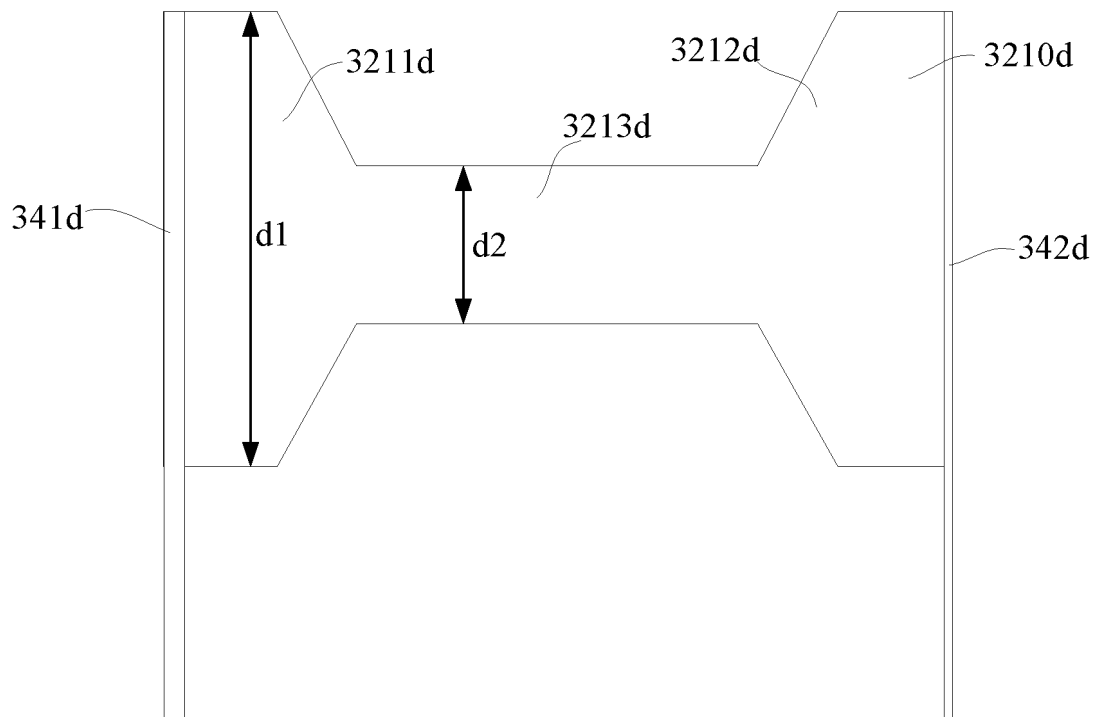


FIG. 9

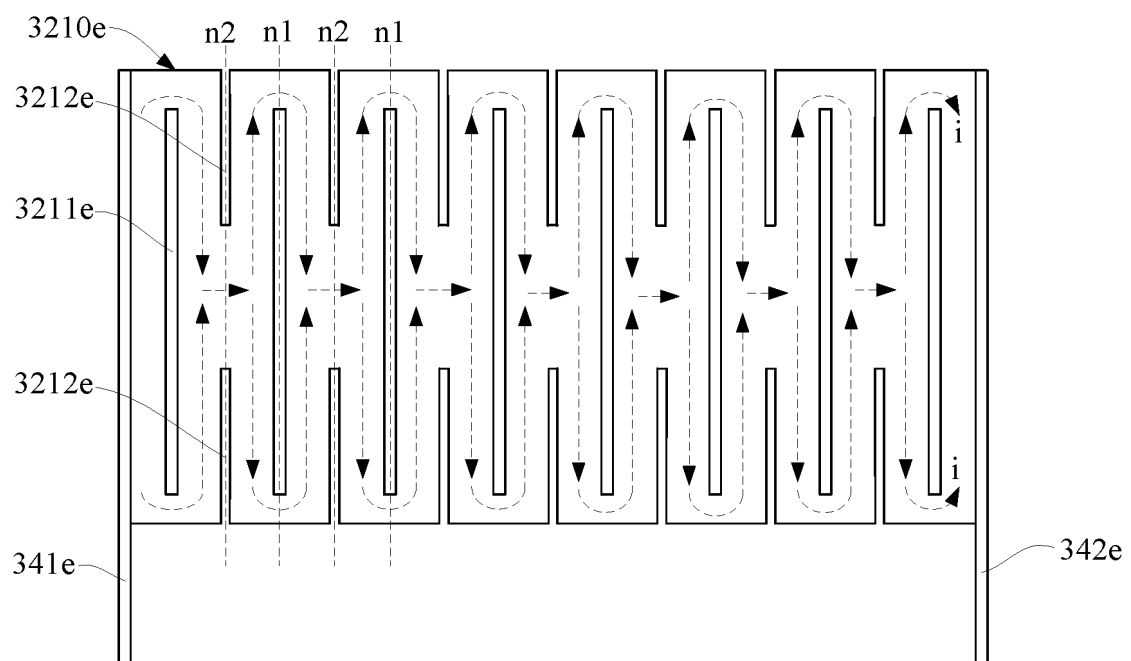


FIG. 10

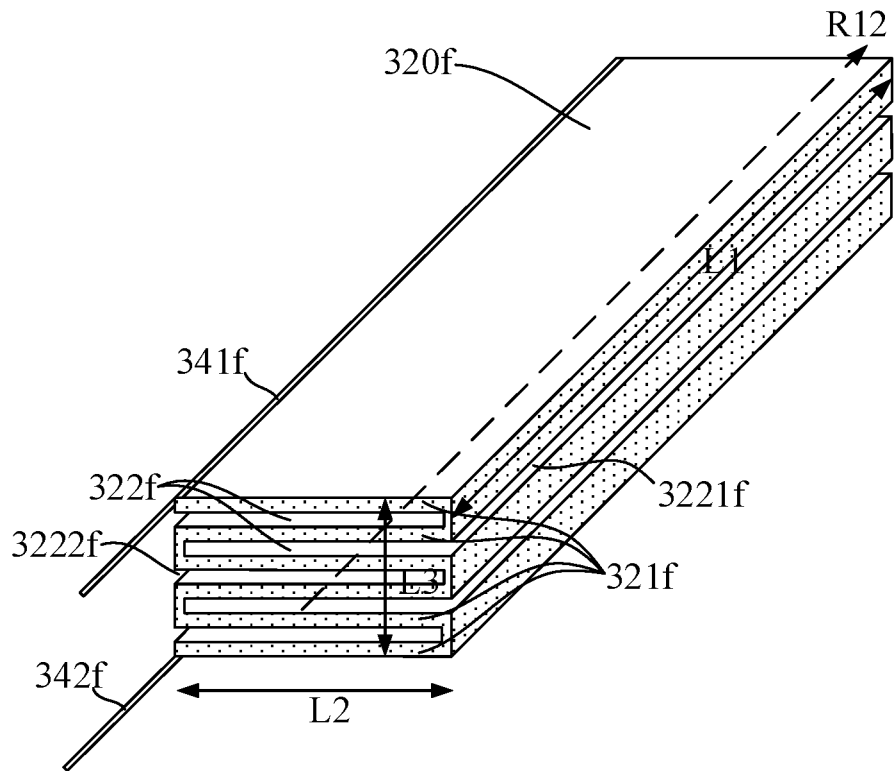


FIG. 11

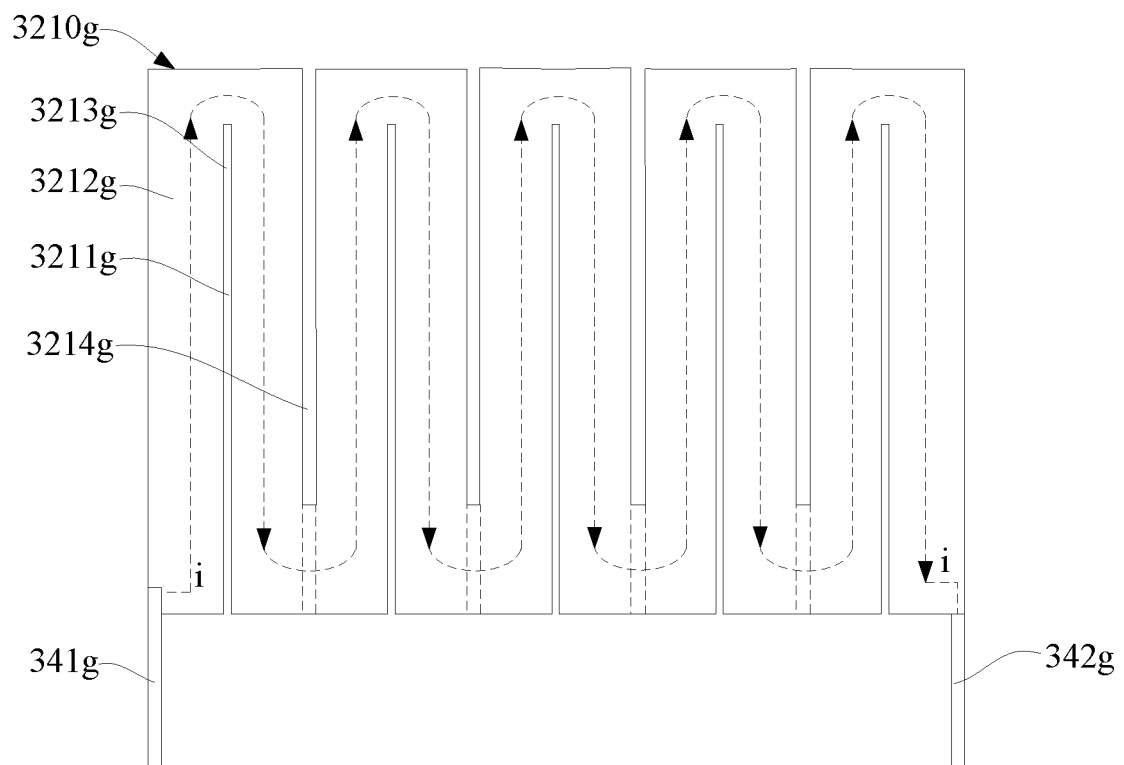


FIG. 12

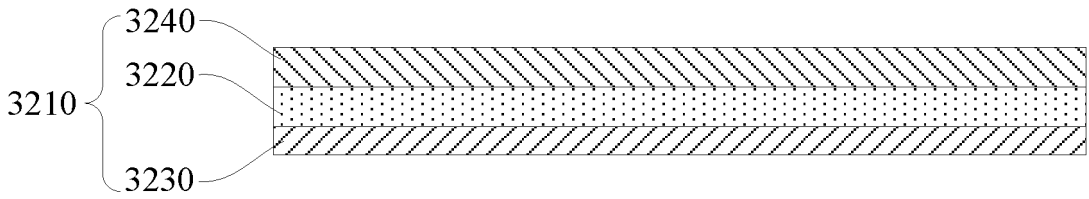


FIG. 13

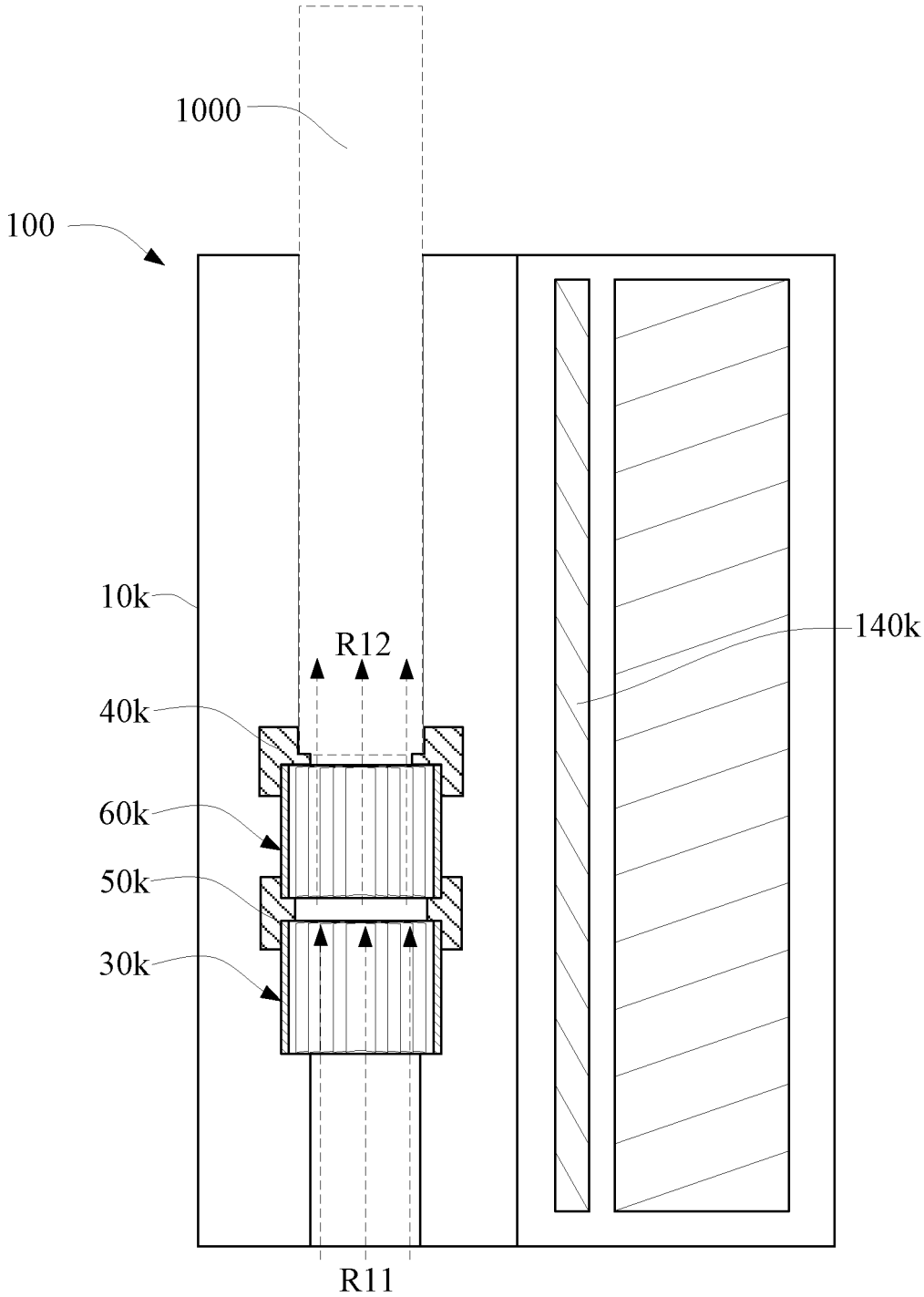


FIG. 14

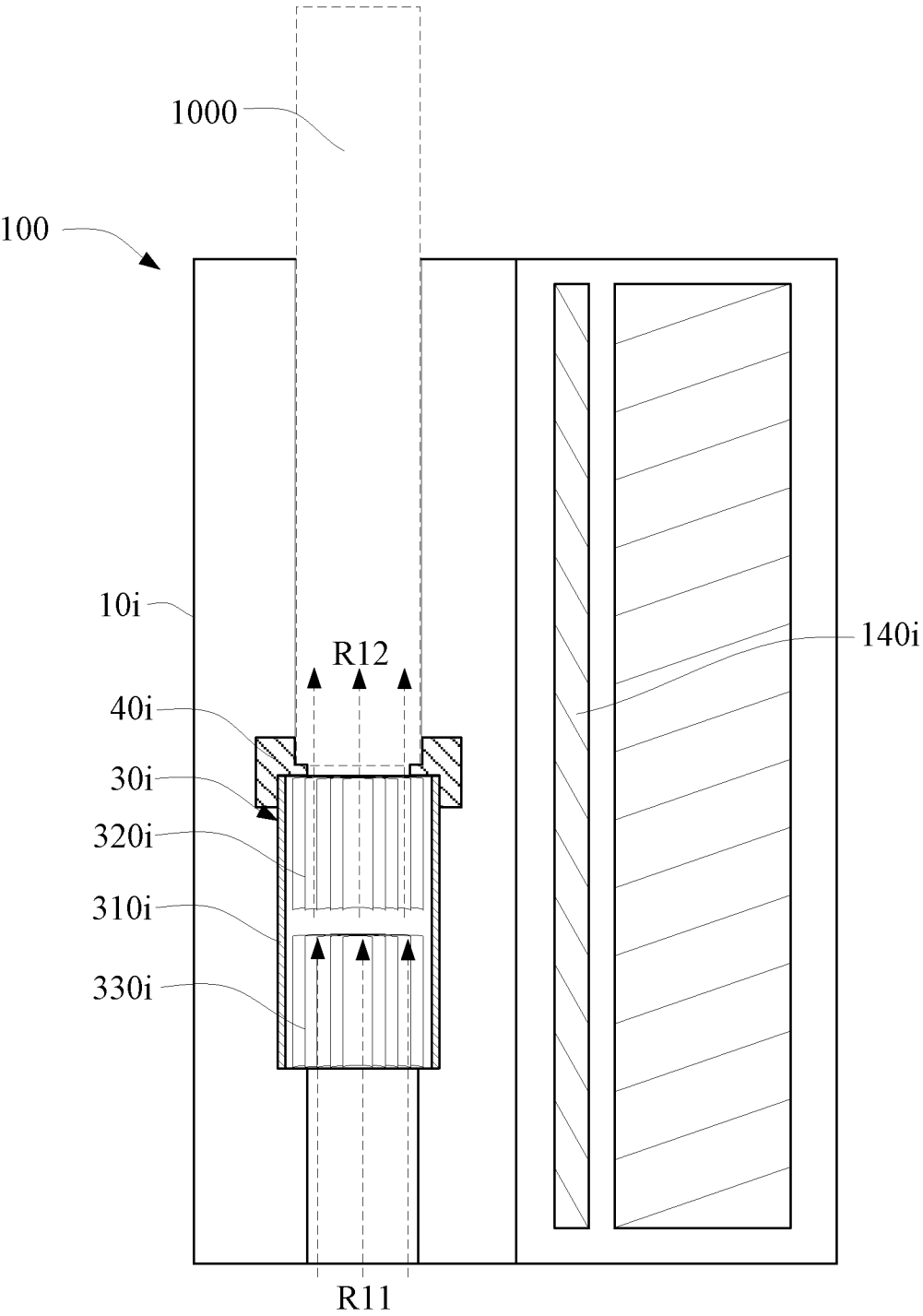


FIG. 15

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2023/097454

A. CLASSIFICATION OF SUBJECT MATTER A24F40/20(2020.01)i; A24F40/46(2020.01)i; A24F47/00(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:A24F 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) CNTXT; WPABSC; ENTXTC; CNKI; WPABS; ENTXT: 电子烟, 气溶胶, 雾化, 加热, 卷, 绕, 弯, 螺旋, 气流, 感应, 屑, 渣, 挡, cigarette, aerosol, heating, resistance, bending, folding, winding, sheet, flow, induction, induce, resist, stop																					
C. DOCUMENTS CONSIDERED TO BE RELEVANT																						
<table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>PX</td> <td>CN 218073524 U (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 20 December 2022 (2022-12-20) claims 1-24, description, paragraphs [0066]-[0170], and figures 1-15</td> <td>1-24</td> </tr> <tr> <td>X</td> <td>KR 20220023450 A (KT & G CORP.) 02 March 2022 (2022-03-02) description, paragraphs [0037]-[0092], and figures 1 and 3-6</td> <td>1-10, 12-24</td> </tr> <tr> <td>Y</td> <td>KR 20220023450 A (KT & G CORP.) 02 March 2022 (2022-03-02) description, paragraphs [0037]-[0092], and figures 1 and 3-6</td> <td>11</td> </tr> <tr> <td>Y</td> <td>CN 216533831 U (NANTONG JINYUAN NEW MATERIAL CO., LTD.) 17 May 2022 (2022-05-17) description, paragraphs [0023]-[0027], and figures 1-3</td> <td>11</td> </tr> <tr> <td>X</td> <td>CN 214127020 U (SHENZHEN INNOKIN TECHNOLOGY CO., LTD.) 07 September 2021 (2021-09-07) description, paragraphs [0024]-[0029], and figures 1-4</td> <td>1-10, 12-23</td> </tr> <tr> <td>X</td> <td>CN 210008531 U (CHANGZHOU PATENT ELECTRONIC TECHNOLOGY CO., LTD.) 04 February 2020 (2020-02-04) description, paragraphs [0033]-[0053], and figures 1-6</td> <td>1-10, 12-23</td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	PX	CN 218073524 U (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 20 December 2022 (2022-12-20) claims 1-24, description, paragraphs [0066]-[0170], and figures 1-15	1-24	X	KR 20220023450 A (KT & G CORP.) 02 March 2022 (2022-03-02) description, paragraphs [0037]-[0092], and figures 1 and 3-6	1-10, 12-24	Y	KR 20220023450 A (KT & G CORP.) 02 March 2022 (2022-03-02) description, paragraphs [0037]-[0092], and figures 1 and 3-6	11	Y	CN 216533831 U (NANTONG JINYUAN NEW MATERIAL CO., LTD.) 17 May 2022 (2022-05-17) description, paragraphs [0023]-[0027], and figures 1-3	11	X	CN 214127020 U (SHENZHEN INNOKIN TECHNOLOGY CO., LTD.) 07 September 2021 (2021-09-07) description, paragraphs [0024]-[0029], and figures 1-4	1-10, 12-23	X	CN 210008531 U (CHANGZHOU PATENT ELECTRONIC TECHNOLOGY CO., LTD.) 04 February 2020 (2020-02-04) description, paragraphs [0033]-[0053], and figures 1-6	1-10, 12-23	☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.
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PX	CN 218073524 U (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 20 December 2022 (2022-12-20) claims 1-24, description, paragraphs [0066]-[0170], and figures 1-15	1-24																				
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* Special categories of cited documents: “A” document defining the general state of the art which is not considered to be of particular relevance “D” document cited by the applicant in the international application “E” earlier application or patent but published on or after the international filing date “L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) “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 11 August 2023	Date of mailing of the international search report 02 September 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/CN2023/097454

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 210017883 U (CHANGZHOU PATENT ELECTRONIC TECHNOLOGY CO., LTD.) 07 February 2020 (2020-02-07) description, paragraphs [0032]-[0052], and figures 1-6	1-10, 12-23
A	CN 215347057 U (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 31 December 2021 (2021-12-31) entire document	1-24
A	US 2021212382 A1 (FUISZ HNB TECHNOLOGIES LLC) 15 July 2021 (2021-07-15) entire document	1-24
A	CN 113576048 A (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 02 November 2021 (2021-11-02) entire document	1-24

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International application No.

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