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

(11) EP 4 399 982 A1

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

(43) Date of publication:
17.07.2024 Bulletin 2024/29

(21) Application number: **22866723.4**

(22) Date of filing: **08.09.2022**

(51) International Patent Classification (IPC):
A24F 40/20 *(2020.01)* ***A24F 40/53*** *(2020.01)*
A24F 40/465 *(2020.01)* ***A24D 1/20*** *(2020.01)*

(52) Cooperative Patent Classification (CPC):
A24D 1/20; A24F 40/20; A24F 40/40; A24F 40/46; A24F 40/465; A24F 40/50; A24F 40/53

(86) International application number:
PCT/CN2022/117905

(87) International publication number:
WO 2023/036262 (16.03.2023 Gazette 2023/11)

(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 MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **08.09.2021 CN 202111048301**

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

(72) Inventors:
- **WANG, Kuan**
  Shenzhen, Guangdong 518000 (CN)
- **XU, Zhongli**
  Shenzhen, Guangdong 518000 (CN)
- **LI, Yonghai**
  Shenzhen, Guangdong 518000 (CN)

(74) Representative: **Proi World Intellectual Property GmbH**
Obermattweg 12
6052 Hergiswil, Kanton Nidwalden (CH)

(54) **AEROSOL GENERATION DEVICE AND CONTROL METHOD THEREFOR**

(57) An aerosol generation device and a control method therefor are provided. The aerosol generation device includes: a chamber (A), configured to removably receive an aerosol generation article (40) including a magnetic material (43); a heater (10), configured to heat the aerosol generation article (40) received in the chamber (A) to generate an aerosol; a detection circuit (32), including a capacitor (C2) connected in series with the heater (10); and a controller (31), configured to control the detection circuit (32) to have a direct current flowing therethrough, and determine, based on a duration for which a potential difference between two ends of the capacitor (C2) reaches a preset potential difference threshold, that the aerosol generation article (40) is received in the chamber (A) or the aerosol generation article (40) is removed from the chamber (A). The device determines, based on the duration for which the potential difference between the two ends of the capacitor (C2) reaches the preset potential difference threshold, whether the aerosol generation article (40) is inserted into the heating chamber (A), and then controls an action of the heater (10). The implementation mode is simple, and user experience is improved.

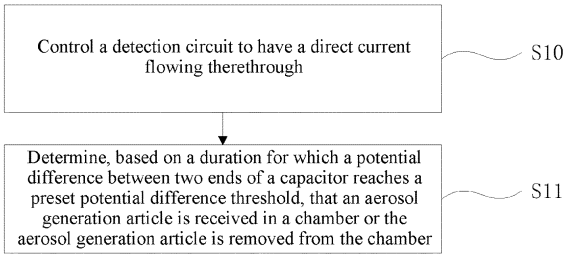

FIG. 5

EP 4 399 982 A1

Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to Chinese Patent Application No. 202111048301.8, filed with the China National Intellectual Property Administration on September 8, 2021 and entitled "AEROSOL GENERATION DEVICE AND CONTROL METHOD THEREFOR", which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] This application relates to the field of cigarette devices, and in particular, to an aerosol generation device and a control method therefor.

BACKGROUND

[0003] During use of smoking articles such as cigarettes or cigars, tobacco is burnt to produce smoke. An attempt has been made to provide substitutes for these tobacco-burning articles by producing products that release compounds without burning. An example of the products is a heat-not-burn product, which releases compounds by heating tobacco rather than burning the tobacco.

[0004] The patent document with the Publication No. CN111511233A discloses an aerosol generation device and an operation method therefor. An electromagnetic inductor is arranged in a cigarette, and a detector having a coil is arranged in the aerosol generation device. Electromagnetic induction may occur between the coil and the electromagnetic inductor, so that a characteristic change of a current generated by the electromagnetic induction and flowing through the coil may be detected, and an insertion state of the cigarette into the aerosol generation device may be determined.

SUMMARY

[0005] This application is intended to provide an aerosol generation device and a control method therefor different from an existing cigarette insertion detection method.

[0006] An aspect of this application provides an aerosol generation device, including:

a chamber, configured to removably receive an aerosol generation article including a magnetic material;
a heater, configured to heat the aerosol generation article received in the chamber to generate an aerosol;
a detection circuit, including a capacitor connected in series with the heater; and
a controller, configured to control the detection circuit to have a direct current flowing therethrough, and determine, based on a duration for which a potential difference between two ends of the capacitor reaches a preset potential difference threshold, that the aerosol generation article is received in the chamber or the aerosol generation article is removed from the chamber. Another aspect of this application provides a control method for an aerosol generation device. The aerosol generation device includes a chamber, a heater, and a detection circuit. The detection circuit includes a capacitor connected in series with the heater. The method includes:
controlling the detection circuit to have a direct current flowing therethrough; and
determining, based on the duration for which the potential difference between the two ends of the capacitor reaches the preset potential difference threshold, that the aerosol generation article is received in the chamber or the aerosol generation article is removed from the chamber.

[0007] According to the aerosol generation device and the control method therefor provided in this application, it is determined, based on the duration for which the potential difference between the two ends of the capacitor reaches the preset potential difference threshold, whether a cigarette is inserted into the heating chamber, and then an action of the heater is controlled. The implementation mode is simple, and user experience is improved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] 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 a limitation on the embodiments. Elements in the accompanying drawings that have same reference numerals are represented as similar elements, and unless otherwise particularly stated, the figures in the accompanying drawings are not drawn to scale.

FIG. 1 is a schematic diagram of an aerosol generation device according to an implementation of this application.
FIG. 2 is a schematic diagram of an aerosol generation article according to an implementation of this application.
FIG. 3 is a schematic diagram of a controller according to an implementation of this application.
FIG. 4 is a schematic diagram of a detection circuit and a switch transistor circuit according to an implementation of this application.
FIG. 5 is a schematic diagram of a control method for an aerosol generation device according to an implementation of this application.
FIG. 6 is a schematic diagram of a control process of an aerosol generation device according to an implementation of this application.

DETAILED DESCRIPTION

[0009] For ease of understanding of this application, this application is described below in more detail with reference to the 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 one 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.

[0010] Unless otherwise defined, meanings of all technical and scientific terms used in this specification are the same as that usually understood by a person skilled in the technical field 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. A term "and/or" used in this specification includes any or all combinations of one or more related listed items.

[0011] FIG. 1 is a schematic diagram of an aerosol generation device according to an implementation of this application. The aerosol generation device includes:

a chamber A, where an aerosol generation article 40 is removably received in the chamber A;
a heater 10, where when the aerosol generation article 40 is received in the chamber A, the heater 10 is inserted into the aerosol generation article 40 for heating to generate an aerosol;
a battery core 20, configured to supply power; and
a circuit board 30, arranged between the battery core 20 and the heater 10. Various circuits are integrated on the circuit board 30 to control the aerosol generation device. For example, the battery core 20 is controlled to supply power to the heater 10.

[0012] The aerosol generation article 40 is preferably made of a tobacco-containing material that releases a volatile compound from a substrate when being heated, or a non-tobacco material suitable for electric heating to smoke after being heated. The aerosol generation article 40 is preferably made of a solid substrate, which may include one or more of powder, particles, fragments, strips, or sheets of one or more of vanilla leaves, tobacco leaves, homogeneous tobacco, and expanded tobacco. Alternatively, the solid substrate may include additional tobacco or non-tobacco volatile aroma compounds to be released when the substrate is heated. In some examples, the aerosol generation article 40 includes a liquid substrate, or a carrier carrying the liquid substrate, or a container carrying the liquid substrate.

[0013] It should be noted that, heating methods of the heater 10 include, but are not limited to, resistive heating, electromagnetic heating, and infrared heating. In an exemplary embodiment, a shape of the heater 10 includes, but is not limited to, a needle, a pin, a tube, or a sheet.

[0014] It should be further noted that, unlike the example of FIG. 1, in another example, it is also feasible that the heater 10 is constructed to heat around at least part of the aerosol generation article 40, commonly referred to as circumferential heating, peripheral heating, or the like.

[0015] FIG. 2 is a schematic diagram of an aerosol generation article according to an implementation of this application.

[0016] The aerosol generation article 40 includes a filter section 41 and an aerosol generation section 42 having an inhalable material. In a preferred implementation, the aerosol generation article 40 is provided with a magnetic material 43. The magnetic material 43 may be a ferromagnetic material, or another material having a magnetic permeability of approximately 100 H/m or more. The magnetic material 43 may be a coating formed on an outer surface of the aerosol generation article 40, for example, arranged close to a lower end of the aerosol generation section 202, or may be a component arranged on the outer surface of the aerosol generation article 40. Alternatively, the magnetic material 43 is located in the aerosol generation article 40 and mixed with the inhalable material.

[0017] FIG. 3 is a schematic diagram of a controller according to an implementation of this application. FIG. 4 is a schematic diagram of a detection circuit and a switch transistor circuit according to an implementation of this application.

[0018] In this example, a controller 31, a detection circuit 32, and a switch transistor circuit 33 are integrated on a circuit board 30. Certainly, it is also feasible that the controller, the detection circuit, and the switch transistor circuit are integrated on another circuit board. The controller 31 adopts a micro controller unit (MCU). It may be understood that, in another example, the controller 31 may adopt an application-specific integrated chip, or another chip having a processor function.

[0019] In this example, the controller 31 has a TEST_VCC port, a TEST_AIN port, a PWM_OUT_P port, and a PWM_OUT_N port.

[0020] The detection circuit 32 includes a resistor R2, an electric heater C2, a resistor R2, a capacitor C2, and a heater 10 connected in series. Specifically, one end of the resistor R2 is electrically connected to the TEST_VCC port of the controller 31, and an other end of the resistor R2 is electrically connected to one end (indicated by WH+ in the figure) of the heater 10. An other end (indicated by WH- in the figure) of the heater 10 is electrically connected to one end of the capacitor C2 and the TEST_AIN port of the controller 31, and an other end of the capacitor C2 is connected to the ground.

[0021] The switch transistor circuit 33 includes a switch transistor Q3, a switch transistor Q5, and a switch transistor Q7. In this example, the switch transistor Q3 and the switch transistor Q7 are NMOS transistors, and the switch transistor Q5 is a PMOS transistor. The PWM_OUT_P port of the controller 31 is electrically connected to a gate of the switch transistor Q3, a drain of the switch transistor Q3 is electrically connected to a gate of the switch transistor Q5, and a source of the switch transistor Q3 is grounded. A source of the switch transistor Q5 is electrically connected to the battery core 20 (indicated by VBAT in the figure), and a drain of the switch transistor Q5 is electrically connected to one end (indicated by WH+ in the figure) of the heater 10. The PWM_OUT_N port is electrically connected to a gate of the switch transistor Q7, a drain of the switch transistor Q7 is electrically connected to an other end (indicated by WH- in the figure) of the heater 10, and a source of the switch transistor Q7 is grounded. For other components and the electrical connection thereof, reference may be made to FIG. 3. The switch transistor circuit 33 is configured to electrically connect the heater 10 to a battery core 20 (indicated by VBAT in the figure) or disconnect the heater from the battery core.

[0022] In this example, the controller 31 is configured to: output a control signal to control the switch transistor circuit 33 to be open; control the detection circuit 32 to have the direct current flowing therethrough in a case that the switch transistor circuit 33 is open and after a countdown time of a timer is reached; and determine, based on the duration for which the potential difference between the two ends of the capacitor C2 reaches the preset potential difference threshold, that the aerosol generation article 40 is received in the chamber A or the aerosol generation article 40 is removed from the chamber A, and then control an action of the heater 10.

[0023] Specifically, the controller 31 may control the PWM_OUT_P port to output a low level, so that the switch transistor Q3 is turned off, and the switch transistor Q5 is turned off. In addition, the PWM_OUT_N port is controlled to output the low level, so that the switch transistor Q7 is turned off. In this way, an electrical connection between the heater 10 and the battery core 20 is cut off.

[0024] The controller 31 is integrated with a countdown timer (not shown in the figure), whereby a function to determine whether the aerosol generation article 40 is received in the chamber A is enabled by using a timed wake-up function, to control the action of the heater 10. To be specific, the heater 10 is controlled to start or stop heating.

[0025] The controller 31 may control the TEST_VCC port to output a high level, so that the detection circuit 32 has the direct current flowing therethrough.

[0026] As shown in FIG. 4, the heater 10 may be equivalent to a series connection of a resistor R and an inductor L. The resistor R is a fixed value, and an inductance of the inductor L is related to receiving of the aerosol generation article 40 in the chamber A, that is, insertion of the aerosol generation article 40 into the chamber A.

[0027] A line impedance of the detection circuit 32 may be represented by using the following formula: $|\mathbf{Z}| = \sqrt{\mathbf{R}^2 + (\mathbf{X_L} - \mathbf{X_{c2}})^2}$ where |Z| is a line impedance, X_L is an inductive reactance of the inductor L, and X_{c2} is a capacitive reactance of the capacitor C2.

[0028] A change in the inductance of the inductor L may affect a magnitude of the line impedance |Z|, and then change a charging time of the capacitor C2. Specifically, when the aerosol generation article 40 is inserted into the chamber A, the aerosol generation article 40 having the magnetic material may increase the inductance of the inductor L, thereby increasing the line impedance |Z|.

[0029] Therefore, after the controller 31 controls the TEST_VCC port to output the high level, a charging time of the capacitor C2 before the aerosol generation article 40 is inserted into the chamber A is different from that after the aerosol generation article 40 is inserted into the chamber A. The charging time of the capacitor C2 after the aerosol generation article 40 is inserted into the chamber A is greater than the charging time of the capacitor C2 before the aerosol generation article 40 is inserted into the chamber A.

[0030] Based on the foregoing principle, it may be determined, based on the duration for which the potential difference between the two ends of the capacitor C2 reaches the preset potential difference threshold, that the aerosol generation article 40 is received in the chamber A or the aerosol generation article 40 is removed from the chamber A, and then the action of the heater 10 is controlled.

[0031] In this example, the TEST_AIN port of controller 31 is an interrupt port, and a countup timer (not shown in the figure) is integrated in the controller 31.

[0032] The controller 31 is configured to: control the countup timer to start countup when controlling the TEST_VCC port to output the high level; generate an interrupt when the potential difference between the two ends of the capacitor C2 reaches the preset potential difference threshold, to obtain a countup time of the countup timer; and determine, based on the countup time of the countup timer, that the aerosol generation article 40 is received in the chamber A or the aerosol generation article 40 is removed from the chamber A, and then control the action of the heater 10.

[0033] In this example, the preset potential difference threshold is of a high level, may be a potential difference between the two ends when the capacitor C2 is full, or may be less than the potential difference between the two ends when the capacitor C2 is full.

[0034] In an alternative implementation, the duration for which the potential difference between the two ends of the capacitor C2 reaches the preset potential difference threshold may be compared with a preset time threshold.

[0035] If the duration for which the potential difference between the two ends of the capacitor C2 reaches the preset potential difference threshold is greater than the preset time threshold, it may be determined that the aerosol generation article 40 is received in the chamber A. In this case, the control signal (such as a square wave signal) is outputted to control the operation of the switch transistor circuit 33, and then the heater 10 is started for heating.

[0036] If the duration for which the potential difference between the two ends of the capacitor C2 reaches the preset potential difference threshold is not greater than the preset time threshold, it may be determined that the aerosol generation article 40 is not received in the chamber A. In this case, the switch transistor circuit 33 is controlled to remain open. To be specific, the heater 10 is in an unheated state.

[0037] The preset time threshold may be set to the duration for which the potential difference between the two ends of the capacitor C2 reaches the preset potential difference threshold when the aerosol generation article 40 is not received in the chamber A.

[0038] Based on the foregoing determination, when the aerosol generation article 40 is inserted into the chamber A, the heater 10 may be automatically controlled to start heating without a key operation, which improves user experience. On the other hand, when the aerosol generation article 40 without the magnetic material is inserted into the chamber A, the change of the line impedance |Z| is very small. Therefore, the duration for which the potential difference between the two ends of the capacitor C2 reaches the preset potential difference threshold is almost unchanged. In this case, the heater 10 is not automatically controlled to start heating, which may play an anti-counterfeiting role.

[0039] In another alternative implementation, a difference between the duration for which the potential difference between the two ends of the capacitor C2 reaches the preset potential difference threshold and the preset time threshold may be determined. If the difference is not greater than the preset difference threshold and is greater than zero, the control signal (such as the square wave signal) is outputted to control the switch transistor circuit 33 to operate, and then the heater 10 is started for heating. If the difference is greater than the preset difference threshold or the difference is less than or equal to zero, the switch transistor circuit 33 is controlled to remain open.

[0040] In the implementation, in a case that the aerosol generation article 40 has a magnetic material, a consistency of the magnetic material may provide fixed time intervals after the aerosol generation article 40 is inserted into the chamber A and before the aerosol generation article 40 is inserted into the chamber A. Therefore, it may be determined, by determining that the difference between the duration for which the potential difference between the two ends of the capacitor C2 reaches the preset potential difference threshold and the preset time threshold is within a preset range, that the aerosol generation article 40 is received in the chamber A. The heater 10 is automatically controlled to start heating without a key operation, which improves user experience. Otherwise, if the difference between the duration for which the potential difference between the two ends of the capacitor C2 reaches the preset potential difference threshold and the preset time threshold is greater than the preset difference threshold, it may be determined that the aerosol generation article 40 is a counterfeit product. In this case, the heater 10 is not controlled to start heating. Further, if the difference between the duration for which the potential difference between the two ends of the capacitor C2 reaches the preset potential difference threshold and the preset time threshold is less than or equal to zero, it may be determined that the aerosol generation article 40 is not inserted into the chamber A. In this case, the heater 10 is not controlled to start heating.

[0041] In the foregoing two implementations, if the heater 10 has been controlled to start heating, the determination of whether the aerosol generation article 40 is received in the chamber A may be performed again in a case that the heater 10 is in a heating gap. If the aerosol generation article 40 is inserted into the chamber A, the heating is continued. If the aerosol generation article 40 is removed from the chamber A, the heating is stopped. For the determination process, reference may be made to the foregoing implementations.

[0042] It should be noted that, in this example, the heating gap refers to a time period between two adjacent high levels (or low levels) in the square wave signal.

[0043] It should be further noted that, unlike the foregoing example, in another example, it is feasible that the controller 31 does not adopt the interrupt. To be specific, the TEST_AIN port is a general port. In this case, when the potential difference between the two ends of the capacitor C2 reaches the preset potential difference threshold, the controller 31 obtains the countup time of the countup timer. The subsequent process is similar to the foregoing process, and details are not described herein.

[0044] FIG. 5 is a schematic diagram of a control method for an aerosol generation device according to an implementation of this application. The aerosol generation device is consistent with the foregoing content, and details are not described herein.

[0045] The method includes the following steps:

Step S11: Control a detection circuit 32 to have a direct current flowing therethrough.

Step S12: Determine, based on a duration for which a potential difference between two ends of a capacitor C2 reaches a preset potential difference threshold, that an aerosol generation article 40 is received in a chamber A or the aerosol generation article 40 is removed from the chamber A.

[0046] In an example, the method includes:

controlling a countup timer to start countup when controlling the detection circuit 32 to have the direct current flowing therethrough;
obtaining a countup time of the countup timer when the potential difference between the two ends of the capacitor C2 reaches the preset potential difference threshold; and
determining, based on the countup time of the countup timer, that the aerosol generation article 40 is received in the chamber A or the aerosol generation article 40 is removed from the chamber A.

[0047] In an example, the method includes:

outputting a first control signal to control the switch transistor circuit 33 to be open;
controlling the detection circuit 32 to have the direct current flowing therethrough in a case that the switch transistor circuit 33 is open; and
determining, based on the duration for which the potential difference between the two ends of the capacitor C2 reaches the preset potential difference threshold, that the aerosol generation article 40 is received in the chamber A or the aerosol generation article 40 is removed from the chamber A.

[0048] In an example, the determining, based on the duration for which the potential difference between the two ends of the capacitor C2 reaches the preset potential difference threshold, that the aerosol generation article 40 is received in the chamber A or the aerosol generation article 40 is removed from the chamber A includes:

comparing the duration for which the potential difference between the two ends of the capacitor C2 reaches the preset potential difference threshold with a preset time threshold;
outputting a second control signal to control the switch transistor circuit 33 to operate, and then starting the heater 10 for heating if the duration for which the potential difference between the two ends of the capacitor C2 reaches the preset potential difference threshold is greater than the preset time threshold; and
controlling the switch transistor circuit 33 to remain open if the duration for which the potential difference between the two ends of the capacitor C2 reaches the preset potential difference threshold is not greater than the preset time threshold.

[0049] In an example, the determining, based on the duration for which the potential difference between the two ends of the capacitor C2 reaches the preset potential difference threshold, that the aerosol generation article 40 is received in the chamber A or the aerosol generation article 40 is removed from the chamber A includes:

determining a difference between the duration for which the potential difference between the two ends of the capacitor C2 reaches the preset potential difference threshold and the preset time threshold;
outputting a third control signal to control the switch transistor circuit 33 to operate, and then starting the heater 10 for heating if the difference is not greater than the preset difference threshold and is greater than zero; and
controlling the switch transistor circuit to remain open if the difference is greater than the preset difference threshold.

[0050] In an example, the method includes:

controlling the detection circuit 32 to have the direct current flowing therethrough after a countdown time of a countdown timer is reached; and
determining, based on the duration for which the potential difference between the two ends of the capacitor C2 reaches the preset potential difference threshold, that the aerosol generation article 40 is received in the chamber A or the aerosol generation article 40 is removed from the chamber A.

[0051] FIG. 6 is a schematic diagram of a control process of an aerosol generation device according to an implementation of this application.

[0052] Specifically, the control process includes the following steps:

Step S21: A switch transistor circuit 33 is open.

[0053] A controller 31 controls a PWM_OUT_P port to output a low level, so that a switch transistor Q3 is turned off, and a switch transistor Q5 is turned off. In addition, a PWM_OUT_N port is controlled to output the low level, so that a switch transistor Q7 is turned off. In this way, an electrical connection between a heater 10 and a battery core 20 is cut off.

[0054] Step S22: Determine whether a countdown time of a countdown timer is reached.

[0055] A function to determine whether the aerosol generation article 40 is received in the chamber A is enabled by using a timed wake-up function to control the action of the heater 10. If the countdown time of the countdown timer is not reached, the switch transistor circuit 33 is remains open.

[0056] Step S23: Control a countup timer to start countup when a TEST_VCC port is controlled to output a high level.

[0057] Step S24: Whether a TEST_AIN port receives an interrupt signal.

[0058] Step S25: Obtain a countup time of the countup timer.

[0059] For example, an interrupt for a high-level signal is generated, and the countup time of the countup timer is read through an interrupt program.

[0060] Step S26: Determine whether the countup time of the countup timer is greater than a preset time threshold.

[0061] If the countup time is greater than the preset time threshold, step S27 is performed. Otherwise, it may be determined that the aerosol generation article 40 is not received in the chamber A, and the switch transistor circuit 33 remains open, waiting for timed wake-up.

[0062] Step S27 and Step S28: Determine that the aerosol generation article 40 is received in the chamber A. In this case, a square wave signal is outputted to control the switch transistor circuit 33, and then the heater 10 is started for heating.

[0063] 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 descriptions, and all the improvements and modifications shall fall within the protection scope of the appended claims of this application.

Claims

1. An aerosol generation device, comprising:

a chamber, configured to removably receive an aerosol generation article comprising a magnetic material;
a heater, configured to heat the aerosol generation article received in the chamber to generate an aerosol;
a detection circuit, comprising a capacitor connected in series with the heater; and
a controller, configured to control the detection circuit to have a direct current flowing therethrough, and determine, based on a duration for which a potential difference between two ends of the capacitor reaches a preset potential difference threshold, that the aerosol generation article is received in the chamber or the aerosol generation article is removed from the chamber.

2. The aerosol generation device according to claim 1, wherein the detection circuit further comprises resistors connected in series.

3. The aerosol generation device according to claim 1, wherein the controller comprises a first port; one end of the detection circuit is electrically connected to the first port, and an other end is electrically connected to the ground; and
the controller is configured to control the first port to output a high level, so that the detection circuit has the direct current flowing therethrough.

4. The aerosol generation device according to claim 3, wherein the controller comprises a second port; one end of the capacitor is electrically connected to the second port and the heater, and an other end is electrically connected to the ground;

the controller further comprises a countup timer; and
the controller is configured to: control the countup timer to start countup when controlling the first port to output the high level; obtain the potential difference between the two ends of the capacitor through the second port; obtain a countup time of the countup timer when the potential difference between the two ends of the capacitor reaches the preset potential difference threshold; and determine, based on the countup time of the countup timer, that the aerosol generation article is received in the chamber or the aerosol generation article is removed from the chamber.

5. The aerosol generation device according to claim 3, wherein the controller comprises an interrupt port; one end of the capacitor is electrically connected to the interrupt port and the heater, and an other end is electrically connected to the ground;

the controller further comprises a countup timer; and
the controller is configured to: control the countup timer to start countup when controlling the first port to output the high level; generate an interrupt when the potential difference between the two ends of the capacitor reaches the preset potential difference threshold, to obtain a countup time of the countup timer; and determine, based on the countup time of the countup timer, that the aerosol generation article is received in the chamber or the aerosol generation article is removed from the chamber.

6. The aerosol generation device according to claim 1, further comprising a switch transistor circuit, wherein

the switch transistor circuit is configured to electrically connect the heater to a battery core or disconnect the heater from the battery core; and
the controller is configured to: output a first control signal to control the switch transistor circuit to be open; control the detection circuit to have the direct current flowing therethrough in a case

that the switch transistor circuit is open; and determine, based on the duration for which the potential difference between the two ends of the capacitor reaches the preset potential difference threshold, that the aerosol generation article is received in the chamber or the aerosol generation article is removed from the chamber, and then control the switch transistor circuit.

7. The aerosol generation device according to claim 6, wherein the controller is configured to: compare the duration for which the potential difference between the two ends of the capacitor reaches the preset potential difference threshold with a preset time threshold; output a second control signal to control the switch transistor circuit to operate, and then start the heater for heating if the duration for which the potential difference between the two ends of the capacitor reaches the preset potential difference threshold is greater than the preset time threshold; and control the switch transistor circuit to remain open if the duration for which the potential difference between the two ends of the capacitor reaches the preset potential difference threshold is not greater than the preset time threshold.

8. The aerosol generation device according to claim 6, wherein the controller is configured to: determine a difference between the duration for which the potential difference between the two ends of the capacitor reaches the preset potential difference threshold and a preset time threshold; output a third control signal to control the switch transistor circuit to operate, and then start the heater for heating if the difference is not greater than the preset difference threshold and is greater than zero; and control the switch transistor circuit to remain open if the difference is greater than the preset difference threshold or less than or equal to zero.

9. The aerosol generation device according to claim 7 or 8, wherein the controller is configured to: control the detection circuit to have the direct current flowing therethrough again in a case that the heater is in a heating gap; and determine, based on the duration for which the potential difference between the two ends of the capacitor reaches the preset potential difference threshold, that the aerosol generation article is received in the chamber or the aerosol generation article is removed from the chamber.

10. The aerosol generation device according to claim 1, wherein the controller further comprises a countdown timer; and
the controller is configured to: control the detection circuit to have the direct current flowing therethrough after a countdown time of the countdown timer is reached; and determine, based on the duration for which the potential difference between the two ends of the capacitor reaches the preset potential difference threshold, that the aerosol generation article is received in the chamber or the aerosol generation article is removed from the chamber.

11. A control method for an aerosol generation device, wherein the aerosol generation device comprises a chamber, a heater, and a detection circuit, the detection circuit comprises a capacitor connected in series with the heater, and the method comprises:

controlling the detection circuit to have a direct current flowing therethrough; and
determining, based on the duration for which the potential difference between the two ends of the capacitor reaches the preset potential difference threshold, that the aerosol generation article is received in the chamber or the aerosol generation article is removed from the chamber.

12. The method according to claim 11, wherein the aerosol generation device further comprises a countup timer; and
the method comprises:

controlling the countup timer to start countup when controlling the detection circuit to have the direct current flowing therethrough;
obtaining a countup time of the countup timer when the potential difference between the two ends of the capacitor reaches the preset potential difference threshold; and
determining, based on the countup time of the countup timer, that the aerosol generation article is received in the chamber or the aerosol generation article is removed from the chamber.

13. The method according to claim 11, wherein the aerosol generation device further comprises a switch transistor circuit, and
the method comprises:

outputting a first control signal to control the switch transistor circuit to be open;
controlling the detection circuit to have the direct current flowing therethrough in a case that the switch transistor circuit is open; and
determining, based on the duration for which the potential difference between the two ends of the capacitor reaches the preset potential difference threshold, that the aerosol generation article is received in the chamber or the aerosol generation article is removed from the chamber, and then controlling the switch transistor circuit.

14. The method according to claim 13, wherein the determining, based on the duration for which the po-

tential difference between the two ends of the capacitor reaches the preset potential difference threshold, that the aerosol generation article is received in the chamber or the aerosol generation article is removed from the chamber, and then controlling the switch transistor circuit comprises:

comparing the duration for which the potential difference between the two ends of the capacitor reaches the preset potential difference threshold with a preset time threshold;
outputting a second control signal to control the switch transistor circuit to operate, and then starting the heater for heating if the duration for which the potential difference between the two ends of the capacitor reaches the preset potential difference threshold is greater than the preset time threshold; and
controlling the switch transistor circuit to remain open if the duration for which the potential difference between the two ends of the capacitor reaches the preset potential difference threshold is not greater than the preset time threshold.

15. The method according to claim 13, wherein the determining, based on the duration for which the potential difference between the two ends of the capacitor reaches the preset potential difference threshold, that the aerosol generation article is received in the chamber or the aerosol generation article is removed from the chamber comprises:

determining a difference between the duration for which the potential difference between the two ends of the capacitor reaches the preset potential difference threshold and a preset time threshold;
outputting a third control signal to control the switch transistor circuit to operate, and then starting the heater for heating if the difference is not greater than the preset difference threshold and is greater than zero; and
controlling the switch transistor circuit to remain open if the difference is greater than the preset difference threshold.

16. The method according to claim 11, wherein the aerosol generation device further comprises a countdown timer; and
the method comprises:

controlling the detection circuit to have the direct current flowing therethrough after a countdown time of the countdown timer is reached; and
determining, based on the duration for which the potential difference between the two ends of the capacitor reaches the preset potential difference threshold, that the aerosol generation article is received in the chamber or the aerosol generation article is removed from the chamber.

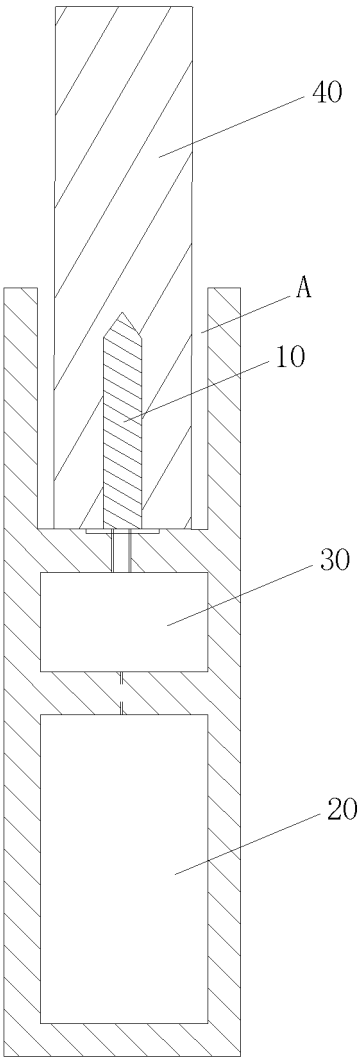

FIG. 1

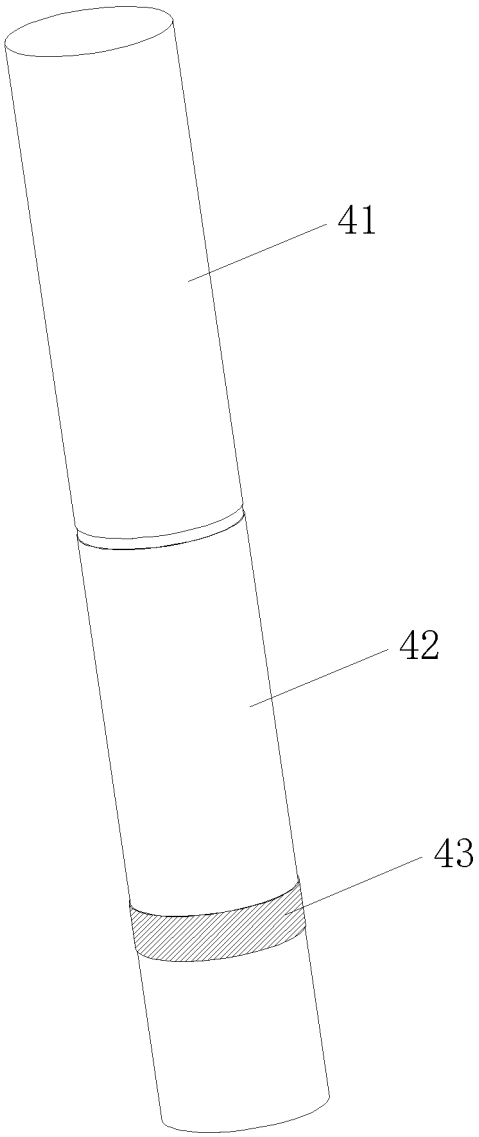

FIG. 2

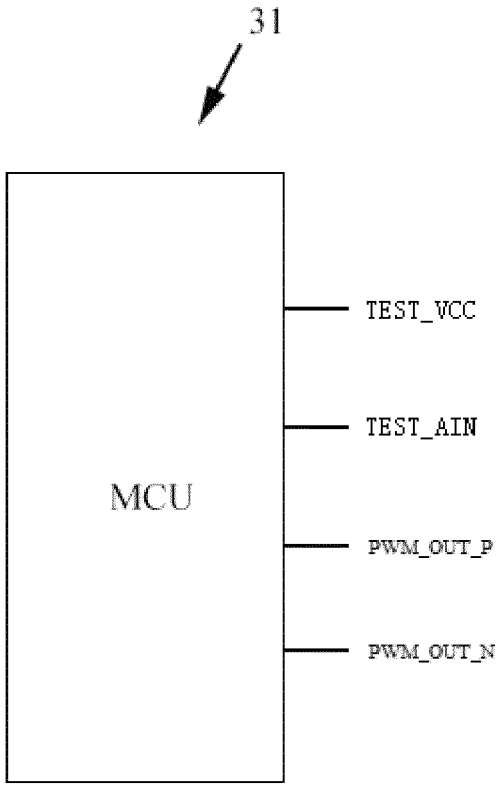

FIG. 3

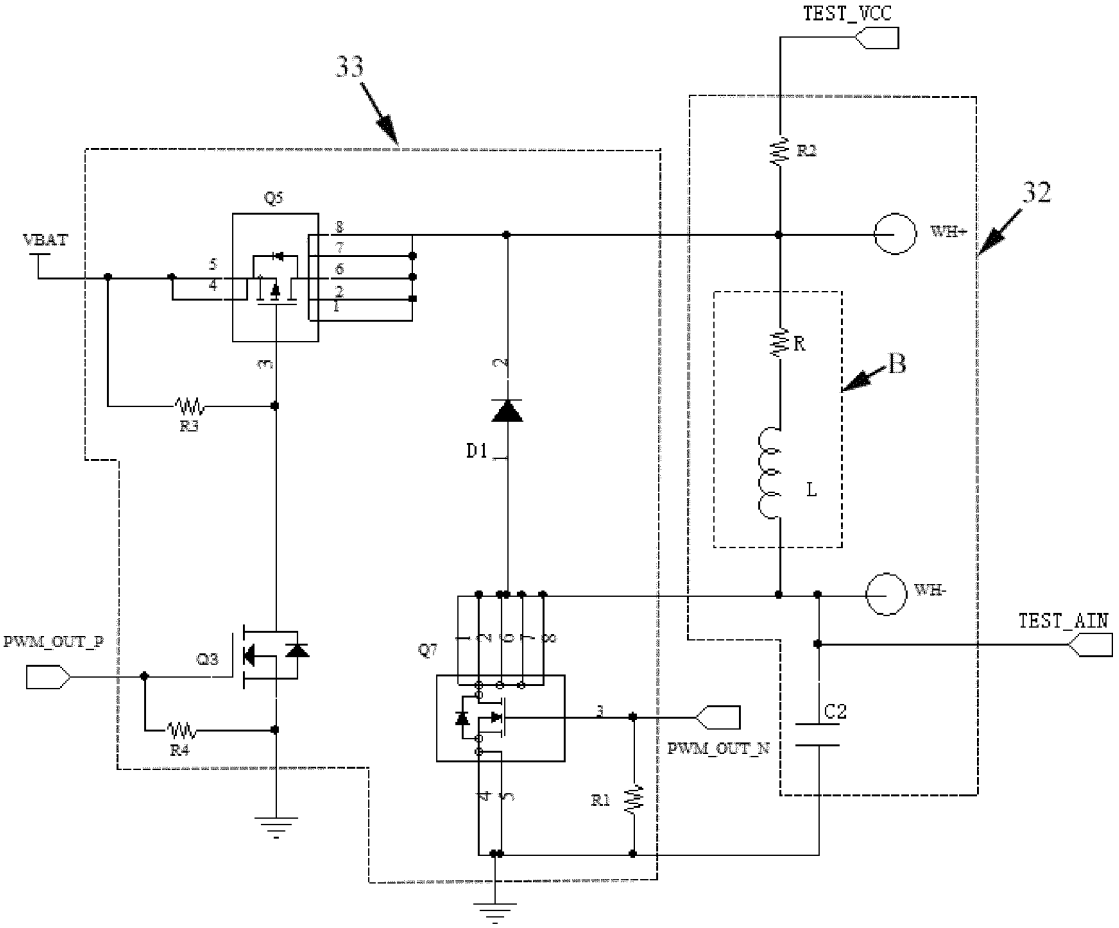
TEST_VCC
33
R2
32
Q5
VBAT
WH+
R
B
R3
D1
L
WH-
TEST_AIN
PWM_OUT_P
Q3
Q7
C2
PWM_OUT_N
R4
R1

FIG. 4

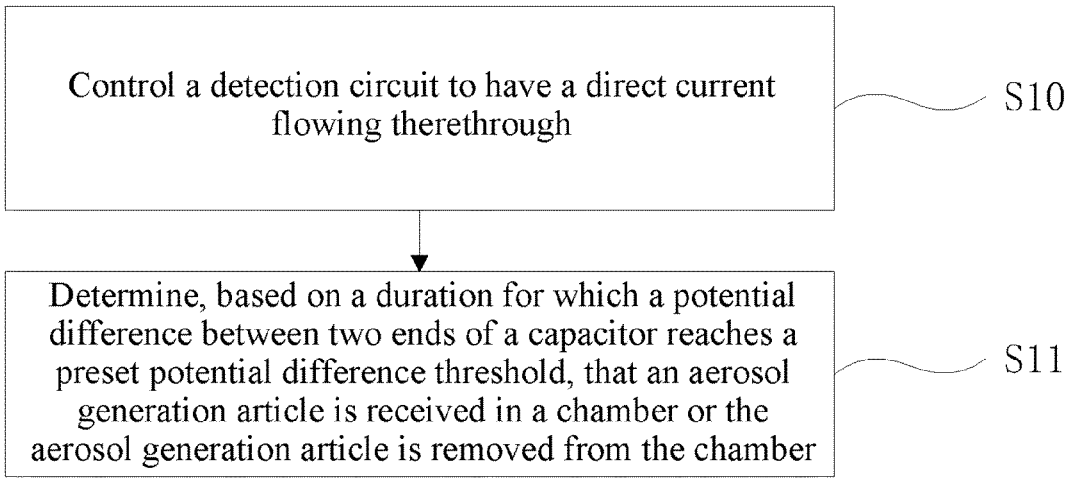
Control a detection circuit to have a direct current flowing therethrough
S10
Determine, based on a duration for which a potential difference between two ends of a capacitor reaches a preset potential difference threshold, that an aerosol generation article is received in a chamber or the aerosol generation article is removed from the chamber
S11

FIG. 5

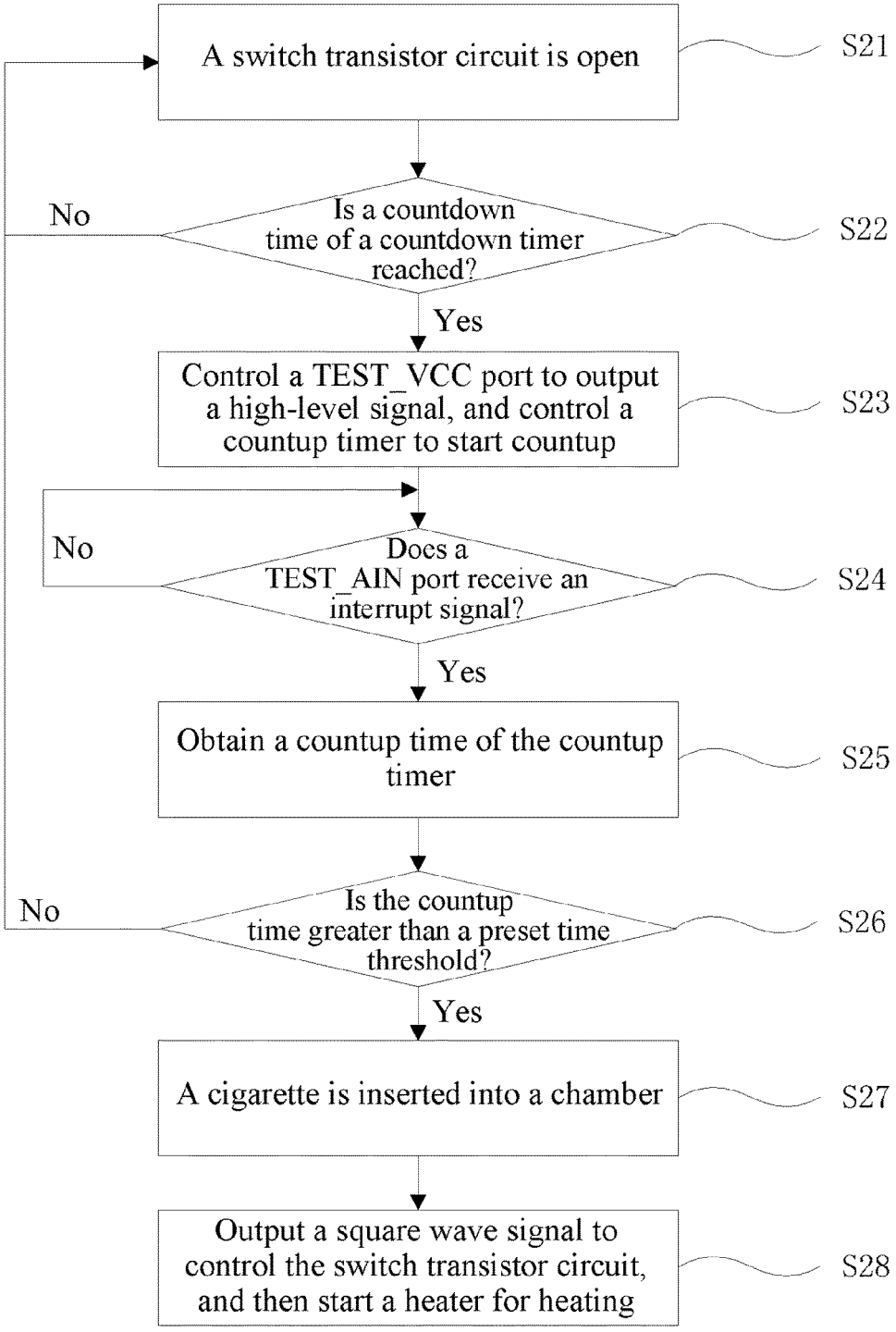
A switch transistor circuit is open
S21
Is a countdown time of a countdown timer reached?
No
S22
Yes
Control a TEST_VCC port to output a high-level signal, and control a countup timer to start countup
S23
Does a TEST_AIN port receive an interrupt signal?
No
S24
Yes
Obtain a countup time of the countup timer
S25
Is the countup time greater than a preset time threshold?
No
S26
Yes
A cigarette is inserted into a chamber
S27
Output a square wave signal to control the switch transistor circuit, and then start a heater for heating
S28

FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2022/117905

A. CLASSIFICATION OF SUBJECT MATTER

A24F 40/20(2020.01)i; A24F 40/53(2020.01)i; A24F 40/465(2020.01)i; A24D 1/20(2020.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A24F,A24D

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)

CNPAT, WPI, EPODOC, CNKI: 电子烟, 气溶胶, 雾化, 加热, 感应, 电容, 充电, 放电, 电压, 电位差, 时间, 计时, electri+ cigarette, smoke, atomizati+, heat+, induce, charg+, potential difference, time, capacitance

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2021037403 A1 (PHILIP MORRIS PRODUCTS S.A.) 04 March 2021 (2021-03-04) description, page 44, the last paragraph, page 52, the last paragraph, and figures 1-6	1-16
Y	CN 107144725 A (ETA SOLUTIONS CO., LTD.) 08 September 2017 (2017-09-08) description, paragraphs [0014]-[0028], and figures 1-2	1-16
A	CN 108303190 A (JISHIFU ELECTRONIC TECHNOLOGY DONGGUAN CO., LTD.) 20 July 2018 (2018-07-20) entire document	1-16
A	CN 106597063 A (HANGZHOU SILAN MICROELECTRONICS CO., LTD.) 26 April 2017 (2017-04-26) entire document	1-16
A	CN 110612034 A (KT&G CORP.) 24 December 2019 (2019-12-24) entire document	1-16
A	CN 107404107 A (HUIZHOU HAPPY VAPING TECHNOLOGY LTD.) 28 November 2017 (2017-11-28) entire document	1-16
A	WO 2020193187 A1 (NERUDIA LTD.) 01 October 2020 (2020-10-01) entire document	1-16

☑ 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
"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
20 October 2022	**30 November 2022**

Name and mailing address of the ISA/CN	Authorized officer
China National Intellectual Property Administration (ISA/CN) **No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088, China**	
Facsimile No. **(86-10)62019451**	Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2022/117905

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR 20210088299 A (KT & G CORP.) 14 July 2021 (2021-07-14) entire document	1-16

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2022/117905

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
WO 2021037403 A1	04 March 2021	CA 3149060 A1	04 March 2021
		KR 20220049587 A	21 April 2022
		EP 4017298 A1	29 June 2022
		BR 112022000058 A2	24 May 2022
		CN 114245713 A	25 March 2022
		AU 2020336814 A1	31 March 2022
		IL 290777 A	01 April 2022
CN 107144725 A	08 September 2017	CN 107144725 B	25 September 2020
CN 108303190 A	20 July 2018	WO 2019134457 A1	11 July 2019
		CN 108303190 B	22 December 2020
CN 106597063 A	26 April 2017	None	
CN 110612034 A	24 December 2019	JP 2020521438 A	27 July 2020
		KR 20180129637 A	05 December 2018
		EP 3632240 A1	08 April 2020
		WO 2018216961 A1	29 November 2018
		US 2020093185 A1	26 March 2020
		KR 102231228 B1	24 March 2021
		JP 6927648 B2	01 September 2021
CN 107404107 A	28 November 2017	WO 2019033887 A1	21 February 2019
		CN 107404107 B	14 February 2020
WO 2020193187 A1	01 October 2020	EP 3941262 A1	26 January 2022
		EP 3711531 A1	23 September 2020
KR 20210088299 A	14 July 2021	JP 2022519467 A	24 March 2022
		WO 2021141249 A1	15 July 2021
		CN 113412067 A	17 September 2021
		EP 3890525 A1	13 October 2021
		KR 102397451 B1	12 May 2022

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- CN 202111048301 **[0001]**
- CN 111511233 A **[0004]**