(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
03 March 2022 (03.03.2022)

WIPO | PCT

(10) International Publication Number
WO 2022/045585 A1

(51) International Patent Classification:
*A24D 1/20* (2020.01) *A24C 5/18* (2006.01)
*A24B 15/14* (2006.01) *A24D 1/02* (2006.01)
*A24B 3/14* (2006.01) *A24D 1/00* (2006.01)
*A24D 1/04* (2006.01) *A24B 15/30* (2006.01)

(21) International Application Number:
PCT/KR2021/009274

(22) International Filing Date:
19 July 2021 (19.07.2021)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10-2020-0108551 27 August 2020 (27.08.2020) KR

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

(72) Inventors: **JANG, Seok Su**; 10-203, 71, Beotkkot-gil, Daedeok-gu, Daejeon 34337 (KR). **HAN, Dae Nam**; 106-1401, 50, Gaepo-ro 110-gil, Gangnam-gu, Seoul 06344 (KR). **KIM, Yong Hwan**; 6-302, 40, Seoksu-ro, Man-an-gu, Anyang-si, Gyeonggi-do 13970 (KR). **YOON, Sung Wook**; 108-2302, 246, Gwongwang-ro, Paldal-gu, Su-won-si, Gyeonggi-do 16534 (KR). **LEE, Seung Won**; 104-307, 88, Mokgam-ro, Gwangmyeong-si, Gyeonggi-do 14293 (KR).

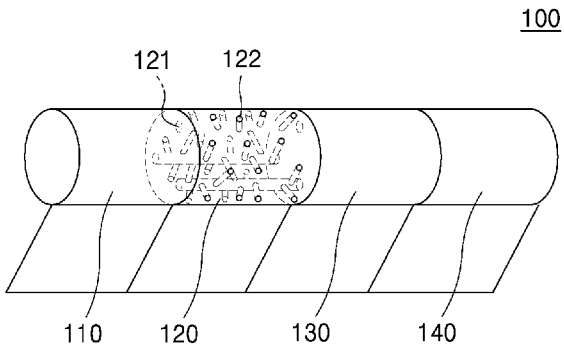
(74) Agent: **Y.P.LEE, MOCK & PARTNERS**; 12F Daelim Acrotel, 13 Eonju-ro 30-gil, Gangnam-gu, Seoul 06292 (KR).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, IT, JO, JP, KE, KG, KH, KN, KP, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

**Published:**
— *with international search report (Art. 21(3))*

(54) Title: AEROSOL GENERATING ARTICLE INCLUDING POROUS TOBACCO SOLID AND METHOD OF MANUFACTURING POROUS TOBACCO SOLID




(57) Abstract: Provided is an aerosol generating article including a first portion comprising an aerosol generating element, a second portion comprising a tobacco element, a third portion comprising a cooling element, and a fourth portion comprising a filter element, wherein the first portion, the second portion, the third portion, and the fourth portion are sequentially provided in a length direction of the aerosol generating article, and wherein the second portion comprises a porous tobacco solid that comprises the tobacco element.

WO 2022/045585 A1

# Description

# Title of Invention: AEROSOL GENERATING ARTICLE INCLUDING POROUS TOBACCO SOLID AND METHOD OF MANUFACTURING POROUS TOBACCO SOLID

## Technical Field

[1] The present disclosure relates to an aerosol generating article including a porous tobacco solid and a method of manufacturing a porous tobacco solid.

## Background Art

[2] Recently, the demand for alternative methods to overcome the disadvantages of traditional cigarettes has increased. For example, there is growing demand for an aerosol generating device which generates aerosol by heating an aerosol generating material, rather than by combusting cigarettes. Accordingly, researches on a heating-type aerosol generating device has been actively conducted.

## Disclosure of Invention

## Technical Problem

[3] The present disclosure provides an aerosol generating article including a porous tobacco solid and a method of manufacturing a porous tobacco solid.

## Solution to Problem

[4] According to an aspect of the present disclosure, an aerosol generating article includes a first portion including an aerosol generating element, a second portion including a tobacco element, a third portion including a cooling element, and a fourth portion including a filter element, wherein the first portion, the second portion, the third portion, and the fourth portion are sequentially arranged based on a length direction of the aerosol generating article, and the second portion includes a porous tobacco solid including the tobacco element.

[5] According to an aspect of the present disclosure, a method of manufacturing a porous tobacco solid includes preparing a tobacco composition including tobacco powder, a binder, and a moisturizer, inserting the tobacco composition into a cylindrical frame in which at least one gas spray pipe is located, and manufacturing the porous tobacco solid by spraying gas from the at least one gas spray pipe onto the tobacco composition inserted into the cylindrical frame.

## Advantageous Effects of Invention

[6] An aerosol generating article according to the present disclosure may transfer rich nicotine through a porous structure of a tobacco solid.

[7] In addition, the method for manufacturing a porous tobacco solid according to the

present disclosure may provide a technique for manufacturing a tobacco solid having a porous structure that may transfer rich nicotine by using a relatively simple method.

## Brief Description of Drawings

[8] FIG. 1 illustrates an example in which an aerosol generating article is inserted into an internal heating-type aerosol generating apparatus.

[9] FIG. 2 illustrates an example in which an aerosol generating article is inserted into an external heating-type aerosol generating apparatus.

[10] FIG. 3 illustrates another example in which an aerosol generating article is inserted into an external heating-type aerosol generating apparatus.

[11] FIG. 4 illustrates an example of an aerosol generating apparatus using an induction heating method.

[12] FIG. 5 schematically illustrates a structure of an aerosol generating article according to an example embodiment.

[13] FIG. 6 schematically illustrates a configuration of an aerosol generating article according to another example embodiment.

[14] FIG. 7A illustrates a cross-sectional view of a second portion of the aerosol generating article according to the example embodiment illustrated in FIG. 6.

[15] FIG. 7B illustrates a cross-sectional view of a second portion of an aerosol generating article according to another example embodiment.

[16] FIG. 8 illustrates the aerosol generating article according to the example embodiment illustrated in FIG. 6 being inserted into an aerosol generating apparatus according to an example embodiment.

[17] FIG. 9 illustrates a method of manufacturing a porous tobacco solid of the aerosol generating article according to the example embodiment illustrated in FIG. 6.

## Best Mode for Carrying out the Invention

[18] According to an aspect of the present disclosure, an aerosol generating article includes a first portion including an aerosol generating element, a second portion including a tobacco element, a third portion including a cooling element, and a fourth portion including a filter element, wherein the first portion, the second portion, the third portion, and the fourth portion are sequentially provided in a length direction of the aerosol generating article. The second portion includes a porous tobacco solid including the tobacco element.

[19] In addition, the porous tobacco solid may include at least one passage penetrating from an upstream of the aerosol generating article to a downstream of the aerosol generating article, and a plurality of pores connected to the at least one passage may be formed in an outer circumferential surface of the porous tobacco solid.

[20] In addition, an average diameter of the at least one passage may range from 1 mm to

4 mm.

[21] In addition, an average diameter of the plurality of pores may range from 0.1 mm to 1 mm.

[22] In addition, a specific surface area of the porous tobacco solid may range from 200 $m^2/g$ to 1000 $m^2/g$.

[23] In addition, the second portion may include a thermally conductive wrapper provided on the porous tobacco solid.

[24] According to another aspect of the present disclosure, a method of manufacturing a porous tobacco solid includes providing a tobacco composition including tobacco powder, a binder, and a moisturizer, inserting the tobacco composition into a cylindrical frame in which at least one gas spray pipe is provided, and spraying gas from the at least one gas spray pipe onto the tobacco composition inserted into the cylindrical frame to form the porous tobacco solid.

[25] In addition, the tobacco composition may include 60 wt.% to 80 wt.% of the tobacco powder, 15 wt.% to 30 wt.% of the binder, and 5 wt.% to 10 wt.% of the moisturizer.

[26] In addition, the at least one gas spray pipe may have a plurality of holes through which gas is sprayable onto an outer circumferential surface of the porous tobacco solid.

[27] In addition, the method of manufacturing a porous tobacco solid may further include drying the outside of the tobacco composition inserted into the cylindrical frame after the inserting the tobacco composition into the cylindrical frame and prior to the spraying the gas.

[28] In addition, a temperature of the gas sprayed from the gas spray pipe may range from 80 °C to 120 °C.

[29] In addition, a pressure of the gas sprayed from the gas spray pipe may range from 0.5 mmbar to 3 mmbar.

[30] In addition, the gas sprayed from the at least one gas spray pipe may further include a flavor element.

## Mode for the Invention

[31] With respect to the terms used to describe in the various example 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, a term which is not commonly used can be selected. In such a case, the meaning of the term 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] In addition, terms including ordinal numbers such as "first" or "second" used in the present specification may be used to describe various components, but the components are not limited by the terms. Terms are only used for the purpose of distinguishing one component from another component.

[34] As used herein, expressions such as "at least one of," when preceding a list of elements, modify the entire list of elements and do not modify the individual elements of the list. For example, the expression, "at least one of a, b, and c," should be understood as including only a, only b, only c, both a and b, both a and c, both b and c, or all of a, b, and c.

[35] It will be understood that when an element or layer is referred to as being "over," "above," "on," "connected to" or "coupled to" another element or layer, it can be directly over, above, on, connected or coupled to the other element or layer or intervening elements or layers may be present. In contrast, when an element is referred to as being "directly over," "directly above," "directly on," "directly connected to" or "directly coupled to" another element or layer, there are no intervening elements or layers present. Like numerals refer to like elements throughout.

[36] Throughout the specification, an aerosol generating article may be an article used to smoke. For example, the aerosol generating article may be a general combustion-type cigarette used in a manner that is ignited and burned or may also be a heating-type cigarette used in a manner that is heated by an aerosol generating apparatus. In another example, an aerosol generating article may also be an article used in a manner in which a liquid included in a cartridge is heated.

[37] Throughout the specification, a tobacco element may be an element including a tobacco material.

[38] Throughout the specification, a tobacco material may be any type of material including components derived from a tobacco leaf.

[39] Throughout the specification, a cooling element may be an element that cools a material. For example, the cooling element may cool an aerosol generated in the tobacco element.

[40] Throughout the specification, a filter element may be an element including a

filtration material. For example, the filter element may include a plurality of strands of fibers.

[41] Throughout the specification, a length direction of an aerosol generating article may be a direction in which the length of the aerosol generating article is extended or a direction in which the aerosol generating article is inserted into an aerosol generating apparatus.

[42] Throughout the specification, a porous tobacco solid may be a solid material having a structure in which a plurality of holes are formed inside and/or on a surface and including a tobacco material.

[43] Hereinafter, example embodiments of the present disclosure will be described in detail with reference to the accompanying drawings so that those of ordinary skill in the art may easily implement the example embodiments. However, the present disclosure may be implemented in various different forms and is not limited to the example embodiments described herein.

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

[45] FIG. 1 illustrates an example in which an aerosol generating article is inserted into an aerosol generating device.

[46] Referring to FIG. 1, the aerosol generating device 10000 may include a battery 11000, a processor 12000, and a heater 13000. The aerosol generating article 20000 may also be inserted into an inner space of the aerosol generating device 10000.

[47] FIG. 1 illustrates components of the aerosol generating device 10000, which are related to the example embodiment. Therefore, it will be understood by one of ordinary skill in the art related to the example embodiment that other general-purpose components may be further included in the aerosol generating device 10000, in addition to the components illustrated in FIG. 1.

[48] FIG. 1 illustrates that the battery 11000, the processor 12000, and the heater 13000 are arranged in series, but the arrangement is not limited thereto. For example, according to the design of the aerosol generating device 10000, the battery 11000, the processor 12000, and the heater 13000 may be differently arranged.

[49] When the aerosol generating article 20000 is inserted into the aerosol generating device 10000, the aerosol generating device 10000 heats the heater 13000. The temperature of an aerosol generating material in the aerosol generating article 20000 is raised by the heated heater 13000, and thus the aerosol is generated.

[50] The generated aerosol is delivered to a user through a filter 22000, as illustrated in FIG. 5, of the aerosol generating article 20000.

[51] When the aerosol generating article 20000 is not inserted into the aerosol generating device 10000, the aerosol generating device 10000 may heat the heater 13000 when

necessary. For example, the battery 11000 may supply power to heat the heater 13000, and may supply power for operating the processor 12000. Also, the battery 11000 may supply power for operations of a display, a sensor, a motor, etc. mounted in the aerosol generating device 10000.

[52] The processor 12000 may control operations of the aerosol generating device 10000. For example, the processor 12000 may control not only operations of the battery 11000 and the heater 13000, but also operations of other components included in the aerosol generating device 10000. The processor 12000 may also check a state of each of the components of the aerosol generating device 10000 to determine whether or not the aerosol generating device 10000 may operate.

[53] A processor 12000 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 in the microprocessor is stored. It will be understood by one of ordinary skill in the art that the processor may be implemented in other forms of hardware.

[54] The heater 13000 may be heated by power supplied from the battery 11000. For example, when the aerosol generating article 20000 is inserted into the aerosol generating device 10000, the heater 13000 may be located inside the aerosol generating article 20000. Thus, the heated heater 13000 may increase a temperature of an aerosol generating material in the aerosol generating article 20000.

[55] The heater 13000 may include an electro-resistive heater. For example, the heater 13000 may include an electrically conductive track, and the heater 13000 may be heated when currents flow through the electrically conductive track. However, the heater 13000 is not limited to the example described above and may include all types of heaters which may be heated to a desired temperature. Here, the desired temperature may be pre-set in the aerosol generating device 10000 or may be set by a user.

[56] For example, the heater 13000 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 aerosol generating article 20000, according to the shape of the heating element.

[57] The aerosol generating device 10000 may also include a plurality of heaters 13000. Here, the plurality of heaters 13000 may be inserted into the aerosol generating article 20000 or may be arranged outside of the aerosol generating article 20000. Some of the plurality of heaters 13000 may also be inserted into the aerosol generating article 20000, and the other of the plurality of heaters 13000 may be arranged outside of the aerosol generating article 20000. In addition, the shape of the heater 13000 is not limited to the shape illustrated in FIG. 1, and may include various shapes.

[58] The aerosol generating device 10000 may further include general-purpose

components in addition to the battery 11000, the processor 12000, and the heater 13000. For example, the aerosol generating device 10000 may include a display configured to output visual information and/or a motor for outputting haptic information. The aerosol generating device 10000 may also include at least one sensor, for example, a puff detecting sensor, a temperature detecting sensor, an aerosol generating article insertion detecting sensor, etc. The aerosol generating device 10000 may also be formed as a structure where, even when the aerosol generating article 20000 is inserted into the aerosol generating device 10000, external air may be introduced or internal air may be discharged.

[59] The aerosol generating device 10000 and an additional cradle may together form a system. For example, the cradle may be used to charge the battery 11000 of the aerosol generating device 10000. According to another example, the heater 13000 may be heated when the cradle and the aerosol generating device 10000 are coupled to each other.

[60] The aerosol generating article 20000 may be similar as a general combustive cigarette. For example, the aerosol generating article 20000 may include at least one of a tobacco material and an aerosol generating material. For example, at least one of the tobacco material and the aerosol-generating material may be inserted into the first portion or the second portion of the aerosol generating article 20000.

[61] For example, the external air may flow into at least one air passage formed in the aerosol generating device 10000. For example, the opening and closing and/or a size of the air passage formed in the aerosol generating device 10000 may be adjusted by the user. Accordingly, the amount of smoke and a smoking impression may be adjusted by the user. As another example, the external air may flow into the aerosol generating article 20000 through at least one hole formed on a surface of the aerosol generating article 20000.

[62] FIG. 2 illustrates an example in which an aerosol generating article is inserted into an external heating-type aerosol generating apparatus.

[63] Referring to FIG. 2, an aerosol generating apparatus 10000 further includes a vaporizer 14000 in addition to the configurations illustrated in FIG. 1. An aerosol generating article 20000, a battery 11000, a processor 12000, and a heater 13000 of FIG. 2 may correspond respectively to the aerosol generating article 20000, the battery 11000, the processor 12000, and the heater 13000 of FIG. 1. Therefore, redundant descriptions thereof are omitted.

[64] FIG. 2 illustrate components of the aerosol generating device 10000, which are related to the example embodiment. Therefore, it will be understood by one of ordinary skill in the art related to the example embodiment that other general-purpose components may be further included in the aerosol generating device 10000, in

addition to the components illustrated in FIG. 2.

[65] FIG. 2 illustrate that the aerosol generating device 10000 also includes the heater 13000. However, as necessary, the heater 13000 may be omitted.

[66] FIG. 2 illustrates that the battery 11000, the processor 12000, the vaporizer 14000, and the heater 13000 are arranged in series. However, the arrangement is not limited thereto.

[67] When the aerosol generating article 20000 is inserted into the aerosol generating device 10000, the aerosol generating device 10000 may operate the vaporizer 14000 to generate aerosol from the vaporizer 14000. The aerosol generated by the heater 13000 and/or the vaporizer 14000 is delivered to the user by passing through the aerosol generating article 20000.

[68] The battery 11000 may supply power to be used for the aerosol generating device 10000 to operate. The processor 12000 may generally control operations of the vaporizer 14000.

[69] The vaporizer 14000 may generate aerosol by heating a liquid composition and the generated aerosol may pass through the aerosol generating article 20000 to be delivered to a user. For example, the aerosol generated via the vaporizer 14000 may move along an air flow passage of the aerosol generating device 10000. The air flow passage may be configured such that the aerosol generated via the vaporizer 14000 passes through the aerosol generating article to be delivered to the user.

[70] For example, the vaporizer 14000 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 10000 as independent modules.

[71] 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 14000 or may be formed integrally with the vaporizer 14000.

[72] 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. The liquid composition may also include an aerosol forming substance, such as glycerin and propylene glycol.

[73] 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.

[74] 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 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 of heating the liquid composition, aerosol may be generated.

[75] For example, the vaporizer 14000 may be a cartomizer or an atomizer, but it is not limited thereto.

[76] FIG. 3 illustrates another example in which an aerosol generating article is inserted into an external heating-type aerosol generating apparatus.

[77] An aerosol generating article 20000, a battery 11000, a processor 12000, a heater 13000, and a vaporizer 14000 of FIG. 3 may correspond respectively to the aerosol generating article 20000, the battery 11000, the processor 12000, the heater 13000, and the vaporizer 14000 of FIG. 2. Therefore, redundant descriptions thereof are omitted.

[78] FIG. 3 illustrates an example in which the vaporizer 14000 and the heater 13000 are arranged in parallel. For example, the vaporizer 14000 and the heater 13000 may be arranged in a line in series as illustrated in FIG. 2 or may be arranged in parallel as illustrated in FIG. 3. However, an internal structure of the aerosol generating apparatus 10000 is not limited to the structures illustrated in FIGS. 2 and 3. For example, the battery 11000, the processor 12000, the heater 13000, and the vaporizer 14000 may be arranged differently depending on the design of the aerosol generating apparatus 10000.

[79] FIG. 4 illustrates an example of an aerosol generating apparatus using an induction heating method.

[80] Referring to FIG. 4, an aerosol generating apparatus 10000 includes a battery 11000, a processor 12000, a coil C, and a susceptor S. In addition, at least part of the aerosol generating article 20000 may be accommodated in a cavity V of the aerosol generating apparatus 10000. The aerosol generating article 20000, the battery 11000, and the processor 12000 of FIG. 4 may correspond respectively to the aerosol generating article 20000, the battery 11000, and the processor 12000 of FIGS. 1 to 3. In addition, the coil C and the susceptor S may be included in the heater 13000. Therefore, redundant descriptions thereof are omitted.

[81] Components relating to the example embodiment are illustrated in the aerosol generating apparatus 10000 illustrated in FIG. 4. Therefore, those skilled in the art

relating to the example embodiment will appreciate that general-purpose components other than the components illustrated in FIG. 4 may be further included in the aerosol generating apparatus 10000.

[82] The coil C may be provided around the cavity V. FIG. 4 illustrates that the coil C surrounds the cavity V, but embodiments are not limited thereto.

[83] When the aerosol generating article 20000 is accommodated in the cavity V of the aerosol generating apparatus 10000, the aerosol generating apparatus 10000 may supply power to the coil C so that the coil C generates a magnetic field. As the magnetic field generated by the coil C passes through the susceptor S, the susceptor S may be heated.

[84] Such an induction heating phenomenon is a known phenomenon described by Faraday's Law of induction. Specifically, when a magnetic induction in the susceptor S changes, an electric field is generated in the susceptor S, and thereby, an eddy current flows in the susceptor S. The eddy current generates heat proportional to current density and conductor resistance in the susceptor S.

[85] As the susceptor S is heated by the eddy current and an aerosol generating material in the aerosol generating article 20000 is heated by the heated susceptor S, and thus, an aerosol may be generated. The aerosol generated from the aerosol generating material passes through the aerosol generating article 20000 to be delivered to a user.

[86] The battery 11000 may supply power so that the coil C may generate a magnetic field. The processor 12000 may be electrically connected to the coil C.

[87] The coil C may be an electrically conductive coil that generates a magnetic field by using the power supplied from the battery 11000. The coil C may surround at least part of the cavity V. The magnetic field generated by the coil C may be applied to the susceptor S arranged at an inner end portion of the cavity V.

[88] The susceptor S is heated as the magnetic field generated from the coil C penetrates therethrough. The susceptor S may include metal or carbon. For example, the susceptor S may include at least one of ferrite, ferromagnetic alloy, stainless steel, and aluminum.

[89] The susceptor S may also include at least one of ceramic such as graphite, molybdenum, silicon carbide, niobium, nickel alloy, metal film, or zirconia, a transition metal such as nickel (Ni) or cobalt (Co), and metalloid such as boron (B) or phosphorus (P). However, the susceptor S is not limited to the above-described example and may be made of any material as long as the material may be heated to a desirable temperature as a magnetic field is applied thereto. Here, the desirable temperature may also be preset in the aerosol generating apparatus 10000 or may also be set to a desirable temperature by a user.

[90] When the aerosol generating article 20000 is accommodated in the cavity V of the

aerosol generating apparatus 10000, the susceptor S may surround at least part of the aerosol generating article 20000. Therefore, the heated susceptor S may increase a temperature of an aerosol generating material in the aerosol generating article 20000.

[91] FIG. 4 illustrates that the susceptor S surrounds at least part of the aerosol generating article 20000, but embodiments are not limited thereto. For example, the susceptor S may include a tubular heating element, a plate-shaped heating element, a needle-shaped heating element, or a rod-shaped heating element, and the interior or exterior of the aerosol generating article 20000 may be heated according to the shape of the heating element.

[92] In addition, a plurality of susceptors S may also be arranged in the aerosol generating apparatus 10000. In this case, the plurality of susceptors S may also be arranged on the outside of the aerosol generating article 20000 or may also be arranged to be inserted thereinto. In addition, some of the plurality of susceptors S may be arranged to be inserted into the aerosol generating article 20000, and the rest may be arranged on the outside of the aerosol generating article 20000. In addition, the shape of the susceptor S is not limited to the shape illustrated in FIG. 4 and may have various shapes.

[93] FIG. 5 illustrates a structure of an aerosol generating article 20000 according to an example embodiment.

[94] Referring to FIG. 5, the aerosol generating article 20000 may include a first portion 21000, a second portion 22000, a third portion 23000, and a fourth portion 24000. For example, the first portion 21000, the second portion 22000, the third portion 23000, and the fourth portion 24000 may each include an aerosol generating element, a tobacco element, a cooling element, and a filter element. In an example, the first portion 21000 may include an aerosol generating material, the second portion 22000 may include a tobacco material and a moisturizer, the third portion 23000 may cool an airflow passing through the first portion 21000 and the second portion 22000, and the fourth portion 24000 may include a filter material.

[95] Referring to FIG. 5, the first portion 21000, the second portion 22000, the third portion 23000, and the fourth portion 24000 may be sequentially arranged in a length direction of the aerosol generating article 20000. Here, the length direction of the aerosol generating article 20000 may be a direction in which the length of the aerosol generating article 20000 is extended. For example, the length direction of the aerosol generating article 20000 may be a direction from the first portion 21000 to the fourth portion 24000. Accordingly, an aerosol generated in at least one of the first portion 21000 and the second portion 22000 may sequentially pass through the first portion 21000, the second portion 22000, the third portion 23000, and the fourth portion 24000 to form an airflow, and thus, a user may inhale the aerosol from the fourth portion 24000.

[96] The first portion 21000 may include an aerosol generating element. In addition, the first portion 21000 may include other additive materials such as a flavoring agent, a wetting agent, and/or organic acid and may include a flavoring liquid such as menthol or a moisturizer. Here, the aerosol generating element may include at least one of, for example, glycerin, propylene glycol, ethylene glycol, dipropylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol, and oleyl alcohol. However, embodiments are not limited to the above-described example, and the present disclosure may include all of various types of aerosol generating elements well known in the art.

[97] The first portion 21000 may include a crimped sheet, and the aerosol generating element may be included in the first portion 21000 in a state of being impregnated with the crimped sheet. In addition, other additive materials such as a flavoring agent, a wetting agent, and/or organic acid and a flavoring liquid may be included in the first portion 21000 in a state of being absorbed by the crimped sheet.

[98] The crimped sheet may be a sheet made of a polymer material. For example, the polymer material may include at least one of paper, cellulose acetate, lyocell, and polylactic acid. For example, the crimped sheet may be a paper sheet that does not cause off-flavor due to heat even when heated to a high temperature. However, embodiments are not limited thereto.

[99] The first portion 21000 may extend from an end of the aerosol generating article 20000 to a point of about 7 mm to about 20 mm. The second portion 22000 may be about 7 mm to about a point where the first portion 21000 ends, and may be extended to the point of 20 mm. However, embodiments are not limited to the numerical range, and lengths in which the first portion 21000 and the second portion 22000 extend may be appropriately adjusted within a range that may be easily changed by a person skilled in the art.

[100] The second portion 22000 may include a tobacco element. The tobacco element may be a tobacco material of a specific type. For example, the tobacco element may have a form of cut tobacco, tobacco particles, a tobacco sheet, tobacco beads, tobacco granule, tobacco powder or tobacco extract. In addition, the tobacco material may include one or more of, for example, a tobacco leave, a tobacco side vein, puffed tobacco, cut tobacco, cut plate leaf, and reconstituted tobacco.

[101] The third portion 23000 may cool an airflow passing through the first portion 21000 and the second portion 22000. The third portion 23000 may be made of a polymer material or a biodegradable polymer material and may have a cooling function. For example, the third portion 23000 may be made of a polylactic acid (PLA) fiber, but is not limited thereto. According to another example, the third portion 23000 may be made of a cellulose acetate filter having a plurality of holes. However, the third portion 23000 is not limited to the above-described examples, and a material having a function

of cooling an aerosol may be used the third portion 23000 without limitation. For example, the third portion 23000 may be a tube filter or a branch pipe filter including a hollow.

[102] The fourth portion 24000 may include a filter material. For example, the fourth portion 24000 may be a cellulose acetate filter. In addition, a shape of the fourth portion 24000 is not limited. For example, the fourth portion 24000 may also be a cylindrical rod or may also be a tube-type rod including a hollow therein. In addition, the fourth portion 24000 may be a recess-type rod. When the fourth portion 24000 includes a plurality of segments, at least one of the plurality of segments may have a different shape from the others.

[103] The fourth portion 24000 may also generate flavor. In an example, a flavoring liquid may also be sprayed on the fourth portion 24000, or a separate fiber coated with the flavoring liquid may also be inserted into the fourth portion 24000.

[104] The aerosol generating article 20000 may include a wrapper 25000 surrounding at least part of the first portion 21000 to the fourth portion 24000. In addition, the aerosol generating article 20000 may include the wrapper 25000 surrounding all of the first portion 21000 to the fourth portion 24000. The wrapper 25000 may be at the outermost part of the aerosol generating article 20000, and the wrapper 25000 may be a single wrapper or may be a combination of a plurality of wrappers.

[105] In an example, the first portion 21000 of the aerosol generating article 20000 may include a crimped corrugated sheet including an aerosol generating material, the second portion 22000 may include a cut plate leaf as a tobacco material and glycerin as a moisturizer, the third portion 23000 may include a branch pipe, and the fourth portion 24000 may include a cellulose acetate (CA) fiber, but embodiments are not limited thereto.

[106] FIG. 6 illustrates a configuration of an aerosol generating article 100 according to an example embodiment.

[107] According to an example embodiment, an aerosol generating article 100 may include a first portion 110 including an aerosol generating element, a second portion 120 including a tobacco element, a third portion 130 including a cooling element, and a fourth portion 140 including a filter element.

[108] The first portion 21000, the second portion 22000, the third portion 23000, and the fourth portion 24000 described above with reference to FIG. 5 may be equally applied to the first portion 110, the second portion 120, the third portion 130, and the fourth portion 140.

[109] The first portion 110, the second portion 120, the third portion 130, and the fourth portion 140 may be sequentially arranged in a length direction of the aerosol generating article 100.

[110] In an example embodiment, the first portion 110 may include an aerosol generating element. The aerosol generating element may include at least one of, for example, glycerin, propylene glycol, ethylene glycol, dipropylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol, and oleyl alcohol. However, embodiments are not limited to the above-described example, and the present disclosure may include all of various types of aerosol generating elements well known in the art. In addition, the first portion 110 may contain other additive materials such as a flavoring agent, a wetting agent, and/or organic acid, and may contain a flavoring liquid such as menthol or a moisturizer.

[111] The first portion 110 may include a crimped sheet, and the aerosol generating element may be included in the first portion 110 in a state of being impregnated with the crimped sheet. In addition, other additive materials such as a flavoring agent, a wetting agent, and/or organic acid and a flavoring liquid may be included in the first portion 110 in a state of being absorbed by the crimped sheet.

[112] In an example embodiment, the third portion 130 may include a cooling element. The third portion 130 may cool an airflow formed by the generated aerosol. The third portion 130 may be made of a polymer material or a biodegradable polymer material and may have a cooling function. For example, the third portion 130 may be made of a PLA fiber but is not limited thereto. According to another example, the third portion 130 may be made of a cellulose acetate filter having a plurality of holes. However, the third portion 130 is not limited to the above-described example, and a material having a function of cooling an aerosol may be used for the third portion 130 without limitation. For example, the third portion 130 may be a tube filter or a branch pipe filter including a hollow therein.

[113] In an example embodiment, the fourth portion 140 may include a filter element. The filter element may serve to filter an aerosol and may also function as a mouthpiece. The filter element may include a filter segment and a hollow portion.

[114] Hereinafter, the second portion 120 of the aerosol generating article 100 will be described in more detail.

[115] In an example embodiment, the second portion 120 may include a porous tobacco solid including a tobacco element.

[116] As will be described below, the aerosol generating article 100 according to the example embodiment includes a porous tobacco solid in the second portion 120, thereby enabling uniform heating over the entire second portion 120. For example, when the second portion is heated by an external heating-type aerosol generating apparatus, heat may be relatively smoothly provided not only to the outside of the second portion adjacent to a heater but also to the inside of the second portion, and thus, uniform heating may be possible. Because the entire second portion is uniformly

heated, the residual amount of nicotine contained in a tobacco element after stopping smoking is reduced, and a high level of a nicotine transfer rate may be provided to a user. In addition, as a removal rate of an aerosol generated in the first portion is reduced due to the porous structure, a sufficient amount of atomization may be provided to the user.

[117] In an example embodiment, the second portion 120 may include one porous tobacco solid, and the porous tobacco solid may have a cylindrical shape. When one porous tobacco solid is included, heating of a more uniform temperature may be achieved compared to a case where a plurality of porous tobacco solids are included.

[118] FIG. 7A is a cross-sectional view 200 of the second portion 120 of the aerosol generating article according to the example embodiment illustrated in FIG. 6.

[119] The porous tobacco solid may include at least one passage 201 penetrating from an upstream to a downstream of the aerosol generating article (i.e., extending in the length direction of the aerosol generating article), and a plurality of pores 202 connected to the at least one passage may be formed on an outer circumferential surface of the porous tobacco solid.

[120] The at least one passage 201 penetrating from the upstream to the downstream may serve as a passage through which the heat provided moves and may allow nicotine in the second portion and the aerosol generated in the first portion to be smoothly transferred.

[121] In addition, at least one passage 201 penetrating from the upstream to the downstream may be connected to a plurality of pores 202 formed on an outer circumferential surface of a porous tobacco solid. The plurality of pores 202 may allow heat provided by the aerosol generating apparatus to smoothly enter or exit the porous tobacco solid so that the entire porous tobacco solid is uniformly heated and may serve as passages through which nicotine generated inside the porous tobacco solid is transferred. Accordingly, the amount of transfer of nicotine of an aerosol of the aerosol generating article may be adjusted by adjusting sizes and the number of the plurality of pores 202.

[122] The at least one passage 201 penetrating from the upstream to the downstream may have an average diameter of 1 mm to 4 mm based on the aerosol generating article having a diameter of 4.5 mm to 8 mm, by considering smooth transfer of heat, an aerosol, and nicotine. For example, the at least one passage 201 may have an average diameter ranging from 1.2 mm to 3 mm, or an average diameter ranging from 1.5 mm to 2.5 mm.

[123] In addition, the plurality of pores 202 may have an average diameter ranging from 0.1 mm to 1 mm based on the aerosol generating article having a diameter ranging from 4.5 mm to 8 mm, by considering the transfer of heat and nicotine. For example,

the plurality of pores 202 may have an average diameter ranging from 0.2 mm to 0.9 mm, or an average diameter ranging from 0.4 mm to 0.8 mm. However, embodiments are not limited to the above description. For example, a porous structure may include the passages 201 and the pores 202 of various sizes and shapes.

[124] For example, the at least one passage 201 penetrating from the upstream to the downstream may have an average diameter ranging from 1.2 mm to 3 mm based on the aerosol generating article having a diameter ranging from 4.5 mm to 8 mm, and the plurality of pores 202 may have an average diameter ranging from 0.2 mm to 0.9 mm. In this case, a nicotine transfer rate may be increased because heat applied to and provided from an external heating-type aerosol generating apparatus is smoothly introduced and discharged. For example, an aerosol generating article including a tobacco solid that does not have a porous structure has the residual amount of nicotine ranging from about 40 % to 70 % after a user stops smoking, whereas an aerosol generating article including a porous tobacco solid according to an example embodiment may have the residual amount of nicotine of 10 % or less. In addition, absorption resistance may be appropriately adjusted by the porous structure, and excessive temperature rise of the aerosol generating article during smoking may be prevented.

[125] As illustrated in FIG. 7A, the porous tobacco solid may include at least three passages 201 penetrating from an upstream to a downstream, but embodiments are not limited thereto. For example, the number of passages 201 may be appropriately adjusted by considering a size of the aerosol generating article, a diameter of at least one passage penetrating from the upstream to the downstream, a nicotine transfer rate, absorption resistance of the porous tobacco solid, aerosol removal performance, and the like. For example, the porous tobacco solid may include one to five passages penetrating from the upstream to the downstream.

[126] FIG. 7B illustrates a cross-sectional view of a second portion 300 of an aerosol generating article according to another example embodiment.

[127] Referring to FIG. 7B, a porous tobacco solid may include a passage 301 penetrating from an upstream to a downstream. The number of the plurality of pores 302 may be proportional to the number of passages 301 penetrating from the upstream to the downstream, and as the number of passages penetrating from the upstream to the downstream is reduced compared to the example embodiment illustrated in FIG. 7A, the number of the plurality of pores 302 formed on an outer circumferential surface may also be reduced.

[128] By adjusting the number of the plurality of pores 302, a specific surface area of the porous tobacco solid may also be adjusted. The porous tobacco solid may have a specific surface area ranging from 200 $m^2/g$ to 1000 $m^2/g$. For example, the specific

surface area of the porous tobacco solid may range from 300 $m^2/g$ to 800 $m^2/g$. By adjusting the specific surface area of the porous tobacco solid, a nicotine transfer rate and feeling of heat of an aerosol generating article may be adjusted.

[129] In an example embodiment, a second portion may include a thermally conductive wrapper surrounding the porous tobacco solid. The thermally conductive wrapper may be formed of aluminum (Al), gold (Au), iron (Fe), nickel (Ni), cobalt (Co), conductive carbon (C), graphite, mild steel, stainless steel, copper, or bronze. The thermally conductive wrapper may have a thickness of several μm to several hundred μm, but is not limited thereto. The thermally conductive wrapper may uniformly transfer heat to a porous tobacco solid extending in a length direction of an aerosol generating article.

[130] A thermal conductivity of the thermally conductive wrapper may be adjusted by changing a material and thickness of the thermally conductive wrapper, and thus, components of an aerosol provided to a user may be adjusted.

[131] FIG. 8 illustrates an aerosol generating article 400 according to the example embodiment illustrated in FIG. 6 being inserted into an aerosol generating apparatus 10 according to an example embodiment.

[132] Referring to FIG. 8, an aerosol generating system may include an accommodation space 12 for accommodating the aerosol generating article 400, a heating element 11 for heating the aerosol generating article 400, and a battery for supplying power to the heating element 11.

[133] The above-described example embodiments of an aerosol generating article may be applied to the aerosol generating article 400.

[134] In an example embodiment, the heating element 11 may have a cylindrical shape surrounding the accommodation space 12. However, the heating element 11 is not limited thereto and may be provided inside of the accommodation space 12 or may also have a sawing needle shape.

[135] In an example embodiment, when the aerosol generating article is inserted into the accommodation space, a part of the first portion and a part of the second portion may be covered by the heating element in a length direction of the aerosol generating article 400.

[136] When the heating element 11 operates, an aerosol generating element included in the first portion 410 and a tobacco element included in the second portion 420 may be heated. The generated aerosol may be directed to the outside of the aerosol generating article 400 by passing through the third portion 430 and the fourth portion 440.

[137] Referring to FIG. 8, as described above, even when the aerosol generating article 400 is heated by the external heating-type heating element 11, heat may be more uniformly supplied to a central portion by a porous structure of the second portion 420, and thus, a user may be provided with an increased nicotine transfer rate.

[138] According to an example embodiment, a method of manufacturing a porous tobacco solid may include preparing a tobacco composition including tobacco powder, a binder, and a moisturizer, inserting the tobacco composition into a cylindrical frame in which at least one gas spray pipe is located, and spraying gas from the at least one gas spray pipe onto the tobacco composition inserted into the cylindrical frame to form the porous tobacco solid.

[139] Here, the porous tobacco solid may have a configuration included in the second portion of the aerosol generating article of FIGS. 6 to 7B.

[140] FIG. 9 illustrates a method of manufacturing a porous tobacco solid of an aerosol generating article according to the example embodiment illustrated in FIG. 6. Hereinafter, the method of manufacturing the porous tobacco solid will be described with reference to FIG. 9.

[141] A tobacco composition 20 may be a composition obtained by mixing tobacco powder, a binder, and a moisturizer. The tobacco powder may be a pulverized material of at least one of the above-described tobacco materials. The binder may be, for example, guar gum, xanthan gum, carboxymethyl cellulose (CMC), hydroxypropyl cellulose (HPC), or hydroxypropylmethyl cellulose (HPMC). The moisturizer may include at least one of, for example, glycerin, propylene glycol, ethylene glycol, dipropylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol, and oleyl alcohol.

[142] In an example embodiment, the tobacco composition 20 may include 60 wt.% to 80 wt.% of tobacco powder, 15 wt.% to 30 wt.% of a binder, and 5 wt.% to 10 wt.% of a moisturizer. A composition of the tobacco composition 20 may affect a porous structure formed by gas spray of the gas spray pipe 21, particularly, formation of pores formed on an outer circumferential surface of the porous tobacco solid. When the tobacco composition is provided outside a composition range of the tobacco powder, the binder, and the moisturizer described above, pores having a desirable size may not be uniformly distributed on a surface of the tobacco solid in the gas spray process and pores having irregular sizes may be formed.

[143] In the example embodiment, the manufactured porous tobacco solid may have at least one passage penetrating from the upstream to the downstream at a position into which the gas spray pipe 21 is inserted.

[144] In the example embodiment, at least one gas spray pipe 21 may have a plurality of holes 22 through which gas may be sprayed on an outer circumferential surface. A plurality of pores connected to at least one passage by gas sprayed from the plurality of holes 22 of the gas spray pipe 21 may be formed on an outer circumferential surface of the porous tobacco solid.

[145] In the example embodiment, the method of manufacturing the porous tobacco solid

may further include a step of drying the outside of the tobacco composition 20 inserted into the cylindrical frame between inserting the tobacco composition into a cylindrical frame and manufacturing the porous tobacco solid . An external hardness of the tobacco composition 20 prior to the spray of gas may affect formation of a porous structure. The gas sprayed from the plurality of holes 22 of the gas spray pipe 21 escapes to the outside of the tobacco composition 20 and forms pores. When the outer hardness of the tobacco composition 20 from which the gas escapes is less than or equal to a certain level, the sprayed gas does not form pores and remains inside and is compressed. As a result, the tobacco composition 20 may explode. Therefore, to the method may further include a step of increasing the external hardness of by drying the outside of the tobacco composition 20 before gas is sprayed through the gas spray pipe 21.

[146] According to the example embodiment, an outer circumferential surface of a cylindrical frame may have a gas discharge hole having a larger diameter than diameters of the plurality of holes 22 formed on an outer circumferential surface of the gas spray pipe 21. The gas discharge hole induces smooth discharge of the gas sprayed from the gas spray pipe 21 so that a porous tobacco solid may maintain a cylindrical shape easily used for an aerosol generating article assembly process in the future.

[147] In the example embodiment, the gas sprayed from the gas spray pipe 21 may have a temperature ranging from 80 °C to 120 °C. When the temperature of the gas sprayed from the gas spray pipe 21 is less than or equal to 80°C, it may be difficult to form pores having a uniform size on the outer circumferential surface of the porous tobacco solid, and when the temperature of the gas exceeds 120°C, the tobacco composition 20 may burn or explode during a manufacturing process.

[148] In addition, the gas sprayed from the gas spray pipe 21 may have a pressure of 0.5 mmbar to 3 mmbar. If the pressure of the sprayed gas is less than 0.5 mmbar, pores may not be formed due to insufficient pressure of the gas, and when the pressure exceeds 3 mmbar, the tobacco composition 20 may explode in the cylindrical frame due to an excessively strong pressure, or a specific surface area may be reduced due to an increase in sizes of the pores.

[149] In the example embodiment, the gas sprayed from the gas spray pipe 21 may be, for example, water vapor or an inert gas, but is not limited to the above-described example, and any gas capable of forming pores may be used without limitation.

[150] In the example embodiment, the gas sprayed from the gas spray pipe 21 may further include a flavor element. The flavor element includes fragrance or a flavoring agent. The fragrance may include menthol, peppermint, spearmint oil, various fruit flavoring ingredients, and the like, but is not limited thereto. The flavoring agent may include ingredients capable of providing various flavors or fragrances to a user.

[151] The flavor elements included in gas may remain in the manufactured porous tobacco solid to provide various flavors or fragrances to the user when smoking. For example, water vapor including a flavoring agent may be used as the gas sprayed from the gas spray pipe 21.

[152] At least one of the components, elements, modules or units (collectively "components" in this paragraph) represented by a block in the drawings may be embodied as various numbers of hardware, software and/or firmware structures that execute respective functions described above, according to an exemplary embodiment. For example, at least one of these components may use a direct circuit structure, such as a memory, a processor, a logic circuit, a look-up table, etc. that may execute the respective functions through controls of one or more microprocessors or other control apparatuses. Also, at least one of these components may be specifically embodied by a module, a program, or a part of code, which contains one or more executable instructions for performing specified logic functions, and executed by one or more microprocessors or other control apparatuses. Further, at least one of these components may include or may be implemented by a processor such as a central processing unit (CPU) that performs the respective functions, a microprocessor, or the like. Two or more of these components may be combined into one single component which performs all operations or functions of the combined two or more components. Also, at least part of functions of at least one of these components may be performed by another of these components. Further, although a bus is not illustrated in the above block diagrams, communication between the components may be performed through the bus. Functional aspects of the above exemplary embodiments may be implemented in algorithms that execute on one or more processors. Furthermore, the components represented by a block or processing steps may employ any number of related art techniques for electronics configuration, signal processing and/or control, data processing and the like.

[153] Those of ordinary skill in the art related to the example embodiments may understand that various changes in form and details can 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.

# Claims

[Claim 1] An aerosol generating article comprising:
a first portion comprising an aerosol generating element;
a second portion comprising a tobacco element;
a third portion comprising a cooling element; and
a fourth portion comprising a filter element,
wherein the first portion, the second portion, the third portion, and the fourth portion are sequentially provided in a length direction of the aerosol generating article, and
wherein the second portion comprises a porous tobacco solid that comprises the tobacco element.

[Claim 2] The aerosol generating article of claim 1, wherein the porous tobacco solid comprises at least one passage penetrating from upstream of the aerosol generating article to downstream of the aerosol generating article, and
wherein a plurality of pores connected to the at least one passage is formed in an outer circumferential surface of the porous tobacco solid.

[Claim 3] The aerosol generating article of claim 2, wherein an average diameter of the at least one passage ranges from 1 mm to 4 mm.

[Claim 4] The aerosol generating article of claim 2, wherein an average diameter of the plurality of pores ranges from 0.1 mm to 1 mm.

[Claim 5] The aerosol generating article of claim 1, wherein a specific surface area of the porous tobacco solid ranges from 200 $m^2/g$ to 1000 $m^2/g$.

[Claim 6] The aerosol generating article of claim 1, wherein the second portion comprises a thermally conductive wrapper provided on the porous tobacco solid.

[Claim 7] A method of manufacturing a porous tobacco solid, the method comprising:
providing a tobacco composition including tobacco powder, a binder, and a moisturizer;
inserting the tobacco composition into a cylindrical frame in which at least one gas spray pipe is provided; and
spraying gas from the at least one gas spray pipe on the tobacco composition inserted into the cylindrical frame to form the porous tobacco solid.

[Claim 8] The method of claim 7, wherein the tobacco composition includes 60 wt.% to 80 wt.% of the tobacco powder, 15 wt.% to 30 wt.% of the

binder, and 5 wt.% to 10 wt.% of the moisturizer.

[Claim 9] The method of claim 7, wherein the at least one gas spray pipe has a plurality of holes through which gas is sprayable onto an outer circumferential surface of the porous tobacco solid.

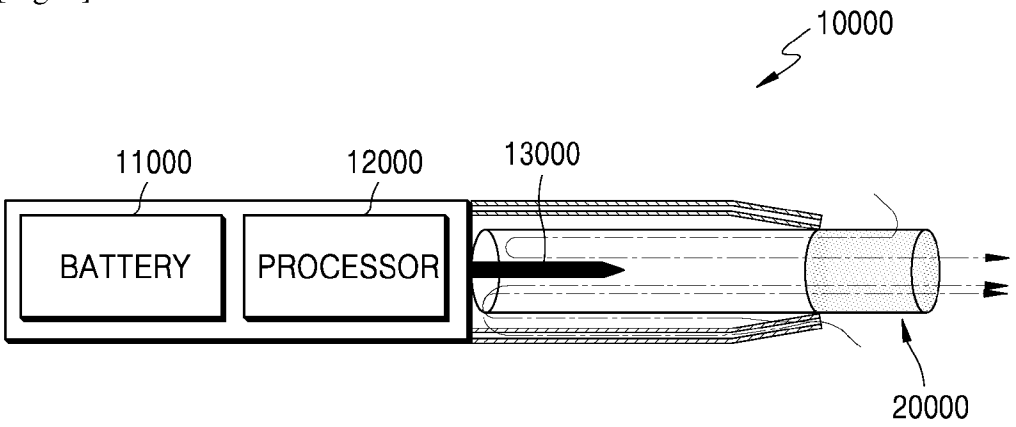
[Claim 10] The method of claim 7, further comprising:
drying the outside of the tobacco composition inserted into the cylindrical frame after the inserting the tobacco composition into the cylindrical frame and prior to the spraying the gas.

[Claim 11] The method of claim 7, wherein a temperature of the gas sprayed from the gas spray pipe ranges from 80 °C to 120 °C.

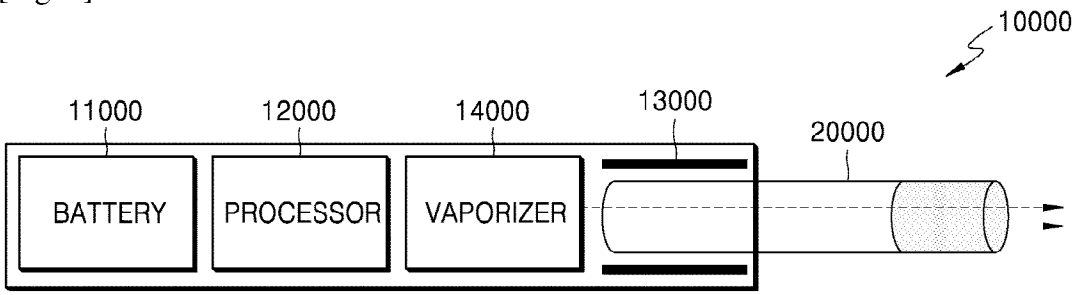
[Claim 12] The method of claim 7, wherein a pressure of the gas sprayed from the gas spray pipe ranges from 0.5 mmbar to 3 mmbar.

[Claim 13] The method of claim 7, wherein the gas sprayed from the at least one gas spray pipe further comprises a flavor element.

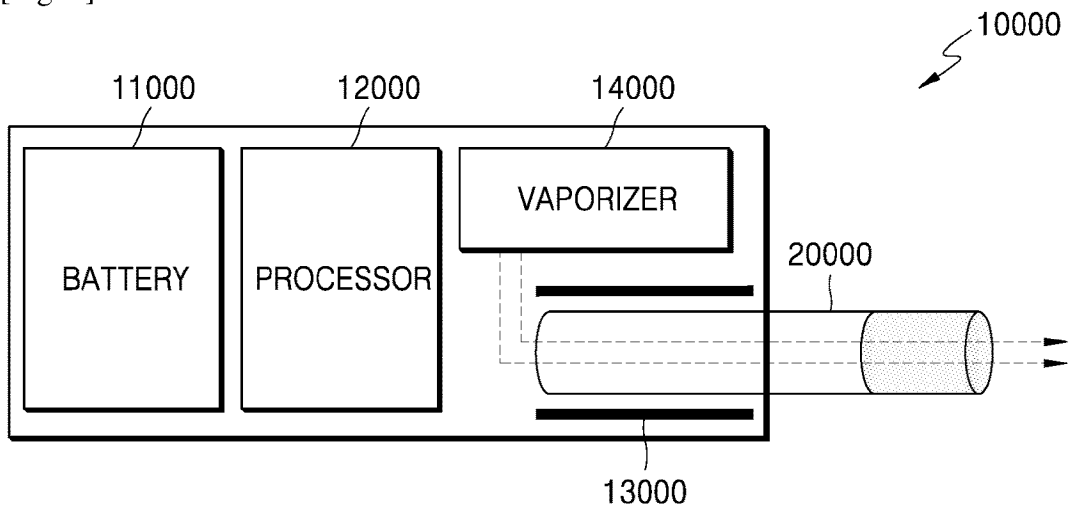
[Fig. 1]



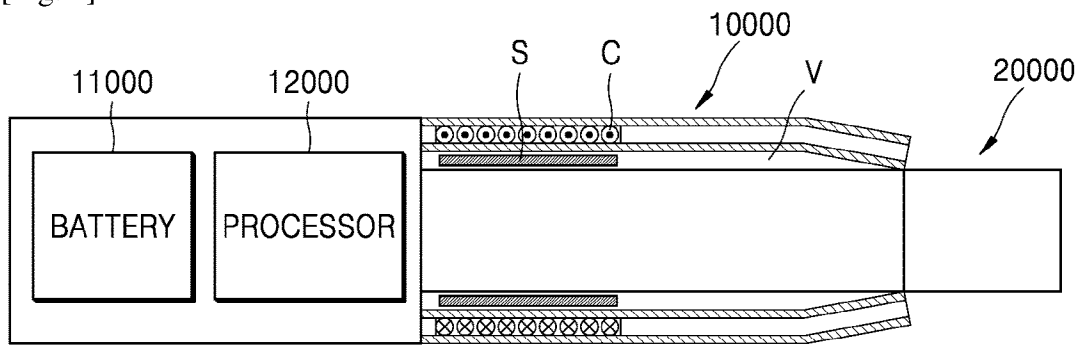

[Fig. 2]



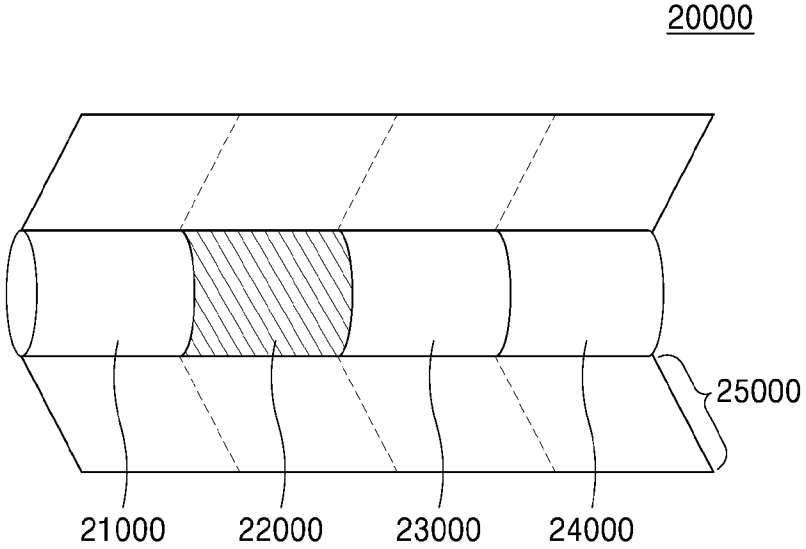

[Fig. 3]



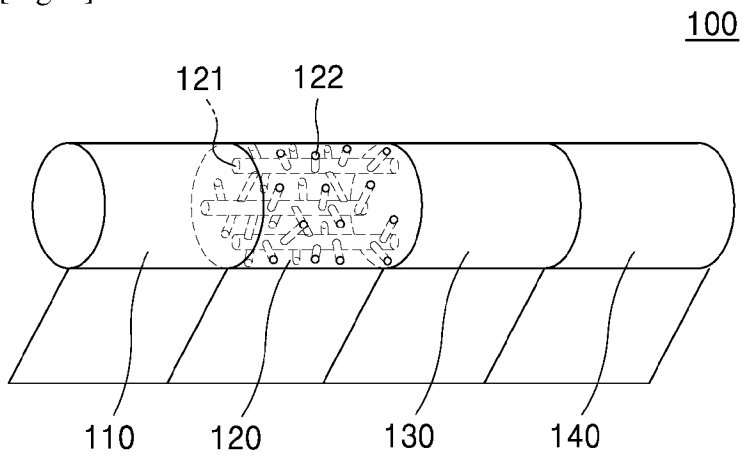

[Fig. 4]



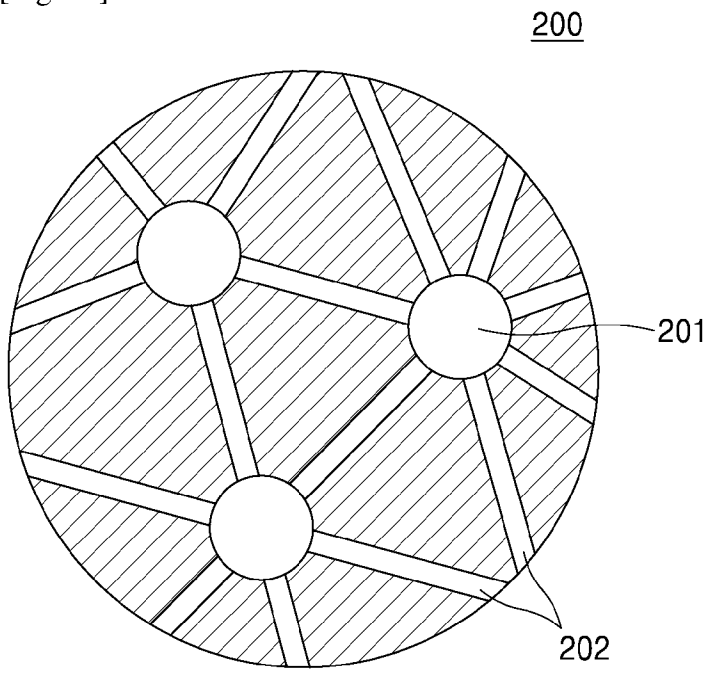
[Fig. 5]



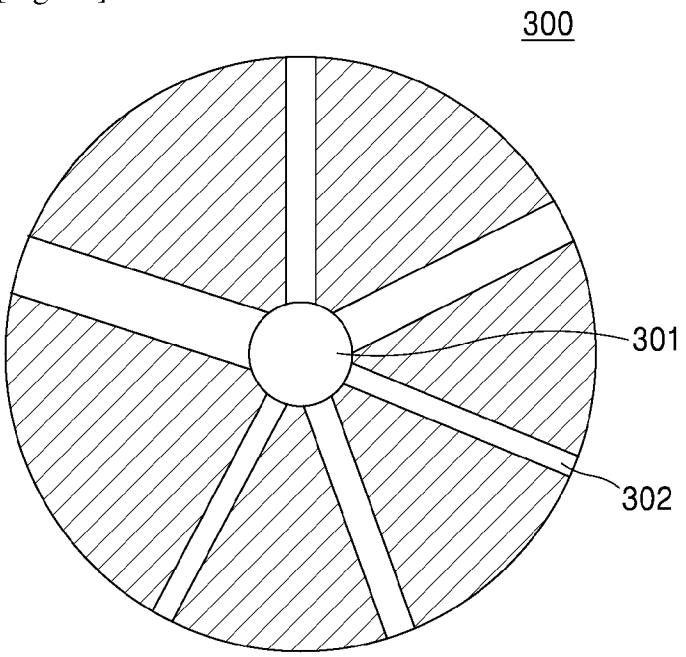

[Fig. 6]



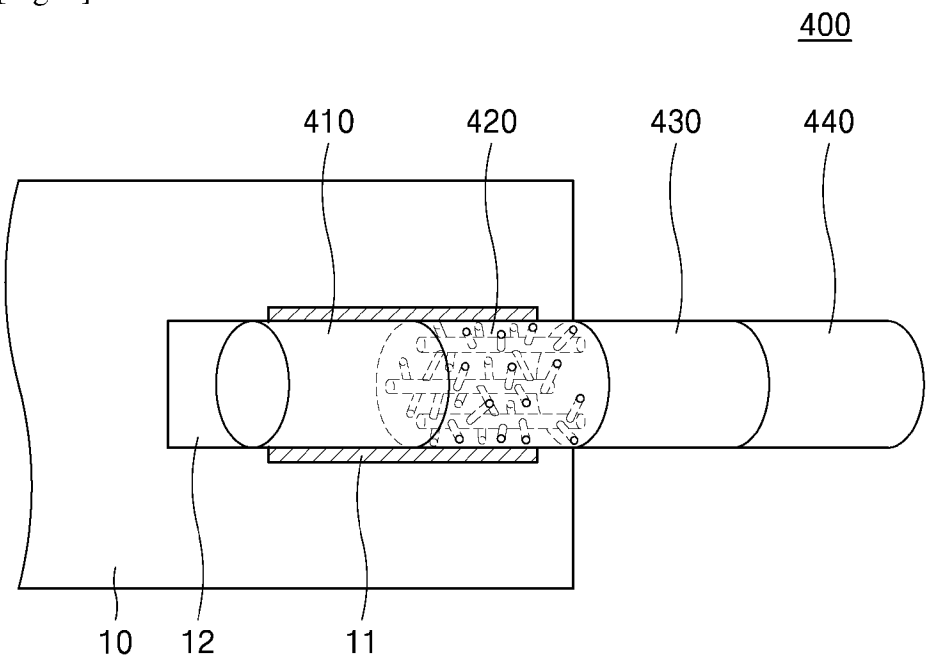

[Fig. 7a]



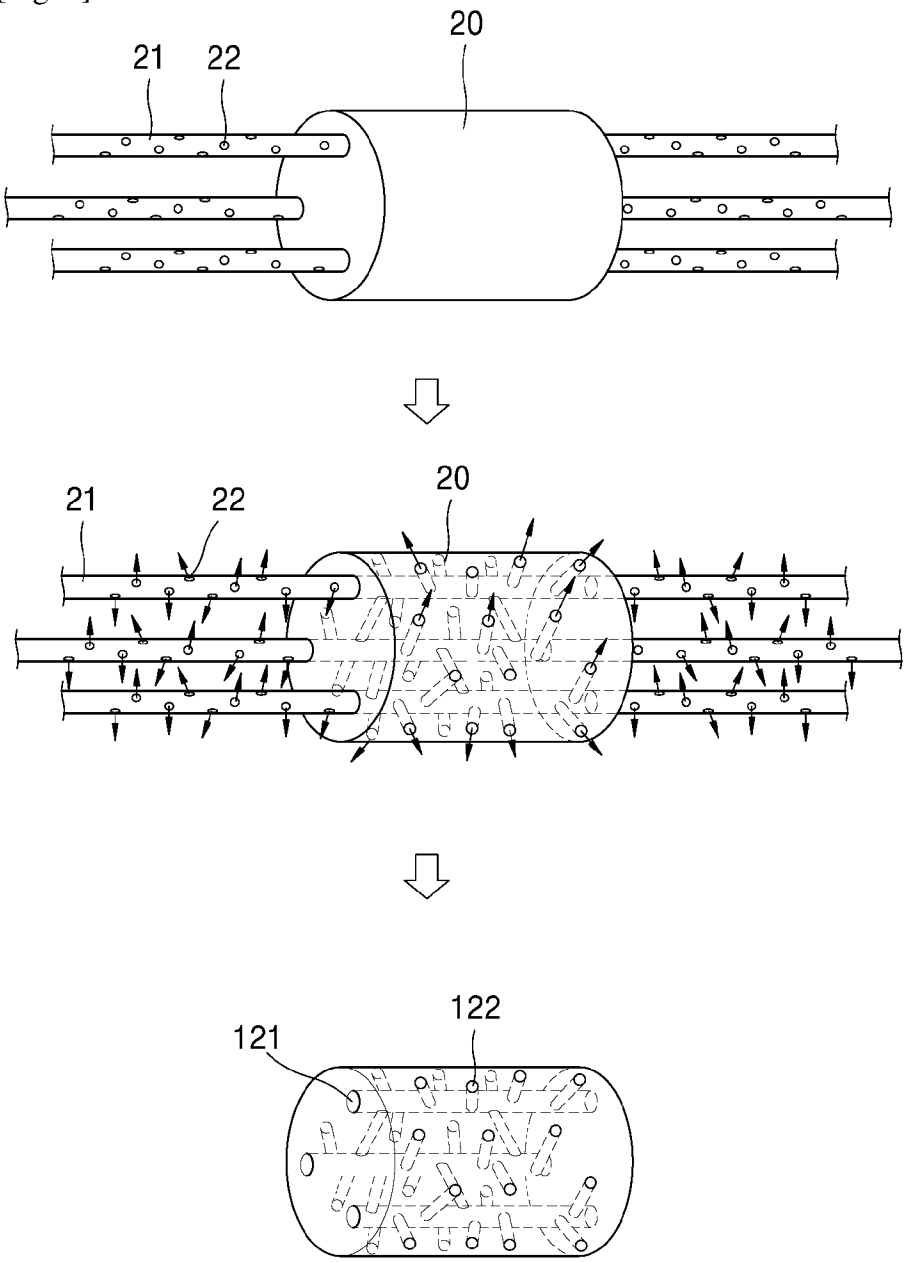
[Fig. 7b]




[Fig. 8]



[Fig. 9]



# INTERNATIONAL SEARCH REPORT

International application No.
**PCT/KR2021/009274**

## A. CLASSIFICATION OF SUBJECT MATTER

**A24D 1/20**(2020.01)i; **A24B 15/14**(2006.01)i; **A24B 3/14**(2006.01)i; **A24D 1/04**(2006.01)i; **A24C 5/18**(2006.01)i; **A24D 1/02**(2006.01)i; **A24D 1/00**(2006.01)i; **A24B 15/30**(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)

A24D 1/20(2020.01); A24B 15/12(2006.01); A24B 15/16(2006.01); A24B 3/14(2006.01); A24D 1/04(2006.01); A24D 3/04(2006.01); A24F 40/20(2020.01); B33Y 10/00(2015.01)

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: aerosol, tobacco, porous, gas, spray

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | KR 10-2020-0035001 A (PHILIP MORRIS PRODUCTS S.A.) 01 April 2020 (2020-04-01)<br>claims 1-5; paragraphs [0039]-[0082]; figures 1-3 | 1-6 |
| A | | 7-13 |
| A | US 2018-0177222 A1 (PHILIP MORRIS PRODUCTS S.A.) 28 June 2018 (2018-06-28)<br>the whole document | 1-13 |
| A | JP 2001-046045 A (FILTRONA INTERNATL LTD. et al.) 20 February 2001 (2001-02-20)<br>the whole document | 1-13 |
| A | EP 3073845 B1 (G.D S.P.A.) 23 May 2018 (2018-05-23)<br>the whole document | 1-13 |
| A | WO 2011-101164 A1 (PHILIP MORRIS PRODUCTS S.A.) 25 August 2011 (2011-08-25)<br>the whole document | 1-13 |

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

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

| Date of the actual completion of the international search | Date of mailing of the international search report |
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| **26 October 2021** | **26 October 2021** |

| Name and mailing address of the ISA/KR | Authorized officer |
|---|---|
| **Korean Intellectual Property Office**<br>**189 Cheongsa-ro, Seo-gu, Daejeon**<br>**35208, Republic of Korea** | **Jung, Da Won** |
| Facsimile No. **+82-42-481-8578** | Telephone No. **+82-42-481-5373** |

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