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

(11) EP 4 559 331 A1

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

(43) Date of publication:
28.05.2025 Bulletin 2025/22

(21) Application number: **23842432.9**

(22) Date of filing: **21.07.2023**

(51) International Patent Classification (IPC):
A24F 40/10 *(2020.01)*

(52) Cooperative Patent Classification (CPC):
A24F 40/10; A24F 40/20; A24F 40/40; A24F 40/46; A24F 40/51; A24F 40/57

(86) International application number:
PCT/CN2023/108641

(87) International publication number:
WO 2024/017370 (25.01.2024 Gazette 2024/04)

(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:
KH MA MD TN

(30) Priority: **21.07.2022 CN 202210872754**

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

(72) Inventors:
- **YU, Peixia**
  Shenzhen, Guangdong 518000 (CN)
- **LU, Zhiming**
  Shenzhen, Guangdong 518000 (CN)
- **CHEN, Wei**
  Shenzhen, Guangdong 518000 (CN)
- **HU, Ruilong**
  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 DEVICE AND CONTROL METHOD THEREFOR, AND METHOD FOR GENERATING AEROSOLS

(57) An aerosol generation device (100) and a control method therefor, and a method for generating aerosols. The control method comprises: within a first partial period of a control period of a heater (11), controlling a power source to only provide heating power to a first heating region, such that the temperature of the first heating region rises from an initial temperature to a first preset target temperature; and within the remaining partial periods of the control period of the heater (11), controlling the power source to provide the heating power to the first heating region and a second heating region at the same time, wherein the duration of the first partial period is between 10s-30s. Within a first partial period of a control period of a heater (11), a first heating region is controlled to start heating and a second heating region is controlled to not start heating; and within the remaining partial periods, the first heating region and the second heating region are controlled to start heating at the same time, such that the preheating time of an aerosol-forming matrix is shortened, the problem of a user feeling a burning sensation in his/her mouth when vaping aerosols is prevented, and the vaping experience and usage experience of the user are improved.

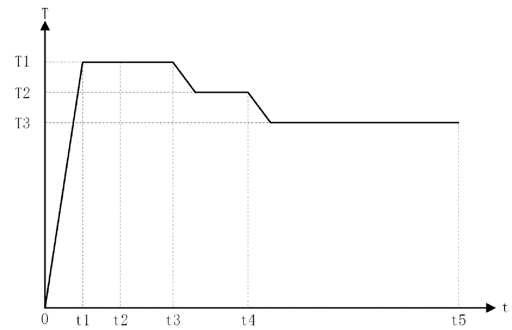

FIG. 8

EP 4 559 331 A1

Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to Chinese Patent Application No. 202210872754.0, entitled "AEROSOL GENERATION DEVICE AND CONTROL METHOD THEREFOR, AND METHOD FOR GENERATING AEROSOLS" filed with the China National Intellectual Property Administration on July 21, 2022, which is incorporated by reference in its entirety.

TECHNICAL FIELD

[0002] This application relates to the field of electronic vaporization technologies, and particularly, to an aerosol generation device and a control method therefor, and a method for generating an aerosol.

BACKGROUND

[0003] An existing aerosol generation device mainly has a far-infrared coating and a conductive coating coated on an outer surface of a base body, and the energized far-infrared coating emits far-infrared rays that penetrate the base body and heat an aerosol-forming substrate in the base body. Because of having strong penetrability, the far-infrared rays can penetrate the periphery of the aerosol-forming substrate to enter the interior, so that the aerosol-forming substrate is heated evenly.

[0004] A problem of the aerosol generation device is that a preheating time of the aerosol-forming substrate is long, and when inhaling an aerosol, a user feels hot in the mouth, which affects a use experience of the user.

SUMMARY

[0005] This application provides an aerosol generation device and a control method therefor, and a method for generating an aerosol, to resolve problems of a long preheating time and the burnt mouth during inhalation in the existing aerosol generation device.

[0006] According to an aspect of this application, an aerosol generation device is provided, configured to heat an aerosol-forming substrate to generate an aerosol, the aerosol-generating substrate including a first part of aerosol-generating substrate and a second part of aerosol-generating substrate; the aerosol generation device includes:

> a power source;
> a heater, including a first heating region for heating the first part of aerosol-forming substrate and a second heating region for heating the second part of aerosol-forming substrate; and
> a controller, configured to:
>
> > control, during a first partial period of a control period of the heater, the power source to provide heating power only to the first heating region, to raise a temperature of the first heating region from an initial temperature to a first preset target temperature; and
> > control, during a remaining partial period of the control period of the heater, the power source to provide heating power to the first heating region and the second heating region simultaneously, where
> > a duration of the first partial period ranges from 10s to 30s.

[0007] According to another aspect of this application, a control method for an aerosol generation device is further provided, the aerosol generation device being configured to heat an aerosol-forming substrate to form an aerosol, and the aerosol generation device including a power source, a first heating region for heating a first part of aerosol-forming substrate, and a second heating region for heating a second part of aerosol-forming substrate, the aerosol-generating substrate including a first part of aerosol-generating substrate and a second part of aerosol-generating substrate;
the control method includes:

> controlling, during a first partial period of a control period of the heater, the power source to provide heating power only to the first heating region, to raise a temperature of the first heating region from an initial temperature to a first preset target temperature; and
> controlling, during a remaining partial period of the control period of the heater, the power source to provide heating power to the first heating region and the second heating region simultaneously, where
> a duration of the first partial period ranges from 10s to 30s.

[0008] According to another aspect of this application, a method for generating an aerosol from an aerosol-generating substrate using an aerosol generation device,

> the aerosol-generating substrate including a first part of aerosol-generating substrate and a second part of aerosol-generating substrate, and the aerosol generation device including a first heating region for heating a first part of aerosol-forming substrate and a second heating region for heating a second part of aerosol-forming substrate, where
> the method includes:
>
> > causing, during a first partial period of a control period of the heater, the first heating region to start heating and rise from an initial temperature to a first preset target temperature, and causing the second heating region not to start heating;

and

causing, during a remaining partial period of the control period of the heater, the first heating region and the second heating region to start heating simultaneously, where

a duration of the first partial period ranges from 10s to 30s.

[0009] According to the aerosol generation device and the control method therefor and the method for generating an aerosol provided in this application, by controlling, during the first partial period of the control period of the heater, only the first heating region to start heating and the second heating region not to start heating, and controlling, during the remaining partial period, the first heating region and the second heating region to start heating simultaneously, a preheating time of an aerosol-forming substrate is shortened, the problem that a user feels hot in the mouth when inhaling an aerosol is avoided, and a vaping and use experience of the user is improved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] One or more embodiments are exemplarily described with reference to the corresponding figures in the accompanying drawings, and the descriptions are not to be construed as limiting the embodiments. Components in the accompanying drawings that have same reference numerals are represented as similar components, and 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 implementation of this application;

FIG. 2 is a schematic exploded view of an aerosol generation device according to an implementation of this application;

FIG. 3 is a schematic diagram of a heater according to an implementation of this application;

FIG. 4 is a schematic diagram of an infrared electrothermal coating in a heater according to an implementation of this application after being unrolled;

FIG. 5 is a schematic diagram of a connecting electrode according to an implementation of this application;

FIG. 6 is a schematic diagram of another heater according to an implementation of this application;

FIG. 7 is a schematic diagram of an infrared electrothermal coating in another heater according to an implementation of this application after being unrolled;

FIG. 8 is a schematic diagram of a control curve of a heater according to an implementation of this application; and

FIG. 9 is a schematic diagram of an actual temperature curve of a heater according to an implementation of this application.

DETAILED DESCRIPTION

[0011] For ease of understanding of this application, this application is described below in more detail with reference to accompanying drawings and specific implementations. It should be noted that, when an element is expressed as "being fixed to" another element, the element may be directly on the another element, or one or more intermediate elements may exist between the element and the another element. When an element is expressed as "being connected to" another element, the element may be directly connected to the another element, or one or more intermediate elements may exist between the element and the another element. The terms "upper", "lower", "left", "right", "inner", "outer", and similar expressions used in this specification are merely used for an illustrative purpose.

[0012] Unless otherwise defined, meanings of all technical and scientific terms used in this specification are the same as those usually understood by a person skilled in the art to which this application belongs. The terms used in this specification of this application are merely intended to describe objectives of the specific implementations, and 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.

[0013] FIG. 1 and FIG. 2 show an aerosol generation device 100, including a housing assembly 6 and a heater 11, according to an implementation of this application. The heater 11 is arranged in the housing assembly 6. The heater 11 can radiate infrared rays to heat an aerosol-forming substrate to generate an inhalable aerosol.

[0014] The housing assembly 6 includes an outer shell 61, a fixing shell 62, a base, and a bottom cap 64, and both the fixing shell 62 and the base are fixed in the outer shell 61, where the base is configured to fix the heater 11, the base is arranged in the fixing shell 62, and the bottom cap 64 is arranged at a distal end 9 of the outer shell 61 and covers the outer shell 61. The fixing shell 62 is provided with an insertion port, and the aerosol-forming substrate is removably received or inserted into the heater 11 through the insertion port.

[0015] The base includes a base 15 sleeved on an upper end of the heater 11 and a base 13 sleeved on a lower end of the heater 11. Both the base 15 and the base 13 are arranged in the fixing shell 62. An air inlet tube 641 is protrudingly arranged on the bottom cap 64. One end of the base 13 away from the base 15 is connected to the air inlet tube 641. The base 15, the heater 11, the base 13, and the air inlet tube 641 are coaxially arranged. In addition, the heater 11 and the base 15 as well as the base 13 are sealed by seals, the base 13 and the air inlet tube 641 are also sealed, and the air inlet tube 641 is in communication with outside air to facilitate smooth air intaking during vaping by a user.

[0016] The aerosol generation device 100 further includes a circuit board 3 and a battery core 7. The fixing shell 62 includes a front shell 621 and a rear shell 622, the front shell 621 is fixedly connected to the rear shell 622, the circuit board 3 and the battery core 7 are both arranged in the fixing shell 62, and the battery core 7 is electrically connected to the circuit board 3. A button 4 is protrudingly arranged on the outer shell 61, and the heater 11 can be energized or unenergized by pressing the button 4. The circuit board 3 is further connected to a charging interface 31, the charging interface 31 is exposed on the bottom cap 64, and the user may charge or upgrade the aerosol generation device 100 through the charging interface 31, to ensure continuous use of the aerosol generation device 100.

[0017] The aerosol generation device 100 further includes a heat insulation tube 17, the heat insulation tube 17 is arranged in the fixing shell 62, the heat insulation tube 17 is sleeved on the periphery of the heater 11, and the heat insulation tube 17 can prevent a lot of heat from being transferred to the outer shell 61 and causing the user to feel hot on a hand. The heat insulation tube includes a heat insulation material, and the heat insulation material may be heat insulation glue, aerogel, aerogel felt, asbestos, aluminum silicate, calcium silicate, diatomite, zirconium oxide, or the like. The heat insulation tube may also be a vacuum heat insulation tube. An infrared ray reflective coating may be further formed in the heat insulation tube 17, to reflect the infrared rays radiated by the heater 11 toward the aerosol-forming substrate, thereby improving the heating efficiency.

[0018] The aerosol generation device 100 further includes a temperature sensor 2, such as an NTC temperature sensor, configured to detect a real-time temperature of the heater 11 and transmit the detected real-time temperature to the circuit board 3. The circuit board 3 adjusts a magnitude of a current flowing through the heater 11 based on the real-time temperature.

[0019] FIG. 3 and FIG. 4 show heater according to an implementation of this application. The heater 11 includes:

a base body 110, which may be made of a high temperature-resistant and transparent material such as quartz glass, ceramics, or mica, or may be made of another material having high infrared ray transmittance such as a high temperature-resistant material whose infrared ray transmittance is greater than 95%, which is not specifically limited herein.

[0020] The base body 110 is approximately tubular, and preferably, in a shape of a round tube. An internal hollow part of the base body 110 defines or forms a cavity for receiving the aerosol-forming substrate. An inner diameter of the base body 110 ranges from 7 mm to 14 mm, or ranges from 7 mm to 12 mm, or ranges from 7 mm to 10 mm.

[0021] The aerosol-forming substrate is a substrate that can release a volatile compound that can form an aerosol. Such a volatile compound may be released by heating the aerosol-forming substrate. The aerosol-forming substrate may be solid, liquid, or include solid and liquid components. The aerosol-forming substrate may be carried on a carrier or a support through absorption, coating, impregnation, or another manner. The aerosol-forming substrate may conveniently be a part of an aerosol-generating product.

[0022] The aerosol-forming substrate may include nicotine. The aerosol-forming substrate may include tobacco, for example, may include a tobacco-containing material including a volatile tobacco-flavor compound. The volatile tobacco-flavor compound is released from the aerosol-forming substrate when the aerosol-forming substrate is heated. The aerosol-forming substrate may include at least one aerosol-forming agent, and the aerosol-forming agent may be any suitable known compound or a mixture of compounds. In use, the compound or the mixture of compounds facilitates formation of a dense and stable aerosol and is substantially resistant to thermal degradation at an operating temperature of an aerosol-generating system. A suitable aerosol forming agent is well known in the art, and includes, but is not limited to: polyol such as triethylene glycol, 1,3-butanediol, or glycerin; ester of polyol such as glyceryl monoacetate, glyceryl diacetate, or glyceryl triacetate; and fatty acid ester of monobasic carboxylic acid, dibasic carboxylic acid, or polybasic carboxylic acid such as dimethyl dodecane dibasic ester and dimethyl tetradecane dibasic ester.

[0023] An infrared electrothermal coating 111 is formed on a surface of the base body 110. The infrared electrothermal coating 111 may be formed on an outer surface of the base body 110, or may be formed on an inner surface of the base body 110.

[0024] The infrared electrothermal coating 111 receives electric power to generate heat, to further radiate infrared rays of specific wavelengths, for example, far-infrared rays of 8 μm to 15 μm. When the wavelengths of the infrared rays match absorption wavelengths of the aerosol-forming substrate, energy of the infrared rays is easily absorbed by the aerosol-forming substrate. In this example, the wavelengths of the infrared rays are not limited. The infrared rays may be infrared rays of 0.75 μm to 1000 μm, and preferably, far-infrared rays of 1.5 μm to 400 μm.

[0025] In this example, the infrared electrothermal coating 111 is formed on the outer surface of the base body 110. The infrared electrothermal coating 111 includes two infrared electrothermal coatings spaced apart, shown as an infrared electrothermal coating 111a and an infrared electrothermal coating 111b in the figure. The infrared electrothermal coating 111a is closer to a mouthpiece end 8 of the aerosol generation device 100 than the infrared electrothermal coating 111b is.

[0026] The infrared electrothermal coating 111a is spaced apart from an upper end of the base body 110 by a spacing distance ranging from 0.2 mm to 1 mm, which facilitates manufacturing and production. A spacing distance between the infrared electrothermal coating 111a and the infrared electrothermal coating 111b ranges from 0.2 mm to 1 mm. The infrared electrothermal coating 111b is also spaced apart from a lower end of the base body 110 by a spacing distance ranging from 1 mm to 4 mm, which facilitates arrangement of conductive electrodes while preventing the lower end of the base body 110 from having an excessively high temperature. It should be noted that, from a perspective of a flowing direction of the aerosol, the upper end of the base body 110 is downstream of the lower end of the base body 110. An axial extension length of the infrared electrothermal coating 111a may be the same as or different from an axial extension length of the infrared electrothermal coating 111b.

[0027] The conductive element includes a conductive electrode 112a, a conductive electrode 112b, a conductive electrode 112c, a connecting electrode 112d, and a connecting electrode 112e that are arranged on the surface of the base body 110 at intervals.

[0028] The conductive electrode 112a includes a coupling portion 112a1 extending along a circumferential direction of the base body 110 and a conductive portion 112a2 extending axially from the coupling portion 112a1 toward the upper end of the base body 110. The coupling portion 112a1 is arc-shaped, the coupling portion 112a1 is spaced apart from the infrared electrothermal coating 111b, and the coupling portion 112a1 is arranged between the infrared electrothermal coating 111b and the lower end of the base body 110. A wire may be soldered to the coupling portion 112a1 to form an electrical connection to a power source outside the heater 11, for example, the battery core 7 or a converted voltage of the battery core 7, or may be electrically connected to the power source by another electrical connector. The conductive portion 112a2 is strip-shaped, and has an axial extension length greater than the axial extension length of the infrared electrothermal coating 111b, and an upper end of the conductive portion 112a2 is flush with an upper end of the infrared electrothermal coating 111b. The conductive portion 112a2 keeps in contact with the infrared electrothermal coating 111b, to form an electrical connection.

[0029] The conductive electrode 112b is strip-shaped, and its axial extension length is the same as the axial extension length of the infrared electrothermal coating 111a. The conductive electrode 112b keeps in contact with the infrared electrothermal coating 111a, to form an electrical connection.

[0030] A structure of the conductive electrode 112c is similar to that of the conductive electrode 112a. A coupling portion 112c1 of the conductive electrode 112c is arranged between the infrared electrothermal coating 111b and the lower end of the base body 110. A conductive portion 112c2 is strip-shaped, but its axial extension length is greater than a sum of the axial extension lengths of the infrared electrothermal coating 111a and the infrared electrothermal coating 111b, and an upper end of the conductive portion 112c2 is flush with an upper end of the infrared electrothermal coating 111a. The conductive portion 112c2 keeps in contact with both the infrared electrothermal coating 111a and the infrared electrothermal coating 111b, to form electrical connections.

[0031] Both the connecting electrode 112d and the connecting electrode e are strip-shaped and arranged in the infrared electrothermal coating 111b. Axial extension lengths of the connecting electrode 112d and the connecting electrode e are the same as the axial extension length of the infrared electrothermal coating 111b.

[0032] The connecting electrode 112d is arranged between the conductive electrode 112a and the conductive electrode 112c. The connecting electrode 112d separates an infrared electrothermal coating between the conductive electrode 112a and the conductive electrode 112c into two infrared electrothermal sub-coatings (shown as B1 and B2 in FIG. 4) connected in series between the conductive electrode 112a and the conductive electrode 112c, and the infrared electrothermal sub-coating B1 and the infrared electrothermal sub-coating B2 are distributed along the circumferential direction of the base body 110. An equivalent resistance of the infrared electrothermal sub-coating B1 may be the same as or different from an equivalent resistance of the infrared electrothermal sub-coating B2.

[0033] The connecting electrode 112e is also arranged between the conductive electrode 112a and the conductive electrode 112c. The connecting electrode 112e separates an infrared electrothermal coating between the conductive electrode 112a and the conductive electrode 112c into two infrared electrothermal sub-coatings (shown as B3 and B4 in FIG. 4) connected in series between the conductive electrode 112a and the conductive electrode 112c, and the infrared electrothermal sub-coating B3 and the infrared electrothermal sub-coating B4 are distributed along the circumferential direction of the base body 110. An equivalent resistance of the infrared electrothermal sub-coating B3 may be the same as or different from an equivalent resistance of the infrared electrothermal sub-coating B4.

[0034] An overall resistance of the infrared electrothermal coating 111b can be reduced by arranging the connecting electrode 112d and the connecting electrode 112e.

[0035] It should be noted that, a plurality of connecting electrodes 112d and/or connecting electrodes 112e may be arranged between the conductive electrode 112a and the conductive electrode 112c as required, to separate the infrared electrothermal coating into a plurality of infrared electrothermal sub-coatings connected in series between the conductive electrode 112a and the conductive electrode 112c. For example, two connecting electrodes 112d separate the infrared electrothermal coating into three infrared electrothermal sub-coatings connected in series between the conductive electrode 112a and the conductive electrode 112c. Equivalent resistances of the three infrared electrothermal sub-coatings may all be the same or different, or two of the three infrared electrothermal sub-coatings have a same equivalent resistance.

[0036] It should be further noted that, a plurality of connecting electrodes 112d and/or connecting electrodes 112e may be arranged between the conductive electrode 112b and the conductive electrode 112c as required, to reduce an overall resistance of the infrared electrothermal coating 111a.

[0037] Preferably, a continuous conductive coating is used for the conductive electrode 112a, the conductive electrode 112b, the conductive electrode 112c, the connecting electrode 112d, and the connecting electrode 112e. The conductive coating may be a metal coating. The metal coating may include silver, gold, palladium, platinum, copper, nickel, molybdenum, tungsten, niobium, or an alloy material of the foregoing metals. Widths of the connecting electrode 112d and the connecting electrode 112e range 0.5 mm to 3 mm or from 0.5 mm and 2.5 mm, and in a specific example, may be 1 mm or 2 mm.

[0038] In another example, a non-continuous conductive coating, for example, a meshed conductive coating shown in FIG. 5, may also be used as the connecting electrode 112d and the connecting electrode 112e.

[0039] It should be noted that, in a process of preparing the heater 11, the connecting electrode 112d and/or the connecting electrode 112e may be arranged between the base body 110 and the infrared electrothermal coating 111b along a direction perpendicular to a surface of the base body 110. Alternatively, the infrared electrothermal coating 111b may be arranged between the base body 110 and the connecting electrode. The conductive portion 112a2 of the conductive electrode 112a and the conductive portion 112c2 of the conductive electrode 112c may also be arranged in this way.

[0040] Through arrangement of the conductive elements in FIG. 3, the infrared electrothermal coating 111a and the infrared electrothermal coating 111b can be independently controlled. Specifically, the power source can be controlled to provide heating power to the infrared electrothermal coating 111a and/or the infrared electrothermal coating 111b. For example, the power source is first controlled to provide heating power to the infrared electrothermal coating 111a to heat an upper half part (a part corresponding to a region of the infrared electrothermal coating 111a) of the aerosol-generating product; and then, the power source is controlled to provide heating power to the infrared electrothermal coating 111b, to heat a lower half part (a part corresponding to a region of the infrared electrothermal coating 111b) of the aerosol-generating product. Vice versa.

[0041] Alternatively, the power source is first controlled to provide heating power to the infrared electrothermal coating 111a, to heat the upper half part of the aerosol-generating product; and then, the power source is controlled to provide heating power to the infrared electrothermal coating 111a and the infrared electrothermal coating 111b simultaneously, to heat the entire aerosol-generating product.

[0042] Alternatively, the power source is first controlled to provide heating power to the infrared electrothermal coating 111b, to heat the lower half part of the aerosol-generating product; and then, the power source is controlled to provide heating power to the infrared electrothermal coating 111a and the infrared electrothermal coating 111b simultaneously, to heat the entire aerosol-generating product.

[0043] When the infrared electrothermal coating 111a is controlled to perform heating, for example, the conductive electrode 112b is electrically connected to a positive pole of the power source, and the coupling portion 112c1 is electrically connected to a negative pole of the power source. In this way, a current flows in from the conductive electrode 112b, and flows out from the conductive portion 112c2 after passing through an infrared electrothermal sub-coating A1 or an infrared electrothermal sub-coating A2 along the circumferential direction of the base body 110.

[0044] When the infrared electrothermal coating 111b is controlled to perform heating, for example, the coupling portion 112a1 is electrically connected to a positive pole of the battery core 7, and the coupling portion 112c1 is electrically connected to a negative pole of the battery core 7. A current flows in from the conductive portion 112a2, and flows out from the conductive portion 112c2 after sequentially passing through the infrared electrothermal sub-coating B1 and the infrared electrothermal sub-coating B2 while sequentially passing through the infrared electrothermal sub-coating B4 and the infrared electrothermal sub-coating B3. The connecting electrode 112d and the connecting electrode 112e are not connected to the power source or the circuit outside the heater 11, that is, the connecting electrode 112d and the connecting electrode 112e are suspended, and a current cannot directly flow in from the connecting electrode 112c, and then flow out from the conductive portion 112b2 or the conductive portion 112a2. Existence of the connecting electrode 112d and the connecting electrode 112e can reduce the overall resistance of the infrared electrothermal coating 111b.

[0045] Referring to FIG. 3 again, a mark 113 is arranged in the region of the infrared electrothermal coating 111a. The mark 113 is used for positioning when the temperature sensor 2 is assembled. The temperature sensor 2 detects a real-time temperature of the region of the infrared electrothermal coating 111a and transmits the detected real-time temperature to the circuit board 3, and the circuit board 3 can control a temperature of the infrared electrothermal coating 111a and/or a temperature of the infrared electrothermal coating 111b based on the real-time temperature (which is described below).

[0046] It should be noted that, the heater 11 shown in FIG. 3 to FIG. 5 has a plurality of implementations after variation. For example, it is also feasible to replace the conductive electrode 112c with two electrode similar to the conductive electrode 112a and the conductive electrode 112b. Alternatively, the conductive electrode 112a, the conductive electrode 112b, and the conductive electrode 112c are all of a ring-shaped electrode structure, to separate the infrared electrothermal coating 111 into two, upper and lower infrared electrothermal coatings, and it is also feasible that one or more connecting electrodes of a ring-shaped structure can be arranged on the infrared electrothermal coating at a lower end. Alternatively, the conductive electrode 112a, the conductive electrode 112b, and the conductive electrode 112c are all of a spiral electrode structure, and it is also feasible that the connecting electrode is also of a spiral structure.

[0047] FIG. 6 and FIG. 7 are schematic diagrams of another heater according to an implementation of this application.

[0048] Different from the examples in FIG. 3 and FIG. 4, an axial extension length of the conductive portion 112a2 of the conductive electrode 112a is greater than a sum of the axial extension lengths of the infrared electrothermal coating 111a and the infrared electrothermal coating 111b, and an upper end of the conductive portion 112c2 is flush with an upper end of the infrared electrothermal coating 111a. The conductive electrode 112b and the conductive electrode 112d are both arranged between the conductive portion 112a2 of the conductive electrode 112a and the conductive portion 112c2 of the conductive electrode 112c, and the conductive electrode 112b and the conductive electrode 112d are both arranged in a region of the infrared electrothermal coating 111a.

[0049] Different from the examples in FIG. 3 to FIG. 4, the infrared electrothermal coating 111a can be independently controlled, and the infrared electrothermal coating 111b cannot be independently controlled.

[0050] When the heater 11 is controlled to perform heating, the power source is first controlled through the conductive electrode 112b and the conductive electrode 112d to provide heating power to the infrared electrothermal coating 111a; and Then, the power source is controlled through the conductive electrode 112a and the conductive electrode 112c to provide the heating energy to the infrared electrothermal coating 111a and the infrared electrothermal coating 111b simultaneously.

[0051] When the conductive electrode 112b and the conductive electrode 112d are energized, conductive portions (the conductive portion 112a2 of the conductive electrode 112a and the conductive portion 112c2 of the conductive electrode 112c) located between the conductive electrode 112b and the conductive electrode 112d are not energized, and the conductive portions are equivalent to the connecting electrodes in the examples in FIG. 3 and FIG. 4, thereby reducing the overall resistance of the infrared electrothermal coating 111a, so that the infrared electrothermal coating 111a rapidly heats up, and can rapidly heat the upper half part of the aerosol-generating product, to achieve an objective of rapidly generating an aerosol.

[0052] When the conductive electrode 112a and the conductive electrode 112c are energized, the conductive electrode 112b and the conductive electrode 112d located between the conductive electrode 112a and the conductive electrode 112c are not energized, and are also equivalent to the connecting electrodes in the examples in FIG. 3 and FIG. 4, thereby reducing the overall resistance of the infrared electrothermal coating 111a. In this case, because the infrared electrothermal coating 111a and the infrared electrothermal coating 111b perform heating simultaneously or the infrared electrothermal coating 111 performs heating entirely, existence of the conductive electrode 112b and the conductive electrode 112d reduces the overall resistance of the infrared electrothermal coating 111a, so that a temperature of the region of the infrared electrothermal coating 111a is raised, thereby changing a temperature field of the entire region of the infrared electrothermal coating 111.

[0053] Similar to the examples in FIG. 3 and FIG. 4, the temperature sensor 2 detects a real-time temperature of the region of the infrared electrothermal coating 111a and transmits the detected real-time temperature to the circuit board 3, and the circuit board 3 can control a temperature of the infrared electrothermal coating 111a and/or a temperature of the infrared electrothermal coating 111b based on the real-time temperature.

[0054] FIG. 8 is a schematic diagram of a control curve of a heater according to an implementation of this application.

[0055] In FIG. 8, a horizontal coordinate t represents a time, 0 to t5 represent a control period of the region of the infrared electrothermal coating 111a, and a vertical coordinate T represents a temperature of the region of the infrared electrothermal coating 111a. A value of the temperature can be detected and fed back by the temperature sensor 2. During the entire control period of the region of the infrared electrothermal coating 111a, the heating power provided by the power source is controlled based on temperature information of the region of the infrared electrothermal coating 111a.

[0056] Descriptions are provided below by using the heater 11 exemplified in FIG. 3 and FIG. 4 as an example.

1. During a period of 0 to t1, the power source is controlled to provide heating power to the infrared electrothermal coating 111a, to raise a temperature of the region of the infrared electrothermal coating 111a from an initial temperature to a first preset target temperature T1.

[0057] The initial temperature may be an ambient temperature, or may be a temperature greater than the ambient temperature.

[0058] The first preset target temperature T1 ranges from 230°C to 300°C, preferably from 240°C to 300°C, more preferably from 240°C to 290°C, further preferably from 240°C to 280°C, and in a specific example, may be set to 250°C, 260°C, 270°C, or the like.

[0059] Generally, within a duration of this period, the power source is controlled to provide maximum heating power, for example, heating power of 20 W to 40 W, to the infrared electrothermal coating 11 1a, so that the temperature of the region of the infrared electrothermal coating 111a can rapidly rise to the first preset target temperature T1.

[0060] Generally, a start time point of the period 0 to t1 is a predetermined time point (including a time point at which a start signal is received, and a specific time point after the start signal is received) after a controller 32 receives the start signal, and at this time point, the controller 32 starts a control action. The start signal may be a signal generated by an airflow sensor or a signal generated by a button switch.

[0061] 2. During a period of t1 to t2, the power source is controlled to provide heating power to the infrared electrothermal coating 111a, to keep the region of the infrared electrothermal coating 111a at the first preset target temperature T1.

[0062] Generally, within a duration of this period, the power source is controlled to provide smaller heating power, for example, heating power of about 5 W to 15 W, to the infrared electrothermal coating 11 1a, so that the temperature of the region of the infrared electrothermal coating 111a is kept at the first preset target temperature T1. Being kept at the first preset target temperature T1 means that the temperature of the region of the infrared electrothermal coating 111a may fluctuate around the target temperature T1, or the temperature of the region of the infrared electrothermal coating 111a does not exceed the target temperature T1.

[0063] The period of 0 to t2 may also be referred to as a preheating stage or a preheating period, and a duration of this period ranges from 10s to 30s (including endpoint values), for example, may be 12s, 15s, 20s, 25s, 30s, or the like. Prompt information may be generated at the time point t2, to prompt a user that an aerosol is inhalable. A prompting manner includes, but is not limited to, sound, light, vibration, and the like. A period of t2 to t5 may also be referred to as an inhalation period, and in this period, the user may inhale an aerosol generated from an aerosol-generating substrate.

[0064] In the period of 0 to t2, because the power source does not provide heating power to the infrared electrothermal coating 111b, only the infrared electrothermal coating 111a starts heating, and the infrared electrothermal coating 111b does not start heating. In other words, the aerosol-generating product heated in this period is only a first part of the product corresponding to the infrared electrothermal coating 111a, and compared with the entire aerosol-generating product, the heated part is less, which, on the one hand, is beneficial to rapidly generating an inhalable aerosol, and on the other hand, avoids the problem that the user feels hot in the mouth when inhaling the aerosol (especially when inhaling the first puff of the aerosol) since a water content in the heated product is relatively reduced.

[0065] It may be understood that, due to thermal conductivity of the base body 110, the product, and the like, a temperature of the region of the infrared electrothermal coating 111b and a temperature of a second part of the product corresponding to the infrared electrothermal coating 111b both slowly rise. The two parts of the product, namely, the first part of the product corresponding to the infrared electrothermal coating 111a and the second part of the product corresponding to the region of the infrared electrothermal coating 111b, may include aerosol-forming substrates having a substantially same composition, or may include different components. There is no physical separation between the two parts of the product, or there is heat transfer between the two parts of the product.

[0066] It should be noted that, in another example, it is also feasible that there is no so-called holding or maintaining period during the period of t1 to t2. In this case, during the period of 0 to t2, the temperature of the region of the infrared electrothermal coating 111a may be controlled to rise from the initial temperature to the first preset target temperature T1 with a slow rising trend (or a small curve slope).

[0067] 3. During a period of t2 to t3, the power source is controlled to provide heating power to the infrared electrothermal coating 111a and the infrared electrothermal coating 111b simultaneously, to keep the region of the infrared electrothermal coating 111a at the first preset target temperature T1 under the allocated heating power.

[0068] A duration of the period of t2 to t3 ranges from 30s to 50s, and in a specific example, may be 40s.

[0069] Within the duration of this period, the heating power provided by the power source to the infrared electrothermal coating 111 is allocated to two heating regions, namely, the infrared electrothermal coating 111a and the infrared electrothermal coating 111b. The infrared electrothermal coating 111a and the infrared electrothermal coating 111b are equivalent to two heating regions working in parallel. Therefore, a region with a smaller resistance obtains larger heating power, and conversely, a region with a larger resistance obtains smaller heating power. Assuming that a resistance R111a of the infrared electrothermal coating 111a and a resistance R111b of the infrared electrothermal coating 111b are 3:2, and the heating power provided by the power source is 10 W, heating power allocated to the region of the infrared electrothermal coating 111a is 4 W, and heating power allocated to the region of the infrared electrothermal coating 111b is 6 W.

[0070] Similar to the period of t1 to t2, during the period of t2 to t3, the power source may be controlled to provide smaller heating power, for example, heating power of about 5 W to 15 W, to the infrared electrothermal coating 111, so that the temperature of the region of the infrared electrothermal coating 111a can be kept at the first preset target temperature T1 under the allocated heating power.

[0071] Different from the period of 0 to t2, during the period of t2 to t3, the temperature of the region of the infrared electrothermal coating 111b can rapidly rise under the allocated heating power (although the power is small) and a temperature difference between the region of the infrared electrothermal coating 111a and the region of the infrared electrothermal coating 111b.

[0072] 4. During a period of t3 to t4, the power source is controlled to provide heating power to the infrared electrothermal coating 111a and the infrared electrothermal coating 111b simultaneously, so that under allocated heating power, the temperature of the region of the infrared electrothermal coating 111a drops from the first preset target temperature T1 to a second preset target temperature T2 and be kept at the second preset target temperature T2.

[0073] A duration of the period of t3 to t4 ranges from 30s to 50s, and in a specific example, may be 40s.

[0074] Generally, a difference between the first preset target temperature T1 and the second preset target temperature T2 ranges from 10°C to 30°C, and in a specific example, may be 20°C.

[0075] Similar to the period of t2 to t3, during the period of t3 to t4, the heating power provided by the power source is allocated to the two regions, namely, the infrared electrothermal coating 111a and the infrared electrothermal coating 111b.

[0076] Similar to the period of t2 to t3, during the period of t3 to t4, the power source may be controlled to provide smaller heating power, for example, heating power of about 5 W to 15 W, to the infrared electrothermal coating 111, so that the temperature of the region of the infrared electrothermal coating 111a can, under the allocated heating power, drop from the first preset target temperature T1 to the second preset target temperature T2 and be kept at the second preset target temperature T2.

[0077] Different from the period of t2 to t3, during the period of t3 to t4, a temperature change of the region of the infrared electrothermal coating 111b is approximately the same as that of the region of the infrared electrothermal coating under the allocated heating power and a temperature difference between the region of the infrared electrothermal coating 111a and the region of the infrared electrothermal coating 111b.

[0078] 5. During a period of t4 to t5, the power source is controlled to provide heating power to the infrared electrothermal coating 111a and the infrared electrothermal coating 111b simultaneously, so that under allocated heating power, the temperature of the region of the infrared electrothermal coating 111a drops from the second preset target temperature T2 to a third preset target temperature T3 and be kept at the third preset target temperature T3.

[0079] A duration of the period of t4 to t5 ranges from 30s to 200s, and

Generally, a difference between the second preset target temperature T2 and the third preset target temperature T3 ranges from 10°C to 20°C, and in a specific example, may be 15°C.

[0080] Similar to the period of t3 to t4, during the period of t4 to t5, the heating power provided by the power source is allocated to the region of the infrared electrothermal coating 111a and the region of the infrared electrothermal coating 111b.

[0081] Similar to the period of t3 to t4, during the period of t4 to t5, the power source may be controlled to provide smaller heating power, for example, heating power of about 5 W to 15 W, to the infrared electrothermal coating 111, so that the temperature of the region of the infrared electrothermal coating 111a can, under the allocated heating power, drop from the second preset target temperature T2 to the third preset target temperature T3 and be kept at the third preset target temperature T3.

[0082] Similar to the period of t3 to t4, during the period of t4 to t5, a temperature change of the region of the infrared electrothermal coating 111b is approximately the same as that of the region of the infrared electrothermal coating under the allocated heating power and a temperature difference between the region of the infrared electrothermal coating 111a and the region of the infrared electrothermal coating 111b.

[0083] It should be noted that, during the period of t4 to t5, the temperature difference between the region of the infrared electrothermal coating 111a and the region of the infrared electrothermal coating 111b depends on a resistance relationship between them. That is, if the two have the same resistance, there may be no temperature difference between the two; and if the two have different resistances, and a region with a smaller resistance is allocated with larger heating power, a temperature of the region with a smaller resistance is higher than a temperature of a region with a larger resistance. Based on this characteristic, in an actual operation process, an overall resistance of the infrared electrothermal coating 111b is reduced through the connecting electrode 112d and the connecting electrode 112e. On the one hand, it helps the infrared electrothermal coating 111b obtain larger heating power during the period of t4 to t5, so that a temperature of the infrared electrothermal coating 111b is higher than a temperature of the infrared electrothermal coating 111a, thereby avoiding, while keeping consistency of vaping, a problem that a vaping experience of the user is degraded due to generation of a smaller amount of aerosol within the period t4 of to t5. On the other hand, a time during which a part of the product corresponding to the infrared electrothermal coating 111b is heated is later than a time during which a part of the product corresponding to the infrared electrothermal coating 111a is heated. Reducing the overall resistance of the infrared electrothermal coating 111b through the connecting electrode 112d and the connecting electrode 112e can ensure that the part of the product corresponding to the infrared electrothermal coating 111b is fully heated, in other words, a waste caused by the part of the product being not fully heated can be avoided.

[0084] At the time point t5, an aerosol-generating product has been or is considered to be consumed. At this time point, the power source may be controlled to stop providing heating power to the infrared electrothermal coating 111. Further, prompt information can be generated to prompt the user to replace the aerosol-generating product or that the aerosol-generating product has been consumed. A prompting manner includes, but is not limited to, sound, light, vibration, and the like.

[0085] It should be noted that, a control curve shown in FIG. 8 can also be applied to other heating modes, for example, resistance heating, electromagnetic heating, and air heating.

[0086] It should be noted that, in another example, it is also feasible that there is no so-called temperature dropping trend during a period of t3 to t5. In this case, during the period of t3 to t5, the power source is controlled to provide heating power to the infrared electrothermal coating 111a and the infrared electrothermal coating 111b simultaneously, to always keep the temperature of the region of the infrared electrothermal coating 111a at the first preset target temperature T1.

[0087] FIG. 9 is a schematic diagram of an actual temperature curve of a heater according to an implementation of this application.

[0088] Based on the heater 11 exemplified in FIG. 3 and FIG. 4, the heater 11 is controlled by using the control curve shown in FIG. 8, then a real-time temperature of the region of the infrared electrothermal coating 111a and a real-time temperature of the region of the infrared electrothermal coating 111b are respectively measured by two temperature sensors (an existing temperature sensor exemplified in FIG. 3 and FIG. 4 may be used as the temperature sensor of the region of the infrared electrothermal coating 111a), and finally, a schematic diagram of a time-temperature curve is obtained.

[0089] As shown in FIG. 9, S1 is a schematic diagram of a time-temperature curve of the region of the infrared electrothermal coating 111a, and S2 is a schematic diagram of a time-temperature curve of the region of the infrared electrothermal coating 111b.

[0090] It should be noted that, the "control curve" indicates that the controller 32 controls, based on the curve, the heater 11 to work, and the "temperature curve" indicates a relationship between a temperature generated by the heater 11 during working and a time. The controller 32 may be a part of the circuit board 3, and includes, but is not limited to, an MCU.

[0091] During a period of 0s to 30s (corresponding to the control period of 0 to t2 in FIG. 8), the temperature of the region of the infrared electrothermal coating 111a rises from an initial temperature (about 28°C) to about 270°C. However, because the region of the infrared electrothermal coating 111b does not start heating, the temperature of the region of the infrared electrothermal coating 111b slowly rises to about 80°C under an effect of heat transfer.

[0092] During a period of 30s to 70s (corresponding to the control period of t2 to t3 in FIG. 8), because at a time point of 30s, both the infrared electrothermal coating 111b and the infrared electrothermal coating 111a start heating, the temperature of the region of the infrared electrothermal coating 111b rapidly rises. However, the temperature of the region of the infrared electrothermal coating 111a tends to be stabilized (slightly drop).

[0093] During a period of 70s to 110s (corresponding to the control period of t3 to t4 in FIG. 8), the temperature of the region of the infrared electrothermal coating 111a drops to 230°C, and a temperature change of a region of the infrared electrothermal coating 111b is approximately the same as a temperature change of a region of the infrared electrothermal coating 111a.

[0094] During a period of 110s to 240s (corresponding to the control period of t4 to t5 in FIG. 8), the temperature of the region of the infrared electrothermal coating 111a drops to 210°C, and a temperature change of a region of the infrared electrothermal coating 111b is also approximately the same as a temperature change of a region of the infrared electrothermal coating 111a. Then, the temperature of the region of the infrared electrothermal coating 111b and the temperature of the region of the infrared electrothermal coating 111a reach balance at about 140s. During a period of 140s to 240s, because a resistance of the infrared electrothermal coating 111b is smaller than a resistance of the infrared electrothermal coating 111a, the temperature of the region of the infrared electrothermal coating 111b is significantly higher than the temperature of the region of the infrared electrothermal coating 111a.

[0095] It should be noted that, the specification of this application and the accompanying drawings thereof illustrate preferred embodiments of this application. However, this application may be implemented in various different forms, and is not limited to the embodiments described in this specification. These embodiments are not intended to be an additional limitation on the content of this application, and are described for the purpose of providing a more thorough and comprehensive understanding of the content disclosed in this application. Moreover, the foregoing technical features are further combined to form various embodiments not listed above, and all such embodiments shall be construed as falling within the scope of this application. Further, a person of ordinary skill in the art may make improvements or modifications according to the foregoing description, and all of the improvements and modifications should all fall within the protection scope of the attached claims of this application.

Claims

1. An aerosol generation device, configured to heat an aerosol-forming substrate to generate an aerosol, the aerosol-generating substrate comprising a first part of aerosol-generating substrate and a second part of aerosol-generating substrate, **characterized in that** the aerosol generation device comprises:

   a power source;
   a heater, comprising a first heating region for

heating the first part of aerosol-forming substrate and a second heating region for heating the second part of aerosol-forming substrate; and

a controller, configured to:

control, during a first partial period of a control period of the heater, the power source to provide heating power only to the first heating region, to raise a temperature of the first heating region from an initial temperature to a first preset target temperature; and

control, during a remaining partial period of the control period of the heater, the power source to provide heating power to the first heating region and the second heating region simultaneously,

wherein a duration of the first partial period ranges from 10s to 30s.

2. The aerosol generation device according to claim 1, wherein the aerosol generation device has a mouthpiece end and a distal end opposite the mouthpiece end, wherein

the first part of aerosol-forming substrate is closer to the mouthpiece end relative to the second part of aerosol-forming substrate.

3. The aerosol generation device according to claim 1, wherein the first heating region and the second heating region are both independently controllable; or the first heating region is independently controllable, and the second heating region is not independently controllable.

4. The aerosol generation device according to claim 1, further comprising a temperature sensor, configured to measure temperature information of the first heating region, wherein

the controller is configured to control the heating power provided by the power source during the entire control period of the heater, based on the temperature information of the first heating region fed back by the temperature sensor.

5. The aerosol generation device according to claim **1,** wherein a start time point of the first partial period is a predetermined time point after the controller receives a start signal.

6. The aerosol generation device according to claim **1,** wherein the first partial period comprises a first duration and a second duration; and

the controller is configured to:

control, within the first duration, the power source to provide first heating power to the first heating region, to raise the temperature of the first heating region from the initial temperature to the first preset target temperature; and

control, within the second duration, the power source to provide second heating power to the first heating region, to maintain the temperature of the first heating region at the first preset target temperature,

wherein the second heating power is smaller than the first heating power.

7. The aerosol generation device according to claim **1,** wherein the remaining partial period comprises a third duration; and

the controller is configured to control, within the third duration, the power source to provide heating power to the first heating region and the second heating region simultaneously, to maintain the temperature of the first heating region at the first preset target temperature.

8. The aerosol generation device according to claim **1,** wherein the remaining partial period comprises a fourth duration; and

the controller is configured to control, within the fourth duration, the power source to provide heating power to the first heating region and the second heating region simultaneously, to cause the temperature of the first heating region to decrease from the first preset target temperature to a second preset target temperature and to maintain the second preset target temperature.

9. The aerosol generation device according to claim 8, wherein the remaining partial period comprises a fifth duration; and

the controller is configured to control, within the fifth duration, the power source to provide heating power to the first heating region and the second heating region simultaneously, to cause the temperature of the first heating region to first decrease from the first preset target temperature to a third preset target temperature and to maintain the third preset target temperature before decreasing to the second preset target temperature.

10. The aerosol generation device according to claim 8, wherein the remaining partial period comprises a time point at which the temperature of the first heating region and a temperature of the second heating region reach balance; and

a time point at which the temperature of the first heating region decreases to the second preset target temperature is earlier than the time point at which the temperature of the first heating region and the temperature of the second heating region reaches balance.

11. The aerosol generation device according to claim 1, wherein the remaining partial period comprises a sixth duration, wherein an end time point of the sixth duration is an end time point of the control period of the heater; and
the controller is configured to control, within the sixth duration, the power source to provide heating power to the first heating region and the second heating region simultaneously, to cause the temperature of the first heating region to be lower than a temperature of the second heating region.

12. The aerosol generation device according to claim 1, wherein the first heating region and the second heating region are configured to work in parallel during the remaining partial period, wherein
heating power provided by the power source in the remaining partial period is allocated to the first heating region and the second heating region based on a preset resistance relationship between the first heating region and the second heating region.

13. The aerosol generation device according to claim 12, wherein a resistance of the first heating region is greater than a resistance of the second heating region.

14. The aerosol generation device according to claim 1, wherein the heater comprises:

a base body;
an infrared electrothermal coating, arranged on a surface of the base body, the infrared electrothermal coating comprising a first infrared electrothermal coating defining or forming the first heating region and a second infrared electrothermal coating defining or forming the second heating region; and
a conductive element, comprising a first conductive electrode, a second conductive electrode, and a third conductive electrode arranged on the surface of the base body at intervals,
wherein the power source provides heating power to the first infrared electrothermal coating through the first conductive electrode and the third conductive electrode, and provides heating power to the second infrared electrothermal coating through the second conductive electrode and the third conductive electrode.

15. The aerosol generation device according to claim 14, wherein the conductive element further comprises at least one connecting electrode; and
the at least one connecting electrode is configured to separate the second infrared electrothermal coating into at least two infrared electrothermal sub-coatings connected in series between the second conductive electrode and the third conductive electrode.

16. A control method for an aerosol generation device, the aerosol generation device configured to heat an aerosol-forming substrate to generate an aerosol, and the aerosol generation device comprising a power source, a first heating region for heating a first part of aerosol-forming substrate, and a second heating region for heating a second part of aerosol-forming substrate, the aerosol-generating substrate comprising a first part of aerosol-generating substrate and a second part of aerosol-generating substrate, **characterized in that** the control method comprises:

controlling, during a first partial period of a control period of the heater, the power source to provide heating power only to the first heating region, to raise a temperature of the first heating region from an initial temperature to a first preset target temperature; and
controlling, during a remaining partial period of the control period of the heater, the power source to provide heating power to the first heating region and the second heating region simultaneously,
wherein a duration of the first partial period ranges from 10s to 30s.

17. A method for generating an aerosol from an aerosol-generating substrate using an aerosol generation device,

the aerosol-generating substrate comprising a first part of aerosol-generating substrate and a second part of aerosol-generating substrate, and the aerosol generation device comprising a first heating region for heating a first part of aerosol-forming substrate and a second heating region for heating a second part of aerosol-forming substrate,
characterized in that the method comprises:

during a first partial period of a control period of the heater, causing the first heating region to start heating and raise its temperature from an initial temperature to a first preset target temperature, and causing the second heating region not to start heating; and
during a remaining partial period of the control period of the heater, causing the first heating region and the second heating region to start heating simultaneously,
wherein a duration of the first partial period ranges from 10s to 30s.

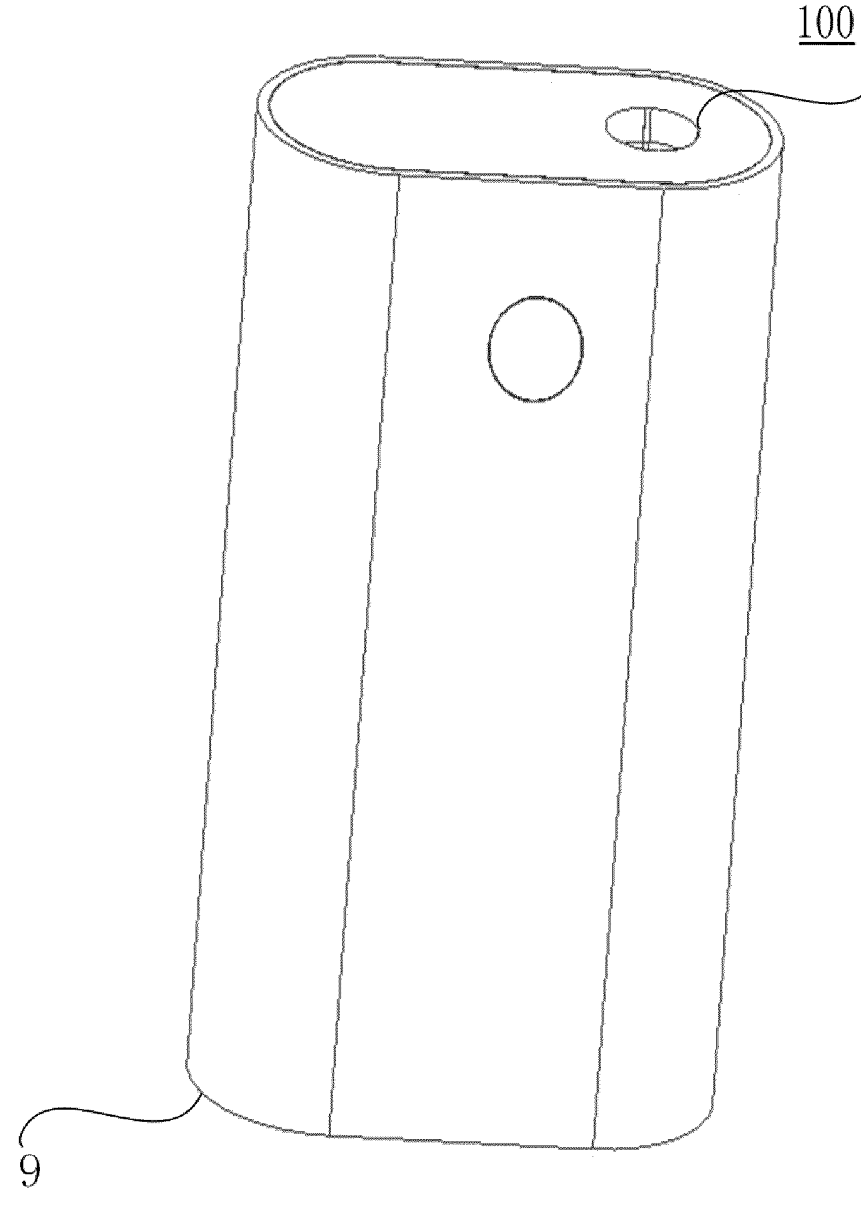

FIG. 1

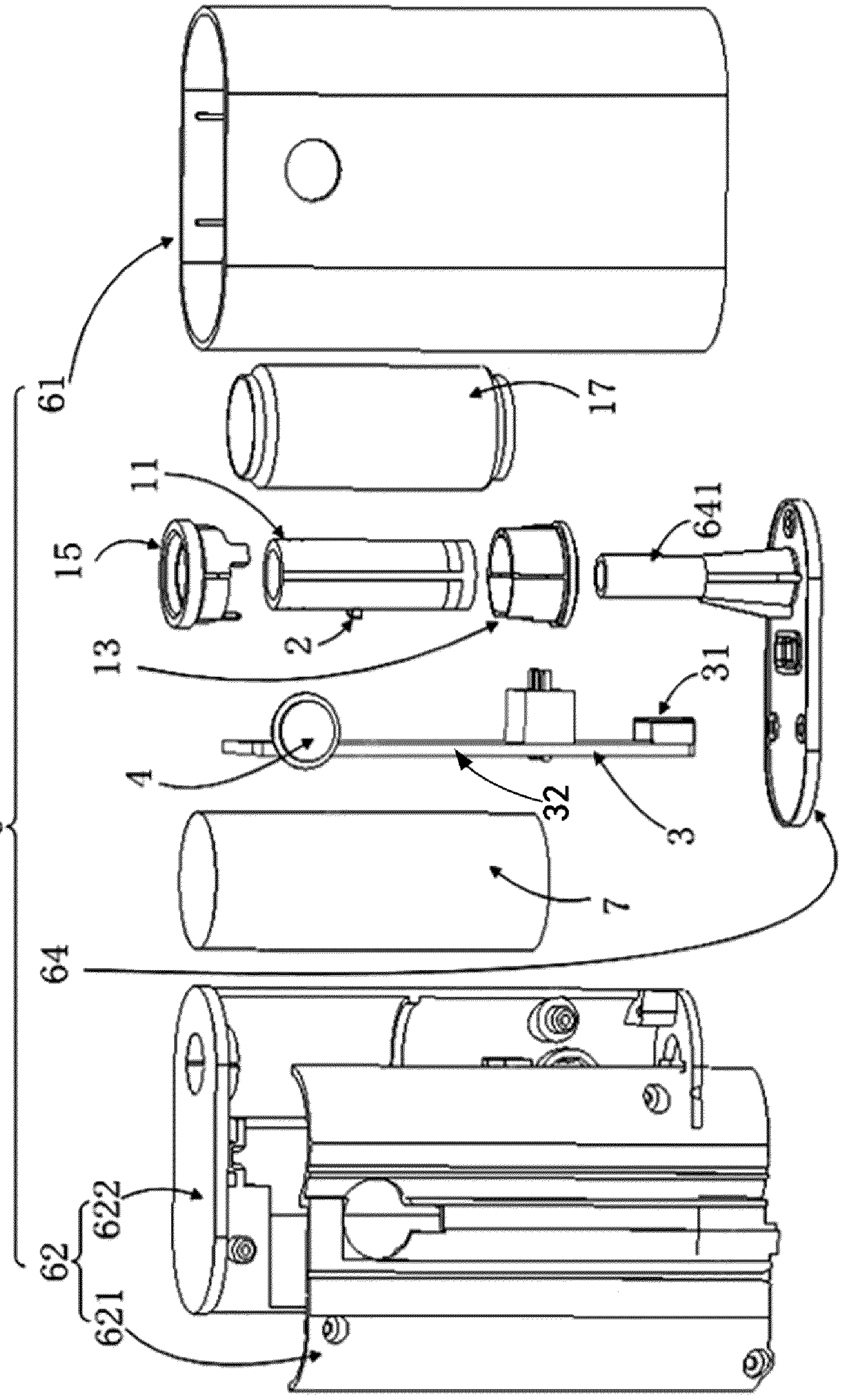

FIG. 2

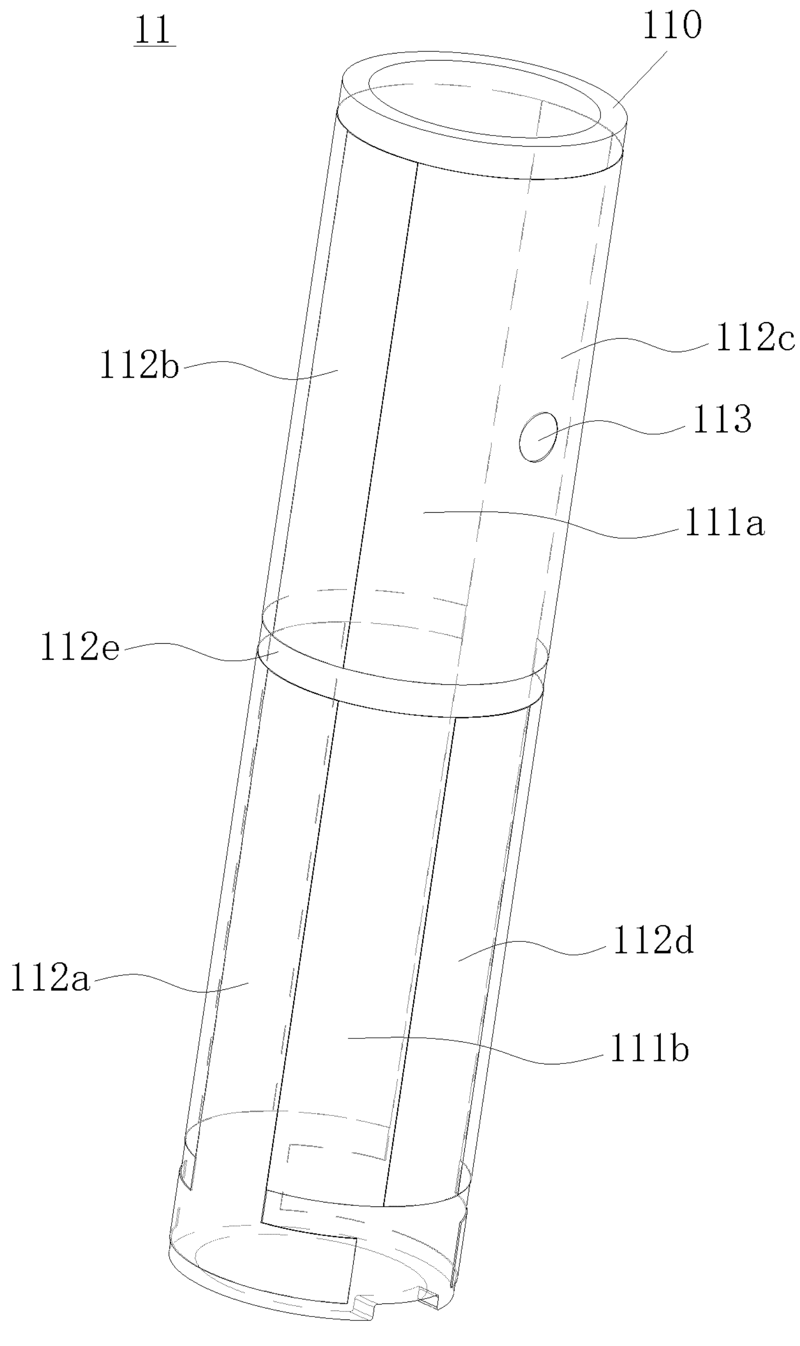

FIG. 3

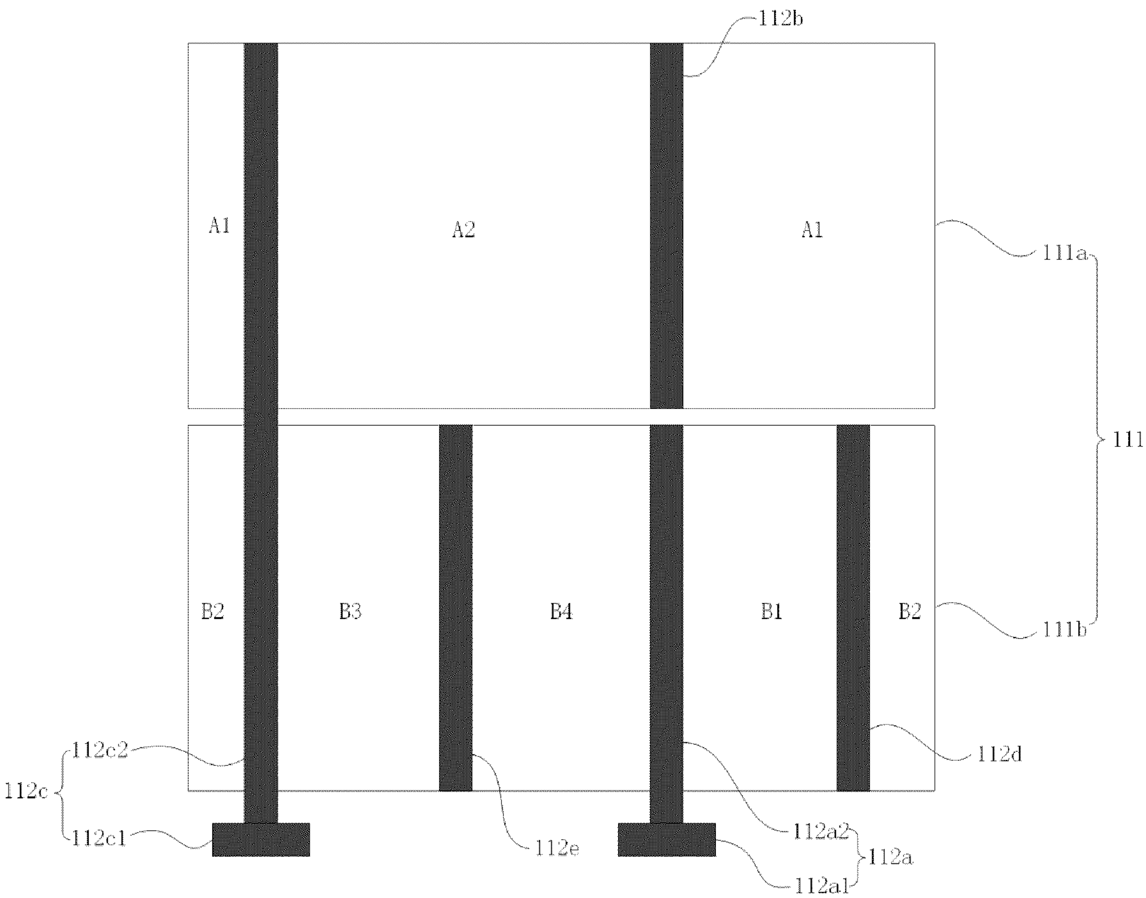
112b
A1
A2
A1
111a
111
B2
B3
B4
B1
B2
111b
112c2
112c
112c1
112d
112e
112a2
112a
112a1

FIG. 4

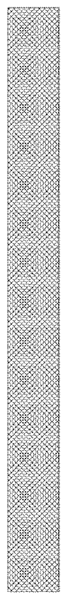

FIG. 5

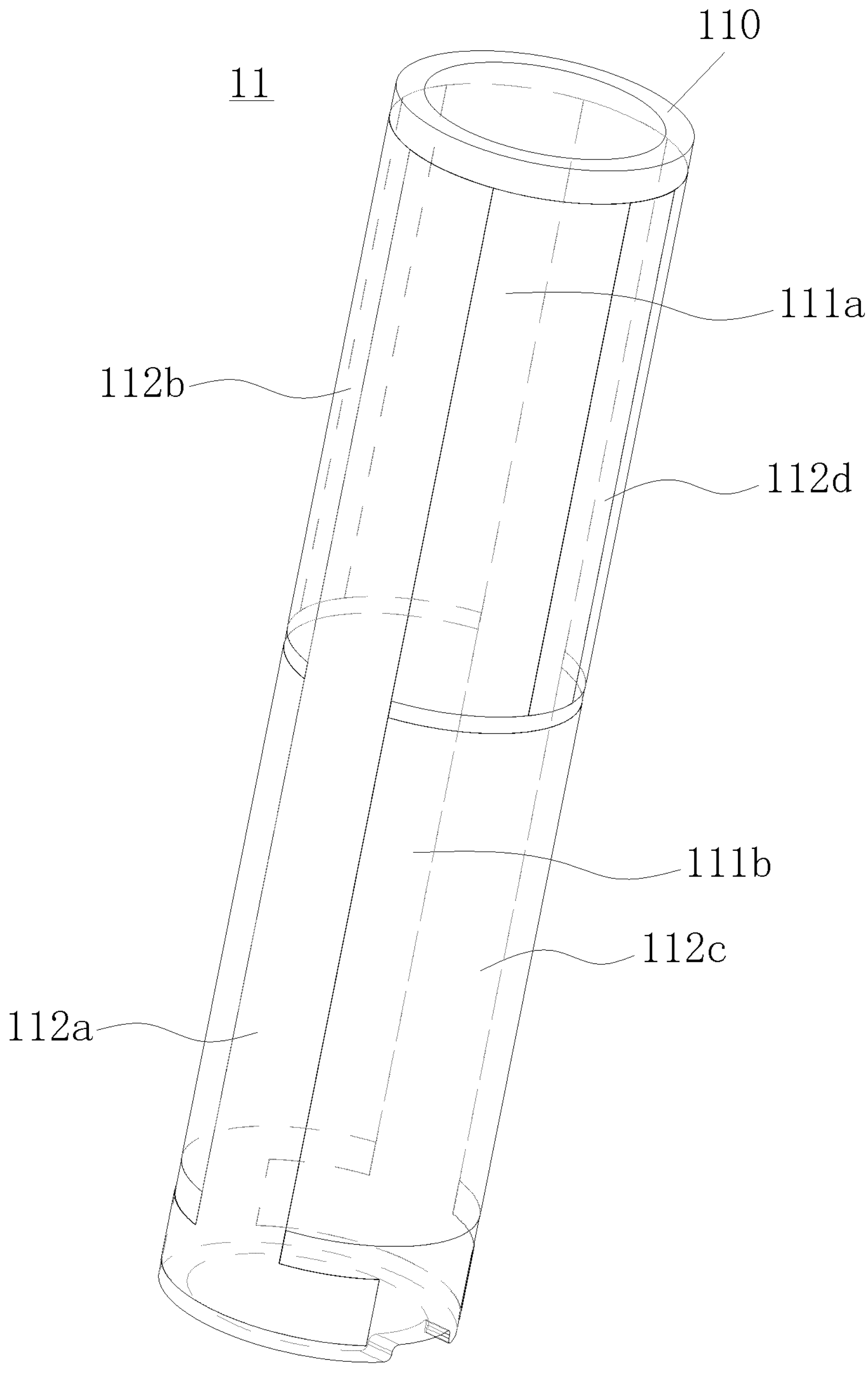

FIG. 6

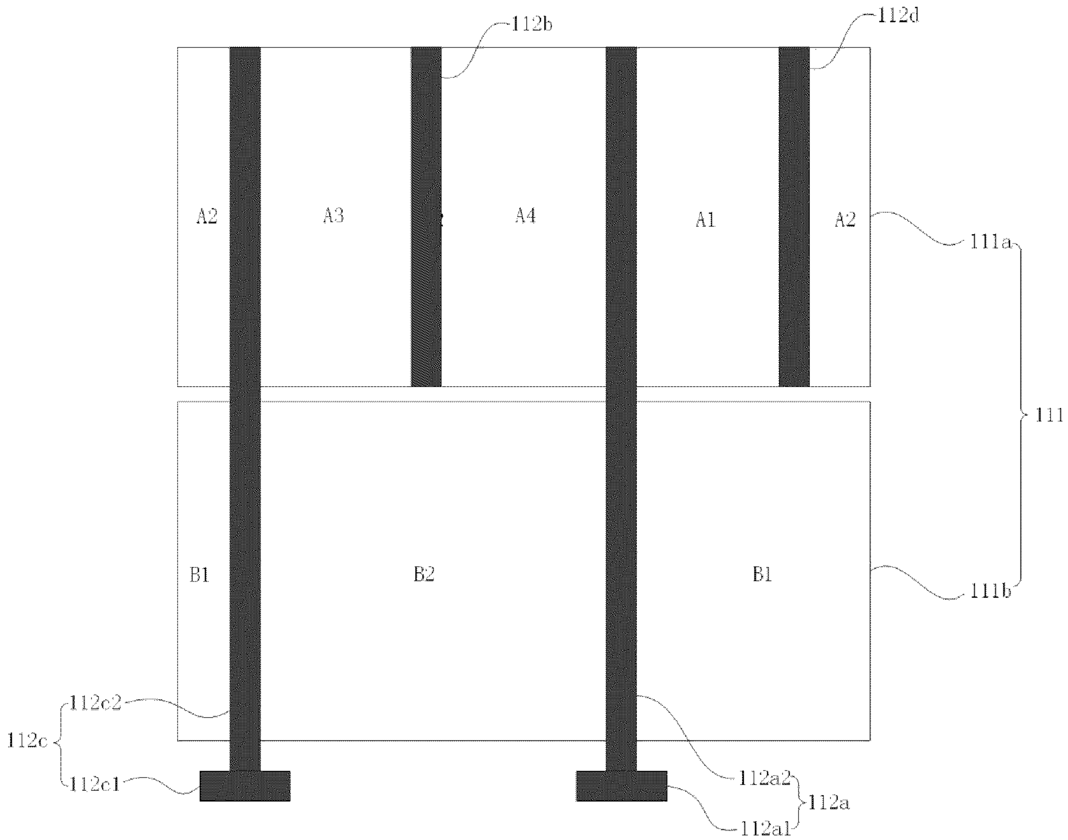
112b
112d
A2
A3
A4
A1
A2
111a
111
B1
B2
B1
111b
112c2
112c
112c1
112a2
112a
112a1

FIG. 7

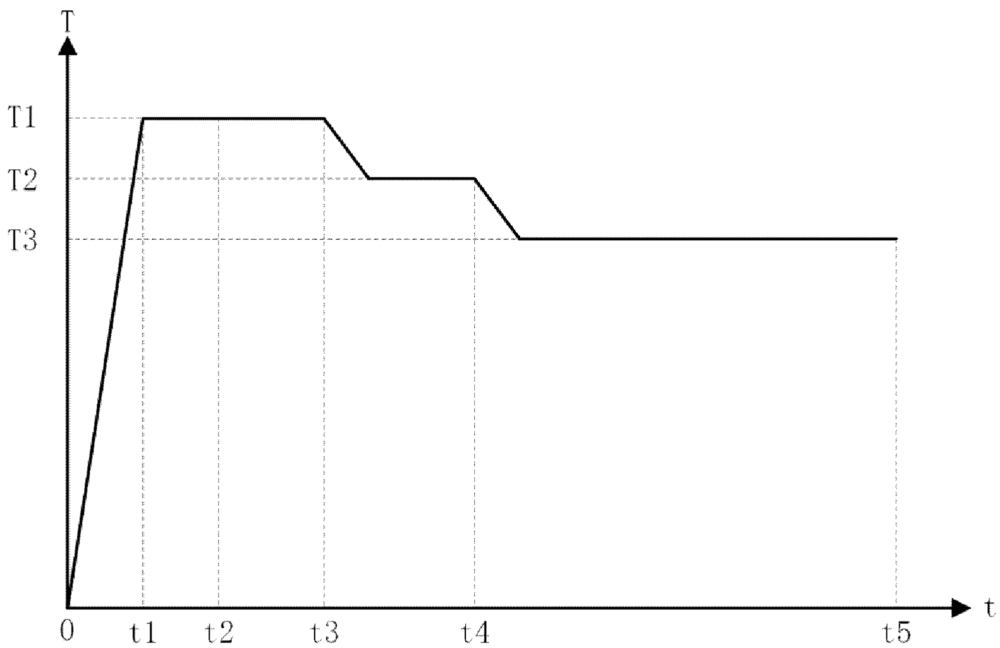
T
T1
T2
T3
0
t1
t2
t3
t4
t5
t

FIG. 8

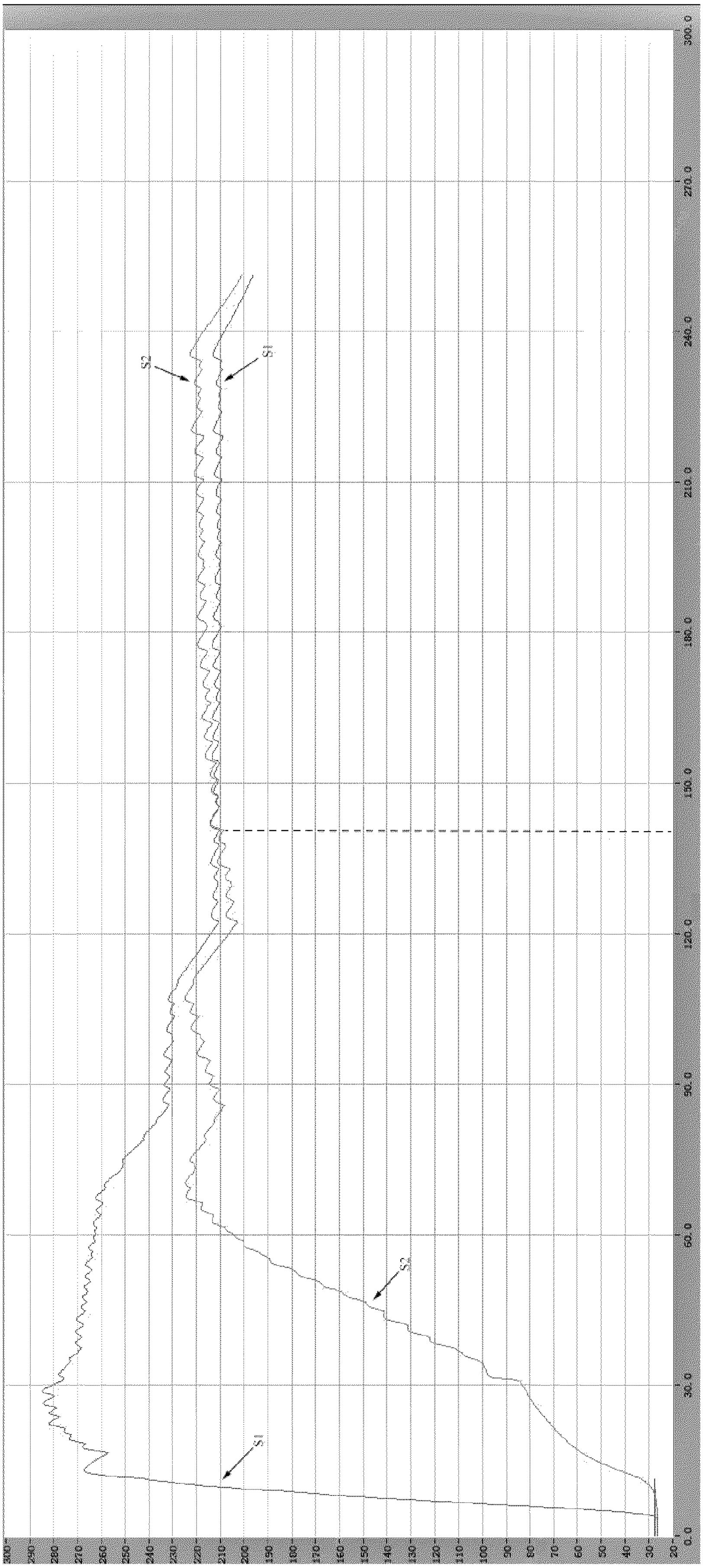

FIG. 9

INTERNATIONAL SEARCH REPORT

International application No. **PCT/CN2023/108641**

A. CLASSIFICATION OF SUBJECT MATTER

A24F40/10(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)

WPABS; CNTXT; ENTXT; VEN; CNKI; 万方, WANFANG; 读秀, DUXIU; ISI Web of Knowledge; Elsevier Science; ACS; RSC: 加热, 发热, 生热, 产热, 加温, 升温, 电热, 受热, 热受, 红外, 导热, 热, 热辐射, 功率, heat+, warm+, therm+, hot, IR, infra+, radiat+, power

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 109496129 A (BRITISH AMERICAN TOBACCO (INVESTMENTS) LTD.) 19 March 2019 (2019-03-19) description, paragraphs 62-121, and figure 1	1-17
X	CN 113712280 A (BRITISH AMERICAN TOBACCO INVESTMENTS LTD.) 30 November 2021 (2021-11-30) description, paragraphs 63-122, and figure 1	1-17
X	CN 103596458 A (BRITISH AMERICAN TOBACCO (INVESTMENTS) LTD.) 19 February 2014 (2014-02-19) description, paragraphs 28-72, and figures 1-9	1-17
X	CN 103763953 A (BRITISH AMERICAN TOBACCO (INVESTMENTS) LTD.) 30 April 2014 (2014-04-30) description, paragraphs 30-73, and figures 1-9	1-17
X	CN 103826482 A (BRITISH AMERICAN TOBACCO (INVESTMENTS) LTD.) 28 May 2014 (2014-05-28) description, paragraphs 32-82, and figures 1-9	1-17

☑ 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
22 October 2023	**24 October 2023**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088**	Authorized officer Telephone No.

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/108641

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 105188427 A (BRITISH AMERICAN TOBACCO (INVESTMENTS) LTD.) 23 December 2015 (2015-12-23) description, paragraph 50, and figures 2-5	1-17
X	CN 106213591 A (BRITISH AMERICAN TOBACCO (INVESTMENTS) LTD.) 14 December 2016 (2016-12-14) description, paragraphs 33-83, and figures 1-9	1-17
X	CN 106307620 A (BRITISH AMERICAN TOBACCO (INVESTMENTS) LTD.) 11 January 2017 (2017-01-11) description, paragraphs 33-83, and figures 1-9	1-17
X	CN 108783602 A (WEITAO ELECTRONIC TECHNOLOGY (SHENZHEN) CO., LTD.) 13 November 2018 (2018-11-13) description, paragraphs 37-94, and figure 1	1-17
X	CN 109076650 A (BRITISH AMERICAN TOBACCO (INVESTMENTS) LTD.) 21 December 2018 (2018-12-21) description, paragraphs 30-58, and figures 1-4	1-17
X	CN 109561733 A (BRITISH AMERICAN TOBACCO (INVESTMENTS) LTD.) 02 April 2019 (2019-04-02) description, paragraphs 26-106, and figures 1-13	1-17
X	CN 109788801 A (BRITISH AMERICAN TOBACCO (INVESTMENTS) LTD.) 21 May 2019 (2019-05-21) description, paragraphs 27-93, and figures 1-12	1-17
X	CN 112021674 A (ANDRES TANG SEBASTIAN) 04 December 2020 (2020-12-04) description, paragraphs 47-79, and figures 4-5	1-17
X	CN 112218554 A (PHILIP MORRIS PRODUCTS S.A.) 12 January 2021 (2021-01-12) description, paragraphs 58-72, and figures 1-2	1-17
X	CN 112335940 A (SHENZHEN FIRST UNION TECHNOLOGY CO., LTD.) 09 February 2021 (2021-02-09) description, paragraphs 96-126, and figure 6	1-17
X	CN 113891660 A (BRITISH AMERICAN TOBACCO INVESTMENTS LTD.) 04 January 2022 (2022-01-04) description, paragraphs 24-158, and figures 7-10	1-17
X	WO 2021105483 A1 (NICOVENTURES TRADING LTD.) 03 June 2021 (2021-06-03) description, pp. 6-24, and figures 1-4	1-17
X	WO 2022043698 A1 (NICOVENTURES TRADING LTD.) 03 March 2022 (2022-03-03) description, pp. 3-23, and figures 5-7	1-17
A	KR 20180125852 A (LEE CHUNG EON) 26 November 2018 (2018-11-26) entire document	1-17

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2023/108641

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 109496129 A	19 March 2019	EP 3868231 A2	25 August 2021
		EP 3868231 A3	03 November 2021
		RU 2020111196 A	18 May 2020
		US 2019159517 A1	30 May 2019
		US 11141548 B2	12 October 2021
		KR 20230093380 A	27 June 2023
		MY 192847 A	12 September 2022
		ES 2871999 T3	02 November 2021
		MX 2019001149 A	10 June 2019
		CA 3158386 A1	01 February 2018
		EP 3490395 A1	05 June 2019
		EP 3490395 B1	21 April 2021
		AR 109139 A1	31 October 2018
		KR 20190021439 A	05 March 2019
		KR 102284091 B1	29 July 2021
		BR 112019001744 A2	07 May 2019
		US 2022001120 A1	06 January 2022
		JP 2019526237 A	19 September 2019
		JP 6888763 B2	16 June 2021
		CA 3031703 A1	01 February 2018
		CA 3031703 C	12 July 2022
		WO 2018019855 A1	01 February 2018
		AU 2017301985 A1	07 February 2019
		AU 2017301985 B2	30 January 2020
		RU 2718354 C1	02 April 2020
		KR 20210095744 A	02 August 2021
		CL 2019000182 A1	07 June 2019
		PL 3490395 T3	08 November 2021
		UA 125626 C2	04 May 2022
		TW 201804920 A	16 February 2018
		GB 201612945 D0	07 September 2016
		PH 12019500155 A1	21 October 2019
CN 113712280 A	30 November 2021	EP 3868231 A2	25 August 2021
		EP 3868231 A3	03 November 2021
		RU 2020111196 A	18 May 2020
		US 2019159517 A1	30 May 2019
		US 11141548 B2	12 October 2021
		KR 20230093380 A	27 June 2023
		MY 192847 A	12 September 2022
		ES 2871999 T3	02 November 2021
		MX 2019001149 A	10 June 2019
		CA 3158386 A1	01 February 2018
		EP 3490395 A1	05 June 2019
		EP 3490395 B1	21 April 2021
		AR 109139 A1	31 October 2018
		KR 20190021439 A	05 March 2019
		KR 102284091 B1	29 July 2021
		BR 112019001744 A2	07 May 2019
		US 2022001120 A1	06 January 2022
		JP 2019526237 A	19 September 2019

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2023/108641

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
		JP 6888763 B2	16 June 2021
		CA 3031703 A1	01 February 2018
		CA 3031703 C	12 July 2022
		WO 2018019855 A1	01 February 2018
		AU 2017301985 A1	07 February 2019
		AU 2017301985 B2	30 January 2020
		RU 2718354 C1	02 April 2020
		KR 20210095744 A	02 August 2021
		CL 2019000182 A1	07 June 2019
		PL 3490395 T3	08 November 2021
		UA 125626 C2	04 May 2022
		TW 201804920 A	16 February 2018
		GB 201612945 D0	07 September 2016
		PH 12019500155 A1	21 October 2019
CN 103596458 A	19 February 2014	JP 2014518095 A	28 July 2014
		US 2014360515 A1	11 December 2014
		US 10729176 B2	04 August 2020
		WO 2013034454 A1	14 March 2013
		JP 2016073309 A	12 May 2016
		JP 6265966 B2	24 January 2018
		EP 2753200 A1	16 July 2014
		EP 2753200 B1	27 December 2017
		JP 2018029613 A	01 March 2018
		JP 6503438 B2	17 April 2019
		RU 2013155697 A	20 October 2015
		RU 2614615 C2	28 March 2017
CN 103763953 A	30 April 2014	MY 164560 A	15 January 2018
		BR 112013032558 A2	24 January 2017
		BR 112013032558 B1	12 January 2021
		AU 2012306504 A1	16 January 2014
		AU 2012306504 B2	20 August 2015
		PL 2753202 T3	30 November 2016
		KR 20190022908 A	06 March 2019
		KR 102060691 B1	11 February 2020
		JP 2014518096 A	28 July 2014
		JP 5808490 B2	10 November 2015
		KR 20200000467 A	02 January 2020
		KR 102196913 B1	30 December 2020
		AR 088436 A1	11 June 2014
		KR 20200143532 A	23 December 2020
		KR 102309513 B1	05 October 2021
		WO 2013034459 A1	14 March 2013
		US 2021068460 A1	11 March 2021
		US 11672279 B2	13 June 2023
		UA 111622 C2	25 May 2016
		UA 110646 C2	25 January 2016
		US 2014202476 A1	24 July 2014
		KR 20140068807 A	09 June 2014
		KR 101953201 B1	28 February 2019
		US 2021401048 A1	30 December 2021

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2023/108641

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
		CA 2839099 A1	14 March 2013
		CA 2839099 C	28 June 2016
		HK 1194630 A1	24 October 2014
		RU 2013155701 A	27 November 2015
		RU 2595971 C2	27 August 2016
		EP 2753202 A1	16 July 2014
		EP 2753202 B1	27 April 2016
CN 103826482 A	28 May 2014	UA 117923 C2	25 October 2018
		CA 2839806 A1	14 March 2013
		CA 2839806 C	08 January 2019
		KR 20200004440 A	13 January 2020
		KR 102174891 B1	05 November 2020
		RU 2018135854 A	10 April 2020
		RU 2018135854 A3	27 December 2021
		UA 111846 C2	24 June 2016
		MY 194229 A	23 November 2022
		BR 122016030996 A2	27 August 2019
		BR 112013032671 A2	24 January 2017
		BR 112013032671 B1	15 December 2020
		KR 20200128182 A	11 November 2020
		JP 2023024672 A	16 February 2023
		PL 2753204 T3	31 August 2016
		US 2016088875 A1	31 March 2016
		US 9554598 B2	31 January 2017
		MY 168756 A	04 December 2018
		UA 122162 C2	25 September 2020
		US 2017095006 A1	06 April 2017
		JP 2020184998 A	19 November 2020
		EP 4242508 A2	13 September 2023
		WO 2013034458 A1	14 March 2013
		JP 2016178937 A	13 October 2016
		EP 3033954 A1	22 June 2016
		EP 3033954 B1	23 August 2023
		RU 2013156469 A	20 October 2015
		RU 2606069 C2	10 January 2017
		KR 20140068808 A	09 June 2014
		US 2014270726 A1	18 September 2014
		US 9357803 B2	07 June 2016
		AU 2012306503 A1	16 January 2014
		AU 2012306503 B2	28 January 2016
		GB 201207054 D0	06 June 2012
		HUE 027407 T2	28 October 2016
		RU 2675712 C1	24 December 2018
		RU 2675712 C9	15 April 2019
		JP 2014520542 A	25 August 2014
		JP 6014132 B2	25 October 2016
		CL 2013003637 A1	25 July 2014
		ES 2570931 T3	23 May 2016
		JP 2022132557 A	08 September 2022
		EP 2753204 A1	16 July 2014

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2023/108641

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
		EP 2753204 B1	10 February 2016
		RU 2640438 C1	09 January 2018
		RU 2640438 C9	11 April 2018
		RU 2020135861 A	05 April 2021
		RU 2020135861 A3	13 April 2021
		RU 2766196 C2	09 February 2022
		HK 1194629 A1	24 October 2014
		AR 088435 A1	11 June 2014
		JP 2018166513 A	01 November 2018
		JP 6736608 B2	05 August 2020
		KR 20190040079 A	16 April 2019
		KR 102100245 B1	15 May 2020
		MX 2013014949 A	16 April 2014
		MX 355927 B	27 April 2018
CN 105188427 A	23 December 2015	CA 2904776 A1	25 September 2014
		CA 2904776 C	23 April 2019
		US 2016044963 A1	18 February 2016
		ES 2718686 T3	03 July 2019
		EP 2975951 A1	27 January 2016
		EP 2975951 B1	05 December 2018
		EP 3494815 A1	12 June 2019
		EP 3494815 B1	23 August 2023
		KR 20180003648 A	09 January 2018
		KR 20230021163 A	13 February 2023
		JP 2023071714 A	23 May 2023
		KR 20150119425 A	23 October 2015
		UA 116128 C2	12 February 2018
		AR 095701 A1	04 November 2015
		GB 201305294 D0	01 May 2013
		GB 2515992 A	14 January 2015
		TR 201903327 T4	22 April 2019
		WO 2014147114 A1	25 September 2014
		JP 2018029596 A	01 March 2018
		AU 2014234390 A1	24 September 2015
		AU 2014234390 B2	27 October 2016
		CA 3033618 A1	25 September 2014
		BR 112015024250 A2	18 July 2017
		JP 2021019636 A	18 February 2021
		KR 20210084703 A	07 July 2021
		KR 102450286 B1	30 September 2022
		HK 1220584 A1	12 May 2017
		JP 2020039363 A	19 March 2020
		JP 7193208 B2	20 December 2022
		RU 2015140135 A	27 March 2017
		RU 2647773 C2	19 March 2018
		MY 172066 A	13 November 2019
		PL 2975951 T3	31 May 2019
		JP 2016512703 A	09 May 2016
		KR 20200057121 A	25 May 2020
		KR 102494679 B1	31 January 2023

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2023/108641

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
		US 2021170116 A1	10 June 2021
		EP 3799738 A1	07 April 2021
		HUE 043731 T2	30 September 2019
CN 106213591 A	14 December 2016	None	
CN 106307620 A	11 January 2017	None	
CN 108783602 A	13 November 2018	None	
CN 109076650 A	21 December 2018	RU 2704113 C1	24 October 2019
		AR 108476 A1	22 August 2018
		WO 2017194769 A1	16 November 2017
		EP 3869908 A1	25 August 2021
		JP 2022130578 A	06 September 2022
		JP 2019518430 A	04 July 2019
		JP 6833157 B2	24 February 2021
		US 2020253280 A1	13 August 2020
		PL 3456150 T3	23 August 2021
		HUE 054675 T2	28 September 2021
		JP 2021048844 A	01 April 2021
		ES 2871880 T3	02 November 2021
		EP 3456150 A1	20 March 2019
		EP 3456150 B1	05 May 2021
		TW 201740827 A	01 December 2017
CN 109561733 A	02 April 2019	RU 2705639 C1	11 November 2019
		ES 2808027 T3	25 February 2021
		KR 20190022793 A	06 March 2019
		KR 102317770 B1	25 October 2021
		EP 3490394 A1	05 June 2019
		EP 3490394 B1	03 June 2020
		ZA 201900304 B	23 December 2020
		CL 2019000179 A1	07 June 2019
		BR 112019001662 A2	28 May 2019
		BR 112019001662 B1	17 January 2023
		AR 109120 A1	31 October 2018
		KR 20210130256 A	29 October 2021
		KR 102454929 B1	13 October 2022
		UA 124467 C2	22 September 2021
		JP 2019531049 A	31 October 2019
		JP 6833159 B2	24 February 2021
		TW 201808124 A	16 March 2018
		PH 12019500055 A1	07 October 2019
		CA 3031709 A1	01 February 2018
		CA 3031709 C	11 May 2021
		WO 2018019786 A1	01 February 2018
		AU 2017301840 A1	24 January 2019
		AU 2017301840 B2	30 January 2020
		MX 2019001150 A	10 June 2019
		PL 3490394 T3	14 December 2020
		HUE 051428 T2	01 March 2021
		US 2019166918 A1	06 June 2019
		US 11235109 B2	01 February 2022

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2023/108641

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 109788801 A	21 May 2019	WO 2018054793 A1	29 March 2018
		PL 3515219 T3	13 March 2023
		EP 3515219 A1	31 July 2019
		EP 3515219 B1	16 November 2022
		EP 4173507 A1	03 May 2023
		JP 2019528737 A	17 October 2019
		JP 6838784 B2	03 March 2021
		US 2021274854 A1	09 September 2021
		US 11602173 B2	14 March 2023
		US 2023157364 A1	25 May 2023
		RU 2709939 C1	23 December 2019
CN 112021674 A	04 December 2020	None	
CN 112218554 A	12 January 2021	JP 2021525539 A	27 September 2021
		WO 2019234143 A1	12 December 2019
		US 2021235762 A1	05 August 2021
		EP 3801088 A1	14 April 2021
		EP 3801088 B1	25 May 2022
		KR 20210018424 A	17 February 2021
CN 112335940 A	09 February 2021	None	
CN 113891660 A	04 January 2022	IL 287922 A	01 January 2022
		AU 2020281950 A1	02 December 2021
		CA 3141981 A1	03 December 2020
		GB 201907702 D0	17 July 2019
		US 2022151297 A1	19 May 2022
		WO 2020239987 A1	03 December 2020
		EP 3975768 A1	06 April 2022
		JP 2022534286 A	28 July 2022
		KR 20220013576 A	04 February 2022
		BR 112021023813 A2	04 January 2022
WO 2021105483 A1	03 June 2021	JP 2023505080 A	08 February 2023
		GB 201917476 D0	15 January 2020
		KR 20220121788 A	01 September 2022
		US 2023012023 A1	12 January 2023
		EP 4064895 A1	05 October 2022
		AR 120588 A1	23 February 2022
WO 2022043698 A1	03 March 2022	JP 2023538513 A	08 September 2023
		KR 20230054878 A	25 April 2023
		GB 202013412 D0	14 October 2020
		EP 4203719 A1	05 July 2023
KR 20180125852 A	26 November 2018	None	

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

REFERENCES CITED IN THE DESCRIPTION

Patent documents cited in the description

- CN 202210872754 **[0001]**