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(54) **AEROSOL GENERATING DEVICE, HEATER FOR AEROSOL GENERATING DEVICE, AND CONTROL METHOD**

(57) An aerosol generating device (100), a heater (30) for the aerosol generating device (100), and a control method. The aerosol generating device (100) is configured to heat an aerosol generating product (1000) to generate an aerosol, and comprises: a chamber at least partially receiving the aerosol generating product (1000); a heater (30) surrounding the chamber and used for heating the aerosol generating product (1000), wherein the heater (30) at least comprises a first heating area, a second heating area and a third heating area which are sequentially arranged in the circumferential direction of the chamber; a battery cell (130) used for providing a

power to the heater (30); and a circuit configured to control the battery cell (130) to provide the power to the heater (30) so as to simultaneously heat the first heating area, the second heating area and the third heating area, and to selectively heat one of the first heating area, the second heating area and the third heating area at a higher speed or a higher power than the other two. When the aerosol generating device (100) simultaneously heats the aerosol generating product (1000) in the circumferential direction, it is advantageous to generate the aerosol differentially in different areas.

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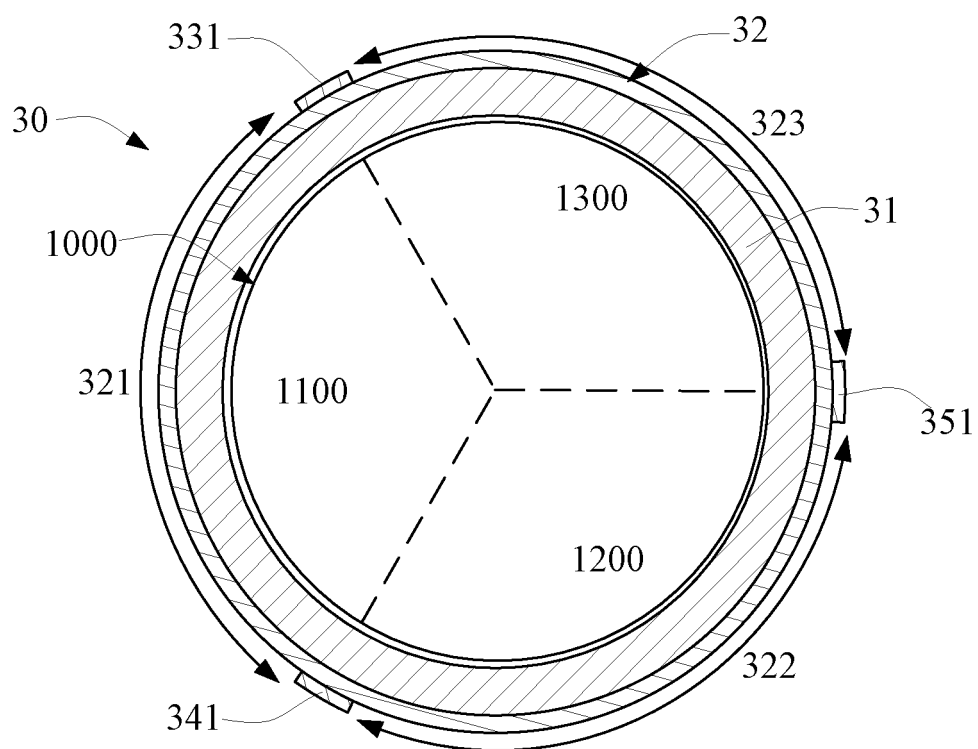


FIG. 2

Description

[0001] This application claims priority to Chinese Patent Application No. 202210968889.7, filed with the China National Intellectual Property Administration on August 12, 2022 and entitled "AEROSOL GENERATING DEVICE, HEATER FOR AEROSOL GENERATING DEVICE, AND CONTROL METHOD", which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] Embodiments of this application relate to the technical field of heat-not-burn aerosol generation, and in particular to, an aerosol generating device, a heater for the aerosol generating device, and a control method.

BACKGROUND

[0003] Tobacco products (such as cigarettes and cigars) burn tobacco in use to produce tobacco smoke. Attempts are made to replace these tobacco-burning products by making products that release compounds without burning.

[0004] An example of such products is a heating device, which releases compounds by heating rather than burning a material. For example, the material may be tobacco or other non-tobacco products. These non-tobacco products may or may not include nicotine. A known heating device is provided with a tubular heater surrounding the tobacco or other non-tobacco products. In a case that the heater is provided with a plurality of heating areas arranged at intervals in the circumferential direction, the heating areas may be independently started to respectively heat different areas in the circumferential direction of the tobacco or the non-tobacco products.

SUMMARY

[0005] An embodiment of this application provides an aerosol generating device, configured to heat an aerosol generating product to generate an aerosol, and including:

- a chamber, at least partially receiving the aerosol generating product;
- a heater, constructed to at least partially surround the chamber, and used for heating the aerosol generating product, the heater at least including a first heating area, a second heating area and a third heating area sequentially arranged in the circumferential direction of the chamber;
- a battery cell, used for providing a power to the heater; and
- a circuit, configured to control the battery cell to provide the power to the heater so as to simultaneously heat the first heating area, the second heating area and the third heating area, and to selectively heat one of the first heating area, the second heating

area and the third heating area at a higher speed or a higher power than the other two.

[0006] In some implementations, the heater is constructed not to only heat one or two of the first heating area, the second heating area and the third heating area.

[0007] In some implementations, the first heating area, the second heating area and the third heating area are constructed to be only heated at a same time.

[0008] In some implementations, the heater is not disposed in more heating areas beyond the first heating area, the second heating area and the third heating area; and/or, the heater only includes three heating areas.

[0009] In some implementations, a radian of one of the first heating area, the second heating area and the third heating area heated at a higher speed or a higher power in the circumferential direction of the heater is smaller than π , and a sum of radians of the other two heating areas heated at a lower speed or a lower power in the circumferential direction of the heater is greater than π .

[0010] In some implementations, the heater at least includes a first heating element, a second heating element and a third heating element sequentially arranged in the circumferential direction of the chamber, where

the first heating element at least partially defines the first heating area;

the second heating element at least partially defines the second heating area; and

the third heating element at least partially defines the third heating area.

[0011] In some implementations, the circuit is configured to selectively change an electric connection relationship of the first heating element, the second heating element and the third heating element to further enable one of the first heating area, the second heating area and the third heating area to be heated at a higher speed or a higher power than the other two. The electric connection relationship includes connection in series and/or connection in parallel.

[0012] In some implementations, the circuit is configured to selectively connect two of the first heating element, the second heating element and the third heating element in series and then connect the two of the first heating element, the second heating element and the third heating element in parallel with the other one to further enable one of the first heating area, the second heating area and the third heating area to be heated at a higher speed or a higher power than the other two.

[0013] In some implementations, a radian of the two of the first heating element, the second heating element and the third heating element connected in series in the circumferential direction of the heater is greater than π , and a radian of the other one heating element in the circumferential direction of the heater is smaller than π .

[0014] In some implementations, the heater further includes a first electrode element, a second electrode

element and a third electrode element sequentially arranged in the circumferential direction of the chamber;

at least a part of the first heating element is electrically connected between the first electrode element and the second electrode element, so that a current is able to be guided by the first electrode element and the second electrode element at the first heating element in use;

at least a part of the second heating element is electrically connected between the second electrode element and the third electrode element, so that a current is able to be guided by the second electrode element and the third electrode element at the second heating element in use; and

at least a part of the third heating element is electrically connected between the third electrode element and the first electrode element, so that a current is able to be guided by the third electrode element and the first electrode element at the third heating element in use.

[0015] In some implementations, the circuit is configured to selectively connect only two of the first electrode element, the second electrode element and the third electrode element to further supply power to the heater, so that one of the first heating area, the second heating area and the third heating area is heated at a higher speed or a higher power than the other two.

[0016] In some implementations, any two of the first electrode element, the second electrode element and the third electrode element are asymmetrically arranged in a radial direction of the heater;

and/or, any two of the first electrode element, the second electrode element and the third electrode element are asymmetrically arranged in a manner of being rotated by 180° around a central axis of the heater.

[0017] In some implementations, the first heating element is at least one of an infrared heating element or a resistive heating element;

and/or, the second heating element is at least one of an infrared heating element or a resistive heating element;

and/or, the third heating element is at least one of an infrared heating element or a resistive heating element.

[0018] In some implementations, the heater includes:

a base body, at least partially surrounding the chamber;

an infrared emitting layer formed or combined on the base body; and

a first electrode element, a second electrode element and a third electrode element arranged in the circumferential direction of the base body, wherein the first heating area is defined by a part of the

infrared emitting layer located between the first electrode element and the second electrode element, the second heating area is defined by a part of the infrared emitting layer located between the second electrode element and the third electrode element, and the third heating area is defined by a part of the infrared emitting layer located between the third electrode element and the first electrode element.

[0019] In some implementations, the circuit is configured to control the battery cell to provide a power to the heater so that the first heating area is heated at a higher speed or a higher power than the second heating area and/or the third heating area in a first time period, the second heating area is heated at a higher speed or a higher power than the first heating area and/or the third heating area in a second time period, and the third heating area is heated at a higher speed or a higher power than the first heating area and/or the second heating area in a third time period.

[0020] In some implementations, in the first time period, the power provided by the circuit to the first heating area is substantially four times the power provided to the second heating area and/or the third heating area;

and/or, in the second time period, the power provided by the circuit to the second heating area is substantially four times the power provided to the first heating area and/or the third heating area;

and/or, in the third time period, the power provided by the circuit to the third heating area is substantially four times the power provided to the first heating area and/or the second heating area.

[0021] In some implementations, the circuit is configured to control the battery cell to provide a power to the heater so as to heat, in a first time period, the first heating area at a first power, and heat the second heating area and the third heating area at substantially a same second power; to heat, in a second time period, the second heating area at a third power, and to heat the first heating area and the third heating area at substantially a same fourth power; and to heat, in a third time period, the third heating area at a fifth power, and to heat the first heating area and the second heating area at substantially a same sixth power.

[0022] In some implementations, the circuit is further configured to control the battery cell to provide a power to the heater so as to heat the first heating area to a first target temperature and enable temperatures of the second heating area and the third heating area to be lower than the first target temperature in the first time period; to heat the second heating area to a second target temperature and enable a temperature of the third heating area to be lower than the second target temperature in the second time period; and to heat the third heating area to a third target temperature and enable temperatures of the first heating area and the second heating area not to

be lower than the third target temperature in the third time period.

[0023] In some implementations, the first time period is 100 s to 150 s;

and/or, the second time period is 20 s to 30 s;

and/or, the duration of the third time period is about 60 s to 120 s;

and/or, the duration of the fourth time period is about 60 s to 150 s.

[0024] Another embodiment of this application further provides an aerosol generating device, configured to heat an aerosol generating product to generate an aerosol, the aerosol generating product including a first area, a second area and a third area sequentially arranged in the circumferential direction, wherein the aerosol generating device includes:

a chamber, at least partially receiving the aerosol generating product;

a heater, constructed to at least partially surround the chamber and used for heating the aerosol generating product; and

a circuit, configured to control the battery cell to provide the power to the heater so as to simultaneously heat the first area, the second area and the third area of the aerosol generating product, and to selectively heat one of the first area, the second area and the third area at a higher speed or a higher power than the other two.

[0025] In some implementations, the circuit is configured to control the battery cell to provide a power to the heater so that the first area is heated at a higher speed or a higher power than the second area and/or the third area in a first time period, the second area is heated at a higher speed or a higher power than the first area and/or the third area in a second time period, and the third area is heated at a higher speed or a higher power than the first area and/or the second area in a third time period.

[0026] In some implementations, the circuit is configured to control the battery cell to provide a power to the heater so as to heat, in a first time period, the first area at a first power, and heat the second area and the third area at substantially a same second power; to heat, in a second time period, the second area at a third power, and to heat the first area and the third area at substantially a same fourth power; and to heat, in a third time period, the third area at a fifth power, and to heat the first area and the second area at substantially a same sixth power.

[0027] In some implementations, the circuit is further configured to control the battery cell to provide a power to the heater so as to heat the first area to a first target temperature and enable temperatures of the second area and the third area to be lower than the first target temperature in the first time period; to heat, in a second time period, the second area to a second target temperature

and enable a temperature of the third area to be lower than the second target temperature; and to heat, in a third time period, the third area to a third target temperature and enable temperatures of the first area and the second area not to be lower than the third target temperature.

[0028] Another embodiment of this application further provides an aerosol generating device, configured to heat an aerosol generating product to generate an aerosol, the aerosol generating product including a first area, a second area and a third area sequentially arranged in the circumferential direction, wherein the aerosol generating device includes:

a chamber, at least partially receiving the aerosol generating product;

a heater, constructed to at least partially surround the chamber and used for heating the aerosol generating product; and

a circuit, configured to: control a battery cell to provide a power to the heater to simultaneously heat the first area, the second area and the third area of the aerosol generating product; and in a first time period, heat the first area to a first target temperature and enable temperatures of the second area and the third area to be lower than the first target temperature; in a second time period, heat the second area to a second target temperature and enable a temperature of the third area to be lower than the second target temperature; and in a third time period, heat the third area to a third target temperature and enable temperatures of the first area and the second area not to be lower than the third target temperature.

[0029] Another embodiment of this application further provides an aerosol generating device, configured to heat an aerosol generating product to generate an aerosol, and including:

a chamber, at least partially receiving the aerosol generating product; and

a heater, constructed to at least partially surround the chamber, and used for heating the aerosol generating product, the heater at least including:

a first heating element, a second heating element and a third heating element sequentially arranged in the circumferential direction of the chamber; and

a first electrode element, a second electrode element and a third electrode element sequentially arranged in the circumferential direction of the chamber, wherein at least a part of the first heating element is electrically connected between the first electrode element and the second electrode element, so that a current is able to be guided by the first electrode element and the second electrode element at the first heating element in use;

at least a part of the second heating element is electrically connected between the second electrode element and the third electrode element, so that a current is able to be guided by the second electrode element and the third electrode element at the second heating element in use; and

at least a part of the third heating element is electrically connected between the third electrode element and the first electrode element, so that a current is able to be guided by the third electrode element and the first electrode element at the third heating element in use.

[0030] In some implementations, the aerosol generating device further includes:

a circuit, configured to selectively connect only two of the first electrode element, the second electrode element and the third electrode element to further supply power to the heater, so that one of the first heating element, the second heating element and the third heating element is heated at a higher speed or a higher power than the other two.

[0031] Another embodiment of this application further provides an aerosol generating device, configured to heat an aerosol generating product to generate an aerosol, and including:

a chamber, at least partially receiving the aerosol generating product; and
a heater, constructed to at least partially surround the chamber, and used for heating the aerosol generating product, the heater at least including:

a first heating element and a second heating element sequentially arranged in the circumferential direction of the chamber; and a first electrode element and a second electrode element sequentially arranged in the circumferential direction of the chamber and configured to guide a current on the first heating element and the second heating element in the circumferential direction of the heater, where

the first heating element is located at a first side of a virtual connecting line of the first electrode element and the second electrode element, and a radian of the first heating element in the circumferential direction of the heater is smaller than π ; and

the first heating element is located at a second side of the virtual connecting line of the first electrode element and the second electrode element, and a radian of the first heating element in the circumferential direction of the heater is greater than π .

[0032] In some implementations, the first electrode element and the second electrode element are asymme-

trically arranged in a radial direction of the heater; and/or, the first electrode element and the second electrode element are asymmetrically arranged in a manner of being rotated for 180° around a central axis of the heater.

[0033] Another embodiment of this application further provides a heater for an aerosol generating device. The heater is constructed to present a tubular shape, and at least includes:

a first heating element, a second heating element and a third heating element sequentially arranged in the circumferential direction of the heater; and a first electrode element, a second electrode element and a third electrode element sequentially arranged in the circumferential direction of the heater, where at least a part of the first heating element is electrically connected between the first electrode element and the second electrode element, so that a current is able to be guided by the first electrode element and the second electrode element at the first heating element in use;

at least a part of the second heating element is electrically connected between the second electrode element and the third electrode element, so that a current is able to be guided by the second electrode element and the third electrode element at the second heating element in use; and

at least a part of the third heating element is electrically connected between the third electrode element and the first electrode element, so that a current is able to be guided by the third electrode element and the first electrode element at the third heating element in use.

[0034] Another embodiment of this application further provides a heater for an aerosol generating device. The heater is constructed to present a tubular shape, and at least includes:

a first heating element and a second heating element sequentially arranged in the circumferential direction of the chamber; and a first electrode element and a second electrode element sequentially arranged in the circumferential direction of the chamber and configured to guide a current on the first heating element and the second heating element in the circumferential direction of the heater, where the first heating element is located at a first side of a virtual connecting line of the first electrode element and the second electrode element, and a radian of the first heating element in the circumferential direction of the heater is smaller than π ; and the first heating element is located at a second side of the virtual connecting line of the first electrode element and the second electrode element, and a radian of the first heating element in the circumferential direction of the heater is greater than π .

[0035] Another embodiment of this application provides a control method of an aerosol generating device, the aerosol generating device being configured to heat an aerosol generating product to generate an aerosol, the aerosol generating device including:

a chamber, at least partially receiving the aerosol generating product; and
a heater, constructed to at least partially surround the chamber, and used for heating the aerosol generating product, the heater at least including a first heating area, a second heating area and a third heating area sequentially arranged in the circumferential direction to respectively heat different parts of the aerosol generating product,
where the method includes:

providing a power to the heater to simultaneously heat the first heating area, the second heating area and the third heating area; and
adjusting at least some of electrode elements of the first heating area, the second heating area and the third heating area, so that one of the first heating area, the second heating area and the third heating area is heated at a higher speed or a higher power than the other two.

[0036] In some other embodiments, the method includes:

controlling the battery cell to provide the power to the heater so as to simultaneously heat the first heating area, the second heating area and the third heating area, and to selectively heat one of the first heating area, the second heating area and the third heating area at a higher speed or a higher power than the other two.

[0037] Another embodiment of this application provides a control method of an aerosol generating device, the aerosol generating device being configured to heat an aerosol generating product to generate an aerosol, the aerosol generating product including a first area, a second area and a third area sequentially arranged in the circumferential direction,

the aerosol generating device including: a chamber, at least partially receiving the aerosol generating product; and
a heater, constructed to at least partially surround the chamber and used for heating the aerosol generating product,
where the method includes:

providing a power to the heater to simultaneously heat the first area, the second area and the third area of the aerosol generating product;
heating, in a first time period, the first area to a first target temperature, the first target temperature being higher than current temperatures of

the second area and the third area;
heating, in a second time period, the second area to a second target temperature, the second target temperature being higher than a current temperature of the third area; and
heating, in a third time period, the third area to a third target temperature, the third target temperature being approximately similar to current temperatures of the first area and the second area.

[0038] In some other embodiments, the method includes:

controlling a battery cell to provide a power to the heater to simultaneously heat the first area, the second area and the third area of the aerosol generating product; and in a first time period, heating the first area to a first target temperature and enabling temperatures of the second area and the third area to be lower than the first target temperature; in a second time period, heating the second area to a second target temperature and enabling a temperature of the third area to be lower than the second target temperature; and in a third time period, heating the third area to a third target temperature and enabling temperatures of the first area and the second area not to be lower than the third target temperature.

[0039] When the aerosol generating device simultaneously heats the aerosol generating product in the circumferential direction, it is advantageous to generate the aerosol differentially in different areas.

BRIEF DESCRIPTION OF THE DRAWINGS

[0040] One or more embodiments are exemplified by pictures in the accompanying drawings to which they correspond, but these exemplary descriptions do not constitute a limitation on the embodiments, and elements having the same reference numerals in the accompanying drawings represent as similar elements. Unless otherwise specified, the figures in the accompanying drawings do not constitute a scale limitation.

FIG. 1 is a schematic diagram of an aerosol generating device provided by an embodiment.

FIG. 2 is a schematic cross-sectional view of a heater in FIG. 1 from a view angle.

FIG. 3 is a schematic structural diagram of a heater in FIG. 1 according to an embodiment.

FIG. 4 is a schematic exploded view of the heater in FIG. 3 from a view angle.

FIG. 5 is a schematic structural diagram of a heater in FIG. 1 according to another embodiment.

FIG. 6 is a schematic diagram of current guide on a heater according to an embodiment.

FIG. 7 is a schematic diagram of current guide on a heater according to another embodiment.

FIG. 8 is a schematic diagram of current guide on a heater according to another embodiment.

FIG. 9 is a schematic diagram of heating curves of different areas of an aerosol generating product according to an embodiment.

FIG. 10 is a schematic structural diagram of a heater according to another embodiment.

FIG. 11 is a schematic diagram of a control method of an aerosol generating device according to an embodiment.

DETAILED DESCRIPTION

[0041] For ease of understanding of this application, this application is described below in more detail with reference to accompanying drawings and specific implementations.

[0042] An embodiment of this application provides an aerosol generating device 100, for example, as shown in FIG. 1, used for a heat-not-burn aerosol generating product 1000, such as a cigarette, so that at least one ingredient of the aerosol generating product 1000 is volatilized or released to form an aerosol for smoking.

[0043] In a further optional implementation, the aerosol generating product 1000 is preferably a tobacco-containing material releasing a volatile compound from a substrate when being heated; or, it may be a non-tobacco material suitable for electrical heating smoke generation after being heated. The aerosol generating product 1000 preferably uses a solid substrate, and may include one or more of vanilla planifolia andrews leaves, tobacco leaves, homogeneous tobacco and expanded tobacco in one or more forms, such as powder, particles, fragment strips, strips or slices. Or, the solid substrate may include additional tobacco or non-tobacco volatile flavor compounds, so as to be released when the substrate is heated.

[0044] As shown in FIG. 1, after the aerosol generating product 1000 is received in the aerosol generating device 100, a part of the aerosol generating product, for example, a filter tip, is exposed outside the aerosol generating device 100, and it is advantageous for a user to smoke.

[0045] A configuration of an aerosol generating device according to an embodiment of this application may be shown in FIG. 1. The appearance of the device is approximately constructed to present a flat cylinder shape, and external components of the aerosol generating device 100 includes:

a housing 10, having a hollow structure inside to form an assembly space for a component with a necessary function, for example, an electric device, a heating device, etc. The housing 10 is provided with a near end 110 and a far end 120 which are opposite in a length direction.

[0046] The near end 110 is provided with an opening 111, and the aerosol generating product 1000 may be received in the housing 10 through the opening 111 to be heated in the housing or removed from the housing 10.

[0047] The far end 120 is provided with an air inlet 121. The air inlet 121 is formed to supply outside air into the housing 10 during smoking.

[0048] Further, as shown in FIG. 1, the aerosol generating device 100 further includes:

a chamber configured to accommodate or receive the aerosol generating product 1000. In use, the aerosol generating product 1000 may be removably received in the chamber through the opening 111. In some embodiments, a length of the aerosol generating product 1000 surrounded and heated by a heater 30 is greater than 30 mm.

[0049] As shown in FIG. 1, the aerosol generating device 100 further includes:

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

[0050] Further, as shown in FIG. 1, the aerosol generating device 100 further includes:

a battery cell 130, configured to supply power, preferably the battery cell 130 being a rechargeable direct-current battery cell 130 and being capable of being connected to an external power supply to be charged; and

a circuit board 140, for example, a PCB, provided with a circuit or an MCU controller. The circuit may be an integrated circuit.

[0051] Further, as shown in FIG. 1, the aerosol generating device 100 further includes:

a heater 30 at least partially surrounding and defining the chamber. When the aerosol generating product 1000 is received in the housing 10, the heater 30 at least partially surrounds or encircles the aerosol generating product 1000, and heats the aerosol generating product 1000 from the periphery of the aerosol generating product. Moreover, when the aerosol generating product 1000 is received in the housing 10, at least a part of the aerosol generating product is accommodated and held in the heater 30.

[0052] Further, referring to FIG. 2, the heater 30 is constructed to basically present a longitudinal tubular shape, and includes:

a tubular base body 31, a material of the base body 31 being an infrared transmitting material, such as quartz, glass or ceramics, and in use, at least a part of the base body 31 being defined to accommodate and hold the aerosol generating product 1000;

and at least one or more heating elements formed or combined on the base body 31, for example, an infrared heating element radiating infrared rays to the aerosol generating product 1000 to heat the aerosol generating product 1000, a resistive heating element, or the like.

[0053] In some specific implementations, the base body 31 has a wall thickness of about 0.05 mm to 1

mm, the base body 31 has an inner diameter of about 5.0 mm to 8.0 mm, and the base body 31 has a length of about 30 mm to 60 mm.

[0054] In some embodiments, the infrared heating element is at least one or more infrared emitting layers combined or formed on the base body 31, for example, surrounding or being combined on an outer surface of the base body 31. Or, in some other embodiments, at least one or more infrared emitting layers are formed on an inner surface of the base body 31.

[0055] In some embodiments, the at least one or more infrared emitting layers are coating layers or thin layers that are formed on the base body 31 through deposition, spray coating, etc. Or, in some other embodiments, the at least one or more infrared emitting layers are films wrapped or combined on the base body 31.

[0056] In embodiments, at least one or more infrared emitting layers are electroactive infrared emitting layers. By directly providing a direct current voltage to the at least one or more infrared emitting layers, the at least one or more infrared emitting layers may radiate infrared rays through being driven by the voltage.

[0057] In some implementations, the at least one or more infrared emitting layers may be a coating layer prepared from ceramic system materials such as Zr, or Fe-Mn-Cu system, W system or transition metal or their oxide materials.

[0058] In some implementations, the at least one or more infrared emitting layers are formed by an oxide of at least one metal element such as Mg, Al, Ti, Zr, Mn, Fe, Co, Ni, Cu, Cr and Zn. When the metal oxide is heated to a suitable temperature, far infrared rays with a heating effect may be radiated out. A thickness of the at least one or more infrared emitting layers may be preferably controlled to be 30 μm to 50 μm . A manner of forming the oxide on the surface of the tubular base body 31 may be spray coating the oxide of the metal element on the outer surface of the tubular base body 31 through atmospheric plasma spray coating, and then performing solidification.

[0059] Or, in some other variant embodiments, the two or more infrared emitting layers are sequentially arranged in a circumferential direction of the base body 31 and/or the heater 30. An extension angle or radian of any one of the two or more infrared emitting layers in the circumferential direction is different from that of the other infrared emitting layers. Or, in some other variant embodiments, the two or more infrared emitting layers respectively have an extension angle or radian different from that of other infrared emitting layer in the circumferential direction. The two or more infrared emitting layers radiate infrared rays inwards to the aerosol generating product 1000 in a radial direction.

[0060] Or, in some other embodiments, extension angles or radians of the two or more infrared emitting layers in the circumferential direction gradually change in the circumferential direction of the heater 30. For example, in some specific embodiments, extension angles or radians of the two or more infrared emitting layers in the circum-

ferential direction gradually or sequentially increase; or, extension angles or radians of the two or more infrared emitting layers in the circumferential direction gradually or sequentially decrease.

[0061] In some embodiments, the plurality of infrared emitting layers formed on the base body 31 are independently arranged and separated from each other, and are respectively and separately connected to a circuit board 140 through an electrode, a lead, etc. Or, in some embodiments, the plurality of infrared emitting layers formed on the base body 31 are defined by separating a complete infrared emitting layer into parts located in different areas. For example, as shown in FIG. 2, the infrared emitting layer 321, the infrared emitting layer 322 and the infrared emitting layer 323 sequentially arranged on the base body 31 in the circumferential direction are formed by separating a complete annular infrared emitting layer 32 into different areas.

[0062] Or, in some other embodiments, the heater 30 may further include three infrared emitting layers, i.e., the infrared emitting layer 321, the infrared emitting layer 322 and the infrared emitting layer 323. Or, in some other embodiments, the heater 30 further includes more infrared emitting layers sequentially arranged in the circumferential direction, for example, four, five, six or more infrared emitting layers sequentially arranged in the circumferential direction of the base body 31. Further, in use, they may respectively heat different areas of the aerosol generating product 1000 surrounded by them, for example, an area 1100, an area 1200 and an area 1300 sequentially arranged in the circumferential direction of the aerosol generating product 1000 as shown in FIG. 2.

[0063] Moreover, the followings are further defined on the surface of the base body 31:

- a bare area 313 located between a first end 311 and the infrared emitting layer 32; and
- a bare area 314 located between the infrared emitting layer 32 and a second end 312.

[0064] In addition, during implementation, the bare area 313 and/or the bare area 314 have/has an extension length of about 1 mm to 4 mm.

[0065] In some embodiments, a temperature measurement identifier area is disposed on each of the infrared emitting layer 321, the infrared emitting layer 322 and the infrared emitting layer 323, to indicate attachment of a temperature sensor. For example, in FIG. 3 to FIG. 5, the temperature measurement identifier area 36 is formed on the infrared emitting layer 32, and is an identifiable color formed by spray spraying, or hollow parts formed on the infrared emitting layer 32, or an identifiable graphic or pattern, etc. During preparation, a temperature sensor is combined on the temperature measurement identifier area 36 through paste mounting, welding, or the like, so as to accurately sense a temperature of the infrared emitting layer 32. Similarly, the temperature measurement identifier area 36 may be located on any one or

more of the infrared emitting layer 321, the infrared emitting layer 322 and the infrared emitting layer 323.

[0066] In some embodiments, the infrared emitting layer 321, the infrared emitting layer 322 and the infrared emitting layer 323 are made of a same material, so they have a same infrared radiation wave length or a same infrared radiation efficiency when different areas of the aerosol generating product 1000 are heated.

[0067] Or, in some other variant embodiments, one and the other two of the infrared emitting layer 321, the infrared emitting layer 322 and the infrared emitting layer 323 are made of different materials, and the infrared emitting spectra of the one and the other two of the infrared emitting layer 321, the infrared emitting layer 322 and the infrared emitting layer 323 have different peak wave lengths (WLPs, wave lengths corresponding to a position with a maximum radiation power), and they may be respectively suitable for optimal absorption wave lengths of different organic ingredients in the aerosol generating product 1000. Or, in some other embodiments, the infrared emitting layer 321, the infrared emitting layer 322 and the infrared emitting layer 323 are made of different materials, and any two of the infrared emitting layer 321, the infrared emitting layer 322 and the infrared emitting layer 323 have different infrared emitting spectra and/or WLPs.

[0068] Further, in the embodiments shown in FIG. 2 to FIG. 4, the heater 30 further includes:

an electrode coating layer 331, an electrode coating layer 341 and an electrode coating layer 351 sequentially arranged at intervals in the circumferential direction. Each of the electrode coating layer 331, the electrode coating layer 341 and the electrode coating layer 351 is in a long or slender shape extending in a longitudinal direction of the heater 30. Moreover, an extension length of the electrode coating layer 331, the electrode coating layer 341 and the electrode coating layer 351 is greater than or equal to that of the infrared emitting layer 321/the infrared emitting layer 322/the infrared emitting layer 323.

[0069] In addition, in this embodiment, the electrode coating layer 331 and the electrode coating layer 341 are respectively arranged at two sides of the infrared emitting layer 321 in the circumferential direction, and are in conductive connection to the infrared emitting layer 321, so as to guide a current in the circumferential direction of the infrared emitting layer 321.

[0070] The electrode coating layer 341 and the electrode coating layer 351 are respectively arranged at two sides of the infrared emitting layer 322 in the circumferential direction, and are in conductive connection to the infrared emitting layer 322, so as to guide a current in the circumferential direction of the infrared emitting layer 322.

[0071] The electrode coating layer 351 and the electrode coating layer 331 are respectively arranged at two sides of the infrared emitting layer 323 in the circumferential direction, and are in conductive connection to the

infrared emitting layer 323, so as to guide a current in the circumferential direction of the infrared emitting layer 323.

[0072] Or further, in the embodiments shown in FIG. 2 to FIG. 4, the heater 30 further includes: an electrode coating layer 331, an electrode coating layer 341 and an electrode coating layer 351 sequentially arranged at intervals in the circumferential direction. Each of the electrode coating layer 331, the electrode coating layer 341 and the electrode coating layer 351 is in a long or slender shape extending in a longitudinal direction of the heater 30. Moreover, an extension length of the electrode coating layer 331, the electrode coating layer 341 and the electrode coating layer 351 is greater than or equal to that of the infrared emitting layer 32. Further, during implementation, one complete infrared emitting layer 32 is separated or defined by the electrode coating layer 331, the electrode coating layer 341 and the electrode coating layer 351 to form a plurality of infrared emitting layers capable of working independently. For example: an area of the infrared emitting layer 32 located between the electrode coating layer 331 and the electrode coating layer 341 is defined and separated by the electrode coating layer and the electrode coating layer to form the infrared emitting layer 321, and a current may be guided in the circumferential direction of the infrared emitting layer 321 through the electrode coating layer 331 and the electrode coating layer 341. Moreover, an area of the infrared emitting layer 32 located between the electrode coating layer 341 and the electrode coating layer 351 is defined and separated by the electrode coating layer and the electrode coating layer to form the infrared emitting layer 322, and a current may be guided in the circumferential direction of the infrared emitting layer 322 through the electrode coating layer 341 and the electrode coating layer 351. Moreover, an area of the infrared emitting layer 32 located between the electrode coating layer 351 and the electrode coating layer 331 is defined and separated by the electrode coating layer and the electrode coating layer to form the infrared emitting layer 323, and a current may be guided in the circumferential direction of the infrared emitting layer 323 through the electrode coating layer 351 and the electrode coating layer 331.

[0073] Moreover, the infrared emitting layer 321 and the infrared emitting layer 323 respectively located at two sides of the electrode coating layer 331 may further be connected in series through the electrode coating layer 321. Moreover, the infrared emitting layer 321 and the infrared emitting layer 322 respectively located at two sides of the electrode coating layer 341 may further be connected in series through the electrode coating layer 341. Moreover, the infrared emitting layer 322 and the infrared emitting layer 323 respectively located at two sides of the electrode coating layer 351 may further be connected in series through the electrode coating layer 351.

[0074] In addition, in some embodiments, the elec-

trode coating layer 331 and/or the electrode coating layer 341 and/or the electrode coating layer 351 use/uses a low-electrical-resistivity metal or alloy, for example, Ag, Au, Pd, Pt, Cu, Ni, Mo, W, Nb or their alloys. The electrode coating layer 331 and/or the electrode coating layer 341 and/or the electrode coating layer 351 are/is formed through spray coating, printing, etc.

[0075] In addition, in some embodiments, the electrode coating layer 331 and/or the electrode coating layer 341 and/or the electrode coating layer 351 are/is basically in a longitudinal shape; and the electrode coating layer 331 and/or the electrode coating layer 341 and/or the electrode coating layer 351 have/has a width of about 2 mm to 4 mm.

[0076] Further, referring to FIG. 3 and FIG. 4, in order that the infrared emitting layer 321, the infrared emitting layer 322 and the infrared emitting layer 323 may be conveniently connected to the circuit board 140, the heater 30 further includes:

an electrode plate 332, an electrode plate 342 and an electrode plate 352. The electrode plate 332 and/or the electrode plate 342 and/or the electrode plate 352 are/is a thin slice made of a low-electrical-resistivity metal or alloy. Moreover, an extension length of the electrode plate 332 and/or the electrode plate 342 and/or the electrode plate 352 is greater than an extension length of the electrode coating layer 331 and/or the electrode coating layer 341 and/or the electrode coating layer 351.

[0077] In addition, during implementation, the electrode plate 332, the electrode plate 342 and the electrode plate 352 protrude out or extend out of the second end 312. The electrode plate 332, the electrode plate 342 and the electrode plate 352 have widths of greater than 1 mm to 4 mm.

[0078] In addition, during implementation, the electrode plate 332 is abutted or adhered to the electrode coating layer 331 and is in conductive connection to the electrode coating layer 331. The electrode plate 342 is abutted or adhered to the electrode coating layer 341 and is in conductive connection to the electrode coating layer 341. The electrode plate 352 is abutted or adhered to the electrode coating layer 351 and is in conductive connection to the electrode coating layer 351.

[0079] Then, the electrode plate 332 and/or the electrode plate 342 and/or the electrode plate 352 are/is respectively connected to the circuit board 140 through soldering leads, etc., so that the electrode coating layer 331 and/or the electrode coating layer 341 and/or the electrode coating layer 351 are/is connected to the circuit board 140. The electrode coating layer 331 and/or the electrode coating layer 341 and/or the electrode coating layer 351 are/is indirectly connected to the circuit board 140 through the electrode plates, and it is more convenient for preparation of the heater 30.

[0080] Or, in some other variant embodiments, the electrode coating layer 331 and/or the electrode coating layer 341 and/or the electrode coating layer 351 may be directly connected to the circuit board 140 through sol-

dering leads, etc.

[0081] Moreover, in some other variant embodiments, the heater 30 may be not provided with the electrode coating layer 331 and/or the electrode coating layer 341 and/or the electrode coating layer 351, and forms electric conduction by directly attaching the electrode plate 332 and/or the electrode plate 342 and/or the electrode plate 352 to the infrared emitting layer. That is, the heater 30 may include one or two of the electrode coating layer 331 and the electrode plate 332, one or two of the electrode coating layer 341 and the electrode plate 342, and one or two of the electrode coating layer 351 and the electrode plate 352.

[0082] Or, in some other variant embodiments, the heater 30 further includes:

a first temperature sensor 40 attached to the infrared emitting layer 321 to further sense a temperature of the infrared emitting layer 321; a second temperature sensor attached to the infrared emitting layer 322 to further sense a temperature of the infrared emitting layer 322; and a third temperature sensor attached to the infrared emitting layer 323 to further sense a temperature of the infrared emitting layer 323.

[0083] Or, in some other variant embodiments, the heater 30 further includes:

a thermoplastic attaching component surrounding the first temperature sensor 40 and/or the second temperature sensor and/or the third temperature sensor outside the heater 30 to enable the first temperature sensor and/or the second temperature sensor and/or the third temperature sensor to be tightly attached to the outside of the infrared emitting layer 32.

[0084] In some embodiments, the thermoplastic attaching component includes at least one of heat-resistant synthetic resin, polytetrafluoroethylene as Teflon, or silicon. In some other variant embodiments, the thermoplastic attaching component includes a heat shrinkable tube or a high-temperature-resistant gummed tape.

[0085] In addition, in some embodiments, the thermoplastic attaching component is further used for fastening or holding one or more of the electrode plate 332, the electrode plate 342 and the electrode plate 352.

[0086] Or, in some other variant embodiments, the heater 30 further includes:

a heat insulation element configured to surround or encircle the infrared emitting layer 321 and/or the infrared emitting layer 322 and/or the infrared emitting layer 323 at the outer sides so as to provide heat insulation at their outer sides. The heat insulation element is, for example, a rolled-up aerogel blanket, a porous material, a vacuum tube, or the like.

[0087] Or, in some other variant embodiments, the heat insulation element of the heater 30 is a tube with an inner heat insulation cavity. A heat insulation cavity is formed between an inner surface and an outer surface of the tubular heat insulation element, and a pressure of the heat insulation cavity is lower than an external pressure. That is, the heat insulation element is a vacuum heat

insulation tube with vacuum degree. Or, in some other variant embodiments, a heat insulation cavity is formed between an inner surface and an outer surface of the tubular heat insulation element, and the heat insulation cavity is filled with heat insulation gas such as argon gas. At a same pressure and temperature, a heat conduction coefficient of the argon gas is approximately one third less than that of the air, so the heat insulation is effectively provided.

[0088] Or, FIG. 5 is a schematic structural diagram of a heater 30 in another variant embodiment. In this embodiment, the heater 30 includes:

a base body 31, for example, an infrared transmitting quartz tube, a glass tube, a ceramic tube, etc.;
an infrared emitting layer 32 formed or combined on the base body 31;
and three or more electrode elements arranged at intervals in a circumferential direction, so as to separate and define the infrared emitting layer 32 to form the three infrared emitting layers 321, 322 and 323 or more respectively heating different circumferential areas of the aerosol generating product 1000.

[0089] For example, in the embodiment of FIG. 5, an electrode element 331a includes a part 3311a and a part 3312a. The part 3311a extends from an upper end to a lower end of the infrared emitting layer 32, or extends from the bare area 313 to the bare area 314. The part 3312a is of an arc shape located in the bare area 314 and extending in the circumferential direction. Similarly, an electrode element 341a includes a part 3411a and a part 3412a. The part 3411a extends from an upper end to a lower end of the infrared emitting layer 32, or extends from the bare area 313 to the bare area 314. The part 3412a is of an arc shape located in the bare area 314 and extending in the circumferential direction.

[0090] In this embodiment, a length of the bare area 314 is greater than a length of the bare area 313. The length of the bare area 313 is about 1 mm to 3 mm. The length of the bare area 314 is about 3 mm to 6 mm.

[0091] During assembly, the heater 30 respectively abuts or combines conductive elements onto the part 3312a of the electrode element 331a and the part 3412a of the electrode element 341a to form electric conduction, and then, lead wires, etc. are welded on the conductive elements to realize connection to the circuit board 140. During implementation, the conductive elements cooperating with the electrode element 331a and the electrode element 341a may be in a long strip shape, a longitudinal thin slice, or a shape and structure of a conductive element, and details of assembly, fixation, etc. provided by the applicant in Chinese Patent Application No. CN215958354U, which is incorporated by reference in its entirety.

[0092] Corresponding to an infrared emitting layer 321, an infrared emitting layer 322 and an infrared emitting layer 323 sequentially arranged in the circumferential

direction of the heater 30, the circuit board 140 may selectively connect any two of the electrode coating layer 331/the electrode plate 332, the electrode coating layer 341/the electrode plate 342, and the electrode coating layer 351/the electrode plate 352 to a positive electrode and a negative electrode of the battery cell 130 through a switch tube such as a triode or an MOS tube, so when the infrared emitting layer 321, the infrared emitting layer 322 and the infrared emitting layer 323 radiate out infrared rays at the same time to heat the aerosol generating product 1000, one of the infrared emitting layers is heated at a higher speed or a higher power than the other two.

[0093] Further, FIG. 6 to FIG. 8 are schematic diagrams showing that the infrared emitting layer 321, the infrared emitting layer 322 and the infrared emitting layer 323 work at the same time in different power supply modes.

[0094] Or, for example, in FIG. 6, the electrode coating layer 331/the electrode plate 332 is operably connected to the positive electrode of the battery cell 130 through the switch tube, etc., and the electrode coating layer 341/the electrode plate 342 is connected to the negative electrode. At this moment, a current i_{11} flowing through the infrared emitting layer 321 from the electrode coating layer 331 to the electrode coating layer 341 in the circumferential direction and a current i_{12} flowing through the infrared emitting layer 323 and the infrared emitting layer 322 from the electrode coating layer 331 to the electrode coating layer 341 in the circumferential direction are formed. At this moment, the infrared emitting layer 323 and the infrared emitting layer 322 are connected in series through the electrode coating layer 351. Moreover, the infrared emitting layer 321 is connected in parallel with the infrared emitting layer 323 and the infrared emitting layer 322 which are connected in series. At this moment, the infrared emitting layer 321 forming the current i_{11} is a minor arc (the radian is less than π), and the infrared emitting layer 323 and the infrared emitting layer 322 which form the current i_{12} and are connected in series are a major arc (the radian is greater than π). At this moment, when the infrared emitting layer 321, the infrared emitting layer 322 and the infrared emitting layer 323 have the same materials, shapes and thicknesses, apparently, the current i_{11} flowing through the infrared emitting layer 321 is twice the current i_{12} flowing through the infrared emitting layer 323 and the infrared emitting layer 322 which are connected in series, so that the power of the infrared emitting layer 321 is 4 times the power of the infrared emitting layer 322 and/or the infrared emitting layer 323. At this moment, the area 1100 surrounded by the infrared emitting layer 321 of the aerosol generating product 1000 is heated at a higher speed or a higher temperature or a higher power than the area 1200 surrounded by the infrared emitting layer 322 and/or the area 1300 surrounded by the infrared emitting layer 323. At this moment, the power of the infrared emitting layer 322 and the power of the infrared emitting layer 323 are basically the same.

[0095] Or, for example, in FIG. 7, the electrode coating layer 341/the electrode plate 342 is operably connected to the positive electrode of the battery cell 130 through the switch tube, etc., and the electrode coating layer 351/the electrode plate 352 is connected to the negative electrode. At this moment, a current i_{11a} flowing through the infrared emitting layer 322 from the electrode coating layer 341 to the electrode coating layer 351 in the circumferential direction and a current i_{12a} flowing through the infrared emitting layer 321 and the infrared emitting layer 323 from the electrode coating layer 341 to the electrode coating layer 351 in the circumferential direction are formed. At this moment, the infrared emitting layer 321 and the infrared emitting layer 323 are connected in series through the electrode coating layer 331. Moreover, the infrared emitting layer 322 is connected in parallel with the infrared emitting layer 321 and the infrared emitting layer 323 which are connected in series. At this moment, the operating power of the infrared emitting layer 322 is 4 times the power of the infrared emitting layer 321 and/or the infrared emitting layer 323. At this moment, the area 1200 surrounded by the infrared emitting layer 322 of the aerosol generating product 1000 is heated at a higher speed or a higher temperature or a higher power than the area 1100 surrounded by the infrared emitting layer 321 and/or the area 1300 surrounded by the infrared emitting layer 323.

[0096] Or, for example, in FIG. 8, the electrode coating layer 351/the electrode plate 352 is operably connected to the positive electrode of the battery cell 130 through the switch tube, etc., and the electrode coating layer 331/the electrode plate 332 is connected to the negative electrode. At this moment, a current i_{11b} flowing through the infrared emitting layer 323 from the electrode coating layer 351 to the electrode coating layer 331 in the circumferential direction and a current i_{12b} flowing through the infrared emitting layer 322 and the infrared emitting layer 321 from the electrode coating layer 351 to the electrode coating layer 331 in the circumferential direction are formed. At this moment, the infrared emitting layer 322 and the infrared emitting layer 321 are connected in series through the electrode coating layer 341. Moreover, the infrared emitting layer 323 is connected in parallel with the infrared emitting layer 322 and the infrared emitting layer 321 which are connected in series. At this moment, the operating power of the infrared emitting layer 323 is 4 times the power of the infrared emitting layer 322 and/or the infrared emitting layer 321. At this moment, the area 1300 surrounded by the infrared emitting layer 323 of the aerosol generating product 1000 is heated at a higher speed or a higher temperature or a higher power than the area 1200 surrounded by the infrared emitting layer 322 and/or the area 1100 surrounded by the infrared emitting layer 321.

[0097] Based on the above, another embodiment of this application further provides a control method for controlling a heater 30 to heat an area 1100, an area 1200 and an area 1300 of an aerosol generating product

1000. In a manner of selectively connecting the heater 30 to a battery cell 130, when the area 1100, the area 1200 and the area 1300 of the aerosol generating product 1000 are heated at the same time, one of the area 1100, the area 1200 and the area 1300 may be heated at a higher speed or a higher power than the other two.

[0098] Further, for example, FIG. 9 is a schematic diagram of temperature curves in a process of heating different areas of an aerosol generating product 1000 in an embodiment. A curve S1 is a temperature curve of the area 1100 when the area is heated by the infrared emitting layer 321, a curve S2 is a temperature curve of the area 1200 when the area is heated by the infrared emitting layer 322, and a curve S3 is a temperature curve of the area 1300 when the area is heated by the infrared emitting layer 323. As shown in FIG. 9, the heating process includes the following:

In a first time period (0 to t_1), the battery cell 130 may supply power to the heater 30 in a mode shown in FIG. 6, so that the area 1100 is heated at a higher speed than the area 1200 and/or the area 1300. In addition, in the first time period, the area 1100 is heated to a first target temperature, for example, the temperature T_1 , and a heating temperature or a current temperature of the area 1200 and/or the area 1300 is lower than the first target temperature.

[0099] In a second time period (t_1 to t_2), the battery cell 130 may supply power to the heater 30 in a mode shown in FIG. 7, so that the area 1200 is heated at a higher speed than the area 1100 and/or the area 1300. Therefore, in the second time period, the area 1200 is heated to a second target temperature, for example, the temperature T_2 , and a heating temperature or a current temperature of the area 1300 is lower than the second target temperature.

[0100] In a third time period (t_2 to t_3), the battery cell 130 may supply power to the heater 30 in a mode shown in FIG. 8, so that the area 1300 is heated at a higher speed than the area 1100 and/or the area 1200. Therefore, in the third time period, the area 1300 is heated to a third target temperature, for example, the temperature T_3 . At the time t_3 , the area 1100, the area 1200 and the area 1300 may be heated to a degree that the temperatures are basically the same or similar.

[0101] In the fourth time period (t_3 to t_4), the power supply modes as shown in FIG. 6 to FIG. 8 are cyclically switched at a short time or frequency, so that the area 1100, the area 1200 and the area 1300 are heated at the basically identical temperature till the time t_4 or the ending.

[0102] In the above embodiment, the electrode element of each infrared emitting layer 321/the infrared emitting layer 322/the infrared emitting layer 323 is adjusted in different periods, so that one area is heated at a higher speed or a higher power than the other two areas.

[0103] In the fourth time period, for example, the power supply modes as shown in FIG. 6, FIG. 7 and FIG. 8 are cyclically switched at a frequency, for example, 200 ms, 500 ms, 1 s, 2 s, etc., so the heating temperatures of the

area 1100, the area 1200 and the area 1300 are basically the same in this period, or a difference value of their heating temperatures is kept to a value smaller than 20°C.

[0104] In the above embodiment, the first target temperature, the second target temperature and the third target temperature may gradually increase. For example, in a specific embodiment, the first target temperature T1 may be set to 220°C to 250°C, the second target temperature T2 may be set to 240°C to 270°C, and the third target temperature T3 may be set to 260°C to 350°C. In addition, in the above embodiment, in the fourth time period, the temperatures of the area 1100, the area 1200 and the area 1300 are basically kept at the third target temperature.

[0105] As shown in FIG. 9, in the first time period, a temperature rising speed of the area 1200 and the area 1300 is lower than that of the area 1100. In the first time period, the heating temperatures of the area 1200 and the area 1300 are lower than a mass volatilization temperature of volatile materials in the area 1200 and the area 1300. Therefore, in the first time period, only preheating the area 1200 and the area 1300 is insufficient to enable the area 1200 and the area 1300 to generate a great number of aerosols.

[0106] Or, in some other embodiments, the first target temperature T1, the second target temperature T2 and the third target temperature T3 may be the same. Or, in some embodiments, the first target temperature T1, the second target temperature T2 and the third target temperature T3 gradually decrease in sequence.

[0107] Or, in some other embodiments, the duration of the first time period is about 10 s to 60 s; the duration of the second time period is about 20 s to 40 s; the duration of the third time period is about 10 s to 30 s; and the duration of the fourth time period is about 60 s to 150 s. Or, in some embodiments, the duration of the fourth time period is longer than the duration of the first time period and/or the second time period and/or the third time period. Or, the duration of the first time period is longer than the duration of the second time period and/or the third time period.

[0108] Or, in some other variant embodiments, the aerosol generating product 1000 may be heated for one or several of the first time period, the second time period, the third time period and the fourth time period. For example, there may be only the heating processes of the first time period, the second time period and the third time period, but there is no heating process of the fourth time period. Or, there may be only the heating processes of the first time period and the fourth time period, but there are no heating processes of the second time period and the third time period.

[0109] In some embodiments, the first time period, the second time period, the third time period and the fourth time period are consecutive. Or, in some other variant embodiments, the first time period, the second time period, the third time period and the fourth time period

are non-consecutive or at intervals.

[0110] Or, in further another embodiment, a method for controlling the aerosol generating device to heat the area 1100, the area 1200 and the area 1300 of the aerosol generating product 1000 is further provided, and includes the following:

in the first time period, the infrared emitting layer 321 of the heater 30 heats the area 1100 at a power P10, the infrared emitting layer 322 heats the area 1200 at a power P20, and the infrared emitting layer 323 heats the area 1300 at a power P30; the power P10 is greater than the power P20, and/or the power P10 is greater than the power P30, and/or the power P20 is basically equal to the power P30;

in the second time period, the infrared emitting layer 321 of the heater 30 heats the area 1100 at a power P40, the infrared emitting layer 322 heats the area 1200 at a power P50, and the infrared emitting layer 323 heats the area 1300 at a power P60; and/or the power P50 is greater than the power P40, and/or the power P50 is greater than the power P60, and/or the power P50 is basically equal to the power P10, and the power P40 is basically equal to the power P60; and/or, the power P40, the power P60, the power P20 and the power P30 are basically the same; and/or, the power P40 and/or the power P60 are/is lower than the power P10; and

in the third time period, the infrared emitting layer 321 of the heater 30 heats the area 1100 at a power P70, the infrared emitting layer 322 heats the area 1200 at a power P80, and the infrared emitting layer 323 heats the area 1300 at a power P90; and/or, the power P90 is greater than the power P70, and/or the power P90 is greater than the power P80, and/or the power P90 is basically equal to the power P10 or the power P50; and/or, the power P70 is basically equal to the power P80.

[0111] Or, in further another embodiment, a method for controlling the aerosol generating device to heat the area 1100, the area 1200 and the area 1300 of the aerosol generating product 1000 is further provided, and, as shown in FIG. 11, includes the following:

S100: in a first time period, the area 1100 is heated at a higher speed or a higher temperature or a higher power than the area 1200 and/or the area 1300;

S200: in a second time period, the area 1200 is heated at a higher speed or a higher temperature or a higher power than the area 1100 and/or the area 1300; and

S300: in a third time period, the area 1300 is heated at a higher speed or a higher temperature or a higher power than the area 1100 and/or the area 1200.

[0112] In some embodiments, the first time period, the second time period and the third time period are con-

secutive. Or, in some other embodiments, the first time period, the second time period and the third time period are non-consecutive, or there is an interval between the first time period and the second time period, or there is an interval between the second time period and the third time period.

[0113] In the above embodiment, the area 1100, the area 1200 and the area 1300 of the aerosol generating product 1000 are always heated at the same time. That is, the heater 30 basically cannot selectively or separately heat one or two of the area 1100, the area 1200 and the area 1300.

[0114] Or, FIG. 10 is a schematic diagram of heating the area 1100, the area 1200 and the area 1300 of the aerosol generating product 1000 by the heater 30 in further another specific embodiment. In FIG. 10, a curve S1 is a temperature curve of the area 1100 when the area is heated by the infrared emitting layer 321, a curve S2 is a temperature curve of the area 1200 when the area is heated by the infrared emitting layer 322, and a curve S3 is a temperature curve of the area 1300 when the area is heated by the infrared emitting layer 323.

[0115] In the specific embodiment shown in FIG. 10, the first target temperature, the second target temperature and the third target temperature are basically the same, and are about 240°C. In the specific embodiment shown in FIG. 10, in some embodiments, the duration of the first time period is about 100 s to 150 s; the duration of the second time period is about 20 s to 30 s; the duration of the third time period is about 40 s to 120 s; and the duration of the fourth time period is about 60 s to 150 s. In a specific embodiment, the duration of the first time period is about 130 s, and the duration of the second time period is about 25 s; the duration of the third time period is about 100 s; and the duration of the fourth time period is about 120 s.

[0116] In some embodiments, the duration of the fourth time period is longer than the duration of the first time period and/or the second time period and/or the third time period. In some embodiments, the duration of the first time period is longer than the duration of the second time period and/or the third time period.

[0117] Or, in some other variant embodiments, the heater 30 includes:

a first resistive heating element, a second resistive heating element and a third resistive heating element sequentially arranged in the circumferential direction.

[0118] The first resistive heating element is configured to surround and heat the area 1100.

[0119] The second resistive heating element is configured to surround and heat the area 1200.

[0120] The third resistive heating element is configured to surround and heat the area 1300.

[0121] Or, FIG. 10 is a schematic diagram of a heater 30 in another variant embodiment. In this embodiment, the heater 30b includes:

an infrared transmitting base body 31b, constructed

to present a tubular shape surrounding or accommodating the aerosol generating product 1000; an infrared emitting layer 32b, formed on the base body 31b and basically presenting an annular shape closed in a circumferential direction; and

at least two electrode elements, for example, an electrode element 341b and an electrode element 351b, arranged at intervals in the circumferential direction and combined on the infrared emitting layer 32b. Further, the infrared emitting layer 32b is separated by the electrode element 341b and the electrode element 351b to form an infrared emitting area 321b and an infrared emitting area 322b located at two sides of a virtual connection line m of the electrode element 341b and the electrode element 351b.

[0122] In this embodiment, the electrode element 341b and the electrode element 351b are asymmetrically arranged in a radial direction of the heater 30b and/or the infrared emitting layer 32b. Or, the electrode element 341b and the electrode element 351b are asymmetrically arranged in a manner of being rotated by 180° about a central axis O of the heater 30b. Or, a distance d1 between the electrode element 341b and the electrode element 351b is smaller than an outer diameter D of the infrared emitting layer 32b or the heater 30b. Therefore, a radian of the infrared emitting area 321b in the circumferential direction is a minor arc, and a radian of the infrared emitting area 322b in the circumferential direction is a major arc. In some exemplary implementations, a radian of the minor arc of the infrared emitting area 321b is between $\pi/9$ and $8\pi/9$. That is, an angle is about 20° to 160°. Correspondingly, a radian of the major arc of the infrared emitting area 322b is between $10\pi/9$ and $17\pi/9$. That is, the angle is between 200° and 340°.

[0123] Further, during implementation, one of the electrode element 341b and the electrode element 351b is connected to a positive electrode of the battery cell 130, and the other one is connected to a negative electrode. In operation, a power or a heating speed of the infrared emitting area 321b is greater than that of the infrared emitting area 322b. Therefore, in operation, the area 1100b surrounded by the infrared emitting area 321b of the aerosol generating product 1000 may be heated at a higher speed or a higher power than the area 1200b surrounded by the infrared emitting area 322b.

[0124] It should be noted that the specification and the accompanying drawings of this application illustrate exemplary embodiments of this application, but this application is not limited to the embodiments described in this specification. Further, a person of ordinary skill in the art may make improvements or modifications according to the foregoing description, and all the improvements and modifications shall fall within the protection scope of the appended claims of this application.

Claims

1. An aerosol generating device, configured to heat an aerosol generating product to generate an aerosol, **characterized in that** the aerosol generating device comprises:
 - a chamber, configured to at least partially receive the aerosol generating product;
 - a heater, configured to at least partially surround the chamber and used for heating the aerosol generating product, the heater at least comprising a first heating area, a second heating area and a third heating area sequentially arranged in the circumferential direction of the chamber;
 - a battery cell, configured to provide power to the heater; and
 - a circuit, configured to control the battery cell to provide power to the heater so as to simultaneously heat the first heating area, the second heating area and the third heating area, and to selectively heat one of the first heating area, the second heating area and the third heating area at a higher speed or a higher power than the other two.
2. The aerosol generating device according to claim 1, wherein the heater is configured not to heat only one or two of the first heating area, the second heating area and the third heating area.
3. The aerosol generating device according to claim 1 or 2, wherein the first heating area, the second heating area and the third heating area are configured to be only heated simultaneously.
4. The aerosol generating device according to claim 1 or 2, wherein the heater does not have any heating areas beyond the first heating area, the second heating area and the third heating area; and/or, the heater comprises only three heating areas.
5. The aerosol generating device according to claim 1 or 2, wherein a radian of one of the first heating area, the second heating area and the third heating area heated at a higher speed or a higher power in the circumferential direction of the heater is smaller than π , and a sum of radians of the other two heating areas heated at a lower speed or a lower power in the circumferential direction of the heater is greater than π .
6. The aerosol generating device according to claim 1 or 2, wherein the heater comprises at least a first heating element, a second heating element and a third heating element sequentially arranged in the circumferential direction of the chamber, wherein:
 - the first heating element at least partially defines the first heating area;
 - the second heating element at least partially defines the second heating area; and
 - the third heating element at least partially defines the third heating area.
7. The aerosol generating device according to claim 6, wherein the circuit is configured to selectively change an electric connection relationship of the first heating element, the second heating element and the third heating element to enable one of the first heating area, the second heating area and the third heating area to be heated at a higher speed or a higher power than the other two.
8. The aerosol generating device according to claim 6, wherein the circuit is configured to selectively connect two of the first heating element, the second heating element and the third heating element in series and then connect the two of the first heating element, the second heating element and the third heating element in parallel with the other one to enable one of the first heating area, the second heating area and the third heating area to be heated at a higher speed or a higher power than the other two.
9. The aerosol generating device according to claim 8, wherein a radian of the two of the first heating element, the second heating element and the third heating element connected in series in the circumferential direction of the heater is greater than π , and a radian of the other one heating element in the circumferential direction of the heater is smaller than π .
10. The aerosol generating device according to claim 6, wherein the heater further comprises a first electrode element, a second electrode element and a third electrode element sequentially arranged in the circumferential direction of the chamber;
 - at least a part of the first heating element is electrically connected between the first electrode element and the second electrode element, so that a current is able to be guided by the first electrode element and the second electrode element at the first heating element in use;
 - at least a part of the second heating element is electrically connected between the second electrode element and the third electrode element, so that a current is able to be guided by the second electrode element and the third electrode element at the second heating element in use; and
 - at least a part of the third heating element is electrically connected between the third elec-

trode element and the first electrode element, so that a current is able to be guided by the third electrode element and the first electrode element at the third heating element in use.

11. The aerosol generating device according to claim 10, wherein the circuit is configured to selectively connect only two of the first electrode element, the second electrode element and the third electrode element to supply power to the heater, so that one of the first heating area, the second heating area and the third heating area is heated at a higher speed or a higher power than the other two.

12. The aerosol generating device according to claim 10, wherein any two of the first electrode element, the second electrode element and the third electrode element are asymmetrically arranged in a radial direction of the heater;
and/or, any two of the first electrode element, the second electrode element and the third electrode element are asymmetrically arranged in a manner of being rotated by 180° around a central axis of the heater.

13. The aerosol generating device according to claim 6, wherein the first heating element is at least one of an infrared heating element or a resistive heating element;

and/or, the second heating element is at least one of an infrared heating element or a resistive heating element;
and/or, the third heating element is at least one of an infrared heating element or a resistive heating element.

14. The aerosol generating device according to claim 1 or 2, wherein the heater comprises:

a base body, at least partially surrounding the chamber;
an infrared emitting layer, formed or combined on the base body; and
a first electrode element, a second electrode element and a third electrode element arranged in the circumferential direction of the base body, wherein the first heating area is defined by a part of the infrared emitting layer located between the first electrode element and the second electrode element, the second heating area is defined by a part of the infrared emitting layer located between the second electrode element and the third electrode element, and the third heating area is defined by a part of the infrared emitting layer located between the third electrode element and the first electrode element.

15. The aerosol generating device according to claim 1 or 2, wherein the circuit is configured to control the battery cell to provide power to the heater, so that the first heating area is heated at a higher speed or a higher power than the second heating area and/or the third heating area in a first time period, the second heating area is heated at a higher speed or a higher power than the first heating area and/or the third heating area in a second time period, and the third heating area is heated at a higher speed or a higher power than the first heating area and/or the second heating area in a third time period.

16. The aerosol generating device according to claim 15, wherein in the first time period, the power provided by the circuit to the first heating area is substantially four times the power provided to the second heating area and/or the third heating area;

and/or, in the second time period, the power provided by the circuit to the second heating area is substantially four times the power provided to the first heating area and/or the third heating area;

and/or, in the third time period, the power provided by the circuit to the third heating area is substantially four times the power provided to the first heating area and/or the second heating area.

17. The aerosol generating device according to claim 1 or 2, wherein the circuit is configured to control the battery cell to provide power to the heater, so as to: in a first time period, heat the first heating area at a first power and heat the second heating area and the third heating area at substantially a same second power; in a second time period, heat the second heating area at a third power and heat the first heating area and the third heating area at substantially a same fourth power; and in a third time period, heat the third heating area at a fifth power and heat the first heating area and the second heating area at substantially a same sixth power.

18. The aerosol generating device according to claim 15, wherein the circuit is further configured to control the battery cell to provide power to the heater so as to: heat the first heating area to a first target temperature and enable temperatures of the second heating area and the third heating area to be lower than the first target temperature in the first time period; heat the second heating area to a second target temperature and enable a temperature of the third heating area to be lower than the second target temperature in the second time period; and heat the third heating area to a third target temperature and enable temperatures of the first heating area and the second heating area not to be lower than the third target temperature in

the third time period.

19. The aerosol generating device according to claim 15, wherein the first time period is 100 s to 150 s;

and/or, the second time period is 20 s to 30 s;
and/or, the duration of the third time period is about 60 s to 120 s;
and/or, the duration of the fourth time period is about 60 s to 150 s.

20. An aerosol generating device, configured to heat an aerosol generating product to generate an aerosol, the aerosol generating product comprising a first area, a second area and a third area sequentially arranged in a circumferential direction, **characterized in that** the aerosol generating device comprises:

a chamber, configured to at least partially receive the aerosol generating product;
a heater, configured to at least partially surround the chamber and used for heating the aerosol generating product; and
a circuit, configured to: control a battery cell to provide power to the heater to simultaneously heat the first area, the second area and the third area of the aerosol generating product; and in a first time period, heat the first area to a first target temperature and enable temperatures of the second area and the third area to be lower than the first target temperature; in a second time period, heat the second area to a second target temperature and enable a temperature of the third area to be lower than the second target temperature, and in a third time period, heat the third area to a third target temperature and enable temperatures of the first area and the second area not to be lower than the third target temperature.

21. An aerosol generating device, configured to heat an aerosol generating product to generate an aerosol, **characterized in that** the aerosol generating device comprises:

a chamber, configured to at least partially receive the aerosol generating product; and
a heater, configured to at least partially surround the chamber and used for heating the aerosol generating product, the heater comprising at least:

a first heating element, a second heating element and a third heating element sequentially arranged in the circumferential direction of the chamber; and
a first electrode element, a second elec-

trode element and a third electrode element sequentially arranged in the circumferential direction of the chamber, wherein:

at least a part of the first heating element is electrically connected between the first electrode element and the second electrode element, so that a current is able to be guided by the first electrode element and the second electrode element at the first heating element in use;

at least a part of the second heating element is electrically connected between the second electrode element and the third electrode element, so that a current is able to be guided by the second electrode element and the third electrode element at the second heating element in use; and

at least a part of the third heating element is electrically connected between the third electrode element and the first electrode element, so that a current is able to be guided by the third electrode element and the first electrode element at the third heating element in use.

22. The aerosol generating device according to claim 21, further comprising:

a circuit, configured to selectively connect only two of the first electrode element, the second electrode element and the third electrode element to supply power to the heater, so that one of the first heating element, the second heating element and the third heating element is heated at a higher speed or a higher power than the other two.

23. An aerosol generating device, configured to heat an aerosol generating product to generate an aerosol, **characterized in that** the aerosol generating device comprises:

a chamber, configured to at least partially receive the aerosol generating product; and
a heater, configured to at least partially surround the chamber and used for heating the aerosol generating product, the heater comprising at least:

a first heating element and a second heating element sequentially arranged in the circumferential direction of the chamber; and a first electrode element and a second electrode element sequentially arranged in the circumferential direction of the chamber and configured to guide a current on the first heating element and the second heating element in the circumferential direction of the heater, wherein:

the first heating element is located at a first side of a virtual line connecting the first electrode element and the second electrode element, and a radian of the first heating element in the circumferential direction of the heater is smaller than π ; and
 5 the first heating element is located at a second side of the virtual line connecting the first electrode element and the second electrode element, and a radian of the first heating element in the circumferential direction of the heater is greater than π .
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24. The aerosol generating device according to claim 23,
 15 the first electrode element and the second electrode element are asymmetrically arranged in a radial direction of the heater;
 and/or, the first electrode element and the second electrode element are asymmetrically arranged in a manner of being rotated for 180° around a central
 20 axis of the heater.

25. A heater for an aerosol generating device, **characterized in that** the heater is formed in a tubular shape and comprises at least:

a first heating element, a second heating element and a third heating element sequentially arranged in the circumferential direction of the heater; and
 30 a first electrode element, a second electrode element and a third electrode element sequentially arranged in the circumferential direction of the heater, wherein:

at least a part of the first heating element is electrically connected between the first electrode element and the second electrode element, so that a current is able to be guided by the first electrode element and the second electrode element at the first heating element in use;
 40 at least a part of the second heating element is electrically connected between the second electrode element and the third electrode element, so that a current is able to be guided by the second electrode element and the third electrode element at the second heating element in use; and
 45 at least a part of the third heating element is electrically connected between the third electrode element and the first electrode element, so that a current is able to be guided by the third electrode element and the first electrode element at the third heating element in use.
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26. A heater for an aerosol generating device, **characterized in that** the heater is formed in a tubular shape and comprises at least:

terized in that the heater is formed in a tubular shape and comprises at least:

a first heating element and a second heating element sequentially arranged in the circumferential direction of the chamber; and a first electrode element and a second electrode element sequentially arranged in the circumferential direction of the chamber and configured to guide a current on the first heating element and the second heating element in the circumferential direction of the heater, wherein:

the first heating element is located at a first side of a virtual line connecting the first electrode element and the second electrode element, and a radian of the first heating element in the circumferential direction of the heater is smaller than π ; and
 the first heating element is located at a second side of the virtual line connecting the first electrode element and the second electrode element, and a radian of the first heating element in the circumferential direction of the heater is greater than π .

- 25 27. A control method for an aerosol generating device, the aerosol generating device configured to heat an aerosol generating product to generate an aerosol, and the aerosol generating device comprising:

a chamber, configured to at least partially receive the aerosol generating product; and
 a heater, configured to at least partially surround the chamber and used for heating the aerosol generating product, the heater comprising at least a first heating area, a second heating area and a third heating area sequentially arranged in the circumferential direction to respectively heat different parts of the aerosol generating product, wherein the method comprises:

providing power to the heater to simultaneously heat the first heating area, the second heating area and the third heating area; and
 adjusting at least some of electrode elements of the first heating area, the second heating area and the third heating area, so that one of the first heating area, the second heating area and the third heating area is heated at a higher speed or a higher power than the other two.

28. A control method for an aerosol generating device, the aerosol generating device configured to heat an aerosol generating product to generate an aerosol, and the aerosol generating product comprising a first area, a second area and a third area sequentially arranged in a circumferential direction,

the aerosol generating device comprising: a chamber, configured to at least partially receive the aerosol generating product; and a heater, configured to at least partially surround the chamber and used for heating the aerosol generating product, wherein the method comprises:

providing power to the heater to simultaneously heat the first area, the second area and the third area of the aerosol generating product;
heating, in a first time period, the first area to a first target temperature, the first target temperature being higher than current temperatures of the second area and the third area;
heating, in a second time period, the second area to a second target temperature, the second target temperature being higher than a current temperature of the third area;
and
heating, in a third time period, the third area to a third target temperature, the third target temperature being approximately similar to current temperatures of the first area and the second area.

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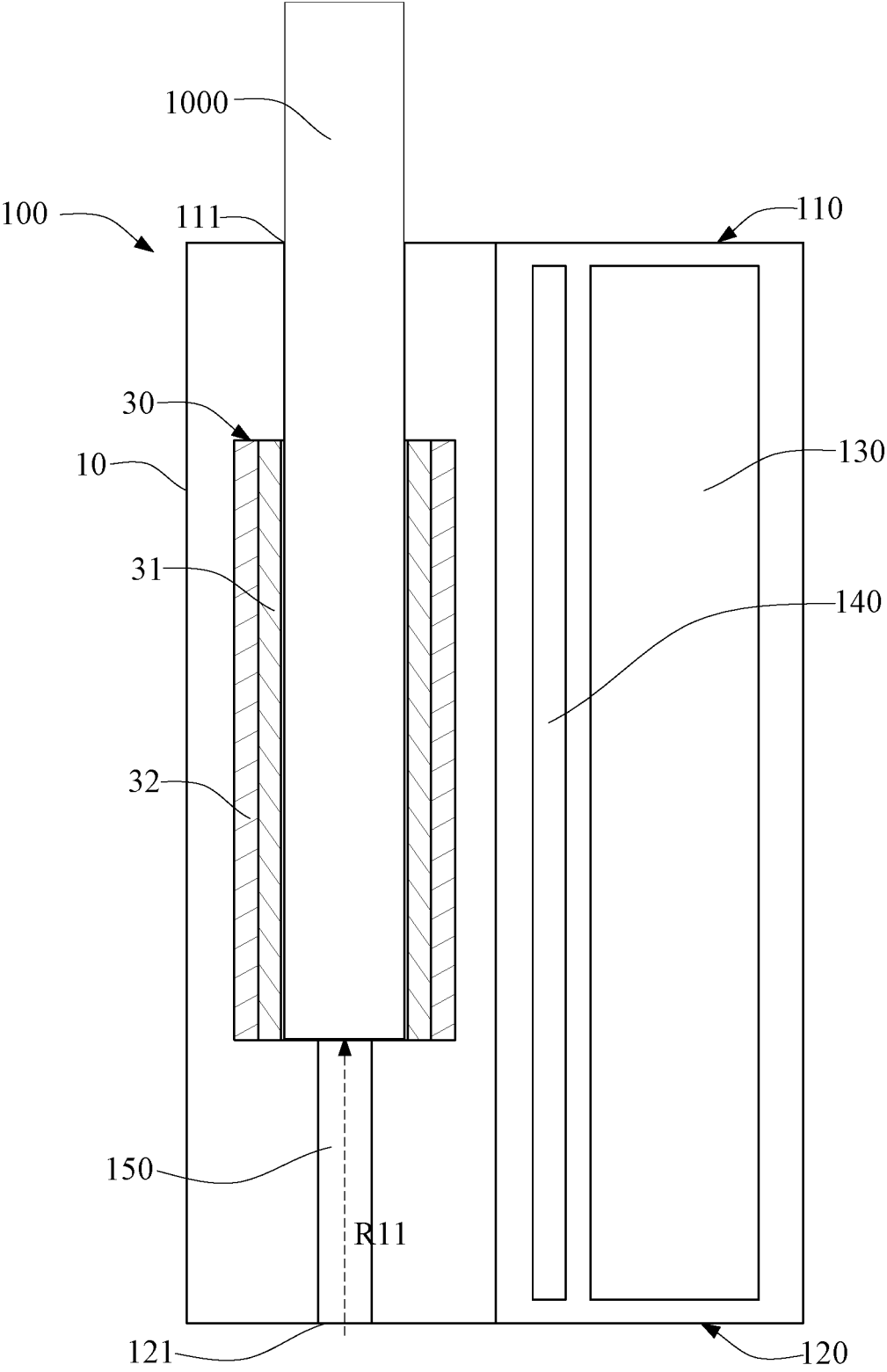


FIG. 1

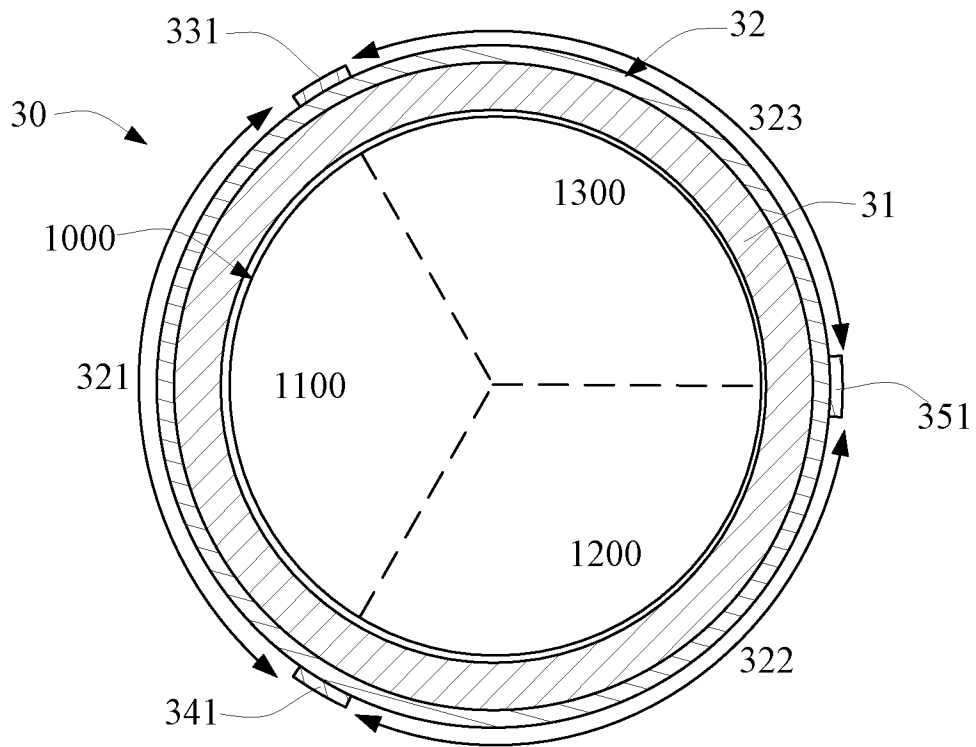


FIG. 2

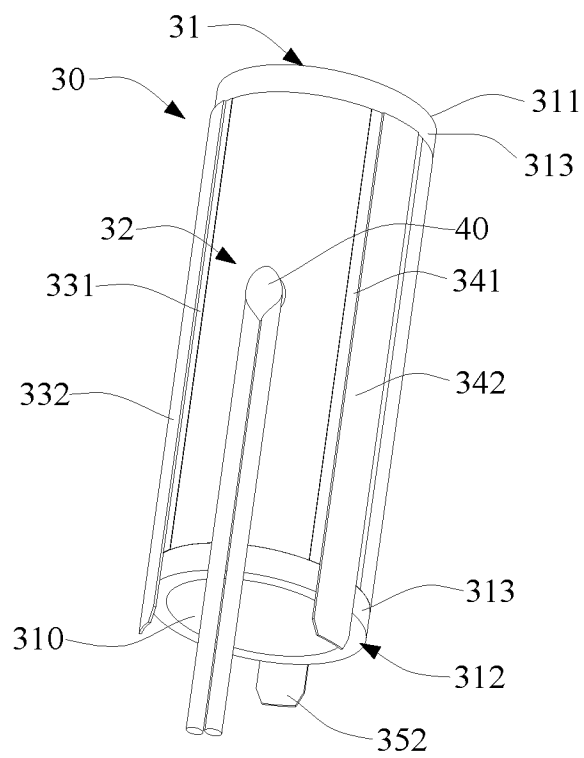


FIG. 3

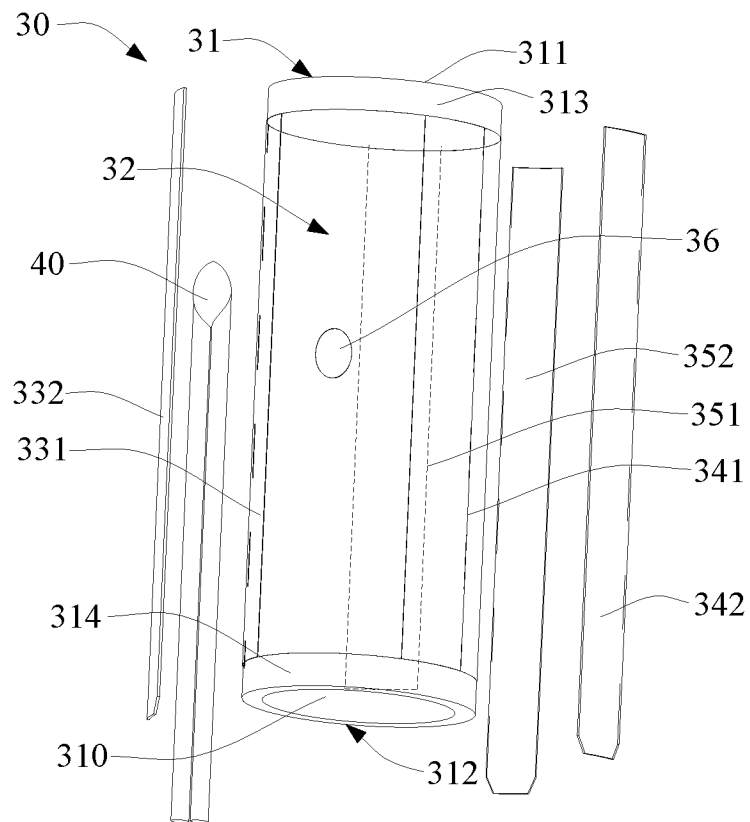


FIG. 4

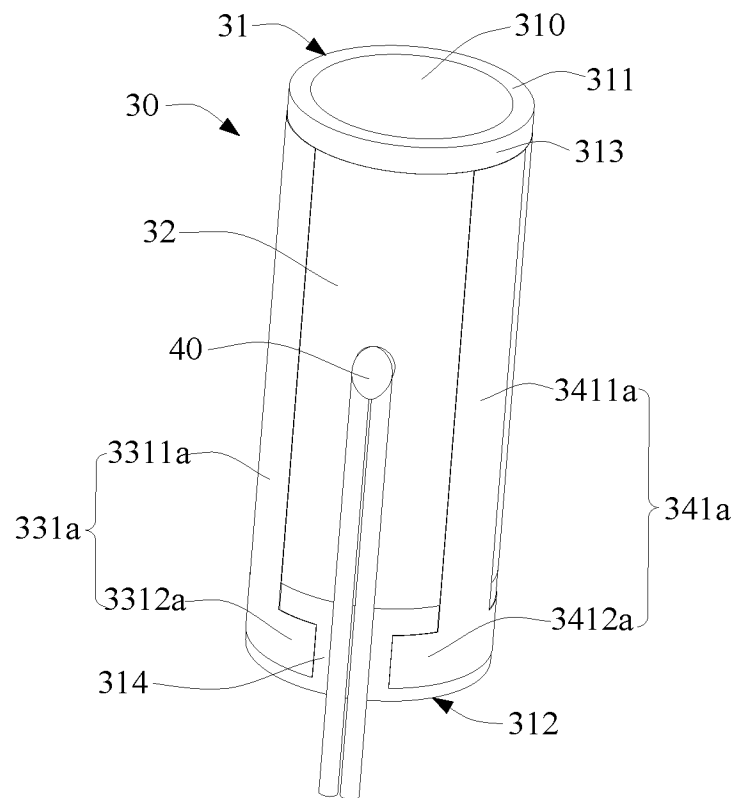


FIG. 5

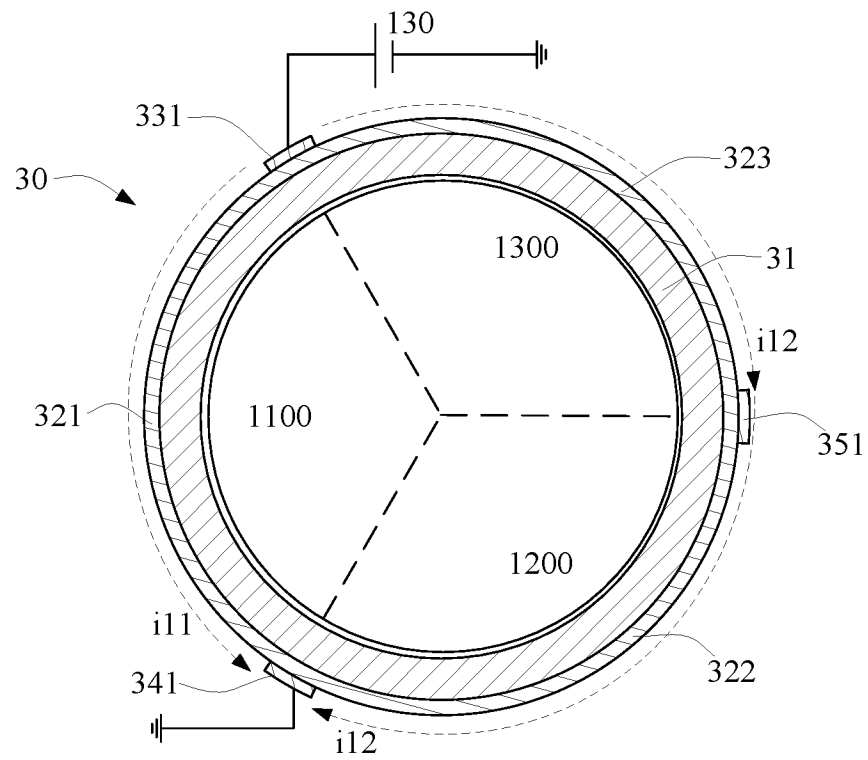


FIG. 6

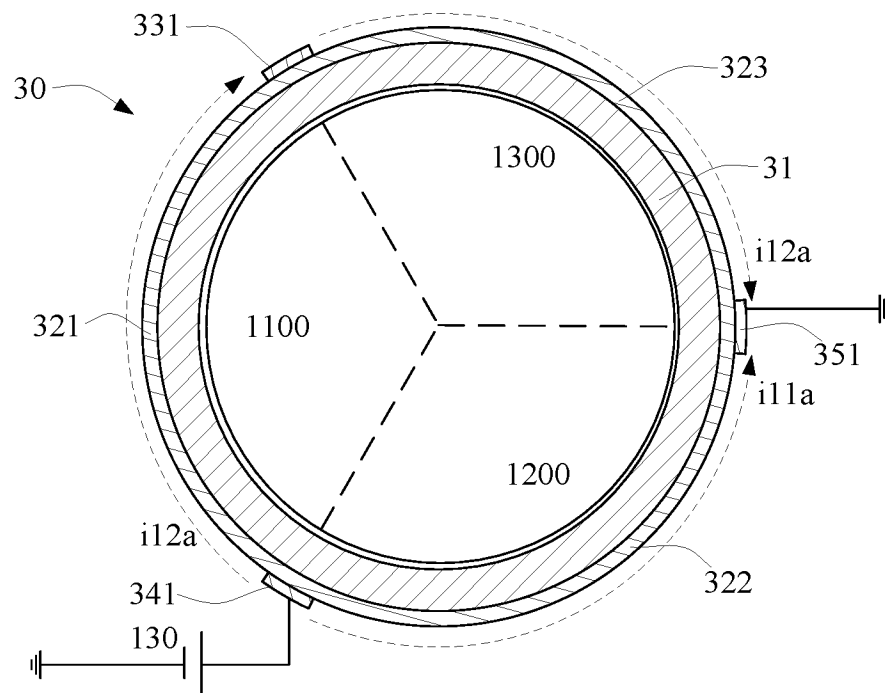


FIG. 7

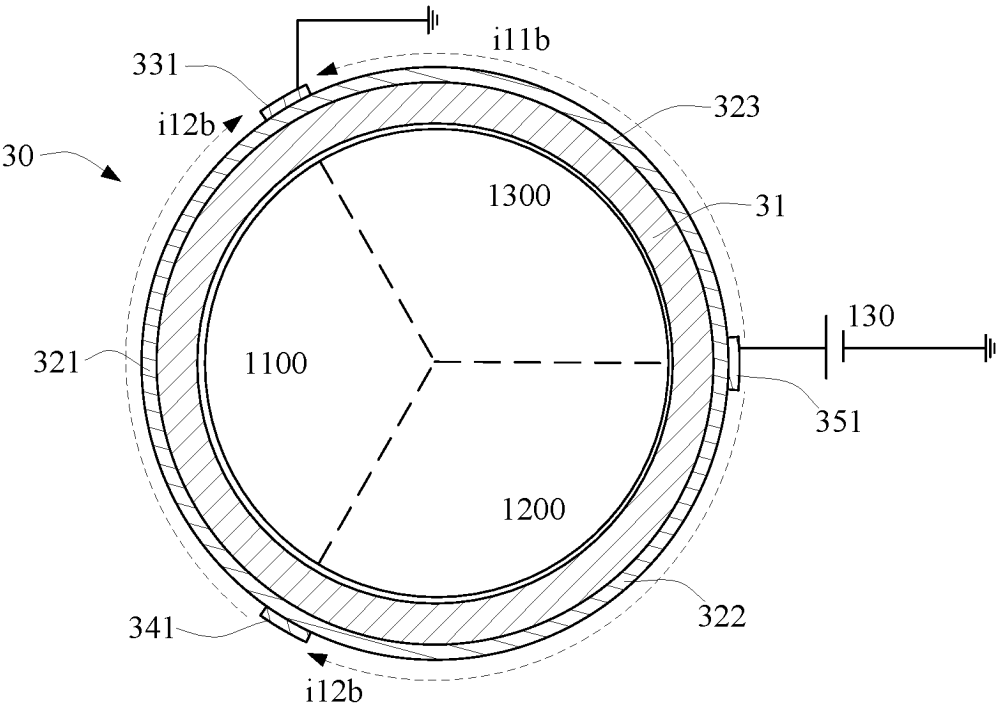


FIG. 8

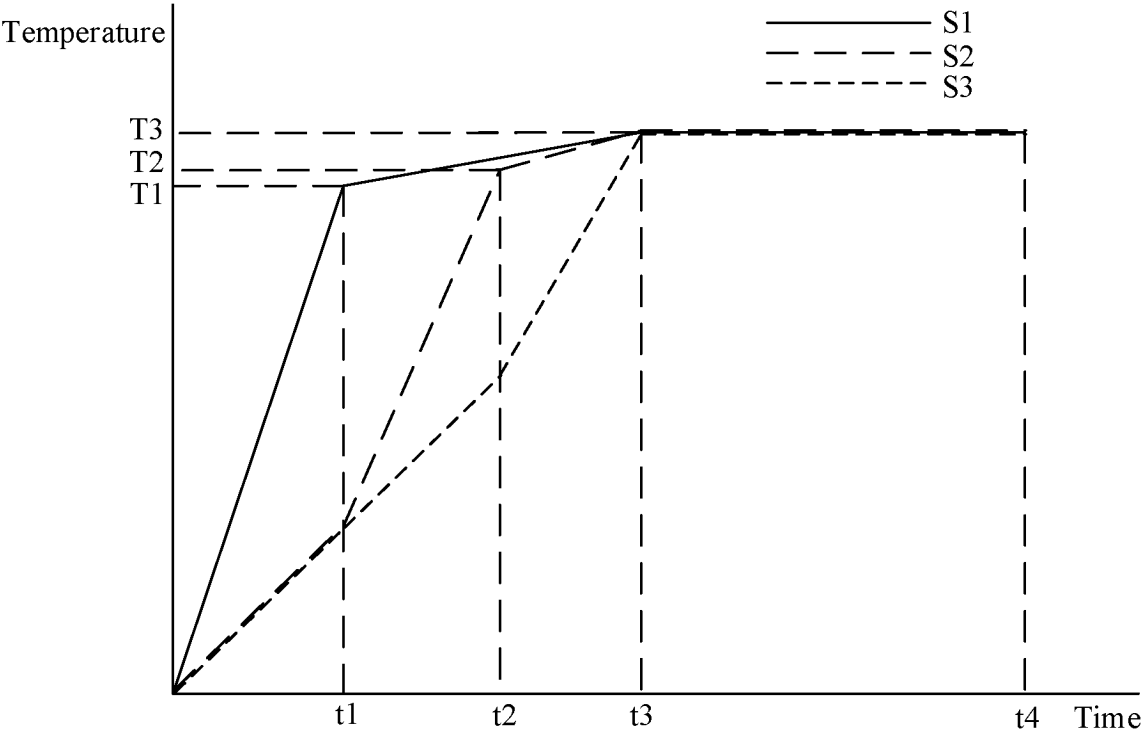


FIG. 9

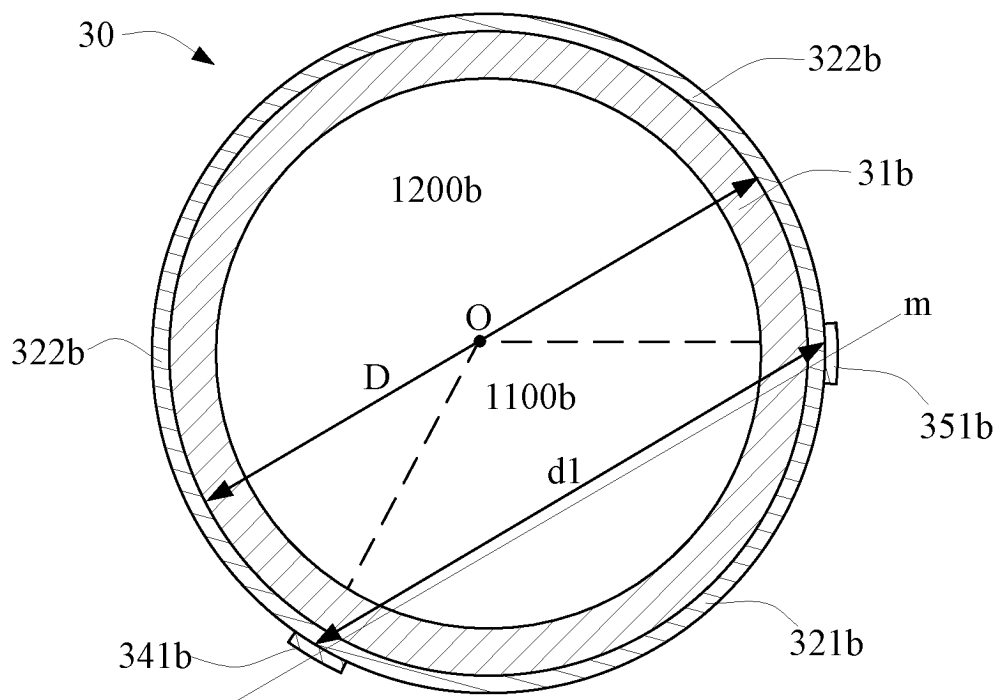


FIG. 10

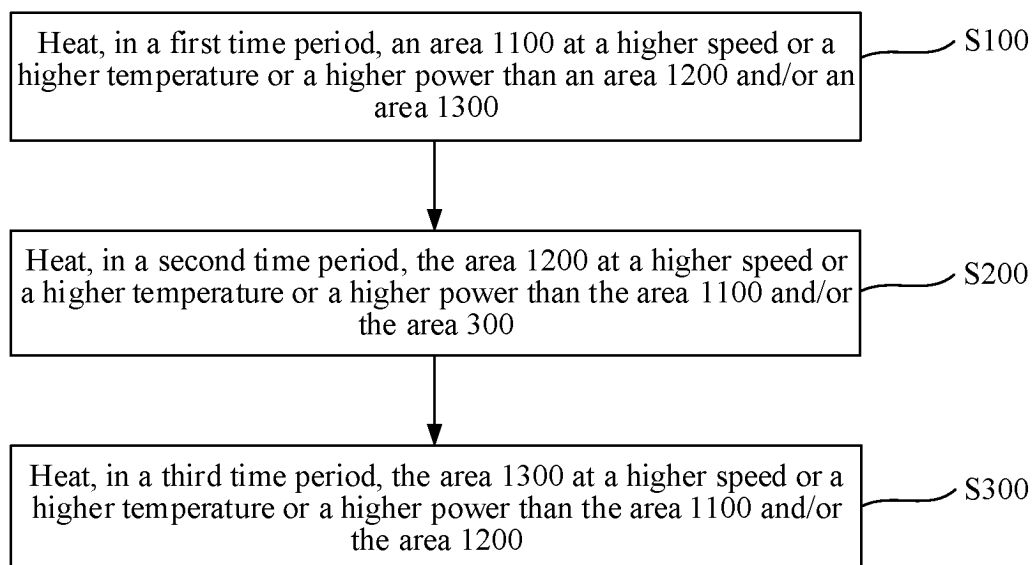


FIG. 11

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2023/110813

A. CLASSIFICATION OF SUBJECT MATTER

A24F40/46(2020.01)i; A24F40/40(2020.01)i; A24F40/50(2020.01)i; A24F40/20(2020.01)i; A24F40/57(2020.01)i; A24F40/51(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)

CNKI, CNTXT, CNABS, ENTXTC, VEN: 气雾, 气溶胶, 加热, 红外, 不同, 分段, 功率, 环, 环绕, 环形, 环状, 区域, 时间, 温度, 圆周, 周向, 电阻, aerosol, heat+, infrared, different, segment+, power, ring, surround, annulus, zone+, region+, time, temperature, circumference, circumferential, resistance

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 218354633 U (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 24 January 2023 (2023-01-24) claims 1-30, and description, paragraphs 114-225, and figures 1-11	1-28
X	CN 113115990 A (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 16 July 2021 (2021-07-16) claims 1-24, and description, paragraphs 76-129, and figures 3-13	21,25
Y	CN 113115990 A (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 16 July 2021 (2021-07-16) claims 1-24, and description, paragraphs 76-129, and figures 3-13	1-20, 22-24, 26-28
X	CN 112385906 A (HUBEI CHINA TOBACCO INDUSTRY CO., LTD.) 23 February 2021 (2021-02-23) claims 1-19, and description, paragraphs 35-64, and figures 1-7	21, 25
Y	CN 112385906 A (HUBEI CHINA TOBACCO INDUSTRY CO., LTD.) 23 February 2021 (2021-02-23) claims 1-19, and description, paragraphs 35-64, and figures 1-7	1-20, 22-24, 26-28

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

* Special categories of cited documents:	"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
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"D" document cited by the applicant in the international application	"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
"E" earlier application or patent but published on or after the international filing date	"&" document member of the same patent family
"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	

Date of the actual completion of the international search

02 November 2023

Date of mailing of the international search report

15 November 2023

Name and mailing address of the ISA/CN

China National Intellectual Property Administration (ISA/
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Beijing 100088

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	CN 114631647 A (BYD CO., LTD.) 17 June 2022 (2022-06-17) description, paragraphs 26-65	15-20, 28
Y	CN 114098166 A (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 01 March 2022 (2022-03-01) description, paragraph 61	1-19, 22-24, 26-27
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A	CN 106333387 A (SHENZHEN INNOKIN TECHNOLOGY CO., LTD.) 18 January 2017 (2017-01-18) entire document	1-28
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A	WO 2022136608 A1 (NICOVENTURES TRADING LTD.) 30 June 2022 (2022-06-30) entire document	1-28

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2023/110813

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CN	112385906	A	23 February 2021		None			
CN	215347048	U	31 December 2021		None			
CN	114631647	A	17 June 2022		None			
CN	114098166	A	01 March 2022		None			
CN	218999525	U	12 May 2023		None			
CN	106333387	A	18 January 2017		None			
CN	107485055	A	19 December 2017		None			
WO	2022136608	A1	30 June 2022		GB	202020429	D0	03 February 2021
					KR	20230108326	A	18 July 2023

Form PCT/ISA/210 (patent family annex) (July 2022)

REFERENCES CITED IN THE DESCRIPTION

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