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(54) **HEATING ASSEMBLY, ATOMIZER AND AEROSOL GENERATING APPARATUS**

(57) A heating assembly (10), an atomizer (20), and an aerosol generating apparatus. The heating assembly (10) comprises: a base (1) and a radiation layer (2). The base (1) is a hollow cavity (12) with an opening (11) at one end, and is used for accommodating an aerosol generating product (22) in the cavity (12) or removing same from the cavity (12) through the opening (11); and the radiation layer (2) is provided at least corresponding to the side wall of the base (1) and is used for radiating infrared rays when heated, so as to heat the aerosol generating product (22) in the cavity (12). The heating assembly (10) effectively increases the types and content of aroma substances formed by atomization, and improves the utilization rate and heating uniformity of the aerosol generating product (22). Meanwhile, it can be ensured that the aerosol generating product (22) is always in a relatively stable cracking temperature environment.

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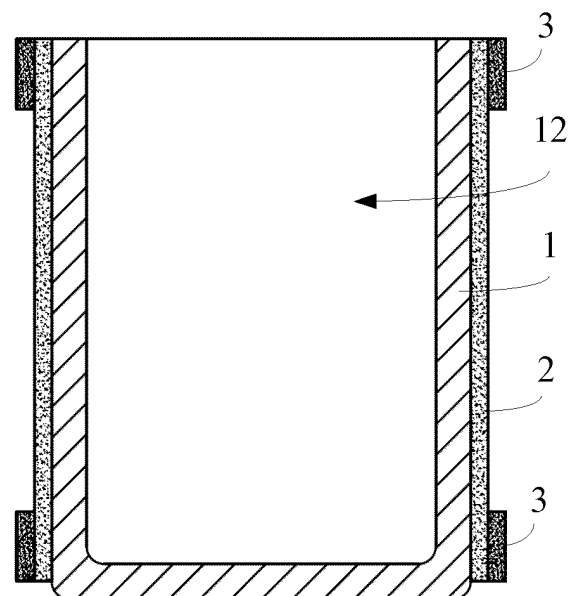


FIG. 2

Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims the priority of the Chinese patent application No. 202210936179.6, filed on August 3, 2022, contents of which are incorporated herein by its entirety.

TECHNICAL FIELD

[0002] Embodiments of the present disclosure relate to the technical field of electronic atomizing, and more specifically, to a heating assembly, an atomizer, and an aerosol-generating device.

BACKGROUND

[0003] A low-temperature baking aerosol-generating device is safe, can be used conveniently and healthily, and is environmental friendly, and therefore, the low-temperature baking aerosol-generating device is getting more and more attention and favor.

[0004] The aerosol-generating device typically includes a heating assembly and a power supply assembly. The heating assembly is configured to receive an aerosol-generating article and heats and atomizes the aerosol-generating article to generate an inhalable aerosol. In the art, when the heating assembly is ventilated, oxygen is ventilated at the atmospheric pressure to enable inhalation, and that is, an air flow is introduced from an outside of the heating assembly, and the air flow continuously passes through the aerosol-generating article to carry the atomized aerosol.

[0005] However, when passing through the aerosol-generating article, the air flow may rapidly reduce a heating temperature of the aerosol-generating article, and stability of the aerosol-generating article to perform a cleavage reaction is poor, in addition, the air flow provides sufficient oxygen. Therefore, an oxidation reaction is a dominant reaction performed in the aerosol-generating article, such that varieties and contents of aroma substances generated from atomization are reduced, and the user experience is poor.

SUMMARY

[0006] The present disclosure provides a heating assembly, an atomizer, and an aerosol-generating device to solve the technical problem of varieties and contents of aroma substances generated from atomization being reduced and providing a poor user experience, which is caused by the oxidation reaction being the dominant reaction performed in the aerosol-generating article. The oxidation reaction being dominant is due to the air flow, when passing through the aerosol-generating article, providing sufficient oxygen and rapidly reducing the heating temperature of the aerosol-generating article, caus-

ing the stability of the aerosol-generating article performing the cleavage reaction being poor.

[0007] In an aspect, the present disclosure provides a heating assembly, including: a substrate, being a hollow cavity having an opening at one end to enable an aerosol-generating article to be received in or removed out of the cavity through the opening; a radiation layer, disposed at least corresponding to a side wall of the substrate and configured to radiate, when being heated, infrared rays to heat the aerosol-generating article in the cavity.

[0008] In some embodiments, the heating assembly further includes a resistive heating layer, the resistive heating layer is disposed on a side of an outer wall surface of the side wall of the substrate and is configured to generate, when being supplied with power, heat to heat the radiation layer.

[0009] In some embodiments, the radiation layer is disposed on a side of the outer wall surface of the side wall of the substrate; the resistive heating layer is disposed on a side of the radiation layer away from the substrate.

[0010] Alternatively, the radiation layer is disposed on a side of an inner wall surface of the side wall of the substrate, the resistive heating layer is disposed on a side of the substrate away from the radiation layer.

[0011] In some embodiments, the substrate is a transparent substrate.

[0012] In some embodiments, the radiation layer is disposed on a side of an outer wall surface of the side wall of the substrate and is configured to generate, when being supplied with power, heat to heat the aerosol-generating article received in the cavity.

[0013] In some embodiments, the substrate is an insulating substrate; the radiation layer is disposed on the outer wall surface of the side wall of the substrate.

[0014] In some embodiments, the substrate is a conductive metal substrate; the heating assembly further comprises an insulating layer, the insulating layer is disposed between the radiation layer and the substrate.

[0015] In some embodiments, the radiation layer is disposed corresponding to the entire outer wall surface of the side wall of the substrate.

[0016] In some embodiments, the heating assembly further includes an electrode layer electrically connected to the radiation layer to supply power to the radiation layer. The electrode layer is disposed on a surface of the radiation layer away from the substrate.

[0017] Alternatively, the electrode layer and the radiation layer are arranged at the same layer.

[0018] In some embodiments, the heating assembly further comprises an electrically conductive coil, the electrically conductive coil is arranged to surround an outer periphery of the radiation layer and is configured to generate, when being supplied with power, a varying magnetic field. The radiation layer is disposed on a side of an outer wall surface of the side wall of the substrate, the radiation layer is configured to form eddy currents in the varying magnetic field to be heated

[0019] In some embodiments, the heating assembly further includes an electrically conductive coil disposed to surround an outer periphery of the substrate to generate, when being supplied with power, a varying magnetic field; the radiation layer is disposed on a side of an inner wall surface of the side wall of the substrate; the substrate is configured to form eddy currents in the varying magnetic field to generate heat to heat the radiation layer.

[0020] In some embodiments, the radiation layer is an infrared layer.

[0021] In another aspect, the present disclosure provides an atomizer, including: the heating assembly as described in the above; a shell, having a receiving chamber and at least one air inlet communicating with the receiving chamber and ambient air; and the aerosol-generating article, received in the receiving chamber. A portion of the shell is detachably connected to an interior of the cavity of the heating assembly; the at least one air inlet is defined in a portion of the shell protruding out of the heating assembly.

[0022] In still another aspect, the present disclosure provides an aerosol-generating device, including: one of the heating assembly as described in the above and the atomizer as described in the above; and a power supply assembly, electrically connected to the heating assembly or the atomizer to supply power to the heating assembly or the atomizer.

[0023] According to the present disclosure, the heating assembly, the atomizer and the aerosol-generating device are provided. For the heating assembly, the substrate configured to receive the aerosol-generating article is a hollow cavity having an opening at one end. In this way, during inhalation, the amount of low-temperature fresh air flow passing through the aerosol-generating article in the cavity is effectively reduced, such that the aerosol-generating article, at an initial stage of heating, is subjected to a negative pressure and less oxygen. When inhaling at the negative pressure and less oxygen, materials in the aerosol-generated article mainly undergo hydrogenation, reduction reactions and cleavage reactions, such that the varieties and contents of the aroma substances generated from atomization can be effectively increased. The problem of generating less aroma substances due to oxidation reactions caused by the fresh air flow passing through the aerosol-generated article can be overcome. At the same time, it is ensured that the aerosol-generating article is always in a stable cleavage temperature, overcoming the problem of the cleavage reaction being unstable caused by a rapid decrease in the temperature of the aerosol-generating article due to the fresh air flow passing through the aerosol-generating article. In addition, since the radiation layer is arranged on the side wall of the substrate, infrared rays are radiated during heating, such that the aerosol-generated articles in the cavity is heated. In this way, a utilization rate of the aerosol-generated article and the uniformity of heating are effectively improved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024]

FIG. 1 is a structural schematic view of a heating assembly according to an embodiment of the present disclosure.

FIG. 2 is a cross-sectional view of the heating assembly according to an embodiment of the present disclosure.

FIG. 3 is a structural schematic view of a substrate according to an embodiment of the present disclosure.

FIG. 4 is a cross-sectional view of the heating assembly according to a second embodiment of the present disclosure.

FIG. 5 is a cross-sectional view of the heating assembly according to a third embodiment of the present disclosure.

FIG. 6 is a cross-sectional view of the heating assembly according to a fourth embodiment of the present disclosure.

FIG. 7 is a plane view of a radiation layer, a resistive heating film layer, and an electrode layer according to an embodiment of the present disclosure.

FIG. 8 is a cross-sectional view of the heating assembly according to a fifth embodiment of the present disclosure.

FIG. 9 is a cross-sectional view of the heating assembly according to a sixth embodiment of the present disclosure.

FIG. 10 is a cross-sectional view of the heating assembly according to a seventh embodiment of the present disclosure.

FIG. 11 is a structural schematic view of an atomizer according to an embodiment of the present disclosure.

FIG. 12 is a simplified structural schematic view of an aerosol-generating device according to an embodiment of the present disclosure.

FIG. 13 is a simplified structural schematic view of the aerosol-generating device according to another embodiment of the present disclosure.

Reference numerals in the drawings:

[0025] Heating assembly 10; substrate 1; opening 11; cavity 12; radiation layer 2; electrode layer 3; electrically conductive coil 4; resistive heating layer 5; atomizer 20; shell 21; air inlet 211; air outlet channel 212; aerosol-generating article 22; power supply assembly 30.

DETAILED DESCRIPTIONS

[0026] Technical solutions in embodiments of the present disclosure will be described clearly and completely in the following by referring to accompanying drawings in the embodiments of the present disclosure. Apparently,

the described embodiments are only a part of, not all of, the embodiments of the present disclosure. All other embodiments, which are obtained by any ordinary skilled person in the art based on the embodiments in the present disclosure without making creative work, shall fall within the scope of the present disclosure.

[0027] Terms "first", "second", and "third" in the present disclosure are used for descriptive purposes only and are shall not be interpreted as indicating or implying relative importance or implicitly specifying the number of technical features. Therefore, a feature defined by the "first", the "second", or the "third" may explicitly or implicitly include at least one such feature. In the description of the present disclosure, "a plurality of" means at least two, such as two, three, and so on, unless otherwise expressly and specifically limited. All directional indications (such as up, down, left, right, front, rear) in the embodiments of the present disclosure are only used to explain a relative positional relationship and movement between components in a particular attitude (the attitude as shown in the accompanying drawings). The directional indications may be changed accordingly when the particular attitude is changed. Furthermore, the terms "include", "have" and any variations thereof are intended to cover non-exclusive inclusion. For example, a process, a method, a system, a product or an apparatus including a series of steps or units is not limited to the listed steps or units, but may further include steps or units that are not listed or include steps or units that are inherently included in the process, the method, the system, the product or the apparatus.

[0028] Reference to "embodiments" herein implies that particular features, structures, or characteristics described in embodiments may be included in at least one embodiment of the present disclosure. Presence of the term at various sections in the specification does not necessarily refer to one same embodiment, nor a separate or alternative embodiment that is mutually exclusive of other embodiments. It is understood by any ordinary skilled person in the art, both explicitly and implicitly, that the embodiments described herein may be combined with other embodiments.

[0029] The present disclosure is described in detail below by referring to the accompanying drawings and embodiments.

[0030] As shown in FIG. 1, FIG. 1 is a structural schematic view of a heating assembly according to an embodiment of the present disclosure; and FIG. 2 is a cross-sectional view of the heating assembly according to an embodiment of the present disclosure. In the present embodiment, the heating assembly 10 is provided and is configured to heat and atomize, when power is applied, an aerosol-generating article 22 (as shown in FIG. 11 below) to generate an aerosol. The heating assembly 10 may be applied in various fields, such as medical cares, cosmetics, and recreational vaping. The aerosol-generating article 22 may preferably be a solid matrix, including plant leaves such as tobacco, vanilla leaves, tea leaves,

mint leaves, and so on; one or more of: one or more powders, granules, fragmented thin strips, strips, or flakes. Alternatively, the solid matrix may contain additional volatile flavor compounds to be released when the matrix is heated. Of course, the aerosol-generated article 22 may alternatively be a liquid matrix or a paste matrix, such as oils, medicinal liquids, and so on. In the following embodiments, the aerosol-generating article 22 is the solid matrix, as an example.

[0031] As shown in FIG. 2, the heating assembly 10 includes a substrate 1, a radiation layer 2, and an electrode layer 3. As shown in FIG. 3, FIG. 3 is a structural schematic view of the substrate according to an embodiment of the present disclosure. The substrate 1 is a hollow cavity 12 having an opening 11 at one end. For example, the substrate 1 may be a hollow cylinder enabling the aerosol-generating article 22 to be received in or removed out of the cavity 12 through the opening 11. An inner diameter of the cavity 12 may be adapted to an outer diameter of the to-be-received aerosol-generating article 22, such that a gap between the aerosol-generating article 22 and a side wall of the cavity 12 is reduced.

[0032] Compared to a hollow substrate having two openings respectively at two ends, the substrate 1 for receiving the aerosol-generating article 22 being configured as the hollow cavity 12 having one opening 11 at one end effectively reduces the amount of low-temperature fresh air flow passing through the cavity 12 to flow through the aerosol-generating article 22 during heating, such that the aerosol-generating article 22 is subjected to the negative pressure and less oxygen at the initial stage of heating. When being subjected to the negative pressure and less oxygen for inhalation, materials in the aerosol-generating article 22 mainly undergo hydrogenation, reduction reactions and cleavage reactions. Therefore, varieties and contents of the aroma substances generated from atomization are effectively increased, overcoming the problem of less aroma substances being generated due to sufficient oxidation brought by the fresh air flowing through the aerosol-generating article 22. In addition, it is ensured that the aerosol-generating article 22 is stably subjected to a cleavage temperature, overcoming the problem of the cleavage reaction being unstable caused by the rapid decrease in temperature of the aerosol-generating article 22 due to the fresh air flow passing through the aerosol-generating article 22.

[0033] As shown in FIG. 2, the radiation layer 2 is arranged corresponding to the side wall of the substrate 1 and is configured to radiate infrared rays when the substrate is heating the aerosol-generating article 22 in the cavity 12. In this way, the utilization rate of the aerosol-generating article 22 and uniformity of heating are effectively improved. Of course, in other embodiments, the radiation layer 2 may be further arranged corresponding to a bottom wall of the substrate 1 (i.e., an end wall opposite to the end having the opening 11) to improve a heating efficiency of the heating assembly 10.

[0034] In a specific embodiment, the radiation layer 2 may be an infrared layer. The infrared outer layer radiates the infrared rays when being heated. Since the infrared rays have a strong thermal radiation capability, the infrared rays can penetrate an interior of the aerosol-generating article 22 and simultaneously heat an entirety of the aerosol-generating article 22, including both the interior and an exterior of the aerosol-generating article 22. In this way, a temperature difference between an internal temperature and an external temperature of the aerosol-generating article 22 is reduced. Compared to a conventional resistive heating manner or an electromagnetic heating manner, the infrared heating provides improved heating uniformity, overcoming the problem of the aerosol-generating article 22 being burnt due to a local high temperature. The radiation layer 2 may be a far-infrared ceramic layer, a metal layer, or a conductive carbon layer, which may be determined as needed.

[0035] In a specific embodiment, the radiation layer 2 is an infrared ceramic coating. The radiation layer 2 radiates the infrared rays during operation to heat the aerosol-generated article 22. An infrared heating wavelength is 2.5 μm to 20 μm . Regarding to characteristics of heating the aerosol-generated article 22, an infrared emission rate is usually above 0.8 when a heating temperature is at 200° C to 300° C. When the heating temperature reaches about 350° C, an energy radiation limit is achieved when the infrared heating wavelength is in the 3 μm to 5 μm .

[0036] In an embodiment, as shown in FIG. 2, the radiation layer 2 is specifically arranged on a side of an outer wall surface of the side wall of the substrate 1. The infrared rays radiated by the radiation layer 2 pass through the substrate 1 to enter an interior of the cavity 12 to heat the aerosol-generating article 22 received in the cavity 12. Specifically, the substrate 1 may be a transparent substrate. In this way, the infrared rays radiated by the radiation layer 2 can optimally pass through the substrate 1 to heat the aerosol-generating article 22 inside the cavity 12. A utilization rate of the infrared rays and the heating efficiency of the aerosol-generating article 22 are improved.

[0037] In a specific embodiment, as shown in FIG. 2, the electrode layer 3 is electrically connected to the radiation layer 2. After power is supplied to the electrode layer 3, a current flows through the radiation layer 2, a temperature of the radiation layer 2 increases to stimulate higher infrared radiation. Since infrared radiation having a wavelength of less than 4 μm can pass through the transparent quartz substrate 1 infrared energy stimulated by the radiation layer 2 passes through the substrate 1 to heat the aerosol-generating article 22 in the cavity 12. At the same time, the substrate 1 is heated by the radiation layer 2, such that far-infrared radiation is excited to heat the aerosol-generating article 22 inside the substrate 1. In this way, the aerosol-generating article 22 in the cavity 12 can be heated by radiation and by heat conduction, heating uniformity and utilization of the aerosol-generating article 22 can be improved.

[0038] As shown in FIG. 2, the electrode layer 3 may be arranged on a surface of the radiation layer 2 away from the substrate 1 to be electrically connected to the radiation layer 2. Of course, when the radiation layer 2 does not cover edges of two ends of the substrate 1, as shown in FIG. 4, which is a cross-sectional view of the heating assembly according to a second embodiment of the present disclosure, the electrode layer 3 may be arranged at the edges of the two ends of the substrate 1 and is located on the outer wall surface of the side wall of the substrate 1. The electrode layer 3 and the radiation layer 2 are arranged at the same layer, such that electrical connection between the electrode layer 3 and the radiation layer 2 is achieved. In this way, a space at the surface of the substrate 1 can be fully utilized to reduce a space occupied by the entire heating assembly 10.

[0039] Specifically, the electrode layer 3 may be made by sintering a high thermal conductivity metal material on the radiation layer 2 or on the outer wall surface of the side wall of the substrate 1.

[0040] In the present embodiment, the substrate 1 may be made of an insulating material. The substrate 1 may specifically be made of a material that is resistant to high temperatures and has a high infrared transmittance, and the material includes, but not limited to, quartz glass, yttrium-aluminum garnet single crystals, germanium single crystals, magnesium fluoride ceramics, yttrium oxide ceramics, magnesium-aluminum spinel ceramics, sapphire, silicon carbide, and so on. In some embodiments, the substrate 1 is made of quartz glass.

[0041] The radiation layer 2 may be formed on the entire outer wall surface of the side wall of the substrate 1 by silk-screening, coating, sputtering, printing or cast molding, and so on, so as to ensure that the aerosol-generating article 22 received in the cavity 12 can be entirely heated. A shape, an area and a thickness of the radiation layer 2 may be determined based on actual needs. For example, the shape of the radiation layer 2 may be a continuous membrane, a porous mesh, or a strip, and so on. Specifically, the radiation layer 2 may be configured as a membranous surface to generate heat. It is understood that in order to enable the radiation layer 2 to generate heat more uniformly, the radiation layer 2 has a consistent thickness at various locations on the substrate 1. Of course, for some special needs, the thickness of the radiation layer 2 at various locations on the substrate 1 may be varied, such that various regions of the heating assembly 10 may have various infrared energy densities. That is, when the heating assembly 10 is energized to operate, various regions of the heating assembly 10 have various heat densities, forming various temperature fields.

[0042] Specifically, the radiation layer 2 may be made of a conductor or a semiconductor material that can generate heat when being electrically conductive. For example, the radiation layer 2 is made of perovskite in an ABO_3 type having metallic properties. The A is one or more of: La, Sr, Ca, Mg, and Bi; and the B is one or more

of: Al, Ni, Fe, Co, Mn, Mo, and Cr.

[0043] Of course, in some embodiments, the substrate 1 may alternatively be an electrically conductive metal substrate, such as a stainless steel substrate or a metallic aluminum substrate, and so on. In order to prevent a short circuit between the substrate 1 and the radiation layer 2, the heating assembly 10 further includes an insulating layer, the insulating layer is disposed between the radiation layer 2 and a resistive heating layer 5. The insulating layer may specifically be formed on the outer wall surface of the side wall of the substrate 1 by silk-screening, coating, sputtering, printing or cast molding. The insulating layer may specifically be made of an insulating material that is resistant to high temperatures, such as ceramics, quartz glass, mica, or the like.

[0044] In another embodiment, as shown in FIG. 5, FIG. 5 is a cross-sectional view of the heating assembly according to a third embodiment of the present disclosure, being different from the heating assembly 10 provided in the embodiment of FIG. 2, the heating assembly 10 in the present embodiment the heating assembly 10 further includes an electrically conductive coil 4. The electrode layer 3 is electrically connected to the electrically conductive coil 4 to supply power to the electrically conductive coil 4. The radiation layer 2 includes an infrared material and a ferromagnetic material doped in the infrared material. The infrared material may be one or more of: perovskite, spinel, olivine, and carbide. The ferromagnetic material may be one or more of: iron-based metal or alloys, cobalt-based metal or alloys, nickel-based metal or alloys, and ferrite.

[0045] In the present embodiment, the electrically conductive coil 4 surrounds an outer periphery of the radiation layer 2 to generate a varying magnetic field when the power is supplied. The ferromagnetic material of the radiation layer 2 is heated by eddy currents formed in the varying magnetic field.

[0046] Specifically, the electrically conductive coil 4 may be made of an electrically conductive metal material, such as copper, aluminum, silver, and so on. In the present embodiment, the electrically conductive coil 4 is a metal coil made of copper. The electrically conductive coil 4 may specifically be an enameled wire or a Leeds wire, being wound on a side of the radiation layer 2 away from the substrate 1. It is understood that in the present embodiment, an enamel outside the wire is an insulating material in order to prevent short circuits between coils.

[0047] In another embodiment, as shown in FIG. 6, which is a cross-sectional view of the heating assembly according to a fourth embodiment of the present disclosure, being different from the heating assembly 10 provided in the embodiment of FIG. 2, the heating assembly 10 of the present embodiment further includes the resistive heating layer 5 arranged on a surface of the radiation layer 2 away from the substrate 1. The electrode layer 3 is electrically connected to the resistive heating layer 5. When power is supplied to the electrode layer 3, a current flows through the resistive heating layer 5 to cause the

resistive heating layer 5 to generate heat to heat the radiation layer 2, such that the radiation layer 2 is heated to radiate the infrared rays. Specifically, the electrode layer 3 may be arranged on a surface of the resistive heating layer 5 away from the radiation layer 2 or on the same layer as the resistive heating layer 5. The present embodiment does not limit how the electrode layer 3 is arranged, as long as the electrical connection between the electrode layer 3 and the resistive heating layer 5 can be achieved.

[0048] The resistive heating layer 5 may specifically be configured in the form of surface heat generation, for example, the resistive heating layer 5 may have a continuous cylindrical surface. Of course, the resistive heating layer 5 may be configured to have any pattern that satisfies a heating effect. For example, as shown in FIG. 7, FIG. 7 is a plane view of the radiation layer, the resistive heating layer, and the electrode layer according to an embodiment of the present disclosure. The resistive heating layer 5 may be configured to have a W-shape, or an M-shape, or a spiral shape, and so on.

[0049] The resistive heating layer 5 may be made of a mixture of the metal Ag and glass or a material having a positive temperature coefficient of resistance, such as a silver-palladium alloy; or made of a resistive electric heating material having a negative temperature coefficient of resistance.

[0050] In the present embodiment, the material of the radiation layer 2 may be a conductive or insulating material having a high infrared emission rate, such as at least one of: a material of the perovskite system, a material of the spinel system, carbides, silicides, nitrides, oxides, and a material of the rare-earth materials, which has the high infrared emission rate. When the radiation layer 2 is the electrically conductive material, the insulating layer may be further disposed between the radiation layer 2 and the resistive heating layer 5 to prevent a short circuit. A material and configuration of the insulating layer is similar to those mentioned in the above

[0051] In another embodiment, as shown in FIG. 8, FIG. 8 is a cross-sectional view of the heating assembly according to a fifth embodiment of the present disclosure. Being different from the heating assembly 10 provided in the embodiments shown in FIGS. 2 to 7, for the heating assembly 10 in the present embodiment, the radiation layer 2 is disposed on a side of an inner wall surface of the side wall of the substrate 1. Compared to arranging the radiation layer 2 on the outer wall surface of the side wall of the substrate 1, arranging the radiation layer 2 on a side of the inner wall surface of the side wall of the substrate 1 allows the infrared rays radiated by the radiation layer 2 to directly heat the aerosol-generating article 22 without passing through the substrate 1, further improving the utilization rate of the infrared rays.

[0052] In an embodiment, as shown in FIG. 8, the electrode layer 3 may also be electrically connected to the radiation layer 2. In this way, after the power is supplied to the electrode layer 3, the current flows

through the radiation layer 2 to increase the temperature of the radiation layer 2 to excite higher infrared radiation. Details are described in the embodiments shown in FIG. 2. As shown in FIG. 8, the electrode layer 3 in the present embodiment may alternatively be arranged on the inner wall surface of the side wall of the substrate 1 and is located at the same layer as the radiation layer 2. Of course, the electrode layer 3 may also be disposed on the surface of the substrate 1 away from the radiation layer 2 or on the surface of the radiation layer 2 away from the substrate 1.

[0053] The substrate 1 may be the insulating substrate, and the radiation layer 2 is disposed on the inner wall surface of the side wall of the substrate 1, which can be referred to relevant description in the above. Of course, the substrate 1 may alternatively be an electrically conductive metal substrate, and in this case, the insulating layer may be disposed between the radiation layer 2 and the substrate 1 in order to prevent the short circuit between the radiation layer 2 and the substrate 1.

[0054] In another embodiment, as shown in FIG. 9, FIG. 9 is a cross-sectional view of the heating assembly according to a sixth embodiment of the present disclosure. Being different from the heating assembly 10 provided in the embodiment of FIG. 8, for the heating assembly 10 of the present embodiment, the substrate 1 further includes the electrically conductive coil 4, and the electrode layer 3 is electrically connected to the electrically conductive coil 4 to supply power to the electrically conductive coil 4. In the present embodiment, the substrate 1 is made of a material that can generate heat by inducing eddy currents of the varying magnetic field. The substrate 1 may be a metallic substrate, such as one or more of: an iron-based metal or alloy, a cobalt-based metal or alloy or a nickel-based metal or alloy, and ferrites.

[0055] In the present embodiment, the electrically conductive coil 4 surrounds the outer periphery of the substrate 1 and is configured to generate the varying magnetic field when being supplied with power. The substrate 1 is located in a highly frequently varying magnetic field generated by the electrically conductive coil 4 and generates eddy currents due to the magnetic field varying to generate heat, such that the substrate 1 converts electrical energy into thermal energy and transfers, based on heat conduction, the thermal energy to the radiation layer 2. In this way, the temperature of the radiation layer 2 increases, and the radiation layer 2 is excited, such that the radiation layer 2 radiates the infrared rays to heat the aerosol-generating article 22.

[0056] Specifically, the radiation layer 2 may alternatively be made of a material that can generate, by inducing variation of the magnetic field, eddy currents to generate heat, such that the radiation layer 2, in the highly frequently varying magnetic field generated by the electrically conductive coil 4, can induce the variation of the magnetic field to generate eddy currents to generate heat. In this way, an overall heating efficiency of the

heating assembly 10 can be improved. To be noted that, in the present embodiment, the insulating layer is disposed between the radiation layer 2 and the substrate 1 **[0057]** In another embodiment, as shown in FIG. 10, FIG. 10 is a cross-sectional view of the heating assembly according to a seventh embodiment of the present disclosure. Being different from the heating assembly 10 provided in the embodiment of FIG. 8, the heating assembly 10 in the present embodiment further includes the resistive heating layer 5 disposed on the side of the substrate 1 away from the radiation layer 2. The electrode layer 3 is electrically connected to the resistive heating layer 5. When the power is supplied to the electrode layer 3, the current flows through the resistive heating layer 5, such that the resistive heating layer 5 generates heat to heat the substrate 1. The substrate 1 transfers, based on heat conduction, the heat to the radiation layer 2, such that the radiation layer 2 is heated to radiate the infrared rays. The electrode layer 3 is disposed on the surface of the resistive heating layer 5 away from the radiation layer 2 or on the same layer as the resistive heating layer 5. Arrangement of the electrode layer 3 may be referred to the above description.

[0058] When the substrate 1 is the insulating substrate, the resistive heating layer 5 may be disposed on the surface of the substrate 1 away from the radiation layer 2. When the substrate 1 is the electrically conductive metal substrate, the insulating layer is disposed between the resistive heating layer 5 and the substrate 1 to prevent a short circuit. The material and configuration of the insulating layer can be referred to the relevant description above.

[0059] For the heating assembly 10 in the present embodiment, the substrate 1 for receiving the aerosol-generating article 22 is a hollow cavity 12 having the opening 11 at one end. In this way, during inhalation, the amount of low-temperature fresh air flow passing through the aerosol-generating article 22 in the cavity 12 is effectively reduced, such that the aerosol-generating article 22, at an initial stage of heating, is subjected to the negative pressure and less oxygen. When inhaling at the negative pressure and less oxygen, materials in the aerosol-generated article 22 mainly undergo hydrogenation, reduction reactions and cleavage reactions, such that the varieties and contents of the aroma substances generated from atomization can be effectively increased. The problem of generating less aroma substances due to oxidation reactions caused by the fresh air flow passing through the aerosol-generated article can be overcome. At the same time, it is ensured that the aerosol-generating article 22 is always in a stable cleavage temperature, overcoming the problem of the cleavage reaction being unstable caused by a rapid decrease in the temperature of the aerosol-generating article 22 due to the fresh air flow passing through the aerosol-generating article. In addition, since the radiation layer 2 is arranged on the side wall of the substrate 1, infrared rays are radiated during heating, such that the aerosol-generated articles

22 in the cavity 12 is heated. In this way, a utilization rate of the aerosol-generated article 22 and the uniformity of heating are effectively improved.

[0060] As shown in FIG. 11, FIG. 11 is a structural schematic view of an atomizer according to an embodiment of the present disclosure. In the present embodiment, an atomizer 20 is provided and includes the heating assembly 10, a shell 21, and the aerosol-generating article 22. The heating assembly 10 is the heating assembly 10 provided in any of the above embodiments. A specific structure and function of the heating assembly 10 can be referred to the above relevant descriptions, and will not be repeated herein.

[0061] A portion of the shell 21 is detachably connected to the interior of the cavity 12 of the heating assembly 10, and the rest of the shell 21 extends out of the heating assembly 10. In an embodiment, the shell 21 has a receiving chamber, an air outlet channel 212, and at least one air inlet aperture 211. The receiving chamber is formed in the portion of the shell 21 disposed inside the heating assembly 10, and the aerosol-generating article 22 is received in the receiving chamber. The air outlet channel 212 communicates with the receiving chamber to each of the at least one air inlet 211. The number of the at least one air inlet 211 may be two, three, four, or more. Each of the at least one air inlet 211 is respectively communicated to the receiving chamber and an ambient air. Each of the at least one air inlet 211 is defined in the rest of the shell 21 that extends outside of the heating assembly 10 and is located near the opening 11 of the heating assembly 10. During inhaling, air flows in from the at least one air inlet 211, passes through the opening 11 of the substrate 1 to carry the aerosol generated by atomization of the heating assembly 10, and flows out from the air outlet channel 212.

[0062] For the atomizer 20 in the present embodiment, the substrate 1 is the hollow cavity 12 having the opening 11 at one end, and the at least one air inlet 211 communicated with the receiving chamber is located outside the substrate 1 and is located at a position of the shell 21 near the opening 11 of the substrate 1. In this way, during inhaling, the aerosol generated by the atomization of the heating assembly 10 is carried away, the amount of low-temperature fresh air flow passing through the aerosol-generating article 22 is effectively reduced, such that the aerosol-generating article 22, at an initial stage of heating, is subjected to the negative pressure and less oxygen. When inhaling at the negative pressure and less oxygen, materials in the aerosol-generated article 22 mainly undergo hydrogenation, reduction reactions and cleavage reactions, such that the varieties and contents of the aroma substances generated from atomization can be effectively increased. The problem of generating less aroma substances due to oxidation reactions caused by the fresh air flow passing through the aerosol-generated article can be overcome. At the same time, it is ensured that the aerosol-generating article 22 is always in a stable cleavage temperature, overcoming the pro-

blem of the cleavage reaction being unstable caused by a rapid decrease in the temperature of the aerosol-generating article 22 due to the fresh air flow passing through the aerosol-generating article.

[0063] As shown in FIG. 12, FIG. 12 is a simplified structural schematic view of an aerosol-generating device according to an embodiment of the present disclosure. In the present embodiment, an aerosol-generating device is provided and includes the heating assembly 10 and the power supply assembly 30.

[0064] The heating assembly 10 is configured to heat and atomize the aerosol-generating article 22 when the power is supplied. The specific structure and function of the heating assembly 10 can be referred to the description of the heating assembly 10 in the above embodiments, and same or similar technical effects can be achieved, which will not be repeated herein.

[0065] The power supply assembly 30 is electrically connected to the heating assembly 10 to supply the power to the heating assembly 10 to ensure the aerosol-generating device to operate properly. The power supply assembly 30 may be a dry cell battery, a lithium battery, or the like.

[0066] As shown in FIG. 13, FIG. 13 is a simplified structural schematic view of the aerosol-generating device according to another embodiment of the present disclosure. In the present embodiment, another aerosol-generating device is provided and includes the atomizer 20 and the power supply assembly 30.

[0067] The atomizer 20 is configured to heat and atomize, when being supplied with the power, the aerosol-generating article 22 for inhalation by a user. The specific structure and function of the atomizer 20 may be referred to the description of the atomizer 20 provided in the above embodiments, and same or similar technical effects can be achieved, which will not be repeated herein.

[0068] The power supply assembly 30 is electrically connected to the atomizer 20 for supplying power to the atomizer 20 to ensure that the aerosol-generating device to operate properly. The power supply assembly 30 may be the dry battery, the lithium battery, or the like.

[0069] The above shows embodiments of the present disclosure, and does not limit the scope of the present disclosure. Any equivalent structure or equivalent process transformation performed based on the contents of the specification and the accompanying drawings of the present disclosure, applied directly or indirectly in other technical fields, shall all be included in the scope of the present disclosure.

Claims

1. A heating assembly, comprising:

a substrate, being a hollow cavity having an opening at one end to enable an aerosol-generating article to be received in or removed out of

- the cavity through the opening;
a radiation layer, disposed at least corresponding to a side wall of the substrate and configured to radiate, when being heated, infrared rays to heat the aerosol-generating article in the cavity.
2. The heating assembly according to claim 1, wherein the heating assembly further comprises a resistive heating layer, the resistive heating layer is disposed on a side of an outer wall surface of the side wall of the substrate and is configured to generate, when being supplied with power, heat to heat the radiation layer.
 3. The heating assembly according to claim 2, wherein the radiation layer is disposed on a side of the outer wall surface of the side wall of the substrate; the resistive heating layer is disposed on a side of the radiation layer away from the substrate;
or
the radiation layer is disposed on a side of an inner wall surface of the side wall of the substrate, the resistive heating layer is disposed on a side of the substrate away from the radiation layer.
 4. The heating assembly according to claim 2, wherein the substrate is a transparent substrate.
 5. The heating assembly according to claim 1, wherein the radiation layer is disposed on a side of an outer wall surface of the side wall of the substrate and is configured to generate, when being supplied with power, heat to heat the aerosol-generating article received in the cavity.
 6. The heating assembly according to claim 5, wherein the substrate is an insulating substrate; the radiation layer is disposed on the outer wall surface of the side wall of the substrate.
 7. The heating assembly according to claim 5, wherein the substrate is a conductive metal substrate; the heating assembly further comprises an insulating layer, the insulating layer is disposed between the radiation layer and the substrate.
 8. The heating assembly according to claim 5, wherein the radiation layer is disposed corresponding to the entire outer wall surface of the side wall of the substrate.
 9. The heating assembly according to claim 5, further comprising an electrode layer electrically connected to the radiation layer to supply power to the radiation layer;
wherein the electrode layer is disposed on a surface of the radiation layer away from the substrate; or, the electrode layer and the radiation layer are arranged
- at the same layer.
10. The heating assembly according to claim 1, wherein the heating assembly further comprises an electrically conductive coil, the electrically conductive coil is arranged to surround an outer periphery of the radiation layer and is configured to generate, when being supplied with power, a varying magnetic field; the radiation layer is disposed on a side of an outer wall surface of the side wall of the substrate, the radiation layer is configured to form eddy currents in the varying magnetic field to be heated.
 11. The heating assembly according to claim 1, wherein the heating assembly further comprises an electrically conductive coil disposed to surround an outer periphery of the substrate to generate, when being supplied with power, a varying magnetic field; the radiation layer is disposed on a side of an inner wall surface of the side wall of the substrate; the substrate is configured to form eddy currents in the varying magnetic field to generate heat to heat the radiation layer.
 12. The heating assembly according to claim 1, wherein the radiation layer is an infrared layer.
 13. An atomizer, comprising:

the heating assembly according to any one of claims 1-12;
a shell, having a receiving chamber and at least one air inlet communicating with the receiving chamber and ambient air;
the aerosol-generating article, received in the receiving chamber;
wherein a portion of the shell is detachably connected to an interior of the cavity of the heating assembly; the at least one air inlet is defined in a portion of the shell protruding out of the heating assembly.
 14. An aerosol-generating device, comprising:

one of the heating assembly according to any one of claims 1-12 and the atomizer according to claim 13; and
a power supply assembly, electrically connected to the heating assembly or the atomizer to supply power to the heating assembly or the atomizer.

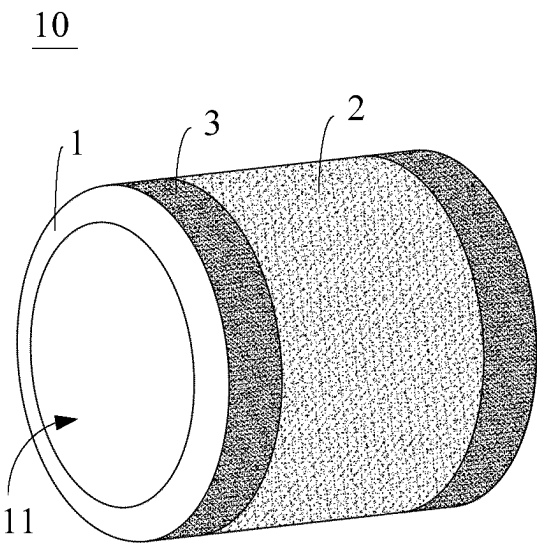


FIG. 1

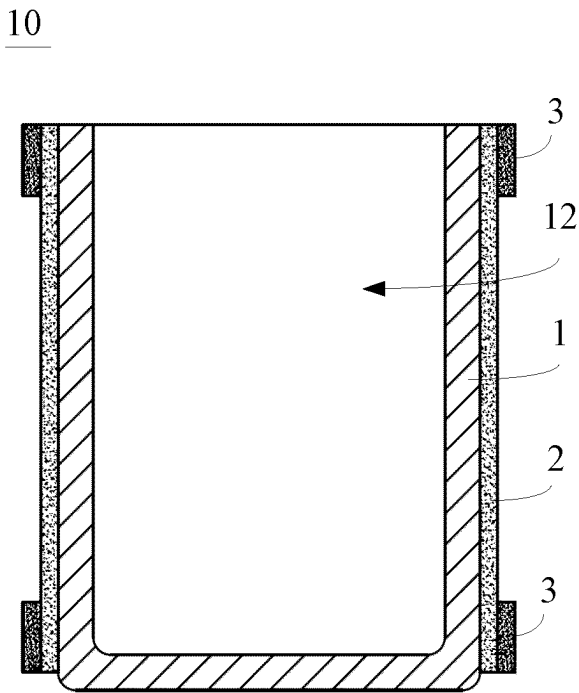


FIG. 2

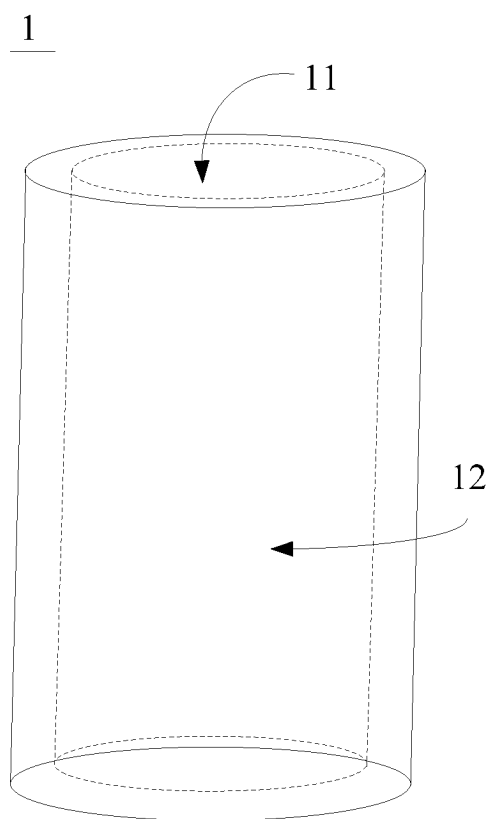


FIG. 3

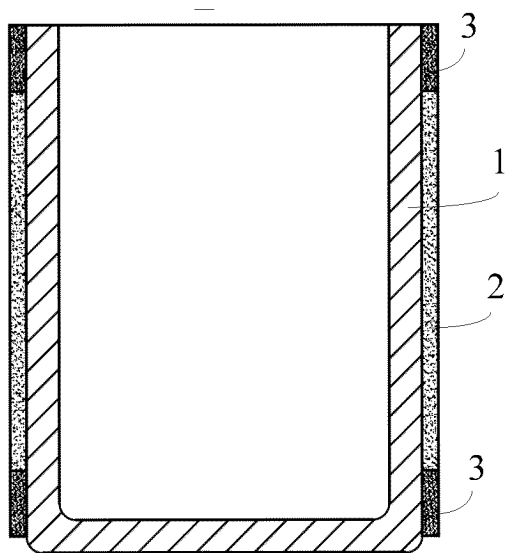


FIG. 4

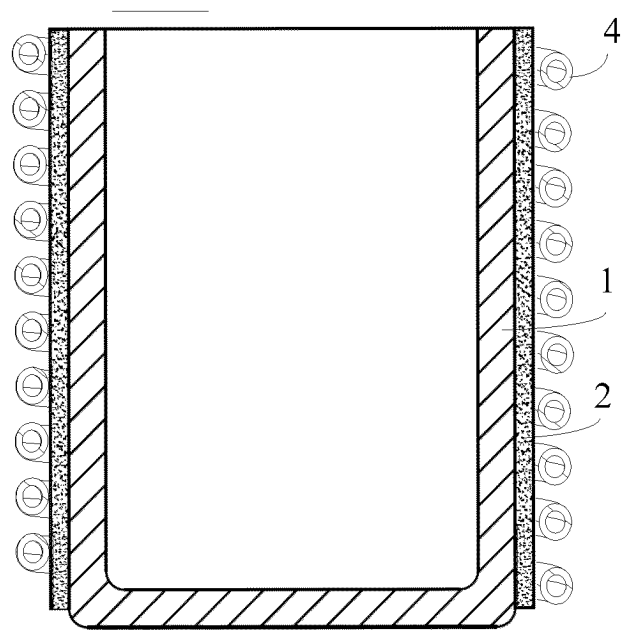


FIG. 5

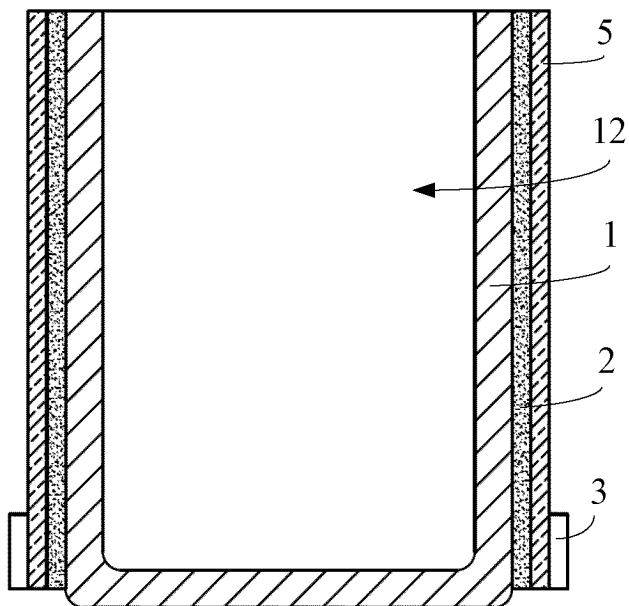


FIG. 6

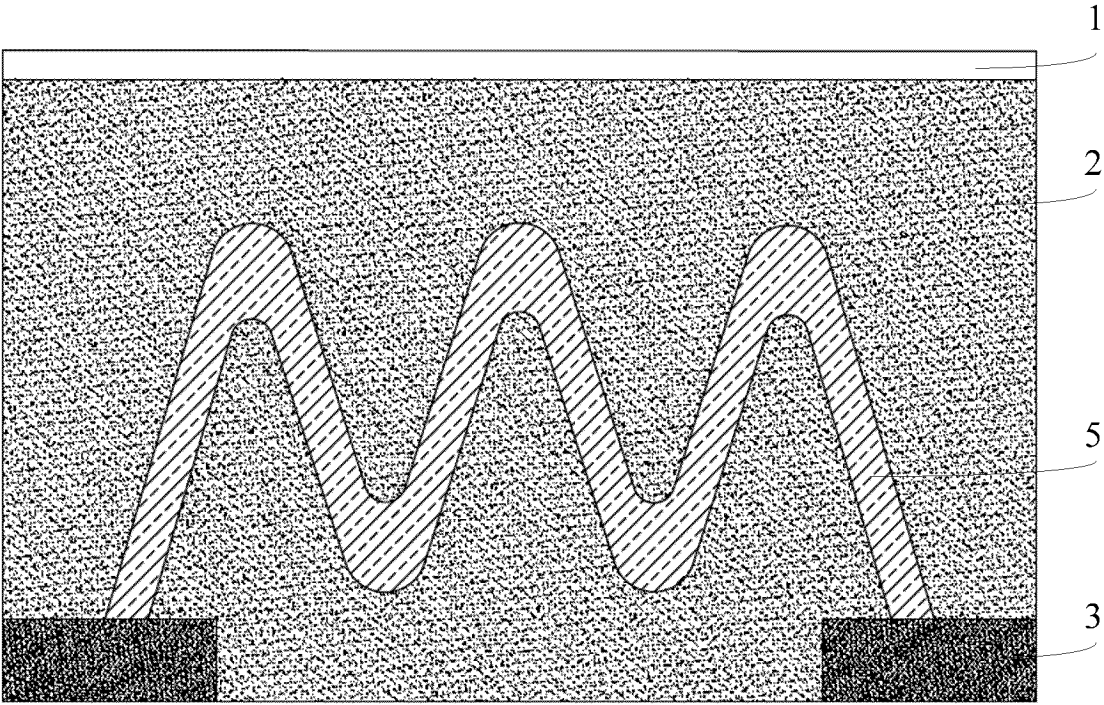


FIG. 7

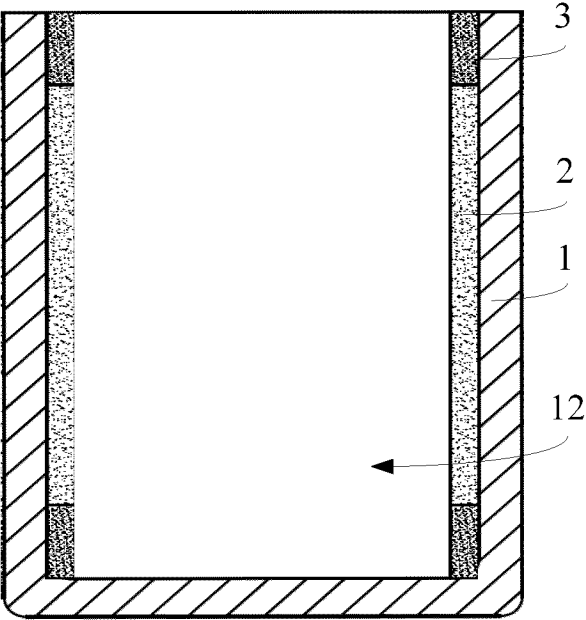


FIG. 8

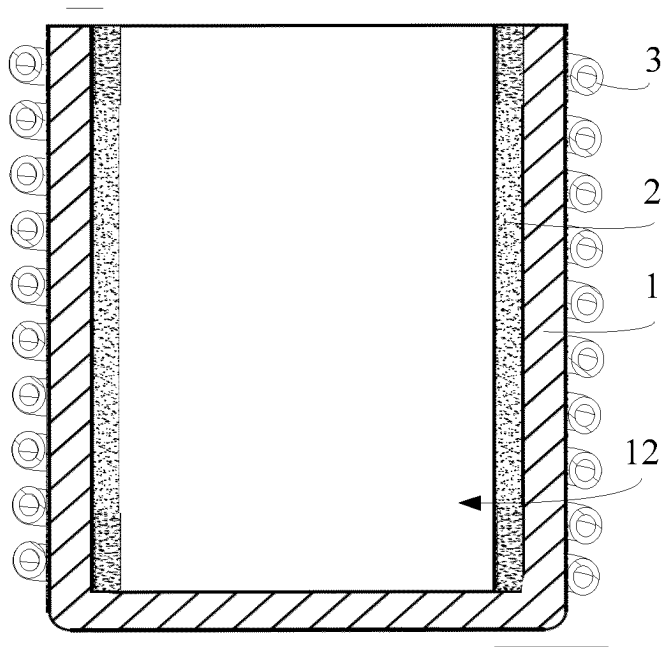


FIG. 9

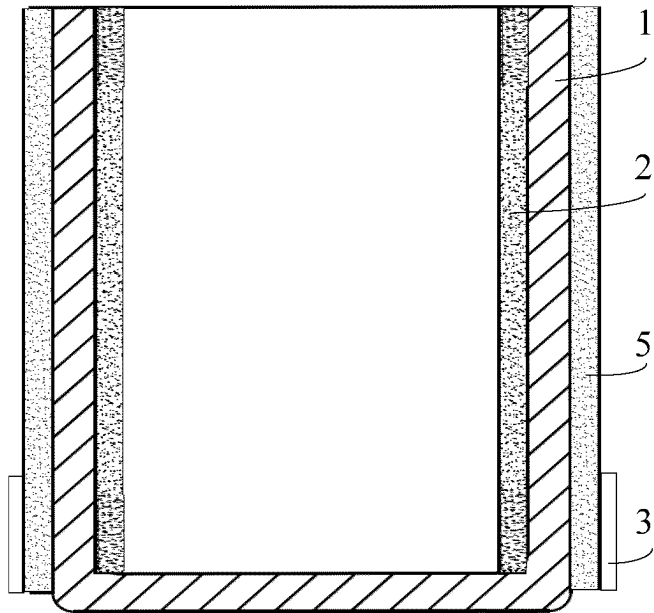


FIG. 10

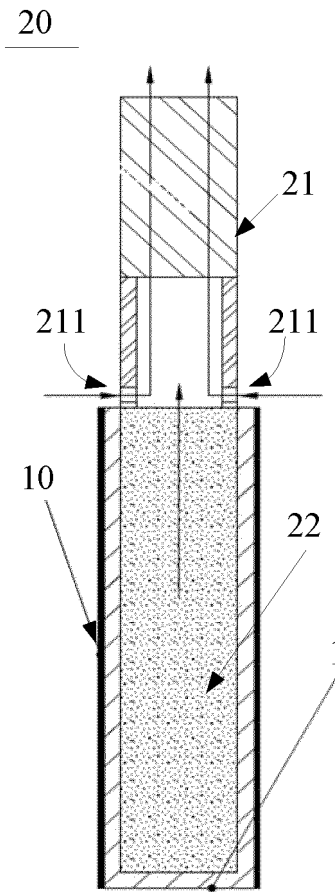


FIG. 11

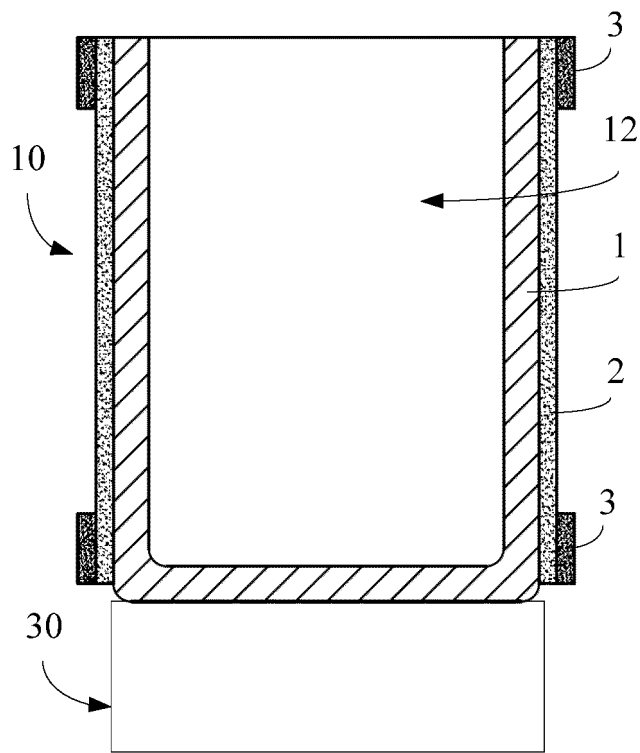


FIG. 12

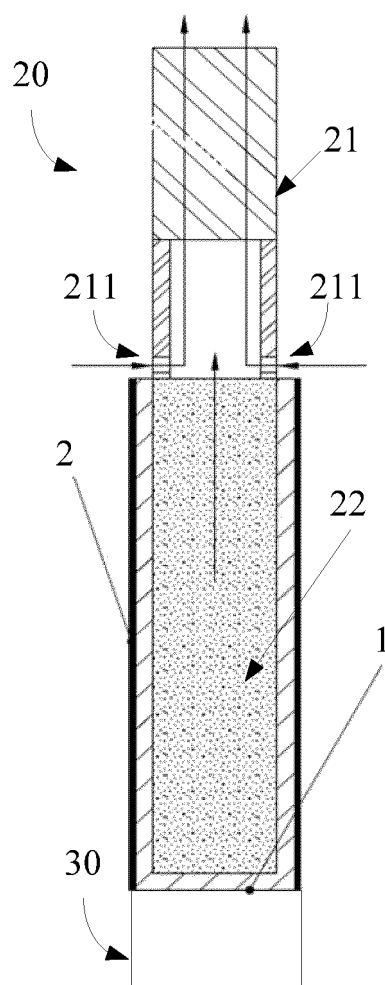


FIG. 13

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2023/103316

A. CLASSIFICATION OF SUBJECT MATTER

A24F40/46(2020.01)i; A24F40/40(2020.01)i; A24F40/20(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)

IPC: A24F 40

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, ENTXTC, ENTXT, VEN: 红外, 辐射, 电阻, 线圈, 磁场, 通电, 电极, 加热, 发热, 透明, 绝缘, infrared, radiation, resistive, coil, magnet+, electrode?, heating, insulating

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 115381142 A (SHENZHEN MAISHI TECHNOLOGY CO., LTD.) 25 November 2022 (2022-11-25) claims 1-14	1-14
X	CN 113068866 A (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 06 July 2021 (2021-07-06) description, paragraphs 32-83, and figures 1-6 and 14-17	1-14
X	CN 212279891 U (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 05 January 2021 (2021-01-05) description, paragraphs 29-81, and figures 5 and 11-14	1-14
X	CN 113633033 A (CHINA TOBACCO ZHEJIANG INDUSTRIAL CO., LTD.) 12 November 2021 (2021-11-12) description, paragraphs 34-75, and figures 1-4	1-14
X	CN 113115995 A (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 16 July 2021 (2021-07-16) description, paragraphs 49-70 and 80-90, and figures 1-5 and 8-10	1-14

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

* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

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“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

21 August 2023

Date of mailing of the international search report

22 August 2023

Name and mailing address of the ISA/CN

China National Intellectual Property Administration (ISA/
CN)China No. 6, Xitucheng Road, Jimenqiao, Haidian District,
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Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2023/103316

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2023/103316

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CN	114886165	A	12 August 2022	CN	217906346	U	29 November 2022
CN	216147266	U	01 April 2022	None			
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REFERENCES CITED IN THE DESCRIPTION

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