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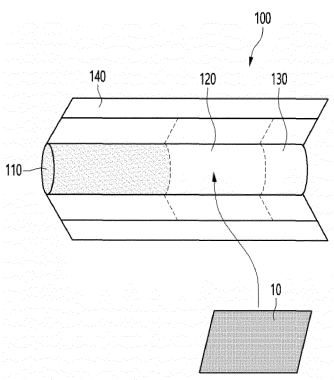
(54) **AEROSOL-GENERATING ARTICLE HAVING IMPROVED COOLING PERFORMANCE AND FRAGRANCE PERSISTENCE, AND METHOD FOR PRODUCING SAME**

(57) An aerosol-generating article with improved cooling performance and flavor persistence and a method of producing the same are provided. The aerosol-generating article according to some embodiments of the present disclosure may include an aerosol-forming substrate part and a cooling part disposed downstream of the aerosol-forming substrate part to cool an aerosol formed in the aerosol-forming substrate part, and a sheet-type material may be disposed on an inner wall of the cooling part. Here, the sheet-type material is a material including a flavoring and may serve as a cooling material as well as a flavor expressing material to improve cooling performance and flavor persistence of the aerosol-generating article.

FIG. 1



EP 4 140 329 A1

Description

Technical Field

[0001] The present disclosure relates to an aerosol-generating article with improved cooling performance and flavor persistence and a method of producing the same, and more particularly, to an aerosol-generating article which includes a cooling part and is capable of simultaneously improving aerosol cooling performance of the cooling part and improving flavor persistence of the article, thus ensuring high smoking satisfaction, and a method of producing the article.

Background Art

[0002] In recent years, demand for alternative articles that overcome the disadvantages of traditional cigarettes has increased. For example, demand for heating-type cigarettes that generate an aerosol when electrically heated by a dedicated device has increased.

[0003] The two factors that greatly influence the smoking satisfaction of the heating-type cigarettes are aerosol cooling performance and flavor persistence.

[0004] Generally, a heating-type cigarette includes a cooling part to allow a user to inhale an aerosol having an appropriate temperature, and in a case in which the performance of the cooling part is degraded, a high-temperature aerosol may be discharged as it is and smoking satisfaction of the user may be decreased.

[0005] Also, generally, a process of flavoring a heating-type cigarette is performed by directly adding (e.g., spraying) a flavoring liquid to a tobacco material or filter plug. However, such a flavoring method has a problem in that, since most of the flavor is expressed at an early stage of smoking, the flavor expressing property is rapidly degraded toward the end of smoking, and thus the smoking satisfaction of the user may be decreased. Further, when a flavoring liquid is added in an excessive amount, a problem in which a wrapper wrapping around the tobacco material or filter plug becomes wet and contaminated may occur.

Disclosure

Technical Problem

[0006] Some embodiments of the present disclosure are directed to providing an aerosol-generating article with improved cooling performance and flavor persistence and a method of producing the same.

[0007] Objectives of the present disclosure are not limited to the above-mentioned objectives, and other unmentioned objectives should be clearly understood by those of ordinary skill in the art to which the present disclosure pertains from the description below.

Technical Solution

[0008] Some embodiments of the present disclosure provide an aerosol-generating article including an aerosol-forming substrate part and a cooling part disposed downstream of the aerosol-forming substrate part to cool an aerosol formed in the aerosol-forming substrate part, wherein a sheet-type material may be disposed on an inner wall of the cooling part, and the sheet-type material may include a polysaccharide material and a flavoring.

[0009] In some embodiments, the sheet-type material may be pleated or folded in a longitudinal direction.

[0010] In some embodiments, resistance to draw of the cooling part may be in a range of 0.1 mmHzO/mm to 1.5 mmHzO/mm.

[0011] In some embodiments, the polysaccharide material may be a cellulose-based material.

[0012] In some embodiments, the sheet-type material may include, with respect to a total of 100 parts by weight, 20 to 60 parts by weight of the polysaccharide material and 20 to 50 parts by weight of the flavoring.

[0013] In some embodiments, a thickness of the sheet-type material may be in a range of 0.1 mm to 1.5 mm.

[0014] In some embodiments, a melting point of the flavoring may be 80 °C or lower.

[Advantageous Effects]

[0015] According to some embodiments of the present disclosure, a sheet-type material including a polysaccharide material and a flavoring can be disposed in (applied to) a cooling part of an aerosol-generating article. When the sheet-type material comes into contact with a high-temperature air flow, the polysaccharide material may undergo a phase change and absorb a large amount of heat, and simultaneously, the flavoring covered by the polysaccharide material may be slowly discharged. Accordingly, cooling performance and flavor persistence of the aerosol-generating article can be improved, and smoking satisfaction of a user can be significantly improved.

[0016] Also, the sheet-type material may be disposed on (e.g., attached to) an inner wall of the cooling part. In this case, since the sheet-type material does not act as a factor that interferes with an airflow passing through the cooling part, a smooth airflow and appropriate resistance to draw can be ensured.

[0017] Also, a flavoring whose melting point is 80 °C or lower may be included in the sheet-type material. In this case, when the sheet-type material comes into contact with an airflow having a temperature of 80 °C or higher, the flavoring may undergo a phase change and further absorb the heat. Thus, the performance of the cooling part can be further improved. Considering the fact that an aerosol heating temperature of typical heating-type cigarette products is 80 °C or higher, the use of the flavoring described above can effectively improve aerosol cooling performance of most aerosol-generating articles.

Further, since the phase-changed flavoring is easily volatilized, the flavor expressing property of the aerosol-generating article can also be improved.

[0018] In addition, as the performance of the cooling part is improved, the cooling part may be designed to have a shorter length as compared to conventional cooling parts, and accordingly, the degree of design freedom of the aerosol-generating article can be improved.

[0019] The advantageous effects according to the technical idea of the present disclosure are not limited to those mentioned above, and other unmentioned advantageous effects should be clearly understood by those of ordinary skill in the art from the description below.

Description of Drawings

[0020]

FIG. 1 is an exemplary view schematically illustrating an aerosol-generating article according to some embodiments of the present disclosure.

FIG. 2 is an exemplary view for describing a method of applying the sheet-type material according to some embodiments of the present disclosure.

FIG. 3 is an exemplary view for describing a processed form of a sheet-type material according to some embodiments of the present disclosure.

FIG. 4 is an exemplary view illustrating an aerosol-generating article according to a first modification of the present disclosure.

FIG. 5 is an exemplary view illustrating an aerosol-generating article according to a second modification of the present disclosure.

FIG. 6 is an exemplary view illustrating an aerosol-generating article according to a third modification of the present disclosure.

FIG. 7 is an exemplary view for describing other methods of applying the sheet-type material according to some embodiments of the present disclosure.

FIG. 8 is an exemplary view for describing another processed form of the sheet-type material according to some embodiments of the present disclosure.

FIGS. 9 to 11 illustrate various types of aerosol generation devices to which an aerosol-generating article according to some embodiments of the present disclosure is applicable.

Modes of the Invention

[0021] Hereinafter, exemplary embodiments of the present disclosure will be described in detail with reference to the accompanying drawings. Advantages and features of the present disclosure and methods of achieving the same should become clear from embodiments described in detail below with reference to the accompanying drawings. However, the technical spirit of the present disclosure is not limited to the following embodiments and may be implemented in various different forms. The following embodiments only make the technical spirit of the present disclosure complete and are provided to completely inform those of ordinary skill in the art to which the present disclosure pertains of the scope of the disclosure. The technical spirit of the present disclosure is defined only by the scope of the claims.

[0022] In assigning reference numerals to components of each drawing, it should be noted that the same reference numerals are assigned to the same components where possible even when the components are illustrated in different drawings. Also, in describing the present disclosure, when detailed description of a known related configuration or function is deemed as having the possibility of obscuring the gist of the present disclosure, the detailed description thereof will be omitted.

[0023] Unless otherwise defined, all terms including technical or scientific terms used in this specification have the same meaning as commonly understood by those of ordinary skill in the art to which the present disclosure pertains. Terms defined in commonly used dictionaries should not be construed in an idealized or overly formal sense unless expressly so defined herein. Terms used in this specification are for describing the embodiments and are not intended to limit the present disclosure. In this specification, a singular expression includes a plural expression unless the context clearly indicates otherwise.

[0024] Also, in describing components of the present disclosure, terms such as first, second, A, B, (a), and (b) may be used. Such terms are only used for distinguishing one component from another component, and the essence, order, sequence, or the like of the corresponding component is not limited by the terms. In a case in which a certain component is described as being "connected," "coupled," or "linked" to another component, it should be understood that, although the component may be directly connected or linked to the other component, still another component may also be "connected," "coupled," or "linked" between the two components.

[0025] The terms "comprises" and/or "comprising" used herein do not preclude the possibility of presence or addition of one or more components, steps, operations, and/or devices other than those mentioned.

[0026] Prior to the description of various embodiments of the present disclosure, some terms used in the following embodiments will be clarified.

[0027] In the following embodiments, "aerosol-forming substrate" may refer to a material that is able to form an aerosol. The aerosol may include a volatile compound. The aerosol-forming substrate may be a solid or liquid.

[0028] For example, solid aerosol-forming substrates may include solid materials based on tobacco raw materials such as reconstituted tobacco leaves, shredded tobacco, and reconstituted tobacco, and liquid aerosol-forming substrates may include liquid compositions based on nicotine, tobacco extracts, and/or various flavoring agents. However, the scope of the present disclosure is not limited to the above-listed examples.

[0029] In the following embodiments, "aerosol generation device" may refer to a device that generates an aerosol using an aerosol-forming substrate in order to generate an aerosol that can be inhaled directly into the user's lungs through the user's mouth. Some examples of the aerosol generation device will be described below with reference to FIGS. 9 to 11.

[0030] In the following embodiments, "aerosol-generating article" may refer to an article that is able to generate an aerosol. The aerosol-generating article may include an aerosol-forming substrate. A typical example of the aerosol-generating article may include a cigarette, but the scope of the present disclosure is not limited thereto.

[0031] In the following embodiments, "puff" refers to inhalation by a user, and the inhalation may be a situation in which a user draws smoke into his or her oral cavity, nasal cavity, or lungs through the mouth or nose.

[0032] In the following embodiments, "longitudinal direction" may refer to a direction corresponding to a longitudinal axis of an aerosol-generating article.

[0033] In the following embodiments, "sheet" may refer to a thin layer component whose width and length are substantially larger than a thickness thereof. The term "sheet" may be interchangeably used with the term "web" or "film" in the art.

[0034] Hereinafter, various embodiments of the present disclosure will be described.

[0035] FIG. 1 is an exemplary view schematically illustrating an aerosol-generating article 100 according to some embodiments of the present disclosure.

[0036] As illustrated in FIG. 1, the aerosol-generating article 100 may include an aerosol-forming substrate part 110, a cooling part 120, a filter part 130, and a wrapper 140. However, only the components relating to the embodiment of the present disclosure are illustrated in FIG. 1. Therefore, those of ordinary skill in the art to which the present disclosure pertains should understand that the aerosol-generating article 100 may further include general-purpose components other than the components illustrated in FIG. 1. Also, FIG. 1 only schematically illustrates some examples of aerosol-generating articles according to various embodiments of the present disclosure, and a specific structure of the aerosol-generating article may be changed from that illustrated in FIG. 1. FIGS. 4 to 6 may be referenced for examples of aerosol-generating articles having different structures. Hereinafter, each component of the aerosol-generating article 100 will be described.

[0037] The aerosol-forming substrate part 110 may serve to form an aerosol. Specifically, the aerosol-forming substrate part 110 may include an aerosol-forming substrate and may form an aerosol using the aerosol-forming substrate. For example, the aerosol-forming substrate part 110 may form an aerosol when heated by an aerosol generation device (e.g., 1000 of FIG. 9). The formed aerosol may be delivered to the oral region of a user via the cooling part 120 and the filter part 130 by a puff.

[0038] As illustrated, the aerosol-forming substrate part 110 may be disposed upstream of the cooling part 120 and abut an upstream end of the cooling part 120. The aerosol-forming substrate part 110 may further include the wrapper 140 that wraps around the aerosol-forming substrate.

[0039] The aerosol-forming substrate part 110 is produced in the form of a rod and thus may also be referred to as "aerosol-forming rod 110" or "tobacco rod 110" in some cases. Alternatively, the aerosol-forming substrate part 110 may also be referred to as "medium portion 110" in some cases.

[0040] Next, the cooling part 120 may serve to cool the aerosol formed in the aerosol-forming substrate part 110. The cooling part 120 may allow an aerosol having an appropriate temperature to be delivered to the user, thus improving smoking satisfaction of the user. The cooling part 120 may further include the wrapper 140 that wraps around a cooling structure.

[0041] According to various embodiments of the present disclosure, as illustrated, a sheet-type material 10 may be disposed in (applied to) the cooling part 120. Here, the sheet-type material 10 is a material in the form of a sheet that contains a polysaccharide material and a flavoring, and by using the property of the polysaccharide material that undergoes a phase change and absorbs a large amount of heat, the sheet-type material 10 may improve performance of the cooling part 120. Further, since the flavoring covered by the polysaccharide material is slowly expressed according to the phase change of the polysaccharide material, flavor persistence of the aerosol-generating article 100 may also be improved. That is, the sheet-type material 10 may serve as a cooling material as well as a flavor expressing material in the cooling part 120. Materials constituting the sheet-type material 10 and a method of producing the same will be described in detail below. Hereinafter, for convenience of description, the sheet-type material 10 will be referred to as "flavoring sheet 10." However, in some cases, the sheet-type material 10 may also be referred to as "cooling sheet 10."

[0042] In some embodiments, the flavoring sheet 10 may be disposed on (e.g., attached to) an inner wall of the cooling part 120. For example, as illustrated in FIG. 2, in a case in which the cooling part 120 is formed of a tubular structure in which a hollow or cavity is formed, the flavoring sheet 10 may be disposed on an inner wall of the structure (that is, an inner wall of the hollow). In this case, since the flavoring sheet 10 does not act as a factor that interferes with an airflow passing through the cooling part 120, a smooth airflow and appropriate resistance to draw can be ensured. In some other embodiments, the flavoring sheet 10 may be disposed in another form, and this will be described below with reference to FIGS. 6 to 8.

[0043] Meanwhile, specific processed forms of the flavoring sheet 10 may vary according to embodiments.

[0044] In some embodiments, as illustrated in FIG. 3,

the flavoring sheet 10 may be processed to be pleated or folded in a longitudinal direction (that is, a direction MD) of the aerosol-generating article 100. For example, the flavoring sheet 10 may be pleated or folded according to at least one of a crimping process, a pleating process, a folding process, and a gathering process. Specifically, the crimping process is a process in which creep is assigned to a sheet surface through a difference between pressure and speed of a roller of a crimping device, and the crimping process may be divided into a wet process and a dry process. The wet process refers to a process in which base paper is soaked in water and then softened and crimped and undergoes a re-drying process. The dry process refers to a drying process using two dryers with different temperatures. Since the pleating process, folding process, and gathering process should already be familiar to those of ordinary skill in the art, further descriptions thereof will be omitted. According to the present embodiment, a plurality of channels may be formed in the flavoring sheet 10 in a longitudinal direction thereof by at least one of the processes described above, and a smooth airflow and appropriate resistance to draw may be ensured by the formed channels. Further, an area of contact between the flavoring sheet 10 and a high-temperature air flow is increased, and thus cooling performance may be improved.

[0045] Also, in some embodiments, a plurality of holes may be formed in the flavoring sheet 10 (see FIG. 8). For example, the plurality of holes may be formed in the flavoring sheet 10 by a punching process. In this case, an area of contact between the flavoring sheet 10 and the airflow may be maximized, and thus the cooling performance may be further improved.

[0046] Also, in some embodiments, the flavoring sheet 10 may be processed on the basis of a combination of the embodiments described above.

[0047] Description will be given by referring back to FIG. 1.

[0048] The resistance to draw of the cooling part 120 may be designed to vary. In some embodiments, the resistance to draw of the cooling part 120 may be in a range of about 0.05 mmH_2O/mm to 3.0 mmH_2O/mm, preferably, about 0.1 mmH_2O/mm to 2.5 mmH_2O/mm, about 0.1 mmHzO/mm to 2.0 mmHzO/mm, about 0.5 mmHzO/mm to 2.0 mmH_2O/mm, or about 1.0 mmHzO/mm to 1.5 mmHzO/mm. However, the resistance to draw of the cooling part 120 is not limited thereto.

[0049] The length, thickness, and/or circumference of the cooling part 120 may be designed to vary. For example, the length of the cooling part 120 may be about 5 mm or larger, and the circumference of the cooling part 120 may be in a range of about 14 mm to 25 mm. However, the length and circumference of the cooling part 120 are not limited thereto.

[0050] Next, the filter part 130 may perform a function of filtering an aerosol. To this end, the filter part 130 may include a filter material. Examples of the filter material may include a cellulose acetate fiber, paper, etc., but the scope of the present disclosure is not limited thereto.

[0051] The filter part 130 may be disposed downstream of the cooling part 120 and abut a downstream end of the cooling part 120. Also, the filter part 130 may be disposed at a downstream end portion of the aerosol-generating article 100 and serve as a mouthpiece that comes into contact with the oral region of the user. The filter part 130 may further include the wrapper 140 that wraps around a filter material (plug).

[0052] Since the filter part 130 is also provided in the form of a rod, the filter part 130 may be referred to as "filter rod 130" in some cases and may be produced in various shapes such as a cylindrical shape, a tubular shape including a hollow therein (e.g., a tubular cellulose acetate filter), and a recessed shape. Alternatively, since the filter part 130 serves as a mouthpiece, the filter part 130 may also be referred to as "mouthpiece part 130."

[0053] Next, the wrapper 140 may refer to a wrapper that wraps around at least a portion of the aerosol-forming substrate part 110, the cooling part 120, and/or the filter part 130. The wrapper 140 may refer to a separate wrapper of the aerosol-forming substrate part 110, the cooling part 120, or the filter part 130 or may refer to a wrapper, such as a tipping wrapper, that wraps around at least a portion of the aerosol-forming substrate part 110 and at least a portion of the filter part 130 together. The wrapper 140 may also collectively refer to all wrappers used in the aerosol-generating article 100. The wrapper 140 may be made of porous or nonporous paper, but the scope of the present disclosure is not limited thereto. For example, the wrapper 140 may be made of a metal foil or have a form in which paper and a metal foil are laminated with each other.

[0054] Meanwhile, although not illustrated in FIG. 1, the aerosol-generating article 100 may further include a plug (not illustrated) disposed at an end. For example, the plug may be disposed at an upstream end of the aerosol-generating article 100 and serve to suitably control the overall length of the aerosol-generating article 100. Also, in a case in which the aerosol-generating article 100 is inserted into an aerosol generation device (e.g., 1000 of FIG. 9), the plug may also serve to perform control so that the aerosol-forming substrate part 110 is disposed at a suitable position inside the aerosol generation device (e.g., 1000 of FIG. 9).

[0055] Overall description of the aerosol-generating article 100 according to some embodiments of the present disclosure has been given above with reference to FIGS. 1 to 3. According to the above description, the flavoring sheet 10 including a polysaccharide material and a flavoring may be disposed in (applied to) the cooling part 120 of the aerosol-generating article 100. When the flavoring sheet 10 comes into contact with a high-temperature airflow, the polysaccharide material may undergo a phase change and absorb a large amount of heat, and simultaneously, the flavoring covered by the polysaccharide material may be slowly discharged. Accordingly, the cooling performance and flavor persist-

ence of the aerosol-generating article 100 may be improved, and smoking satisfaction of the user may be significantly improved.

[0056] Hereinafter, various modifications of the above-described aerosol-generating article 100 will be introduced with reference to FIG. 4 and so on. However, for clarity of the present disclosure, description of contents overlapping with the previous embodiments will be omitted.

[0057] FIG. 4 is an exemplary view illustrating an aerosol-generating article 200 according to a first modification of the present disclosure. In particular, FIGS. 4 and 5 illustrate an example in which the flavoring sheet 10 is disposed on an inner wall of a cooling part (e.g., 230). Also, in FIG. 4 and so on, illustration of a wrapper (e.g., 140) has been omitted for convenience.

[0058] As illustrated in FIG. 4, the aerosol-generating article 200 may include an aerosol-forming substrate part 210, the cooling part 230, a first filter part 220, and a second filter part 240.

[0059] The aerosol-forming substrate part 210 and the cooling part 230 may correspond to the aerosol-forming substrate part 110 and the cooling part 120, respectively, of FIG. 1. Thus, descriptions thereof will be omitted.

[0060] The first filter part 220 may be disposed upstream of the cooling part 230 and disposed between the aerosol-forming substrate part 210 and the cooling part 230. As illustrated, the first filter part 220 may be a segment having a hollow formed therein. For example, the first filter part 220 may be a tubular cellulose acetate filter or a paper tube. However, the scope of the present disclosure is not limited thereto. The first filter part 220 may perform a filtering function for an aerosol and may also perform a cooling function for the aerosol passing through the hollow.

[0061] In a case in which the cooling part 230 is disposed downstream of the first filter part 220 having the hollow formed therein, a high-temperature aerosol formed in the aerosol-forming substrate part 210 may be primarily cooled while passing through the hollow of the first filter part 220. Also, the primarily-cooled aerosol may enter the cooling part 230, and accordingly, performance of the cooling part 230 due to the flavoring sheet 10 may be well preserved until the end of smoking, and the flavor expressing property may also be maintained well. For example, in a case in which a high-temperature aerosol immediately enters the cooling part 230, a substance (e.g., polysaccharide material) forming the flavoring sheet 10 may rapidly undergo a phase change and cause the cooling performance to be gradually degraded, and a relatively large amount of flavoring may be delivered at an early stage of smoking. However, such phenomena may be significantly mitigated in the structure illustrated in FIG. 4.

[0062] Meanwhile, in some embodiments, the aerosol-generating article 200 may be designed so that the first filter part 220 is disposed downstream of the cooling part 230, and the cooling part 230 is disposed between the aerosol-forming substrate part 210 and the first filter part 220.

[0063] Also, in some embodiments, the flavoring sheet 10 may also be applied to the first filter part 220. In such a case, the cooling performance, flavour persistence, and flavour expressing property of the aerosol-generating article 200 may be further improved.

[0064] Also, in some embodiments, an average cross-sectional area of the hollow of the cooling part 230 may be greater than an average cross-sectional area of the hollow of the first filter part 220 by a factor of about 1.5, preferably, by a factor of about 2 or 3, and more preferably, by a factor of about 4, 5, or 6. In this case, since an airflow (e.g., mainstream smoke) that moves from the hollow of the first filter part 220 to the hollow of the cooling part 230 rapidly spreads, and thus an area and time of contact with external air (e.g., air entering through perforations formed in the cooling part 230) are increased, the aerosol cooling performance may be further improved.

[0065] Also, in some embodiments, an inner diameter ratio between the first filter part 220 and the cooling part 230 may be in a range of about 1: 1 to 1:3.5, preferably in a range of about 1: 1.5 to 1:3.5 or 1: 1.5 to 1:3. As a specific example, in a case in which the inner diameter of the first filter part 220 is 2.5 mm, the inner diameter of the cooling part 230 may be in a range of 3.75 mm to 7.5 mm, preferably, in a range of 5 mm to 7.5 mm, and more preferably, in a range of 6 mm to 7 mm. Within such numerical ranges, the aerosol cooling performance may be significantly improved.

[0066] Next, the second filter part 240 may be disposed downstream of the cooling part 230 and perform a filtering function for the cooled aerosol. As illustrated, the second filter part 240 may be a segment in which a hollow is not formed. The second filter part 240 may correspond to the filter part 130 of FIG. 1, and thus further description thereof will be omitted.

[0067] Hereinafter, in order to provide convenience in understanding, a filter part (e.g., 220) having a hollow formed therein will be referred to as "first filter part," and a filter part (e.g., 240) in which a hollow is not formed will be referred to as "second filter part," regardless of the arrangement order of the filter parts.

[0068] FIG. 5 is an exemplary view illustrating an aerosol-generating article 300 according to a second modification of the present disclosure.

[0069] As illustrated in FIG. 5, similar to the first modification described above, the aerosol-generating article 300 may include an aerosol-forming substrate part 310, a cooling part 320, a first filter part 340, and a second filter part 330. However, different from the first modification described above, the second filter part 330 is disposed between the cooling part 320 and the first filter part 340, and the first filter part 340 is disposed downstream of the second filter part 330 and serves as a mouthpiece.

[0070] FIG. 6 is an exemplary view illustrating an aer-

osol-generating article 400 according to a third modification of the present disclosure.

[0071] As illustrated in FIG. 6, similar to the structure illustrated in FIG. 1, the aerosol-generating article 400 may include an aerosol-forming substrate part 410, a cooling part 420, and a filter part 430.

[0072] The aerosol-forming substrate part 410 and the filter part 430 may correspond to the aerosol-forming substrate part 110 and the filter part 130, respectively, of FIG. 1, and thus, descriptions thereof will be omitted.

[0073] In the present modification, as illustrated, the flavoring sheet 10 may be disposed (applied) in a rolled form inside the cooling part 420 instead of being disposed on an inner wall of the cooling part 420. Alternatively, the flavoring sheet 10 may be disposed in a folded form inside the cooling part 420. For example, as illustrated in FIG. 7, the flavoring sheet 10 may be disposed to be rolled or folded in irregular patterns (see "10-1"), disposed to be rolled in a vortex form (see "10-2") or a concentric form (see "10-3"), or disposed in a form of being folded several times (e.g., a form of being folded to secure an airflow path in the longitudinal direction; see "10-4"). When the flavoring sheet 10 is disposed in the above-listed forms, an airflow path may be secured in the longitudinal direction, and thus a smooth airflow and appropriate resistance to draw may be ensured. Also, an area of contact between the flavoring sheet 10 and a high-temperature airflow is increased, and thus the aerosol cooling performance may be improved.

[0074] In some embodiments, the flavoring sheet 10 illustrated in FIG. 7 (that is, the sheet before rolling or folding) may be a sheet that is pleated or folded as illustrated in FIG. 3. In this case, since the rolling or folding process may be easily performed, workability may be improved.

[0075] Also, in some embodiments, the flavoring sheet 10 illustrated in FIG. 7 may be processed so that a plurality of holes 101 are formed therein as illustrated in FIG. 8. For example, the plurality of holes 101 may be formed in the flavoring sheet 10 by a punching process. In this case, an area of contact between the flavoring sheet 10 and the airflow may be maximized, and thus the cooling performance may be further improved.

[0076] In the embodiments described above, a diameter of the hole 101 may be in a range of about 0.05 mm to 5 mm, preferably, about 0.1 mm to 3 mm, about 0.2 mm to 2.5 mm, about 0.3 mm to 2.1 mm, or about 0.4 mm toe 1.8 mm. Within such numerical ranges, a smooth airflow and appropriate resistance to draw may be ensured. Further, an area of contact between the flavoring sheet 10 and a high-temperature airflow is significantly increased, and thus the cooling performance may be improved even more.

[0077] The aerosol-generating articles 200 to 400 according to some modifications of the present disclosure have been described above with reference to FIGS. 4 to 8. Hereinafter, the flavoring sheet 10 and a method of producing the same according to some embodiments of the present disclosure will be described.

[0078] The flavoring sheet 10 may be produced through producing a sheet composition in a liquid phase (e.g., slurry state) and drying the produced sheet composition. Here, the liquid phase may not only include a liquid state but also include a state in which a liquid and solid are mixed (e.g., slurry state). For example, the flavoring sheet 10 may be produced by stretching (casting) the sheet composition on a predetermined substrate and drying the sheet composition. However, a method of producing the flavoring sheet 10 is not limited thereto, and a specific method of producing the flavoring sheet 10 may vary.

[0079] A thickness of the flavoring sheet 10 may be designed to vary.

[0080] In some embodiments, the thickness of the flavoring sheet 10 may be less than or equal to about 2.0 mm, preferably, in a range of about 0.05 mm to 1.8 mm, about 0.1 mm to 1.5 mm, or about 0.1 mm to 1.0 mm. It was confirmed that, within such numerical ranges, the flavoring sheet 10 has appropriate durability and flexibility and workability is ensured. For example, when the thickness of the flavoring sheet 10 is too thin, the flavoring sheet 10 may have low durability, and thus the flavoring sheet 10 may be easily damaged in the process of being processed (e.g., crimped, rolled, folded, etc.) or disposed. Conversely, when the thickness of the flavoring sheet 10 is too thick, the flavoring sheet 10 may have low flexibility, and thus the flavoring sheet 10 may break during processing such as rolling or folding. Alternatively, the flavoring sheet 10 may not be attached well to an inner wall of a cooling part (e.g., 120).

[0081] Meanwhile, a specific composition of the sheet composition may be designed to vary.

[0082] In some embodiments, the sheet composition may include distilled water, a solvent such as ethanol, a polysaccharide material, and a flavoring. The flavoring sheet 10 produced from such a sheet composition may hold a large amount of flavor and have excellent flavor retention, and thus flavor persistence of an aerosol-generating article (e.g., 100) may be significantly improved. Hereinafter, each material constituting the sheet composition will be described.

[0083] The distilled water and the solvent such as ethanol may be factors for controlling the viscosity of the slurry-type sheet composition.

[0084] Next, the polysaccharide material may be a material for covering and fixing the flavoring and may be a sheet-forming substance for forming a sheet. Examples of the polysaccharide material may include cellulose-based materials such as hydroxypropyl methylcellulose (HPMC), methyl cellulose (MC), carboxymethyl cellulose (CMC), and agar. Such cellulose-based materials have a property of easily absorbing heat through a phase change upon contact with a high-temperature aerosol, and thus the flavoring sheet 10 may be utilized as a cooling material as well as a flavor expressing material.

[0085] In some embodiments, the sheet composition

may include modified cellulose among various polysaccharide materials. Here, "modified cellulose" may refer to cellulose in which a specific functional group is substituted in a molecular structure. Examples of modified cellulose may include HPMC, MC, CMC, and ethyl cellulose (EC), but modified cellulose is not limited thereto. For example, HPMC may have a grade in a range of about 4 to 40000 according to a proportion and molecular weight in which a hydroxypropyl group and a methyl group (or methoxy group) are substituted. The viscosity of modified cellulose may be determined according to the grade. More specifically, physicochemical characteristics of HPMC relate to a proportion of the methoxy group and a proportion and molecular weight of the hydroxypropyl group, and according to the The United States Pharmacopeial Convention (USP), types of HPMC may be classified into HPMC1828, HPMC2208, HPMC2906, HPMC2910, and the like according to proportions of the methoxy group and hydroxypropyl group. Here, the first two numbers may be a proportion of the methoxy group, and the last two numbers may be a proportion of the hydroxypropyl group. As a result of continuous experiments by the inventors of the present disclosure, the flavoring sheet 10 produced from a sheet composition including modified cellulose was confirmed as having excellent physical properties and holding a large amount of flavor.

[0086] Next, examples of the flavoring may include menthol, nicotine, nicotine salt, a leaf tobacco extract, a leaf tobacco extract containing nicotine, a natural vegetable flavoring (e.g., cinnamon, sage, herb, chamomile, kudzu, amacha, clove, lavender, cardamom, clove, nutmeg, bergamot, geranium, honey essence, rose oil, lemon, orgae, cinnamon, caraway, jasmine, ginger, coriander, vanilla extract, spearmint, peppermint, cassia, coffee, celery, cascarilla, sandalwood, cocoa, ylang-ylang, fennel, anise, licorice, St. John's bread, plum extract, peach extract, etc.), sugars (e.g., glucose, fructose, isomerized sugar, caramel, etc.), cocoa (e.g., powder, extract, etc.), esters (e.g., isoamyl acetate, linalyl acetate, isoamyl propionate, linalyl butyrate, etc.) ketones (e.g., menthone, ionone, damascenone, ethyl maltol, etc.), alcohols (e.g., geraniol, linalool, anetol, eugenol, etc.), aldehydes (e.g., vanillin, benzaldehyde, anisaldehyde, etc.), lactones, (e.g., γ-undecalactone, γ-nonalactone, etc.), an animal flavoring (e.g., musk, ambergris, civet, castoreum, etc.), and hydrocarbons (e.g., limonene, pinene, etc.). The flavoring may be used in a solid state or may be used by being dissolved or dispersed in an appropriate solvent, e.g., propylene glycol, ethyl alcohol, benzyl alcohol, or triethyl citrate. Also, a flavoring that is easily dispersed in a solvent by addition of an emulsifier, e.g., a hydrophobic flavoring or an oil-soluble flavoring, may be used. These flavorings may be used alone or used as a mixture. However, the scope of the present disclosure is not limited by the examples described above.

[0087] In some embodiments, a flavoring whose melting point is 80 °C or lower may be used. In this case, when the sheet-type material comes into contact with an airflow having a temperature of 80 °C or higher, the flavoring may undergo a phase change and further absorb the heat. Thus, performance of a cooling part (e.g., 120) may be further improved. Considering the fact that a heated aerosol generally has a temperature of 80 °C or higher, the use of the above flavorings may effectively improve cooling performance of most aerosol-generating articles (e.g., 100). Further, since the phase-changed flavoring is easily volatilized, the flavor expressing property of the aerosol-generating article (e.g., 100) may also be improved. An example of the flavoring whose melting point is 80 °C or lower may include menthol, but the flavoring is not limited thereto.

[0088] Meanwhile, in some embodiments, the sheet composition may further include low methoxyl pectin (LM-pectin). LM-pectin is a low ester-pectin or low methoxyl pectin in which relatively little esterification is performed. Specifically, LM pectin may be pectin that contains a carboxyl group by less than about 50% in a molecular structure. Due to having a characteristic of not gelating when cooled unlike carrageenan, LM-pectin may lower the viscosity of the slurry-type sheet composition (e.g., to about 600 cp to 800 cp). Further, since the slurry-type sheet composition can be produced without an emulsifier, a safety problem due to emulsifiers may not occur.

[0089] LM-pectin may contain a carboxyl group by less than about 50%, less than about 40%, less than about 30%, less than about 20%, or less than about 10% in a molecular structure. The lower the content of carboxyl group in the molecular structure of LM-pectin, the lower the viscosity of a slurry including LM-pectin.

[0090] Also, in some embodiments, the sheet composition may further include a bulking agent. The bulking agent may be a material that increases the total mass of components other than distilled water (that is, dry mass) to increase the volume of the flavoring sheet 10 being produced but does not affect the original function of the flavoring sheet 10. Specifically, the bulking agent may have characteristics of increasing the volume of the flavoring sheet 10 but not adversely affecting the flavor retaining function of the flavoring sheet 10 while not substantially increasing the viscosity of the slurry. Preferably, the bulking agent may be starch, modified starch, or starch hydrolyzate but is not limited thereto.

[0091] Modified starch refers to starch acetate, oxidized starch, hydroxypropyl distarch phosphate, hydroxypropyl starch, distarch phosphate, monostarch phosphate, phosphorylated distarch phosphate, or the like.

[0092] Starch hydrolyzate refers to a material obtained by a process that includes a process of hydrolyzing starch. For example, starch hydrolyzate may include a material obtained by directly hydrolyzing starch (that is, dextrin) or a material obtained by heating and hydrolyzing starch (that is, indigestible dextrin). For example, the bulking agent may be dextrin, more specifically, cyclo-

dextrin.

[0093] Generally, starch hydrolyzate may be starch hydrolyzate having a dextrose equivalent (DE) value in a range of about 2 to about 40, preferably, starch hydrolyzate having a DE value in a range of about 2 to about 20. For example, as the starch hydrolyzate having a DE value in a range of about 2 to about 20, Pinedex #100 (Matsutani Chemical Industry Co. Ltd), Pinefiber (Matsutani Chemical Industry Co. Ltd), TK-16 (Matsutani Chemical Industry Co. Ltd), or the like may be utilized.

[0094] Here, "DE" is an abbreviation of "dextrose equivalent," and the DE value indicates a degree of hydrolysis of starch, that is, a saccharification rate of starch. In the present disclosure, the DE value may be a value measured by the Willstatter-Schudel method. Characteristics of hydrolyzed starch (starch hydrolyzate), for example, characteristics such as a molecular weight of starch hydrolyzate and arrangement of sugar molecules constituting starch hydrolyzate, may not be constant for each moledule of starch hydrolyzate and may be present with a certain distribution or variation. Due to the distribution or variation of the characteristics of starch hydrolyzate or a difference in cut sections, each molecule of starch hydrolyzate may exhibit different physical properties (e.g., DE value). In this way, starch hydrolyzate is a set of molecules exhibiting different physical properties, but a measurement result (that is, DE value) by the Willstatter-Schudel method is considered a representative value indicating the degree of hydrolysis of starch.

[0095] Preferably, starch hydrolyzate may be selected from the group consisting of dextrin having a DE value in a range of about 2 to about 5, indigestible dextrin having a DE value in a range of about 10 to about 15, and a mixture thereof. For example, as the dextrin having a DE value in a range of about 2 to about 5, Pinedex #100 (Matsutani Chemical Industry Co. Ltd) may be utilized. As the indigestible dextrin having a DE value in a range of about 10 to about 15, Pinefiber (Matsutani Chemical Industry Co. Ltd) may be utilized.

[0096] Also, in some embodiments, the sheet composition may further include a plasticizer. The plasticizer may add appropriate flexibility to the flavoring sheet 10 and thus improve the physical property of the sheet. For example, the plasticizer may include at least one of glycerin and propylene glycol but is not limited thereto.

[0097] Also, in some embodiments, the sheet composition may further include an emulsifier. The emulsifier may allow a highly fat-soluble flavoring and a water-soluble polysaccharide material to be mixed well and increase the amount of flavor held in the flavoring sheet 10. An example of the emulsifier may include lecithin, but the emulsifier is not limited thereto.

[0098] Meanwhile, the flavoring sheet 10 produced from the above-described sheet composition may have various content ratios (composition ratios).

[0099] In some embodiments, the flavoring sheet 10 may include, with respect to a total of 100 parts by weight, about 20 to 60 parts by weight of the polysaccharide material and about 20 to 50 parts by weight of the flavoring. Of course, the flavoring sheet 10 may further include an appropriate amount of moisture. The flavoring sheet 10 configured in this way confirmed as significantly improving the flavor persistence and cooling performance of an aerosol-generating article (e.g., 100).

[0100] In some embodiments, the flavoring sheet 10 may include, with respect to a total of 100 parts by weight, about 2 to about 15 parts by weight of moisture, about 25 to about 90 parts by weight of modified cellulose, and about 0.1 to about 60 parts by weight of flavoring.

[0101] Also, in some embodiments, the flavoring sheet 10 may include, with respect to a total of 100 parts by weight, about 2 to about 15 parts by weight of moisture, about 1 to about 60 parts by weight of polysaccharide material, about 1 to about 60 parts by weight of LM-pectin, and about 0.1 to about 60 parts by weight of flavoring.

[0102] In some embodiments, with respect to a total of 100 parts by weight of the flavoring sheet 10, the plasticizer may be included by about 0.1 to about 15 parts by weight, preferably, about 1 to 10 parts by weight. For example, the flavoring sheet 10 may include, with respect to a total of 100 parts by weight, about 20 to 60 parts by weight of polysaccharide material, about 10 to 50 parts by weight of flavoring, and about 1 to 10 parts by weight of plasticizer. Within such numerical ranges, a sheet having appropriate flexibility (physical property) may be formed, and since processing (e.g., crimping, rolling, folding, etc.) of the flavoring sheet 10 is easy, workability may be improved. For example, in a case in which the amount of added plasticizer is too small, flexibility of the sheet may be decreased and thus the sheet may be easily damaged during processes, and in a case in which the amount of added plasticizer is too large, the sheet may not be formed well.

[0103] The flavoring sheet 10 and a method of producing the same according to some embodiments of the present disclosure have been described above. Hereinafter, various types of aerosol generation devices 1000 to which the above-described aerosol-generating article (e.g., 100) is applicable will be described with reference to FIGS. 9 to 11.

[0104] FIGS. 9 to 11 are exemplary block diagrams illustrating aerosol generation devices 1000. Specifically, FIG. 9 illustrates a cigarette-type aerosol generation device 1000, and FIGS. 10 and 11 illustrate hybrid-type aerosol generation devices 1000 that use a liquid and a cigarette together. Hereinafter, each aerosol generation device 1000 will be described.

[0105] As illustrated in FIG. 9, the aerosol generation device 1000 may include a heater 1300, a battery 1100, and a controller 1200. However, this is only a preferred embodiment for achieving the objectives of the present disclosure, and, of course, some components may be added or omitted as necessary. Also, the components of the aerosol generation device 1000 illustrated in FIG. 9 represent functional components that are functionally distinct, and the plurality of components may be imple-

mented in a form of being integrated with each other in an actual physical environment, or a single component may be implemented in a form of being divided into a plurality of specific functional components. Hereinafter, each component of the aerosol generation device 1000 will be described.

[0106] The heater 1300 may be disposed to heat a cigarette 2000 inserted thereinto. The cigarette 2000 may include a solid aerosol-forming substrate and generate an aerosol when heated. The generated aerosol may be inhaled by a user through the oral region of the user. The operation, heating temperature, etc. of the heater 1300 may be controlled by the controller 1200.

[0107] Next, the battery 1100 may supply power used to operate the aerosol generation device 1000. For example, the battery 1100 may supply power to allow the heater 1300 to heat the aerosol-forming substrate included in the cigarette 2000 and may supply power required for the operation of the controller 1200.

[0108] Also, the battery 1100 may supply power required to operate electrical components such as a display (not illustrated), a sensor (not illustrated), and a motor (not illustrated) which are installed in the aerosol generation device 1000.

[0109] Next, the controller 1200 may control the overall operation of the aerosol generation device 1000. For example, the controller 1200 may control the operation of the heater 1300 and the battery 1100 and may also control the operation of other components included in the aerosol generation device 1000. The controller 1200 may control the power supplied by the battery 1100, the heating temperature of the heater 1300, and the like. Also, the controller 1200 may check a state of each of the components of the aerosol generation device 1000 and determine whether the aerosol generation device 1000 is in an operable state.

[0110] The controller 1200 may be implemented with at least one processor. The processor may also be implemented with an array of a plurality of logic gates or implemented with a combination of a general-purpose microprocessor and a memory which stores a program that may be executed by the microprocessor. Also, those of ordinary skill in the art to which the present disclosure pertains should clearly understand that the controller 1200 may also be implemented with other forms of hardware.

[0111] Hereinafter, the hybrid-type aerosol generation devices 1000 will be briefly described with reference to FIGS. 10 and 11.

[0112] FIG. 10 illustrates the aerosol generation device 1000 in which a vaporizer 1400 and the cigarette 2000 are disposed in parallel, and FIG. 11 illustrates the aerosol generation device 1000 in which the vaporizer 1400 and the cigarette 2000 are disposed in series. However, an internal structure of the aerosol generation device 1000 is not limited to those illustrated in FIGS. 10 and 11, and the arrangement of components may be changed according to a design method.

[0113] In FIGS. 10 and 11, the vaporizer 1400 may include a liquid reservoir configured to store a liquid aerosol-forming substrate, a wick configured to absorb the aerosol-forming substrate, and a vaporizing element configured to vaporize the absorbed aerosol-forming substrate to generate an aerosol. The vaporizing element may be implemented in various forms such as a heating element or a vibration element. Also, in some embodiments, the vaporizer 1400 may be designed to have a structure that does not include the wick.

[0114] The aerosol generated in the vaporizer 1400 may pass through the cigarette 2000 and be inhaled through the oral region of the user. The vaporizing element of the vaporizer 1400 may also be controlled by the controller 1200.

[0115] The exemplary aerosol generation devices 1000, to which the aerosol-generating article (e.g., 100) according to some embodiments of the present disclosure may be applied have been described above with reference to FIGS. 9 to 11.

[0116] The embodiments of the present disclosure have been described above with reference to the accompanying drawings, but those of ordinary skill in the art to which the present disclosure pertains should understand that the present disclosure may be embodied in other specific forms without changing the technical concept or essential features thereof. Therefore, the embodiments described above should be understood as being illustrative, instead of limiting, in all aspects. The scope of the present disclosure should be interpreted according to the claims below, and any technical spirit within the scope equivalent to the claims should be interpreted as falling within the scope of the technical spirit defined by the present disclosure.

Claims

1. An aerosol-generating article comprising:

   an aerosol-forming substrate part; and
   a cooling part disposed downstream of the aerosol-forming substrate part to cool an aerosol formed in the aerosol-forming substrate part,
   wherein a sheet-type material is disposed on an inner wall of the cooling part, and
   the sheet-type material includes a polysaccharide material and a flavoring.

2. The aerosol-generating article of claim 1, wherein the sheet-type material is pleated or folded in a longitudinal direction.

3. The aerosol-generating article of claim 1, wherein resistance to draw of the cooling part is in a range of 0.1 mmHzO/mm to 1.5 mmHzO/mm.

4. The aerosol-generating article of claim 1, further

comprising:

a first filter part which is disposed upstream of the cooling part and has a hollow formed therein; and
a second filter part which is disposed downstream of the cooling part and in which a hollow is not formed.

5. The aerosol-generating article of claim 1, further comprising;

a first filter part which is disposed downstream of the cooling part and has a hollow formed therein; and
a second filter part which is disposed downstream of the first filter part and in which a hollow is not formed.

6. The aerosol-generating article of claim 1, further comprising:

a first filter part which is disposed downstream of the cooling part and has a hollow formed therein; and
a second filter part which is disposed between the cooling part and the first filter part and in which a hollow is not formed.

7. The aerosol-generating article of claim 1, wherein the polysaccharide material is a cellulose-based material.

8. The aerosol-generating article of claim 1, wherein the sheet-type material includes:

20 to 60 parts by weight of the polysaccharide material; and
10 to 50 parts by weight of the flavoring.

9. The aerosol-generating article of claim 8, wherein the sheet-type material further includes 1 to 10 parts by weight of a plasticizer.

10. The aerosol-generating article of claim 1, wherein a thickness of the sheet-type material is in a range of 0.1 mm to 1.5 mm.

11. The aerosol-generating article of claim 1, wherein a melting point of the flavoring is 80 °C or lower.

12. The aerosol-generating article of claim 1, wherein a plurality of holes are formed in the sheet-type material.

FIG. 1

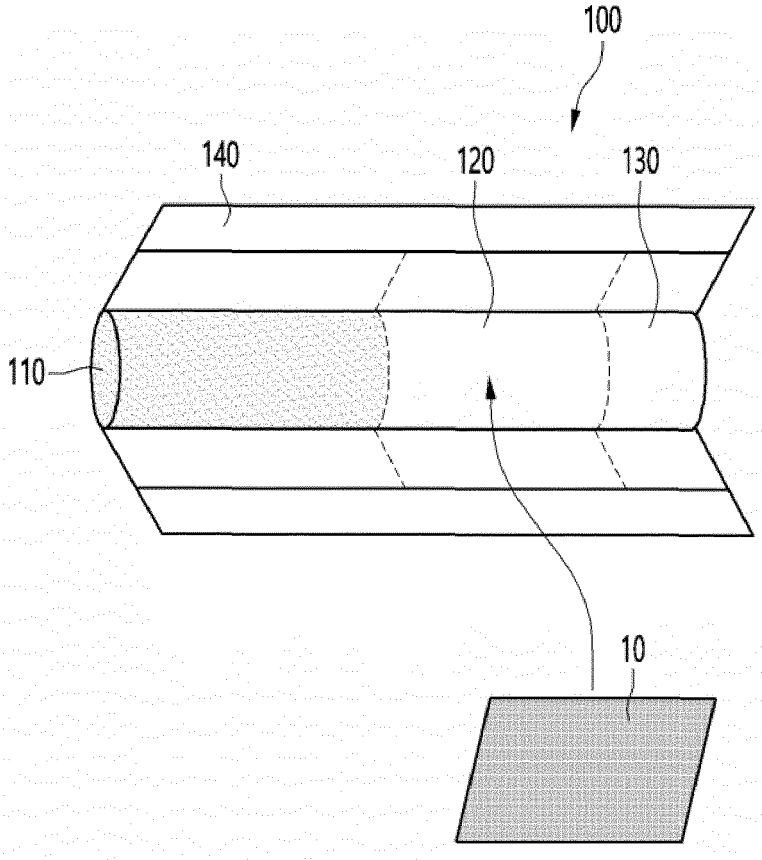


FIG. 2

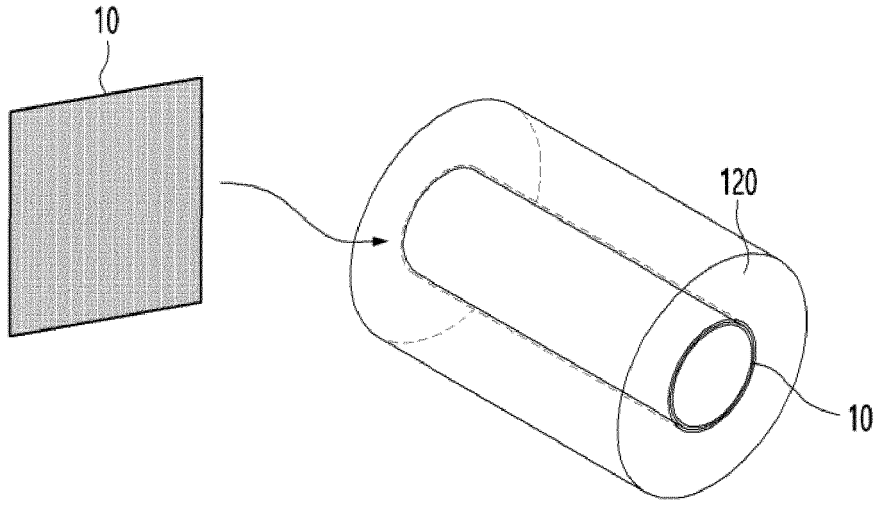


FIG. 3

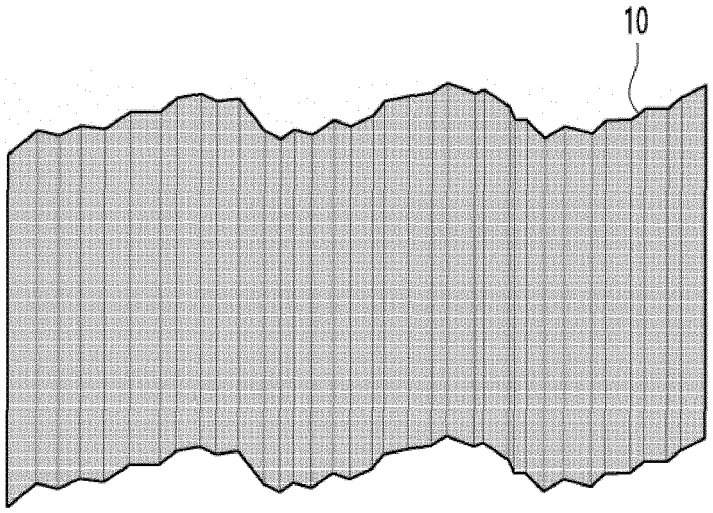


FIG. 4

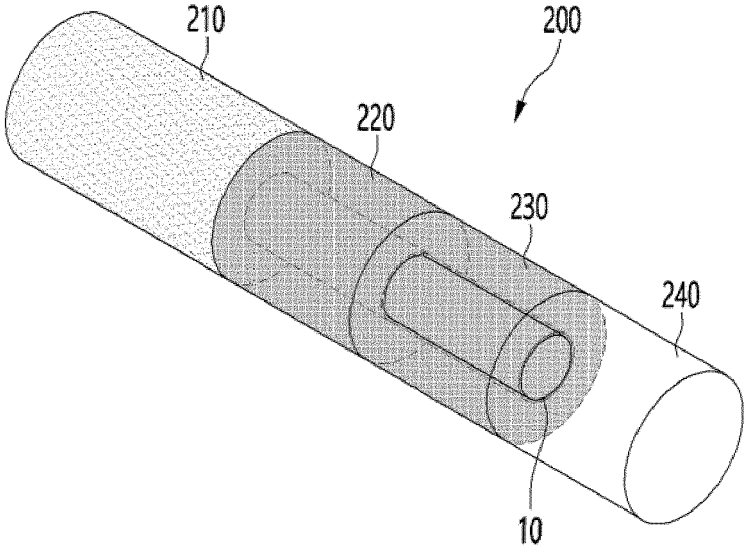


FIG. 5

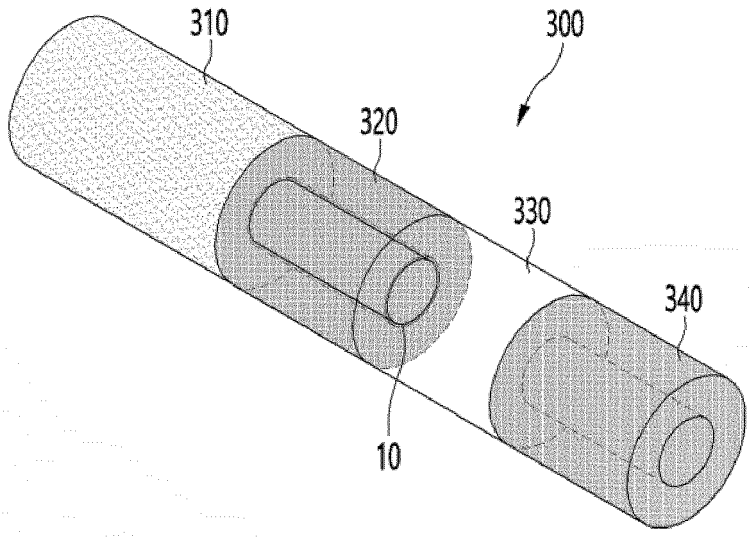


FIG. 6

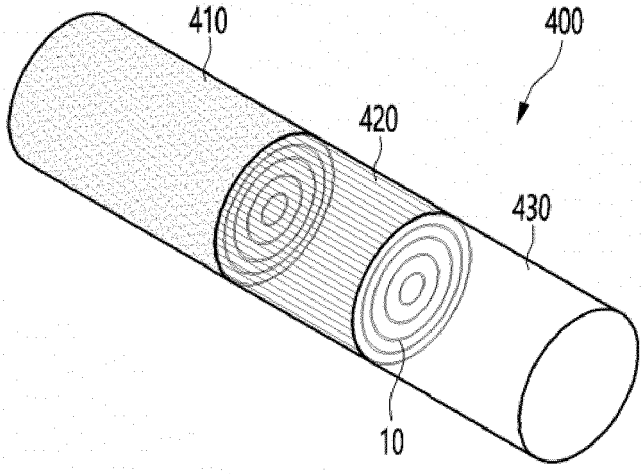


FIG. 7

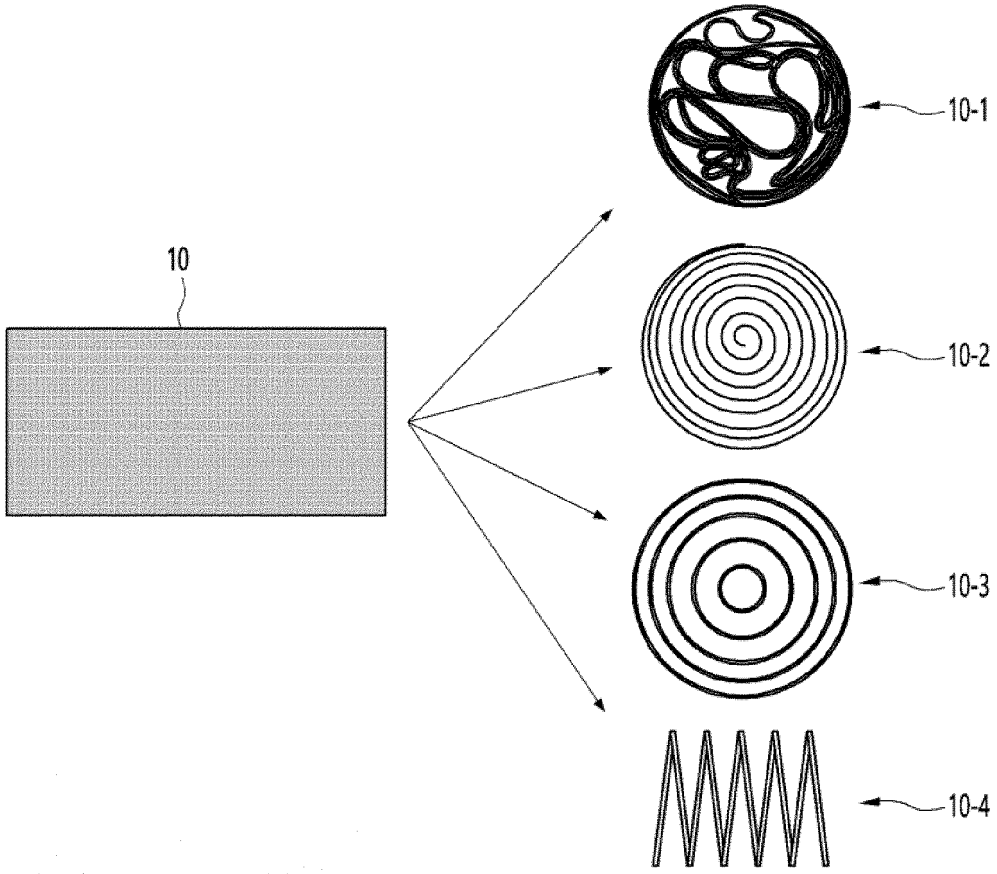


FIG. 8

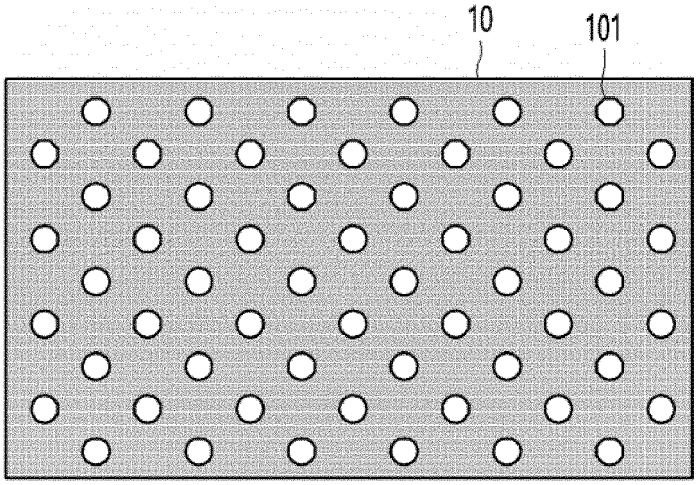


FIG. 9

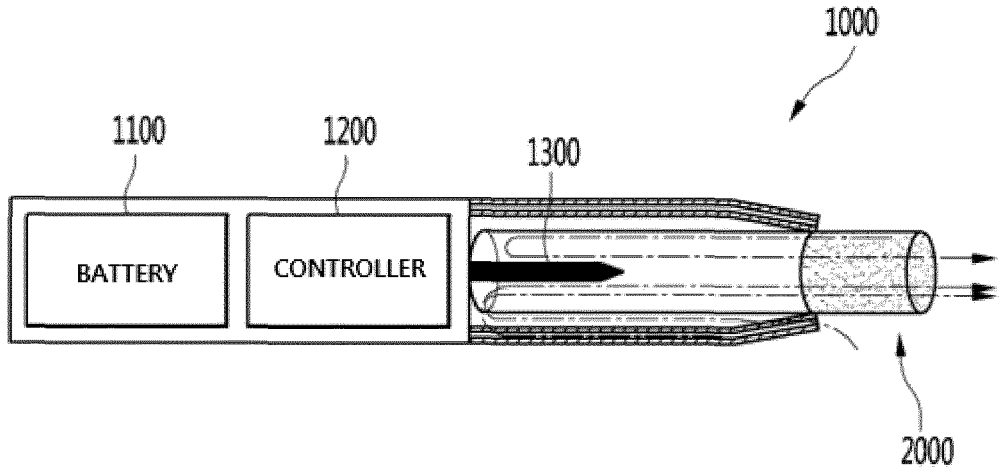


FIG. 10

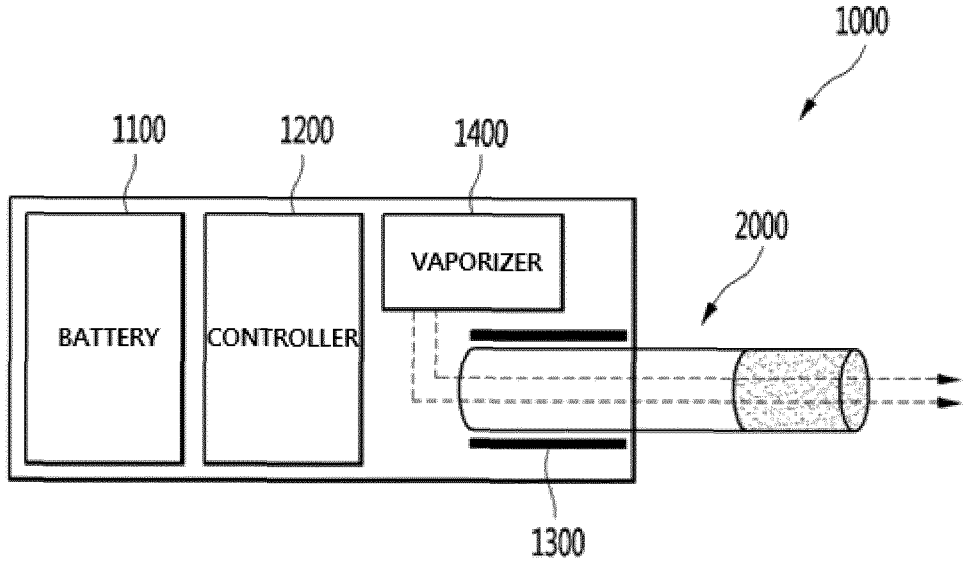
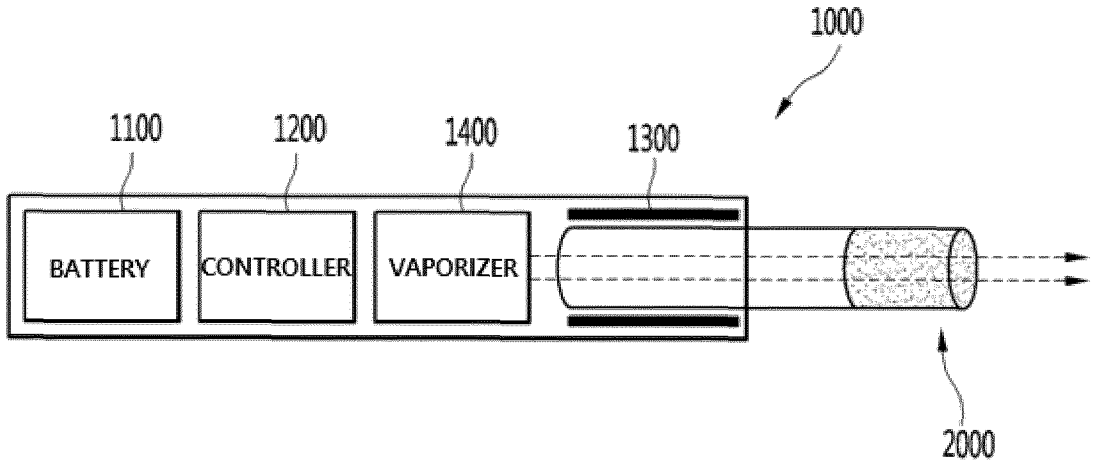


FIG. 11



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2021/016511

A. CLASSIFICATION OF SUBJECT MATTER

A24D 1/20(2020.01)i; **A24D 1/00**(2006.01)i; **A24C 5/18**(2006.01)i; **A24B 3/14**(2006.01)i; **A24D 3/02**(2006.01)i; **A24D 1/04**(2006.01)i; **A24B 15/14**(2006.01)i; **A24B 15/30**(2006.01)i; **A24D 3/10**(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 15/16(2006.01); A24D 1/00(2006.01); A24D 3/04(2006.01); A24D 3/06(2006.01); A24F 40/40(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: IPC as above
Japanese utility models and applications for utility models: IPC as above

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

eKOMPASS (KIPO internal) & keywords: 에어로졸 (aerosol), 냉각 (cool), 시트 (sheet), 필터 (filter), 홀 (hole)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	KR 10-2020-0043165 A (KT & G CORPORATION) 27 April 2020 (2020-04-27) See paragraphs [0060]-[0074]; claims 1-6; and figures 2a-4.	1-12
Y	KR 10-2020-0090212 A (JAPAN TOBACCO INC.) 28 July 2020 (2020-07-28) See claims 1-4.	1-12
Y	KR 10-2018-0070512 A (KT & G CORPORATION) 26 June 2018 (2018-06-26) See claim 10.	4-6
Y	KR 10-2020-0061290 A (KT & G CORPORATION) 02 June 2020 (2020-06-02) See claim 1; and figures 1-2.	12
A	WO 2020-148538 A1 (BRITISH AMERICAN TOBACCO (INVESTMENTS) LIMITED) 23 July 2020 (2020-07-23) See entire document.	1-12

☐ 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
25 February 2022	**25 February 2022**
Name and mailing address of the ISA/KR **Korean Intellectual Property Office** **Government Complex-Daejeon Building 4, 189 Cheongsa-ro, Seo-gu, Daejeon 35208** Facsimile No. **+82-42-481-8578**	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2019)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2021/016511

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		EP 3911181 A1	24 November 2021
		KR 10-2021-0112379 A	14 September 2021

Form PCT/ISA/210 (patent family annex) (July 2019)