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

(11) **EP 4 817 444 A1**

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

(43) Date of publication:
07.10.2026 Bulletin 2026/41

(21) Application number: **24910688.1**

(22) Date of filing: **10.12.2024**

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

(52) Cooperative Patent Classification (CPC):
A24F 40/46; A24F 40/50; A24F 40/51; A24F 40/57

(86) International application number:
PCT/CN2024/138090

(87) International publication number:
WO 2025/139757 (03.07.2025 Gazette 2025/27)

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

(30) Priority: **25.12.2023 CN 202311797236**

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

(72) Inventors:
- **LIU, Chuanyou**
  Shenzhen, Guangdong 518000 (CN)
- **LIU, Bibi**
  Shenzhen, Guangdong 518000 (CN)
- **XU, Zhongli**
  Shenzhen, Guangdong 518000 (CN)
- **LI, Yonghai**
  Shenzhen, Guangdong 518000 (CN)

(74) Representative: **Ran, Handong et al**
Maucher Jenkins
Seventh Floor Offices
Artillery House
11-19 Artillery Row
London SW1P 1RT (GB)

(54) AEROSOL GENERATION APPARATUS AND CONTROL METHOD THEREFOR

(57) Disclosed in the present application are an aerosol generation apparatus and a control method therefor. The aerosol generation apparatus comprises: a heater, which is used for heating an aerosol generation product to generate an aerosol, wherein the heater comprises a first heating part and a second heating part; a battery cell, which is used for providing electric power, a temperature sensor, which is arranged on the first heating part; and a circuit, which is configured to control, within at least one of a plurality of heating stages and on the basis of a real-time temperature of the first heating part measured by the temperature sensor, the battery cell to provide heating energy for the first heating part and the second heating part, wherein the heating energy provided for the second heating part is proportional to the heating energy provided for the first heating part. By means of the aerosol generation apparatus and the control method therefor, when a second heating part has no temperature sensing, it is ensured that the second heating part is heated along with a first heating part, thereby realizing temperature control over the second heating part.

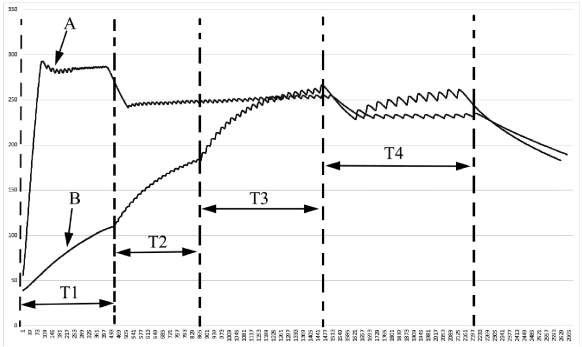


FIG. 10

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Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to Chinese Patent Application No. 202311797236.8, filed with the China National Intellectual Property Administration on December 25, 2023 and entitled "AEROSOL GENERATION DEVICE AND CONTROL METHOD THEREFOR", which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] Embodiments of this application relate to the field of electronic atomization technologies, and in particular, to an aerosol generation device and a control method therefor.

BACKGROUND

[0003] In an aerosol generation device, a heater is used to heat and bake an aerosol generation product, to generate an aerosol to be inhaled by a user. Typically, users usually expect the aerosol generation device to generate the aerosol as quickly as possible after activation, so as to reduce waiting time for aerosol generation. For the aerosol generation device to generate the aerosol quickly to provide satisfactory user experience, some solutions improve the design of the heater or a control method.

[0004] In some solutions known to the inventors of this application, an aerosol generation device usually employs a plurality of heaters. The intention is to control some of the heaters to reach an aerosol generation temperature first, to fully preheat and bake one part of an aerosol generation product, so as to generate an aerosol; and then control the other heaters to reach the aerosol generation temperature, to preheat and bake the other part of the aerosol generation product, so as to generate the aerosol. The foregoing method typically requires a plurality of corresponding temperature sensors for implementation, resulting in high costs.

SUMMARY

[0005] In view of this, some embodiments of this application provide an aerosol generation device and a control method therefor, to achieve temperature control of a plurality of heaters.

[0006] Some embodiments of this application provide an aerosol generation device, including:

a heater, configured to heat an aerosol generation product to generate an aerosol, where the heater includes a first heating portion and a second heating portion;

a battery cell, configured to supply power;

a temperature sensor, disposed on the first heating portion; and

a circuit, configured to control, within at least one of a plurality of heating stages based on a real-time temperature of the first heating portion as detected by the temperature sensor, the battery cell to provide heating energy for the first heating portion and the second heating portion, where the heating energy provided for the second heating portion is proportional to the heating energy provided for the first heating portion.

[0007] In an example, a chamber for removably receiving the aerosol generation product is further included; and

the first heating portion and the second heating portion are sequentially arranged in an axial direction of the chamber.

[0008] In an example, the heating energy provided for the second heating portion is directly proportional to the heating energy provided for the first heating portion.

[0009] In an example, within the at least one heating stage, a proportionality coefficient between the heating energy provided for the second heating portion and the heating energy provided for the first heating portion is constant.

[0010] In an example, the circuit is configured to adjust or change, when a next heating stage is entered from a previous heating stage, a proportionality coefficient between the heating energy provided for the second heating portion and the heating energy provided for the first heating portion.

[0011] In an example, the circuit is configured to control the battery cell to provide the heating energy for the first heating portion and the second heating portion simultaneously.

[0012] In an example, the at least one heating stage includes a plurality of time periods; and

the circuit is configured to control, within the time period, the battery cell to provide the heating energy for the first heating portion and the second heating portion alternately.

[0013] In an example, the time period includes a first partial time period and a second partial time period; and the circuit is configured to:

control, within the first partial time period, the battery cell to provide the heating energy for the first heating portion and stop providing the heating energy for the second heating portion; and

control, within the second partial time period, the battery cell to provide the heating energy for the second heating portion and stop providing the heating energy for the first heating portion.

[0014] In an example, the circuit is configured to control, within the time period, when the battery cell provides the heating energy for the first heating portion, if the heating energy provided for the first heating portion is greater than or equal to a preset first energy threshold,

the battery cell to stop providing the heating energy for the first heating portion and start providing the heating energy for the second heating portion; or

control, within the time period, when the battery cell provides the heating energy for the second heating portion, if the heating energy provided for the second heating portion is greater than or equal to a preset second energy threshold, the battery cell to stop providing the heating energy for the second heating portion.

[0015] In an example, the circuit is configured to control, within the time period, when the first heating portion is in a natural cooling state, or when the battery cell stops providing the heating energy for the first heating portion, or when the battery cell is controlled to provide the heating energy for the second heating portion, if the real-time temperature of the first heating portion is less than or equal to a preset temperature threshold, the battery cell to provide the heating energy for the first heating portion and stop providing the heating energy for the second heating portion.

[0016] Some other embodiments of this application provide an aerosol generation device, including:

a heater, configured to heat an aerosol generation product to generate an aerosol, where the heater includes a first heating portion and a second heating portion;

a battery cell, configured to supply power; and

a circuit, configured to control, within at least one of a plurality of heating stages, the battery cell to provide heating energy for the first heating portion and the second heating portion alternately, where the heating energy provided for the second heating portion is proportional to the heating energy provided for the first heating portion.

[0017] Some other embodiments of this application provide a control method for an aerosol generation device, where the aerosol generation device includes a heater configured to heat an aerosol generation product and a battery cell configured to supply power, and the heater includes a first heating portion and a second heating portion; and

the control method includes:

controlling, within at least one of a plurality of heating stages based on a real-time temperature of the first heating portion as detected by a temperature sensor, the battery cell to provide heating energy for the first heating portion and the second heating portion, where the heating energy provided for the second heating portion is proportional to the heating energy provided for the first heating portion.

[0018] In an example, the heating energy provided for the second heating portion is directly proportional to the heating energy provided for the first heating portion.

[0019] In an example, within the at least one heating stage, a proportionality coefficient between the heating energy provided for the second heating portion and the heating energy provided for the first heating portion is constant.

[0020] In an example, when a next heating stage is entered from a previous heating stage, a proportionality coefficient between the heating energy provided for the second heating portion and the heating energy provided for the first heating portion is adjusted or changed.

[0021] According to the aerosol generation device and the control method therefor that are provided in embodiments of this application, the temperature sensor detects a real-time temperature of the first heating portion, and the battery cell is controlled, based on the real-time temperature, to provide heating energy for the first heating portion and the second heating portion, where the heating energy provided for the second heating portion is proportional to the heating energy provided for the first heating portion. In this way, without temperature sensing on the second heating portion, it is ensured that the second heating portion follows the first heating portion to perform heating, thereby achieving temperature control of the second heating portion.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] One or more embodiments are exemplarily described with reference to the corresponding figures in the accompanying drawings, and these exemplary descriptions are not to be construed as limiting the embodiments. Elements that have same reference numerals in the accompanying drawings indicate similar elements. Unless otherwise particularly stated, the figures in the accompanying drawings are not drawn to scale.

FIG. 1 is a schematic diagram of an aerosol generation device according to an embodiment;

FIG. 2 is a schematic diagram of a structure of a heater in FIG. 1 according to an embodiment;

FIG. 3 is an exploded view of the heater in FIG. 2 before assembly of all parts;

FIG. 4 is a schematic diagram of a heating element in FIG. 3 unfolded in a circumferential direction;

FIG. 5 is a schematic diagram of guiding a current in a heating element according to an embodiment;

FIG. 6 is a schematic diagram of guiding a current in a heating element according to another embodiment;

FIG. 7 is a schematic diagram of guiding a current in a heating element according to another embodiment;

FIG. 8 is a schematic diagram of guiding a current in a heating element according to another embodiment;

FIG. 9 is a schematic flowchart of a control method according to some embodiments of this application;

FIG. 10 is a graph of temperature changes of a first heating portion and a second heating portion in operation according to some embodiments of this application;

FIG. 11 is a graph of providing heating energy for a first heating portion and a second heating portion according to some embodiments of this application;

and

FIG. 12 is a schematic flowchart of a control method according to some other embodiments of this application.

DETAILED DESCRIPTION

[0023] This application is described below in detail with reference to specific embodiments. The following embodiments are conducive to further understanding of this application by a person of ordinary skill in the art, but do not limit this application in any form. It should be noted that a person of ordinary skill in the art may make several modifications and improvements without deviating from the concept of this application. These modifications and improvements shall fall within the protection scope of this application.

[0024] To make the objectives, technical solutions, and advantages of this application clearer, the following further describes this application in detail with reference to the accompanying drawings and the embodiments. It should be understood that the specific embodiments described herein are merely used for explaining this application but are not intended to limit this application.

[0025] It needs to be noted that, if no conflict exists, the features in the embodiments of this application may be combined with one another, and all combinations fall within the protection scope of this application. In addition, although division into functional modules are performed in the schematic diagram of the device, and a logical order is shown in the flowchart, in some cases, the shown or described steps may be performed based on module division different from that in the device or in an order different from that in the flowchart. In addition, the words such as "first", "second", and "third" used herein do not constitute limitation to the data or performing order, but merely distinguish between same items or similar items that provide basically same functions and effects.

[0026] Unless otherwise defined, all technical and scientific terms used in this specification have the same meaning as would normally be understood by a person skilled in the art of this application. In this specification, terms used in the specification of this application are merely intended to describe the specific implementations, but are not intended to limit this application. The term "and/or" used in this specification includes any or all combinations of one or more related listed items.

[0027] In addition, technical features involved in the implementations of this application described below can be combined with each other as long as there is no conflict.

[0028] An embodiment of this application provides an aerosol generation device 100 that heats but does not burn an aerosol generation product 1000, for example, a cigarette, to volatilize or release at least one component of the aerosol generation product 1000 to form an aerosol for inhalation, as shown in FIG. 1.

[0029] In an optional implementation, the aerosol generation product 1000 is preferably made of a tobacco-containing material that releases a volatile compound from a substrate when being heated, or may be made of a non-tobacco material suitable for releasing smoke through electrical heating after being heated. The aerosol generation product 1000 is preferably made of a solid substrate, which may include one or more of powder, particles, fragmented strips, strips, or sheets of one or more of vanilla leaves, dried flowers, herbaceous crops with volatile fragrance, tobacco leaves, homogeneous tobacco, and expanded tobacco. Alternatively, the solid substrate may include additional tobacco or non-tobacco compounds with volatile fragrance to be released when the substrate is heated.

[0030] In addition, as shown in FIG. 1, after the aerosol generation product 1000 is received in the aerosol generation device 100, a part of the aerosol generation product, for example, a filter tip, is exposed outside the aerosol generation device 100, which is beneficial for inhalation by a user.

[0031] A structure of the aerosol generation device 100 according to an embodiment of this application may be shown in FIG. 1. An overall shape of the device is roughly configured into a flat cylinder shape, and an external component of the aerosol generation device 100 includes:

a housing 10, substantially defining an outer surface of the aerosol generation device, being hollow inside, and forming assembly space for necessary functional components such as an electronic device and a heating device. The housing 10 has a proximal end 110 and a distal end 120 that are opposite to each other in a longitudinal direction. During use, the proximal end 110 is an end close to a user to facilitate operation, accommodation, heating, and inhalation of the aerosol generation product 1000; and the distal end 120 is an end away from the user.

[0032] The proximal end 110 is provided with a receiving port 111, and the aerosol generation product 1000 can be received into the housing 10 through the receiving port 111 to be heated or removed from the housing 10.

[0033] The distal end 120 is provided with an air inlet hole 121; and the air inlet hole 121 is provided to allow outside air to enter the housing 10 during inhalation.

[0034] In some examples, the housing 10 may be formed by a metal or alloy such as stainless steel or aluminum. Other suitable materials include various plastics (for example, polycarbonate), metal-plating over plastics, ceramics, and the like.

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

a chamber, configured to accommodate or receive the aerosol generation product 1000. During use, the aerosol generation product 1000 is removably received in the chamber through the receiving port 111.

[0036] In addition, as shown in FIG. 1, the aerosol generation device 100 further includes:

an air channel 150, located between the chamber and the

air inlet hole 121. Then, during use, the air channel 150 provides a channel path from the air inlet hole 121 into the chamber/aerosol generation product 1000, as shown by an arrow R11 in FIG. 1.

[0037] As shown in FIG. 1, the aerosol generation device 100 further includes:

a battery cell 130 for supplying power, where preferably, the battery cell 130 is a rechargeable direct-current battery cell 130 and can be connected to an external power supply for charging; and
a circuit 140, with various components arranged or integrated, configured to control heating or operation of the aerosol generation device 100.

[0038] As shown in FIG. 1, the aerosol generation device 100 further includes:
a heater 30, at least partially surrounding and defining the chamber. When the aerosol generation product 1000 is received in the housing 10, the heater 30 at least partially surrounds or encloses the aerosol generation product 1000 and performs heating from a periphery of the aerosol generation product 1000. In addition, when received in the housing 10, the aerosol generation product 1000 is at least partially accommodated and held in the heater 30.

[0039] As shown in FIG. 2 and FIG. 3, the heater 30 is configured substantially into an elongated tubular shape, and includes:
a tubular base 31, arranged around a chamber; and the chamber that is for receiving the aerosol generation product 1000 and that is surrounded and defined by a tubular hollow 330 of the base 31 during implementation. A material of the base 31 is a material with good thermal conductivity, for example, ceramic, glass, or a surface-insulated metal or alloy such as anodized aluminum, aluminum alloy, copper alloy, or stainless steel. During use, the base 31 is at least partially defined and configured to accommodate and hold the aerosol generation product 1000. In addition, in some implementations, thermal conductivity of the base 31 is at least 10 W/m·k, preferably at least 100 W/m·k. Alternatively, in some implementations, thermal conductivity of the base 31 is greater than 200 W/m·K or higher. In some implementations, the base 31 includes a metal suitable for the foregoing high thermal conductivity, such as aluminum, copper, titanium, or an alloy including at least one of aluminum, copper, and titanium.

[0040] In some specific implementations, the base 31 has a wall thickness of about 0.05 mm to 1 mm; and the base 31 has an inner diameter of about 5.0 mm to 8.0 mm; and the base 31 has a length of about 30 mm to 60 mm. During implementation, the aerosol generation product 1000 is surrounded or enclosed by the base 31 by a length greater than 30 mm; or the aerosol generation product 1000 is heated by the base 31 by a length greater than 30 mm.

[0041] As shown in FIG. 2 and FIG. 3, the heater 30 further includes:
a heating element 32, at least partially surrounding or enclosing the base 31. During use, the base 31 receives or transfers heat from the heating element 32 to heat the aerosol generation product 1000.

[0042] In some implementations, the heating element 32 includes a resistive heating element; and the heating element 32 can generate resistive Joule heat when a direct current flows through the heating element 32. In addition, in some implementations, the heating element 32 is made of a metal material, a metal alloy, graphite, carbon, or a composite material of conductive ceramic or another ceramic material and a metal material, with appropriate impedance. An appropriate metal or alloy material includes at least one of nickel, cobalt, zirconium, titanium, a nickel alloy, a cobalt alloy, a zirconium alloy, a titanium alloy, a nickel chromium alloy, a nickel iron alloy, an iron chromium alloy, an iron chromium aluminum alloy, an iron manganese aluminum based alloy, stainless steel, or the like. Alternatively, in some other implementations, the heating element 32 may further include an electromagnetic induction heating element, an infrared heating element, or the like.

[0043] Alternatively, in some other varied implementations, the heater 30 may include only a heating element 32, and the heating element 32 surrounds or defines a chamber to accommodate the aerosol generation product 1000 and directly transfer heat to the aerosol generation product 1000 for heating.

[0044] Further, as shown in FIG. 2 and FIG. 3, the heating element 32 is configured into a cylindrical shape surrounding or enclosing the base 31. In addition, a dimension of the heating element 32 extending in a longitudinal direction of the heater 30 is less than an extension dimension of the base 31. For example, in some specific implementations, the heating element 32 has a length greater than 20 mm to 50 mm. For example, specifically, as shown in FIG. 2 and FIG. 3, the heater 30 includes a first end portion 310 and a second end portion 320 that face away from each other in the longitudinal direction. In addition, in a specific implementation, the first end portion 310 and the second end portion 320 are defined by two ends of the base 31 in the longitudinal direction. There is a gap d1 between a first end of the heating element 32 and the first end portion 310, and the gap d1 is about 3 mm to 10 mm; and there is a gap d2 between a second end of the heating element 32 and the second end portion 320, and the gap d2 is about 3 mm to 10 mm.

[0045] After assembly, the heating element 32 does not completely surround or enclose an outer surface of the base 31, so that the outer surface of the base 31 has a first exposed region 311 that is defined by the gap d1 and that is close to the first end portion 310. In addition, the outer surface of the base 31 has a second exposed region 312 that is defined by the gap d2 and that is close to the second end portion 320. During assembly, the aerosol generation device 100 supports the heater 30 by combining a clamping component or a supporting

component or a fixing component to the first exposed region defined by the gap d1 and the second exposed region defined by the gap d2.

[0046] In some implementations, the heating element 32 is insulated from the base 31. In some conventional implementations, a surface insulating layer may be formed on the outer surface of the base 31 through surface anodization, spraying, deposition, or the like. The surface insulating layer may include at least one of an oxide, a glaze, ceramic, an organic polymer, and the like. Alternatively, in some other implementations, an insulating organic polymer film is provided between the heating element 32 and the base 31, to provide insulation therebetween. For example, the organic polymer film is a polyimide film or a polytetrafluoroethylene film.

[0047] As shown in FIG. 2 to FIG. 4, the heating element 32 is a resistive heating mesh. In this embodiment, the heating element 32 is a heating element obtained by rolling a sheet or mesh substrate. The rolled heating element 32 is in an unclosed tubular shape in a circumferential direction, and is in a cylindrical shape with a side opening 335 in a longitudinal direction. In addition, the side opening 335 extends from the first end to the second end of the heating element 32 in the longitudinal direction. In addition, in some implementations, the side opening 335 has a width of about 2 mm to 6 mm.

[0048] Alternatively, in some other varied embodiments, the surface of the base 31 is insulated; and the heating element 32 is a resistive heating trace or film or coating formed on the base 31 through printing, spraying, deposition, or the like. For example, the heating element 32 is a resistive heating trace that meanders and twists in the circumferential direction; or the heating element 32 is a patterned resistive heating trace.

[0049] Alternatively, in some other varied embodiments, the heating element 32 is an infrared-emitting coating formed on the base 31 through printing, spraying, deposition, or the like. The heating element 32 is an electrically induced infrared-emitting coating. When a current flows through the infrared-emitting coating, the infrared-emitting coating can emit an infrared ray into the chamber to heat the aerosol generation product 1000. The infrared-emitting coating for radiating infrared rays may include oxides of at least one or more metal elements such as Mg, Al, Ti, Zr, Mn, Fe, Co, Ni, Cu, Cr, and Zn. These metal oxides can radiate far-infrared rays with a heating effect when electrothermally heated to appropriate temperatures.

[0050] As shown in FIG. 2 to FIG. 4, the heating element 32 includes:

a first heating portion 321 and a second heating portion 322 that are arranged in an axial or longitudinal direction. The first heating portion 321 is closer to the proximal end 110 and/or the first end portion 310, and the second heating portion 322 is closer to the distal end 120 and/or the second end portion 320.

[0051] A gap d3 is defined between the first heating portion 321 and the second heating portion 322. The first heating portion 321 and the second heating portion 322 are not arranged continuously through the gap d3. In addition, the first heating portion 321 and the second heating portion 322 are separated through the gap d3, so that the first heating portion 321 and the second heating portion 322 are spaced apart in the longitudinal direction. In some embodiments, the gap d3 has a length of about 3 mm to 10 mm. Then, after assembly, a third exposed region 313 defined by the gap d3 is formed on the surface of the base 31.

[0052] FIG. 4 is a schematic diagram of the heating element 32 unfolded in the circumferential direction. In this embodiment, the first heating portion 321 and the second heating portion 322 of the unfolded heating element 32 are each in a mesh shape. In addition, a length of the unfolded heating element 32 is greater than a width of the unfolded heating element 32. For example, in FIG. 4, a length of the unfolded heating element 32 is about 32.8 mm, and a width of the unfolded heating element 32 is about 18.7 mm. In addition, a ratio of the length to the width of the heating element 32 is at least 1.5 or higher, which is conducive to reducing resistance and increasing power in the same area. Moreover, in some implementations, when a ratio of a length of the heating element 32 to an extension dimension or circumference in the circumferential direction is at least 1.5 or higher, resistance of the heating element 32 can be further reduced to 0.6 Ω or lower by guiding a current in the circumferential direction of the heating element 32, which is advantageous. Alternatively, in some other implementations, resistance of the heating element 32 can be further reduced to 0.3 Ω or lower by guiding a current in the circumferential direction of the heating element 32, and it is conducive to controlling the overall resistance of the heating element 32 to be 0.2 Ω to 0.6 Ω.

[0053] In addition, further, as shown in FIG. 4, in the unfolded heating element 32, the first heating portion 321 is close to or defines the first end, and the second heating portion 322 is close to or defines the second end. Moreover, in some implementations, an extension length of the first heating portion 321 is substantially equal to an extension length of the second heating portion 322; or the first heating portion 321 and the second heating portion 322 have a substantially same extension length. For example, in a specific implementation, the first heating portion 321 and/or the second heating portion 322 have/has a length of about 15 mm. Alternatively, in some other varied implementations, an extension length of the first heating portion 321 is greater than an extension length of the second heating portion 322; or the second heating portion 322 is longer than the first heating portion 321.

[0054] During use, electrodes are spaced apart in the circumferential direction, so that a current is guided in the circumferential direction of the first heating portion 321 and the second heating portion 322 of the heating element 32. The unfolded heating element 32 includes a first side 3210 and a second side 3220 that face away from

each other in a width direction. The heater 30 further includes:

a first electrode 331, for example, an elongated conductive lead, extending from the first end of the heating element 32 to the outside of the second end, where the first electrode 331 is combined with both the first heating portion 321 and the second heating portion 322 on the first side 3210 for electric conduction;
a second electrode 332, for example, an elongated conductive lead, combined with the first heating portion 321 on the second side 3220 for electric conduction; and
a third electrode 333, for example, an elongated conductive lead, combined with the second heating portion 322 on the second side 3220 for electric conduction.

[0055] After arrangement on the base 31, the first side 3210 and the second side 3220 define the side opening 335; or the side opening 335 is located between the first side 3210 and the second side 3220 in the circumferential direction.

[0056] The first electrode 331 and/or the second electrode 332 and/or the third electrode 333 are/is made of a good conductive metal material with relatively low resistivity, such as gold, silver, copper, or an alloy thereof. During use, a current can be guided in the circumferential direction of the first heating portion 321 and the second heating portion 322 through the first electrode 331 and/or the second electrode 332 and/or the third electrode 333. In addition, the first electrode 331 and/or the second electrode 332 and/or the third electrode 333 are/is securely combined with the heating element 32 through welding or in another manner for electric conduction.

[0057] Moreover, the heating element 32 is provided with holes. These holes are provided substantially in a matrix or array or regular pattern, so that the heating element 32 is in a mesh shape. In the implementation shown in FIG. 4, the hole is in a rectangular shape; and a dimension of the hole in a length direction of the heating element 32 is greater than a dimension of the hole in the circumferential direction or a width direction of the heating element 32. Alternatively, the hole extends in a length direction of the heating element 32.

[0058] Alternatively, in some other varied embodiments, the heating element 32 further has more heating portions, for example, a third heating portion spaced apart from the second heating portion 322 in the longitudinal direction; or may further include a fourth heating portion, a fifth heating portion, and the like.

[0059] Correspondingly, the heater 30 may further include more electrodes. In addition, some electrodes may be used as common electrodes of a plurality of heating portions. For example, in some specific embodiments, the heater 30 may include:

a first heating portion 321, a second heating portion 322, and a third heating portion;
a first electrode 331, arranged on the first side 3210, extending from the first heating portion 321 to the second heating portion 322, and performing electric conduction with both the first heating portion 321 and the second heating portion 322;
a second electrode 332, arranged on the second side 3220, and only combined with the first heating portion 321 for electric conduction;
a third electrode 333, arranged on the second side 3220, extending from the second heating portion 322 to the third heating portion, and performing electric conduction with both the second heating portion 322 and the third heating portion; and
a fourth electrode, arranged on the first side 3210, and only combined with the third heating portion for electric conduction.

[0060] During implementation, a manner of connecting the foregoing electrode and circuit may be adjusted to selectively heat one of the first heating portion 321, the second heating portion 322, and the third heating portion alone, heat two of the first heating portion 321, the second heating portion 322, and the third heating portion in parallel or in series, or heat all of the first heating portion 321, the second heating portion 322, and the third heating portion in parallel or in series or in series and parallel.

[0061] Specifically, the holes on the heating element 32 include:

a first hole 3211, arranged on the first heating portion 321; and
a second hole 3221, arranged on the second heating portion 322.

[0062] In some implementations, the first hole 3211 on the first heating portion 321 and/or the second hole 3221 on the second heating portion 322 are/is formed through laser cutting or etching on a sheet substrate before forming the heating element 32 through rolling. The first holes 3211 on the first heating portion 321 are arranged in an array, so that the first heating portion 321 is in a mesh shape; and the second holes 3221 on the second heating portion 322 are arranged in an array, so that the second heating portion 322 is in a mesh shape.

[0063] In the embodiments of FIG. 2 and FIG. 4, the first hole 3211 and/or the second hole 3221 are/is a rectangular hole. Alternatively, in some other varied embodiments, the first hole 3211 and/or the second hole 3221 may be in a circular, triangular, or polygonal shape.

[0064] In some embodiments, an area of the first hole 3211 on the first heating portion 321 is smaller than an area of the second hole 3221 on the second heating portion 322. Alternatively, a length of the first hole 3211 on the first heating portion 321 is less than a length of the second hole 3221 on the second heating portion 322; or a width of the first hole 3211 on the first heating portion 321

is less than a width of the second hole 3221 on the second heating portion 322. For example, in some implementations, the first hole 3211 has a length of about 3 mm to 7 mm and a width of about 0.2 mm to 0.8 mm; and the second hole 3221 has a length of about 4 mm to 8 mm and a width of about 0.7 mm to 1.2 mm.

[0065] Alternatively, in some other varied embodiments, the first hole 3211 and/or the second hole 3221 may be arranged to have a dimension extending in the circumferential direction of the heating element 32 greater than a dimension extending in the longitudinal direction of the heating element 32; that is, the first hole 3211 and/or the second hole 3221 have/has a longer shape in the circumferential direction.

[0066] In the implementation shown in FIG. 4, in a width direction, a gap d31 between adjacent first holes 3211 on the first heating portion 321 is about 0.5 mm; and in a length direction, a gap d32 between adjacent first holes 3211 is about 0.5 mm. In addition, in the implementation shown in FIG. 4, in the width direction, a gap d33 between adjacent second holes 3221 on the second heating portion 322 is about 0.2 mm; and in the length direction, a gap d34 between adjacent second holes 3221 is about 0.2 mm.

[0067] As shown in FIG. 4, the heating element 32 further includes:

a connection portion 324, arranged on the first side 3210, where the connection portion 324 extends from the first heating portion 321 to the second heating portion 322, to connect the first heating portion 321 and the second heating portion 322 for electric conduction. Then, based on the connection portion 324, the gap d33 is closed on the first side 3210, and the gap d33 is open on the second side 3220.

[0068] In some embodiments, the heating element 32 including the first heating portion 321, the connection portion 324, and the second heating portion 322 is formed or prepared integrally. For example, the first heating portion 321, the connection portion 324, and the second heating portion 322 are obtained integrally after a sheet substrate precursor is etched or cut to remove excess parts.

[0069] In an embodiment, the first electrode 331 and the connection portion 324 are combined and electrically conductive. Therefore, it is conducive to improving stability of the electrical connection between the first electrode 331 and the first heating portion 321 as well as between the first electrode 331 and the second heating portion 322.

[0070] In the embodiment shown in FIG. 4, a width of the first heating portion 321 may be greater than a width of the second heating portion 322. Therefore, when the first heating portion 321 and the second heating portion 322 are flush on the first side 3210, the first heating portion 321 protrudes slightly relative to the second heating portion 322 on the second side 3220. In this case, after the second electrode 332 and the third electrode 333 are welded, in the longitudinal direction of the heating element 32, the elongated second electrode 332 and the third electrode 333/second heating portion 322 are staggered, which is conducive to preventing a short circuit therebetween.

[0071] Alternatively, in some other varied embodiments, a width of the first heating portion 321 may be equal to a width of the second heating portion 322. In this case, after the elongated second electrode 332 and the third electrode 333 are welded, an insulating tube is sleeved on or a surface insulating layer is sprayed on each of the second electrode 332 and the third electrode 333, to provide insulation to prevent a short circuit formed due to contact between the second electrode 332 and the third electrode 333 during assembly.

[0072] During use, any two or three of the first electrode 331, the second electrode 332, and the third electrode 333 can be selectively connected to the circuit 140, to selectively guide a current on the first heating portion 321 and/or the second heating portion 322 of the heating element 32. Specifically, for example, through a switch transistor, for example, a MOS transistor, that can switch between an on state and an off state, the first electrode 331, the second electrode 332, and the third electrode 333 are selectively connected to the circuit 140, so that a heated segment of the aerosol generation product 1000 by the heating element 32 can be changed.

[0073] The first electrode 331, the second electrode 332, and the third electrode 333 are selectively connected to the circuit 140 in different electrical connection manners, so that only one of the first heating portion 321 and the second heating portion 322 can be selectively used alone for heating, or the first heating portion 321 and the second heating portion 322 can be selectively used in series or in parallel for simultaneous heating.

[0074] Specifically, for example, one of the first heating portion 321 or the second heating portion 322 may be enabled alone for heating, and the other is not enabled for heating, to heat a partial segment of the aerosol generation product 1000 alone. In another example, the first heating portion 321 or the second heating portion 322 is connected to the circuit 140 in different series or parallel connection manners, so that the first heating portion 321 or the second heating portion 322 can heat different segments of the aerosol generation product 1000 simultaneously with different powers. In this case, different temperatures are generated on the segments that are of the aerosol generation product 1000 and that are surrounded by the first heating portion 321 or the second heating portion 322, resulting in different aerosol generation efficiencies.

[0075] Specifically, for example, FIG. 5 is a schematic diagram in which the first electrode 331 and the second electrode 332 are respectively connected to a positive electrode and a negative electrode of the battery cell 130 after the first electrode 331 and the second electrode 332 are connected to the circuit 140, to form a loop to guide a current i11 on the first heating portion 321 in an embodiment. As shown in FIG. 5, in a connection manner in

which a closed loop is formed in the manner in FIG. 5, a working current in the circumferential direction is formed only on the first heating portion 321, and there is no current on the second heating portion 322.

[0076] As shown in FIG. 5, when a current is guided on the first heating portion 321 through the first electrode 331 and the second electrode 332, several resistive conductor paths from the first electrode 331 to the second electrode 332 in the circumferential direction are formed on the first heating portion 321. These resistive conductor paths substantially extend circuitously; and these resistive conductor paths are defined and formed by several first holes 3211.

[0077] Specifically, for example, FIG. 6 is a schematic diagram in which the first electrode 331 and the third electrode 333 are respectively connected to a positive electrode and a negative electrode of the battery cell 130 after the first electrode 331 and the third electrode 333 are connected to the circuit 140, to form a loop to guide a current i21 on the second heating portion 322 in another embodiment. As shown in FIG. 6, in a connection manner in which a closed loop is formed in the manner in FIG. 6, a working current in the circumferential direction is formed only on the second heating portion 322, and there is no current on the first heating portion 321. As shown in FIG. 6, when a current is guided on the second heating portion 322 through the first electrode 331 and the second electrode 332, several resistive conductor paths from the first electrode 331 to the third electrode 333 in the circumferential direction are formed on the second heating portion 322. These resistive conductor paths substantially extend circuitously; and these resistive conductor paths are defined and formed by several second holes 3221.

[0078] In the implementations of FIG. 5 and FIG. 6, a width of a path of the current i11 is greater than a width of a path of the current i21. In this case, when a current is guided on the first heating portion 321 and the second heating portion 322 in the circumferential direction in the manner of FIG. 5 or FIG. 6, a resistance value of the first heating portion 321 is less than a resistance value of the second heating portion 322.

[0079] FIG. 7 is a schematic diagram of guiding currents simultaneously on the first heating portion 321 and the second heating portion 322 that are in parallel in another embodiment. In FIG. 7, the first electrode 331 is connected to the circuit 140 to be connected to the positive electrode of the battery cell 130, and the second electrode 332 and the third electrode 333 are connected to the circuit 140 to be connected to the negative electrode of the battery cell 130. In this case, a circumferential current i12 on the first heating portion 321 and a circumferential current i22 on the second heating portion 322 can be formed simultaneously, so that the first heating portion 321 and the second heating portion 322 can perform heating simultaneously. In this case, the first heating portion 321 and the second heating portion 322 that are in parallel have same voltages at two ends. Then, it can be learned according to the formula $P = U^2/R$ of a relationship among power, voltage, and resistance that the first heating portion 321 has a smaller resistance, so that the first heating portion 321 has heating power greater than that of the second heating portion 322.

[0080] FIG. 8 is a schematic diagram of guiding currents simultaneously on the first heating portion 321 and the second heating portion 322 that are in series in another embodiment. In FIG. 8, the second electrode 332 is connected to the circuit 140 to be connected to the positive electrode of the battery cell 130, and the third electrode 333 is connected to the circuit 140 to be connected to the negative electrode of the battery cell 130. In addition, in this embodiment, the first electrode 331 is not connected to the circuit, so that a series arrangement of the first heating portion 321 and the second heating portion 322 in FIG. 8 is formed. Moreover, in FIG. 8, a total current i13 on the first heating portion 321 and a total current i23 on the second heating portion 322 are the same. It can be learned according to the formula $P = I^2 \times R$ of a relationship among power, current, and resistance that, when resistance of the first heating portion 321 is lower than resistance of the second heating portion 322, power of the first heating portion 321 is lower than that of the second heating portion 322.

[0081] During implementation, any manner in FIG. 5 to FIG. 8 can be selectively used for the circuit 140 to supply power to the heating element 32, so that only one or both of the first heating portion 321 and the second heating portion 322 can be heated.

[0082] Alternatively, in some other varied embodiments, the heater 30 further includes:

a thermal insulation element, configured to surround or enclose the heating element 32 from an outer side, to provide thermal insulation from the outer side. The thermal insulation element is, for example, a rolled-up aerogel blanket or a porous material or a vacuum tube. Alternatively, in some other varied embodiments, the thermal insulation element of the heater 30 is a tube with an inner thermal insulation cavity. The thermal insulation cavity is provided between an inner surface and an outer surface of the tubular thermal insulation element. A pressure of the thermal insulation cavity is lower than an external pressure. In other words, the thermal insulation element is a vacuum thermal insulation tube with a vacuum degree. Alternatively, in some other varied embodiments, a thermal insulation cavity is provided between an inner surface and an outer surface of the tubular thermal insulation element, and the thermal insulation cavity is filled with a thermal insulation gas, for example, argon. At the same pressure and temperature, thermal conductivity of argon is about one third less than that of air, effectively providing thermal insulation.

[0083] Alternatively, in some other varied embodiments, the heater 30 further includes:

a temperature sensor, attached to the first heating portion 321 to sense a temperature of the first heating portion 321.

[0084] Alternatively, in some other varied embodi-

ments, the heater 30 further includes:
a thermoplastic closely-fitting component, enclosing the temperature sensor outside the heater 30, and configured to surround and secure the temperature sensor.

[0085] In some embodiments, the thermoplastic closely-fitting component includes at least one of heat-resistant synthetic resin, polytetrafluoroethylene as Teflon, and silicon. In some other varied embodiments, the thermoplastic closely-fitting component includes a heat shrinkable tube or high-temperature-resistant tape.

[0086] The control method provided in some embodiments of this application is described below with reference to exemplary applications and implementations of the aerosol generation device provided in embodiments of this application. Refer to FIG. 9. FIG. 9 is a schematic flowchart of a control method according to some embodiments of this application. It may be understood that an execution body of the control method may be one or more controllers of a circuit.

[0087] As shown in FIG. 3, the method S10 may specifically include the following step.

[0088] S11: Control, within at least one of a plurality of heating stages, a battery cell to provide heating energy for a first heating portion and a second heating portion alternately, where the heating energy provided for the second heating portion is proportional to the heating energy provided for the first heating portion.

[0089] Controlling the battery cell to provide the heating energy for the first heating portion and the second heating portion alternately is applicable to a case in which resistance of the first heating portion and resistance of the second heating portion are small. This avoids a problem that the battery cell cannot support simultaneous heating by the first heating portion and the second heating portion due to an excessively large current. It may be understood that, in another example, when a suitable battery cell is selected, it is also feasible for the first heating portion and the second heating portion to perform heating simultaneously.

[0090] It may be understood that, for duration from the start of heating in the activated aerosol generation device to the end of heating in the aerosol generation device, the duration may be divided into different heating stages based on sudden changes in the temperature of the first heating portion or the second heating portion. FIG. 10 is used as an example. A curve A in the figure is a curve of a relationship between a temperature of the first heating portion and time, and a curve B in the figure is a curve of a relationship between a temperature of the second heating portion and time. The entire duration may be divided into a first heating stage T1, a second heating stage T2, a third heating stage T3, and a fourth heating stage T4, and duration of each heating stage is T1, T2, T3, or T4. Certainly, the duration may alternatively be divided into different heating stages based on other parameters, for example, a proportionality coefficient between the heating energy provided for the second heating portion and the heating energy provided for the first heating portion, and heating duration. A quantity of the heating stages is not limited to the foregoing case.

[0091] During the first heating stage T1, the temperature of the first heating portion needs to rise rapidly, for example, rise from an initial temperature (ambient temperature) to 200°C to 350°C, specifically 280°C, so as to generate an aerosol or generate a satisfactory amount of aerosol, to meet an inhalation requirement of users. Typically, time occupied by the first heating stage T1 is short, for example, 15s to 30s. In some examples, the part of the curve A corresponding to the first heating stage T1 further includes a temperature maintenance stage. To be specific, after the temperature of the first heating portion has risen to a maximum operating temperature, the first heating portion is controlled to be maintained at the maximum operating temperature for a period of time.

[0092] During the first heating stage T1, the temperature of the second heating portion rises slowly from an initial temperature (ambient temperature) to a first target temperature, where the first target temperature is lower than the maximum operating temperature of the first heating portion, for example, may be around 120°C. The first target temperature allows the temperature of a partial substrate in an aerosol generation product corresponding to the second heating portion to rise, but is not high enough to cause the partial substrate to generate an aerosol. The second heating portion and the first heating portion may start heating simultaneously. Alternatively, the second heating portion may start heating after the temperature of the first heating portion has risen to the maximum operating temperature.

[0093] At the end of the first heating stage T1, the aerosol generation device outputs a prompt signal indicating that the aerosol is inhalable, to prompt a user to inhale. A prompting manner may be vibration, sound, light (for example, an LED light is constantly on or blinks), or the like.

[0094] During the second heating stage T2, the user may inhale the aerosol generated through heating by the first heating portion. During the second heating stage T2, the temperature of the first heating portion decreases to a first preset temperature and is maintained at the first preset temperature, for example, decreases to 250°C and is maintained at this temperature. The temperature of the second heating portion slowly rises from the first target temperature to a second target temperature, where the second target temperature is still lower than the maximum operating temperature of the first heating portion or lower than the first preset temperature of the first heating portion, for example, may be around 180°C. The second target temperature further allows the temperature of the partial substrate in the aerosol generation product corresponding to the second heating portion to rise, but is still not high enough to cause the partial substrate to generate the aerosol.

[0095] During the third heating stage T3, the temperature of the first heating portion is still maintained at the first preset temperature. During the heating stage, the partial

substrate in the aerosol generation product corresponding to the first heating portion is gradually reduced, and needs to be supplemented with the partial substrate in the aerosol generation product corresponding to the second heating portion, to avoid a problem of poorer inhalation experience of the user caused by reduction of the amount of the aerosol or the contained substance for the user to inhale. Therefore, the temperature of the second heating portion needs to rise from the second target temperature to the first preset temperature to generate the aerosol.

[0096] During the fourth heating stage T4, the partial substrate in the aerosol generation product corresponding to the first heating portion is further reduced or is about to be depleted. In this case, the temperature of the first heating portion may decrease to a second preset temperature and be maintained at the second preset temperature, for example, decrease to 230°C and be maintained at this temperature. However, the temperature of the second heating portion still needs to be maintained at the first preset temperature, to further provide the inhalable aerosol.

[0097] Within at least one of the first heating stage T1 to the fourth heating stage T4, the battery cell is controlled to provide heating energy for the first heating portion and the second heating portion alternately.

[0098] The second heating stage T2 is used as an example. As shown in FIG. 11, the second heating stage T2 is divided into a plurality of time periods, and duration of each time period may be the same or may be different. Preferably, the duration of each time period is the same, for example, as shown in the figure, the duration of each time period is t. In some embodiments, the time period t may range from 200 ms to 1s. An example in which the time period t is 200 ms, and the second heating stage T2 is 60s is used for description. Then, the second heating stage T2 may be divided into 300 time periods t.

[0099] Still refer to FIG. 11. Within any time period t, the battery cell is controlled to provide heating energy for the first heating portion and the second heating portion alternately. The "alternately" means that, at a specific moment, the battery cell provides the heating energy for only one of the first heating portion and the second heating portion, and does not provide the heating energy for the first heating portion and the second heating portion simultaneously. The heating energy is provided for the second heating portion only at the end of providing the heating energy for the first heating portion, and the heating energy is provided for the first heating portion only at the end of providing the heating energy for the second heating portion.

[0100] Within any time period t, the battery cell is controlled to provide the heating energy for the first heating portion and the second heating portion alternately, so that the first heating portion and the second heating portion alternately perform heating at least once. In other words, in some embodiments, within the time period t, the first heating portion and the second heating portion may alternately perform heating multiple times.

[0101] The second heating stage T2 is divided into a plurality of time periods t. Due to short duration that is set for a time period t, for example, 200 ms, for example, less than 1s, within the time period t, time (also referred to as a natural cooling stage) during which the first heating portion or the second heating portion is in a natural cooling state in which no heating energy is provided is also very short. In this case, the extent of temperature drop of the first heating portion or the second heating portion in the natural cooling state is also very limited. In addition, within a next time period t, the temperature drop due to natural cooling of the first heating portion or the second heating portion is quickly supplemented with heating energy, so that the temperature can be maintained and/or increased. Therefore, the rate of aerosol generation cannot be affected in embodiments of this application. Compared with a case in which the first heating portion and the second heating portion simultaneously perform heating throughout the entire process, the embodiments of this application, in which heating energy is provided for the first heating portion and the second heating portion alternately within each time period t, can effectively reduce power consumption and improve an endurance capability.

[0102] In some embodiments, each time period t includes a first partial time period and a second partial time period.

[0103] Step S11 specifically includes:

S111: Control, within the first partial time period, the battery cell to provide the heating energy for the first heating portion and stop providing the heating energy for the second heating portion.

S112: Control, within the second partial time period, the battery cell to provide the heating energy for the second heating portion and stop providing the heating energy for the first heating portion.

[0104] When the first heating stage T1 ends and the second heating stage T2 is entered, a next time period t is entered at intervals of specific time t. Within a first partial time period in a current time period t, the battery cell is controlled to provide heating energy for the first heating portion and stop providing heating energy for the second heating portion. After cumulative time within the current time period t reaches the duration of the first partial time period, a second partial time period is entered. In this case, the battery cell is controlled to provide heating energy for the second heating portion and stop providing heating energy for the first heating portion. After the cumulative time within the current time period t reaches t, a next time period t is entered.

[0105] In this embodiment, through timing, the battery cell is controlled, according to specified duration, to provide the heating energy for the first heating portion and the second heating portion alternately, so that the first heating portion and the second heating portion can accurately perform heating alternately, to uniformly bake

the aerosol generation product, providing an aerosol with good taste, thereby effectively reducing power consumption and improving an endurance capability.

[0106] In some embodiments, step S11 specifically includes:

S113: Within each time period t, detect a real-time temperature of the first heating portion when the first heating portion is in a natural cooling state, or when the battery cell stops providing the heating energy for the first heating portion, or when the battery cell is controlled to provide the heating energy for the second heating portion, and control, if the real-time temperature is less than or equal to a preset first low-temperature threshold, the battery cell to provide the heating energy for the first heating portion and stop providing the heating energy for the second heating portion.

[0107] The natural cooling state is a state in which no heating energy is provided. For example, when the battery cell provides the heating energy for the second heating portion and stops providing the heating energy for the first heating portion, the first heating portion is in the natural cooling state. In the natural cool state, the temperature of the first heating portion and/or the second heating portion decreases due to heat dissipation, but the extent of temperature drop varies based on heat retention performance of different heating components.

[0108] When the first heating portion is in the natural cooling state, a temperature sensor detects the real-time temperature of the first heating portion. If the real-time temperature is less than or equal to the preset temperature threshold, the battery cell is controlled to provide the heating energy for the first heating portion and stop providing the heating energy for the second heating portion.

[0109] The temperature threshold is a lower temperature limit that needs to be provided by the first heating portion. In some embodiments, a person skilled in the art may set the temperature threshold based on heat retention performance of a heating component or another factor.

[0110] Specifically, within a time period t, the first heating portion is in the natural cooling state, that is, the battery cell stops providing the heating energy for the first heating portion. The battery cell provides the heating energy for the first heating portion and the second heating portion alternately. In this case, when the first heating portion is in the natural cooling state, the battery cell provides the heating energy fort the second heating portion. During this period, if it is detected that the real-time temperature of the first heating portion is lower than the temperature threshold, which means excessive heat loss, the battery cell needs to be controlled to immediately provide the heating energy for the first heating portion and stop providing the heating energy for the second heating portion, to ensure the temperature of the first heating portion.

[0111] In this embodiment, within the time period t, the real-time temperature of the first heating portion is detected, and if the real-time temperature is less than or equal to the preset temperature threshold, the battery cell is controlled to provide heating energy for the first heating portion and stop providing the heating energy for the second heating portion, to fully ensure that the first heating portion can quickly reach the predetermined temperature, instead of allowing for excessive temperature drop due to heat dissipation of the first heating portion in the natural cooling state, which affects the heating operation of the aerosol generation device. In this case, the aerosol generation product can be uniformly baked, providing an aerosol with good taste, thereby effectively reducing power consumption and improving an endurance capability.

[0112] In some embodiments, step S11 specifically includes:

S114: Within each time period t, when the battery cell provides the heating energy for the first heating portion, if the heating energy provided for the first heating portion is greater than or equal to a preset first energy threshold, control the battery cell to stop providing the heating energy for the first heating portion and start providing the heating energy for the second heating portion; or

within each time period t, when the battery cell provides the heating energy for the second heating portion, if the heating energy provided for the second heating portion is greater than or equal to a preset second energy threshold, control the battery cell to stop providing the heating energy for the second heating portion.

[0113] In this embodiment, within each time period t, the energy provided by the battery cell for the first heating portion is preset. Specifically, the first energy threshold is set, and the first energy threshold is a rated amount of heating energy provided by the battery cell for the first heating portion within the time period t. It may be understood that a person skilled in the art may set the first energy threshold based on heat retention performance of a heating component or another factor.

[0114] The first energy threshold may be minimum heating energy required by the first heating portion to increase the temperature within the time period t. A current time period t is used as an example for description. When the current time period t is entered, the battery cell is controlled to first provide the heating energy for the first heating portion, and the energy that has been provided for the first heating portion within the current time period t is measured from zero. If the energy that has been provided is greater than or equal to the first energy threshold, which means that the energy that has been provided reaches the rated amount, the battery cell is controlled to stop providing the heating energy for the first heating portion and start providing the heating energy for the second heating portion, to implement alternation.

[0115] In this embodiment, the energy that has been

provided for the first heating portion is accumulated within each time period t, and is provided according to the specified rated amount of the heating energy, so that the first heating portion and the second heating portion can accurately perform heating alternately, to uniformly bake the aerosol generation product, providing an aerosol with good taste, thereby effectively reducing power consumption and improving an endurance capability.

[0116] Similarly, the energy provided by the battery cell for the second heating portion is also preset. Specifically, within each time period t, the heating energy provided for the second heating portion is proportional to the heating energy provided for the first heating portion, and is specifically in a directly proportional relationship (assuming that a proportionality coefficient thereof is k). In this way, if the energy that has been provided for the second heating portion is greater than or equal to the second energy threshold, which means that the energy that has been provided reaches the rated amount, the battery cell is controlled to stop providing the heating energy for the second heating portion and start providing the heating energy for the first heating portion, to implement alternation.

[0117] The proportionality coefficient k remains constant in each heating stage, so that the temperature of the second heating portion gradually rises in a wave-like pattern, avoiding sudden changes in the temperature of the second heating portion in the heating stage, and ensuring that the heating temperature of the second heating portion is within a safe range.

[0118] A value of the proportionality coefficient k may be adjusted or changed when a next heating stage is entered from a previous heating stage, to increase the temperature of the second heating portion, ensuring that the second heating portion follows the first heating portion to perform heating.

[0119] The second heating stage T2 and the third heating stage T3 are used as an example. Within the second heating stage T2, a proportionality coefficient between the heating energy provided for the second heating portion and the heating energy provided for the first heating portion is k1; and within the third heating stage T3, a proportionality coefficient between the heating energy provided for the second heating portion and the heating energy provided for the first heating portion is k2. The proportionality coefficient k2 is greater than the proportionality coefficient k1. In this way, by increasing the proportionality coefficient, the temperature of the second heating portion can be increased within the third heating stage T3, allowing the temperature of the second heating portion to increase to the first preset temperature to generate an aerosol.

[0120] FIG. 12 is a schematic flowchart of a control method according to some other embodiments of this application.

[0121] As shown in FIG. 12, the method S20 may specifically include the following step.

[0122] S21: Control, within at least one of a plurality of heating stages based on a real-time temperature of a first heating portion as detected by a temperature sensor, a battery cell to provide heating energy for the first heating portion and a second heating portion, where the heating energy provided for the second heating portion is proportional to the heating energy provided for the first heating portion.

[0123] Different from the foregoing example, this example allows for controlling the battery cell to provide the heating energy for the first heating portion and the second heating portion simultaneously, or provide the heating energy alternately, or provide the heating energy non-alternately (that is, controlling the first heating portion and the second heating portion to simultaneously start heating, or controlling the first heating portion and the second heating portion to simultaneously stop heating). For the descriptions of alternately providing the heating energy, and the heating energy provided for the second heating portion being proportional to the heating energy provided for the first heating portion, refer to the descriptions of the foregoing example.

[0124] In this example, the heating curve shown in FIG. 10 can also be obtained. In another example, the example of FIG. 9 or FIG. 12 is also applicable to a case in which the first heating portion and the second heating portion simultaneously start heating.

[0125] It needs to be noted that, in the example of FIG. 9 or FIG. 12, the temperature sensor is disposed on the first heating portion, and the second heating portion follows the first heating portion for temperature control. In another example, it is also feasible that the temperature sensor is disposed on the second heating portion, and the first heating portion follows the second heating portion for temperature control.

[0126] It needs to be noted that, the device embodiments described above are merely examples. The units described as separate components may or may not be physically separate, and the components displayed as units may or may not be physical units, that is, may be located in one position, or may be distributed on a plurality of network units. Some or all of the modules may be selected based on an actual need to achieve the objectives of the solutions of embodiments.

[0127] According to the descriptions of the foregoing implementations, a person of ordinary skill in the art may clearly understand that the implementations may be implemented by software with a general-purpose hardware platform, or certainly by hardware. A person of ordinary skill in the art may understand that all or some of the procedures of the method in the foregoing embodiments may be implemented by a computer program instructing relevant hardware. The program may be stored in a computer-readable storage medium. During execution of the program, the procedures of the foregoing method embodiments may be included. The storage medium may be a magnetic disk, an optical disk, a read-only memory (ROM), a random access memory (RAM), or the like.

[0128] Finally, it should be noted that the foregoing embodiments are merely used for describing the technical solutions of this application, but are not intended to limit this application. Under the ideas of this application, the technical features in the foregoing embodiments or different embodiments may also be combined, the steps may be performed in any order, and many other changes in different aspects of this application also exist. These changes are not provided in detail for simplicity. It should be understood by a person of ordinary skill in the art that, although this application has been described in detail with reference to the foregoing embodiments, modifications may still be made to the technical solutions described in the foregoing embodiments, or equivalent replacements may still be made to some technical features therein; and these modifications or replacements do not cause the essence of the corresponding technical solutions to depart from the scope of the technical solutions in the embodiments of this application.

Claims

1. An aerosol generation device, comprising:

a heater, configured to heat an aerosol generation product to generate an aerosol, wherein the heater comprises a first heating portion and a second heating portion;
a battery cell, configured to supply power;
a temperature sensor, disposed on the first heating portion; and
a circuit, configured to control, within at least one of a plurality of heating stages based on a real-time temperature of the first heating portion as detected by the temperature sensor, the battery cell to provide heating energy for the first heating portion and the second heating portion, wherein the heating energy provided for the second heating portion is proportional to the heating energy provided for the first heating portion.

2. The aerosol generation device according to claim 1, further comprising a chamber for removably receiving the aerosol generation product, wherein
the first heating portion and the second heating portion are sequentially arranged in an axial direction of the chamber.

3. The aerosol generation device according to claim 1, wherein the heating energy provided for the second heating portion is directly proportional to the heating energy provided for the first heating portion.

4. The aerosol generation device according to claim 1, wherein within the at least one heating stage, a proportionality coefficient between the heating energy provided for the second heating portion and the heating energy provided for the first heating portion is constant.

5. The aerosol generation device according to claim 1, wherein the circuit is configured to adjust or change, when a next heating stage is entered from a previous heating stage, a proportionality coefficient between the heating energy provided for the second heating portion and the heating energy provided for the first heating portion.

6. The aerosol generation device according to claim 1, wherein the circuit is configured to control the battery cell to provide the heating energy for the first heating portion and the second heating portion simultaneously.

7. The aerosol generation device according to claim 6, wherein the at least one heating stage comprises a plurality of time periods; and
the circuit is configured to control, within the time period, the battery cell to provide the heating energy for the first heating portion and the second heating portion alternately.

8. The aerosol generation device according to claim 7, wherein the time period comprises a first partial time period and a second partial time period; and
the circuit is configured to:

control, within the first partial time period, the battery cell to provide the heating energy for the first heating portion and stop providing the heating energy for the second heating portion; and
control, within the second partial time period, the battery cell to provide the heating energy for the second heating portion and stop providing the heating energy for the first heating portion.

9. The aerosol generation device according to claim 7, wherein the circuit is configured to control, within the time period, when the battery cell provides the heating energy for the first heating portion, if the heating energy provided for the first heating portion is greater than or equal to a preset first energy threshold, the battery cell to stop providing the heating energy for the first heating portion and start providing the heating energy for the second heating portion; or
control, within the time period, when the battery cell provides the heating energy for the second heating portion, if the heating energy provided for the second heating portion is greater than or equal to a preset second energy threshold, the battery cell to stop providing the heating energy for the second heating portion.

10. The aerosol generation device according to claim 7, wherein the circuit is configured to control, within the

time period, when the first heating portion is in a natural cooling state, or when the battery cell stops providing the heating energy for the first heating portion, or when the battery cell is controlled to provide the heating energy for the second heating portion, if the real-time temperature of the first heating portion is less than or equal to a preset temperature threshold, the battery cell to provide the heating energy for the first heating portion and stop providing the heating energy for the second heating portion.

11. An aerosol generation device, comprising:

a heater, configured to heat an aerosol generation product to generate an aerosol, wherein the heater comprises a first heating portion and a second heating portion;
a battery cell, configured to supply power; and
a circuit, configured to control, within at least one of a plurality of heating stages, the battery cell to provide heating energy for the first heating portion and the second heating portion alternately, wherein the heating energy provided for the second heating portion is proportional to the heating energy provided for the first heating portion.

12. A control method for an aerosol generation device, wherein the aerosol generation device comprises a heater configured to heat an aerosol generation product and a battery cell configured to supply power, and the heater comprises a first heating portion and a second heating portion; and
the control method comprises:
controlling, within at least one of a plurality of heating stages based on a real-time temperature of the first heating portion as detected by a temperature sensor, the battery cell to provide heating energy for the first heating portion and the second heating portion, wherein the heating energy provided for the second heating portion is proportional to the heating energy provided for the first heating portion.

13. The method according to claim 12, wherein the heating energy provided for the second heating portion is directly proportional to the heating energy provided for the first heating portion.

14. The method according to claim 12, wherein within the at least one heating stage, a proportionality coefficient between the heating energy provided for the second heating portion and the heating energy provided for the first heating portion is constant.

15. The method according to claim 12, wherein when a next heating stage is entered from a previous heating stage, a proportionality coefficient between the heating energy provided for the second heating portion and the heating energy provided for the first heating portion is adjusted or changed.

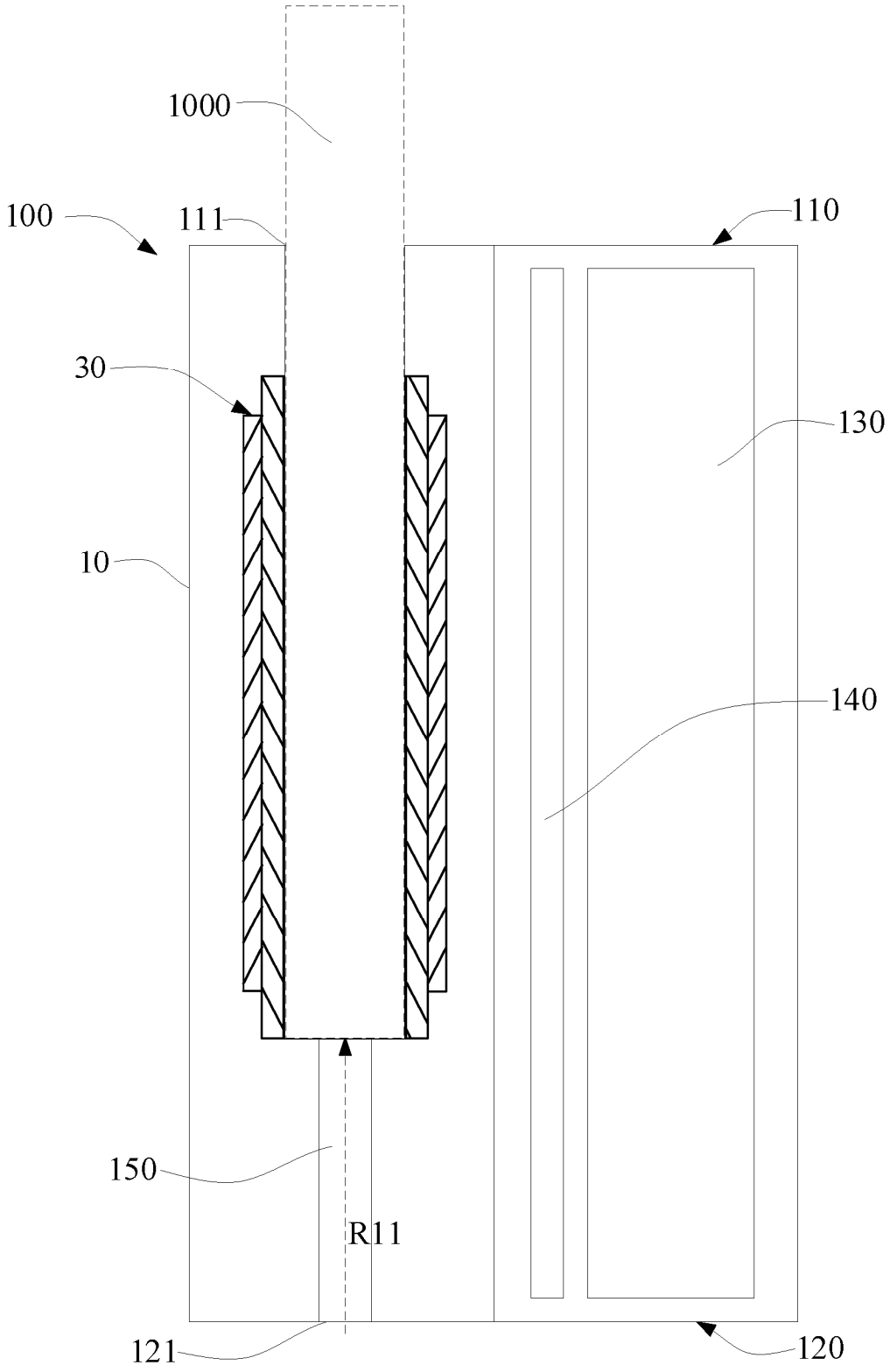


FIG. 1

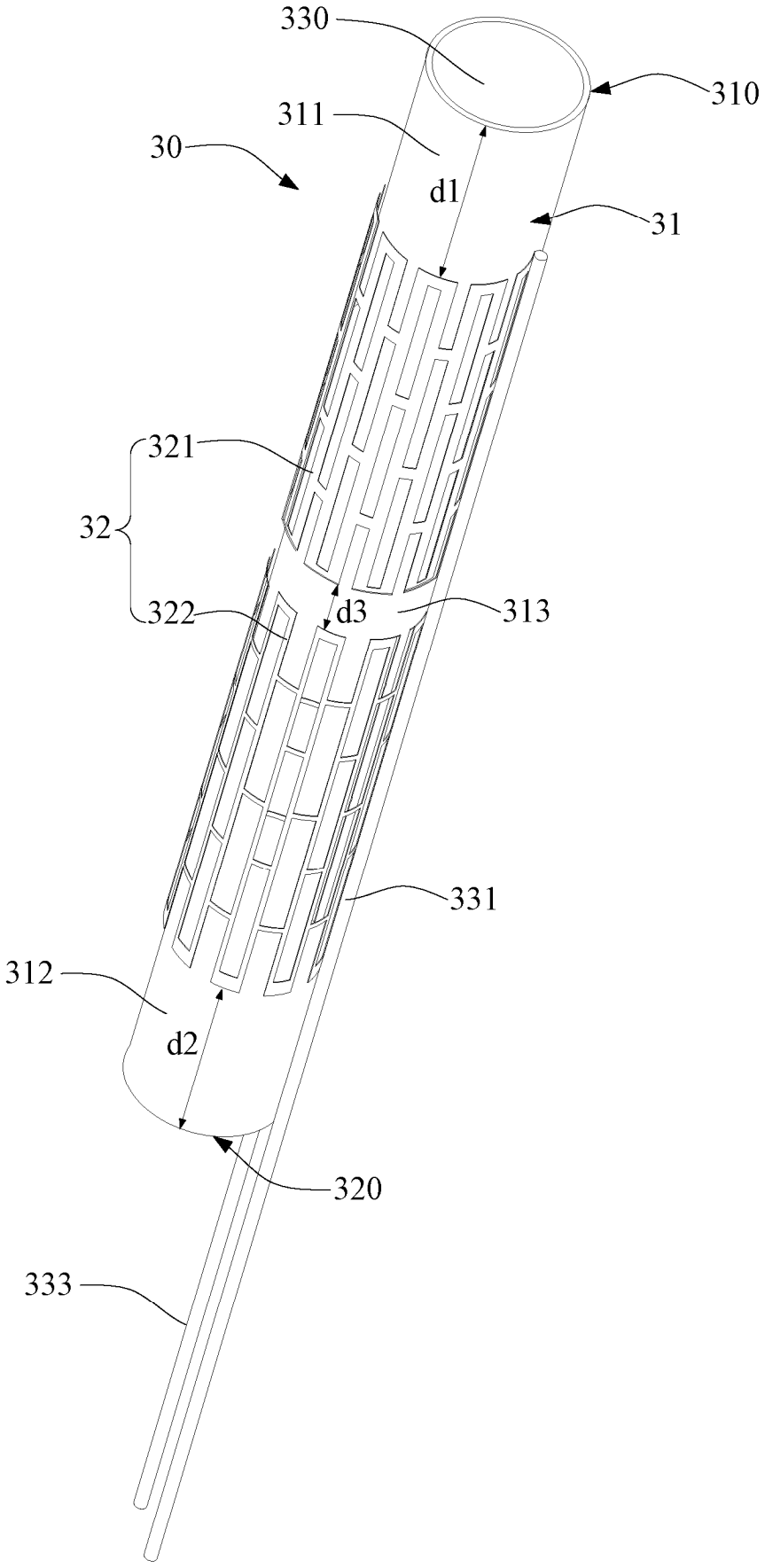


FIG. 2

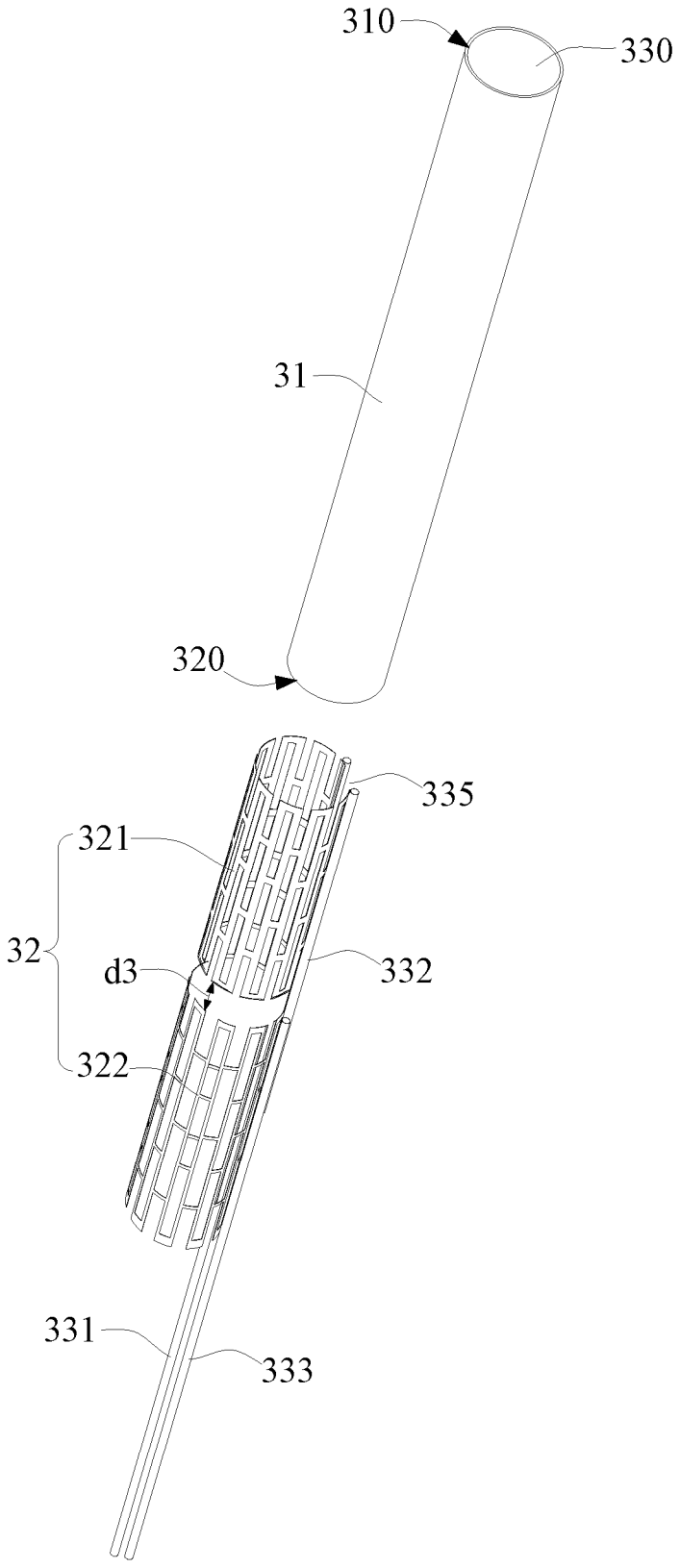


FIG. 3

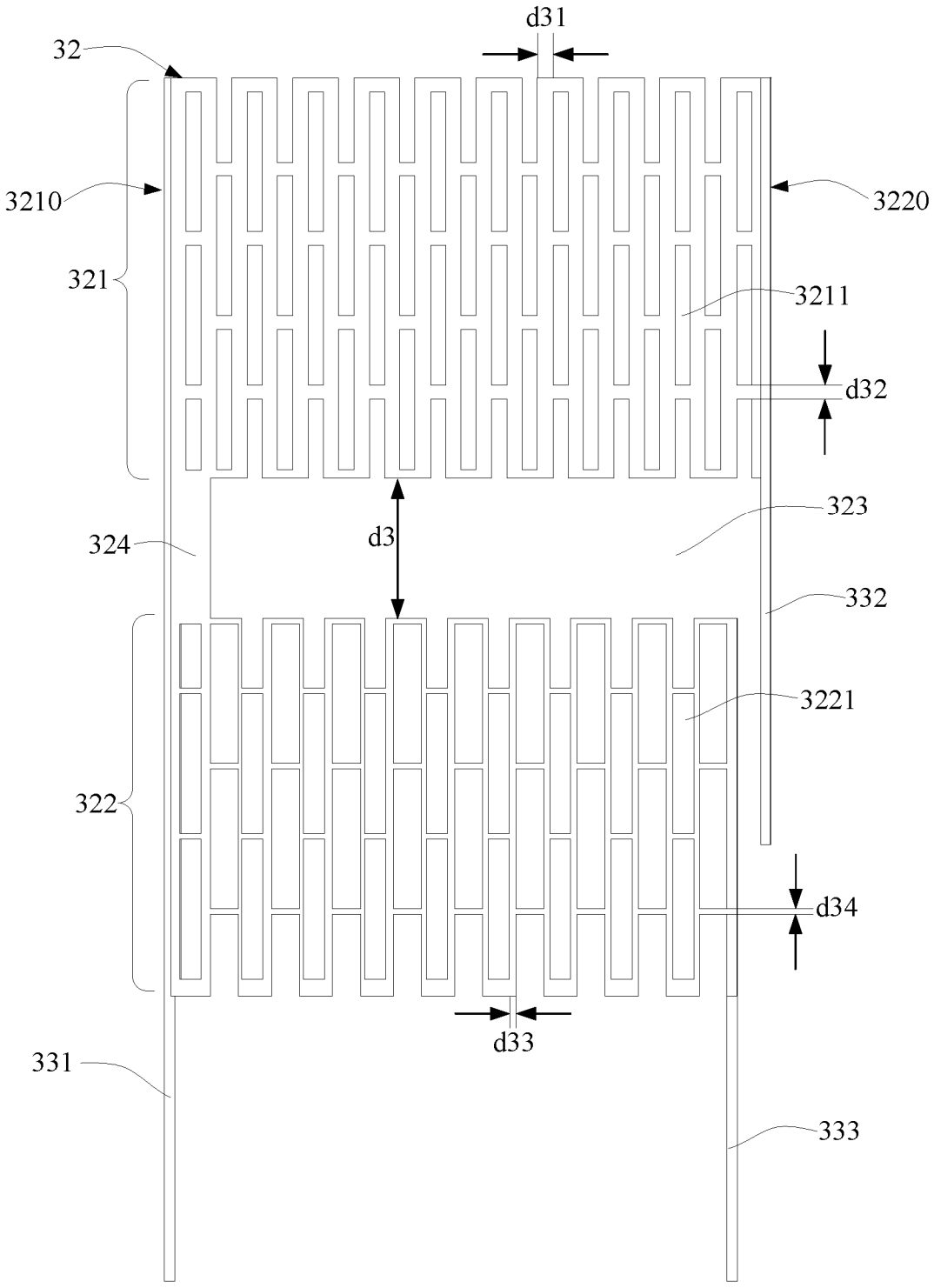

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FIG. 4

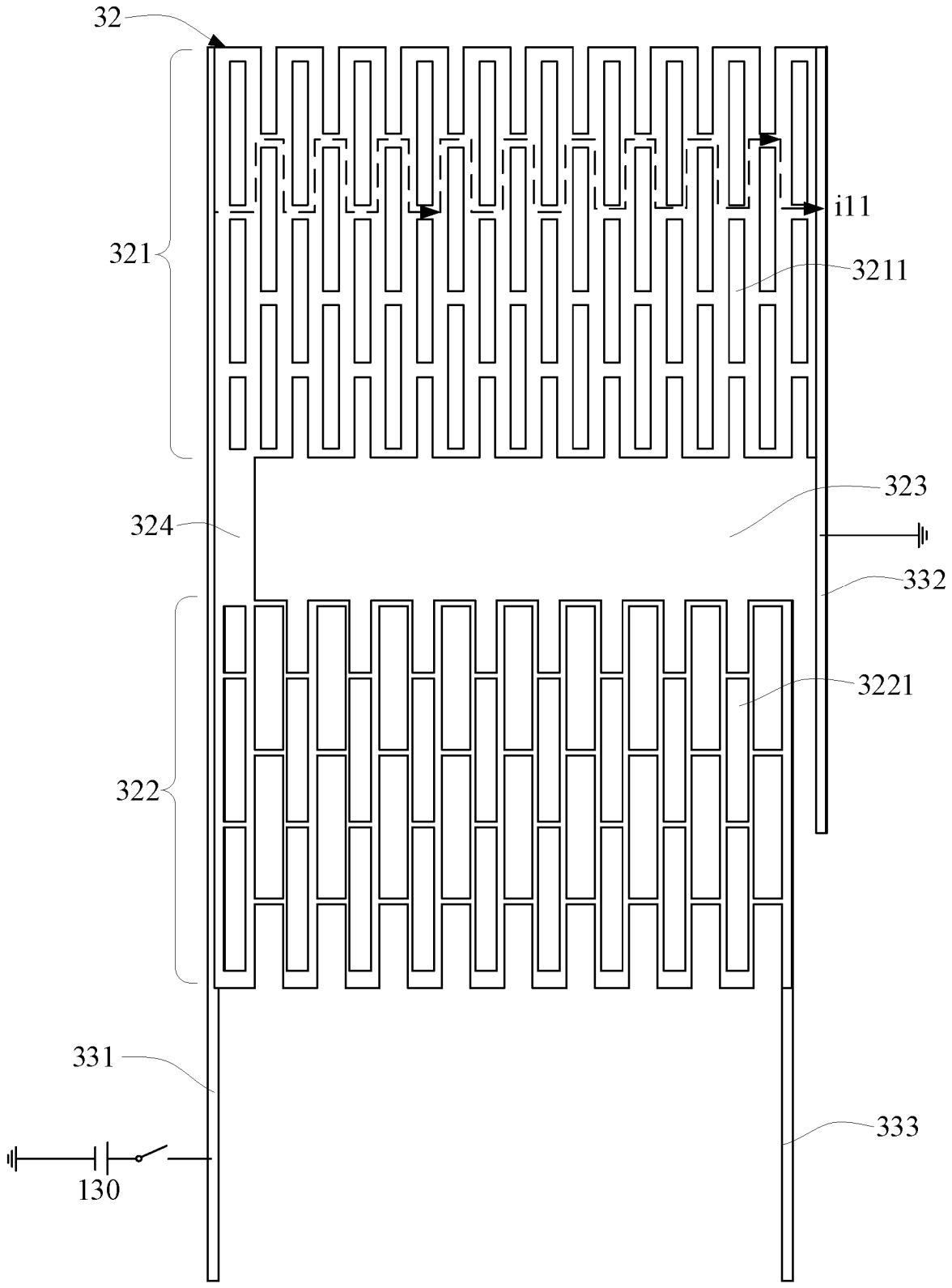


FIG. 5

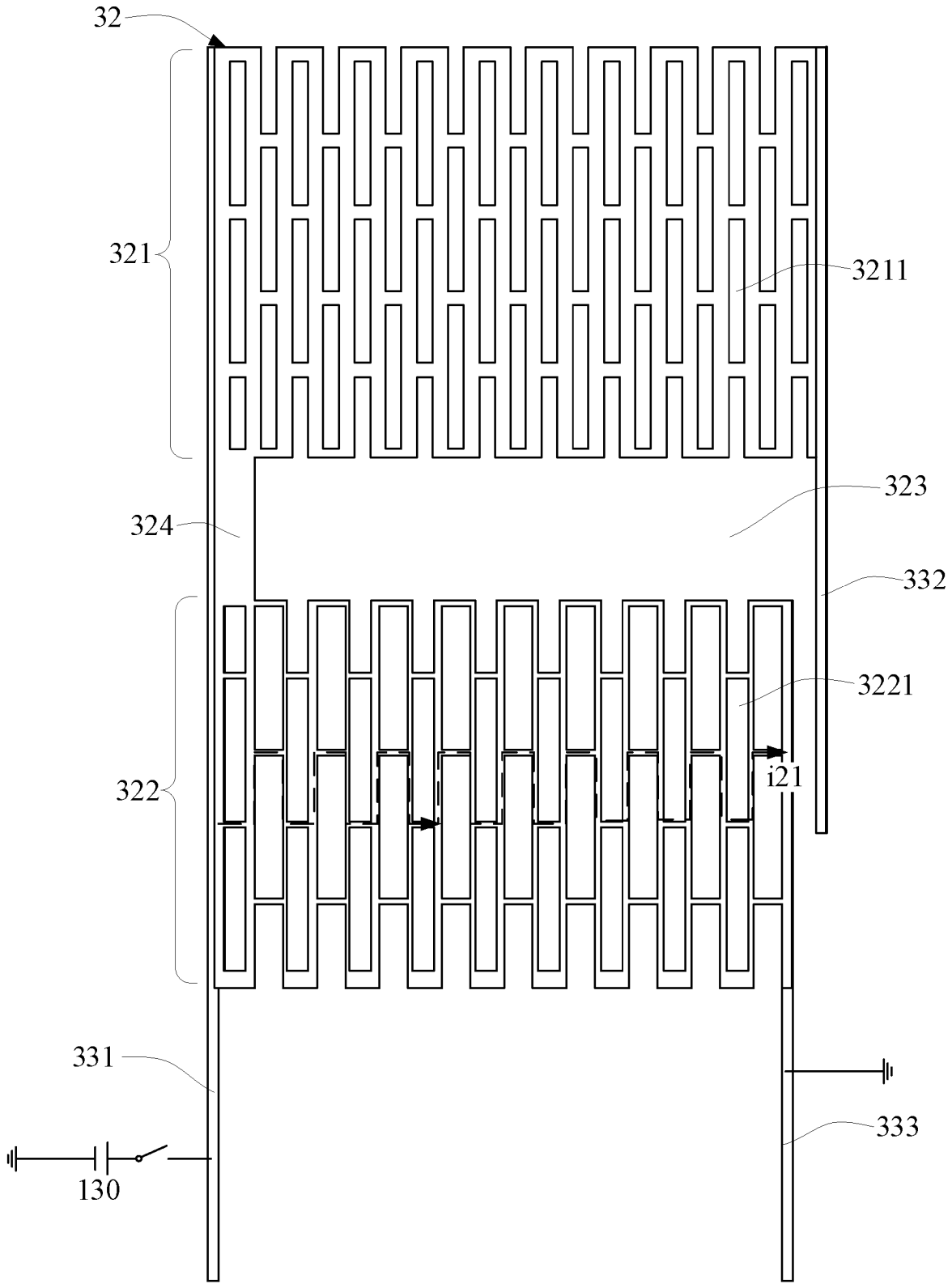


FIG. 6

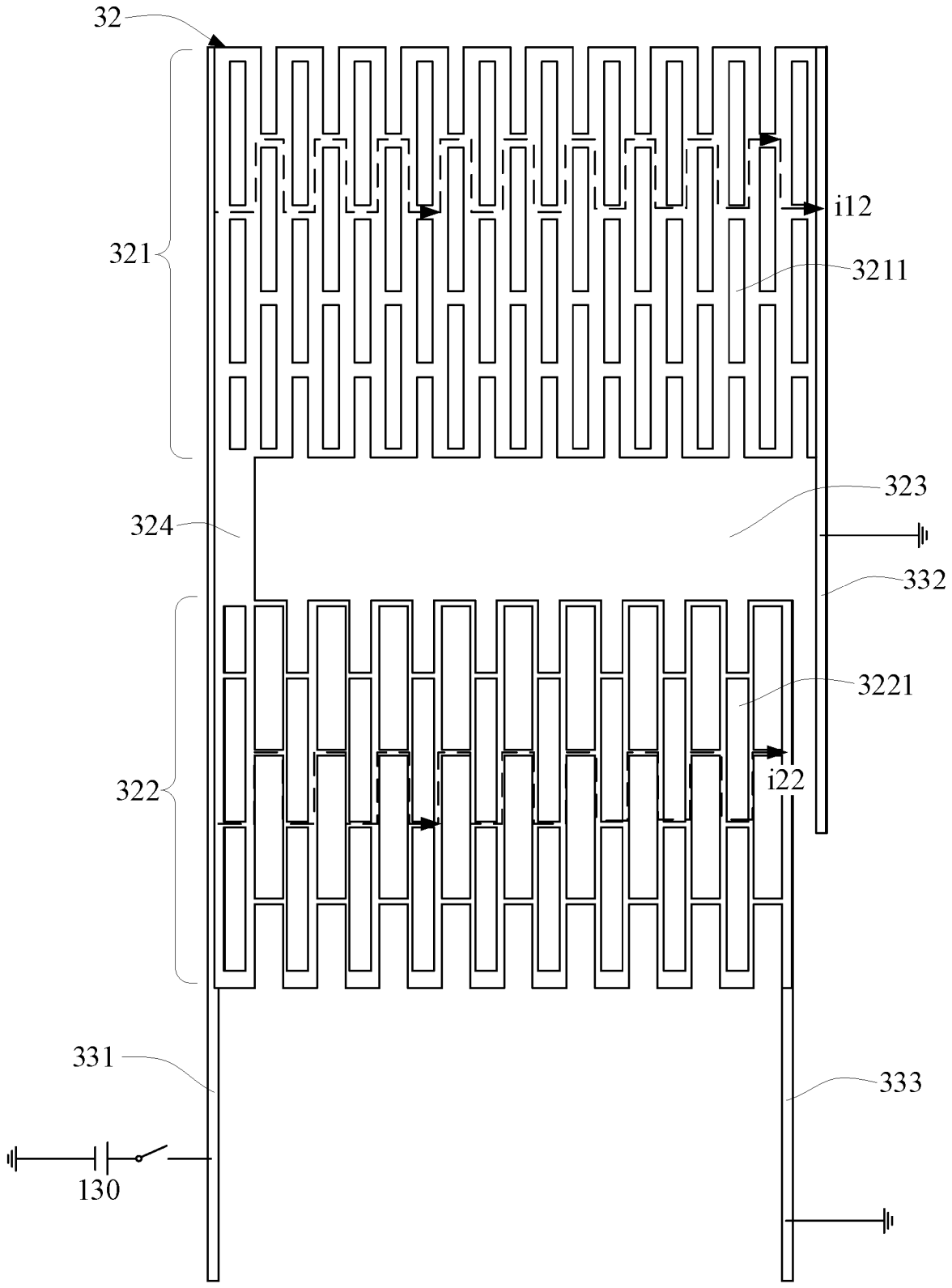


FIG. 7

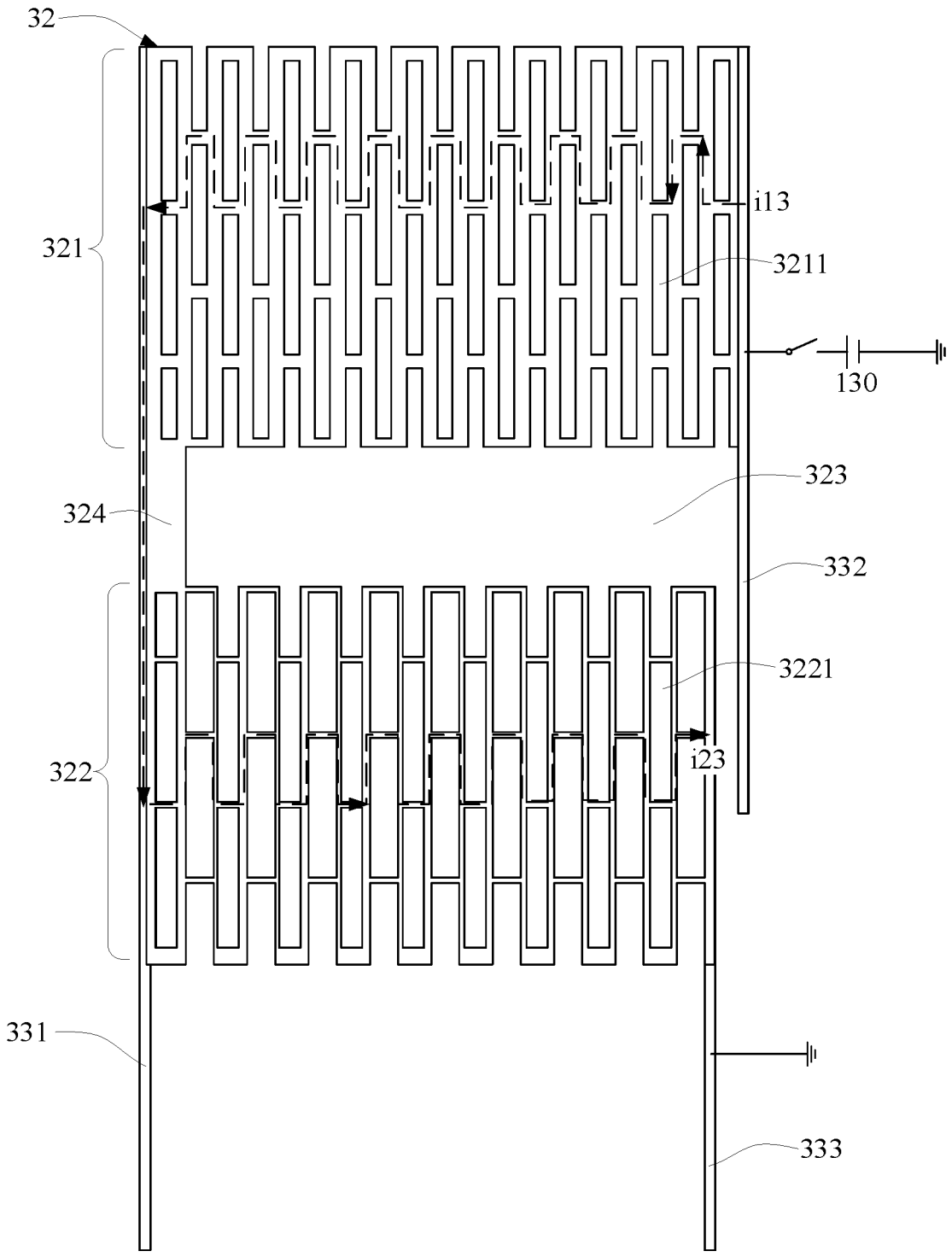

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FIG. 8

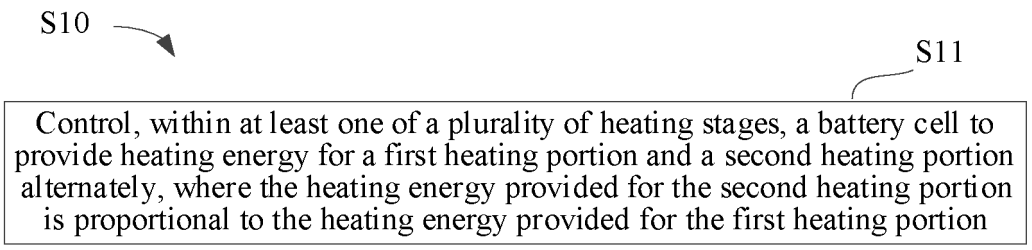

S10
S11
Control, within at least one of a plurality of heating stages, a battery cell to provide heating energy for a first heating portion and a second heating portion alternately, where the heating energy provided for the second heating portion is proportional to the heating energy provided for the first heating portion

FIG. 9

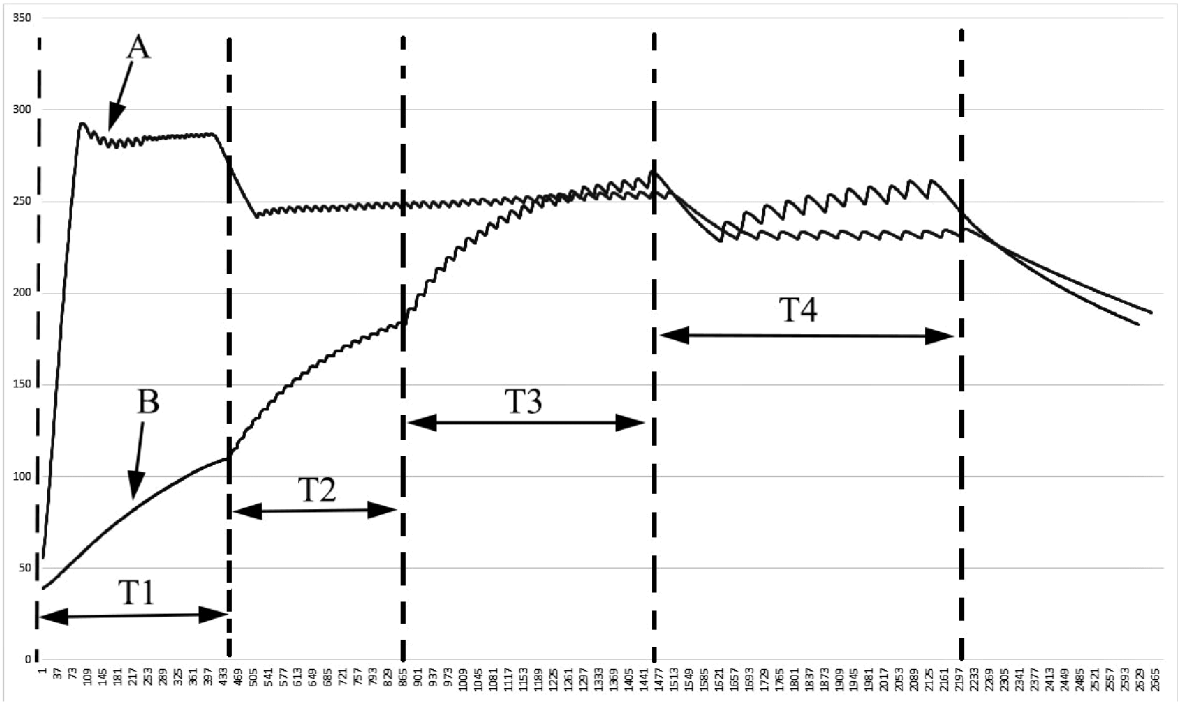


FIG. 10

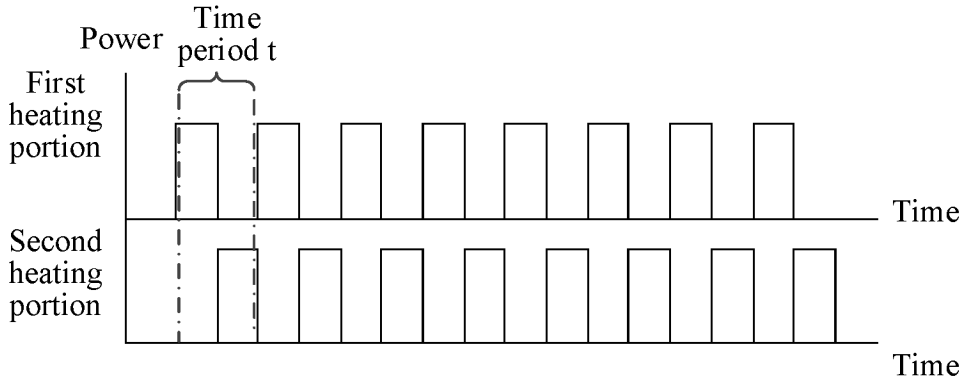


FIG. 11

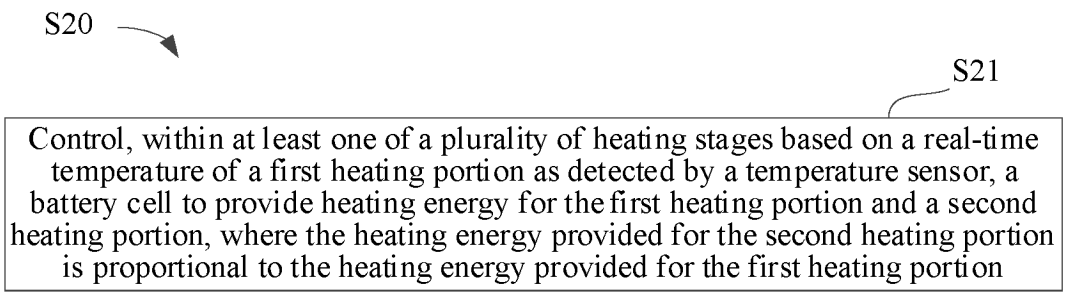


FIG. 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2024/138090

A. CLASSIFICATION OF SUBJECT MATTER

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)

CNTXT, ENTXTC, CNKI: 深圳市合元科技有限公司, 刘传友, 刘币币, 徐中立, 李永海, 气溶胶, 气雾, 加热器, 电池, 电芯, 温度传感器, 电路, 功率, 能量, 时间, 阶段, 第一, 第二, aerosol, heat+, first, second, battery, cell, temperature, sensor, circuit, power, moment, phase, stage

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 220109135 U (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 01 December 2023 (2023-12-01) description, paragraphs 90-202, and figures 1-10	1-15
A	CN 218999525 U (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 12 May 2023 (2023-05-12) entire document	1-15
A	CN 219182812 U (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 16 June 2023 (2023-06-16) entire document	1-15
A	CN 219353086 U (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 18 July 2023 (2023-07-18) entire document	1-15
A	US 2015237916 A1 (PHILIP MORRIS PRODUCTS S.A.) 27 August 2015 (2015-08-27) entire document	1-15

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"D" document cited by the applicant in the international application
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
03 March 2025	**10 March 2025**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088**	Authorized officer Telephone No.

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2024/138090

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 220109135 U	01 December 2023	None	
CN 218999525 U	12 May 2023	None	
CN 219182812 U	16 June 2023	None	
CN 219353086 U	18 July 2023	None	
US 2015237916 A1	27 August 2015	US 2016331038 A1	17 November 2016
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		JP 5971829 B2	17 August 2016
		KR 20160009108 A	25 January 2016
		KR 101660214 B1	26 September 2016

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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