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(71) Applicant: **KT&G CORPORATION** [KR/KR]; 71, Beotkkot-gil, Daedeok-gu, Daejeon 34337 (KR).

(72) Inventors: **KIM, Yong Hwan**; 6-302, 40 Seoksu-ro, Manan-gu, Anyang-si, Gyeonggi-do 13970 (KR). **KWON, Young Bum**; 912-1601, 33 Manhyeon-ro 133beon-gil, Suji-gu, Yongin-si, Gyeonggi-do 16930 (KR). **KIM, Dong Sung**; 124-1205, 264 Gaepo-ro, Gangnam-gu, Seoul 06310 (KR). **LIM, Hun Il**; 332-1903, 62 Jamsil-ro, Songpa-gu, Seoul 05555 (KR).

(74) Agent: **Y.P.LEE, MOCK & PARTNERS**; 12F Daelim Acrotel, 13 Eonju-ro 30-gil, Gangnam-gu, Seoul 06292 (KR).

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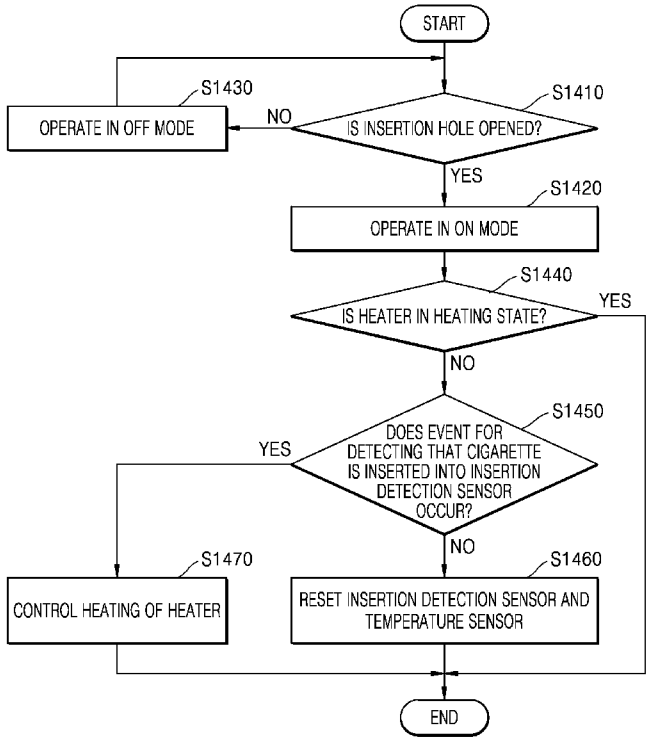

(57) Abstract: An aerosol generating device includes a heater configured to heat the inserted cigarette, a temperature sensor configured to detect a temperature of the heater, an insertion detection sensor configured to detect insertion of the cigarette, a puff sensor configured to detect puffs by a user, and a controller configured to reset at least one of the temperature sensor and the puff sensor in response to a sensing signal output from the insertion detection sensor.

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Description

Title of Invention: AEROSOL GENERATING DEVICE AND METHOD OF CONTROLLING THE SAME

Technical Field

[1] The disclosure relates to an aerosol generating device and an operation method thereof.

Background Art

[2] Recently, the demand for alternative methods for overcoming the shortcomings of general cigarettes has increased. For example, there is an increasing demand for a system for generating aerosols by heating a cigarette or an aerosol generating material by using an aerosol generating device, rather than by burning cigarettes. Accordingly, research on heating-type cigarettes or heating-type aerosol generating devices has been actively conducted.

Disclosure of Invention

Technical Problem

[3] Aerosol generating devices have various types of sensors mounted thereon. The sensors need to operate normally for a stable operation of the aerosol generating devices.

[4] The sensors mounted on the aerosol generating devices are sensitive to environmental changes, e.g., temperature changes, and thus, need to be frequently reset to reduce errors due to the environmental changes.

[5] According to the disclosure, a state of various types of sensors mounted on an aerosol generating device is stably maintained.

Solution to Problem

[6] According to an aspect of the disclosure, an aerosol generating device is configured to allow a cigarette to be inserted thereinto and includes a heater configured to heat the inserted cigarette, a temperature sensor configured to detect a temperature of the heater, an insertion detection sensor configured to detect insertion of the cigarette, a puff sensor configured to detect puffs by a user, and a controller configured to reset at least one of the temperature sensor and the puff sensor in response to a sensing signal output from the insertion detection sensor.

[7] According to another aspect of the disclosure, an aerosol generating device is configured to allow a cigarette to be inserted thereinto and includes a heater configured to heat the inserted cigarette, a temperature sensor configured to detect a temperature of the heater, an insertion detection sensor configured to detect insertion of the cigarette, and a controller configured to set an operation mode of the aerosol

generating device to an ON mode or an OFF mode, wherein the controller is further configured to reset the insertion detection sensor and the temperature sensor when the heater is not activated in the ON mode.

[8] According to another aspect of the disclosure, a method of controlling an aerosol generating device includes operating the aerosol generating device in an ON mode, determining whether or not the heater is activated, and resetting the insertion detection sensor and the temperature sensor when the heater is not activated.

Advantageous Effects of Invention

[9] According to embodiments, various types of sensors mounted on an aerosol generating device may be maintained in an optimal state.

Brief Description of Drawings

[10] FIGS. 1 to 3 are block diagrams illustrating examples in which a cigarette is inserted into an aerosol generating device, according to an embodiment.

[11] FIGS. 4 and 5 are views illustrating examples of a cigarette according to an embodiment.

[12] FIG. 6 is a block diagram of an aerosol generating device according to an embodiment.

[13] FIG. 7 is a perspective view of an aerosol generating device according to some embodiments.

[14] FIG. 8 is a side view of the aerosol generating device illustrated in FIG. 7.

[15] FIG. 9 is a top view of the aerosol generating device illustrated in FIG. 7.

[16] FIG. 10 is a perspective view illustrating an operation state of the aerosol generating device illustrated in FIG. 7.

[17] FIG. 11 is a top view of the aerosol generating device illustrated in FIG. 10.

[18] FIG. 12 is a block diagram illustrating a structure of an aerosol generating device according to some embodiments.

[19] FIG. 13 is a flowchart illustrating an example of a method of controlling an aerosol generating device, according to some embodiments.

[20] FIG. 14 is a flowchart illustrating another example of a method of controlling an aerosol generating device, according to some embodiments.

Best Mode for Carrying out the Invention

[21] According to an aspect of the disclosure, an aerosol generating device is configured to allow a cigarette to be inserted thereinto and includes a heater configured to heat the inserted cigarette, a temperature sensor configured to detect a temperature of the heater, an insertion detection sensor configured to detect insertion of the cigarette, a puff sensor configured to detect puffs by a user, and a controller configured to reset at least one of the temperature sensor and the puff sensor in response to a sensing signal

output from the insertion detection sensor.

[22] The puff sensor may include a pressure sensor, and the controller may be further configured to reset a reference value of the pressure sensor.

[23] The aerosol generating device may further include an output unit configured to output information regarding a state of the aerosol generating device, wherein the controller is further configured to control the output unit to display a notification of a reset failure when at least one of the temperature sensor and the puff sensor fails to be reset.

[24] The controller may be further configured to control the heater to start a heating operation according to a predetermined temperature profile when the cigarette is inserted.

[25] According to another aspect of the disclosure, an aerosol generating device is configured to allow a cigarette to be inserted thereinto and includes a heater configured to heat the inserted cigarette, a temperature sensor configured to detect a temperature of the heater, an insertion detection sensor configured to detect insertion of the cigarette, and a controller configured to set an operation mode of the aerosol generating device to an ON mode or an OFF mode, wherein the controller is further configured to reset the insertion detection sensor and the temperature sensor when the heater is not activated in the ON mode.

[26] The controller may be further configured to control the heater to start a heating operation according to a predetermined temperature profile when an event of the insertion detection sensor detecting that the cigarette is inserted occurs.

[27] The controller may be further configured to reset the insertion detection sensor and the temperature sensor when the insertion detection sensor does not detect the insertion of the cigarette for a preset period of time.

[28] The aerosol generating device may further include a case including an insertion hole into which the cigarette is inserted, a cover configured to open and close the insertion hole, and an opening/closing detection sensor configured to detect whether the insertion hole is opened or closed, wherein the controller is further configured to set the operation mode of the aerosol generating device to the ON mode or the OFF mode based on a sensing signal from the opening/closing detection sensor.

[29] The controller may be further configured to set the operation mode of the aerosol generating device to the ON mode and activate the insertion detection sensor, when the sensing signal indicates that the insertion hole is opened.

[30] The controller may be further configured to set the operation mode of the aerosol generating device to the OFF mode and deactivate the sensing signal from the insertion detection sensor, when the sensing signal indicates that the insertion hole is opened.

Mode for the Invention

[31] Regarding the terms in the various embodiments, the general terms which are currently and widely used are selected in consideration of functions of structural elements in the various embodiments of the present disclosure. However, meanings of the terms can be changed according to intention, a judicial precedence, the appearance of a new technology, and the like. In addition, in certain cases, terms which can be arbitrarily selected by the applicant in particular cases. In such a case, the meaning of the terms will be described in detail at the corresponding portion in the description of the present disclosure. Therefore, the terms used in the various embodiments of the present disclosure should be defined based on the meanings of the terms and the descriptions provided herein.

[32] In addition, unless explicitly described to the contrary, the word "comprise" and variations such as "comprises" or "comprising" will be understood to imply the inclusion of stated elements but not the exclusion of any other elements. In addition, the terms "-er", "-or", and "module" described in the specification mean units for processing at least one function and operation and can be implemented by hardware components or software components and combinations thereof.

[33] Hereinafter, the present disclosure will now be described more fully with reference to the accompanying drawings, in which exemplary embodiments of the present disclosure are shown such that one of ordinary skill in the art may easily work the present disclosure. The present disclosure may be implemented in a form that can be implemented in the aerosol generating devices of the various embodiments described above or may be implemented in various different forms, and is not limited to the embodiments described herein.

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

[35] FIGS. 1 through 3 are diagrams showing examples in which a cigarette is inserted into an aerosol generating device.

[36] Referring to FIG. 1, the aerosol generating device 1 may include a battery 11, a controller 12, and a heater 13. Referring to FIGS. 2 and 3, the aerosol generating device 1 may further include a vaporizer 14. Also, the cigarette 2 may be inserted into an inner space of the aerosol generating device 1.

[37] FIGS. 1 through 3 illustrate components of the aerosol generating device 1, which are related to the present embodiment. Therefore, it will be understood by one of ordinary skill in the art related to the present embodiment that other general-purpose components may be further included in the aerosol generating device 1, in addition to the components illustrated in FIGS. 1 through 3.

[38] Also, FIGS. 2 and 3 illustrate that the aerosol generating device 1 includes the heater 13. However, as necessary, the heater 13 may be omitted.

[39] FIG. 1 illustrates that the battery 11, the controller 12, and the heater 13 are arranged in series. Also, FIG. 2 illustrates that the battery 11, the controller 12, the vaporizer 14, and the heater 13 are arranged in series. Also, FIG. 3 illustrates that the vaporizer 14 and the heater 13 are arranged in parallel. However, the internal structure of the aerosol generating device 1 is not limited to the structures illustrated in FIGS. 1 through 3. In other words, according to the design of the aerosol generating device 1, the battery 11, the controller 12, the heater 13, and the vaporizer 14 may be differently arranged.

[40] When the cigarette 2 is inserted into the aerosol generating device 1, the aerosol generating device 1 may operate the heater 13 and/or the vaporizer 14 to generate aerosol from the cigarette 2 and/or the vaporizer 14. The aerosol generated by the heater 13 and/or the vaporizer 14 is delivered to a user by passing through the cigarette 2.

[41] As necessary, even when the cigarette 2 is not inserted into the aerosol generating device 1, the aerosol generating device 1 may heat the heater 13.

[42] The battery 11 may supply power to be used for the aerosol generating device 1 to operate. For example, the battery 11 may supply power to heat the heater 13 or the vaporizer 14, and may supply power for operating the controller 12. Also, the battery 11 may supply power for operations of a display, a sensor, a motor, etc. mounted in the aerosol generating device 1.

[43] The controller 12 may generally control operations of the aerosol generating device 1. In detail, the controller 12 may control not only operations of the battery 11, the heater 13, and the vaporizer 14, but also operations of other components included in the aerosol generating device 1. Also, the controller 12 may check a state of each of the components of the aerosol generating device 1 to determine whether or not the aerosol generating device 1 is able to operate.

[44] The controller 12 may include at least one processor. A processor can be implemented as an array of a plurality of logic gates or can be implemented as a combination of a general-purpose microprocessor and a memory in which a program executable in the microprocessor is stored. It will be understood by one of ordinary skill in the art that the processor can be implemented in other forms of hardware.

[45] The heater 13 may be heated by the power supplied from the battery 11. For example, when the cigarette 2 is inserted into the aerosol generating device 1, the heater 13 may be located outside the cigarette 2. Thus, the heated heater 13 may increase a temperature of an aerosol generating material in the cigarette 2.

[46] The heater 13 may include an electro-resistive heater. For example, the heater 13 may include an electrically conductive track, and the heater 13 may be heated when

currents flow through the electrically conductive track. However, the heater 13 is not limited to the example described above and may include all heaters which may be heated to a desired temperature. Here, the desired temperature may be pre-set in the aerosol generating device 1 or may be set by a user.

[47] As another example, the heater 13 may include an induction heater. In detail, the heater 13 may include an electrically conductive coil for heating an aerosol generating article in an induction heating method, and the aerosol generating article may include a susceptor which may be heated by the induction heater.

[48] For example, the heater 13 may include a tube-type heating element, a plate-type heating element, a needle-type heating element, or a rod-type heating element, and may heat the inside or the outside of the cigarette 2, according to the shape of the heating element.

[49] Also, the aerosol generating device 1 may include a plurality of heaters 130. Here, the plurality of heaters 130 may be inserted into the cigarette 2 or may be arranged outside the cigarette 2. Also, some of the plurality of heaters 130 may be inserted into the cigarette 2 and the others may be arranged outside the cigarette 2. In addition, the shape of the heater 13 is not limited to the shapes illustrated in FIGS. 1 through 3 and may include various shapes.

[50] The vaporizer 14 may generate aerosol by heating a liquid composition and the generated aerosol may pass through the cigarette 2 to be delivered to a user. In other words, the aerosol generated via the vaporizer 14 may move along an air flow passage of the aerosol generating device 1 and the air flow passage may be configured such that the aerosol generated via the vaporizer 14 passes through the cigarette 2 to be delivered to the user.

[51] For example, the vaporizer 14 may include a liquid storage, a liquid delivery element, and a heating element, but it is not limited thereto. For example, the liquid storage, the liquid delivery element, and the heating element may be included in the aerosol generating device 1 as independent modules.

[52] The liquid storage may store a liquid composition. For example, the liquid composition may be a liquid including a tobacco-containing material having a volatile tobacco flavor component, or a liquid including a non-tobacco material. The liquid storage may be formed to be detachable from the vaporizer 14 or may be formed integrally with the vaporizer 14.

[53] For example, the liquid composition may include water, a solvent, ethanol, plant extract, spices, flavorings, or a vitamin mixture. The spices may include menthol, peppermint, spearmint oil, and various fruit-flavored ingredients, but are not limited thereto. The flavorings may include ingredients capable of providing various flavors or tastes to a user. Vitamin mixtures may be a mixture of at least one of vitamin A,

vitamin B, vitamin C, and vitamin E, but are not limited thereto. Also, the liquid composition may include an aerosol forming substance, such as glycerin and propylene glycol.

[54] The liquid delivery element may deliver the liquid composition of the liquid storage to the heating element. For example, the liquid delivery element may be a wick such as cotton fiber, ceramic fiber, glass fiber, or porous ceramic, but is not limited thereto.

[55] The heating element is an element for heating the liquid composition delivered by the liquid delivery element. For example, the heating element may be a metal heating wire, a metal hot plate, a ceramic heater, or the like, but is not limited thereto. In addition, the heating element may include a conductive filament such as nichrome wire and may be positioned as being wound around the liquid delivery element. The heating element may be heated by a current supply and may transfer heat to the liquid composition in contact with the heating element, thereby heating the liquid composition. As a result, aerosol may be generated.

[56] For example, the vaporizer 14 may be referred to as a cartomizer or an atomizer, but it is not limited thereto.

[57] The aerosol generating device 1 may further include general-purpose components in addition to the battery 11, the controller 12, the heater 13, and the vaporizer 14. For example, the aerosol generating device 1 may include a display capable of outputting visual information and/or a motor for outputting haptic information. Also, the aerosol generating device 1 may include at least one sensor (a puff sensor, a temperature sensor, an aerosol generating article insertion detecting sensor, etc.). Also, the aerosol generating device 1 may be formed as a structure that, even when the cigarette 2 is inserted into the aerosol generating device 1, may introduce external air or discharge internal air.

[58] Although not illustrated in FIGS. 1 through 3, the aerosol generating device 1 and an additional cradle may form together a system. For example, the cradle may be used to charge the battery 11 of the aerosol generating device 1. Alternatively, the heater 13 may be heated when the cradle and the aerosol generating device 1 are coupled to each other.

[59] The cigarette 2 may be similar to a general combustive cigarette. For example, the cigarette 2 may be divided into a first portion including an aerosol generating material and a second portion including a filter, etc. Alternatively, the second portion of the cigarette 2 may also include an aerosol generating material. For example, an aerosol generating material made in the form of granules or capsules may be inserted into the second portion.

[60] The entire first portion may be inserted into the aerosol generating device 1, and the second portion may be exposed to the outside. Alternatively, only a portion of the first

portion may be inserted into the aerosol generating device 1, or the entire first portion and a portion of the second portion may be inserted into the aerosol generating device 1. The user may puff aerosol while holding the second portion by the mouth of the user. In this case, the aerosol is generated by the external air passing through the first portion, and the generated aerosol passes through the second portion and is delivered to the user's mouth.

[61] For example, the external air may flow into at least one air passage formed in the aerosol generating device 1. For example, opening and closing of the air passage and/or a size of the air passage formed in the aerosol generating device 1 may be adjusted by the user. Accordingly, the amount and the quality of smoking may be adjusted by the user. As another example, the external air may flow into the cigarette 2 through at least one hole formed in a surface of the cigarette 2.

[62] Hereinafter, an example of the cigarette 2 will be described with reference to FIGS. 4 and 5.

[63] FIGS. 4 and 5 illustrate an example of a cigarette.

[64] Referring to FIG. 4, the cigarette 2 includes a tobacco rod 21 and a filter rod 22. The first portion described above with reference to FIGS. 1 through 3 may include the tobacco rod 21, and the second portion may include the filter rod 22.

[65] FIG. 4 illustrates that the filter rod 22 includes a single segment, but is not limited thereto. In other words, the filter rod 22 may include a plurality of segments. For example, the filter rod 22 may include a segment configured to cool an aerosol and a segment configured to filter a certain component included in the aerosol. Also, according to necessity, the filter rod 22 may further include at least one segment configured to perform other functions.

[66] A diameter of the cigarette 2 may range from 5 mm to 9 mm, and a length of the cigarette 20 may be about 48 mm, but embodiments are not limited thereto. For example, the length of the tobacco rod 21 may be about 12 mm, the length of a first segment of the filter rod 22 may be about 10 mm, the length of a second segment of the filter rod 22 is about 14 mm, the length of a third segment may be about 12 mm, but embodiments are not limited thereto.

[67] The cigarette 20 may be packaged via at least one wrapper 24. The wrapper 24 may have at least one hole through which external air may be introduced or internal air may be discharged. For example, the cigarette 2 may be packaged via one wrapper 24. As another example, the cigarette 2 may be doubly packaged via at least two wrappers 24. For example, the tobacco rod 21 may be packaged via a first wrapper 241, and the filter rod 22 may be packaged via wrappers 242, 243, and 244. Also, the entire cigarette 2 may be re-packaged by a fifth wrapper 245, which is a single wrapper. When the filter rod 22 includes a plurality of segments, each segment may be packaged

via separate wrappers 242, 243, and 244.

[68] The first wrapper 241 and the second wrapper 242 may be made of a general filter wrapper. For example, the first wrapper 241 and the second wrapper 242 may be a porous wrapper or a non-porous wrapper. In addition, the first wrapper 241 and the second wrapper 242 may be made of a paper and/or aluminum laminate wrapper having oil resistance.

[69] The third wrapper 243 may be made of a hard wrapper. For example, the basis weight of the third wrapper 243 may be within a range of 88 g/m^2 to 96 g/m^2, for example, in the range of 90 g/m^2 to 94 g/m^2. In addition, the thickness of the third wrapper 243 may be included in a range of 120 μm to 130 μm, for example, about 125 μm.

[70] The fourth wrapper 244 may be made of a hard wrapper having oil resistance. For example, the basis weight of the fourth wrapper 244 may be within a range of 88 g/m^2 to 96 g/m^2, for example, in the range of 90 g/m^2 to 94 g/m^2. In addition, the thickness of the fourth wrapper 244 may be within a range of 120 μm to 130 μm, for example, about 125 μm.

[71] The fifth wrapper 245 may be made of a sterilized paper MFW. Here, the sterilized paper MFW refers to a paper specially prepared such that the tensile strength, water resistance, and smoothness thereof are improved compared to ordinary paper. For example, the basis weight of the fifth wrapper 245 may be within 57 g/m^2 to 63 g/m^2, for example, about 60 g/m^2. In addition, the thickness of the fifth wrapper 245 may be within a range of 64 μm to 70 μm, for example, about 67 μm.

[72] A certain material may be added into the fifth wrapper 245. Here, silicon may be used as an example of the certain material. However, embodiments of the present disclosure are not limited thereto. For example, silicon possesses characteristics such as thermal resistance resulting in little change with temperature, non-oxidizing nature, resistance to various chemicals, water repellency, and electrical insulation. However, even if it is not silicon, any material having the above-described characteristics may be applied (or coated) to the fifth wrapper 245.

[73] The fifth wrapper 245 may prevent combustion of the cigarette 2. For example, if the tobacco rod 210 is heated by the heater 13, the cigarette 2 may be combusted. In detail, when the temperature of any one of the materials included in the tobacco rod 310 rises above the ignition point, the cigarette 2 may be combusted. Even in this case, because the fifth wrapper 245 includes a non-combustible material, the cigarette 2 may be prevented from being combusted.

[74] In addition, the fifth wrapper 245 may prevent the aerosol generating device 1 from being contaminated by materials generated in the cigarette 2. Liquid may be generated from the cigarette 2 by a user's puff. For example, because the aerosol generated from

the cigarette 2 is cooled by air from the outside, liquid (for example, moisture, etc.) may be generated. Because the cigarette 2 is wrapped by the fifth wrapper 245, liquid generated from the cigarette 2 may be prevented from leaking outside the cigarette 2.

[75] The tobacco rod 21 may include an aerosol generating material. For example, the aerosol generating material may include at least one of glycerin, propylene glycol, ethylene glycol, dipropylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol, and oleyl alcohol, but is not limited thereto. Also, the tobacco rod 21 may include other additives, such as flavors, a wetting agent, and/or organic acid. Also, the tobacco rod 21 may include a flavored liquid, such as menthol or a moisturizer, which is sprayed onto the tobacco rod 21.

[76] The tobacco rod 21 may be manufactured in various forms. For example, the tobacco rod 21 may be formed as a sheet or a strand. Also, the tobacco rod 21 may be formed as a pipe tobacco, which is formed of tiny bits cut from a tobacco sheet. Also, the tobacco rod 21 may be surrounded by a heat conductive material. For example, the heat conductive material may be, but is not limited to, a metal foil such as aluminum foil. For example, the heat conductive material surrounding the tobacco rod 21 may uniformly distribute heat transmitted to the tobacco rod 21, and thus, the heat conductivity applied to the tobacco rod may be increased and taste of the tobacco may be improved. Also, the heat conductive material surrounding the tobacco rod 21 may function as a susceptor heated by the induction heater. Here, although not illustrated in the drawings, the tobacco rod 21 may further include an additional susceptor, in addition to the heat conductive material surrounding the tobacco rod 21.

[77] The filter rod 22 may include a cellulose acetate filter. Shapes of the filter rod 22 are not limited. For example, the filter rod 22 may include a cylinder-type rod or a tube-type rod having a hollow inside. Also, the filter rod 22 may include a recess-type rod. When the filter rod 22 includes a plurality of segments, at least one of the plurality of segments may have a different shape.

[78] The first segment of the filter rod 22 may include a cellulose acetate filter. For example, the first segment may be a tube-shaped structure including a hollow inside. When the heater 13 is inserted by the first segment, the inner material of the tobacco rod 210 may be prevented from being pushed backward, and a cooling effect of the aerosol may be generated. A diameter of the hollow included in the first segment may be implemented within a range of about 2 mm to about 4.5 mm, but embodiments are not limited thereto.

[79] A length of the first segment may be implemented within a range of about 4 mm to about 30 mm, but embodiments are not limited thereto. For example, the length of the first segment may be about 10 mm, but is not limited thereto.

[80] The rigidity of the first segment may be controlled by controlling the content of the

plasticizer during the manufacture of the first segment. In addition, the first segment may be manufactured by inserting a structure such as a film or tube made of the same material or different materials to the inside (i.e., the hollow) of the first segment.

[81] The second segment of the filter rod 22 cools the aerosol generated by heating the tobacco rod 21 through the heater 13. Accordingly, the user may inhale the aerosol cooled to an appropriate temperature.

[82] The length or diameter of the second segment may be determined in various ways according to the form of cigarette 2. For example, the length of the second segment can be implemented appropriately within a range of about 7 mm to about 20 mm. For example, the length of the second segment may be about 14 mm, but is not limited thereto.

[83] The second segment may be made by weaving polymer fibers. In this case, flavoring liquid may be applied to fibers made of polymer. Alternatively, the second segment may be manufactured by weaving a separate fiber onto which flavoring liquid is applied and a fiber made of polymer together. Alternatively, the second segment may be formed by a crimped polymer sheet.

[84] For example, polymer may be formed of a material selected from a group consisting of polyethylene (PE), polypropylene (PP), polyvinyl chloride (PVC), polyethylene terephthalate (PET), polylactic acid (PLA), cellulose acetate (CA), and aluminum foil.

[85] As the second segment is formed by a polymer fiber or a crimped polymer sheet, the second segment may include a single or a plurality of channels extending in a longitudinal direction. Here, the channel refers to a passage through which a gas (e.g., air or aerosol) passes.

[86] For example, the second segment consisting of a crimped polymer sheet may be formed of a material having a thickness between about 5 μm and about 300 μm, for example, between about 10 μm, and about 250 μm. In addition, the entire surface area of the second segment may be between about 300 mm^2/mm and about 1,000 mm^2/mm. In addition, an aerosol cooling element may be formed of a material having a specific surface area of between about 10 mm^2/mg and about 100 mm^2/mg.

[87] The second segment may include a thread containing volatile flavor components. Here, volatile flavor components may be menthol, but are not limited thereto. For example, in a thread, a sufficient amount of menthol may be filled so that menthol of more than 1.5 mg may be provided to the second segment.

[88] The third segment of the filter rod 22 may include a cellulose acetate filter. The length of the third segment may be implemented appropriately within a range of about 4 mm to about 20 mm. For example, the length of the third segment may be about 12 mm, but is not limited thereto.

[89] The third segment may be manufactured such that flavor is generated by spraying

flavoring liquid on the third segment. Alternatively, a separate fiber to which a flavoring liquid is applied may be inserted into the third segment. The aerosol generated by the tobacco rod 21 is cooled as it passes through the second segment of the filter rod 22, and the cooled aerosol is delivered to the user through the third segment. Thus, when a flavoring element is added to the third segment, the persistence of the flavor transmitted to the user may be enhanced.

[90] Also, the filter rod 22 may include at least one capsule 23. Here, the capsule 23 may generate a flavor or an aerosol. For example, the capsule 23 may have a configuration in which a liquid containing a flavoring material is wrapped with a film. For example, the capsule 23 may have a spherical or cylindrical shape, but is not limited thereto.

[91] Referring to FIG. 5, the cigarette 3 may further include a front-end plug 33. The front-end plug 33 may be located on a side of the tobacco rod 31, the side facing the filter rod 32. The front-end plug 33 may prevent the tobacco rod 31 from escaping to the outside and may prevent a liquefied aerosol from flowing from the tobacco rod 31 into an aerosol generating device (1 of FIGS. 1 to 3) during smoking.

[92] The filter rod 32 may include a first segment 321 and a second segment 322. Here, the first segment 321 may correspond to the first segment of the filter rod 22 of FIG. 4, and the second segment 322 may correspond to the third segment of the filter rod 22 of FIG. 4.

[93] The diameter and the total length of the cigarette 3 may correspond to the diameter and the total length of the cigarette 2 of FIG. 4. For example, the length of the front-end plug 33 may be about 7 mm, the length of the tobacco rod 31 may be about 15 mm, the length of the first segment 321 may be about 12 mm, and the length of the second segment 322 may be about 14 mm, but it is not limited to thereto.

[94] The cigarette 3 may be wrapped by at least one wrapper 35. The wrapper 35 may have at least one hole through which external air may be introduced or internal air may be discharged. For example, the front-end plug 33 may be wrapped by a first wrapper 351, the tobacco rod 31 may be wrapped by a second wrapper 352, the first segment 321 may be wrapped by a third wrapper 353, and the second segment 322 may be wrapped by a fourth wrapper 354. Also, the entire cigarette 3 may be re-wrapped by a fifth wrapper 355.

[95] Also, the fifth wrapper 355 may have at least one hole 36. For example, the hole 36 may be formed in an area surrounding the tobacco rod 31, but is not limited thereto. The hole 36 may serve to transfer heat generated by the heater 13 illustrated in FIGS. 2 and 3 to the inside of the tobacco rod 31.

[96] Also, the second segment 322 may include at least one capsule 34. Here, the capsule 34 may generate a flavor or an aerosol. For example, the capsule 34 may have a configuration in which a liquid containing a flavoring material is wrapped with a film. The

capsule 34 may have a spherical or cylindrical shape, but is not limited thereto.

[97] The first wrapper 351 may be a combination of a general filter wrapper and a metal foil such as aluminum foil. For example, the overall thickness of the first wrapper 351 may be within a range of about 45 μm to about 55 μm, for example, about 50.3 μm. In addition, the thickness of a metal foil of the first wrapper 351 may be within a range of about 6 μm to about 7 μm, for example, about 6.3 μm. In addition, the basis weight of the first wrapper 351 may be within about 50 g/m^2 to about 55 g/m^2, for example, about 53 g/m^2.

[98] The second wrapper 352 and the third wrapper 353 may be made of a general filter wrapper. For example, the second wrapper 352 and the third wrapper 353 may be a porous wrapper or a non-porous wrapper.

[99] For example, the porosity of the second wrapper 352 may be 35,000 cu, but is not limited thereto. In addition, the thickness of the second wrapper 352 may be within a range of about 70 μm to about 80 μm, for example, about 78 μm. In addition, the basis weight of the second wrapper 352 may be within about 20 g/m^2 to about 25 g/m^2, for example, about 23.5 g/m^2.

[100] For example, the porosity of the third wrapper 353 may be 24,000 cu, but is not limited thereto. In addition, the thickness of the third wrapper 353 may be within a range of about 60 μm to about 70 μm, for example, about 68 μm. In addition, the basis weight of the third wrapper 353 may be within about 20 g/m^2 to about 25 g/m^2, for example, about 21 g/m^2.

[101] The fourth wrapper 354 may be made of a PLA laminating paper. Here, the PLA laminating paper refers to a three-layer paper including a paper layer, a PLA layer, and a paper layer. For example, the thickness of the fourth wrapper 354 may be within a range of about 100 μm to about 120 μm, for example, about 110 μm. In addition, the basis weight of the fourth wrapper 354 may be within a range of about 80 g/m^2 to about 100 g/m^2, for example, about 88 g/m^2.

[102] The fifth wrapper 355 may be made of a sterilized paper MFW. Here, the sterilized paper MFW refers to a paper specially prepared such that the tensile strength, water resistance, and smoothness thereof are improved compared to ordinary paper. For example, the basis weight of the fifth wrapper 355 may be within about 57 g/m^2 to about 63 g/m^2, for example, about 60 g/m^2. In addition, the thickness of the fifth wrapper 355 may be within a range of about 64 μm to about 70 μm, for example, about 67 μm.

[103] A certain material may be added into the fifth wrapper 355. Here, silicon may be used as an example of the certain material. However, embodiments are not limited thereto. For example, silicon has properties such as heat resistance resulting in little change with temperature, non-oxidizing nature, resistance to various chemicals, water

repellency, electrical insulation, or the like. However, even if it is not silicon, any material having the above-described characteristics may be applied (or coated) to the fifth wrapper 355.

[104] The front-end plug 33 may be made of cellulose acetate. As an example, the front-end plug 33 may be generated by adding a plasticizer (e.g., triacetin) to the cellulose acetate tow. The mono denier of a filament constituting the cellulose acetate tow may be within a range of about 1.0 to about 10.0, for example, from about 4.0 to about 6.0. For example, the mono denier of the filament of the front-end plug 33 may be 5.0. In addition, the cross section of the filament constituting the front-end plug 33 may be a Y-shaped type. The total denier of the front-end plug 33 may be within a range of about 20,000 to about 30,000, for example, from about 25,000 to about 30,000. For example, the total denier of the front-end plug 33 may be 28,000.

[105] In addition, as needed, the front-end plug 33 may include at least one channel, and the cross-sectional shape of the channel may be manufactured in various ways.

[106] The tobacco rod 31 may correspond to the tobacco rod 21 described above with reference to FIG. 4. Therefore, the specific description of the tobacco rod 31 is omitted below.

[107] The first segment 321 may be made of cellulose acetate. For example, the first segment may be a tube-shaped structure including a hollow inside. The first segment 321 may be produced by adding a plasticizer (e.g., triacetin) to the cellulose acetate tow. For example, the mono denier and the total denier of the first segment 321 may be the same as the mono denier and the total denier of the front-end plug 33.

[108] The second segment 322 may be made of cellulose acetate. The mono denier of the filament constituting the second segment 322 may be within a range of about 1.0 to about 10.0, for example, from about 8.0 to about 10.0. For example, the mono denier of the filament of the second segment 322 may be 9.0. In addition, the cross-section of the filament of the second segment 322 may be a Y-shaped type. The total denier of the second segment 322 may be within a range of about 20,000 to about 30,000, for example, about 25,000.

[109] FIG. 6 is a block diagram of an aerosol generating device 600 according to another embodiment.

[110] The aerosol generating device 600 may include a controller 610, a sensing unit 620, an output unit 630, a battery 640, a heater 650, a user input unit 660, a memory 670, and a communication unit 680. However, the internal structure of the aerosol generating device 600 is not limited to those illustrated in FIG. 6. In other words, according to the design of the aerosol generating device 600, it will be understood by one of ordinary skill in the art that some of the components shown in FIG. 6 may be omitted or new components may be added.

[111] The sensing unit 620 may sense a state of the aerosol generating device 600 and a state around the aerosol generating device 600, and transmit sensed information to the controller 610. Based on the sensed information, the controller 610 may control the aerosol generating device 600 to perform various functions, such as controlling an operation of the heater 650, limiting smoking, determining whether an aerosol generating article (e.g., a cigarette, a cartridge, or the like) is inserted, displaying a notification, or the like.

[112] The sensing unit 620 may include at least one of a temperature sensor 622, an insertion detection sensor 624, and a puff sensor 626, but is not limited thereto.

[113] The temperature sensor 622 may sense a temperature at which the heater 650 (or an aerosol generating material) is heated. The aerosol generating device 600 may include a separate temperature sensor for sensing the temperature of the heater 650, or the heater 650 may serve as a temperature sensor. Alternatively, the temperature sensor 622 may also be arranged around the battery 640 to monitor the temperature of the battery 640.

[114] The insertion detection sensor 624 may sense insertion and/or removal of an aerosol generating article. For example, the insertion detection sensor 624 may include at least one of a film sensor, a pressure sensor, an optical sensor, a resistive sensor, a capacitive sensor, an inductive sensor, and an infrared sensor, and may sense a signal change according to the insertion and/or removal of an aerosol generating article.

[115] The puff sensor 626 may sense a user's puff on the basis of various physical changes in an airflow passage or an airflow channel. The puff sensor 626 may include at least one pressure sensor. For example, the puff sensor 626 may sense a user's puff on the basis of any one of a temperature change, a flow change, a voltage change, and a pressure change. When pressure within the aerosol generating device 600 is lower than or equal to reference pressure, the puff sensor 626 may transmit a puff sensing signal to the controller 610. The controller 610 may heat the heater 650 in response to the puff detection signal.

[116] An opening/closing detection sensor 628 may be a sensor that detects whether a cigarette insertion hole formed in the aerosol generating device 600 is opened or closed. For example, the opening/closing detection sensor 628 may be an on/off switch that generates an on signal when a cover moves to open the cigarette insertion hole and generates an off signal when the cover moves to close the cigarette insertion hole.

[117] The sensing unit 620 may include, in addition to the temperature sensor 622, the insertion detection sensor 624, and the puff sensor 626 described above, at least one of a temperature/humidity sensor, a barometric pressure sensor, a magnetic sensor, an acceleration sensor, a gyroscope sensor, a location sensor (e.g., a global positioning system (GPS)), a proximity sensor, and a red-green-blue (RGB) sensor (illuminance

sensor). Because a function of each of sensors may be intuitively inferred by one of ordinary skill in the art from the name of the sensor, a detailed description thereof may be omitted.

[118] The output unit 630 may output information on a state of the aerosol generating device 600 and provide the information to a user. The output unit 630 may include at least one of a display unit 632, a haptic unit 634, and a sound output unit 636, but is not limited thereto. When the display unit 632 and a touch pad form a layered structure to form a touch screen, the display unit 632 may also be used as an input device in addition to an output device.

[119] The display unit 632 may visually provide information about the aerosol generating device 600 to the user. For example, information about the aerosol generating device 600 may mean various pieces of information, such as a charging/discharging state of the battery 640 of the aerosol generating device 600, a preheating state of the heater 650, an insertion/removal state of an aerosol generating article, or a state in which the use of the aerosol generating device 600 is restricted (e.g., sensing of an abnormal object), or the like, and the display unit 632 may output the information to the outside. The display unit 632 may be, for example, a liquid crystal display panel (LCD), an organic light-emitting diode (OLED) display panel, or the like. In addition, the display unit 632 may be in the form of a light-emitting diode (LED) light-emitting device.

[120] The haptic unit 634 may tactilely provide information about the aerosol generating device 600 to the user by converting an electrical signal into a mechanical stimulus or an electrical stimulus. For example, the haptic unit 634 may include a motor, a piezo-electric element, or an electrical stimulation device.

[121] The sound output unit 636 may audibly provide information about the aerosol generating device 600 to the user. For example, the sound output unit 636 may convert an electrical signal into a sound signal and output the same to the outside.

[122] The battery 640 may supply power used to operate the aerosol generating device 600. The battery 640 may supply power such that the heater 650 may be heated. In addition, the battery 640 may supply power required for operations of other components (e.g., the sensing unit 620, the output unit 630, the user input unit 660, the memory 670, and the communication unit 680) in the aerosol generating device 600. The battery 640 may be a rechargeable battery or a disposable battery. For example, the battery 640 may be a lithium polymer (LiPoly) battery, but is not limited thereto.

[123] The heater 650 may receive power from the battery 640 to heat an aerosol generating material. Although not illustrated in FIG. 6, the aerosol generating device 600 may further include a power conversion circuit (e.g., a direct current (DC)/DC converter) that converts power of the battery 640 and supplies the same to the heater 650. In addition, when the aerosol generating device 600 generates aerosols in an induction

heating method, the aerosol generating device 600 may further include a DC/alternating current (AC) that converts DC power of the battery 640 into AC power.

[124] The controller 610, the sensing unit 620, the output unit 630, the user input unit 660, the memory 670, and the communication unit 680 may each receive power from the battery 640 to perform a function. Although not illustrated in FIG. 6, the aerosol generating device 600 may further include a power conversion circuit that converts power of the battery 640 to supply the power to respective components, for example, a low dropout (LDO) circuit, or a voltage regulator circuit.

[125] In an embodiment, the heater 650 may be formed of any suitable electrically resistive material. For example, the suitable electrically resistive material may be a metal or a metal alloy including titanium, zirconium, tantalum, platinum, nickel, cobalt, chromium, hafnium, niobium, molybdenum, tungsten, tin, gallium, manganese, iron, copper, stainless steel, nichrome, or the like, but is not limited thereto. In addition, the heater 650 may be implemented by a metal wire, a metal plate on which an electrically conductive track is arranged, a ceramic heating element, or the like, but is not limited thereto.

[126] In another embodiment, the heater 650 may be a heater of an induction heating type. For example, the heater 650 may include a susceptor that heats an aerosol generating material by generating heat through a magnetic field applied by a coil.

[127] The user input unit 660 may receive information input from the user or may output information to the user. For example, the user input unit 660 may include a key pad, a dome switch, a touch pad (a contact capacitive method, a pressure resistance film method, an infrared sensing method, a surface ultrasonic conduction method, an integral tension measurement method, a piezo effect method, or the like), a jog wheel, a jog switch, or the like, but is not limited thereto. In addition, although not illustrated in FIG. 6, the aerosol generating device 600 may further include a connection interface, such as a universal serial bus (USB) interface, and may connect to other external devices through the connection interface, such as the USB interface, to transmit and receive information, or to charge the battery 640.

[128] The memory 670 is a hardware component that stores various types of data processed in the aerosol generating device 600, and may store data processed and data to be processed by the controller 610. The memory 670 may include at least one type of storage medium from among a flash memory type, a hard disk type, a multimedia card micro type memory, a card-type memory (for example, secure digital (SD) or extreme digital (XD) memory, etc.), random access memory (RAM), static random access memory (SRAM), read-only memory (ROM), electrically erasable programmable read-only memory (EEPROM), programmable read-only memory (PROM), a magnetic memory, a magnetic disk, and an optical disk. The memory 670 may store an operation

time of the aerosol generating device 600, the maximum number of puffs, the current number of puffs, at least one temperature profile, data on a user's smoking pattern, etc.

[129] The communication unit 680 may include at least one component for communication with another electronic device. For example, the communication unit 680 may include a short-range wireless communication unit 682 and a wireless communication unit 684.

[130] The short-range wireless communication unit 682 may include a Bluetooth communication unit, a Bluetooth Low Energy (BLE) communication unit, a near field communication unit, a wireless LAN (WLAN) (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, an Ant+ communication unit, or the like, but is not limited thereto.

[131] The wireless communication unit 684 may include a cellular network communication unit, an Internet communication unit, a computer network (e.g., local area network (LAN) or wide area network (WAN)) communication unit, or the like, but is not limited thereto. The wireless communication unit 684 may also identify and authenticate the aerosol generating device 600 within a communication network by using subscriber information (e.g., International Mobile Subscriber Identifier (IMSI)).

[132] The controller 610 may control general operations of the aerosol generating device 600. In an embodiment, the controller 610 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. The controller 610 may further include a real time clock (RTC). It will be understood by one of ordinary skill in the art that the processor may be implemented in other forms of hardware.

[133] The controller 610 may control the temperature of the heater 650 by controlling supply of power of the battery 640 to the heater 650. For example, the controller 610 may control power supply by controlling switching of a switching element between the battery 640 and the heater 650. In another example, a direct heating circuit may also control power supply to the heater 650 according to a control command of the controller 610.

[134] The controller 610 may analyze a result sensed by the sensing unit 620 and control subsequent processes to be performed. For example, the controller 610 may control power supplied to the heater 650 to start or end an operation of the heater 650 on the basis of a result sensed by the sensing unit 620. As another example, the controller 610 may control, based on a result sensed by the sensing unit 620, an amount of power supplied to the heater 650 and the time the power is supplied, such that the heater 650 may be heated to a certain temperature or maintained at an appropriate temperature.

[135] The controller 610 may control the output unit 630 on the basis of a result sensed by

the sensing unit 620. For example, when the number of puffs counted through the puff sensor 626 reaches a preset number, the controller 610 may notify the user that the aerosol generating device 600 will soon be terminated through at least one of the display unit 632, the haptic unit 634, and the sound output unit 636.

[136] The controller 610 may include a real time clock (RTC). The RTC may output time information measured from a reference time. For example, when the reference time is 0:00 on January 1, 1970, the RTC may measure a passage of time from 0:00 on January 1, 1970. When the reference time of the RTC may be 0:00 on January 1, 1970 and one year elapses from a point in time at which the RTC starts to measure time information, the RTC may output time information of 0:00 on January 1, 1971.

[137] The RTC may output, in real time, time information measured from an initial reference time while power supply continues. However, when power supply to the RTC is cut off, the reference time of the RTC may be initialized, and thus, the time information may be lost. For example, the RTC may be initialized when the power supply to the RTC is cut off as the controller 610 is reset or booted or an abnormal operation of the aerosol generating device 600 is detected. When the RTC is initialized, time information measured from an initialization time may be output by the RTC. The initialization time may correspond to an initial value set in the RTC.

[138] The initialization time of the RTC may be determined regardless of a point in time when the aerosol generating device 600 is manufactured. In a process of manufacturing the aerosol generating device 600, the reference time of the RTC may be initially synchronized with a point in time when the aerosol generating device 600 is manufactured. Here, an initial synchronization time may be determined by a supplier during the manufacturing process of the aerosol generating device 600., and the reference time of the RTC may be synchronized with the initial synchronization time.

[139] In addition, there is a time difference between a point in time when the aerosol generating device 600 is manufactured and a point in time when the aerosol generating device 600 is sold. The aerosol generating device 600 is not being used by the user while the aerosol generating device 600 is being transported or stored, and thus, counting of the number of days of use using the RTC should not be performed. Accordingly, measurement of time information by the RTC may be started when a mode of the aerosol generating device 600 is released from a shipping mode. For example, when the user purchases an aerosol generating device 600 and then starts charging (e.g., connecting a charging port of the aerosol generating device 600 to an external power source), the shipping mode may be released, and the counting of the number of days of use using the RTC may be started.

[140] The memory 670 may store time information output from the RTC. The memory 670 may be initialized at the time of manufacturing or shipping the aerosol generating

device 600, and then may receive and store time information output from the RTC when the RTC starts measuring time information.

[141] The memory 670 may periodically store time information output from the RTC according to a certain period, but is not limited thereto. The memory 670 may also store time information when a preset operation is performed. The preset operation may include at least one of resetting or booting the controller 610, releasing the shipping mode, ending a smoking operation (e.g., a heating operation of a heater), starting a charging operation, and receiving a user input (e.g., a touch or button input), but is not limited thereto. When the preset operation is performed, the controller 610 may store, in the memory 670, time information output from the RTC.

[142] FIG. 7 is a perspective view of an aerosol generating device according to some embodiments. FIG. 8 is a side view of the aerosol generating device illustrated in FIG. 7. FIG. 9 is a top view of the aerosol generating device illustrated in FIG. 7. FIG. 10 is a perspective view illustrating an operation state of the aerosol generating device illustrated in FIG. 7. FIG. 11 is a top view of the aerosol generating device illustrated in FIG. 10.

[143] An aerosol generating device 5 according to embodiments illustrated in FIGS. 7 to 11 includes a case 20 into which a cigarette 7 may be inserted. The cigarette 7 may correspond to the cigarette 2 of FIGS. 1 to 4. Accordingly, a description thereof is omitted.

[144] A cap 10 is coupled to an upper portion of the case 20. The cap 10 is detachably coupled to the case 20. A cover 30 is installed on an upper surface of the cap 10 to slide. However, the structure of the aerosol generating device 5 illustrated in FIGS. 7 to 11 is only an example, but is not limited thereto. For example, the case 20 and the cap 10 may have an integral structure coupled to each other not to be detachable from each other.

[145] A rail 16 extending in a sliding direction of the cover 30 and a cigarette insertion hole 18 into which the cigarette 7 is inserted are installed on the upper surface of the cap 10. The rail 16 may be opened to connect the outside and the inside of the cap 10.

[146] When the cover 30 moves along the rail 16 formed in the upper surface of the cap 10 to a position illustrated in FIG. 8, the cigarette insertion hole 18 may be exposed to the outside, and thus, the cigarette 7 may be inserted into the cigarette insertion hole 18.

[147] The method in which the cover 30 is coupled to the cap 10 is not limited by the structure of the embodiment illustrated in FIGS. 7 to 11, for example, the cover 30 may open or close the cigarette insertion hole 18 by rotating about a hinge.

[148] When the cover 30 slides along the upper surface of the cap 10, various preparation operations may be performed in conjunction with an operation of opening the cigarette insertion hole 18. For example, when the cigarette insertion hole 18 is opened by the

cover 30, an operation of changing an operation mode of the aerosol generating device 5, a preheating operation of internal heaters, an operation of recognizing a user, or the like may be executed. Hereinafter, a method of controlling the aerosol generating device 5, which is linked to the operation of opening the cigarette insertion hole 18 by sliding the cover 30 along the upper surface of the cap 10, will be described in detail with reference to FIGS. 12 to 14.

[149] Meanwhile, a button 28 that may be operated by the user and a light emitting diode (LED) 29, which is an example of an indicator for displaying an internal operation state of the aerosol generating device 5 by emitting light in various colors, are installed on the outside of the case 20 of the aerosol generating device 5.

[150] A controller mounted inside the aerosol generating device 5 may display a normal operation state based on conditions such as a normal operation of a heater and/or a sufficient remaining capacity of a battery by controlling the LED 29 to emit light.

[151] When the user performs a manipulation of pressing the button 28, the LED 29 may emit light, and thus, the user may check a remaining amount of electricity charged in the battery from a color of light emitted from the LED 29. For example, green light emitted from the LED 29 may indicate that an amount of electricity charged in the battery is sufficient, and red light emitted from the LED 29 may indicate that the amount of electricity charged in battery is insufficient.

[152] Different predetermined operations may be executed according to the length of time for which the user presses the button 28. For example, when the button 28 is pressed for a predetermined first pressing time by the user, a reset (initialization) operation of the aerosol generating device 5 may be executed. In addition, when the button 28 is pressed for a predetermined second pressing time by the user, a preheating operation of the aerosol generating device 5 may be performed.

[153] FIG. 12 is a block diagram illustrating a structure of an aerosol generating device according to some embodiments.

[154] Referring to FIG. 12, an aerosol generating device 5 may include a vaporizer 40, a heater 52, a battery 60, a first sensor 61, a second sensor 62, and a controller 70, in addition to the cap 10, the case 20, the button 28, and the cover 30 illustrated in FIGS. 7 to 11.

[155] FIG. 12 illustrates that the aerosol generating device 5 includes only components related to the present embodiment. However, it may be understood by one of ordinary skill in the art related to the present embodiment that the aerosol generating device 5 may further include other components, in addition to the components illustrated in FIG. 12. For example, the aerosol generating device 5 may further include a memory (not shown).

[156] The memory may be hardware that stores various types of data processed within the

aerosol generating device 5, e.g., the memory may store pieces of data processed by the aerosol generating device 5 and pieces of data to be processed by the aerosol generating device 5. In addition, the memory may store applications, drivers, and the like to be driven by the aerosol generating device 5.

[157] The memory may include random access memory (RAM) such as dynamic random access memory (DRAM) or static random access memory (SRAM), read-only memory (ROM), electrically erasable programmable read-only memory (EEPROM), CD-ROM, Blu-ray, other optical disk storages, a hard disk drive (HDD), a solid state drive (SSD), or flash memory and may further include other external storage devices that may be accessed by the aerosol generating device 5.

[158] The first sensor 61 may be a sensor that detects whether the cigarette insertion hole 18 is opened or closed. For example, the first sensor 61 may be an on/off switch that generates an "on" signal when the cover 30 moves to open the cigarette insertion hole 18 and generates an "off" signal when the cover 30 moves to close the cigarette insertion hole 18. However, the first sensor 61 is not limited thereto, and may be any appropriate sensor for detecting sliding movement of the cover 30. The first sensor 61 may correspond to the opening/closing detection sensor 628 of FIG. 6.

[159] The second sensor 62 may be a sensor that detects whether or not the cigarette 7 is inserted into the case 20. For example, the second sensor 62 may include at least one of a hall sensor that detects a change in a magnetic field generated from a metal material included in the cigarette 7, a mechanical switch that detects a physical change occurring due to the insertion of the cigarette 7, an infrared sensor that detects an approach of the cigarette 7, and an optical sensor that detects a pattern printed on a surface of the cigarette 7. However, the second sensor 62 is not limited to the previous example, and may be any appropriate sensor for detecting whether or not the cigarette 7 is inserted into the case 20. The second sensor 62 may correspond to the insertion detection sensor 624 of FIG. 6.

[160] The heater 52 may be a heater arranged in the case 20 to heat the cigarette 7 inserted into the case 20. The heater 52 may be arranged on an upper side of a support tube inside the case 20, and may be arranged to surround at least a portion of a side of the cigarette 7 inserted into the case 20. The heater 52 may be manufactured in a film shape having an electrical resistive pattern capable of generating heat when electricity is applied from the outside. The heater 52 may include, for example, a substrate including a material such as polyimide and an electrical resistive pattern arranged on a surface of the substrate.

[161] The heater 52 is, for example, wound in a cylindrical shape or semi-cylindrical shape corresponding to a shape of a heat transfer tube and arranged to surround at least a portion of an outer surface of the heat transfer tube. The cylindrical shape and semi-

cylindrical shape are not limited to a cross-sectional shape of the heater 52 that is a circle or semicircle. The cylindrical shape and semi-cylindrical shape may have a cross section of an arc shape close to a circle or a semicircle.

[162] The vaporizer 40 may refer to a component that accommodates a liquid composition, is detachably coupled to the case 20, and transfers, to the cigarette 7, aerosol generated by heating the liquid composition while the vaporizer 40 is coupled to the case 20.

[163] The battery 60 may supply power used to operate the aerosol generating device 5. For example, the battery 60 may supply power to the controller 70, the heater 52, and the vaporizer 40. In addition, the battery 60 may supply power needed for a display, a sensor, a motor, and the like installed in the aerosol generating device 5 to operate. The battery 60 may be a lithium iron phosphate (LiFePO4) battery, but is not limited to the example described above. For example, the battery 60 may be a lithium cobalt oxide (LiCoO2) battery, a lithium titanate battery, or the like.

[164] The controller 70 includes at least one processor. The controller 70 may control the overall operation of the aerosol generating device 5. For example, the controller 70 may control operations of the vaporizer 40, the heater 52, and the battery 60, and may also control operations of other components included in the aerosol generating device 5. The controller 70 may control power supplied by the battery 60, a heating element included in the vaporizer 40, a temperature of the heater 52, and the like. The controller 70 may determine whether or not the aerosol generating device 5 is operable by checking a state of each of the components of the aerosol generating device 5.

[165] In detail, the controller 70 may determine, on the basis of a sensing signal from the first sensor 61, whether the cigarette insertion hole 18 is opened or closed, and set, on the basis of the result of the determination, an operation mode of the aerosol generating device 5 to one of an ON mode or an OFF mode.

[166] For example, when determining that the cigarette insertion hole 18 is opened, the controller 70 may set the operation mode of the aerosol generating device 5 to the ON mode. When the operation mode of the aerosol generating device 5 is the ON mode, the controller 70 may electrically connect the heater 52 and the vaporizer 40 to the battery 60, such that the battery 60 may supply power to the heater 52 and the vaporizer 40, activate the button 28 to receive a user input, and activate the second sensor 62 to detect whether or not the cigarette 7 is inserted into the case 20.

[167] In addition, when the operation mode of the aerosol generating device 5 is the ON mode, the controller 70 may activate a communication function, such as a Bluetooth function of the aerosol generating device 5, and may activate various functions needed for the operation of the aerosol generating device 5.

[168] When the heater 52 and the vaporizer 40 are electrically connected to the battery 60, the controller 70 may control the battery 60 to supply power to at least one of the

heater 52 and the vaporizer 40. Meanwhile, the activation of the button 28 or the second sensor 62 may indicate that a signal input from the button 28 or the second sensor 62 is not blocked. For example, when the button 28 or the second sensor 62 is activated, an interrupt function of waiting for a signal that is input from the button 28 or the second sensor 62 may be activated.

[169] According to some embodiments, when the operation mode of the aerosol generating device 5 is the ON mode, the controller 70 may control power supply from the battery 60 to the heater 52 so that the heater 52 is preheated to a preset temperature when a user input is received through the activated button 28.

[170] In addition, when the operation mode of the aerosol generating device 5 is the ON mode, the controller 70 may determine whether or not the cigarette 7 is inserted into the case 20, on the basis of a sensing signal from the activated second sensor 62. When it is determined that the cigarette 7 is inserted into the case 20, the controller 70 may control the power supply from the battery 60 to the heater 52 60 so that the heater 52 is preheated to a preset temperature.

[171] The ON mode of the aerosol generating device 5 may indicate that the cigarette insertion hole 18 is opened, and thus, the user may be expected to insert the cigarette 7 into the cigarette insertion hole 18 and smoke. The controller 70 may perform a preheating operation of the heater 52 included in the aerosol generating device 5 when a user input is received through the activated button 28 or a sensing signal is received from the second sensor 62 while the operation mode of the aerosol generating device 5 is the ON mode.

[172] However, embodiments are not limited to the above example. According to an embodiment, when the operation mode of the aerosol generating device 5 is set to the ON mode (i.e., when determining that the cigarette insertion hole 18 is opened), the controller 70 may also perform the preheating operation of the heater 52 without waiting for the user input via the activated button 28 or the sensing signal from the activated second sensor 62. If the controller 70 performs the preheating operation of the heater 52 immediately upon detecting that the cigarette insertion hole 18 is opened, without waiting for the user input via the button 28 or the sensing signal from the second sensor 62, a time for which the user waits to smoke by using the aerosol generating device 5 may be minimized.

[173] When determining that the cigarette insertion hole 18 is closed, the controller 70 may set the operation mode of the aerosol generating device 5 to the OFF mode. When the operation mode of the aerosol generating device 5 is the OFF mode, the controller 70 may cut off the electrical connection of the battery 60 with the heater 52 and the vaporizer 40, cut off the user input that is input through the button 28 (e.g., deactivate the button 28), and cut off the sensing signal from the second sensor 62 (e.g., de-

activate the second sensor 62).

[174] When the electrical connection between the battery 60, and the heater 52 and the vaporizer 40 is cut off, the user input that is input through the button 28 is cut off, and the sensing signal from the second sensor 62 is cut off, an undesired operation of the aerosol generating device 5 performed by accidentally pressing the button 28 may be prevented, and power needlessly consumed when the user does not smoke may be prevented.

[175] In addition, when the operation mode of the aerosol generating device 5 is the OFF mode, the controller 70 may deactivate a communication function such as a Bluetooth function of the aerosol generating device 5, and may deactivate unneeded functions when the user does not smoke by using the aerosol generating device 5.

[176] Meanwhile, even when the operation mode of the aerosol generating device 5 is the OFF mode, a booting-related function of the aerosol generating device 5 may be activated. The booting-related function may include at least one of a clock function, an RTC function, and an interrupt function of waiting for a sensing signal from the first sensor 61. Even when the operation mode of the aerosol generating device 5 is the OFF mode, the booting-related function of the aerosol generating device 5 may be activated. Therefore, when the user does not smoke, unneeded power consumption may be minimized, and the aerosol generating device 5 may be smoothly booted when the user wants to smoke.

[177] FIG. 13 is a flowchart illustrating an example of a method of controlling an aerosol generating device, according to some embodiments.

[178] Referring to FIG. 13, a method of controlling an aerosol generating device includes operations processed in time series in the aerosol generating device 1 or the aerosol generating device 5 illustrated in FIGS. 1 to 12. Therefore, even when the above descriptions of the aerosol generating device 1 or the aerosol generating device 5 of FIGS. 1 to 12 are omitted, the descriptions may also be applied to the method of controlling the aerosol generating device, illustrated in FIG. 13.

[179] In operation S1310, a controller may determine whether or not a cigarette is inserted into an aerosol generating device, on the basis of a sensing signal from an insertion detection sensor.

[180] In operation S1320, the controller may control a heater to start a heating operation when the cigarette is inserted into the aerosol generating device. For example, the controller may control, on the basis of the sensing signal from the insertion detection sensor, power supply from a battery to the heater so that the heater is preheated to a preset temperature.

[181] In operations S1330 to S1360, the controller may reset at least one of a puff sensor and a temperature sensor. Here, the meaning of the reset includes resetting or updating

a baseline of a sensor, or resetting or updating a reference value of the sensor. In detail, the controller may sequentially reset the puff sensor and the temperature sensor immediately after controlling the heater to perform the heating operation. The temperature sensor for detecting a temperature of the heater and the puff sensor for detecting puffs by a user are generally used after the heater performs the heating operation. Thus, it is efficient to reset the temperature sensor and puff sensor immediately after the heater performs the heating operation. In other words, unnecessary power consumption may be reduced by resetting the sensor at a timing when the sensor is actually used. In an embodiment, the controller may first reset the puff sensor and then sequentially reset the temperature sensor. In another embodiment, the controller may first reset the temperature sensor and then sequentially reset the puff sensor.

[182] In operation S1330, the controller may reset the puff sensor for detecting the puffs by the user. In operation S1340, the controller may determine whether or not the reset of the puff sensor is successful. When the reset fails, in operation S1370, may control an output unit to display a notification of the reset failure. For example, in operation S1370, the controller may control the output unit to output visual information or voice information indicating that the reset of the puff sensor has failed.

[183] In operation S1350, the controller may reset the temperature sensor for detecting the temperature of the heater. In operation S1360, the controller may determine whether or not the reset of the temperature sensor is successful. When the reset fails, in operation S1370, may control the output unit to display a notification of the reset failure. For example, in operation S1370, the controller may control the output unit to output visual information or voice information indicating that the reset of the temperature sensor has failed.

[184] FIG. 14 is a flowchart illustrating another example of a method of controlling an aerosol generating device, according to some embodiments.

[185] Operation S1410 is an operation in which a controller determines whether or not a cigarette insertion hole is opened. The controller may determine whether or not the cigarette insertion hole is opened, on the basis of a sensing signal from an opening/closing detection sensor.

[186] The controller may set an operation mode of an aerosol generating device to an ON mode or an OFF mode. When it is determined that the cigarette insertion hole is opened, in operation S1420, the controller may set the operation mode of the aerosol generating device to the ON mode. When it is determined that the cigarette insertion hole is closed, in operation S1430, the controller may set the operation mode of the aerosol generating device to the OFF mode.

[187] In operation S1440, the controller may determine whether or not a heater is in a heating state (i.e., activated). The controller may determine whether or not the heater is

in the heating state by detecting whether or not power is supplied from a battery to the heater. When the heater is in a heating release state (i.e., deactivated), in operation S1460, the controller may reset an insertion detection sensor and a temperature sensor. When the heater is in the heating release state, resetting the temperature sensor for detecting a temperature of the heater may not affect a normal operation of the aerosol generating device. As described above, operation S1450 may be omitted according to an embodiment.

[188] In detail, when an event of detecting that a cigarette is inserted into the insertion detection sensor does not occur for a preset period of time, in operation S1460, the controller may reset the insertion detection sensor and the temperature sensor. The resetting of the insertion detection sensor and the temperature sensor may be sequentially performed. In an embodiment, the controller may first reset the insertion detection sensor and sequentially reset the temperature sensor. In another embodiment, the controller may first reset the temperature sensor and sequentially reset the insertion detection sensor. Even when the cigarette insertion hole is opened, if the heater is not in the heating state and the event of detecting that the cigarette is inserted does not occur for a predetermined period of time, the aerosol generating device is highly likely to be in a use standby mode. Therefore, in this state, even if the insertion detection sensor and temperature sensor are reset, the aerosol generating device may operate normally.

[189] In operation S1450, the controller may determine whether or not the event of detecting insertion of the cigarette into the aerosol generating device by the insertion detection sensor occurs.

[190] When the event of detecting insertion of the cigarette by the insertion detection sensor does not occur for a predetermined period of time, in operation S1460, the controller may reset the insertion detection sensor and the temperature sensor. In other words, the controller may reset the insertion detection sensor and the temperature sensor when the insertion detection sensor does not detect the insertion of the cigarette for a predetermined period of time. The controller may count, by using an RTC, a period during which the event of detecting insertion of the cigarette by the insertion detection sensor does not occur.

[191] When the event of detecting insertion of the cigarette by the insertion detection sensor occurs, in operation S1470, the controller may control the heater in a heating state. In other words, when the insertion detection sensor detects the insertion of the cigarette, the controller may control the heater in the heating state. For example, the controller may control the heater to start a heating operation according to a predetermined temperature profile.

[192] One of ordinary skill in the art pertaining to the present embodiments may un-

derstand that various changes in form and details may be made therein without departing from the scope of the characteristics described above. The disclosed methods should be considered in a descriptive sense only and not for purposes of limitation. The scope of the disclosure is defined by the appended claims rather than by the foregoing description, and all differences within the scope of equivalents thereof should be construed as being included in the present disclosure.

Claims

[Claim 1] An aerosol generating device configured to allow a cigarette to be inserted thereinto and comprising:
a heater configured to heat the inserted cigarette;
a temperature sensor configured to detect a temperature of the heater;
an insertion detection sensor configured to detect insertion of the cigarette;
a puff sensor configured to detect puffs by a user; and
a controller configured to reset at least one of the temperature sensor and the puff sensor in response to a sensing signal output from the insertion detection sensor.

[Claim 2] The aerosol generating device of claim 1, wherein
the puff sensor includes a pressure sensor, and
the controller is further configured to reset a reference value of the pressure sensor.

[Claim 3] The aerosol generating device of claim 1, further comprising an output unit configured to output information regarding a state of the aerosol generating device, wherein the controller is further configured to control the output unit to display a notification of a reset failure when at least one of the temperature sensor and the puff sensor fails to be reset.

[Claim 4] The aerosol generating device of claim 1, wherein the controller is further configured to control the heater to start a heating operation according to a predetermined temperature profile when the cigarette is inserted.

[Claim 5] An aerosol generating device configured to allow a cigarette to be inserted thereinto and comprising:
a heater configured to heat the inserted cigarette;
a temperature sensor configured to detect a temperature of the heater;
an insertion detection sensor configured to detect insertion of the cigarette; and
a controller configured to set an operation mode of the aerosol generating device to an ON mode or an OFF mode,
wherein the controller is further configured to reset the insertion detection sensor and the temperature sensor when the heater is not activated in the ON mode.

[Claim 6] The aerosol generating device of claim 5, wherein the controller is further configured to control the heater to start a heating operation

according to a predetermined temperature profile when the insertion detection sensor detects the insertion of the cigarette.

[Claim 7] The aerosol generating device of claim 5, wherein the controller is further configured to reset the insertion detection sensor and the temperature sensor when the insertion detection sensor does not detect the insertion of the cigarette for a preset period of time.

[Claim 8] The aerosol generating device of claim 5, further comprising:
a case including an insertion hole into which the cigarette is inserted;
a cover configured to open and close the insertion hole; and
an opening/closing detection sensor configured to detect whether the insertion hole is opened or closed,
wherein the controller is further configured to set the operation mode of the aerosol generating device to the ON mode or the OFF mode based on a sensing signal from the opening/closing detection sensor.

[Claim 9] The aerosol generating device of claim 8, wherein the controller is further configured to set the operation mode of the aerosol generating device to the ON mode and activate the insertion detection sensor, when the sensing signal indicates that the insertion hole is opened.

[Claim 10] The aerosol generating device of claim 8, wherein the controller is further configured to set the operation mode of the aerosol generating device to the OFF mode and deactivate the insertion detection sensor, when the sensing signal indicates that the insertion hole is opened.

[Claim 11] A method of controlling an aerosol generating device including a heater configure to heat an inserted cigarette, a temperature sensor configured to detect a temperature of the heater, and an insertion detection sensor configured to detect insertion of the cigarette, the method comprising:
operating the aerosol generating device in an ON mode;
determining whether or not the heater is activated; and
resetting the insertion detection sensor and the temperature sensor when the heater is not activated.

[Claim 12] The method of claim 11, further comprising, when the insertion detection sensor detects the insertion of the cigarette, controlling the heater to start a heating operation according to a predetermined temperature profile.

[Claim 13] The method of claim 11, wherein the resetting is performed based on the insertion of the cigarette being not detected for a preset period of time.

[Claim 14] The method of claim 11, further comprising:

determining whether or not an insertion hole for the cigarette is opened or closed; and

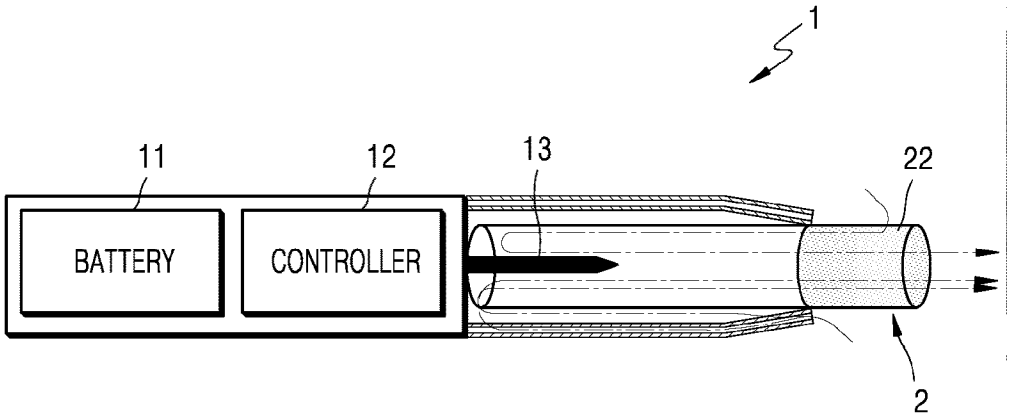
setting an operation mode of the aerosol generating device to the ON mode based on the insertion hole being opened.

[Claim 15] The method of claim 11, further comprising:

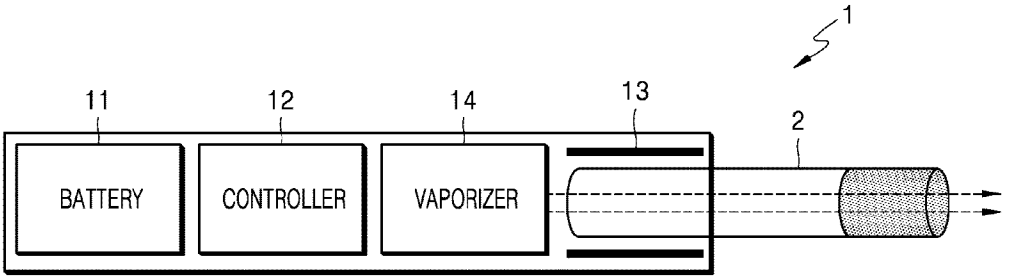
determining whether or not an insertion hole for the cigarette is opened or closed; and

when determining that the insertion hole is closed, setting an operation mode of the aerosol generating device to an OFF mode.

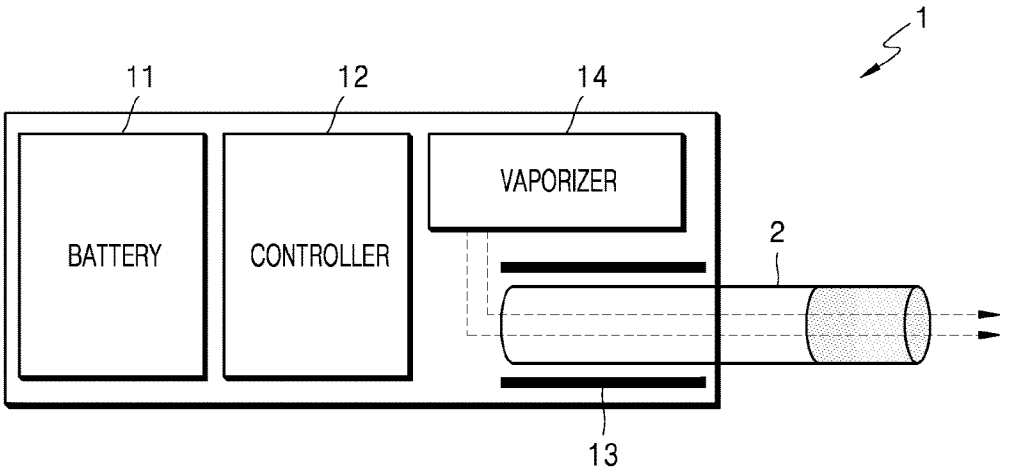
[Fig. 1]



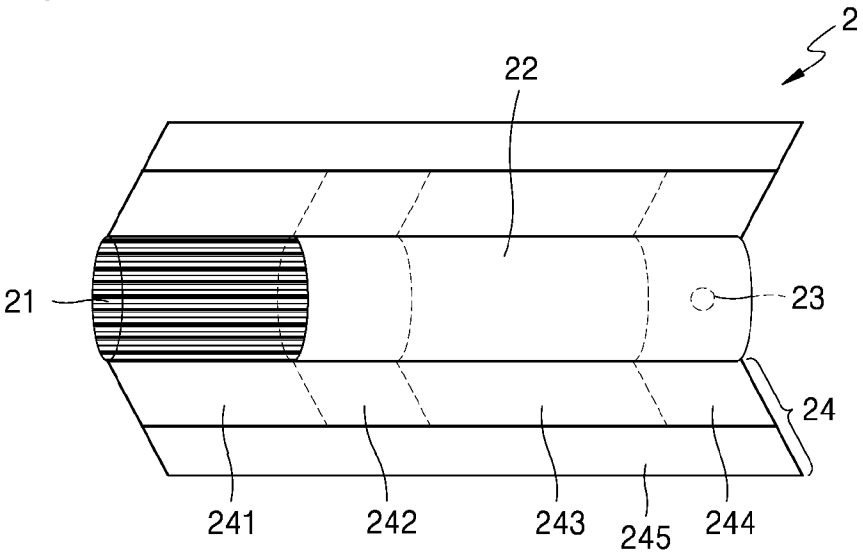
[Fig. 2]



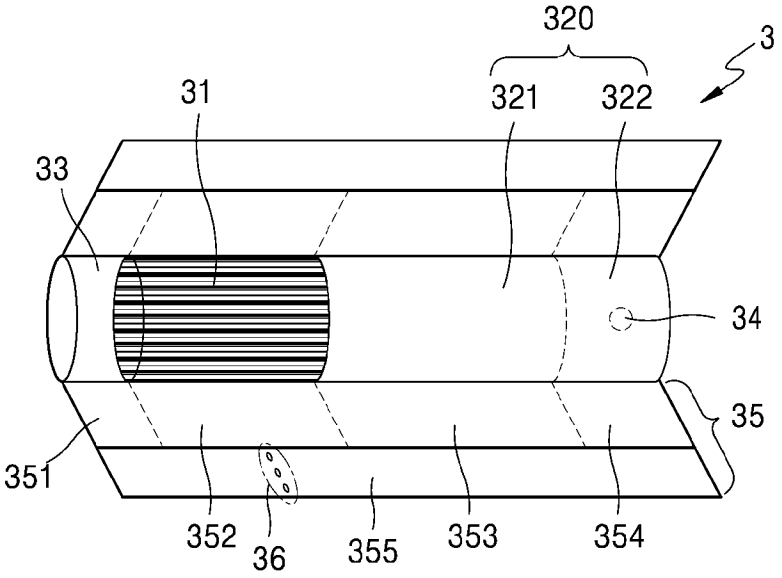
[Fig. 3]



[Fig. 4]



[Fig. 5]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322
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351
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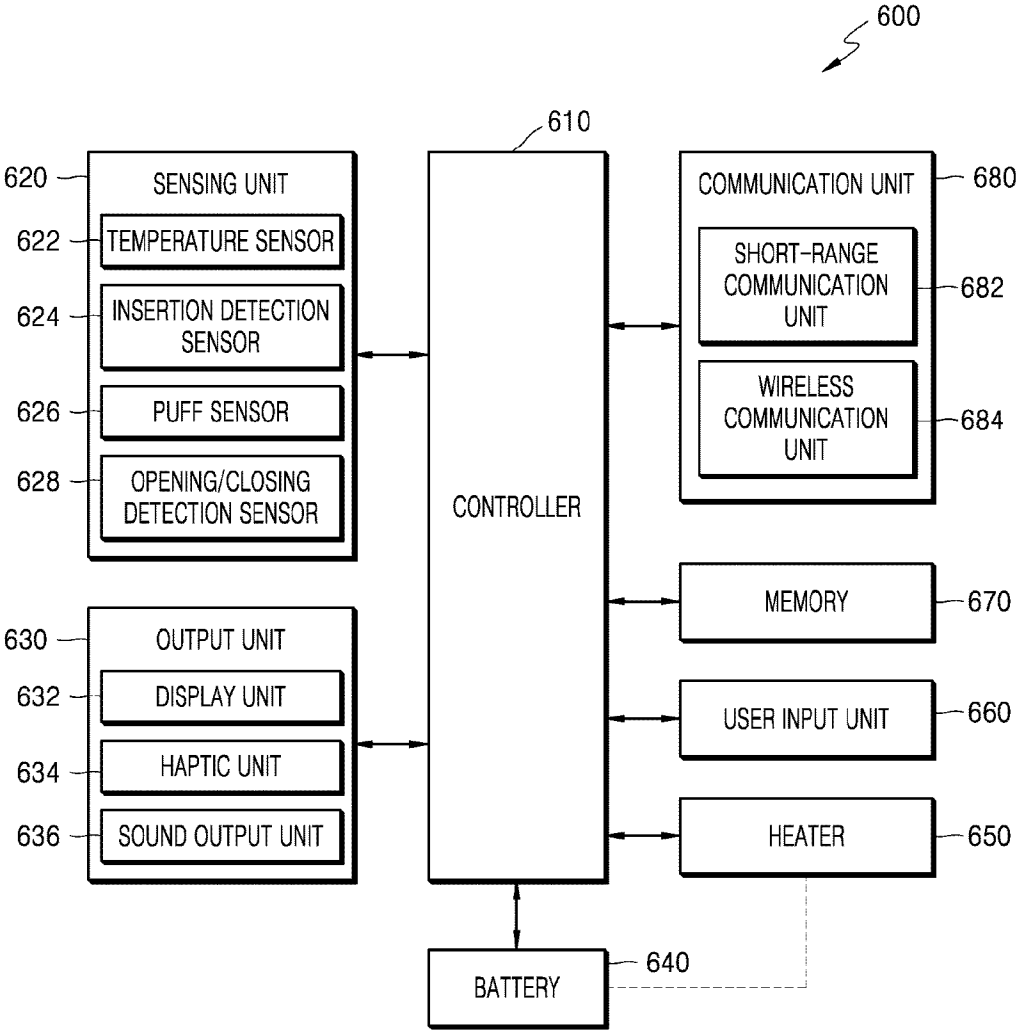
353
354

[Fig. 6]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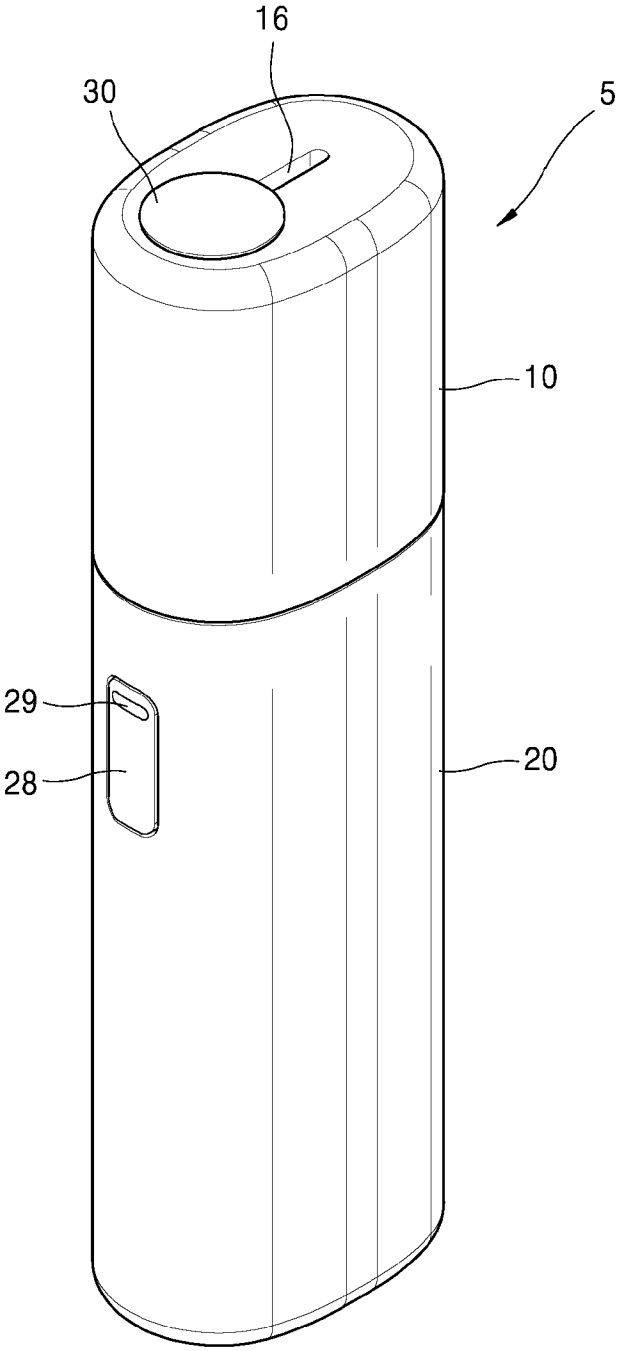
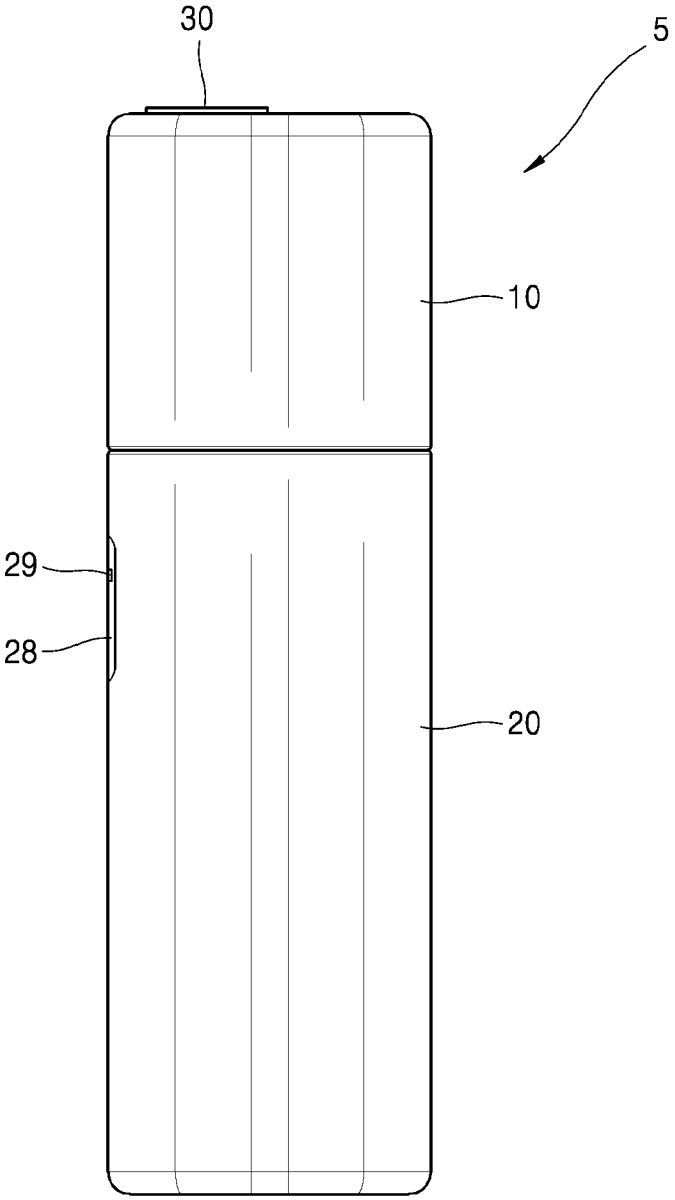
610
620
SENSING UNIT
622
TEMPERATURE SENSOR
624
INSERTION DETECTION SENSOR
626
PUFF SENSOR
628
OPENING/CLOSING DETECTION SENSOR
630
OUTPUT UNIT
632
DISPLAY UNIT
634
HAPTIC UNIT
636
SOUND OUTPUT UNIT
CONTROLLER
COMMUNICATION UNIT
680
SHORT-RANGE COMMUNICATION UNIT
682
WIRELESS COMMUNICATION UNIT
684
MEMORY
670
USER INPUT UNIT
660
HEATER
650
BATTERY
640

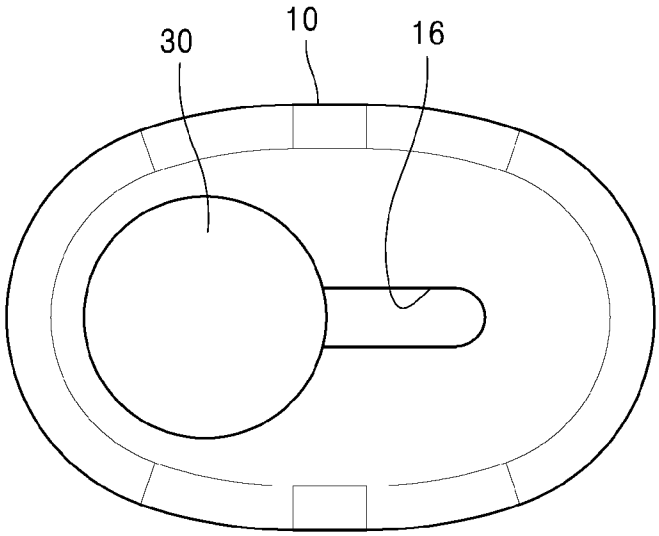
[Fig. 7]



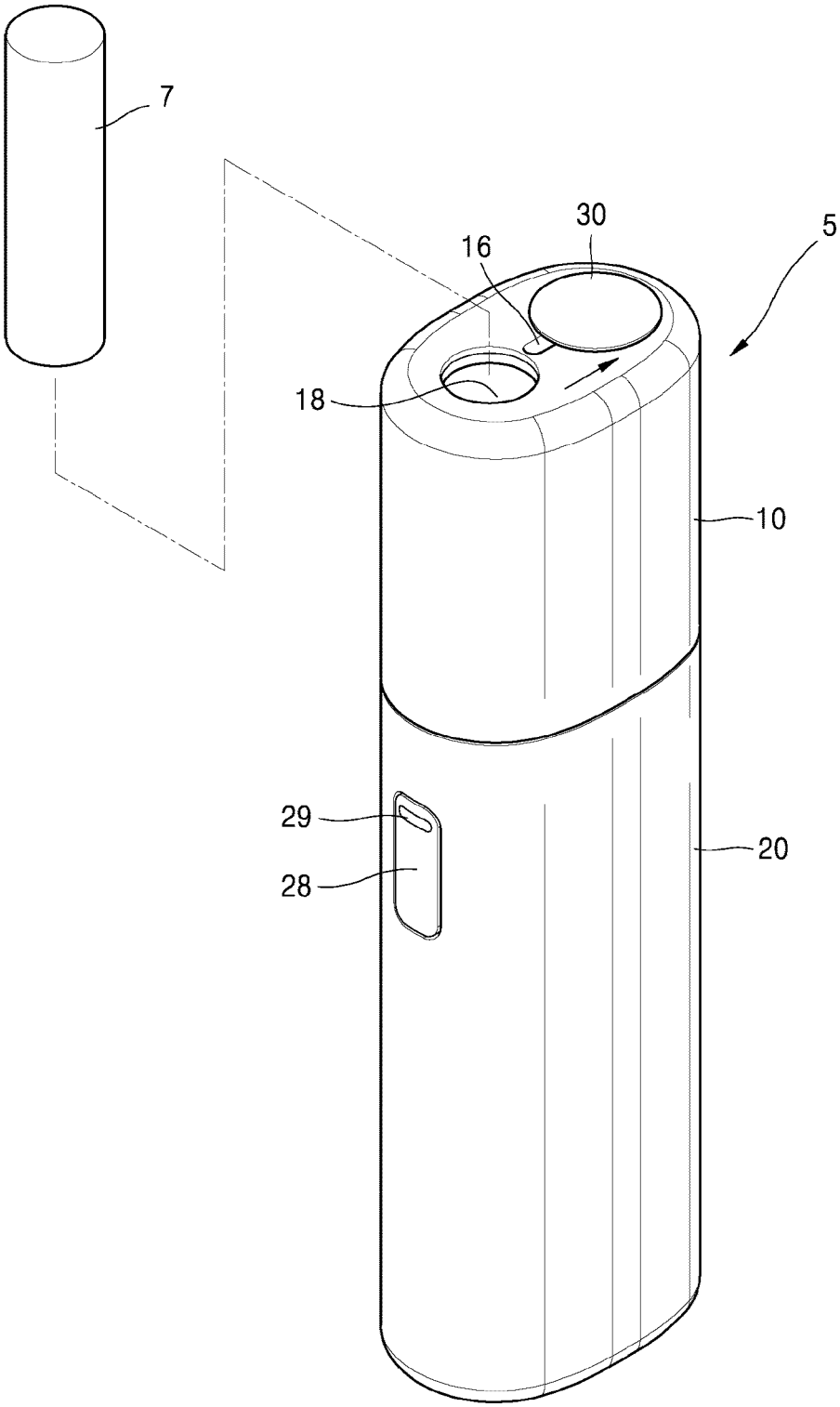
[Fig. 8]



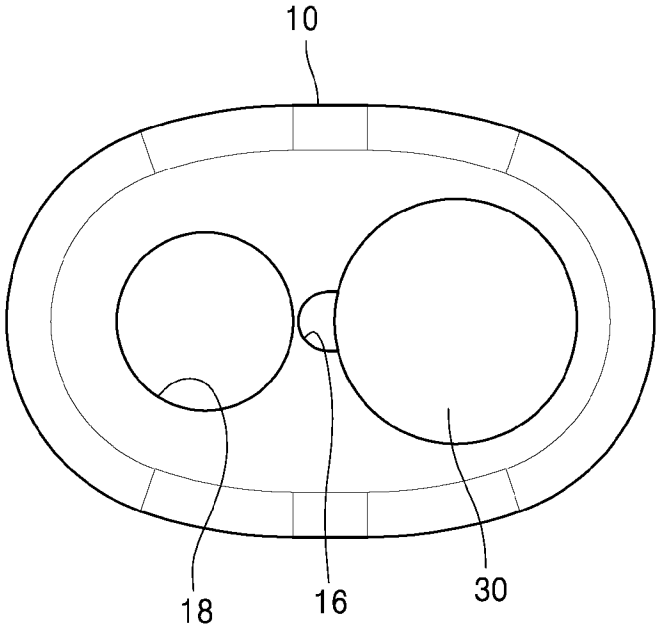
[Fig. 9]



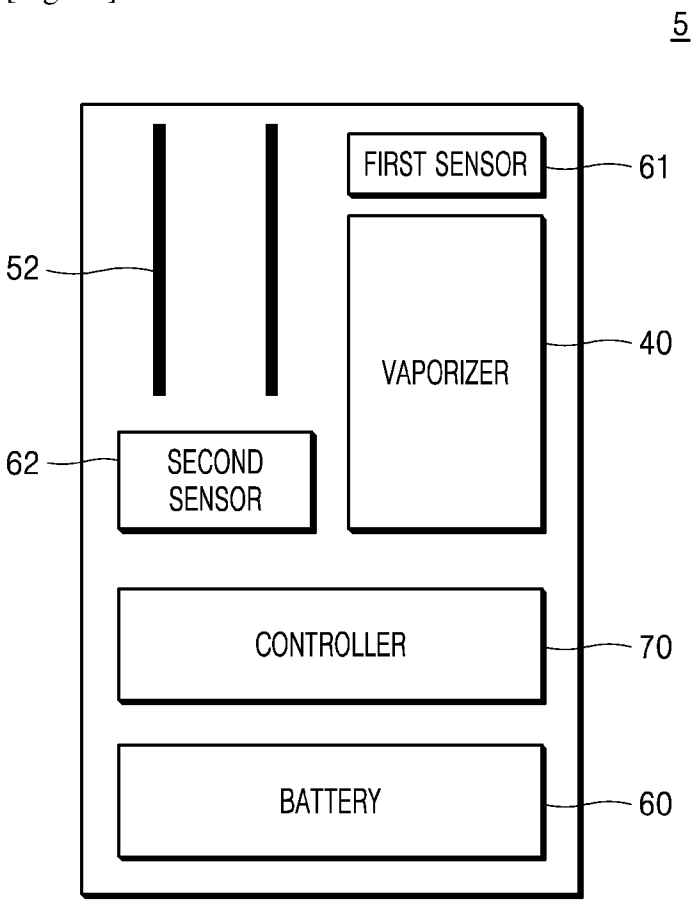
[Fig. 10]



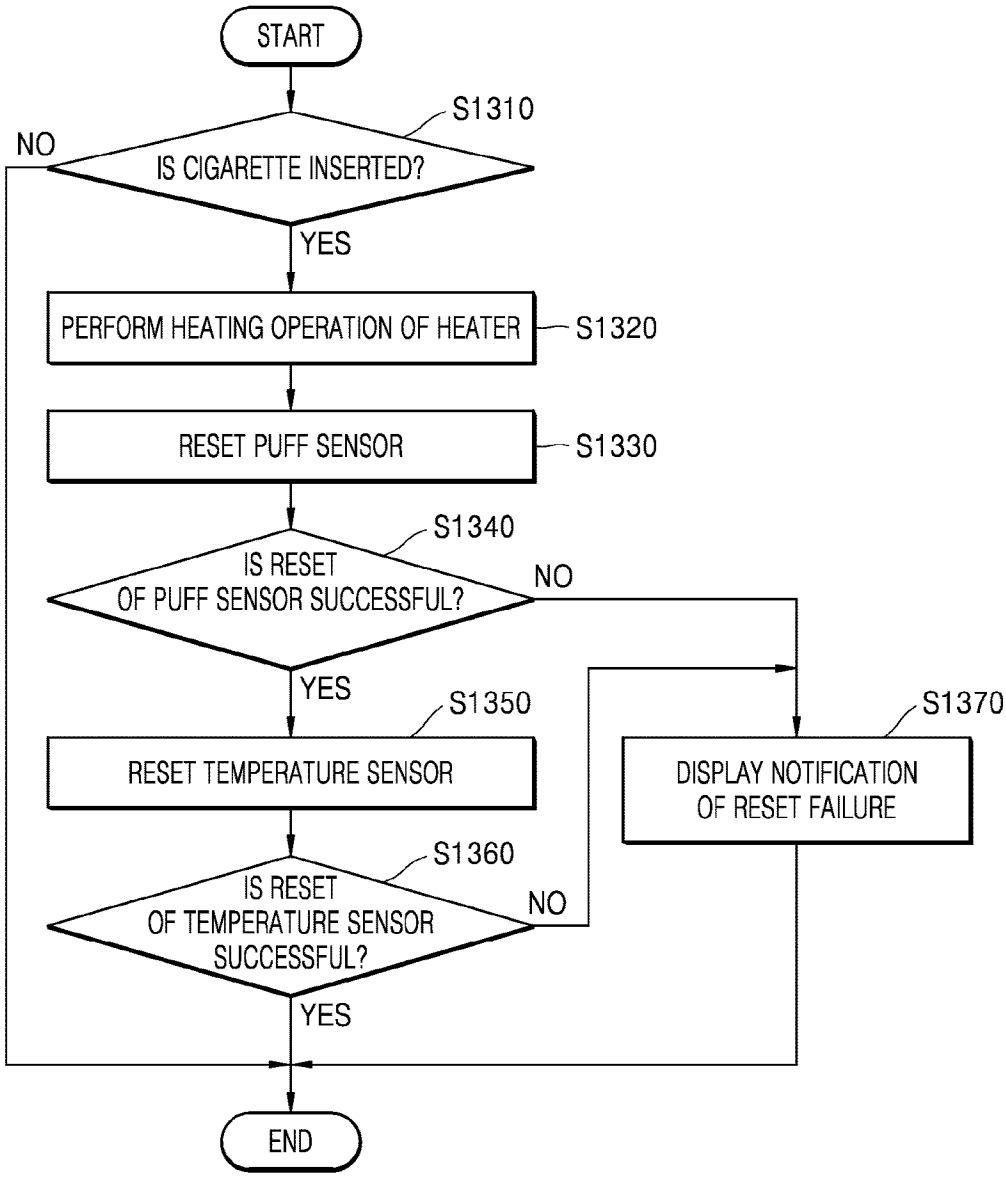
[Fig. 11]


10
18
16
30

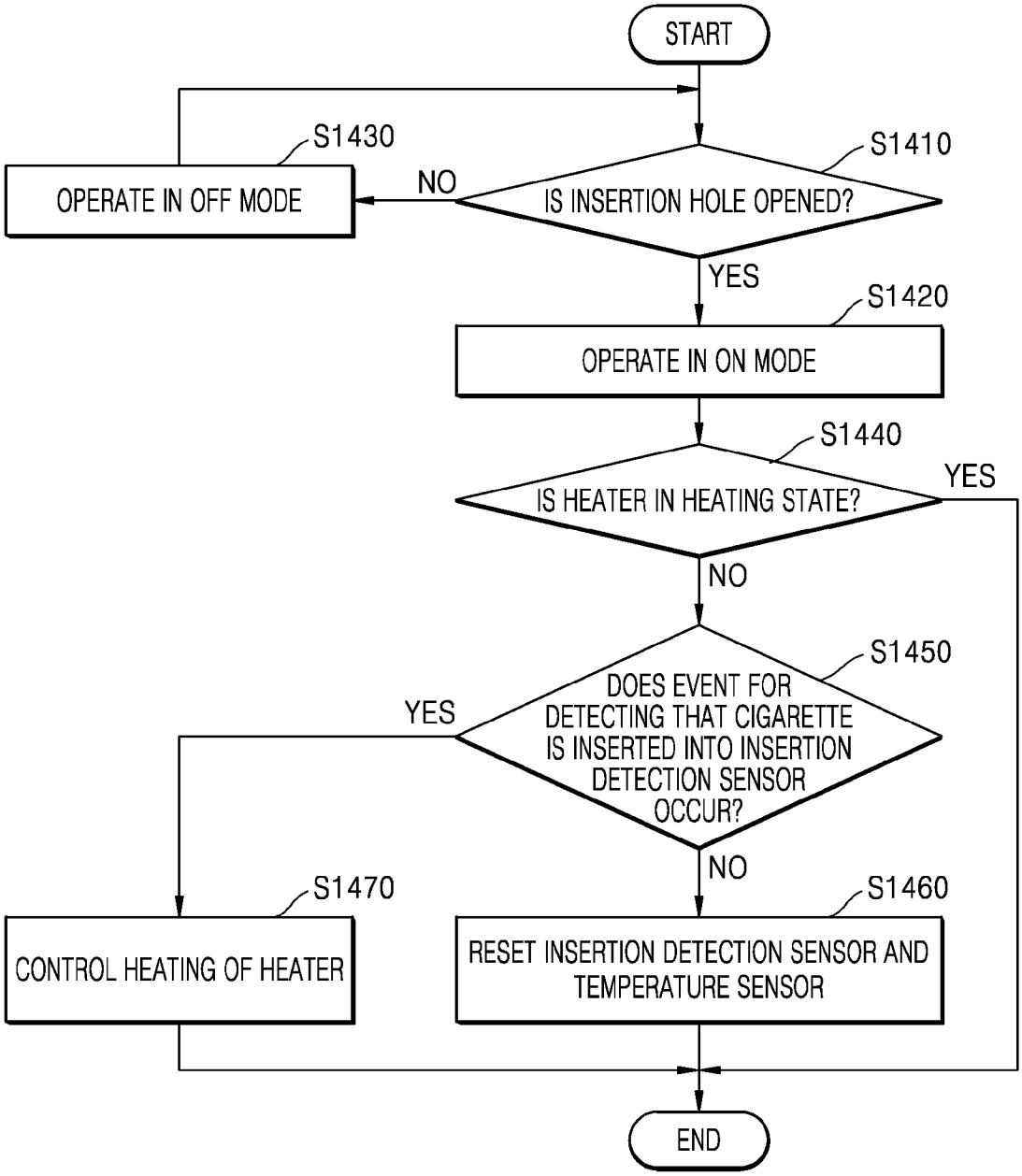
[Fig. 12]


5
FIRST SENSOR
61
52
VAPORIZER
40
62
SECOND SENSOR
CONTROLLER
70
BATTERY
60

[Fig. 13]


START
S1310
IS CIGARETTE INSERTED?
NO
YES
PERFORM HEATING OPERATION OF HEATER
S1320
RESET PUFF SENSOR
S1330
S1340
IS RESET OF PUFF SENSOR SUCCESSFUL?
NO
YES
S1350
RESET TEMPERATURE SENSOR
S1360
IS RESET OF TEMPERATURE SENSOR SUCCESSFUL?
NO
YES
S1370
DISPLAY NOTIFICATION OF RESET FAILURE
END

[Fig. 14]


START
S1410
IS INSERTION HOLE OPENED?
NO
S1430
OPERATE IN OFF MODE
YES
S1420
OPERATE IN ON MODE
S1440
IS HEATER IN HEATING STATE?
YES
NO
S1450
DOES EVENT FOR DETECTING THAT CIGARETTE IS INSERTED INTO INSERTION DETECTION SENSOR OCCUR?
YES
NO
S1470
CONTROL HEATING OF HEATER
S1460
RESET INSERTION DETECTION SENSOR AND TEMPERATURE SENSOR
END

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2023/013173

A. CLASSIFICATION OF SUBJECT MATTER

A24F 40/51(2020.01)i; **A24F 40/46**(2020.01)i; **A24F 40/60**(2020.01)i; **A24F 40/53**(2020.01)i; **A24F 40/20**(2020.01)i; **A24F 40/50**(2020.01)i; **A24F 47/00**(2006.01)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 40/51(2020.01); A24F 40/42(2020.01); A24F 40/50(2020.01); A24F 40/60(2020.01); A24F 47/00(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
Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & Keywords: sensor, temperature, puff, insertion, reset, control, heating, mode

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2022-0183382 A1 (KT&G CORPORATION) 16 June 2022 (2022-06-16) claim 1; paragraphs [0077], [0085], [0087]	1-4
A		5-15
Y	KR 10-2019-0049647 A (KT&G CORPORATION) 09 May 2019 (2019-05-09) claim 6; paragraphs [0011], [0054]	1-4
A	KR 10-2022-0053234 A (KT&G CORPORATION) 29 April 2022 (2022-04-29) the whole document	1-15
A	KR 10-2141648 B1 (ALTRIA CLIENT SERVICES LLC.) 05 August 2020 (2020-08-05) the whole document	1-15
A	KR 10-2141648 B1 (KT&G CORPORATION) 05 August 2020 the whole document	1-15

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

* Special categories of cited documents:
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"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
08 December 2023	**11 December 2023**

Name and mailing address of the ISA/KR	Authorized officer
Korean Intellectual Property Office **189 Cheongsa-ro, Seo-gu, Daejeon** **35208, Republic of Korea**	**HEO, Joo Hyung**
Facsimile No. **+82-42-481-8578**	Telephone No. **+82-42-481-5373**

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2023/013173

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2023/013173

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		JP	7269219	B2	08 May 2023
		JP	7306777	B2	11 July 2023
		JP	7311223	B2	19 July 2023
		JP	7311231	B2	19 July 2023