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

(11) **EP 4 516 138 A1**

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

(43) Date of publication:
05.03.2025 Bulletin 2025/10

(21) Application number: **23868312.2**

(22) Date of filing: **02.06.2023**

(51) International Patent Classification (IPC):
A24F 40/40 *(2020.01)* ***A24F 40/46*** *(2020.01)*
H05B 3/00 *(2006.01)* ***A24F 40/60*** *(2020.01)*
A24F 40/51 *(2020.01)* ***A24D 1/20*** *(2020.01)*
A24F 40/20 *(2020.01)*

(52) Cooperative Patent Classification (CPC):
A24D 1/20; A24F 40/20; A24F 40/40; A24F 40/46; A24F 40/51; A24F 40/60; H05B 3/00

(86) International application number:
PCT/KR2023/007583

(87) International publication number:
WO 2024/063247 (28.03.2024 Gazette 2024/13)

(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: **23.09.2022 KR 20220120567**

(71) Applicant: **KT&G Corporation**
Daedeok-gu
Daejeon 34337 (KR)

(72) Inventors:
- **JANG, Chul Ho**
  Daejeon 34128 (KR)
- **GO, Gyoung Min**
  Daejeon 34128 (KR)
- **BAE, Hyung Jin**
  Daejeon 34128 (KR)
- **SEO, Jangwon**
  Daejeon 34128 (KR)
- **JEONG, Jong Seong**
  Daejeon 34128 (KR)
- **JUNG, Jinchul**
  Daejeon 34128 (KR)

(74) Representative: **Ter Meer Steinmeister & Partner**
Patentanwälte mbB
Nymphenburger Straße 4
80335 München (DE)

(54) AEROSOL-GENERATING DEVICE AND AEROSOL-GENERATING ARTICLE

(57) An aerosol-generating device according to various embodiments may comprise: a housing comprising an open end and an elongated cavity configured to communicate with the open end so as to contain an aerosol-generating article; a stick holder disposed in the elongated cavity so as to capture the aerosol-generating article and to rotate the aerosol-generating article around the longitudinal center axis thereof; and a light-emitting element for emitting light such that a medium segment included in the aerosol-generating article is heated.

EP 4 516 138 A1

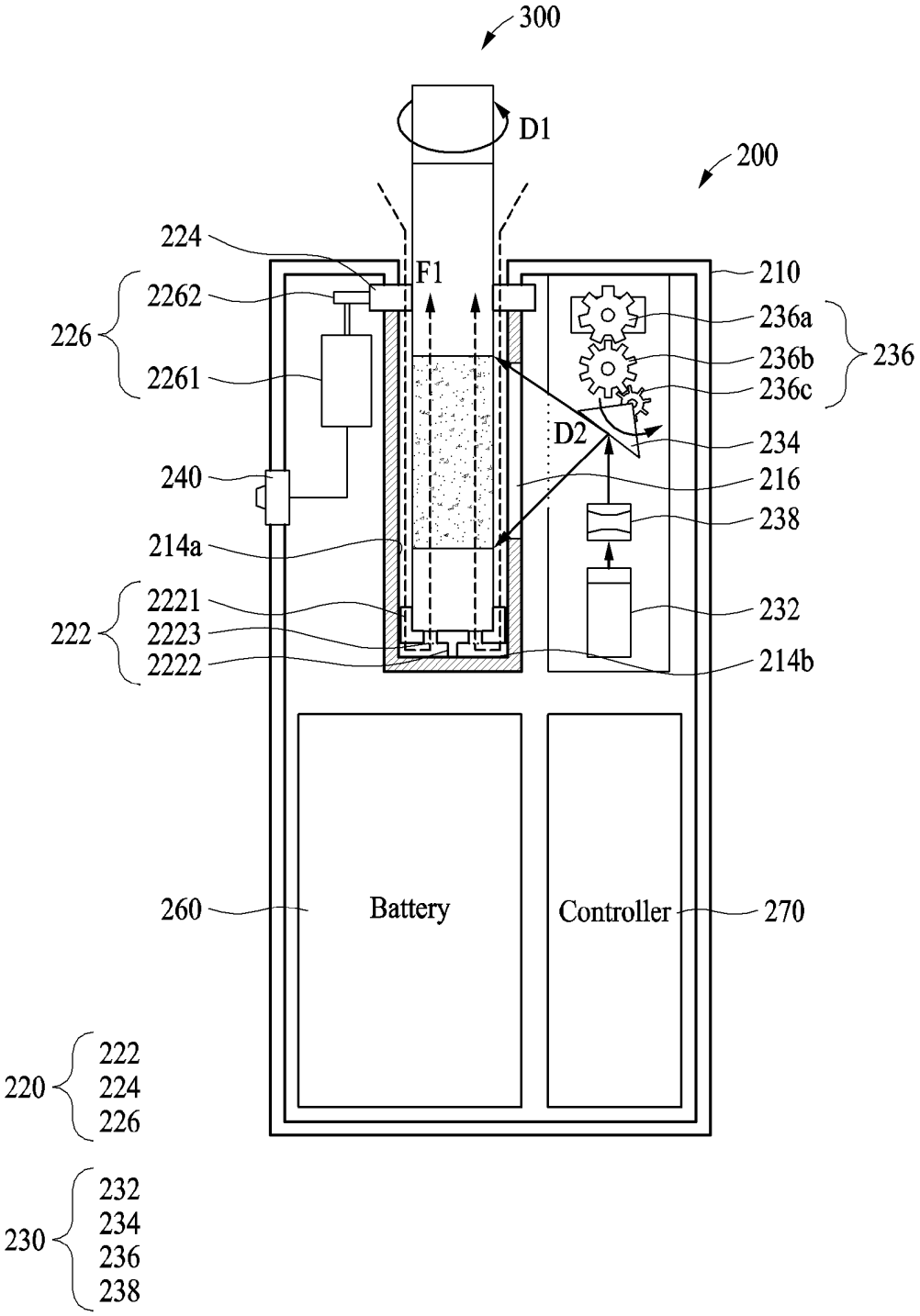
300
D1
200
224
F1
210
2262
236a
226
2261
236b
236
236c
D2
234
240
216
238
214a
2221
232
222
2223
2222
214b
Battery
Controller
260
270
220
222
224
226
230
232
234
236
238

FIG. 2B

Description

Technical Field

[0001] The following embodiments relate to an aerosol generating device and an aerosol generating article.

Background Art

[0002] Recently, demands for alternative articles to overcome disadvantages of general cigarettes have increased. For example, there is an increasing demand for a device (e.g., a cigarette-type electronic cigarette) that generates an aerosol by electrically heating a cigarette stick. Accordingly, research on an electrically heated aerosol generating device and a cigarette stick (or an aerosol generating article) applied thereto is being actively conducted. For example, Korean Patent Application Publication No. 10-2017-0132823 discloses a non-combustion-type flavor inhaler, a flavor inhalation component source unit, and an atomizing unit.

Disclosure of the Invention

Technical Goals

[0003] An object according to an embodiment is to provide an aerosol generating device and an aerosol generating article in which a heat loss is reduced through heating by a laser heating source.

[0004] Another object according to an embodiment is to provide an aerosol generating device and an aerosol generating article for generating a uniform amount of aerosol during use.

Technical Solutions

[0005] An aerosol generating device according to various embodiments includes a housing including an open end, and an elongated cavity communicating with the open end to accommodate an aerosol generating article, a stick holder disposed in the elongated cavity and holding and rotating the aerosol generating article about a central longitudinal axis of the aerosol generating article, and a light irradiation element configured to emit light to heat a medium segment included in the aerosol generating article.

[0006] In an embodiment, the light irradiation element may be disposed side by side with the elongated cavity, and the light irradiation element may include a light source unit configured to emit light, a reflection unit configured to cause the light emitted from the light source unit to be directed toward the medium segment, and an angle adjustment unit disposed adjacent to the reflection unit and configured to adjust an angle of light reflected by the reflection unit to cause the light to evenly reach the medium segment.

[0007] In an embodiment, the aerosol generating article may further include a first segment disposed on an upstream side of the medium segment, and a second segment disposed on a downstream side of the medium segment, the medium segment may include a first medium end that contacts with the first segment, and a second medium end that contacts with the second segment, and the angle adjustment unit may be configured to cause the light reflected by the reflection unit to be emitted continuously from the first medium end to the second medium end.

[0008] In an embodiment, the stick holder may include a first holder disposed on a bottom surface of the elongated cavity to hold the first segment of the aerosol generating article, and a second holder disposed adjacent to the open end of the housing to hold the second segment of the aerosol generating article.

[0009] In an embodiment, the aerosol generating device may further include a rotation element, and the rotation element may be configured to rotate the stick holder about a central depth axis of the elongated cavity.

[0010] In an embodiment, the aerosol generating device may further include an input button connected to the rotation element, and an operation of the input button may activate the rotation element to rotate the rotation element.

[0011] In an embodiment, the aerosol generating device may further include a puff sensor connected to the rotation element and configured to detect a user's puff, and an operation of the puff sensor may activate the rotation element to rotate the rotation element.

[0012] In an embodiment, the elongated cavity may include an inner wall surface facing the aerosol generating article, and at least a portion of the inner wall surface may be formed of a material that transmits light.

[0013] In an embodiment, the medium segment may include a medium, and the medium may be exposed to outside of the aerosol generating article.

[0014] An aerosol generating article according to various embodiments includes a first end surface, a second end surface formed on a side opposite to the first end surface, a side surface formed between the first end surface and the second end surface, a medium segment, a first segment, a second segment, and a wrapper. The first segment may be disposed on an upstream side of the medium segment, the second segment may be disposed on a downstream side of the medium segment, and the wrapper may wrap the side surface corresponding to the first segment and the second segment excluding the medium segment.

[0015] In an embodiment, the medium segment may include a hollow tube, and an aerosol formed by heating the medium segment may move toward the second end surface through the hollow tube.

[0016] In an embodiment, the medium segment may be filled with a tobacco sheet medium that is bent or rolled.

[0017] In an embodiment, the medium segment may include a medium, and the medium may be exposed to

outside.

Effects

[0018] An aerosol generating device and an aerosol generating article according to an embodiment may reduce a heat loss through heating by a laser heating source.

[0019] An aerosol generating device and an aerosol generating article according to an embodiment may generate a uniform amount of aerosol during use.

[0020] The effects of the aerosol generating device and the aerosol generating article according to an embodiment are not limited to the above-mentioned effects, and other unmentioned effects may be clearly understood from the following description by one of ordinary skill in the art. Brief Description of Drawings

FIG. 1 is a block diagram of an aerosol generating device according to an embodiment.

FIG. 2A is a schematic diagram of an aerosol generating device according to an embodiment.

FIG. 2B is a schematic diagram of an aerosol generating device in which an aerosol generating article is inserted according to an embodiment.

FIG. 3 is a cross-sectional perspective view of an aerosol generating article according to an embodiment.

FIG. 4A is a perspective view of the inside of an aerosol generating device according to an embodiment.

FIG. 4B is an enlarged view of an area A of the aerosol generating device according to an embodiment of FIG. 4A.

FIG. 5 is an enlarged view of an aerosol generating device according to an embodiment.

Best Mode for Carrying Out the Invention

[0021] The terms used in the embodiments are selected from among common terms that are currently widely used, in consideration of their function in the disclosure. However, the terms may become different according to an intention of one of ordinary skill in the art, a precedent, or the advent of new technology. Also, in particular cases, the terms are discretionally selected by the applicant of the disclosure, and the meaning of those terms will be described in detail in the corresponding part of the detailed description. Therefore, the terms used in the disclosure are not merely designations of the terms, but the terms are defined based on the meaning of the terms and content throughout the disclosure.

[0022] It will be understood that when a certain part "includes" a certain component, the part does not exclude another component but may further include another component, unless the context clearly dictates otherwise. Also, terms such as "unit," "module," etc., as used in the specification may refer to a part for processing at least one function or operation and which may be implemented as hardware, software, or a combination of hardware and software.

[0023] As used herein, an expression such as "at least one of" that precedes listed components modifies not each of the listed components but all the listed components. For example, the expression "at least one of a, b, or c" should be construed as including a, b, c, a and b, a and c, b and c, or a, b, and c.

[0024] In the following embodiments, the term "aerosol generating article" may refer to an article that accommodates a medium, in which an aerosol passes through the article and the medium is transferred. A representative example of the aerosol generating article may be a cigarette. However, the scope of the disclosure is not limited thereto.

[0025] In the following embodiments, the term "upstream" or "upstream direction" may refer to a direction away from an oral region of a user (smoker), and the term "downstream" or "downstream direction" may refer to a direction approaching the oral region of the user. The terms "upstream" and "downstream" may be used to describe relative positions of components of an aerosol generating article.

[0026] In the following embodiments, the term "puff" refers to inhalation by a user, and the inhalation refers to a situation in which a user draws in an aerosol into his or her oral cavity, nasal cavity, or lungs through the mouth or nose.

[0027] In an embodiment, an aerosol generating device may be a device that generates an aerosol by electrically heating an aerosol generating article accommodated in an inner space.

[0028] The aerosol generating device may include a heater. In an embodiment, the heater may be an electrically resistive heater. For example, the heater may include an electrically conductive track, and the heater may be heated as a current flows through the electrically conductive track.

[0029] The heater may include a tubular heating element, a plate-shaped heating element, a needle-shaped heating element, or a rod-shaped heating element, and may heat the inside or outside of the aerosol generating article according to the shape of a heating element.

[0030] The aerosol generating article may include a tobacco rod and a filter rod. The tobacco rod may be formed as a sheet or a strand, or may be formed of tobacco leaves finely cut from a tobacco sheet. In addition, the tobacco rod may be enveloped by a thermally conductive material. For example, the thermally conductive material may be metal foil such as aluminum foil. However, embodiments are not limited thereto.

[0031] The filter rod may be a cellulose acetate filter. The filter rod may include at least one segment. For example, the filter rod may include a first segment that cools an aerosol and a second segment that filters a predetermined ingredient contained in the aerosol.

[0032] In another embodiment, the aerosol generating device may be a device that generates an aerosol using a cartridge containing an aerosol generating material.

[0033] The aerosol generating device may include a cartridge containing the aerosol generating material and a main body supporting the cartridge. The cartridge may be detachably coupled to the main body. However, embodiments are not limited thereto. The cartridge may be integrally formed or assembled with the main body, and may be secured to the main body so as not to be detached by a user. The cartridge may be mounted on the main body while the aerosol generating material is accommodated therein. However, embodiments are not limited thereto. The aerosol generating material may be injected into the cartridge while the cartridge is coupled to the main body.

[0034] The cartridge may hold the aerosol generating material in any one of various states, such as a liquid state, a solid state, a gaseous state, and a gel state. The aerosol generating material may include a liquid composition. For example, the liquid composition may be a liquid including a tobacco-containing material having a volatile tobacco flavor component, or may be a liquid including a non-tobacco material.

[0035] The cartridge may be operated by an electrical signal or a wireless signal transmitted from the main body to perform the function of generating an aerosol by converting a phase of the aerosol generating material inside the cartridge to a gaseous phase. The aerosol may refer to a gas in which vaporized particles generated from the aerosol generating material are mixed with air.

[0036] In another embodiment, the aerosol generating device may generate an aerosol by heating the liquid composition, and the generated aerosol may pass through the cigarette and be delivered to the user. That is, the aerosol generated from the liquid composition may travel along an airflow path of the aerosol generating device, and the airflow path may be configured to allow the aerosol to pass through the cigarette and be delivered to the user.

[0037] In another embodiment, the aerosol generating device may be a device that generates an aerosol from the aerosol generating material using an ultrasonic vibration manner. In this case, the ultrasonic vibration manner may refer to a manner of generating an aerosol by atomizing the aerosol generating material with ultrasonic vibration generated by a vibrator.

[0038] The aerosol generating device may include a vibrator, and may generate vibration at short intervals through the vibrator to atomize the aerosol generating material. The vibration generated by the vibrator may be ultrasonic vibration, and a frequency band of the ultrasonic vibration may be from about 100 kilohertz (kHz) to about 3.5 megahertz (MHz). However, embodiments are not limited thereto.

[0039] The aerosol generating device may further include a wick that absorbs the aerosol generating material. For example, the wick may be disposed to surround at least one area of the vibrator or may be disposed to contact at least one area of the vibrator.

[0040] As a voltage (e.g., an alternating voltage) is applied to the vibrator, the vibrator may generate heat and/or ultrasonic vibration, and the heat and/or ultrasonic vibration generated by the vibrator may be transmitted to the aerosol generating material absorbed in the wick. The aerosol generating material absorbed in the wick may be converted into a gas phase by the heat and/or ultrasonic vibration transmitted from the vibrator, and consequently, an aerosol may be generated.

[0041] For example, the viscosity of the aerosol generating material absorbed in the wick may be lowered by the heat generated by the vibrator, and the aerosol generating material whose viscosity is lowered may change to fine particles by the ultrasonic vibration generated by the vibrator, so that an aerosol may be generated. However, embodiments are not limited thereto.

[0042] In another embodiment, the aerosol generating device may be a device that generates an aerosol by heating the aerosol generating article accommodated therein in an induction heating manner.

[0043] The aerosol generating device may include a susceptor and a coil. In an embodiment, the coil may apply a magnetic field to the susceptor. As the aerosol generating device supplies power to the coil, a magnetic field may be formed inside the coil. In an embodiment, the susceptor may be a magnetic body that generates heat by an external magnetic field. As the susceptor is positioned inside the coil and generates heat with the magnetic field applied, the aerosol generating article may be heated. Also, optionally, the susceptor may be positioned in the aerosol generating article.

[0044] In another embodiment, the aerosol generating device may further include a cradle.

[0045] The aerosol generating device and the separate cradle may form a system together. For example, the cradle may be used to charge a battery of the aerosol generating device. Alternatively, a heater may be heated when the cradle and the aerosol generating device are coupled to each other.

[0046] Hereinafter, embodiments of the disclosure will be described in detail with reference to the accompanying drawings such that one of ordinary skill in the art may easily practice the disclosure. The disclosure may be practiced in forms that are implementable in the aerosol generating devices according to various embodiments described above or may be embodied and practiced in many different forms and is not limited to the embodiments described herein.

[0047] Hereinafter, embodiments of the disclosure will be described in detail with reference to the drawings.

[0048] FIG. 1 is a block diagram of an aerosol gener-

ating device 100 according to an embodiment.

[0049] The aerosol generating device 100 may include a controller 110, a sensing unit 120, an output unit 130, a battery 140, a heater 150, a user input unit 160, a memory 170, and a communication unit 180. However, an internal structure of the aerosol generating device 100 is not limited to what is shown in FIG. 1. It is to be understood by one of ordinary skill in the art to which the disclosure pertains that some of the components shown in FIG. 1 may be omitted or new components may be added according to the design of the aerosol generating device 100.

[0050] The sensing unit 120 may sense a state of the aerosol generating device 100 or a state of an environment around the aerosol generating device 100, and transmit sensing information obtained through the sensing to the controller 110. Based on the sensing information, the controller 110 may control the aerosol generating device 100 to control operations of the heater 150, restrict smoking, determine whether an aerosol generating article (e.g., an aerosol generating article, a cartridge, etc.) is inserted, display a notification, and perform other functions.

[0051] The sensing unit 120 may include at least one of a temperature sensor 122, an insertion detection sensor 124, or a puff sensor 126. However, embodiments are not limited thereto.

[0052] The temperature sensor 122 may sense a temperature at which the heater 150 (or an aerosol generating material) is heated. The aerosol generating device 100 may include a separate temperature sensor for sensing the temperature of the heater 150, or the heater 150 itself may also function as a temperature sensor. Alternatively, the temperature sensor 122 may be arranged around the battery 140 to monitor a temperature of the battery 140.

[0053] The insertion detection sensor 124 may sense whether the aerosol generating article is inserted and/or removed. The insertion detection sensor 124 may include, for example, at least one of a film sensor, a pressure sensor, a light sensor, a resistive sensor, a capacitive sensor, an inductive sensor, or an infrared sensor, which may sense a signal change by the insertion and/or removal of the aerosol generating article.

[0054] The puff sensor 126 may sense a puff from a user based on various physical changes in an airflow path or airflow channel. For example, the puff sensor 126 may sense the puff from the user based on one of a temperature change, a flow change, a voltage change, and a pressure change.

[0055] The sensing unit 120 may further include at least one of a temperature/humidity sensor, an atmospheric pressure sensor, a magnetic sensor, an acceleration sensor, a gyroscope sensor, a position sensor (e.g., a global positioning system (GPS)), a proximity sensor, or a red, green, blue (RGB) sensor (e.g., an illuminance sensor), in addition to the sensors 122 to 126 described above. A function of each sensor may be intuitively inferable from its name by one of ordinary skill in the art, and thus, a more detailed description thereof will be omitted here.

[0056] The output unit 130 may output information about the state of the aerosol generating device 100 and provide the information to the user. The output unit 130 may include at least one of a display 132, a haptic portion 134, or a sound outputter 136. However, embodiments are not limited thereto. When the display 132 and a touchpad are provided in a layered structure to form a touchscreen, the display 132 may be used as an input device in addition to an output device.

[0057] The display 132 may visually provide information about the aerosol generating device 100 to the user. The information about the aerosol generating device 100 may include, for example, a charging/discharging state of the battery 140 of the aerosol generating device 100, a preheating state of the heater 150, an insertion/removal state of the aerosol generating article, a limited usage state (e.g., an abnormal article detected) of the aerosol generating device 100, or the like, and the display 132 may externally output the information. The display 132 may be, for example, a liquid-crystal display panel (LCD), an organic light-emitting display panel (OLED), or the like. The display 132 may also be in the form of a light-emitting diode (LED) device.

[0058] The haptic portion 134 may provide information about the aerosol generating device 100 to the user in a haptic way by converting an electrical signal into a mechanical stimulus or an electrical stimulus. The haptic portion 134 may include, for example, a motor, a piezoelectric element, or an electrical stimulation device.

[0059] The sound outputter 136 may provide information about the aerosol generating device 100 to the user in an auditory way. For example, the sound outputter 136 may convert an electrical signal into a sound signal and externally output the sound signal.

[0060] The battery 140 may supply power to be used to operate the aerosol generating device 100. The battery 140 may supply power to heat the heater 150. In addition, the battery 140 may supply power required for operations of the other components (e.g., the sensing unit 120, the output unit 130, the user input unit 160, the memory 170, and the communication unit 180) included in the aerosol generating device 100. The battery 140 may be a rechargeable battery or a disposable battery. The battery 140 may be, for example, a lithium polymer (LiPoly) battery. However, embodiments are not limited thereto.

[0061] The heater 150 may receive power from the battery 140 to heat the aerosol generating material. Although not shown in FIG. 1, the aerosol generating device 100 may further include a power conversion circuit (e.g., a direct current (DC)-to-DC (DC/DC) converter) that converts power of the battery 140 and supplies the power to the heater 150. In addition, when the aerosol generating device 100 generates an aerosol by induction heating, the aerosol generating device 100 may further include a DC-to-alternating current (AC) (DC/AC) con-

verter that converts DC power of the battery 140 into AC power.

[0062] The controller 110, the sensing unit 120, the output unit 130, the user input unit 160, the memory 170, and the communication unit 180 may receive power from the battery 140 to perform functions. Although not shown in FIG. 1, the aerosol generating device 100 may further include a power conversion circuit, for example, a low dropout (LDO) circuit or a voltage regulator circuit, which converts power of the battery 140 and supplies the power to respective components.

[0063] In an embodiment, the heater 150 may be formed of a predetermined electrically resistive material that is suitable. The electrically resistive material may be a metal or a metal alloy including, for example, titanium, zirconium, tantalum, platinum, nickel, cobalt, chromium, hafnium, niobium, molybdenum, tungsten, tin, gallium, manganese, iron, copper, stainless steel, nichrome, or the like. However, embodiments are not limited thereto. In addition, the heater 150 may be implemented as a metal heating wire, a metal heating plate on which an electrically conductive track is arranged, a ceramic heating element, or the like. However, embodiments are not limited thereto.

[0064] In another embodiment, the heater 150 may be an induction heater. For example, the heater 150 may include a susceptor that heats the aerosol generating material by generating heat through a magnetic field applied by a coil.

[0065] In an embodiment, the heater 150 may include a plurality of heaters. For example, the heater 150 may include a first heater for heating the aerosol generating article and a second heater for heating a liquid.

[0066] The user input unit 160 may receive information input from the user or may output information to the user. For example, the user input unit 160 may include a key pad, a dome switch, a touchpad (e.g., a contact capacitive type, a pressure resistive film type, an infrared sensing type, a surface ultrasonic conduction type, an integral tension measurement type, a piezo effect method, etc.), a jog wheel, a jog switch, or the like. However, embodiments are not limited thereto. In addition, although not shown in FIG. 1, the aerosol generating device 100 may further include a connection interface such as a universal serial bus (USB) interface, and may be connected to another external device through the connection interface such as a USB interface to transmit and receive information or to charge the battery 140.

[0067] The memory 170, which is hardware for storing various pieces of data processed in the aerosol generating device 100, may store data processed by the controller 110 and data to be processed by the controller 110. The memory 170 may include at least one type of storage medium of flash memory-type memory, hard disk-type memory, multimedia card micro-type memory, card-type memory (e.g., secure digital (SD) or extreme digital (XD) memory), random access memory (RAM), static RAM (SRAM), read-only memory (ROM), electrically erasable programmable ROM (EEPROM), programmable ROM (PROM), magnetic memory, a magnetic disk, or an optical disk. The memory 170 may store an operating time of the aerosol generating device 100, a maximum number of puffs, a current number of puffs, at least one temperature profile, data associated with a smoking pattern of the user, or the like.

[0068] The communication unit 180 may include at least one component for communicating with another electronic device. For example, the communication unit 180 may include a short-range wireless communication unit 182 and a wireless communication unit 184.

[0069] The short-range wireless communication unit 182 may include a Bluetooth communication unit, a Bluetooth low energy (BLE) communication unit, a near field communication unit, a wireless local area network (WLAN) (wireless fidelity (Wi-Fi)) communication unit, a ZigBee communication unit, an infrared data association (IrDA) communication unit, a Wi-Fi direct (WFD) communication unit, an ultra-wideband (UWB) communication unit, and an Ant+ communication unit. However, embodiments are not limited thereto.

[0070] The wireless communication unit 184 may include, for example, a cellular network communication unit, an Internet communication unit, a computer network (e.g., a LAN or wide-area network (WAN) communication unit, or the like. However, embodiments are not limited thereto. The wireless communication unit 184 may use subscriber information (e.g., international mobile subscriber identity (IMSI)) to identify and authenticate the aerosol generating device 100 in a communication network.

[0071] The controller 110 may control the overall operation of the aerosol generating device 100. In an embodiment, the controller 110 may include at least one processor. The processor may be implemented as an array of a plurality of logic gates, or may be implemented as a combination of a general-purpose microprocessor and a memory in which a program executable by the microprocessor is stored. In addition, it is to be understood by one of ordinary skill in the art to which the present disclosure pertains that it may be implemented in other types of hardware.

[0072] The controller 110 may control the temperature of the heater 150 by controlling supply of power from the battery 140 to the heater 150. For example, the controller 110 may control the supply of power by controlling switching of a switching element between the battery 140 and the heater 150. In another example, a direct heating circuit may control the supply of power to the heater 150 according to a control command from the controller 110.

[0073] The controller 110 may analyze a sensing result obtained by the sensing of the sensing unit 120 and control processes to be performed thereafter. For example, the controller 110 may control power to be supplied to the heater 150 to start or end an operation of the heater 150 based on the sensing result obtained by the sensing

unit 120. In another example, the controller 110 may control an amount of power to be supplied to the heater 150 and a time for which the power is to be supplied, such that the heater 150 may be heated up to a predetermined temperature or maintained at a desired temperature, based on the sensing result obtained by the sensing unit 120.

[0074] The controller 110 may control the output unit 130 based on the sensing result obtained by the sensing unit 120. For example, when the number of puffs counted through the puff sensor 126 reaches a preset number, the controller 110 may inform the user that the aerosol generating device 100 is to be ended soon, through at least one of the display 132, the haptic portion 134, or the sound outputter 136.

[0075] In an embodiment, the controller 110 may control a power supply time and/or a power supply amount for the heater 150 according to a state of the aerosol generating article sensed by the sensing unit 120. For example, when the aerosol generating article is in an over-humidified state, the controller 110 may control the power supply time for an inductive coil to increase a preheating time, compared to a case where the aerosol generating article is in a general state.

[0076] An embodiment may be implemented in the form of a recording medium including instructions executable by a computer, such as a program module executable by the computer. A computer-readable medium may be any available medium that may be accessed by a computer and includes a volatile medium, a non-volatile medium, a removable medium, and a non-removable medium. In addition, the computer-readable medium may include both a computer storage medium and a communication medium. The computer storage medium includes all of a volatile medium, a non-volatile medium, a removable medium, and a non-removable medium implemented by any method or technology for storage of information such as computer-readable instructions, data structures, program modules or other data. The communication medium typically includes computer-readable instructions, data structures, other data in modulated data signals such as program modules, or other transmission mechanisms, and includes any information transfer medium.

[0077] FIG. 2A is a schematic diagram of an aerosol generating device 200 (e.g., the aerosol generating device 100 of FIG. 1) according to an embodiment. FIG. 2B is a schematic diagram of the aerosol generating device 200 in which an aerosol generating article 300 is inserted according to an embodiment.

[0078] Referring to FIGS. 2A and 2B, the aerosol generating device according to an embodiment may include a housing 210, a stick holder 220, a rotation element 226, a light irradiation element 230, an input button 240, and a battery 260, and a controller 270.

[0079] The housing 210 according to an embodiment may include one end, another end formed on a side opposite to the one end, open end 212, and an elongated cavity 214. In an embodiment, the housing 210 may accommodate various mechanical/electronic components of the aerosol generating device 200 in an inner space of the housing 210. In an embodiment, the housing 210 may be formed of a rigid material (e.g., plastic, a metal, a carbon plate, a synthetic resin, etc.).

[0080] The open end 212 according to an embodiment may be disposed on one surface of the one end or the other end to communicate with the elongated cavity 214. The elongated cavity 214 according to an embodiment is a cavity formed by extending from the open end 212 of the housing 210 to the inside of the housing 210, and may include a space in which an aerosol generating article is accommodated.

[0081] In an embodiment, the elongated cavity 214 may include an inner wall surface 214a and a bottom surface 214b. The inner wall surface 214a according to an embodiment may correspond to an inner wall surface of the elongated cavity 214 and may correspond to a side surface of an aerosol generating article when the aerosol generating article is inserted into the elongated cavity 214. The bottom surface 214b according to an embodiment may correspond to an end surface of the elongated cavity 214 and may correspond to an upstream end of an aerosol generating article when the aerosol generating article is inserted into the elongated cavity 214.

[0082] In an embodiment, the elongated cavity 214 may include a light transmitting element 216. In an embodiment, at least a portion of the inner wall surface 214a of the elongated cavity 214 may be formed of a material that may transmit light. In an embodiment, the light transmitting element 216 may be disposed to correspond to a direction in which the light irradiation element 230 is disposed with respect to the elongated cavity 214. Since the light transmitting element 216 according to an embodiment is disposed to correspond to the direction in which the light irradiation element 230 is disposed, light from the light irradiation element 230 may be emitted to the inside of the elongated cavity 214.

[0083] In an embodiment, the stick holder 220 may include a first holder 222 and a second holder 224.

[0084] In an embodiment, the first holder 222 may be disposed on the bottom surface 214b of the elongated cavity 214. In an embodiment, the first holder 222 may hold one end (e.g., a first segment 320 of FIG. 3) of an aerosol generating article (e.g., the aerosol generating article 300 of FIG. 3). In an embodiment, the first holder 222 may include a holding portion 2221, a shaft 2222, and a perforation 2223. In an embodiment, the holding portion 2221 may correspond to a portion in which the one end of the aerosol generating article 300 is accommodated. In an embodiment, an inner diameter of the holding portion 2221 may be equal to an inner diameter of the aerosol generating article 300. In an embodiment, the inner diameter of the holding portion 2221 may be larger than the inner diameter of the aerosol generating article 300. In an embodiment, the inner diameter of the holding portion 2221 may be smaller than the inner diameter of the

aerosol generating article 300. In an embodiment, the shaft 2222 may be disposed to connect the holding portion 2221 and the bottom surface 214b of the elongated cavity 214 to help the holding portion 2221 to stably accommodate the aerosol generating article 300. In an embodiment, the shaft 2222 may be formed of the same material as that of the holding portion 2221 continuously from the holding portion 2221. In an embodiment, the shaft 2222 may be a different part from the holding portion 2221 and may be coupled to the holding portion 2221. In an embodiment, the perforation 2223 may be formed to penetrate a wall of the holding portion 2221 disposed parallel to the bottom surface 214b of the elongated cavity 214. In an embodiment, an airflow introduced into the aerosol generating device 200 may move into the aerosol generating article 300 through the perforation 2223 (see an arrow F1 of FIG. 2B).

[0085] In an embodiment, the second holder 224 may be disposed adjacent to the open end 212 of the housing 210. In an embodiment, the second holder 224 may hold a middle portion (e.g., a second segment 330 of FIG. 3) of the aerosol generating article 300. In an embodiment, the second holder 224 may include a gear. In an embodiment, the second holder 224 may be disposed to surround an inlet of the elongated cavity 214 to rotate about a central longitudinal axis of the elongated cavity 214. In an embodiment, the second holder 224 may be formed to protrude toward the central longitudinal axis than the inner wall 214a of the elongated cavity 214 to hold the aerosol generating article 300. In an embodiment, the second holder 224 may include a perforation (not shown) to facilitate the introduction of an airflow. In an embodiment, the perforation of the second holder 224 may be formed parallel to a perforation 2243 of the first holder 222.

[0086] In an embodiment, the rotation element 226 may rotate the stick holder 220 about a central depth axis of the elongated cavity 214. In an embodiment, the rotation element 226 may include a motor 2261 and a gear 2262. The motor 2261 according to an embodiment may include an energy source that actively generates a rotational movement. The motor 2261 according to an embodiment may include a servo motor. When the rotation element 226 includes a servo motor, the user may rotate the stick holder 220 by a desired angle. The gear 2262 according to an embodiment may be disposed to be coupled to a motor shaft of the motor 2261. The gear 2262 according to an embodiment may be driven in an interlocked manner with a gear of the second holder 224. For example, the gear 2262 according to an embodiment may be a driving gear connected to the motor 2261, and the gear of the second holder 224 according to an embodiment may be a pinion gear. In an embodiment, a rotation direction of the stick holder 220 may be determined according to a rotation direction of the rotation element 226. The rotation direction of the stick holder 220 according to an embodiment may be opposite to the rotation direction of the rotation element 226. The rotation direction of the stick holder 220 according to an embodiment may be the same as the rotation direction of the rotation element 226. A rotation direction of the aerosol generating article 300 according to an embodiment (e.g., see an arrow D1 of FIG. 2B) may be the same as the rotation direction of the stick holder 220.

[0087] In an embodiment, the light irradiation element 230 may emit light toward the aerosol generating article 300 to heat a medium (e.g., a medium segment 310 of FIG. 3) included in the aerosol generating article 300. The light irradiation element 230 according to an embodiment may be disposed in parallel with the elongated cavity 214. The light irradiation element 230 according to an embodiment may be disposed side by side with the elongated cavity 214. The light irradiation element 230 according to an embodiment may include a light source unit 232, a reflection unit 234, an angle adjustment unit 236, and an enlargement unit 238. In an embodiment, the light source unit 232 may emit light. For example, the light source unit 232 may include a laser emitter. In an embodiment, the reflection unit 234 may reflect the light emitted from the light source unit 232 at an appropriate angle such that the light is directed to the aerosol generating article 300. For example, the reflection unit 234 may include quartz, glass, or a high-gloss metal material, but is not necessarily limited thereto. In an embodiment, the angle adjustment unit 236 may change an angle of the reflection unit 234 such that the light is evenly emitted to a medium segment (e.g., the medium segment 310 of FIG. 3) of the aerosol generating article 300 (e.g., see an arrow D2 of FIG. 2B). In an embodiment, the angle adjustment unit 236 may be disposed adjacent to the reflection unit 234. In an embodiment, the angle adjustment unit 236 may include a motor 236a, a first gear 236b, and a second gear 236c. In an embodiment, the enlargement unit 238 may be disposed between the light source unit 232 and the reflection unit 234. The enlargement unit 238 according to an embodiment may amplify an intensity, brightness, frequency, and/or wavelength of light emitted from the light source unit 232. The light irradiation element 230 according to an embodiment will be described in more detail below with reference to FIGS. 4A and 4B.

[0088] In an embodiment, the input button 240 (e.g., the user input unit 160 of FIG. 1) may be disposed at one end of the housing 210. In an embodiment, the input button 240 may protrude out of the housing 210. In an embodiment, the input button 240 may be connected to the rotation element 226. In an embodiment, the rotation element 226 may be activated by operating the input button 240. For example, the stick holder 220 may rotate by operating the input button 240. In an embodiment, an angle at which the rotation element 226 rotates during a single operation of the input button 240 may vary depending on user's preference, habit, and/or a preset value of the aerosol generating device. In an embodiment, the angle at which the rotation element 226 rotates during a single operation of the input button 240 may be customized.

[0089] In an embodiment, the battery 260 may supply power to be used to operate the aerosol generating device 200. The battery 260 may supply power to activate the motors 2261 and 236a. In addition, the battery 260 may supply power required for operations of the other components (e.g., the light source unit 232 and the input button 240) included in the aerosol generating device 200. The battery 260 may be a rechargeable battery or a disposable battery. The battery 260 may be, for example, a lithium polymer (LiPoly) battery. However, embodiments are not limited thereto.

[0090] In an embodiment, the controller 270 may control the overall operation of the aerosol generating device 200. In an embodiment, the controller 270 may include at least one processor. The processor may be implemented as an array of a plurality of logic gates, or may be implemented as a combination of a general-purpose microprocessor and a memory in which a program executable by the microprocessor is stored. In addition, it is to be understood by one of ordinary skill in the art to which the present disclosure pertains that it may be implemented in other types of hardware.

[0091] FIG. 3 is a cross-sectional perspective view of the aerosol generating article 300 according to an embodiment.

[0092] In an embodiment, the aerosol generating article 300 may be accommodated in the elongated cavity 214 of the aerosol generating device 200 to generate an aerosol. In an embodiment, the aerosol generating article 300 may include a first end surface 300a, a second end surface 300b formed on a side opposite to the first end surface 300a, and a side surface 300c formed between the first end surface 300a and the second end surface 300b. In an embodiment, the aerosol generating article 300 may include the medium segment 310, the first segment 320 disposed on an upstream side of the medium segment 310, the second segment 330 disposed on a downstream side of the medium segment 310, a wrapper 340, and a filter segment 350.

[0093] In an embodiment, the medium segment 310 may include a first medium end 310a and a second medium end 310b. The first medium end 310a according to an embodiment may be an end in contact with the first segment 320. The second medium end 310b according to an embodiment may be an end in contact with the second segment 330. According to an embodiment, the medium segment 310 may include a medium. For example, the medium may include solid materials based on tobacco raw materials such as tobacco sheets, cut tobacco leaves, and reconstituted tobacco and a liquid composition based on nicotine, a tobacco extract, and/or various fragrances. However, embodiments are not limited thereto. For example, the medium segment according to an embodiment may be configured to be filled with a medium, the tobacco sheets, being bent or rolled. In an embodiment, the medium segment 310 may include a hollow tube 312. In an embodiment, an aerosol generated as the medium segment 310 is heated may move toward the first end surface 300a through the hollow tube 312 formed in the middle of the medium segment 310. For example, the aerosol may be smoothly delivered to the user's mouth through the hollow tube 312 formed in the middle of the medium segment 310. In an embodiment, the medium segment 310 may be exposed to the outside of the aerosol generating article 300. For example, the wrapper 340 may be peeled off in the vicinity of the medium segment 310.

[0094] In an embodiment, the first segment 320 may prevent the medium of the medium segment 310 from falling off. For example, the first segment 320 may include a front end plug. The front end plug may be positioned on one side opposite to the second segment 330. In an embodiment, the front end plug may prevent a medium from escaping to the outside, and may also prevent an aerosol liquefied from a medium segment during smoking from flowing into an aerosol generating device. In an embodiment, the front end plug may be formed of cellulose acetate. For example, the front end plug 23 may be manufactured by adding a plasticizer (e.g., triacetin) to cellulose acetate tow. In an embodiment, a cross section of the filament constituting the front end plug may be Y-shaped. In an embodiment, the front end plug may include at least one channel, and a cross-sectional shape of the channel may be provided in various ways.

[0095] In an embodiment, the second segment 330 may be disposed in contact with a downstream side of the medium segment 310. The second segment 330 according to an embodiment may include a paper tube therein. In an embodiment, the second segment 330 may cool an aerosol generated in the medium segment 310.

[0096] In an embodiment, the aerosol generating article 300 may be wrapped with at least one wrapper 340. The wrapper 340 according to an embodiment may have at least one hole through which external air is introduced or internal gas flows out. For example, the first segment 320 and the filter segment 350 may be wrapped by a first wrapper 341, and the first segment 320, the second segment 330, and the filter segment 350 may be wrapped again by a second wrapper 342. For example, the wrapper 340 may wrap the side surface 300c corresponding to the first segment 320, the second segment 330, and the filter segment 350 excluding the medium segment 310.

[0097] In an embodiment, FIG. 3 shows the filter segment 350 as a single segment. However, embodiments are not limited thereto. That is, the filter segment 350 may include a plurality of segments. For example, the filter segment 350 may include a segment that cools an aerosol and a segment that filters a predetermined ingredient contained in an aerosol. In addition, the filter segment 350 may further include at least one segment that performs another function, as needed. The filter segment 350 may be a cellulose acetate filter. However, a shape of the filter segment 350 is not limited. For example, the filter segment 350 may be a cylindrical rod or a tubular rod including a hollow therein. The filter segment 350 may also be a recess-type rod.

[0098] FIG. 4A is a perspective view of the inside of the aerosol generating device 200 according to an embodiment. FIG. 4B is an enlarged view of an area A of the aerosol generating device 200 according to an embodiment of FIG. 4A.

[0099] Referring to FIGS. 4A and 4B, the aerosol generating article 300 may be firmly disposed in an elongated cavity (e.g., the elongated cavity 214 of FIG. 2A) by the first holder 222 and the second holder 224 without being shaken. In an embodiment, light emitted from the light source unit 232 may have linearity. In an embodiment, light emitted from the light source unit 232 may be reflected by the reflection unit 234 to be directed toward the medium segment 310 of the aerosol generating article 300. Since the light emitted from the light source unit 232 has condensed light energy and/or thermal energy, the medium 311 exposed to the outside of a medium segment 310 may be heated. In an embodiment, a position of the medium segment 310 to be heated may vary depending on an angle at which the reflection unit 234 is disposed with respect to the light source unit 232. In an embodiment, the angle of the reflection unit 234 with respect to the light source unit 232 may be adjusted by the angle adjustment unit 236. In an embodiment, the angle of the reflection unit 234 may rotate with respect to an axis in a direction (e.g., a Z direction) perpendicular to a longitudinal direction of the aerosol generating article 300. For example, the angle of the reflection unit 234 may rotate in a direction of the arrow D2 of FIG. 2B and in a direction opposite to the arrow D2. As the reflection unit 234 according to an embodiment rotates, the light emitted from the light source unit 232 may be continuously emitted from a first medium end (e.g., the first medium end 310a of FIG. 3) to a second medium end (e.g., the second medium end 310b of FIG. 3). In an embodiment, an area of a heating region 313 heated by a single continuous irradiation of light may vary depending on a length l1 of the medium segment and a width l2 of the emitted light. In an embodiment, the area of the heating region 313 heated by a single continuous irradiation of light may be calculated as a product of the length 11 of the medium segment and the width l2 of the emitted light.

[0100] In an embodiment, an aerosol generated as a result of heating of the medium segment 310 by the light irradiation element 230 may move toward the second end surface 300b through a hollow tube (e.g., the hollow tube 312 of FIG. 3) generated in the middle of the medium segment 310.

[0101] FIG. 5 is an enlarged view of an aerosol generating device 500 (e.g., the aerosol generating device 200 of FIGS. 2A and 2B) according to an embodiment.

[0102] In an embodiment, the aerosol generating device 500 may include a puff sensor 550. In an embodiment, the puff sensor 550 (e.g., the sensing unit 120 of FIG. 1) may be disposed at one end of a housing 510. In an embodiment, the puff sensor 550 may detect a user's puff inside the housing 510. In an embodiment, the puff sensor 550 may be connected to a rotation element 526. In an embodiment, when the puff sensor 550 detects the user's puff, the rotation element 526 may be activated. For example, a stick holder, particularly, a second holder 524 may rotate by an operation of the puff sensor 550. In an embodiment, an angle at which the rotation element 526 rotates during a single operation of the puff sensor 550 may vary depending on user's preference, habit, and/or a preset value of the aerosol generating device. In an embodiment, the angle at which the rotation element 526 rotates during a single operation of the input button 240 may be customized. In an embodiment, the puff sensor 550 may replace the input button 240 of the aerosol generating device 200 according to an embodiment.

[0103] While the embodiments are described with reference to drawings, it will be apparent to one of ordinary skill in the art that various alterations and modifications in form and details may be made in these embodiments without departing from the spirit and scope of the claims and their equivalents. For example, suitable results may be achieved if the described techniques are performed in a different order, and/or if components in a described system, architecture, device, or circuit are combined in a different manner, or replaced or supplemented by other components or their equivalents.

[0104] Therefore, other implementations, other embodiments, and equivalents of the claims are within the scope of the following claims.

Claims

1. An aerosol generating device comprising:

a housing comprising an open end, and an elongated cavity communicating with the open end to accommodate an aerosol generating article;
a stick holder disposed in the elongated cavity and holding and rotating the aerosol generating article about a central longitudinal axis of the aerosol generating article; and
a light irradiation element configured to emit light to heat a medium segment included in the aerosol generating article.

2. The aerosol generating device of claim 1, wherein

the light irradiation element is disposed side by side with the elongated cavity, and
the light irradiation element comprises:

a light source unit configured to emit light;
a reflection unit configured to cause the light emitted from the light source unit to be directed toward the medium segment; and
an angle adjustment unit disposed adjacent to the reflection unit and configured to adjust

an angle of light reflected by the reflection unit to cause the light to evenly reach the medium segment.

3. The aerosol generating device of claim 2, wherein

the aerosol generating article further comprises a first segment disposed on an upstream side of the medium segment, and a second segment disposed on a downstream side of the medium segment,
the medium segment comprises a first medium end that contacts with the first segment, and a second medium end that contacts with the second segment, and
the angle adjustment unit is configured to cause the light reflected by the reflection unit to be emitted continuously from the first medium end to the second medium end.

4. The aerosol generating device of claim 3, wherein the stick holder comprises:

a first holder disposed on a bottom surface of the elongated cavity to hold the first segment of the aerosol generating article; and
a second holder disposed adjacent to the open end of the housing to hold the second segment of the aerosol generating article.

5. The aerosol generating device of claim 4, further comprising:

a rotation element,
wherein the rotation element is configured to rotate the stick holder about a central depth axis of the elongated cavity.

6. The aerosol generating device of claim 5, further comprising:

an input button connected to the rotation element,
wherein an operation of the input button activates the rotation element to rotate the rotation element.

7. The aerosol generating device of claim 5, further comprising:

a puff sensor connected to the rotation element and configured to detect a user's puff,
wherein an operation of the puff sensor activates the rotation element to rotate the rotation element.

8. The aerosol generating device of claim 1, wherein the elongated cavity comprises an inner wall surface facing the aerosol generating article, and at least a portion of the inner wall surface is formed of a material that transmits light.

9. The aerosol generating device of claim 1, wherein

the medium segment comprises a medium, and the medium is exposed to outside of the aerosol generating article.

10. An aerosol generating article comprising:

a first end surface;
a second end surface formed on a side opposite to the first end surface;
a side surface formed between the first end surface and the second end surface;
a medium segment;
a first segment;
a second segment; and
a wrapper,
wherein the first segment is disposed on an upstream side of the medium segment, and the second segment is disposed on a downstream side of the medium segment, and
wherein the wrapper wraps the side surface corresponding to the first segment and the second segment excluding the medium segment.

11. The aerosol generating article of claim 10, wherein the medium segment comprises a hollow tube, and an aerosol formed by heating the medium segment moves toward the second end surface through the hollow tube.

12. The aerosol generating article of claim 10 or 11, wherein the medium segment is filled with a tobacco sheet medium that is bent or rolled.

13. The aerosol generating article of claim 10, wherein the medium segment comprises a medium, and the medium is exposed to outside.

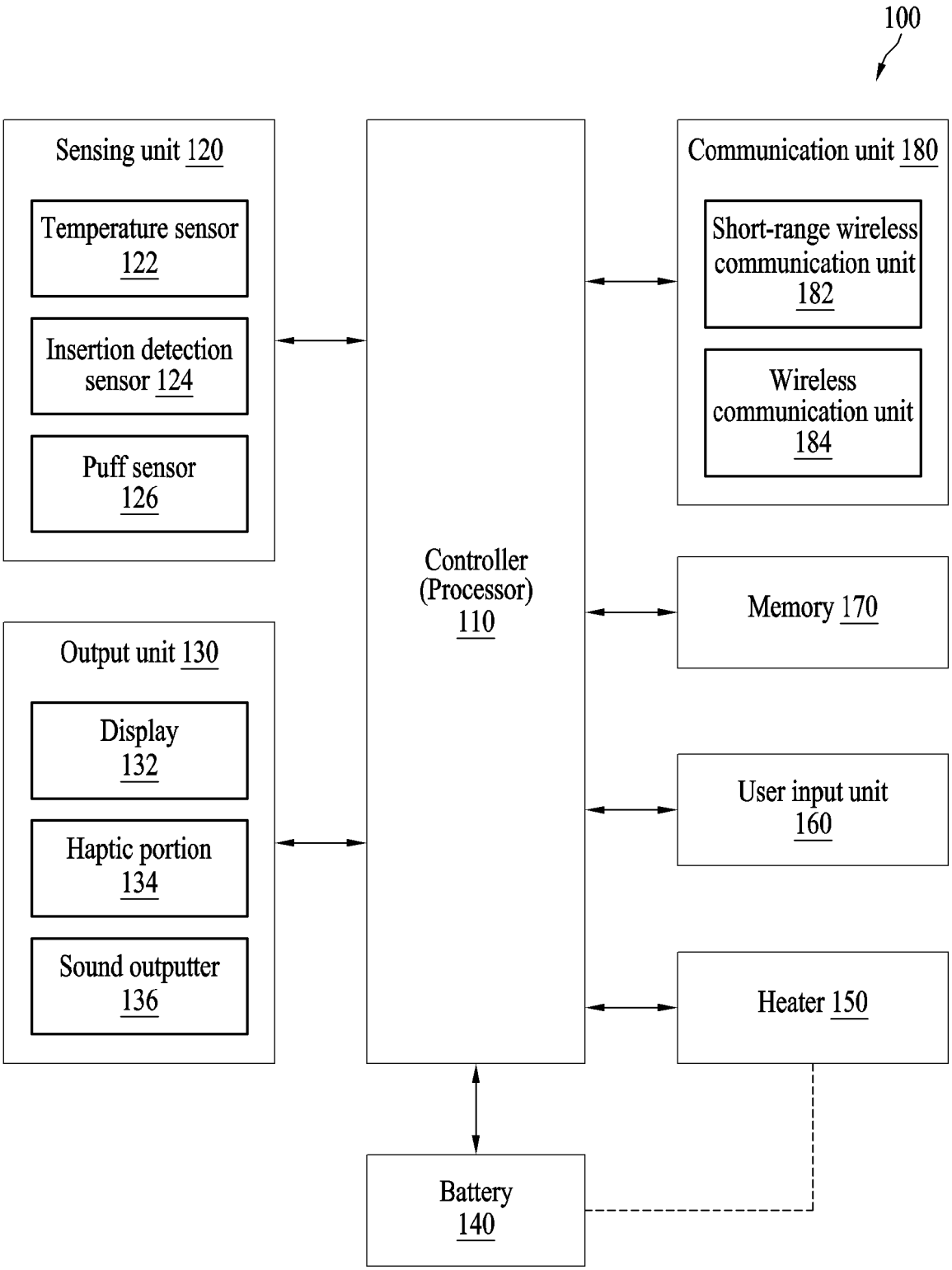
100
Sensing unit 120
Temperature sensor 122
Insertion detection sensor 124
Puff sensor 126
Output unit 130
Display 132
Haptic portion 134
Sound outputter 136
Controller (Processor) 110
Communication unit 180
Short-range wireless communication unit 182
Wireless communication unit 184
Memory 170
User input unit 160
Heater 150
Battery 140

FIG. 1

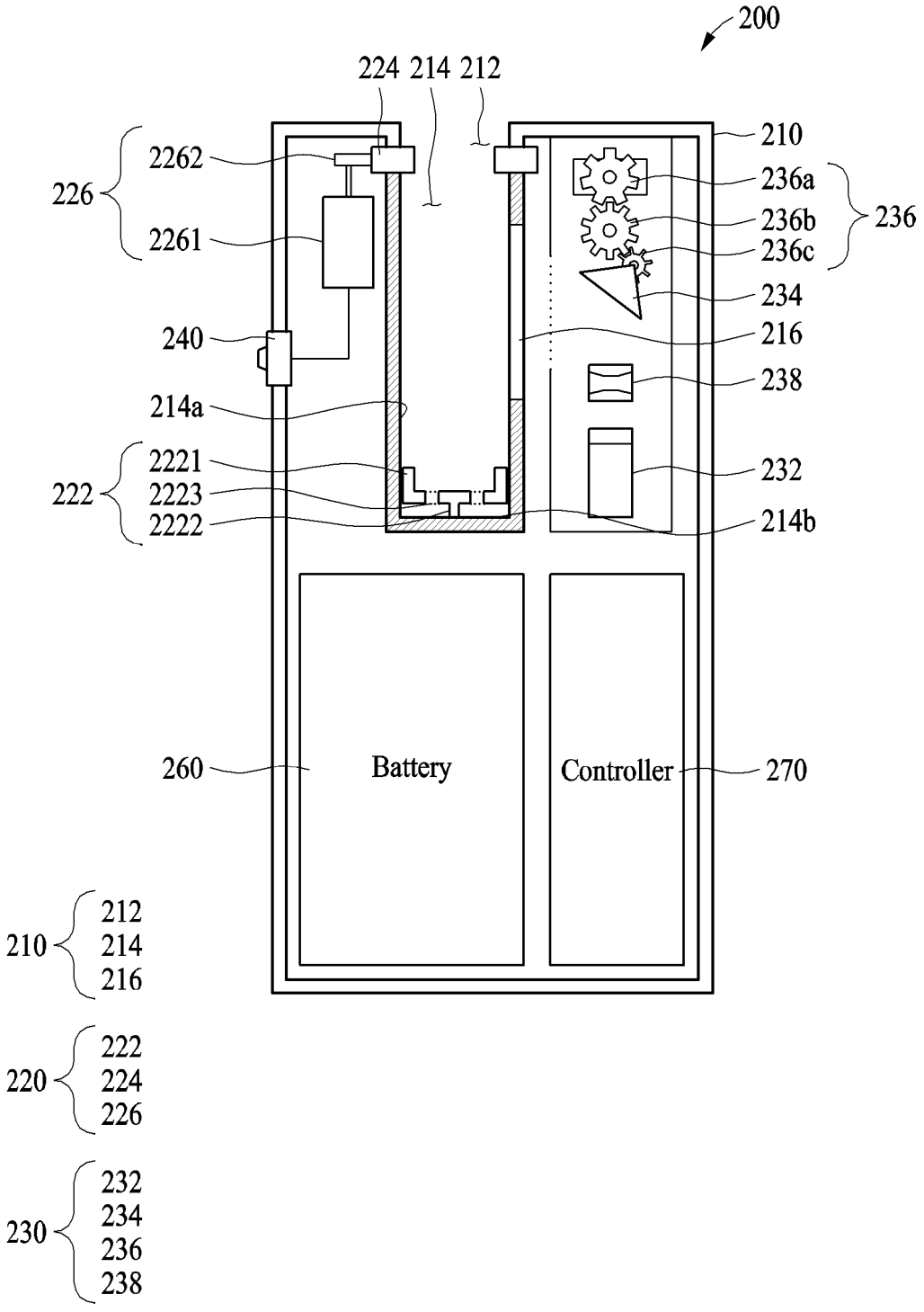
200
224 214 212
210
2262
226
2261
236a
236b
236c
236
234
240
216
238
214a
2221
222
2223
2222
232
214b
Battery
Controller
260
270
210
212
214
216
220
222
224
226
230
232
234
236
238

FIG. 2A

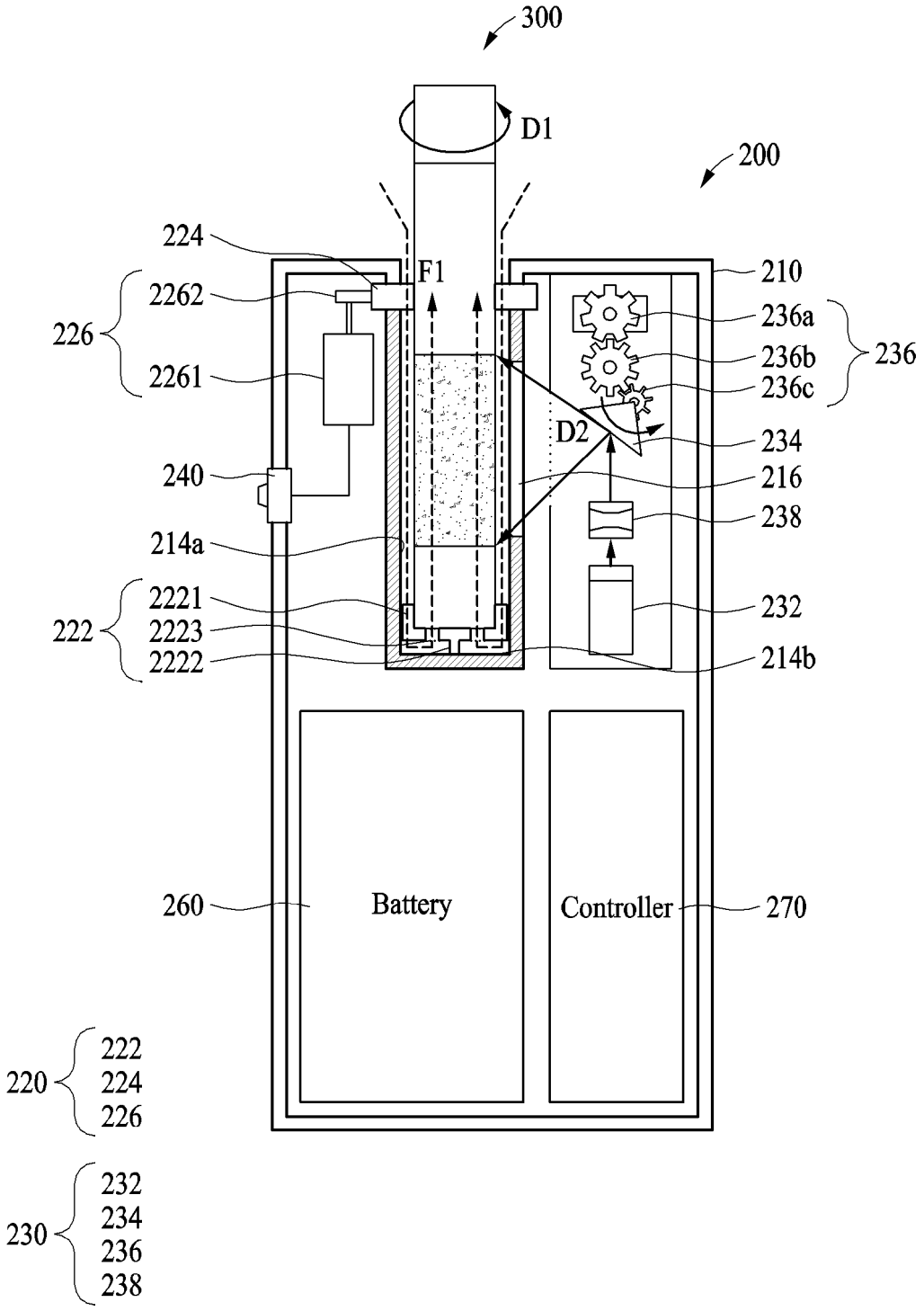
300
D1
200
224
F1
210
2262
236a
226
2261
236b
236
236c
D2
234
240
216
238
214a
2221
232
222
2223
2222
214b
Battery
Controller
260
270
220
222
224
226
230
232
234
236
238

FIG. 2B

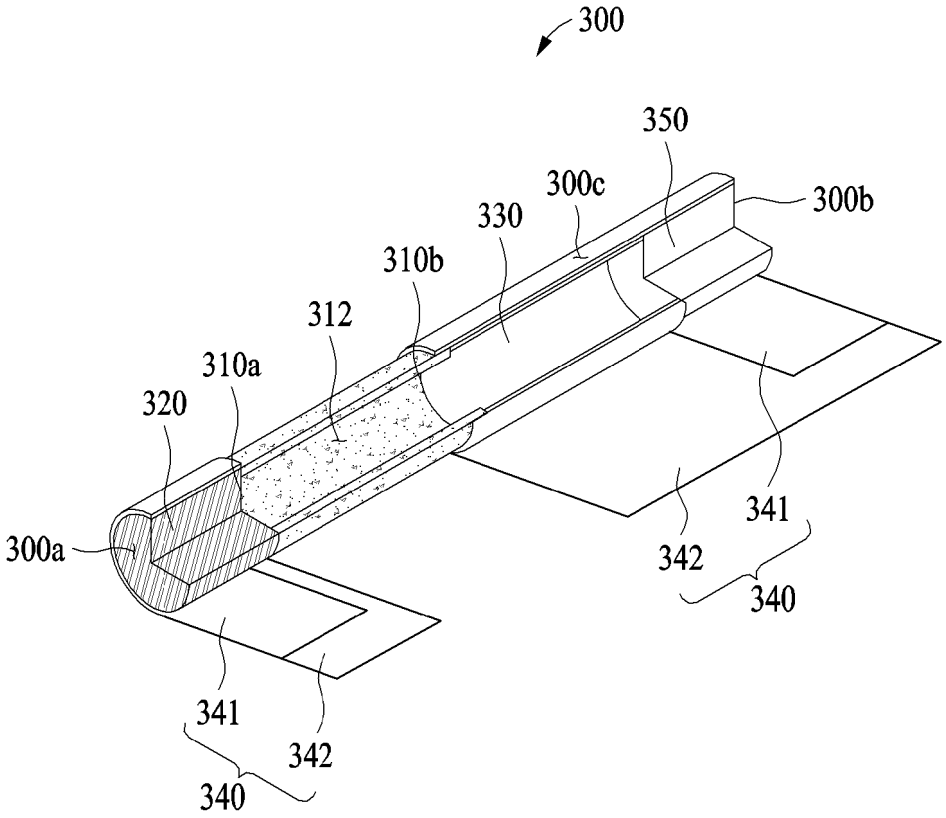
300
350
300c
300b
330
310b
312
310a
320
300a
341
342
340
341
342
340

FIG. 3

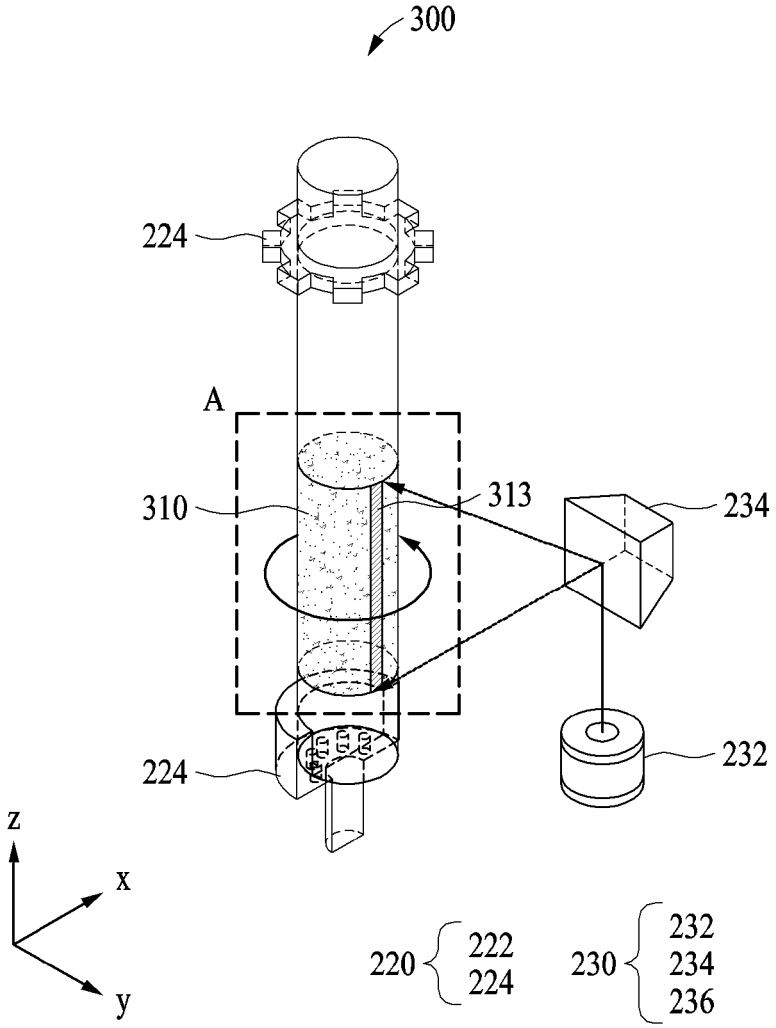

FIG. 4A

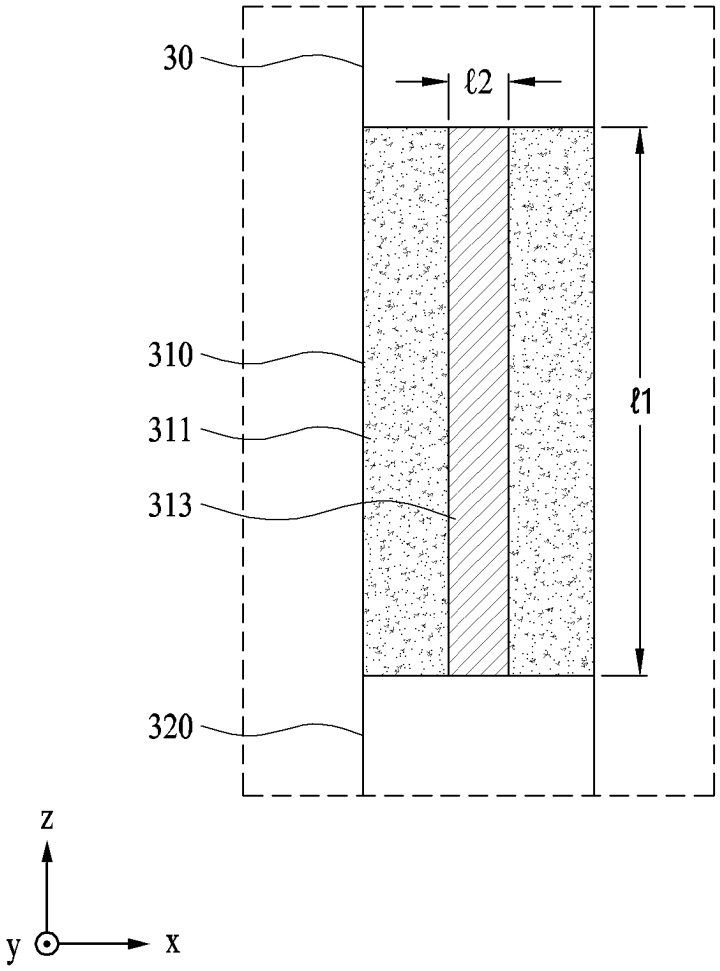

FIG. 4B

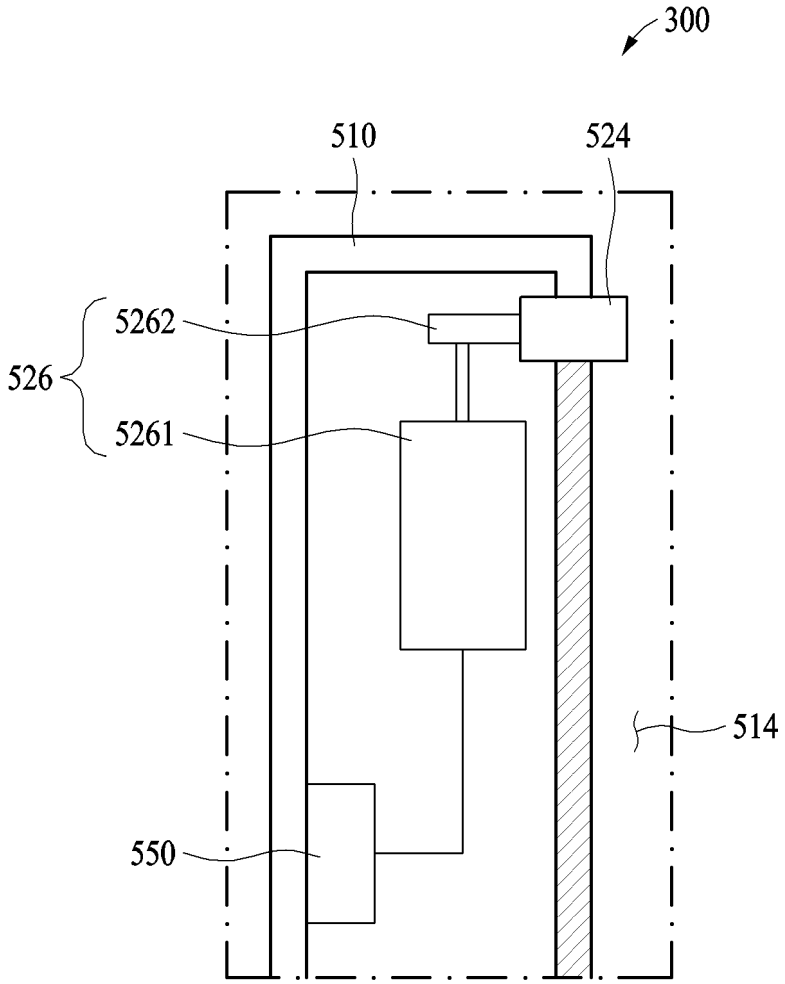

FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2023/007583

A. CLASSIFICATION OF SUBJECT MATTER

A24F 40/40(2020.01)i; **A24F 40/46**(2020.01)i; **H05B 3/00**(2006.01)i; **A24F 40/60**(2020.01)i; **A24F 40/51**(2020.01)i; **A24D 1/20**(2020.01)i; **A24F 40/20**(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 40/40(2020.01); A24B 15/16(2006.01); A24F 40/46(2020.01); A24F 40/60(2020.01); A24F 47/00(2006.01); G02B 3/00(2006.01); G02B 7/182(2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models: IPC as above
Japanese utility models and applications for utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPO internal) & keywords: 에어로졸(aerosol), 궐련(cigarette), 레이저(laser), 가열(heating), 홀더(holder) 및 회전(rotation)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2019-519194 A (BRITISH AMERICAN TOBACCO (INVESTMENTS) LTD.) 11 July 2019 (2019-07-11) See paragraphs [0034]-[0084] and figures 1-10B.	1-13
Y	KR 10-2020-0031570 A (PHILIP MORRIS PRODUCTS S.A.) 24 March 2020 (2020-03-24) See paragraphs [0069]-[0077] and figures 1-3b.	1-9
Y	KR 10-2021-0137833 A (KT & G CORPORATION) 18 November 2021 (2021-11-18) See paragraphs [0031]-[0036] and figures 1-2.	10-13
A	KR 10-2021-0142466 A (KT & G CORPORATION) 25 November 2021 (2021-11-25) See paragraphs [0018]-[0067] and figures 1-5.	1-13
A	KR 10-2016-0134582 A (SEOK, In Sun) 23 November 2016 (2016-11-23) See paragraphs [0027]-[0050] and figures 1-21.	1-13

☐ 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
01 September 2023	**04 September 2023**
Name and mailing address of the ISA/KR **Korean Intellectual Property Office** **Government Complex-Daejeon Building 4, 189 Cheongsa-ro, Seo-gu, Daejeon 35208** Facsimile No. **+82-42-481-8578**	Authorized officer Telephone No.

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2023/007583

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
JP 2019-519194 A	11 July 2019	CN 109068745 A	21 December 2018
		EP 3448189 A1	06 March 2019
		JP 2021-006053 A	21 January 2021
		JP 2022-169694 A	09 November 2022
		JP 6773800 B2	21 October 2020
		JP 7130714 B2	05 September 2022
		US 2019-0133187 A1	09 May 2019
		WO 2017-186946 A1	02 November 2017
KR 10-2020-0031570 A	24 March 2020	BR 112019027752 A2	07 July 2020
		CN 110799050 A	14 February 2020
		EP 3654790 A1	27 May 2020
		EP 3654790 B1	07 September 2022
		JP 2020-527338 A	10 September 2020
		US 11478590 B2	25 October 2022
		US 2021-0145057 A1	20 May 2021
		WO 2019-016740 A1	24 January 2019
KR 10-2021-0137833 A	18 November 2021	KR 10-2455534 B1	17 October 2022
KR 10-2021-0142466 A	25 November 2021	KR 10-2535304 B1	22 May 2023
KR 10-2016-0134582 A	23 November 2016	None	

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

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

- KR 1020170132823 **[0002]**