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(71) Applicant: **Toa Industry Co., Ltd.**
**Tokyo 101-0021 (JP)**

(72) Inventor: **WATANABE, Ryuji**
**Tokyo 101-0021 (JP)**

(74) Representative: **Schön, Christoph**
**Dr. Schön, Neymeyr & Partner mbB**
**Bavariaring 26**
**80336 München (DE)**

# (54) AROMA CARTRIDGE

(57) The present invention provides an aroma cartridge that makes it possible to overcome a problem that characteristically arises in an aroma cartridge that does not use any tobacco component and that uses a non-tobacco material not including a large quantity of fibers; i.e., a decrease in aspiration quantity of an aerosol smoke and a fragrance component released from the non-tobacco material, due to blockage of gas flow passages within an aroma-generating sheet to be heated or an aroma-generating base material to be heated and between aroma-generating sheets to be heated or aroma-generating base materials to be heated, the aroma cartridge being characterized in that at least one of means for optimizing aspiration of the smoke and the fragrance component and/or a gas-generation-maintaining material for maintaining generation of the smoke and the fragrance component is provided to an aroma generator to be heated and/or a mouthpiece.

FIG.2A

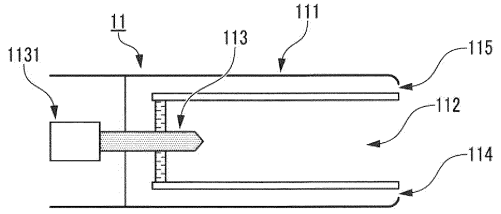



FIG.2B

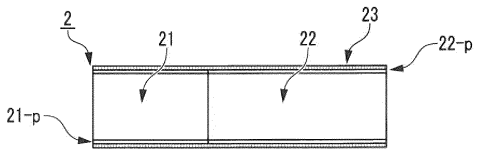
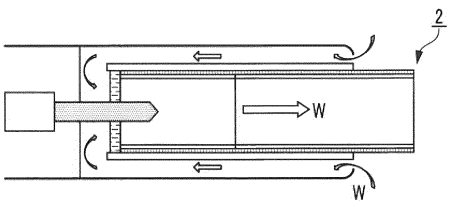



FIG.2C

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## Description

### TECHNICAL FIELD

**[0001]** The present invention relates to an aroma cartridge which is mounted in a chamber provided with an electrically controlled heating element in a heating-type smoking appliance, the aroma cartridge being mounted so as to be in contact with the heating element, whereby an aerosol smoke and a fragrance component generated due to heating of the heating element can be satisfyingly experienced.

### BACKGROUND ART

**[0002]** In recent years, as separation of smoking and non-smoking areas and prohibition of cigarettes have become more widespread in workplaces, restaurants, and other spaces where people congregate, the number of enthusiasts of smoking tobacco that is burned by a flame, such as in cigarettes, has declined, whereas there has been a sharp increase in the number of smoking enthusiasts who use an electronic-cigarette heating-type smoking appliance, by aspirating smoke generated by heat that is transmitted by a heater or other electrically controlled heating element. This is because, in contrast with conventional flame-type smoking in which the smoker and non-smokers in the vicinity of the smoker aspirate harmful substances generated by combustion (600°C or higher) and thermal decomposition of tobacco material and paper, a smoker of an electronic cigarette can enjoy smoking by aspirating an aroma or smoke of a tobacco material or harmless glycerin or the like made from an aerosol former, at a low temperature (200-350°C) that does not lead to combustion or thermal decomposition of the tobacco material, and effects on non-smokers in the vicinity can also be reduced.

**[0003]** Electronic cigarettes are roughly classified into two types (Non-Patent Documents 1 and 2). One type includes a capsule-type electronic cigarette and a stick-type electronic cigarette in which a capsule or stick containing tobacco leaves or the like is heated, and smoke or the like is aspirated. The other type is a liquid-type electronic cigarette in which a vapor generated by heating a scented or flavored liquid is inhaled.

**[0004]** Stick-type electronic cigarettes in particular have a large number of enthusiasts, due to a high degree of similarity thereof in form, smoking method, taste, and other characteristics to conventional cigarettes, as well as a small aspiration quantity of harmful substances, and various developments in stick-type electronic cigarettes have been made (e.g., Patent Documents 1 through 3). A specific example thereof is an electronic cigarette in which a stick (electronic cigarette cartridge), comprising a mouthpiece provided to an aerosol-forming body obtained by processing an aerosol former for generating a smoke-forming aerosol, a perfume, a binder, and other components together with a tobacco component into a cigarette-form stick shape, is mounted to a heating-type smoking appliance and smoked. A mechanism of this smoking is that when the aerosol-forming body is mounted so as to be in contact with a heat source of the heating-type smoking appliance, and the aerosol-forming body is heated, a volatile substance including an aerosol former is released from the aerosol-forming body, while at the same time, the volatile substance is drawn in toward the mouthpiece at another end together with air by suction by the smoker, and in a process of conveyance of the volatile substance, the volatile substance of the aerosol former cools and condenses, and forms an aerosol resembling smoke, and another volatile substance imparts an aroma to the mouth and nose of the smoker, thereby enabling the smoker to enjoy smoking (Patent Document 2). Through this mechanism, in the case of heating-type smoking such as in a stick-type electronic cigarette, smoking can be performed at a temperature of 200-250°C sufficient to volatilize the glycerin, propylene glycol, or other aerosol former included in the aerosol-forming body, i.e., at a temperature at which thermal decomposition of tobacco leaves begins. Therefore, compared with flame-type smoking in which burning occurs at the minimum temperature of 600°C necessary for combustion, and also at a temperature exceeding 900°C during smoking, generation of harmful substances, which are said to be generated in larger amounts as the temperature is increased, is suppressed, and adverse effects on health are low.

**[0005]** Unlike a stick-type electronic cigarette, a liquid-type electronic cigarette does not include a tobacco component, and is a novel smoking appliance whereby it is possible to enjoy various tastes such as coffee, cola, Red Bull, and other beverages; chocolate, vanilla, cream, and other desserts; orange, lemon, melon, and other fruits; and menthol, mint, herbs, and other algefacients (Non-Patent Document 2). A specific example thereof is an electronic cigarette whereby a liquid in which a perfume is mixed with propylene glycol and vegetable glycerin is heated, and a volatilized volatile substance is aspirated. The most significant features of this electronic cigarette are that no harmful substances are included therein, tar or nicotine are also not generated, and a wide variety of tastes can be enjoyed. A wide variety of liquids are actually sold for this electronic cigarette.

**[0006]** A fusion of features of these two types of electronic cigarettes has also been attempted in recent years (Patent Document 4). As described above, the aerosol-forming body processed into a stick shape which is heated in the conventional stick-type electronic cigarette includes a tobacco component, and therefore generates nonetheless small quantities of harmful substances, as well as tar or nicotine. The invention of Patent Document 4 is therefore a stick-type

electronic cigarette that does not include a tobacco component, which was a problem in a stick-type electronic cigarette. Specifically, the invention of Patent Document 4 is a stick-type electronic cigarette in which, instead of a tobacco component, a non-tobacco material is employed for generating only a fragrance which has the effect of smoking for calming mind and body and helping to promote health and beauty, and an aerosol-forming body in which an aerosol former, a binder, and other components are blended is used.

**[0007]** However, in this stick-type electronic cigarette which uses only a non-tobacco material, a tobacco material including a large quantity of fibers cannot be used in the aerosol-forming body, and the stick-type electronic cigarette also has problems that arise as a consequence of using a wide variety of non-tobacco materials to release various flavors.

**[0008]** In an aerosol-forming body that includes a tobacco material, fibers of the tobacco material maintain an aggregated state in the aerosol-forming body and hinder fusion and falling out of the tobacco material. However, when a non-tobacco material not including a large quantity of fibers is used, a large amount of a binder or the like for performing the function of fibers is used to stably maintain an aggregated state in an aroma-generating sheet to be heated or an aroma-generating filler to be heated (referred to hereinbelow as "aroma-generating base material to be heated."). When the amount of the binder is increased, the density of the aroma-generating base material to be heated is therefore increased, flow passages ("gas flow passages" hereinbelow) for volatile components ("gas" hereinbelow) from within the aroma-generating base material to be heated of the non-tobacco material and the aerosol former released by heating are blocked, and aspiration of aerosol smoke or a fragrance component of the non-tobacco material ("aspirated components" hereinbelow) becomes difficult, resulting in a reduced aspiration quantity.

**[0009]** Because the aerosol former is glycerin, propylene glycol, or the like, which is liquid at normal temperature, bleed-out of the aerosol former over time from the aroma-generating base material to be heated increases the larger the amount of the binder is, and aroma-generating base materials to be heated fuse together. Gas flow passages are therefore blocked, and aspiration of aspirated components becomes difficult, resulting in a reduced aspiration quantity. When the fusion described above occurs, not only does it become difficult to insert a heating element into the aroma-generating base material to be heated, but the heating element can also be damaged. Specifically, the aroma-generating base materials to be heated can become stuck together and hardened during transport or storage/keeping at a storefront, leading to difficulty in penetration thereof by a heating element, damage to a cartridge, or damage to the heating element.

**[0010]** Conversely, when the added amount of the binder or the like is reduced to keep gas flow passages clear, the non-tobacco material falls out or forms dust or the like, it is difficult to maintain the cartridge in a rigid form, and the cartridge sometimes breaks when inserted on the heating element. Pieces thereof may also be aspirated into the mouth.

**[0011]** Specifically, because of the need to maintain generation of a smoke-forming aerosol or generation of the fragrance component released from the non-tobacco material, the problems described above are not readily solved by significantly changing a blending ratio or a composition for forming the aroma-generating base material to be heated. Therefore, there is a need for a means of solving the above problems that focuses on, *inter alia,* a mouthpiece structure, which has a marked effect on the aspiration quantity, and on a method for producing the aroma-generating base material to be heated and a filling state thereof.

[Prior Art Documents]

[Patent Documents]

**[0012]**

[Patent Document 1] Japanese National Publication of International Patent Application No. 2010-520764
[Patent Document 2] Japanese National Publication of International Patent Application No. 2013-519384
[Patent Document 3] Japanese National Publication of International Patent Application No. 2016-538848
[Patent Document 4] Japanese Patent No. 6371928

[Non-patent Documents]

**[0013]**

[Non-patent Document 1] "8 Popular Choices in Electronic Cigarettes! Electronic Cigarette Types Explained For Beginners". Digmo Homepage, https:digmo.infoseek.co.jp/articles-410
[Non-patent Document 2] "Ranking of Recommended Electronic Cigarette Liquids | 15 Popular Choices For Smoking Enjoyment". Customlife Homepage, https://customlife-media.jp/electronic-cigarette-liquid

DISCLOSURE OF THE INVENTION

[Problems the Invention is Intended to Solve]

**[0014]** An object of the present invention is to provide an aroma cartridge whereby it is possible to overcome a problem of decreased aspiration force that characteristically arises from using only a non-tobacco material and not using any tobacco component, i.e., a problem of decreased aspiration quantity of an aspirated component due to blockage of gas flow passages within an aroma-generating base material to be heated and between aroma-generating base materials to be heated, and whereby there is also no dust generation or dislodgement of the non-tobacco material and other materials.

**[0015]** The present invention is referred to herein as an "aroma cartridge," but may also be called a "smoking cartridge" or an "electronic-cigarette-compatible cartridge."

**[0016]** The above terms are applied also to a source of a scent in which a non-tobacco material that is free of tobacco components is used.

**[0017]** The term "aroma" herein means "pleasant scent," and includes a scent that wafts from a raw material itself (a fragrance), a scent that drifts in space when heated (an aroma), a scent that plays about the mouth when aspirated (a flavor), or the like.

**[0018]** The term "smoking" usually means smoking tobacco, but in the present invention, "smoking" simply means "enjoying smoke," "tasting smoke," or "satisfyingly experiencing smoke," and is not limited to referring to tobacco as the source of the smoke, and can also be applied to a source in which a non-tobacco material is used. The term "smoke" herein also includes a substance "resembling smoke" or a "smoke-like" substance, such as an aerosol or other droplets dispersed in air, for example.

**[0019]** An "electronic-cigarette-compatible cartridge" is also defined simply as an "(interchangeable) cartridge that can be used interchangeably as a replacement for an electronic cigarette cartridge that includes a tobacco component," regardless of whether the compatible cartridge includes a tobacco component.

**[0020]** More specifically, an object of the present invention is to provide a cylindrical aroma cartridge which can be mounted so as to contact a heating element of a heating-type smoking appliance in which an electrically controlled heating element is provided in a chamber, and whereby an aerosol smoke and a fragrance component generated due to heating by the heating element can be satisfyingly experienced, wherein: a mouthpiece comprising at least a filter for filtering smoke and a fragrance component, and an aroma generator to be heated in which is wound at least an aroma-generating base material to be heated which is in contact with the heating element are adjacent to each other and wound by a cartridge exterior body; the mouthpiece is provided with a mechanism having a function for enhancing the aspiration quantity of a gas and a function for capturing dislodged material or dust of a non-tobacco material or the like; and the aroma generator to be heated is provided with a material having a structure that eliminates dust or dislodgement of non-tobacco material or the like without reducing the aspiration quantity of a gas.

[Means for Solving the Aforementioned Problems]

**[0021]** Specifically, the aroma cartridge of the present invention comprises: an aroma generator to be heated, in which is wound an aroma-generating base material to be heated which is in contact with a heating element; a mouthpiece comprising a filter for filtering an aerosol smoke and a fragrance component generated due to heating by the heating element; and a cartridge exterior body surrounding an external periphery so as to connect the aroma generator to be heated and the mouthpiece, at least one of the aroma generator to be heated and the mouthpiece having at least one of means for optimizing aspiration of the smoke and the fragrance component and a gas-generation-maintaining material for maintaining generation of the smoke and the fragrance component.

**[0022]** The aspiration quantity optimization means and the gas-generation-maintaining material are a structure and a material, respectively, described below. The aspiration quantity optimization means is a mouthpiece structure for enhancing the aspiration quantity, and is a structure for preventing and capturing dislodged material or dust of a non-tobacco material or the like of the aroma generator to be heated. More specifically, what is meant by aspiration quantity optimization means is: a cavity for enhancing the aspiration quantity by enlarging a gas flow passage provided in the filter constituting the mouthpiece; a shape reinforcement member for preventing a decrease in aspiration quantity due to deformation, provided to a support body for preventing the aroma generator to be heated constituting the mouthpiece from moving toward the mouthpiece; a heat insulation material for preventing a joined part from being damaged by heat diffusion, provided to the mouthpiece; and a cover material and a capturing partition wall material for preventing the occurrence of dust or dislodged material of the non-tobacco material, etc. The gas-generation-maintaining material is a material whereby a flow channel for gas released from the aroma generator to be heated is not blocked. More specifically, the gas-generation-maintaining material is: an aroma-generating base material to be heated in which an internal structure thereof is improved by a production method; an aroma-generating base material to be heated which constitutes the

aroma generator to be heated, in which a blended amount thereof is optimized; inorganic particles present within and/or on a surface of the aroma-generating base material to be heated which constitutes the aroma generator to be heated; and an aroma-generating base material to be heated in which a filling ratio thereof is improved. These structures and materials of the present invention will be described below in detail.

**[0023]** First, in the aroma cartridge of the present invention, the filter is obtained by molding fibers into a cylindrical shape, and the filter constitutes all or a portion of the mouthpiece, and the aspiration optimization means includes a cavity provided in the filter in a longitudinal direction so as not to penetrate through the filter. The filter is formed from commonly used cellulose acetate (CA) fibers or polyethylene terephthalate (PET) or other polyester fibers or the like, and because the flow rate of gas aspirated by a typical smoker is not adequate in the case of an aroma cartridge of an aroma generator to be heated which uses a non-tobacco material, the aspiration quantity is enhanced by a cavity in the filter.

**[0024]** A shape or quantity of the cavity is not particularly limited and may be determined as appropriate for the type of aroma generator to be heated, but in consideration of the effect of increasing the quantity of gas aspirated by a typical smoker, and the degree of difficulty of a method for producing the cavity, at least one cavity is preferably arranged in both longitudinal end parts or in either one longitudinal end part of the filter.

**[0025]** A position in which the cavity is formed is arranged so that when a smoker aspirates, the aspirated gas enters the entire mouth uniformly. When there is one cavity, the cavity is preferably formed on a center axis of a cylinder existing in the longitudinal direction of the filter. When there are two cavities, the cavities are preferably formed symmetrically about the center axis of a cylinder existing in the longitudinal direction of the filter. Furthermore, when there are three or more filters, the cavities are preferably arranged in rotationally symmetrical positions about the center axis of a cylinder existing in the longitudinal direction of the filter and on the center axis of a cylinder existing in the longitudinal direction of the filter.

**[0026]** The shape of the cavity is preferably columnar or conical, from the perspective of the effect of increasing the quantity of gas aspirated by a typical smoker, and the degree of difficulty of a method for producing the cavity, but the cavity is not limited to a columnar or conical bottom surface shape. However, the cavities described above are efficiently formed by ordinary mechanical drilling, electrical discharge machining, or laser machining, and are therefore preferably cylindrical or circular conical for the sake of workability.

**[0027]** The filter alone may constitute the entire mouthpiece, or the filter may be a portion of the mouthpiece. When a portion of the mouthpiece is the filter, a remainder thereof is preferably a void formed by the cartridge exterior body. An arrangement of the filter and the void is not particularly limited, and an aroma generator to be heated and the filter may be adjacent, or the aroma generator to be heated and the void may be adjacent. The cartridge exterior body is usually formed using a thin film of PE, PP, or other polyolefin resin, PET resin, CA resin, polylactic acid (PLA), or the like, or thin paper or the like, but when a void is formed by the cartridge exterior body, the thickness thereof, which will vary according to the material, must be sufficient to maintain strength of the mouthpiece.

**[0028]** The mouthpiece can be further equipped with a member having a preferred function other than the filter, to enhance functioning of the mouthpiece. Typical examples of such a member generally include a support member for preventing the aroma generator to be heated from moving toward the mouthpiece, and a cooling member whereby the aerosol former of the aroma generator to be heated is cooled after being volatilized, generation of smoke is promoted, and the temperature of a gas is reduced, and the support member and the cooling member may constitute the mouthpiece together with the filter. Any one or both of the above members may be applied. When one of the members is applied, the member is disposed between the aroma generator to be heated and the filter. When both members are applied, the support member and the cooling member are arranged in this order or in reverse order between the aroma generator to be heated and the filter.

**[0029]** It is necessary to reduce the gas temperature through use of a cooling member not only for the purpose of cooling and condensing the volatilized aerosol former to generate smoke, but also to lower the temperature of the gas itself in an extremely short interval compared to cigarettes between the mouthpiece and a heated part of the aroma cartridge, and make it possible to enjoy a pleasant smoking sensation in the mouth. Consequently, the cooling member preferably serves as a heat exchanger, and a cylindrical porous body having high porosity and continuous holes, or a cylindrical tube or the like provided with numerous through holes is used as the cooling member. The porosity thereof must be at least 50% or greater, and is preferably 70-90%. As the material of the cooling member, PE, PP, and other polyolefin resins, PET resin, CA resin, polylactic acid (PLA), and the like have been used, but a cooling member formed by winding a metal foil of aluminum or the like having high thermal conductivity on the above materials, or a cooling member formed from such a metal is more preferred.

**[0030]** The mouthpiece thus has, as an essential constituent member, a filter for making the aroma cartridge easy for the smoker to hold in the mouth, and for filtering the gas and smoothing the taste of the gas, and a support member and/or a cooling member can be arranged as needed in the mouthpiece. When this structure is used, the filter is what hinders aspiration of gas, and the aspiration quantity can therefore be increased by reducing a length of the filter. A mouthpiece structure for increasing the aspiration quantity by shortening the filter, instead of by providing a cavity as

described above, was therefore investigated.

**[0031]** The length of the aroma cartridge and the length of the aroma generator to be heated are determined in accordance with the structure of the heating-type smoking appliance, and therefore, when the filter of the mouthpiece is shortened, the structure is such that a portion of the filter is replaced by the support member. In the past, since the support member could not hinder passage of gas while preventing the aroma generator to be heated from moving toward the mouthpiece, the support member was a hollow cylindrical structure having a thin side surface, formed using inexpensive polyethylene (PE), polypropylene (PP), or another polyolefin resin, CA resin or another plastic, or paper or the like as the material thereof. The support member is also hollow and preferably has a thin a side surface as possible so as not to hinder passage of gas. However, when the filter is shortened to increase the length of such a support member, a problem arises that the mouthpiece is easily deformed.

**[0032]** To address this problem, the present invention provides an aroma cartridge comprising a mouthpiece constituted from at least a filter and a support member, the support member having a structure whereby the mouthpiece does not deform and the aspiration quantity is not reduced, even when the length of the support member is increased and the thickness of the side surface thereof is decreased.

**[0033]** Specifically, in this aroma cartridge, the mouthpiece has a support member including a through hole, for preventing the aroma generator to be heated from moving toward the mouthpiece, center axes of the support member and a cylinder of the through hole substantially coincide, and the aspiration optimization means includes a shape reinforcement member fixedly or movably arranged in the through hole. More specifically, the shape reinforcement member has axes of the support member and the through hole in a plane thereof, and comprises at least one or more plate-shaped members in contact with an inner wall of the through hole. Arranging such a plate-shaped member in the cylindrical through hole of the support member obviates the need to change a material and makes it possible to prevent deformation of the support member, even when the length of the cylindrical support member is increased and the thickness of the side surface thereof is decreased. A shape of the plate-shaped member is preferably a cross section of a cylinder cut in an axial direction thereof, i.e., a rectangle. From the perspective of aspiration quantity, the plate-shaped member is preferably as thin as possible, and the number thereof is as small as possible, but when prevention of deformation is also considered, it is preferred to have 2-4 plate-shaped members having a thickness of 0.1-0.5 mm formed from a polyolefin resin.

**[0034]** Furthermore, in order to prevent deformation of the support member, the shape reinforcement member more preferably comprises a concentric cylinder having substantially the same center axis as the center axis of a cylinder of the support member and the through hole and having a radius smaller than a radius of the through hole, and a plate-shaped member arranged on an external peripheral side of the concentric cylinder so as to contact an inner wall of the through hole in a radial direction of the concentric cylinder, and from the perspective of gas aspiration, the concentric cylinder is even more preferably hollow.

**[0035]** Aspiration of gas can thus be optimized without deformation of the support member in an aroma cartridge in which is applied a mouthpiece comprising a support member which is adjacent to the aroma generator to be heated and in which is arranged a shape reinforcement member for preventing the aroma generator to be heated from moving toward the mouthpiece, and a filter adjacent to the support member. However, a filter having a cavity is more preferably applied as the filter in order to provide a wider range of control of gas aspiration. A cooling member whereby the volatilized aerosol former can be efficiently converted to an aerosol smoke can also be arranged between the filter and the support member. In both of these cases, a filter having a cavity is preferably applied as the filter in order to further optimize the aspiration quantity.

**[0036]** As the aspiration quantity is increased by improvement of the filter and the support member, heat of a gas is more readily transmitted by convection from the heating element to the filter. Adhesion between members constituting the aroma cartridge may therefore decrease. Locations of joining surfaces at which adhesion is decreased vary according to the configuration of the aroma cartridge, but examples thereof include interfaces of the aroma generator to be heated with the support member, the cooling member, and the cartridge exterior body, interfaces of the filter with the support member, the cooling member, and the cartridge exterior body, interfaces of the support member with the cooling member and the cartridge exterior body, and an interface of the cooling member and the cartridge exterior body.

**[0037]** When adhesion decreases at the interfaces described above, gas leakage occurs which adversely affects the aspiration quantity, and a heat insulation member is therefore preferably provided between the aroma generator to be heated and the mouthpiece. The heat insulation member does not allow a general spread of high-temperature gas, unlike the support member adjacent to the aroma generator to be heated, and is preferably constituted from a heat-insulating porous body made of plastic, such as a sponge having continuous holes with long flow passages, and may also function to retain the high-temperature gas to some degree and cool the gas. Consequently, the heat insulation member has an extremely small length and need not have the degree of cooling functionality of a cooling member, and is preferably applied instead of a support member for preventing the aroma generator to be heated from moving toward the mouthpiece.

**[0038]** In a heating-type smoking appliance (FIG. 3) in which a chamber is covered by the heating element, unlike a common heating-type smoking appliance (FIG. 2) in which a needle-shaped heating element is provided in a bottom of

the chamber, heat has a greater effect on the aroma cartridge, and the decrease in adhesion at the interfaces of members described above is severe. It is therefore necessary to provide a heat insulation member to prevent a decrease in adhesion, i.e., a reduction in aspiration quantity. In this way, the present invention also provides an aroma cartridge in which a heat insulation member as an aspiration optimization means is interposed between the aroma generator to be heated and the mouthpiece, from the perspective of eliminating the effect of heat from the heating element and preventing a decrease in aspiration quantity.

**[0039]** Furthermore, since the aroma-generating base material to be heated releases various aromas, the quantity of a fiber component thereof is sometimes extremely small. A blended amount of a binder, etc., is adjusted in such cases, but in order to maintain aroma, the blending ratio of the non-tobacco material cannot be significantly reduced, and dislodged material or dust of the non-tobacco material, etc., occurs more readily than usual. The dust and dislodged material are carried toward the mouthpiece by smoking, and cause blockage of voids in the cooling member and the filter, and cause an extreme decrease in aspiration quantity. An aroma-generating base material to be heated that is obtained from such blending is also prone to form dislodged material, dust, and the like when impaled on the needle-shaped heating element of the aroma cartridge.

**[0040]** Therefore, the present invention also provides an aroma cartridge in which a cover material arranged on an end part on the mouthpiece side of the aroma generator to be heated, and a partition wall material arranged on an end part on an opposite side to said mouthpiece are arranged as the aspiration optimization means. Either one or both of the cover material and the partition wall material may be provided, in accordance with the state of the aroma-generating base material to be heated and the aroma generator to be heated in which aroma-generating base materials to be heated are bundled. The cover material and/or the partition wall material prevent clogging of the filter and/or the cooling member by dislodged material or dust, and ensure a stable aspiration quantity.

**[0041]** A solution means for structural improvement of gas aspiration optimization in the aroma cartridge is described above. However, the aroma generator to be heated, which is heated to release gas, must also be improved in order to optimize aspiration. A quantity of gas released by the aroma generator to be heated is closely related to the aspiration quantity described above, and this point is described below. In the present invention, a material for stabilizing the quantity of gas released is referred to as a gas-generation-maintaining material.

**[0042]** The reason that the improvement in the quantity of gas released by heating of the aroma generator to be heated is not maintained has already been explained, but due to the importance of this point in the present invention, the reason will be described again. In an aerosol-forming body that includes a tobacco material, fibers of the tobacco material maintain an aggregated state in the aerosol-forming body and hinder fusion and falling out of the tobacco material. However, when a non-tobacco material not including a large quantity of fibers is used, a large amount of a binder or the like for performing the function of fibers is used to stably maintain an aggregated state in an aroma-generating base material to be heated. When the amount of the binder is increased, the density of the aroma-generating base material to be heated is therefore increased, gas flow passages are blocked, and aspiration of aspirated components becomes difficult.

**[0043]** Because the aerosol former is glycerin, propylene glycol, or the like, which is liquid at normal temperature, bleed-out of the aerosol former over time from the aroma-generating base material to be heated increases the larger the amount of the binder is, and aroma-generating base materials to be heated fuse together. Flow passages between aroma-generating base materials to be heated are therefore blocked, and aspiration of aspirated components becomes difficult. When the fusion described above occurs, not only does it become difficult to insert a heating element into the aroma-generating base material to be heated, but the heating element can also be damaged. Conversely, when the added amount of the binder or the like is reduced to keep gas flow passages clear, the non-tobacco material falls out or forms dust or the like, it is difficult to maintain the cartridge in a rigid form, and the cartridge sometimes breaks when inserted on the heating element. Pieces thereof may also be aspirated into the mouth.

**[0044]** Therefore, in the present invention, it was discovered that the problems described above can be solved firstly by a method (device) for producing the aroma-generating base material to be heated. The description below will primarily follow a production method comprising steps, but it is apparent that a producing device exists that is capable of implementing the production method as a whole, by comprising means for executing the steps. Therefore, a production method and a producing device will be described simultaneously (in stacked fashion) using the terms "step (means)" and "method (device)" so that there is no duplication of description thereof.

**[0045]** The reason that the abovementioned problems are solved by a method (device) for producing an aroma-generating base material to be heated is thought to be that the aroma-generating base material to be heated is produced by drying and subsequent cutting of a sheet molded by a paper-making method, roll-pressing, pressing, or another compression molding method, and casting or another method from a composition in which a material selected from a non-tobacco material, an aerosol former, a binder, an adhesion prevention agent, a perfume, a non-tobacco-material extract, an antimicrobial preservative, and the like is dispersed or dissolved as a medium in pure water, alcohol, or another medium, and an internal structure of the aroma-generating base material to be heated is altered in various ways by the production method (device) in molding and drying steps (means).

**[0046]** This is based on the fact that in a blend of different polymers, for example, a phase-separated structure of a blend is affected by the production method (device) or a producing condition, and on the fact that in the case of an emulsion, suspension, or the like in which an oil is dispersed in water, whether the emulsion, suspension, or the like becomes a water-in-oil or oil-in-water-type emulsion, suspension, or the like is affected by the type of oil, the blending ratio of the oil and water, the type of a surfactant, and various other factors. Analysis of clear differences in the structure of aroma-generating base materials to be heated that arise from such differences in the production method (device) is nearly impossible, due to the complexity of material systems included therein, and a method for analyzing these differences would require considerable labor to discover. Reasons for using polymer blend, an emulsion, or the like as the basis for asserting that differences in internal structure arise from the production method (device) is that the substances blended in a polymer blend, an emulsion, or the like are limited, there is a long history of research thereof, and methods for analysis thereof are established, and that the differences in structure that arise from producing conditions are distinct.

**[0047]** Various methods [devices] for producing an aroma-generating base material to be heated have been investigated, but the following method is included as an example. This example is a method (device) for producing an aroma-generating base material to be heated, by cutting an aroma-generating sheet to be heated that is produced by: a step (means) for drying/pulverizing and then dry-mixing a non-tobacco material to prepare a non-tobacco material; a step (means) for preparing raw materials selected from an aerosol former, a binder, an adhesion inhibitor, a perfume, a non-tobacco material extract, an antimicrobial preservative, etc.; a step (means) for preparing pure water and an alcohol; a wet mixing step (means) for mixing the prepared ingredients at once; a paper-making step (means) for producing a water-containing sheet from a slurry produced by wet mixing; a molding step (means) for roll-pressing the resultant water-containing sheet to obtain a sheet; and a step (means) for drying the sheet produced by the molding step (means).

**[0048]** However, the aroma-generating base material to be heated that is produced by this method (device) has problems in that an aggregated state is difficult to maintain therein, a large quantity of binder is required, and fusion of the aroma-generating base material to be heated due to bleed-out of the aerosol former is prone to occur. Consequently, the quantity of gas released by an aroma generator to be heated that uses this aroma-generating base material as a filler changes significantly over time, and a smoker cannot obtain stable aspiration of gas.

**[0049]** The material for stabilizing the quantity of gas released by the aroma generator to be heated in the aroma cartridge of the present invention, i.e., the gas-generation-maintaining material, is firstly an aroma-generating base material to be heated that is produced by: a dry mixing step (means) for mixing a dried and pulverized non-tobacco material; a first wet mixing step (means) for mixing, in an alcohol and pure water mixture, the non-tobacco material produced by the dry mixing step (means), and a material selected from an aerosol former, a binder or thickener, crosslinked polyvinylpyrrolidone (PVP), a perfume, a non-tobacco extract, $\beta$-cyclodextrin, microcrystalline cellulose, and an antimicrobial preservative; a second wet mixing step (means) for producing a slurry including the non-tobacco material, etc., by adding additional pure water and/or alcohol to the alcohol and pure water mixture including the non-tobacco material, etc., produced by the first wet mixing step (means); a paper-making step (means) for producing a water-containing sheet from the slurry produced by the second wet mixing step (means); a sheet molding step (means) for compressing the water-containing sheet to obtain a sheet; a drying step (means) for drying the sheet produced by the sheet molding step (means) to produce an aroma-generating sheet to be heated; and a sheet processing step (means) for cutting or folding the aroma-generating sheet to be heated.

**[0050]** A feature of producing in this method (device) is a second wet mixing. Through this second wet mixing in which pure water and alcohol are added, a dispersion state of the non-tobacco material and the polypropylene glycol, glycerin, or other aerosol former is improved, and the aggregated state of the aroma-generating base material to be heated can therefore be stabilized, and bleed-out of the aerosol former can be reduced without increasing the added quantity of the binder. In particular, ethanol, propanol, or another lower monoalcohol is effective and preferred as the alcohol, and the added quantity thereof is preferably 0.1-10 parts by mass with respect to 100 parts by mass of the non-tobacco material.

**[0051]** A gas-generation-maintaining material in a second aroma cartridge of the present invention is an aroma-generating base material to be heated that is produced by: a dry mixing step (means) for mixing a dried and pulverized non-tobacco material; a first wet mixing step (means) for mixing, in an alcohol and pure water mixture, the non-tobacco material produced by the dry mixing step (means), and a material selected from an aerosol former, a binder or thickener, crosslinked PVP, a perfume, a non-tobacco extract, $\beta$-cyclodextrin, microcrystalline cellulose, and an antimicrobial preservative; a second wet mixing step (means) for producing a slurry including the non-tobacco material, etc., by adding additional pure water and/or alcohol to the alcohol and pure water mixture including the non-tobacco material, etc., produced by the first wet mixing step (means); a paper-making step (means) for producing a water-containing sheet from the slurry produced by the second wet mixing step (means); a sheet molding step (means) for compressing or casting the water-containing sheet to obtain a sheet; an aerosol former absorption step (means) for coating the water-containing sheet with, or dipping the sheet into, the aerosol former, a moisture content of the water-containing sheet being reduced to less than 50% by mass by the sheet molding step (means); a drying step (means) for drying the sheet produced by the aerosol former absorption step (means) and producing an aroma-generating sheet to be heated; and a sheet processing step (means) for cutting or folding the aroma-generating sheet to be heated.

**[0052]** A second wet mixing is also a feature of producing by this method (device), and like the first production method (device), the alcohol is preferably ethanol, propanol, or another lower monoalcohol, and the added quantity thereof is preferably 0.1-10 parts by mass with respect to 100 parts by mass of the non-tobacco material. However, an additional feature of the production method (device) of the second aspect is the addition of an aerosol former absorption step (means) for coating the water-containing sheet with, or dipping the sheet into, the aerosol former, a moisture content of the water-containing sheet being reduced to less than 50% by mass. In the conventional production method (device), the aerosol former and the non-tobacco material were separated in an undried sheet of an aroma-generating base material to be heated, in which the dispersion state of the aerosol former and the non-tobacco material was poor and the moisture content was less than 50% by mass, and absorption of the aerosol former was therefore difficult. However, since the dispersion state is improved by the second wet step (means), the aerosol former is absorbed into the sheet in the aerosol former absorption step (means). Therefore, even when the added quantities of the aerosol former and the binder are the same as in the first production method (device), the aggregated state of the aroma-generating base material to be heated can be stabilized, bleed-out of the aerosol former can be reduced, and the aerosol former is also more readily volatilized by heating.

**[0053]** A gas-generation-maintaining material in a third aroma cartridge of the present invention is an aroma-generating base material to be heated that is produced by: a wet mixing step (means) for producing a slurry of a non-tobacco material by mixing a dried and pulverized non-tobacco material with pure water; a paper-making step (means) for producing a water-containing sheet from the slurry produced by the wet mixing step (means); a sheet molding step (means) for compressing or casting the water-containing sheet to obtain a sheet; a drying step (means) for reducing the moisture content of the sheet produced by the sheet molding step (means) to less than 50% by mass; an absorption and adsorption step (means) for coating the sheet produced by the drying step (means) with, or dipping the sheet into, an alcohol and pure water mixture of a material selected from an aerosol former, a binder or thickener, crosslinked PVP, a perfume, a non-tobacco material extract, $\beta$-cyclodextrin, microcrystalline cellulose, a concentrate of water discharged in the sheet molding step (means), and an antimicrobial preservative; a drying step (means) for drying the sheet produced by the absorption and adsorption step (means) to produce an aroma-generating sheet to be heated; and a sheet processing step (means) for cutting or folding the aroma-generating sheet to be heated.

**[0054]** In the first and second production methods [devices], a water-containing sheet is formed by making a paper from a slurry obtained by wet-mixing the non-tobacco material and all other materials with pure water and alcohol; however, a feature of the third production method (device) is that a water-containing sheet is produced from a slurry of the non-tobacco material alone, and the aerosol former and other materials are absorbed into and adsorbed on a sheet obtained by drying the water-containing sheet. In the first and second production methods [devices], dispersion of the non-tobacco material and the aerosol former is improved with the object of wet-dispersing all of the materials. As a result of investigating a production method (device) that does not have a step (means) for mixing and dispersing the non-tobacco material and the aerosol former, the inventors discovered that a pure water and alcohol mixture of an aerosol former and other materials rapidly permeates, and is absorbed into and adsorbed on, a dried sheet of a non-tobacco material, as in the third production method (device), and thus arrived at the present invention. The aroma-generating base material to be heated that is produced by this method (device) has a stable aggregated state and reduced occurrence of bleed-out of the aerosol former.

**[0055]** A gas-generation-maintaining material in a fourth aroma cartridge of the present invention is an aroma-generating base material to be heated that is produced by: a non-tobacco-material preparation step (means) for drying and pulverizing a non-tobacco material; a perfume and/or non-tobacco extract mixing step (means) for mixing at least a perfume and/or a non-tobacco material extract and crosslinked PVP and/or $\beta$-cyclodextrin in alcohol to cause the perfume and/or non-tobacco extract to reside in the crosslinked PVP and/or $\beta$-cyclodextrin; an aerosol former dissolving step (means) for mixing at least an aerosol former and a binder or thickener with pure water; a wet mixing step (means) for mixing a material produced by the non-tobacco material preparation step (means), a material produced by the perfume and/or non-tobacco extract dissolving step (means), and a material produced by the aerosol former dissolving step (means); a sheet molding step (means) for producing an aroma-generating sheet to be heated, by compression from a material produced by the wet mixing step (means); and a sheet processing step (means) for cutting or folding the aroma-generating sheet to be heated.

**[0056]** The previous production methods [devices] had the feature of molding a sheet obtained by a step (means) for making a paper from a slurry of the non-tobacco material and other components. However, in view of the results of the third production method (device), because casting a sheet from a slurry of the non-tobacco material and other materials having various different properties is itself problematic, rather than using a slurry including large quantities of pure water and alcohol in the above method, a sheet of the aroma-generating base material to be heated is molded from a highly viscous mixture of the non-tobacco material, etc., in which there is little pure water and alcohol, using a roll press such as a three-roll mill. It is thought that all of the materials are uniformly kneaded and dispersed in this method (device) because a large shear force and compression force are applied to the mixture of the non-tobacco material, etc.

**[0057]** Here, it is important that a mixing step (means) for mixing at least a perfume and/or a non-tobacco material

extract and crosslinked PVP and/or β-cyclodextrin in alcohol to cause the perfume and/or non-tobacco extract to reside in the crosslinked PVP and/or β-cyclodextrin, and an aerosol former dissolving step (means) for mixing at least an aerosol former and a binder or thickener with pure water are provided, and that the perfume, the non-tobacco-material extract, the aerosol former, the binder or thickener, and other materials that can be dissolved in pure water and alcohol are dissolved in advance. In particular, when menthol and/or xylitol is used as the perfume, the menthol and/or xylitol is sorbed by the crosslinked PVP and/or β-cyclodextrin, and exists stably in the aroma-generating base material to be heated, and has the effect of suppressing bleed-out of the aerosol former. Therefore, the mixing step (means) for mixing at least a perfume and/or a non-tobacco material extract and crosslinked PVP and/or β-cyclodextrin in alcohol to cause the perfume and/or non-tobacco extract to reside in the crosslinked PVP and/or β-cyclodextrin plays an extremely important role.

**[0058]** By adopting this production method (device), a stable aggregated state of the aroma-generating base material to be heated is obtained, bleed-out of the aerosol former can be markedly reduced, volatilization of gas by heating of the aroma generator to be heated is promoted without fusion of the aroma-generating base material to be heated, and a decrease in the aspiration quantity over time can be prevented.

**[0059]** Furthermore, in the sheet molding step (means) of this production method (device), a step (means) for adding a material selected from a non-tobacco material, an aerosol former, a binder or thickener, crosslinked PVP, a perfume, a non-tobacco extract, β-cyclodextrin, microcrystalline cellulose, an antimicrobial preservative, and pure water is preferably added. This step (means) can promote kneading by a shear force and compression force and control the moisture content in the sheet molding step (means), and increase volatility of the aerosol former.

**[0060]** A gas-generation-maintaining material in a fifth aroma cartridge of the present invention is an aroma-generating base material to be heated that is produced by: a first wet mixing step (means) for mixing a dried and pulverized non-tobacco material, a first binder aqueous solution in which a first binder is dissolved in pure water, and a material selected from an aerosol former, crosslinked PVP, a perfume, a non-tobacco extract, β-cyclodextrin, microcrystalline cellulose, and an antimicrobial preservative; an aging step (means) for stabilizing a mixture produced by the first wet mixing step (means); a second wet mixing step (means) for mixing an aged mixture produced by the aging step (means) and a second binder aqueous solution in which a second binder is dissolved in pure water; a sheet molding step (means) for producing an aroma-generating sheet to be heated, by compression from a material produced by the second wet mixing step (means); and a sheet processing step (means) for cutting or folding the aroma-generating sheet to be heated. In this production method (device) as well, a step (means) for adding a material selected from a non-tobacco material, an aerosol former, a binder or thickener, crosslinked PVP, a perfume, a non-tobacco extract, β-cyclodextrin, microcrystalline cellulose, an antimicrobial preservative, and pure water is preferably added in the sheet molding step (means), the same as in the fourth production method (device).

**[0061]** A feature of this production method (device) in particular is that a step (means) for aging the mixture is provided, and a step (means) for adding a binder in two additions before and after the aging step (means) is provided. The binder of the first addition is preferably a modified cellulose polymer, and the binder of the second addition is preferably a polysaccharide-based polymer other than cellulose.

**[0062]** The aging step (means) is meant as a step in which the dispersion state of the mixture of the non-tobacco material, etc., changes over time, and is estimated to lead to a dispersion state of lowest energy and stable uniformity, because the above state change can form an aggregated state in the aroma-generating base material to be heated.

**[0063]** Dividing addition of a binder into two additions makes it possible to adequately disperse the mixture without reducing the added quantity of the binder, and is for facilitating adjustment of viscosity. This effect is closely related to the aging step (means). Because a stable dispersion state is created by performing the first addition of a binder and then aging, the second addition of a binder is facilitated, the amount of binder added can be reduced, and viscosity adjustment is facilitated. Therefore, a modified cellulose polymer having excellent dispersing ability is preferred for the first addition, and a polysaccharide-based polymer other than cellulose, having ability as a thickener for adjusting viscosity, is preferred for the second addition.

**[0064]** Any one or more of methyl cellulose, ethyl cellulose, carboxymethyl cellulose, carboxyethyl cellulose, hydroxymethyl cellulose, hydroxyethyl cellulose, hydroxypropyl cellulose, and a sodium salt, a potassium salt, or a calcium salt of carboxymethyl cellulose or carboxyethyl cellulose is preferred for use as the modified cellulose polymer, and any one or more of konjac mannan (glucomannan), guar gum, pectin, carrageenan, tamarind seed gum, gum arabic, soybean polysaccharide, locust bean gum, karaya gum, xanthan gum, and agar is preferred for use as the polysaccharide-based polymer.

**[0065]** Blended amounts of the binders are preferably 5-20 parts by mass of the first binder and 0.1-5 parts by mass of the second binder with respect to 100 parts by mass of the non-tobacco material.

**[0066]** There are also appropriate conditions for the aging step (means) that lead to a stable dispersion state, and the aging step is preferably performed at 15-30°C for 72-336 hours. Since the binder is a polymer having a hydroxyl group or a carboxyl group, the presence/absence of hydrogen bond formation brings about a difference in the state of molecules dissolved in the pure water and alcohol, and the appropriate temperature conditions are thought to be due to the fact

that this effect is temperature-dependent. The optimum temperature range was derived as a result of experimentation. There is a minimum amount of time required for the dispersion state to change over time and stabilize, but taking more time than is needed does not produce a significant change, and reduces productivity.

**[0067]** Described above is a material for causing a gas to be stably released from the aroma generator to be heated, i.e., a solution means for optimizing an aroma-generating base material to be heated as a gas-generation-maintaining material by way of the method (device) for producing the same. However, a material that more actively stabilizes gas release has been proposed.

**[0068]** This gas-generation-maintaining material consists of inorganic particles. The inorganic particles have two effects, dependent upon the location in which the inorganic particles are present. The inorganic particles have one effect when present within an aroma filler to be heated. By addition of inorganic particles to the aroma generator to be heated, the density of the aroma-generating base material to be heated decreases, closure of gas flow passages is eliminated, and there is no difficulty in aspiration of gas. The inorganic particles have another effect when on a surface of an aroma-generating sheet to be heated or the aroma-generating base material to be heated. Even when the aerosol former bleeds out over time from the aroma-generating base material to be heated, the inorganic particles can prevent aroma-generating base materials to be heated from fusing together, flow passages between aroma-generating sheets to be heated or aroma-generating base materials to be heated are not closed, and the problem of difficulty in aspirating aspirated components is overcome. Because fusion of aroma-generating sheets to be heated or aroma-generating base materials to be heated is eliminated, the problem of difficulty inserting the heating element into the aroma-generating base material to be heated is also overcome. Introducing inorganic particles to the aroma generator to be heated also has the effect that regardless of whether the inorganic particles are within or on the surface of the aroma-generating base material to be heated, an area of contact between the heating element and an organic component of the aroma-generating base material to be heated is reduced, and fouling of the heating element of a heating-type smoking appliance can therefore be mitigated.

**[0069]** In order to cause the inorganic particles to be present as a gas-generation-maintaining material within the aroma-generating base material to be heated, the inorganic particles may be added in a composition of the aroma-generating base material to be heated, as a raw material in the process for producing the aroma-generating base material to be heated described above. The step (means) for adding the inorganic particles is not particularly limited, but the inorganic particles are preferably added before wet mixing of a tobacco material and other materials.

**[0070]** In order to cause inorganic particles to be present on the surface of the aroma-generating base material to be heated, in the five production methods [devices] described above, there is a step (means) for spraying inorganic particles on the aroma-generating sheet to be heated, after the step (means) whereby the aroma-generating sheet to be heated is produced, and a step (means) for spraying inorganic particles on the aroma-generating base material to be heated, after the sheet processing step (means) whereby the aroma-generating base material to be heated is produced.

**[0071]** The inorganic particles are preferably magnesium oxide, calcium oxide, titanium oxide, iron oxide, alumina, or another metal oxide; magnesium carbonate, calcium carbonate, or another metal carbonate; calcium phosphate or another metal phosphate; potassium titanate, magnesium titanate, or another titanate; zeolite, colloidal silica, fumed silica, or another silicon oxide, or the like, and an average particle diameter thereof is more preferably 1-100 μm. In order for the inorganic particles to function effectively, 0.1-10 parts by mass of the inorganic particles are preferably added with respect to 100 parts by mass of the non-tobacco material.

**[0072]** As described above, the aroma cartridge of the present invention comprises: an aroma generator to be heated, in which is wound an aroma-generating base material to be heated which is in contact with a heating element; a mouthpiece comprising a filter for filtering an aerosol smoke and a fragrance component generated due to heating by the heating element; and a cartridge exterior body surrounding an external periphery so as to connect the aroma generator to be heated and the mouthpiece, at least one of the aroma generator to be heated and the mouthpiece having at least one of means for optimizing aspiration of the smoke and the fragrance component and a gas-generation-maintaining material for maintaining generation of the smoke and the fragrance component. The aspiration optimization means and the gas-generation-maintaining material in the aroma cartridge of the present invention are described above, and aspects of the invention that complement these features are further described below.

**[0073]** The filling ratio of the aroma-generating base material to be heated that constitutes the aroma generator to be heated is preferably 60-90% in order to obtain stable aspiration of gas. Aspiration of gas is difficult when the filling ratio exceeds the above range, and the quantity of gas released is inadequate when the filling ratio is less than the above range. A filling ratio of 60-73% in particular is preferred in order to prevent fusion over time of the aroma-generating base material to be heated. Fusion over time of the aroma-generating base material to be heated becomes noticeable when the filling ratio exceeds 73%. However, the filling ratio is not thus limited in the case of the aroma-generating base material to be heated that is produced from the improved production methods [devices] described above, and the aroma-generating base material to be heated in which inorganic particles are present within and on the surface thereof, and in these materials, severe fusion over time does not occur even when the filling ratio exceeds 73%.

**[0074]** The aerosol former included in the aroma-generating base material to be heated is preferably 50-80 parts by

mass with respect to 100 parts by mass of the non-tobacco material. A volatilized amount of the aerosol former for forming an aerosol is inadequate when the blended amount thereof is less than the above range, and when the blended amount is greater than the above range, bleed-out of the aerosol former from the aroma-generating base material to be heated is severe, and severe fusion of the aroma-generating base material to be heated occurs.

**[0075]** The crosslinked PVP serves to stabilize the aggregated state of the aroma-generating base material to be heated, and to cause temporary residence of the menthol, xylitol, or other fragrance component, and is preferably 7-25 parts by mass with respect to 100 parts by mass of the non-tobacco material. The function of the crosslinked PVP cannot be expressed when the blended amount thereof is less than the above range, and the fragrance component from the non-tobacco material, etc., is insufficient when the blended amount exceeds the above range.

**[0076]** The microcrystalline cellulose is preferably 7-25 parts by mass with respect to 100 parts by mass of the non-tobacco material. This microcrystalline cellulose is a powder having fluid properties that does not dissolve in water, ethanol, or another organic solvent, and is used as an excipient for forming tablets of a medicine. This is because microcrystalline cellulose is effective at preventing adhesion to a die, preventing cohesive failure, etc., in formation of a tablet by direct compression, due to the fluidity thereof and high compressibility with a large volume change thereof. Microcrystalline cellulose has the same effects in the aroma-generating base material to be heated, and the function of the microcrystalline cellulose cannot be expressed when the blended amount thereof is less than 7-25 parts by mass. Conversely, then the blended amount exceeds the above range, the blending ratios of other materials become in adequate relative to the microcrystalline cellulose, and functioning of the aroma-generating base material to be heated is adversely affected.

**[0077]** Lastly, the $\beta$-cyclodextrin is preferably 0.2-1.0 part by mass with respect to 100 parts by mass of the non-tobacco material. The $\beta$-cyclodextrin serves to cause temporary residence of the menthol, xylitol, or other fragrance component, and must therefore be blended in at least the above quantity. However, functioning of the aroma-generating base material to be heated is inhibited when an excessive quantity of $\beta$-cyclodextrin is added. Inclusion of menthol in particular by $\beta$-cyclodextrin is known, and $\beta$-cyclodextrin is preferably added when menthol is used as a fragrance component.

**[0078]** Constituent materials that are particularly suitable for the aroma-generating base material to be heated of the present invention are listed below.

**[0079]** Parts that can be used as the non-tobacco material include roots (including scaly roots (bulbs), tuberous roots (potatoes), corms, etc.), stems, tubers, bark (including stem bark, tree bark, etc.), leaves, flowers (including petals, pistils, stamens, etc.), seeds and fruits, tree trunks or branches, and the like.

**[0080]** In particular, bulbs include onion, cluster amaryllis, tulip, hyacinth, garlic, scallion, and lily, corms include crocus, gladiolus, freesia, iris, taro, and konjac, tubers include konjac, cyclamen, anemone, begonia, Chinese artichoke, potato, and *Apios* (potato bean), rhizomes include canna, lotus (lotus root), and ginger, and tuberous roots include dahlia, sweet potato, and cassava, and Jerusalem artichoke rhizophores include genus *Dioscorea* (yam, Japanese yam, Chinese yam, and other yams). In addition, turnip, burdock, carrot, radish, kudzu, asparagus, bamboo shoots, udo, daikon, yacón, and the like are preferred for use.

**[0081]** Tuberous roots (potatoes) and the plants cited below contain carbohydrates, and are preferred for use as an aroma filling sheet or filler to be heated. Corn starch (maize), potato starch (potato), sweet potato starch (sweet potato), tapioca starch (tapioca), and the like are cited as starches, and function also as thickeners, stabilizers, or the like. These starches can also be crosslinked to enhance acid resistance, enhance heat resistance, enhance shear resistance, etc., or esterified or etherified to enhance storage stability, promote gelatinization, etc., or oxidized to enhance transparency, enhance film properties, enhance storage stability, etc.

**[0082]** Seeds and fruits that are preferred for use include peach, blueberry, lemon, orange, apple, banana, pineapple, mango, grape, kinkan, melon, plum, almond, cacao, coffee bean, peanut, sunflower, olive, walnut, and other nuts and edible fruits (flesh portion) or seeds.

**[0083]** Seaweeds that are preferred for use include sea lettuce, green laver, devil weed, laver, arame, seaweed (*Collema nigrescense*), egonori, gracilaria, Kagome konbu, *Ecklonia cava,* ganiashi, sea grapes, *Ecklonia kurome,* konbu, *Porphyra yezoensis,* dulse, *Pyropia kurogii, Ecklonia stolonifera,* tengusa, shredded konbu, *Arthrothamnus,* nori (seaweed), *Petalonia binghamiae,* hijiki, hitoegusa, hirome, funori, gutweed, Japanese kelp, mekabu, mozuku, and wakame.

**[0084]** A plant used as an herb or spice can also be preferred for use as the non-tobacco material, and dried gardenia fruit, kaffir lime leaves, Japanese ginger, mugwort, wasabi, ajowan seed, anise, alfalfa, echinacea, shallot, tarragon, everlasting flower, elder, allspice, orris root, oregano, orange peel, orange flower, orange leaf, Cayenne chili pepper (Cayenne chili pepper), German chamomile, Roman chamomile, cardamom, curry leaf, garlic (garlic), catnip, caraway, caraway seed, fragrant olive, cumin, cumin seed, clove, green cardamom, green pepper, cornflower, saffron, cedar, cinnamon, jasmine, juniper berry, jolokia, ginger (ginger), star anise, spearmint, sumac, sage, savory (savory), celery, celery seed, turmeric (*Curcuma*), thyme, tamarind, tarragon, chervil (cerfeuil), chives, dill, dill seed, tomato (dried tomato), tonka bean, dried coriander, nutmeg, hibiscus, habanero, jalapeno, bird's eye chili, basil, vanilla, phakchi (coriander),

parsley, paprika, hyssop, Piment d'Espelette, pink peppercorn, fenugreek seed, fennel, brown mustard, black cardamom, black cumin, black pepper, vetiver, pennyroyal, peppermint (Japanese mint), horseradish, white pepper, white mustard, poppy seed, porcini, marjoram, mustard seed, Maniguette pepper, marigold, Malva flower, mace, yarrow flower, eucalyptus, lavender, licorice, linden, red clover, red pepper, lemongrass, lemon verbena, lemon balm, lemon peel, rose (rose), rose bud (purple), rose hip, rose petal, rosemary, rose red, laurel (bay leaf), long pepper, sesame (raw sesame, roasted sesame), golden chili pepper, szechuan pepper (hoa jao), Mitaka pepper, Japanese pepper, chili pepper, yuzu, and the like can be used. Mixed spices (e.g., five-spice powder, garam masala, ras el hanout, baligoule, chicken curry masala, tandoori masala, quatre epices, herbes de Provence), or a mixture of various plants used as potpourri or the like can also be used.

**[0085]** Teas can also be preferred for use. Teas not only differ according to the plant used to form the tea, but different teas can be formed from the same plant depending on the processing method (device) that is used, and teas are therefore preferred as non-tobacco materials each having different aroma components. Specific examples thereof include Japanese tea, black tea, ashitaba tea, sweet tea, jiaogulan tea, aloe tea, ginkgo leaf tea, oolong tea, curcuma tea, urajirogashi tea, Siberian ginseng tea, plantain tea, kakiodoshi tea, persimmon leaf tea, German chamomile tea, chamomile tea, *Chamaecrista nomame* tea, Chinese quince tea, chrysanthemum tea, gymnema tea, guava tea, *Lycium* tea, mulberry leaf tea, black soybean tea, geranium tea, brown rice tea, burdock tea, comfrey tea, kelp tea, sakura tea, saffron tea, shiitake tea, perilla tea, jasmine tea, ginger tea, horsetail tea, Japanese sweet flag tea, *Swertia* tea, buckwheat tea, *Aralia elata* tea, dandelion tea, sweet tea, *Houttuynia cordata tea,* tochu tea, natamame tea, elder tea, privet tea, adlay tea, habu Tea, loquat leaf tea, pu-erh tea, safflower tea, pine needle tea, mate tea, barley tea, *Acer maximowiczianum* tea, mugwort tea, eucalyptus tea, luo han guo tea, rooibos tea, bitter gourd tea, and the like. In the case of teas, used tea leaves after drinking may be used. A merit of using used tea leaves is that an expensive tea can be reused for effective utilization.

**[0086]** Rice varieties that are preferred for use include indica varieties (Indica type, continent-type, long-grain type), *glaberrima* varieties (African rice), sativa varieties (Asian rice), *Javanica* varieties (*Javanica* type, tropical island type, large-grain varieties), *Japonica* varieties (*Japonica* type, temperate island type, short-grain varieties), and NERICA (interspecies hybrid of Asian rice and African rice), and the rice can also be used in the form of flour or bran.

**[0087]** Wheat varieties that are preferred for use include *Setaria italica,* oats (cultivated varieties of wild oat, oats), barley (barley), wild oats, millet, kodra (kodon millet), wheat (wheat), finger millet, teff, pearl millet, naked barley (barley variant), adlay (fruit, not seed), barnyard millet, fonio, wild rice, Mochi Mugi (mochi variety of barley), *Sorghum bicolor* (Indian millet, kaoliang, sorghum), corn, rye (rye), buckwheat, amaranth (amaranth, *Amaranthus caudatus*), quinoa, and *Fagopyrum tataricum.*

**[0088]** Legume grains (Fabaceae) that are preferred for use include adzuki, carob, common bean, garden pea, pigeon pea, cluster bean, grass pea (*Lathyrus sativus*), black lentil, cowpea, winged bean, *Macrotyloma geocarpum,* fava bean, soybean, ricebean, jack bean, tamarind, tepary bean, sword bean, velvet beam (*Mucuna pruriens*), *Vigna subterranea,* chickpea, hyacinth bean, scarlet runner bean, horse gram (*Macrotyloma uniflorum*), moth bean, lima bean, peanut, mung bean, lupine, lentil, and lentil (almond).

**[0089]** Mushrooms that are preferred for use include matsutake, shiitake, *Lactarius hatsudake, Lyophyllum shimeji,* truffle, mushroom, and *Agaricus campestris*.

**[0090]** In addition, trunks, branches, bark, leaves, and roots of sugar cane (which may be syrup of molasses), sugar beet (beet), cypress, pine, cedar, hiba, camellia, sandalwood, and other aromatic trees are also preferred for use.

**[0091]** Ferns, mosses, and the like can also be used as the non-tobacco material.

**[0092]** A byproduct, strained lees (sake lees or strained grape lees (comprising skin, seeds, stems, etc., of grapes)), or the like from production of sake, wine, or other fermented liquor can also be used.

**[0093]** Known herbal medicines are also preferred for use. Specific examples thereof include indigo (aisou), *Rubia cordifolia* root (akanekon), *Mallotus* bark (akamekashiwa), gambir (asenyaku), benzoin (ansokukou), *Clematis* root (ireisen), *Artemisiae capillaris* (inchinkou), fennel (uigyou), curcuma (turmeric), *Prunus mume* (ubai), *Lindera* root (uyaku), *Quercus salicina* (urajirogashi), bearberry leaf, rosae fructus (eijitsu), *Corydalis* tuber (engosaku), herba rabdosiae (enmeisou), *Astragalus* root (uogi), *Scutellaria* root (uogon), phellodendron bark (uobaku), *Coptis* rhizome (uoren), *Pruni* cortex (ouhi), *Hypericum erectum* (otogirisou), *Polygala* root (onji), *Sophora japonica* flower (kaika), Long-stamen onion bulb (gaihaku), *Prunella* spike (kagosou), chebulic myrobalan (kashi), *Polygonum* tuber (kashuu), *Curcuma* rhizome (gajutsu), *Pogostemon* herb (kakkou), kudzu vine root (kakkon), German chamomile flower, Trichosanthes root (karokon), *Trichosanthes kirilowii* (karonin), dried ginger (kankyou), licorice root (kanzou), common coltsfoot flower (kantouka), *Artemisia* leaf (gaiyou), *Platycodon* root (kikyou), *Hovenia dulcis* (kugishi), orange fruit (kikoku), immature orange fruit (kijitsu), Chrysanthemum flower (kikuka), dried tangerine peel (kippi), *Angelicae koreanae* radix (kyoukatsu), apricot kernel (kyounin), kumquat (kinkan), Japanese honeysuckle (kinginka), *Desmodium styracifolium* (kinsensou), barbary wolfberry fruit (kukoshi), *Lycium* leaf (kukoyou), *Sophora* root (kujin), walnut (kurumi), *Melia azedarach* (kurenpi), *Lindera umbellata* (kuromoji), *Dianthus superbus* (kubaku), *Schizonepeta* herb (keigai), *Cassia* bark (keihi), *Cassia* seed (ketsumeishi), *Pharbitis* seed (kengoshi), figwort root (genjin), *Saccharum granorum* (koui), safflower (kouka), *Albizia ju-*

*librissin* bark (goukanpi), *Dalbergia odorifera* (koukou), *Glycine max* (koushi), crested latesummer mint (kouju), red ginseng (koujin), *Cyperus* rhizome (koubushi), non-glutinous rice (koubei), magnolia bark (kouboku), *Ligusticum sinense* root (kouhon), *Acanthopanax gracilis* (gokahi), *Achyranthes* root (goshitsu), *Euodia* fruit (goshuyu), Japanese knotweed (gojoukon), great burdock achene (goboushi), *Schisandra* fruit (gomishi), *Bupleurum* root (saiko), *Asiasari radix* (saishin), saffron, *Smilax* rhizome (sankirai), hawthorn fruit (sanzashi), *Gardenia* fruit (sanshishi), *Cornus* fruit (sanshuyu), Vietnamese *Sophora* root (sanzukon), jujube seed (sansounin), Japanese pepper (sanshou), *Scirpus fluviatilis* (sanryou), *Dioscorea* rhizome (sanyaku), *Rehmannia* root (jiou), aster (shion), *Lycium* bark (jikoppi), *Lithospermum* root (shikon), *Perilla* fruit (shisoshi), *Perilla* herb (shisoyou), *Tribulus* fruit (shitsurishi), persimmon calyx (shitei), belvedere fruit (jifushi), peony root (shakuyaku), *Cnidium monnieri* fruit (jashoushi), *Codonopsis* root (shajin), plantain seed (shazenshi), plantain herb (shazensou), *Amomum* seed (shukusha), *Houttuynia* herb (juuyaku), ginger (shoukyou), hemp palm fruit (shurojitsu), hemp palm leaf (shuroyou), *Cimicifuga* rhizome (shouma), *Tritici fructus* (shoubaku), *Acorus calamus* (shoubukon), magnolia flower (shin'i), *Ligustrum* fruit (joteishi), *Fraxini* bark (shinpi), malted rice (shinkiku), *Gentiana macrophylla* root (jingyou), motherwort fruit (juuishi), *Zanthoxylum* seed (shokumoku), green tangerine peel (seihi), *Acorus tatarinowii* (sekishoukon), pomegranate fruit peel (sekiryuujitsuhi), Dendrobium herb (sekkoku), *Szechwan lovage* rhizome (senkyuu), *Peucedanum praeruptorum* root (zenko), *Nuphar* rhizome (senkotsu), *Inula japonica* (senpukuka), *Sambucus williamsii* stem (sekkotsuboku), black cardamom (souka), *Gleditsia sinensis* (soukakushi), *Viscum* stem (soukisei), *Xanthium strumarium* (soujishi), *Atractylodes* rhizome (soujutsu), *Thuja orientalis* (sokuhakuyou), dipsaci root (zokudan), mulberry bark (souhakuhi), sappan wood (soboku), *Perilla* leaf (soyou), *Gleditsia sinensis* (soukyou), rhubarb (daiou), jujube (taisou), *Areca* peel (daifukuhi), *Alisma* rhizome (takusha), danshen herb (tanjin), bamboo culm (chikujo), *Panax* rhizome (chikusetsuninjin), *Phyllostachys nigra* leaf (chikuyou), *Anemarrhena* rhizome (chimo), garden burnet root (chiyu), clove (choujji), gambir plant (choutoukou), dried tangerine peel (chinpi), *Arisaematis* rhizoma (tennanshou), *Gastrodia* tuber (tenma), *Asparagi radix* (tenmontou), *Benincasa* seed (tougashi), Japanese *Angelica* root (touki), castor oil plant (tougoma), *Codonopsis* root (toujin), common rush (toushinsou), peach seed (tounin), bitter orange peel (touhi), dodder seed (toshishi), *Aesculus turbinata* fruit (tochinomi), *Eucommia* bark (tochuu), *Aralia* rhizome (dokkatsu), *Trichosanthes cucumeroides* (dokakon), *Cistanche* herb (nikujuyou), nutmeg, *Lonicera japonica* (nindou), ginseng (ninjin), *Fritillaria* bulb (baimo), germinated barley (bakuga), *Platycladus orientalis* (hakushonin), white hyacinth bean (hakuhenzu), *Ophiopogonis* tuber (bakumontou), *Psoralea corylifoli* (hakoshi), mentha herb (hakka), peppermint (hakka), guava fruit (banka), *Pinellia* tuber (hange), *Agkistrodon* (hanbi), *Isatidis* root (banrankon), *Scutellaria barbata* (hanshiren), lily root (yurine), *Angelica dahurica* (byakushi), *Hedyotis diffusa* (byakukajazetsusou), Japanese stemona root (hyakubukon), *Atractylodes macrocephala* (byakujutsu), *Areca* seed (binrouji), *Sinomenium* stem (boui), *Imperata* rhizome (boukon), *Saposhnikovia* root (boufuu), *Typha angustifolia* pollen (houou), *Taraxacum* root (houeikon), *Moutan* bark (botanpi), *Ephedra* herb (maou), hemp fruit (mashinin), *Vitex rotundifola* fruit (mankeishi), pine resin (matsuyani), *Akebia* stem (mokutsuu), *Chaenomeles* fruit (mokka), *Saussurea* root (mokkou), myrrh (motsuyaku), *Equisetum hyemale* (mokuzoku), *Belamcanda chinensis* (yakan), bitter cardamom (yakuchi), *Fallopia multiflora* (yakoutou), *Siraitia grosvenorii* (rakanka), *Eupatorium fortunei* (ransou), longan aril (ryuuganniku), Japanese gentian (ryuutan), *Alpinia offcinarum* rhizome (ryoukyou), *Ganoderma lucidum* (reishi), *Forsythia* fruit (rengyou), *Glechoma hederacea* (rensensou), *Nelumbo* seed (renniku), and *Phragmitis* rhizome (rokon).

**[0094]** Lastly, an extract or so-called essence of a non-tobacco material can be used, and the extract may be in the form of a liquid, a starch syrup, a powder, granules, a solution, or the like.

**[0095]** Glycerin, propylene glycol, sorbitol, triethylene glycol, lactic acid, diacetin (glycerin diacetal), triacetin (glycerin triacetate), triethylene glycol diacetate, triethyl citrate, isopropyl myristate, methyl stearate, dimethyl dodecane dioate, dimethyl tetradecanedioate, or the like can be used as the aerosol former, but glycerin and propylene glycol are particularly preferred for use.

**[0096]** A commercially available product, such as Divergan (registered trademark) produced by BASF SE or Polyclar (registered trademark) produced by ISP Inc., can be used without modification as the crosslinked PVP.

[Effect of the Invention]

**[0097]** Through the aroma cartridge of the present invention provided with an aspiration optimization means, it is possible to overcome the problem of decreased aspiration quantity of a gas by a smoker due to blockage of gas flow passages within and between aroma-generating base materials to be heated, which is a problem that characteristically arises in an aroma cartridge that uses a non-tobacco material and does not use any tobacco component. Meanwhile, in the aroma cartridge provided with a gas-generation-maintaining material, a decrease in the released quantity of gas due to blockage of gas flow passages can be remedied, and it is possible to provide an aroma cartridge in which there is no dust generation or dislodgement of the non-tobacco material and other materials.

**[0098]** Through the aroma generator to be heated of the present invention, in which inorganic particles are provided as the gas-generation-maintaining material, fusion of aroma-generating base materials to be heated is prevented, and it is possible to overcome the problem of inability to mount an aroma cartridge on the heating element of a heating-type

smoking appliance when the aroma cartridge has been stored for a long time, as well as the problem of the heating element becoming damaged or contaminated.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0099]**

FIG. 1 is a schematic diagram illustrating a general structure and steps (means) in a method (device) for producing a cylindrical aroma cartridge which can be mounted so as to contact a heating element of a heating-type smoking appliance in which an electrically controlled heating element is provided in a chamber, and whereby an aerosol smoke and a fragrance component generated due to heating by the heating element can be satisfyingly experienced.
FIG. 2A is a schematic diagram illustrating a heating-type smoking appliance in which a needle-shaped electrically controlled heating element is provided in a bottom of a chamber. FIG. 2B is a schematic diagram illustrating the structure of a cylindrical aroma cartridge which is mounted in the heating-type smoking appliance of FIG. 2A and whereby an aerosol smoke and a fragrance component generated due to heating by the heating element can be satisfyingly experienced. FIG. 2C is a schematic diagram of a state in which the aroma cartridge of FIG. 2B is mounted in the heating-type smoking appliance of FIG. 2A.
FIG. 3A is a schematic diagram illustrating a heating-type smoking appliance in which an electrically controlled heating element is provided on an external periphery of a chamber so as to surround an aroma cartridge. FIG. 3B is a schematic diagram of a state in which the aroma cartridge of FIG. 2B is mounted in the heating-type smoking appliance of FIG. 3A.
FIG. 4 is an outline diagram illustrating the structure of a mouthpiece provided with an aspiration stabilization means of the present invention, and steps (means) of a production method (device) for producing an aroma cartridge by joining the mouthpiece to an aroma generator to be heated that is not provided with a gas-generation-maintaining material.
FIG. 5 is a schematic diagram illustrating a straight cylindrical aroma cartridge according to an embodiment of the present invention, in which an aroma generator to be heated and a mouthpiece are adjacent, the mouthpiece being constituted from a filter unit which filters a gas and in which a single cavity is formed, the cavity being straight cylindrical and being arranged in the filter from a longitudinal end part of the filter on an aroma-generator-to-be-heated side thereof so that center axes of straight cylinders of the filter and the cavity substantially coincide in the aroma cartridge.
FIG. 6 is a schematic diagram illustrating a straight cylindrical aroma cartridge according to an embodiment of the present invention, in which an aroma generator to be heated and a mouthpiece are adjacent, the mouthpiece being constituted from a filter unit which filters a gas and in which two cavities are formed, the cavities being straight cylindrical and being arranged in the filter from both longitudinal end parts of the filter so that center axes of straight cylinders of the filter and the cavities substantially coincide in the aroma cartridge.
FIG. 7 is a schematic diagram illustrating a straight cylindrical aroma cartridge according to an embodiment of the present invention, in which an aroma generator to be heated and a mouthpiece are adjacent, the mouthpiece being constituted from a filter unit which filters a gas and in which four cavities are formed, the cavities being straight cylindrical and being arranged in the filter from a longitudinal end part of the filter on an aroma-generator-to-be-heated side thereof, in rotationally symmetrical positions about the center axis of a straight cylinder existing in the longitudinal direction of the filter in the aroma cartridge.
FIG. 8 is a schematic diagram illustrating a straight cylindrical aroma cartridge according to an embodiment of the present invention, in which an aroma generator to be heated and a mouthpiece are adjacent, the mouthpiece being constituted from a filter unit which filters a gas and in which five cavities are formed, the cavities all being straight cylindrical in shape, four cavities being arranged in the filter from the longitudinal end part of the filter on the aroma-generator-to-be-heated side thereof, in rotationally symmetrical positions about the center axis of a straight cylinder existing in the longitudinal direction of the filter, and one cavity being arranged in the filter from the longitudinal end part on an opposite side of the filter from the aroma generator to be heated, such that the center axes of straight cylinders of the filter and the cavity substantially coincide in the aroma cartridge.
FIG. 9 is a schematic diagram illustrating a straight cylindrical aroma cartridge according to an embodiment of the present invention, in which an aroma generator to be heated and a mouthpiece are adjacent, the mouthpiece being constituted from a filter unit which filters a gas and in which a single cavity is formed, the cavity being right-circular conical and arranged in the filter from a longitudinal end part of the filter on an aroma-generator-to-be-heated side thereof so that a center axis of a straight cylinder of the filter and a center axis of a right circular cone of the cavity substantially coincide in the aroma cartridge.
FIG. 10 is a schematic diagram illustrating a straight cylindrical aroma cartridge according to an embodiment of the present invention, in which an aroma generator to be heated and a mouthpiece are adjacent, the mouthpiece being

constituted from a filter unit which filters a gas and in which three cavities are formed, the cavities being right-circular conical and being arranged in the filter from a longitudinal end part of the filter on an aroma-generator-to-be-heated side thereof, in rotationally symmetrical positions about a center axis of a straight cylinder existing in the longitudinal direction of the filter in the aroma cartridge.

FIG. 11 is a schematic diagram illustrating a straight cylindrical aroma cartridge according to an embodiment of the present invention, in which a mouthpiece constituted from a filter which filters a gas and in which a single cavity is formed, and a void formed by a cartridge exterior body, is configured so that an aroma generator to be heated and the filter are adjacent, the cavity being straight cylindrical and being arranged in the filter from a longitudinal end part of the filter on the aroma-generator-to-be-heated side thereof so that center axes of straight cylinders of the filter and the cavity substantially coincide.

FIG. 12 is a schematic diagram illustrating a straight cylindrical aroma cartridge according to an embodiment of the present invention, in which a mouthpiece constituted from a filter which filters a gas and in which four cavities are formed, and a void formed by a cartridge exterior body, is configured so that an aroma generator to be heated and the filter are adjacent, the cavities being straight cylindrical and being arranged in the filter from a longitudinal end part of the filter on the aroma-generator-to-be-heated side thereof, in rotationally symmetrical positions about a center axis of a straight cylinder existing in the longitudinal direction of the filter in the aroma cartridge.

FIG. 13 is a schematic diagram illustrating an aroma cartridge according to an embodiment of the present invention, in which a mouthpiece is adjacent to an aroma generator to be heated, the mouthpiece being constituted from a cylindrical support member which is adjacent to the aroma generator to be heated and which prevents the aroma generator to be heated from moving toward the mouthpiece, and a filter which filters a gas and in which a single cavity is formed, the filter being adjacent to the cylindrical support member, the cavity being arranged so that center axes of straight cylinders of the filter and the cavity substantially coincide at both longitudinal end parts of the filter.

FIG. 14 is a schematic diagram illustrating an aroma cartridge according to an embodiment of the present invention, in which a mouthpiece is adjacent to an aroma generator to be heated, the mouthpiece being constituted from a cylindrical support member which is adjacent to the aroma generator to be heated and which prevents the aroma generator to be heated from moving toward the mouthpiece, a cylindrical cooling member which is adjacent to the support member and which cools a component that is volatilized upon heating of the aroma generator to be heated, and a filter which filters a gas and in which a single cavity adjacent to the cooling member is formed, the cavity being arranged so that center axes of straight cylinders of the filter and the cavity substantially coincide at both longitudinal end parts of the filter.

FIG. 15 is a schematic diagram illustrating an aroma cartridge according to an embodiment of the present invention, in which a mouthpiece is adjacent to an aroma generator to be heated, the mouthpiece being constituted from a cylindrical cooling member which is adjacent to an aroma generator to be heated and which cools a component that is volatilized upon heating of the aroma generator to be heated, and a filter which filters a gas and in which a single cavity adjacent to the cooling member is formed, the cavity being arranged so that center axes of straight cylinders of the filter and the cavity substantially coincide at both longitudinal end parts of the filter.

FIG. 16 is a schematic diagram illustrating an aroma cartridge according to an embodiment of the present invention, in which a mouthpiece is adjacent to an aroma generator to be heated, the mouthpiece being constituted from a support member which is adjacent to the aroma generator to be heated and which prevents the aroma generator to be heated from moving toward the mouthpiece, and a filter which is adjacent to the support member and which filters a gas, an aspiration optimization means being a single plate-shaped reinforcing material which is in contact with an inner wall of a through hole in the support member, the through hole being formed so that center axes of the support member and a straight cylinder of the through hole substantially coincide, and the reinforcing material being fixedly or movably arranged in the through hole, and having axes of the support member and the through hole in a plane thereof.

FIG. 17 is a schematic diagram illustrating an aroma cartridge according to an embodiment of the present invention, in which a mouthpiece is adjacent to an aroma generator to be heated, the mouthpiece being constituted from a support member which is adjacent to the aroma generator to be heated and which prevents the aroma generator to be heated from moving toward the mouthpiece, and a filter which is adjacent to the support member and which filters a gas, an aspiration optimization means being two plate-shaped reinforcing materials which are in contact with an inner wall of a through hole in the support member, the through hole being formed so that center axes of the support member and a straight cylinder of the through hole substantially coincide, and the reinforcing materials being fixedly or movably arranged in an intersecting manner in the through hole, and having axes of the support member and the through hole in a plane thereof.

FIG. 18 is a schematic diagram illustrating an aroma cartridge according to an embodiment of the present invention, in which a mouthpiece is adjacent to an aroma generator to be heated, the mouthpiece being constituted from a support member which is adjacent to the aroma generator to be heated and which prevents the aroma generator to be heated from moving toward the mouthpiece, and a filter which is adjacent to the support member and which

filters a gas, an aspiration optimization means being fixedly or movably arranged in a through hole of the support member which is formed so that center axes of the support member and a straight cylinder of the through hole substantially coincide, and being constituted from a tubular reinforcing material which is a concentric circular tube having a radius smaller than a radius of the through hole and which has substantially the same axis as the through hole, and four plate-shaped reinforcing materials provided on an external peripheral side of the tubular reinforcing material in a shape so as to contact an inner wall of the through hole in a radial direction of the concentric circular tube.

FIG. 19 is a schematic diagram illustrating an aroma cartridge according to an embodiment of the present invention, in which a solid concentric cylindrical reinforcing material is used instead of the hollow tubular reinforcing material formed by a concentric circular tube in FIG. 18.

FIG. 20 is a schematic diagram illustrating an aroma cartridge according to an embodiment of the present invention, in which a mouthpiece is adjacent to an aroma generator to be heated, the mouthpiece being constituted from: a reinforcing support member provided with a shape reinforcement material, the reinforcing support member being adjacent to the aroma generator to be heated and preventing the aroma generator to be heated from moving toward the mouthpiece; and a filter which is adjacent to the reinforcing support member and which filters a gas, and in which a single cavity is formed; the cavity being arranged in a longitudinal end part of the filter on the aroma-generator-to-be-heated side thereof so that center axes of straight cylinders of the filter and the cavity substantially coincide, and an aspiration optimization means being fixedly or movably arranged in a through hole of the support member which is formed so that center axes of the support member and a straight cylinder of the through hole substantially coincide, and being constituted from a tubular reinforcing material which is a hollow concentric cylinder having a radius smaller than a radius of the through hole and which has substantially the same axis as the through hole, and four plate-shaped reinforcing materials provided on an external peripheral side of the tubular reinforcing material in a shape so as to contact an inner wall of the through hole in a radial direction of the tubular reinforcing material.

FIG. 21 is a schematic diagram illustrating an aroma cartridge according to an embodiment of the present invention, in which a mouthpiece is adjacent to an aroma generator to be heated, the mouthpiece being constituted from: a reinforcing support member provided with a shape reinforcement material, the reinforcing support member being adjacent to the aroma generator to be heated and preventing the aroma generator to be heated from moving toward the mouthpiece; a cylindrical cooling member which is adjacent to the reinforcing support member and which cools a component that is volatilized upon heating of the aroma generator to be heated; and a filter which is adjacent to the cooling member and which filters a gas, and in which a single cavity is formed; the cavity being arranged in a longitudinal end part of the filter on the aroma-generator-to-be-heated side thereof so that center axes of straight cylinders of the filter and the cavity substantially coincide, and an aspiration optimization means being fixedly or movably arranged in a through hole of the support member which is formed so that center axes of the support member and a straight cylinder of the through hole substantially coincide, and being constituted from a tubular reinforcing material which is a hollow concentric cylinder having a radius smaller than a radius of the through hole and which has substantially the same axis as the through hole, and four plate-shaped reinforcing materials provided on an external peripheral side of the tubular reinforcing material in a shape so as to contact an inner wall of the through hole in a radial direction of the tubular reinforcing material.

FIG. 22 is a schematic diagram illustrating an aroma cartridge according to an embodiment of the present invention, in which a mouthpiece is adjacent to an aroma generator to be heated, the mouthpiece being constituted from a heat insulation material which is adjacent to the aroma generator to be heated and is an aspiration optimization means, and a filter which is adjacent to the heat insulation material and which filters a gas.

FIG. 23 is a schematic diagram illustrating an aroma cartridge according to an embodiment of the present invention, in which a mouthpiece is adjacent to an aroma generator to be heated, the mouthpiece being constituted from a heat insulation material which is adjacent to the aroma generator to be heated and is an aspiration optimization means, a cylindrical cooling member which is adjacent to the heat insulation member and which cools a component that is volatilized upon heating of the aroma generator to be heated, and a filter which is adjacent to the cooling member and which filters a gas.

FIG. 24 is a partial schematic diagram of an aroma generator to be heated of an aroma cartridge according to an embodiment of the present invention, in which a cover material and a partition wall material as aspiration optimization means are arranged in both end parts of the aroma generator to be heated.

FIG. 25A is a schematic diagram of an aroma-generating sheet to be heated according to an embodiment of the present invention. FIG. 25B is a schematic diagram of an aroma-generating filler to be heated according to an embodiment of the present invention.

FIG. 26A is a schematic diagram illustrating an aroma generator to be heated according to an embodiment of the present invention, in which a folded aroma-generating sheet to be heated is used. FIG. 26B is a schematic diagram illustrating an aroma generator to be heated according to an embodiment of the present invention, in which a wound aroma-generating sheet to be heated is used. FIG. 26C is a schematic diagram illustrating an aroma generator to be heated according to an embodiment of the present invention, in which an aroma-generating filler to be heated

is used.

FIG. 27 is a flow chart outlining steps (means) for producing an aroma-generating base material to be heated, and a flow chart outlining steps (means) of a production method (device) for producing an aroma generator to be heated, according to an embodiment of the present invention, the aroma-generating base material to be heated being produced from: a dry mixing step (means) for mixing a dried and pulverized non-tobacco material; a first wet mixing step (means) for mixing the non-tobacco material produced in the dry mixing step (means) and a material selected from an aerosol former, a binder or thickener, crosslinked PVP, a perfume, a non-tobacco material extract, $\beta$-cyclodextrin, microcrystalline cellulose, and an antimicrobial preservative in a mixture of alcohol and pure water; a second wet mixing step (means) for producing a slurry including the non-tobacco material, etc., by adding additional pure water and/or alcohol to the mixture of alcohol and pure water including the non-tobacco material, etc., produced by the first wet mixing step (means); a paper-making step (means) for producing a water-containing sheet from the slurry produced by the second wet mixing step (means); a sheet molding step (means) for compressing the water-containing sheet to obtain a sheet; a drying step (means) for producing an aroma-generating sheet to be heated by drying the sheet produced by the molding step (means); and a sheet processing step (means) for cutting or folding the aroma-generating sheet to be heated.

FIG. 28 is a flow chart outlining steps (means) for producing an aroma-generating base material to be heated, and a flow chart outlining steps (means) of a production method (device) for producing an aroma generator to be heated, according to an embodiment of the present invention, the aroma-generating base material to be heated being produced from: a dry mixing step (means) for mixing a dried and pulverized non-tobacco material; a first wet mixing step (means) for mixing the non-tobacco material produced in the dry mixing step (means) and a material selected from an aerosol former, a binder or thickener, crosslinked PVP, a perfume, a non-tobacco material extract, $\beta$-cyclodextrin, microcrystalline cellulose, and an antimicrobial preservative in a mixture of alcohol and pure water; a second wet mixing step (means) for producing a slurry including the non-tobacco material, etc., by adding additional pure water and/or alcohol to the mixture of alcohol and pure water including the non-tobacco material, etc., produced by the first wet mixing step (means); a paper-making step (means) for producing a water-containing sheet from the slurry produced by the second wet mixing step (means); a sheet molding step (means) for compressing or casting the water-containing sheet to obtain a sheet; an aerosol former absorption step (means) for coating the water-containing sheet with, or dipping the sheet into, the aerosol former, a moisture content of the water-containing sheet being reduced to less than 50% by mass by the sheet molding step (means); a drying step (means) for producing an aroma-generating sheet to be heated by drying the sheet produced by the molding step (means); and a sheet processing step (means) for cutting or folding the aroma-generating sheet to be heated.

FIG. 29 is a flow chart outlining steps (means) for producing an aroma-generating base material to be heated, and a flow chart outlining steps (means) of a production method (device) for producing an aroma generator to be heated, according to an embodiment of the present invention, the aroma-generating base material to be heated being produced from: a wet mixing step (means) for producing a slurry of a non-tobacco material by mixing a dried and pulverized non-tobacco material with pure water; a paper-making step (means) for producing a water-containing sheet from the slurry produced by the wet mixing step (means); a sheet molding step (means) for compressing or casting the water-containing sheet to obtain a sheet; a drying step (means) for reducing the moisture content of the sheet produced by the sheet molding step (means) to less than 50% by mass; an absorption and adsorption step (means) for coating the sheet produced by the drying step (means) with, or dipping the sheet into, an alcohol and pure water mixture of a material selected from an aerosol former, a binder or thickener, crosslinked PVP, a perfume, a non-tobacco material extract, $\beta$-cyclodextrin, microcrystalline cellulose, a concentrate of water discharged in the sheet molding step (means), and an antimicrobial preservative; a drying step (means) for drying the sheet produced by the absorption and adsorption step (means) to produce an aroma-generating sheet to be heated; and a sheet processing step (means) for cutting or folding the aroma-generating sheet to be heated.

FIG. 30 is a flow chart outlining steps (means) for producing an aroma-generating base material to be heated, and a flow chart outlining steps (means) of a production method (device) for producing an aroma generator to be heated, according to an embodiment of the present invention, the aroma-generating base material to be heated being produced from: a non-tobacco-material preparation step (means) for drying and pulverizing a non-tobacco material; a perfume and/or non-tobacco extract mixing step (means) for mixing at least a perfume and/or a non-tobacco material extract and crosslinked PVP and/or $\beta$-cyclodextrin in alcohol to cause the perfume and/or non-tobacco extract to reside in the crosslinked PVP and/or $\beta$-cyclodextrin; an aerosol former dissolving step (means) for mixing at least an aerosol former and a binder or thickener with pure water; a wet mixing step (means) for mixing a material produced by the non-tobacco material preparation step (means), a material produced by the perfume and/or non-tobacco extract mixing step (means), and a material produced by the aerosol former dissolving step (means); a sheet molding step (means) for producing an aroma-generating sheet to be heated, by compression from a material produced by the wet mixing step (means); and a sheet processing step (means) for cutting or folding the aroma-generating sheet to be heated.

FIG. 31 is a flow chart outlining steps (means) for producing an aroma-generating base material to be heated, and a flow chart outlining steps (means) of a production method (device) for producing an aroma generator to be heated, according to an embodiment of the present invention, the aroma-generating base material to be heated being produced from: a first wet mixing step (means) for mixing a dried and pulverized non-tobacco material, a first binder aqueous solution in which a first binder is dissolved in pure water, and a material selected from an aerosol former, crosslinked PVP, a perfume, a non-tobacco extract, $\beta$-cyclodextrin, microcrystalline cellulose, and an antimicrobial preservative; an aging step (means) for stabilizing a mixture produced by the first wet mixing step (means); a second wet mixing step (means) for mixing an aged mixture produced by the aging step (means) and a second binder aqueous solution in which a second binder is dissolved in pure water; a sheet molding step (means) for producing an aroma-generating sheet to be heated, by compression from a material produced by the second wet mixing step (means); and a sheet processing step (means) for cutting or folding the aroma-generating sheet to be heated.

FIG. 32 is a flow chart outlining steps (means) for producing an aroma-generating base material to be heated, and a flow chart outlining steps (means) of a production method (device) for producing an aroma generator to be heated, according to an embodiment of the present invention, the aroma-generating base material to be heated being produced from: a step (means) for drying/pulverizing and then dry-mixing a non-tobacco material to prepare a non-tobacco material; a step (means) for preparing raw materials selected from an aerosol former, a binder, an adhesion inhibitor, a perfume, a non-tobacco material extract, an antimicrobial preservative, etc.; a step (means) for preparing pure water and an alcohol; a wet mixing step (means) for mixing the prepared ingredients at once; a paper-making step (means) for producing a water-containing sheet from a slurry produced by wet mixing; a molding step (means) for compressing or casting the resultant water-containing sheet to obtain a sheet; a step (means) for drying the sheet produced by the molding step (means); a step (means) for spraying inorganic particles on the dried sheet; and a sheet processing step (means) for cutting or folding the aroma-generating sheet to be heated, the inorganic particles adhering to a surface thereof.

FIG. 33 is a schematic view illustrating steps (means) of a production method (device) for producing an aroma cartridge in which an aroma generator to be heated that is provided with a gas-generation-maintaining material, and a mouthpiece that is not provided with an aspiration optimization means are joined.

## BEST MODE FOR CARRYING OUT THE INVENTION

**[0100]** The present invention will be described in further detail below using embodiments and the accompanying drawings, but the present invention is not limited thereby, various modifications thereof are possible without departing from the scope of the present invention, and the present invention is limited only by the technical ideas recited in the claims.

**[0101]** FIG. 1 is a schematic diagram illustrating the general structure and the steps (means) in a method (device) for producing a cylindrical aroma cartridge which can be mounted so as to contact a heating element of a heating-type smoking appliance in which an electrically controlled heating element is provided in a chamber, and whereby an aerosol smoke and a fragrance component generated due to heating by the heating element can be satisfyingly experienced. The aroma cartridge of the present invention has basically the same structure and is assembled in the same manner except that no tobacco component is used as an aroma generator to be heated, which is heated by the heating element to generate an aerosol to be released. Specifically, in the aroma cartridge of the present invention, in a state in which a mouthpiece and an aroma generator to be heated, in which an aroma-generating base material to be heated comprising, *inter alia,* a non-tobacco material and an aerosol former is wound, are adjacent in a longitudinal direction of mounting so that the aroma generator to be heated is in contact with the electrically controlled heating element, the mouthpiece and the aroma generator to be heated are connected in a state in which a cartridge exterior body is wound on the outsides thereof.

**[0102]** In FIGS. 2 and 3, a state in which an aroma cartridge of such description is mounted in a heating-type smoking appliance and smoked is illustrated for two forms of heating elements. In order to clarify the features of the aroma cartridge of the present invention, following is a brief description of the mechanism whereby the aroma cartridge is mounted in a heating-type smoking appliance and enjoyed.

**[0103]** FIG. 2A is a schematic cross-sectional view of an electric heating-type smoking appliance (1) 11 comprising a needle-shaped electrically controlled heating element 113 provided in a bottom of a chamber 112 housed in a casing 111. FIG. 2B is a schematic cross-sectional view of an aroma cartridge 2, in which an aroma generator 21 to be heated on which an interior material 21-p is wound, and a mouthpiece 22 on which an interior material 22-p is wound are wrapped by a cartridge exterior body 23 and connected adjacent to each other in a longitudinal direction of the heating-type smoking appliance (1) 11. FIG. 2C illustrates a state in which a smoker aspirates the aroma cartridge 2 using the electric heating-type smoking appliance (1) 11. The aroma-generator 21 to-be-heated side of the aroma cartridge 2 illustrated in FIG. 2B is inserted in the chamber 112, and the aroma generator 21 to be heated is impaled on the electrically controlled heating element 113. When the smoker presses a switch not shown in the drawing, the electrically controlled heating element 113 is heated in accordance with a signal of an electric control unit not shown in the drawing, and an

aerosol smoke and a fragrance component are released from the aroma generator 21 to be heated, and are aspirated. When the smoker aspirates, air enters from an inlet port 115 and passes through a gap between the casing 111 and the chamber 112, as indicated by arrows W, the aerosol former and the fragrance component volatilized from the aroma generator 21 to be heated are carried to the mouthpiece 22 and aspirated into the mouth of the smoker. The smoke is cooled in the mouthpiece 22 and aspirated as an aerosol.

**[0104]** FIG. 3A is a schematic cross-sectional view of an electric heating-type smoking appliance (2) 12 comprising an electrically controlled heating element 123 provided on an external periphery of a chamber 122 housed in a casing 121. FIG. 3B illustrates a state in which a smoker aspirates the aroma cartridge 2 using the electric heating-type smoking appliance (2) 12. When the aroma-generator 21 to-be-heated side of the aroma cartridge 2 illustrated in FIG. 3B is inserted in the chamber 122 from an aroma cartridge insertion port 124, the aroma generator 21 to be heated is surrounded by the electrically controlled heating element 123. When a switch not shown in the drawing is pressed, the electrically controlled heating element 123 is heated in accordance with a signal of an electric control unit 1231, and an aerosol smoke and a fragrance component are released from the aroma generator 21 to be heated, and are aspirated. When the smoker aspirates, air enters from an inlet hole 125 as indicated by arrows W, and the aerosol former and the fragrance component volatilized from the aroma generator 21 to be heated are carried to the mouthpiece 22 and aspirated into the mouth of the smoker. The smoke is cooled in the mouthpiece 22 and aspirated as an aerosol.

**[0105]** In this smoking, an advantage of an aroma cartridge constituted solely from non-tobacco materials is that substances harmful to the human body, tar, and nicotine are not generated, and it is possible to enjoy various tastes such as coffee, cola, Red Bull, and other beverages; chocolate, vanilla, cream, and other desserts; orange, lemon, melon, and other fruits; and menthol, mint, herbs, and other algefacients. However, such an aroma cartridge has problems that arise as a consequence of using a wide variety of non-tobacco materials for releasing various flavors as substitutes for a tobacco material, which includes a large quantity of fibers.

**[0106]** In an aerosol-forming body that includes a tobacco material, fibers of the tobacco material maintain an aggregated state thereof and hinder fusion and falling out of the tobacco material. However, in the aroma-generating base material to be heated, which includes a non-tobacco material that does not include a large quantity of fibers, a large amount of a binder or the like for performing the function of fibers must be blended therein to stably maintain an aggregated state. The density of the aroma-generating base material to be heated is therefore increased, gas flow passages are blocked, and aspiration of aspirated components becomes difficult, resulting in a reduced aspiration quantity.

**[0107]** Because the aerosol former is glycerin, propylene glycol, or the like, which is liquid at normal temperature, bleed-out of the aerosol former over time from the aroma-generating base material to be heated increases the larger the amount of the binder is, and aroma-generating base materials to be heated fuse together. Gas flow passages are therefore blocked, and aspiration of the fragrance component becomes difficult, resulting in a reduced aspiration quantity. When the fusion described above occurs, not only does it become difficult to insert the heating element into the aroma-generating base material to be heated, but the heating element can also be damaged.

**[0108]** Meanwhile, when the added amount of the binder or the like is reduced to keep gas flow passages clear, the non-tobacco material falls out or forms dust or the like, it is difficult to maintain the aroma cartridge in a rigid form, and the aroma cartridge sometimes breaks when inserted on the heating element. Pieces thereof may also be aspirated into the mouth.

**[0109]** An object of the present invention is to provide a means for solving the aforementioned problems. Specifically, the present invention provides a means for keeping gas flow passages clear and preventing a decrease in aspiration quantity. A solution method that significantly changes blending ratios or a composition used to form the aroma-generating base material to be heated cannot be employed, due to the need to maintain generation of a smoke-forming aerosol or generation of the fragrance component released from the non-tobacco material. Therefore, the present invention provides a means for solving the aforementioned problems by two different approaches.

**[0110]** The first approach is a physical means for solving the aforementioned problems that focuses on, *inter alia,* configuring the aroma cartridge, and on the mouthpiece structure, which has a marked effect on the aspiration quantity. Another approach is a chemical means for solving the aforementioned problems that focuses on, *inter alia,* the method (device) for producing the aroma-generating base material to be heated, and on a filling state thereof.

**[0111]** The physical means for solving the aforementioned problems is to provide an aroma cartridge comprising an aspiration optimization means for enhancing the aspiration quantity of the mouthpiece, and provides an aroma cartridge comprising an aspiration optimization means for preventing a decrease in the aspiration quantity by capturing dislodged material or dust of the non-tobacco material and other materials of the aroma generator to be heated. More specifically, the physical means provides a filter constituting the mouthpiece, a support body which constitutes the mouthpiece and prevents the aroma generator to be heated from moving toward the mouthpiece, and an aroma cartridge in which a cavity for enhancing the aspiration quantity by enlarging a gas flow passage, a shape reinforcement member for preventing a decrease in aspiration quantity due to deformation, and a heat insulation material for preventing a joined part from being damaged by heat diffusion are each provided as aspiration optimization means in the mouthpiece. The physical means also provides an aroma cartridge in which a cover material and/or a partition wall material for preventing and

capturing dislodged material or dust of the non-tobacco material are provided as aspiration optimization means in the aroma generator to be heated.

**[0112]** The chemical means for solving the aforementioned problems is to provide an aroma cartridge comprising a gas-generation-maintaining material that does not reduce the aspiration quantity of the aroma generator to be heated. More specifically, the chemical means provides an aroma cartridge in which the aroma generator to be heated is provided with, as gas-generation-maintaining materials, an aroma-generating base material to be heated in which an internal structure thereof is improved by the method (device) used to produce the same, an aroma-generating base material to be heated in which a blended amount thereof is optimized, inorganic particles present within and/or on a surface of the aroma-generating base material to be heated, and an aroma-generating base material to be heated in which a filling ratio thereof is improved.

**[0113]** The aspiration optimization means and the gas-generation-maintaining materials can produce an adequate effect alone, and therefore, FIG. 4 illustrates a configuration of an aroma cartridge in which an aroma generator to be heated that is not provided with a gas-generation-maintaining material, and a mouthpiece that is not provided with an aspiration optimization means are joined, and FIG. 33 illustrates a configuration of an aroma cartridge in which an aroma generator to be heated that is provided with a gas-generation-maintaining material, and a mouthpiece that is not provided with an aspiration optimization means are joined. However, because a more significant effect or a broader effect is obtained by using the physical and chemical means jointly, it is possible to provide aroma cartridges having the extremely wide variation of all the combinations of mouthpieces and aroma generators to be heated that are illustrated in FIGS. 4 and 33.

**[0114]** The aspiration optimization means will first be described in detail using the accompanying drawings. FIG. 5 is a schematic diagram illustrating an aroma cartridge 2-1 according to an embodiment of the present invention, in which an aroma generator 21 to be heated and a mouthpiece 221-1 are adjacent, the mouthpiece 221-1 being constituted from a filter unit 221-1 which filters a gas and in which a single cavity 221-1-c1 is formed, and the aroma generator 21 to be heated and the mouthpiece 221-1 are joined by a cartridge exterior body 23 which is wound thereon, the cavity 221-1-c1 being arranged in the filter 221-1 in a longitudinal end part of the filter 221-1 on the aroma-generator 21 to-be-heated side thereof so that center axes of straight cylinders of the filter 221-1 and the cavity 221-1-c1 substantially coincide in the aroma cartridge 2-1. For example, an outside diameter of the aroma cartridge, the aroma generator to be heated, and the mouthpiece are determined by the heating-type smoking appliance (1) 11 or (2) 12, as indicated in FIGS. 2 and 3, and therefore may be appropriately set. In the description below, an outside diameter j and a length k of the aroma cartridge are respectively 6.9 mm and 45 mm, a length a of the aroma generator to be heated is 12 mm, and a length m (= f) of the mouthpiece (= filter) is 33 mm.

**[0115]** The longer and thicker the dimensions of the cavity are, the more the aspiration quantity can be increased, but to avoid problems related to the strength of the mouthpiece, a length c1, an inside diameter b1, and a surface area of the cavity are preferably 10-25 mm, 1-4 mm, and 34.54-326.54 $mm^2$, respectively. In the example illustrated in FIG. 5, a straight cylindrical cavity having a length c1 of 20 mm and an inside diameter of 3 mm is formed. A straight cylindrical cavity is illustrated as the most preferred shape of the cavity, but the shape of the cavity may also be oblique cylindrical, and is not limited. The cavity need only be a hole that does not penetrate through the filter, and, in consideration of workability and uniform aspiration of gas into the mouth, the hole preferably has a shape that is symmetrical about the center axis of the filter. The hole preferably has a triangular column shape, a square column shape, a pentagonal column shape, or other column shape, a conical shape (FIG. 9), or a trigonal pyramid shape, a square pyramid shape, a pentagonal pyramid shape, or other spindle shape.

**[0116]** The cavity in FIG. 5 is formed in the longitudinal end part of the filter on the aroma-generator-to-be-heated side thereof, but the cavity may also be formed in the end part on the opposite side from said end part.

**[0117]** FIG. 6 is a schematic diagram illustrating an aroma cartridge 2-2 according to an embodiment of the present invention, in which an aroma generator 21 to be heated and a mouthpiece 221-2 are adjacent, the mouthpiece 221-2 being constituted from a filter unit 221-2 which filters a gas and in which two cavities 221-2-c2 and 221-2-c3 are formed, and the aroma generator 21 to be heated and the mouthpiece 221-2 are joined by a cartridge exterior body 23 which is wound thereon, the cavities 221-2-c2 and 221-2-c3 being arranged in the filter 221-2 in both longitudinal end parts of the filter 221-2 so that center axes of straight cylinders of the filter 221-2 and the cavities 221-2-c2 substantially coincide in the aroma cartridge 2-2. As for a cavity shape that makes it possible to enhance the aspiration quantity, the longer and thicker the dimensions of the cavity are, the more the aspiration quantity can be increased. However, to avoid problems related to the strength of the mouthpiece, lengths c2 and c3 are preferably 5-15 mm and outside diameters b2 and b3 are preferably 1-3.5 mm, and a total surface area is preferably 34.54-326.54 $mm^2$. The shape of the cavities is as described above using FIG. 5.

**[0118]** FIG. 7 is a schematic diagram illustrating a straight cylindrical aroma cartridge 2-3 according to an embodiment of the present invention, in which an aroma generator 21 to be heated and a mouthpiece 221-3 are adjacent, the mouthpiece 221-3 being constituted from a filter unit 221-3 which filters a gas and in which four cavities 221-3-c4 are formed, and the aroma generator 21 to be heated and the mouthpiece 221-3 are joined by a cartridge exterior body 23

which is wound thereon, the cavities 221-3-c4 being straight cylindrical and being arranged in the filter 221-3 from the longitudinal end part of the filter 221-3 on the aroma-generator 21 to-be-heated side thereof, in rotationally symmetrical positions about the center axis of a straight cylinder existing in the longitudinal direction of the filter 221-3 in the aroma cartridge 2-3. FIG. 7 illustrates a case in which four cavities are formed as a preferred example, but this configuration is not limiting, and the number of cavities need only be two or more. The number and size of the cavities are set as appropriate for obtaining a balance between aspiration quantity and filter strength, the same as described above using FIG. 6, but are preferably set so as to obtain a total surface area of 34.54-326.54 $mm^2$. The shape is as described above using FIG. 5. The cavities in FIG. 7 are formed in the longitudinal end part of the filter on the aroma-generator-to-be-heated side thereof, but the cavities may also be formed in the end part on the opposite side from said end part.

**[0119]** FIG. 8 is a schematic diagram illustrating a straight cylindrical aroma cartridge 2-4 according to an embodiment of the present invention, in which an aroma generator 21 to be heated and a mouthpiece 221-4 are adjacent, the mouthpiece 221-4 being constituted from a filter unit 221-4 which filters a gas and in which five cavities 221-4-c5 and 221-4-c6 are formed, and the aroma generator 21 to be heated and the mouthpiece 221-4 are joined by a cartridge exterior body 23 which is wound thereon, the cavities all being straight cylindrical in shape, the four cavities 221-4-c5 being arranged in the filter from the longitudinal end part of the filter 221-4 on the aroma-generator 21 to-be-heated side thereof, in rotationally symmetrical positions about the center axis of a straight cylinder existing in the longitudinal direction of the filter 221-4, and the one cavity 221-4-c6 being arranged in the filter from the longitudinal end part on the opposite side of the filter 221-4 from the aroma generator 21 to be heated, such that the center axes of straight cylinders of the filter 221-4 and the cavity 221-4-c6 substantially coincide in the aroma cartridge 2-4. In FIG. 8, an example is illustrated in which there are four cavities 221-4-c5 in the end part on the aroma-generator-to-be-heated side of the filter and the fifth cavitie 221-4-c6 on the opposite side thereof, but the number and shape of the cavities are not limited. As described using FIG. 6 above, the number and size of the cavities are set as appropriate for obtaining a balance between aspiration quantity and filter strength, and are preferably set so as to obtain a total surface area of 34.54-326.54 $mm^2$. The shape of the cavities is as described above using FIG. 5.

**[0120]** FIG. 9 illustrates a modification of the cavity shape, in which the cavity in the aroma cartridge 2-1 shown in FIG. 5 is configured as a right circular conical cavity 221-5-d1. In this case as well, the right circular conical cavity can be designed so that the dimensions thereof give a surface area of 34.54-326.54 $mm^2$. The cavity in FIG. 9 is formed in the longitudinal end part of the filter on the aroma-generator 21 to-be-heated side thereof, but the cavity may also be formed in the end part on the opposite side from said end part.

**[0121]** FIG. 10 also illustrates a modification of the cavity shape, in which the cavities in the aroma cartridge 2-3 shown in FIG. 7 are configured as three right circular conical cavities 221-6-d2. In this case as well, the number and dimensions of the right circular conical cavities can be designed so as to give a surface area of 34.54-326.54 $mm^2$. The cavities in this case are also formed in the longitudinal end part of the filter on the aroma-generator-to-be-heated side thereof, but the cavities may also be formed in the end part on the opposite side from said end part.

**[0122]** FIG. 11 is a schematic diagram illustrating a straight cylindrical aroma cartridge 2-7 according to an embodiment of the present invention, in which an aroma generator 21 to be heated and a mouthpiece 221-7 are joined by a cartridge exterior body 24 which is wound thereon, the mouthpiece being constituted from a filter 2211 which filters a gas and in which a single cavity 221-7-c7 is formed, and a void 221-7-v1 formed by the cartridge exterior body 24, and the aroma generator 21 to be heated and the filter 2211 being adjacent, the cavity 221-7-c7 being straight cylindrical and being arranged in the filter 2211 from a longitudinal end part of the filter 2211 on the aroma-generator 21 to-be-heated side thereof so that center axes of straight cylinders of the filter 2211 and the cavity 221-7-c7 substantially coincide. In FIG. 11, the aroma generator to be heated and the filter are adjacent to each other, but this arrangement is not limiting, and the aroma generator to be heated and the void may instead be adjacent to each other. In this case, because the aspiration quantity increases due to the smaller length f of the filter, the number and size of cavities formed in the filter, i.e., the surface area of the filter, can be reduced. Since the strength of the mouthpiece must also come solely from the cartridge exterior body, the thickness of a PE, PP, or other polyolefin resin, PET resin, CA resin, polylactic acid (PLA) or the like, and paper or the like serving as a material for the cartridge exterior body may be increased, as appropriate, in accordance with the material properties thereof.

**[0123]** FIG. 12 is a schematic diagram illustrating a straight cylindrical aroma cartridge 2-8 in which a mouthpiece 221-8 constituted from a filter 2212 which filters a gas and in which four cavities 221-8-c8 are formed, and a void 221-8-v2 formed by a cartridge exterior body, is configured so that an aroma generator 21 to be heated and the filter 2212 are adjacent, the cavities 221-8-c8 being straight cylindrical and being arranged in the filter 2212 from the longitudinal end part of the filter 2212 on the aroma-generator 21 to-be-heated side thereof, in rotationally symmetrical positions about the center axis of a straight cylinder existing in the longitudinal direction of the filter 2212. In this case as well, as described using FIG. 11, the aroma generator to be heated and the void may be adjacent to each other, and because the length f of the filter is decreased and the aspiration quantity increases, the number and size of cavities formed in the filter, i.e., the surface area of the filter, can be reduced. The strength of the cartridge exterior body is the same as in FIG. 11.

**[0124]** Such a filter provided with a cavity is extremely effective also as an aspiration optimization means for solving

the problem of reduced aspiration quantity in the conventional mouthpiece provided with a support member and/or cooling member.

**[0125]** FIG. 13 is a schematic diagram illustrating an aroma cartridge 2-9 according to an embodiment of the present invention. A mouthpiece 222 is adjacent to an aroma generator 21 to be heated, the mouthpiece 222 being provided with: a cylindrical support member 2221 for preventing the aroma generator 21 to be heated from moving toward the mouthpiece 222; and a filter 2222 which filters a gas and in which a single cavity 2222-c1 is formed, the filter 2222 being adjacent to the cylindrical support member 2221; the mouthpiece 222 and the aroma generator 21 to be heated are joined by the cartridge exterior body 24, which is wound thereon, and the cavity 2222-c1 is arranged in the filter 2222 from a longitudinal end part of the filter 2222 on the support member 2221 side thereof so that center axes of straight cylinders of the filter 2222 and the cavity 2222-c1 substantially coincide. In this case as well, the number, size, and shape of cavities are not limited by FIG. 13, and the configurations thereof illustrated in FIGS. 6-10 may also be applied. However, because the support member is substantially hollow, the number and size of cavities can be considerably reduced.

**[0126]** FIG. 14 is a schematic diagram illustrating an aroma cartridge 2-10 according to an embodiment of the present invention. A mouthpiece 223 is adjacent to the aroma generator 21 to be heated, the mouthpiece 223 being provided with a cylindrical support member 2231 for preventing the adjacent aroma generator 21 to be heated from moving toward a mouthpiece 223, a cylindrical cooling member 2232 which is adjacent to the support member and which cools a component that is volatilized upon heating of the aroma generator 21 to be heated, and a filter 2223 which filters a gas and which has a single cavity 2223-c1 adjacent to the cooling member 2232, and the mouthpiece 223 and the aroma generator 21 to be heated are joined by the cartridge exterior body 23, which is wound thereon. The cavity 2223-c1 is arranged in the filter 2223 from a longitudinal end part of the filter 2223 on the cooling member 2232 side thereof so that center axes of straight cylinders of the filter 2223 and the cavity 2223-c1 substantially coincide. In this case as well, the number, size, and shape of cavities are not limited by FIG. 14, and the configurations thereof illustrated in FIGS. 6-10 may also be applied.

**[0127]** FIG. 15 is a schematic diagram illustrating an aroma cartridge 2-11 according to an embodiment of the present invention. A mouthpiece 224 is adjacent to the aroma generator 21 to be heated, the mouthpiece 224 being provided with a cylindrical cooling member 2241 for cooling a component that is volatilized upon heating of the adjacent aroma generator 21 to be heated, and a filter 2242 which filters a gas and which has a single cavity 2242-c1 adjacent to the cooling member 2241, and the mouthpiece 224 and the aroma generator 21 to be heated are joined by the cartridge exterior body 23, which is wound thereon. The cavity 2242-c1 is arranged in the filter 2242 from a longitudinal end part of the filter 2242 on the cooling member 2241 side thereof so that center axes of straight cylinders of the filter 2242 and the cavity 2242-c1 substantially coincide. In this case as well, the number, size, and shape of cavities are not limited by FIG. 15, the configurations thereof illustrated in FIGS. 6-10 may also be applied, and the number and size of cavities can be designed, as appropriate, in accordance with the structure of the cooling member.

**[0128]** Following is a specific description of a means in the present invention for addressing deformation of the mouthpiece when a filter and a support member and/or a cooling member are arranged in the mouthpiece, as described using FIGS. 13 and 14, and the support member is lengthened to increase the aspiration quantity. Here, because a decrease in the aspiration quantity of gas is eliminated by preventing deformation of the mouthpiece, a mouthpiece shape reinforcement member serves as the aspiration optimization means.

**[0129]** FIG. 16 is a schematic diagram illustrating an aroma cartridge 2-12 according to an embodiment of the present invention for preventing deformation of a mouthpiece. A mouthpiece 225-1 is adjacent to the aroma generator 21 to be heated, the mouthpiece 225-1 being provided with a support member 2251-1 for preventing the adjacent aroma generator 21 to be heated from moving toward the mouthpiece 225-1, and a filter 2252-1 which is adjacent to the support member 2251-1 and which filters a gas, and the mouthpiece 225-1 and the aroma generator 21 to be heated are joined by the cartridge exterior body 23, which is wound thereon. The aspiration optimization means in this case is a single plate-shaped reinforcing material 2252-1-s1 which is in contact with an inner wall of a through hole 2251-1-h, and which is fixedly or movably arranged in the through hole 2251-1-h formed so that the center axis of a straight cylinder thereof is substantially the same as the center axis of the support member 2251-1, the reinforcing material 2252-1-s1 having said center axes in a plane thereof. The support member is thus supported from inside the through hole by the plate-shaped reinforcing material, and it is thereby possible to prevent deformation of the support member and prevent a decrease in aspiration quantity. Grooves may be formed in the through hole, and the plate-shaped reinforcing material may be fixed therein with an adhesive, for example, or the plate-shaped reinforcing material may simply be fitted in the through hole so as to be movable, but other methods can be used.

**[0130]** FIG. 17 is a schematic diagram illustrating an aroma cartridge 2-13 according to an embodiment of the present invention for preventing deformation of a mouthpiece. A mouthpiece 225-2 is adjacent to the aroma generator 21 to be heated, the mouthpiece 225-2 being provided with a support member 2251-2 for preventing the adjacent aroma generator 21 to be heated from moving toward the mouthpiece 225-2, and a filter 2252-2 which is adjacent to the support member 2251-2 and which filters a gas, and the mouthpiece 225-2 and the aroma generator 21 to be heated are joined by a

cartridge exterior body, which is wound thereon. The aspiration optimization means is a plate-shaped reinforcing material 2251-2-s2 which is included in a reinforcing support member 225-2, and in which two plate-shaped members in contact with an inner wall of a through hole 2251-2-h intersect, and the plate-shaped reinforcing material 2251-2-s2 is fixedly or movably arranged in the through hole 2251-2-h formed so that the center axis of a straight cylinder thereof is substantially the same as the center axis of the support member 2251-2, the reinforcing material 2251-2-s2 having said center axes in a plane thereof. This plate-shaped reinforcing material can prevent deformation more strongly than the plate-shaped reinforcing material shown in FIG. 16, and it is therefore possible to further increase the length of the support member and prevent a decrease in aspiration quantity. The method illustrated in FIG. 16, for example, can be applied without modification as the method for fixedly or movably arranging the support member, but other methods can be used.

**[0131]** FIG. 18 is a schematic diagram illustrating an aroma cartridge 2-14 according to an embodiment of the present invention for preventing deformation of a mouthpiece. A mouthpiece 225-3 is adjacent to the aroma generator 21 to be heated, the mouthpiece 225-3 being provided with a support member 2251-3 for preventing the adjacent aroma generator 21 to be heated from moving toward the mouthpiece 225-3, and a filter 2252-3 which is adjacent to the support member 2251-3 and which filters a gas, and the mouthpiece 225-3 and the aroma generator 21 to be heated are joined by a cartridge exterior body 23, which is wound thereon. The aspiration optimization means is a shape-reinforcing material as a reinforcing support member 2252-3 including a fixedly or movably arranged tubular reinforcing material 2251-3-s4 and four plate-shaped reinforcing materials 2251-3-s3. The tubular reinforcing material 2251-3-s4 is a concentric circular tube in a through hole 2251-3-h of the support member 2251-3 which is formed so that the center axis of a straight cylinder thereof is substantially the same as the center axis of the support member 2251-3, and which has substantially the same axis as the through hole 2251-3-h and has a radius smaller than a radius of the through hole 2251-3-h. The four plate-shaped reinforcing materials 2251-3-s3 are provided on an external peripheral side of the tubular reinforcing material 2251-3-s4 in a shape so as to contact an inner wall of the through hole 2251-3-h in a radial direction thereof. The shape-reinforcing material comprising the tubular reinforcing material and the plate-shaped reinforcing materials has an even greater reinforcing effect than the plate-shaped reinforcing material illustrated in FIG. 17, and the length of the support member can be even further increased. The method for fixedly or movably providing the support member is the same as in FIG. 16 in this case as well.

**[0132]** FIG. 19 is a schematic diagram illustrating an aroma cartridge 2-15 in which a (non-hollow) solid concentric cylindrical reinforcing material 2251-4-s4 is used instead of the tubular reinforcing material 2251-3-s4 formed by a concentric circular tube in FIG. 18. It is possible to change, as appropriate, between use of a hollow circular tube and a solid circular column in accordance with the balance between reinforcement effect and aspiration quantity.

**[0133]** The reinforcing support members in FIGS. 16-19 can be used together with the filters in which cavities are formed, described in FIGS. 5-10, to form a mouthpiece, and a cooling member can also be additionally connected to form a mouthpiece.

**[0134]** FIG. 20 is a schematic diagram illustrating an aroma cartridge 2-15, and illustrates an example of an aroma cartridge in which a mouthpiece is joined to an aroma generator to be heated which is adjacent thereto, a reinforcing support member of FIGS. 16-19 and a filter in which a cavity is formed, described in FIGS. 5-10, being connected in the mouthpiece. In this aroma cartridge, a mouthpiece 225-5 is adjacent to the aroma generator 21 to be heated, the mouthpiece 225-5 being provided with a reinforcing support member 2251-5 which is provided with shape-reinforcing materials 2251-3-s3 and 2252-3-s4 and which prevents the adjacent aroma generator 21 to be heated from moving toward the mouthpiece 225-5, and a filter 2252-5 adjacent thereto which filters a gas and in which a single cavity is formed, and the mouthpiece 255-5 and the aroma generator 21 to be heated are joined by a cartridge exterior body 23, which is wound thereon.

**[0135]** The cavity 2252-5-c1 is arranged in the filter 2252-5 in a longitudinal end part of the filter 2252-5 on the aroma-generator 21 to-be-heated side thereof so that center axes of straight cylinders of the filter 2252-5 and the cavity 2252-5-c1 substantially coincide. The aspiration optimization means herein is a shape-reinforcing material having: a tubular reinforcing material 2251-5-s4 as a hollow concentric circular tube in a through hole 2251-5-h of a support member 2251-5 which is formed so that the center axis of a straight cylinder thereof is substantially the same as the center axis of the support member 2251-5, and which has substantially the same axis as the through hole 2251-5-h and has a radius smaller than a radius of the through hole 2251-5-h; and four plate-shaped reinforcing materials 2252-5-s3 provided on an external peripheral side of the tubular reinforcing material 2251-5-s4 in a shape so as to contact an inner wall of the through hole 2251-5-h in a radial direction of the tubular reinforcing material 2251-5-s4; the aspiration optimization means being fixedly or movably arranged as the reinforcing support member 2251-5. This configuration is not limiting, and various reinforcing support members and various filters in which a cavity is formed can be combined.

**[0136]** FIG. 21 is a schematic diagram illustrating an aroma cartridge 2-15, and illustrates an example of an aroma cartridge in which a mouthpiece is connected to an aroma generator to be heated, a cooling member being interposed between a reinforcing support member of FIGS. 16-19 and a filter in which a cavity is formed, described in FIGS. 5-10. A mouthpiece 226 is adjacent to an aroma generator 21 to be heated, the mouthpiece 226 being provided with a reinforcing support member 2261 having shape reinforcement materials 2261-s3 and 2261-s4 for preventing the adjacent

aroma generator 21 to be heated from moving toward the mouthpiece 226, a cooling member for cooling a gas from the aroma generator 21 to be heated, and a filter 2263 which is adjacent to the cooling member 2262 and which filters a gas, and in which a single cavity 2263-c1 is formed, and the mouthpiece 226 and the aroma generator 21 to be heated are joined by a cartridge exterior body 23, which is wound thereon.

**[0137]** The cavity 2263-c1 is disposed in a longitudinal end part of the filter 2263 on the aroma-generator 21 to-be-heated side thereof so that center axes of straight cylinders of the filter 2263 and the cavity 2263-c1 substantially coincide. The aspiration optimization means herein is a shape-reinforcing material having: a tubular reinforcing material 2261-s4 as a hollow concentric circular tube in a through hole 2261-h of a support member 2261 which is formed so that the center axis of a straight cylinder thereof is substantially the same as the center axis of the support member 2261, and which has substantially the same axis as the through hole 2261-h and has a radius smaller than a radius of the through hole 2261-h; and four plate-shaped reinforcing materials 2261-s3 provided on an external peripheral side of the tubular reinforcing material 2261-s4 in a shape so as to contact an inner wall of the through hole 2261-h in a radial direction of the tubular reinforcing material 2261-s4; the aspiration optimization means being fixedly or movably arranged as the reinforcing support member 2261. This configuration is also not limiting in this case, and various reinforcing support members and various filters in which a cavity is formed can be combined with a cooling member interposed therebetween.

**[0138]** As the aspiration quantity is increased by improvement of the filter and support member as described above, heat of a gas is more readily transmitted by convection from the heating element to the filter. Adhesion between members constituting the aroma cartridge therefore decreases, and gas leaks from between members, which may adversely affect the aspiration quantity. Described below is an aroma cartridge capable of solving this problem, in which the aroma cartridge is provided with a heat insulation member between the mouthpiece and the aroma generator to be heated.

**[0139]** FIG. 22 is a schematic diagram illustrating an aroma cartridge 2-18 according to an embodiment of the present invention. The aspiration optimization means herein has a heat insulation member 2271. A mouthpiece 227 and an aroma generator 21 to be heated are adjacent, the mouthpiece 227 being provided with a heat insulation member 2271 adjacent to the aroma generator 21 to be heated, and a filter 2272 which is adjacent to the heat insulation member 2271 and which filters a gas, and the mouthpiece 227 and the aroma generator 21 to be heated are joined by a cartridge exterior body 23, which is wound thereon.

**[0140]** FIG. 23 is a schematic diagram illustrating an aroma cartridge 2-19 according to an embodiment of the present invention. The aspiration optimization means is also a heat insulation member 2281 in this case. A mouthpiece 228 and an aroma generator 21 to be heated are adjacent, the mouthpiece 228 being provided with a heat insulation member 2281 adjacent to the aroma generator 21 to be heated, a cylindrical cooling member 2282 which is adjacent to the heat insulation member 2281 and which cools a gas from the aroma generator 21 to be heated, and a filter 2283 which is adjacent to the cooling member 2282 and which filters a gas, and the mouthpiece 228 and the aroma generator 21 to be heated are joined by a cartridge exterior body 23, which is wound thereon.

**[0141]** The heat insulation members described above do not allow a general spread of high-temperature gas, unlike the support member adjacent to the aroma generator to be heated, and are preferably constituted from a heat-insulating porous body made of plastic, such as a sponge having continuous holes with long flow passages. The heat insulation members also function to retain the high-temperature gas to some degree and cool the gas, and need not have the degree of cooling functionality of a cooling member, and are preferably applied instead of a support member for preventing the aroma generator to be heated from moving toward the mouthpiece. Consequently, a length s of the heat insulation member depends upon the material used therein, but a length of about 1-5 mm is adequate.

**[0142]** A cover material and/or a partition wall material, which function as an aspiration optimization means for preventing an extreme decrease in aspiration quantity due to blockage of voids in the cooling member and the filter by dislodged material or dust of the non-tobacco material, will next be described using the accompanying drawings.

**[0143]** FIG. 24 is a partial schematic diagram of the aroma generator to be heated of an aroma cartridge according to an embodiment of the present invention. The aspiration optimization means herein includes a cover material 211 disposed on an aroma cartridge end part side from among both end parts of the aroma generator to be heated, and a partition wall material 212 disposed on the other end part side of the aroma generator to be heated. A material obtained by slicing a material such a filter extremely finely, a nonwoven fabric, or a material such as a mesh, which does not decrease the aspiration quantity of a gas, is preferably used to form the cover material 211 and the partition wall material 212, and may be fixed by an adhesive or the like to the aroma generator 21 to be heated.

**[0144]** Either one or both of the cover material and the partition wall material may be provided, in accordance with the state of the aroma-generating base material to be heated aroma generator to be heated in which aroma-generating base materials to be heated are bundled. The cover material and/or the partition wall material prevent clogging of the filter and/or the cooling member by dislodged material or dust, and ensure a stable aspiration quantity. The cover material and/or the partition wall material can also prevent dislodged material, dust, or the like from being generated when the aroma cartridge is impaled on the needle-shaped heating element.

**[0145]** Physical solution means for structural improvement to ensure the gas aspiration quantity when smoking the aroma cartridge were described in detail above using the accompanying drawings. A gas-generation-maintaining material

provided to the aroma generator to be heated, in order to solve the problem of a decrease in the aspiration quantity of gas, is described below using the accompanying drawings. The conventional aroma generator to be heated has the drawback that the released quantity of gas decreases over time, which brings about a reduction in the aspiration quantity of gas during smoking. The aroma cartridge of the present invention is provided with an aroma-generating base material to be heated which constitutes an aroma generator to be heated, to which is applied a chemical solution means, as a gas-generation-maintaining material for preventing a decrease in the aspiration quantity of gas.

**[0146]** First, FIG. 25 presents a schematic diagram (A) of an aroma-generating sheet to be heated which constitutes an aroma generator to be heated, according to an embodiment of the present invention, and a schematic diagram (B) of an aroma-generating filler to be heated which constitutes an aroma generator to be heated, according to an embodiment of the present invention.

**[0147]** The aroma-generating base material to be heated is produced by various producing steps (means), but is ultimately wound as a sheet or a filler to become an aroma-generating substrate to be heated. As indicated in FIGS. 2 and 3, the longitudinal direction of the heating-type smoking appliance (1) 11 or (2) 12 and a length z direction correspond, and the gas-generation-maintaining material is cut to a length z corresponding to the heating-type smoking appliance, but has an appropriate width w and thickness y for the gas-generation-maintaining material. Here, dimensions corresponding to the aroma generator to be heated that was described using FIG. 5 are presented as an example using FIG. 25. The longitudinal direction of the aroma cartridge and the length z direction correspond, and the aroma-generating base material to be heated is wrapped in paper to form an aroma generator to be heated. For the aroma-generating sheet (A) to be heated which is in the aroma generator to be heated, the length z of the heating-type smoking appliance is preferably 12 mm, and the width w and the thickness y thereof are preferably in the range of 60-90 mm and 0.1-1.0 mm, respectively. For the aroma-generating filler (B) to be heated, the length z is 12 mm, but the width x and the thickness y are preferably 1.0-2.0 mm and 0.1-1.0 mm, respectively. The aroma-generating filler to be heated is obtained by further cutting the aroma-generating sheet to be heated.

**[0148]** FIG. 26A illustrates an aroma generator to be heated in which a single sheet of the aroma-generating sheet to be heated of FIG. 25A is folded and wrapped in an interior material 21-p for the aroma generator to be heated, and FIG. 26B illustrates an aroma generator to be heated in which a single sheet of the aroma-generating sheet to be heated of FIG. 25A is wound and wrapped in the interior material 21-p for the aroma generator to be heated. FIG. 26C illustrates an aroma generator to be heated in which 50 units of the aroma-generating filler to be heated are wrapped in the interior material 21-p for the aroma generator to be heated. The outside diameter of each of these aroma generators to be heated is set as appropriate for the heating-type smoking appliance (1) 11 or (2) 12, but a filling ratio is within 60-90% when the outside diameter is set to 6.9 mm, corresponding to the aroma generator to be heated that is illustrated in FIG. 5. Severe successive fusion in the aroma-generating base material to be heated is not observed particularly when the filling ratio is 60-73%. This filling ratio is adjusted by the width w of the aroma-generating sheet to be heated and the number of aroma-generating fillers to be heated, and is not thus limited when the gas-generation-maintaining material is present.

**[0149]** Following is a specific description, using the accompanying drawings, of a gas-generation-maintaining material having a function for preventing a decrease in the quantity of gas released by the aroma generator to be heated, which is closely related to a decrease in the aspiration quantity of gas during smoking, and ensuring the aspiration quantity of gas; i.e., a specific description of an aroma-generating base material to be heated to which a chemical solution means is applied. In the aroma cartridge of the present invention, the aroma generator to be heated is provided with an aroma-generating base material to be heated, to which the chemical solution means is applied, as a gas-generation-maintaining material.

**[0150]** Methods [devices] for producing the conventional aroma-generating base material to be heated include various methods [devices], but an example thereof is illustrated in FIG. 33. The conventional aroma-generating base material to be heated is produced by: a step (means) for drying/pulverizing and then dry-mixing a non-tobacco material to prepare a non-tobacco material; a step (means) for preparing raw materials selected from an aerosol former, a binder, an adhesion inhibitor, a perfume, a non-tobacco material extract, an antimicrobial preservative, etc.; a step (means) for preparing pure water and an alcohol; a wet mixing step (means) for mixing the prepared ingredients at once; a paper-making step (means) for producing a water-containing sheet from a slurry produced by wet mixing; a molding step (means) for compressing or casting the resultant water-containing sheet to obtain a sheet; a step (means) for drying the sheet produced by the molding step (means); and a sheet processing step (means) for cutting or folding the dried aroma-generating sheet to be heated.

(Production Example 1) is presented as a specific example.

(Production Example 1)

**[0151]** The pulverized products below were loaded into a dry mixer as non-tobacco materials and dry-mixed for 5

minutes.

| | |
|---|---|
| Black tea dry pulverized product | 100 parts by mass |
| Licorice dry pulverized product | 20 parts by mass |
| Lotus leaf dry pulverized product | 10 parts by mass |

**[0152]** The dry mixture above and the ingredients below were loaded into a wet mixer and wet-mixed for 15 minutes.

| | |
|---|---|
| Polypropylene glycol | 25 parts by mass |
| Glycerin | 25 parts by mass |
| Sodium carboxymethyl cellulose | 5 parts by mass |
| Menthol | 3 parts by mass |
| Ethanol | 3 parts by mass |
| Pure water | 200 parts by mass |

**[0153]** In the step (means) for molding a sheet from a slurry obtained as described above, a water-containing sheet was created by loading a specified amount of the slurry on a frame provided with an appropriate drainboard. At this time in the present Production Example, assuming the moisture content of 100 in the slurry, the moisture content in the water-containing sheet was about 95.

**[0154]** The water-containing sheet was then passed three times through a press roll set to a predetermined clearance to mold the water-containing sheet, an amount of pure water corresponding to 7 parts by mass with respect to 100 parts by mass in the water-containing sheet passed three times through the press roll was then added to the water-containing sheet, and the water-containing sheet was passed five more times through the press roll.

**[0155]** The molded water-containing sheet obtained as described above was then dried for 300 minutes in a 35°C environment to create an aroma-generating sheet to be heated having a moisture content of 20% by mass. The drying temperature is preferably less than 50°C to maintain flavor. The drying temperature is more preferably less than 45°C, and even more preferably less than 40°C. The thickness of the sheet is adjusted as appropriate, but was set to 0.5 mm in the present Production Example. The sheet was cut, and a rectangular aroma-generating sheet to be heated having a length of 240 mm and a width of 75 mm, and an aroma-generating filler to be heated having a length of 240 mm and a width of 1.5 mm were obtained. The length direction of the filler and the sheet cut from the aroma-generating sheet to be heated was parallel to a rotational axis direction of the roll, and the width direction of the filler and the sheet was the rotation direction of the roll.

**[0156]** A single sheet of the aroma-generating sheet to be heated and 50 units of the aroma-generating filler to be heated, fabricated as described above, were wound and then cut to a length of 12 mm to produce an aroma generator to be heated, such as illustrated in FIG. 26A and FIG. 26C. An aroma cartridge of the type illustrated in FIG. 13, in which an aroma generator to be heated is joined to a mouthpiece provided with a support member and a filter, was fabricated. A PE tube in which a through hole having an inside diameter of 4.0 mm is provided in a cylinder having an outside diameter of 6.9 mm was used as the support member. A filter having a length of 23 mm, obtained by molding acetyl cellulose fibers into a cylindrical shape and winding paper having a basis weight of 34 g/m$^2$ thereon, was used as the filter. Using paper having a basis weight of 38 g/m$^2$, the cartridge exterior body was formed by half-winding the paper twice to give an inside diameter of 6.9 mm and sizing the paper. When a paper pipe formed by twice half-winding paper having a basis weight of 32-45 g/m$^2$ is used as the cartridge exterior body, an aroma cartridge is obtained that is suitable for use in which the aroma generator to be heated portion thereof is inserted on the heating element of a heating-type smoking appliance. An aroma cartridge was produced by inserting the support member and the filter from one end of the cartridge exterior body to form a mouthpiece, inserting the aroma generator to be heated from the other end of the cartridge exterior body, and then winding paper having a basis weight of 40 g/m$^2$ thereon so as to overlap with the mouthpiece portion. However, in order to clarify the effect of the production method (device) on the aroma-generating base material to be heated, i.e., the difference in function of the gas-generation-maintaining material, a filter in which a cavity was not formed as an aspiration optimization means was used as the filter.

**[0157]** The aroma generator to be heated and the aroma cartridge fabricated as described above were evaluated in the manner indicated below.

<<Evaluation 1>>

**[0158]** Fabricated aroma cartridges were packed into a paper box 70 mm on a long side thereof, 14 mm on a short side thereof, and having a height of 45 mm, so that the aroma generators to be heated were facing the bottom of the

box. A box containing aroma cartridges thus prepared was placed in a plastic bag and left to stand for two weeks in a 40°C environment. The box was then retrieved and left to stand for one day in a normal-temperature and normal-humidity environment, and the evaluation described below was performed. Packing material was taken from the aroma generators to be heated, and it was confirmed whether the aroma cartridges were packed together. The aroma cartridges were also smoked by five test subjects, and sensory evaluation of the aspiration quantity and flavor was performed.

| | |
|---|---|
| Rank A: | Aroma cartridge immediately comes loose when taken out with tweezers<br>Adequate aspiration quantity and flavor perceived by four or more subjects |
| Rank B: | Aroma cartridge comes loose when pressed with tweezers<br>Adequate aspiration quantity and flavor perceived by two or more subjects |
| Rank C: | Aroma cartridge remains in a mass even when pressed with tweezers Adequate aspiration quantity and flavor not perceived by any subject |

**[0159]** For aroma cartridges in Rank C, difficulty of insertion on the heating element of the heating-type smoking took is made highly likely by prolonged storage and other factors.

**[0160]** The aroma cartridge fabricated in (Production Example 1) was evaluated as Rank C, the aroma-generating sheet to be heated and the aroma filler to be heated fused over time, the quantity of gas released during smoking, i.e., the gas aspiration quantity, was decreased and flavor also deteriorated, and the aroma-generating sheet to be heated and the aroma filler to be heated did not function as gas-generation-maintaining materials for the aroma generator to be heated.

**[0161]** This problem was solved by improving the production method (device). A feature of the improved production method (device) is that a second wet mixing step (means) is introduced as a producing step (means), as indicated in FIG. 27. As is clear from FIG. 27, an aroma-generating base material to be heated is produced by: a dry mixing step (means) Z1 for mixing a dried and pulverized non-tobacco material; a first wet mixing step (means) M2 for mixing the non-tobacco material produced in the wet mixing step (means) and a material selected from an aerosol former, a binder or thickener, crosslinked PVP, a perfume, a non-tobacco material extract, $\beta$-cyclodextrin, microcrystalline cellulose, and an antimicrobial preservative in a mixture of alcohol and pure water; a second wet mixing step (means) M3 for producing a slurry including the non-tobacco material, etc., by adding additional pure water and/or alcohol to the mixture of alcohol and pure water including the non-tobacco material, etc., produced by the first wet mixing step (means); a paper-making step (means) S1 for producing a water-containing sheet from the slurry produced by the second wet mixing step (means); a sheet molding step (means) S2 for compressing the water-containing sheet to obtain a sheet; a drying step (means) S3 for producing an aroma-generating sheet to be heated by drying the sheet produced by the molding step (means); and a sheet processing step (means) H1 for cutting or folding the aroma-generating sheet to be heated.

(Production Example 2) is presented as a specific example.

(Production Example 2)

**[0162]** Black tea leaves were dried at 70°C to give a moisture content of 2% by mass, and then pulverized. Licorice, lotus leaves, and Korean ginseng were also dried and pulverized in the same manner. The drying temperature is preferably 60°C-80°C. When the drying temperature is in this range, it is easy to reach the desired moisture content while avoiding dissipation of necessary flavor components. The desired moisture content is even easier to reach when the drying temperature is 65°C or above, and dissipation of necessary flavor components can be further prevented when the drying temperature is 75°C or below.

**[0163]** The moisture content after pulverization is preferably 5% by mass or less. Slurry formation in the subsequent step (means) is thereby facilitated. A moisture content after pulverization of 3% by mass or less is more preferred. A moisture content of 0.1% by mass or greater is preferred to enable good compatibility with water or the like.

**[0164]** The dried and pulverized materials described above, passed through an 80 mesh sieve, were used as non-tobacco materials, which the non-tobacco materials were loaded into a dry mixer in the blending quantities shown below and dry-mixed for 5 minutes.

| | |
|---|---|
| Black tea dry pulverized product | 100 parts by mass |
| Licorice dry pulverized product | 20 parts by mass |
| Lotus leaf dry pulverized product | 10 parts by mass |
| Korean ginseng dry pulverized product | 5 parts by mass |

**[0165]** The dry mixture above and the ingredients below were loaded into a wet mixer, and a first wet mixing was performed for 15 minutes.

| | |
|---|---|
| Polypropylene glycol | 30 parts by mass |
| Glycerin | 20 parts by mass |
| Sodium carboxymethyl cellulose | 5 parts by mass |
| Menthol | 3 parts by mass |
| Ethanol | 3 parts by mass |
| Pure water | 20 parts by mass |

**[0166]** Then, 180 parts by mass of pure water and 10 parts by mass of ethanol were additionally loaded in the wet mixer including the above slurry, and a second wet mixing was performed for 10 minutes. Ethanol was added in this case because the dispersion state of the dry pulverized products with respect to polypropylene glycol and glycerin can be markedly improved thereby. The alcohol is not limited to ethanol, insofar as the alcohol is a lower monoalcohol. The added amount of such a lower monoalcohol is preferably 0.1-10 parts by mass with respect to 100 parts by mass of the dry pulverized products. An improved dispersion state is observed when the aforementioned added amount is 0.1 part by mass or greater, and keeping the added amount to 10 parts by mass or less makes it possible to suppress persistence of the lower monoalcohol. The effect is more pronounced when the added amount is 0.5-5 parts by mass.

**[0167]** The reason for loading the pure water first to form the mixture is that a slurry having better dispersion can be obtained by advancing dispersion of the mixture beforehand, and then diluting/mixing with additional water. It is also preferred to divide loading of the water into multiple additions. When the water is loaded in multiple additions, a combination of additions is preferred in which small amounts of water are loaded at first, and the amount of water loaded is subsequently increased. This is because dispersion is enhanced to a high degree during loading of water at first, and the slurry becomes uniform as the amount of water loaded is subsequently increased.

**[0168]** In the step (means) for molding a sheet from a slurry obtained as described above, a water-containing sheet was created by loading a specified amount of the slurry on a frame provided with an appropriate drainboard. At this time in the present Production Example, assuming the moisture content of 100 in the slurry, the moisture content in the water-containing sheet was about 95.

**[0169]** The water-containing sheet was then passed three times through a press roll set to a predetermined clearance to mold the water-containing sheet, an amount of pure water corresponding to 7 parts by mass with respect to 100 parts by mass in the water-containing sheet passed three times through the press roll was then added to the water-containing sheet, and the water-containing sheet was passed five more times through the press roll. Preferably, 2 parts by mass to 15 parts by mass of water are added with respect to 100 parts by mass of the water-containing sheet. Adding water over the course of molding the water-containing sheet a plurality of times in this manner has the effect that the water included in the water-containing sheet is readily made uniform in a certain range, and has the effect that conditions in a subsequent drying step (means) can be made uniform, and that the quality of the final product can be made uniform.

**[0170]** The molded water-containing sheet obtained as described above was then dried for 300 minutes in a 35°C environment to create a molded sheet for an electronic cigarette filler, having a moisture content of 20% by mass. The drying temperature is preferably less than 50°C to maintain flavor. The drying temperature is more preferably less than 45°C, and even more preferably less than 40°C. The thickness of the sheet was set to 0.5 mm. In order to be wound as an aroma generator to be heated, the sheet was cut into an aroma-generating sheet to be heated having a length z of 240 mm and a width x of 75 mm, and an aroma-generating filler to be heated having a length z of 240 mm and a width x of 1.5 mm.

**[0171]** A single sheet of the aroma-generating sheet to be heated and 50 units of the aroma-generating filler to be heated, produced by the above method (device), were wound and then cut to a length z of 12 mm to produce an aroma generator to be heated, such as illustrated in FIG. 26A and FIG. 26C. In the same manner as in (Production Example 1), an aroma cartridge of the type illustrated in FIG. 13, in which an aroma generator to be heated is joined to a mouthpiece provided with a support member and a filter, was fabricated. However, in order to clarify the effect of the production method (device) on the aroma-generating base material to be heated, i.e., the difference in function of the gas-generation-maintaining material, a filter in which a cavity was not formed as an aspiration optimization means was used as the filter.

**[0172]** The aroma cartridge was subjected to <<Evaluation 1>> in the same manner as the aroma cartridge fabricated in (Production Example 1), and a result of Rank A was obtained. This reason for this result was considered to be that the aroma-generating base material to be heated which was produced by this method (device) had minimal fusion over time within or between the aroma-generating base materials to be heated, and little change in the amount of gas released by heating, and that the gas aspiration quantity being maintained during smoking. Specifically, the aroma-generating base material to be heated which was produced by this method (device) functions as a gas-generation-maintaining material for the aroma-generating substrate to be heated.

**[0173]** The production method (device) illustrated in FIG. 27 was improved to obtain the production method (device) illustrated in FIG. 28. The production method (device) of FIG. 28 is characterized by comprising the production method (device) illustrated in FIG. 27, a step (means) S3 for adding an aerosol former when the moisture content of the sheet becomes less than 50% being further added in the sheet molding step (means) S2. Specifically, the blended quantity of propylene glycol in the first wet mixing in (Production Example 2) was reduced by 10 parts by mass, an ethanol 50% solution of propylene glycol was sprayed at a temperature of less than 40°C to cause the propylene glycol to be absorbed into the sheet, and the propylene glycol reduced in the first wet mixing was added back. Here, the concentration of the alcohol solution of the aerosol former is preferably in the range of 20-80% from the perspective of absorbability of the aerosol former and drying properties of the alcohol. The aerosol former is not readily absorbed when the concentration is high, and the alcohol takes time to dry when the concentration is low. The temperature for absorption is also preferably 20-50°C for the sake of absorbability of the aerosol former. Evaporation of the aerosol former is severe when the temperature is too high, and the aerosol former is not readily absorbed when the temperature is too low.

**[0174]** The dispersion state in the second wet mixing was good, and absorption of propylene glycol in this step (means) therefore proceeded rapidly. The aroma-generating base material to be heated having a thickness of 0.5 mm, which was produced by this method (device), was also cut to the same size as in (Production Example 2) to produce an aroma cartridge. When the aroma cartridge was subjected to <<Evaluation 1», a result of Rank A was obtained, and it was clear that the aroma-generating sheet produced by this method (device) also functions as a gas-generation-maintaining material for the aroma-generating substrate to be heated.

**[0175]** The improvements shared by the production methods [devices] of FIGS. 27 and 28 are improvements in the mixing and dispersion of the non-tobacco material and the aerosol former. In view of this point, the process (means) for producing an aroma-generating base material to be heated that is illustrated in FIG. 29 was discovered as a production method (device) which does not use a step (means) for mixing and dispersing the non-tobacco material and the aerosol former.

**[0176]** Specifically, an aroma-generating base material to be heated is produced by: a wet mixing step (means) M1 for mixing, with pure water, a dried and pulverized non-tobacco material for producing a gas-generation-maintaining material, and producing a slurry of the non-tobacco material; a paper-making step (means) S1 for producing a water-containing sheet from the slurry produced by the wet mixing step (means); a sheet molding step (means) S2 for compressing or casting the water-containing sheet to obtain a sheet; a drying step (means) S3 reducing the moisture content of the sheet produced by the sheet molding step (means) to less than 50% by mass; an absorption and adsorption step (means) S4 for coating the sheet produced by the drying step (means) with, or dipping the sheet into, an alcohol and pure water mixture of a material selected from an aerosol former, a binder or thickener, crosslinked PVP, a perfume, a non-tobacco material extract, $\beta$-cyclodextrin, microcrystalline cellulose, a concentrate of water discharged in the sheet molding step (means), and an antimicrobial preservative; a drying step (means) for producing an aroma-generating sheet to be heated, by drying the sheet produced by the absorption and adsorption step (means); and a sheet processing step (means) H1 for cutting or folding the aroma-generating sheet to be heated.

(Production Example 3) is presented as a specific example of this production method (device).

(Production Example 3)

**[0177]**

| | |
|---|---|
| Wood fibers | 50 parts by mass |
| Dried black tea | 50 parts by mass |
| Water | 5000 parts by mass |

**[0178]** The above ingredients were mixed to obtain a slurry.

**[0179]** The slurry was cast to obtain a sheet having at thickness of 0.5 mm. Residual water from casting was concentrated and stored, and used for the next step (means).

**[0180]** The sheet was dried, the ingredients below were added per 100 parts by mass of the sheet, and the product was dried to produce a sheet.

| | |
|---|---|
| Polypropylene glycol | 10 parts by mass |
| Glycerin | 20 parts by mass |
| Sodium carboxymethyl cellulose | 2 parts by mass |
| Menthol (50% ethanol solution) | 3 parts by mass |

(continued)

| | |
|---|---|
| Concentrated residual water from casting | 50 parts by mass |

**[0181]** The resultant sheet was used to fabricate an aroma generator to be heated and an aroma cartridge which uses the same, in the same manner as in (Production Example 2), and when <<Evaluation 1>> thereof was performed, a result of Rank A was obtained. It was clear that the aroma-generating sheet to be heated that was produced by this method (device) also functions as a gas-generation-maintaining material for the aroma-generating substrate to be heated.

**[0182]** The production methods [devices] heretofore described feature fabricating an aroma-generating sheet to be heated by producing a slurry of a non-tobacco material, etc., and making a paper thereof. However, since good results have been obtained from a method (device) in which an aerosol former, a perfume, a binder, and other components are absorbed into a water-containing sheet produced by making a paper of a slurry of only a non-tobacco material, as illustrated in FIG. 29, a step (means) for making a paper from a slurry of material having various properties is thought to be unreasonable, and as a result of investigating a production method (device) that does not require a paper making step (means), the method (device) illustrated in FIG. 30 was discovered. This method is characterized in that a large shear force and compression force, such as from a three-roll mill, are applied to a mixture of a non-tobacco material and other ingredients.

**[0183]** Specifically, this method is a method (device) for producing an aroma-generating base material to be heated, by: non-tobacco material preparation steps (means) Z1 and 2 for drying an pulverizing a non-tobacco material; a perfume and/or non-tobacco extract dissolving step (means) M1 for mixing at least a perfume and/or a non-tobacco material extract and crosslinked PVP and/or $\beta$-cyclodextrin in alcohol to cause the perfume and/or non-tobacco extract to reside in the crosslinked PVP and/or $\beta$-cyclodextrin; an aerosol former dissolving step (means) M2 for mixing at least an aerosol former and a binder or thickener with pure water; a wet mixing step (means) M3 for mixing the material produced by the non-tobacco material preparation step (means), the material produced by the perfume and/or non-tobacco extract dissolving step (means), and the material produced by the aerosol former dissolving step (means); a sheet molding step (means) S1 for producing an aroma-generating sheet to be heated, by compression from the material produced by the wet mixing step (means); and a sheet processing step (means) H1 for cutting or folding the aroma-generating sheet to be heated.

(Production Example 4) is presented as a specific example of this production method (device).

(Production Example 4)

**[0184]** In the non-tobacco material preparation steps (means) Z1 and 2 for drying and pulverizing a non-tobacco material, a non-tobacco material having a moisture content of 20% by mass was prepared using black tea leaves as the non-tobacco material, by drying the non-tobacco material in an oven at 70°C, then pulverizing the material using an agitation mill and passing the material through an 80 mesh sieve.

**[0185]** In the step (means) M1 for dissolving menthol, menthol is dissolved by weighing out and mixing menthol, a lower alcohol, and a water-insoluble crosslinked polymer. The water-insoluble crosslinked polymer is preferably added and mixed after the menthol is dissolved in the lower alcohol. An effect whereby dissipation of the menthol is suppressed is obtained when menthol, a lower alcohol, and a water-insoluble crosslinked polymer are mixed.

**[0186]** Here, the menthol is not limited to being obtained from a natural product, and a synthetic product can also be used. Peppermint, mint, peppermint oil, and other materials that include menthol may also be used.

**[0187]** The lower alcohol is a solvent for dissolving the menthol, and ethyl alcohol is especially preferred for use.

**[0188]** The water-insoluble crosslinked polymer is intended as a polymer which is obtained by crosslinking a polymer that is water-soluble in the non-crosslinked form thereof, which then becomes insoluble in water and swells. It is, of course, preferred that the water-insoluble crosslinked polymer swell and not dissolve in the lower alcohol, and such a polymer is selected. Such a water-insoluble crosslinked polymer has a hydrophilic component and a hydrophobic component, and it is thought that the hydrophilic component contributes to swelling, and that dissipation of the menthol is suppressed by orienting of the hydrophilic component toward the menthol. Preferred examples of the hydrophilic crosslinked polymer include crosslinked PVP, and crosslinked polysaccharides obtained by subjecting a water-soluble polysaccharide to epoxy crosslinking, ester crosslinking, and ether crosslinking. An effect in which menthol dissipation is markedly suppressed is observed particularly when ethanol and crosslinked PVP are used together with menthol.

**[0189]** It is sufficient to add enough menthol to achieve a target amount of a desired flavor, but the menthol content in the aroma-generating base material to be heated is preferably 0.1-10% by mass, and more preferably 0.2-5% by mass.

**[0190]** When forming the aroma-generating base material to be heated, the added amount of the hydrophilic crosslinked polymer is preferably 10-2000 parts by mass, more preferably 50-600 parts by mass, with respect to 100 parts by mass of menthol.

**[0191]** In order for the effect of inhibiting dissipation of the menthol to be obtained, the hydrophilic crosslinked polymer is preferably present in a ratio of 2% by mass or more, more preferably 4% by mass or more, in the aroma-generating base material to be heated. Including the hydrophilic crosslinked polymer in such an amount makes long-term storage possible while suppressing dissipation of the menthol, and makes it possible for the cooling sensation of menthol to be enjoyed even after long-term storage. The content of the hydrophilic crosslinked polymer in the aroma-generating base material to be heated is preferably 20% by mass or less, and more preferably 10% by mass or less. Flavors caused by non-plant-derived polyphenols and the like can be maintained when the content of the hydrophilic crosslinked polymer is 10% by mass or less.

**[0192]** The lower alcohol used is preferably included in the amount of 50 parts by mass or more with respect to 100 parts by mass of menthol. When the amount of the lower alcohol is 100 parts by mass or more, adequate mixing of the hydrophilic crosslinked polymer is possible while the menthol is dissolved. When the amount of the lower alcohol is 2000 parts by mass or less, persistence of the lower alcohol in subsequent steps (means) can be reduced, and an efficient production process (means) can be obtained.

Based on the above, as an example,

**[0193]**

| | |
|---|---|
| Menthol | 100 parts by mass |
| Ethyl alcohol | 200 parts by mass |
| Polyvinylpolypyrrolidone | 200 parts by mass |

were weighed, the menthol was dissolved in ethyl alcohol to obtain a menthol ethyl alcohol solution, crosslinked PVP was then added to the menthol ethyl alcohol solution and agitation-mixed, and a menthol/ethyl alcohol/crosslinked PVP mixture was obtained.

**[0194]** Then, in the step (means) M2 for dissolving an aerosol former and other materials, an aerosol former, a flavor additive, a preservative, a binder or thickener, and other ingredients are dissolved in pure water.

**[0195]** Here, glycerin, propylene glycol, sorbitol, triethylene glycol, lactic acid, diacetin (glycerin diacetal), triacetin (glycerin triacetate), triethylene glycol diacetate, triethyl citrate, isopropyl myristate, methyl stearate, dimethyl dodecane dioate, dimethyl tetradecanedioate, or the like can be used as the aerosol former. Glycerin and propylene glycol are particularly preferred for use. These aerosol formers are preferably used in an amount of 1-80% by mass, more preferably 10-40% by mass, with respect to the aroma-generating base material to be heated.

**[0196]** A perfume for adding flavor is used as needed, and examples thereof include essences of peppermint, cocoa, coffee, black tea, and the like.

**[0197]** An antimicrobial preservative for food can also be added as needed. Sorbic acid, potassium sorbate, benzoic acid, sodium benzoate, or the like can be used as the antimicrobial preservative.

**[0198]** Guar gum, xanthan gum, gum arabic, locust bean gum, and other gums; hydroxypropyl cellulose, carboxymethyl cellulose, hydroxyethyl cellulose, methyl cellulose, ethyl cellulose, and other modified cellulose polymers; a starch, alginic acid and other organic acids; sodium alginate, sodium carboxymethyl cellulose, carrageenan, agar, and pectin or another polysaccharide of a conjugate base salt or the like of an organic acid can be used as the binder or thickener or the like. The above substances may be used in combination.

**[0199]** A 20% aqueous solution of glycerin, propylene glycol, sodium carboxymethyl cellulose, methyl cellulose, glucomannan, and xylitol from among the above substances was prepared.

**[0200]** Then, in the step (means) M3 for wet mixing the materials of the non-tobacco material preparation steps (means) Z1 and 2, the perfume dissolving step (means) M1, and the aerosol former dissolving step (means) M2, a non-tobacco plant composition for an aroma-generating base material to be heated was then fabricated by stirring the materials in the blending ratios below for 15 minutes while applying shear force through use of an impeller, using an ordinary wet mixer.

| | |
|---|---|
| Black tea dry pulverized product | 100 parts by mass |
| Menthol/ethyl alcohol/crosslinked PVP | 25 parts by mass |
| Glycerin | 30 parts by mass |
| Propylene glycol | 30 parts by mass |
| Sodium carboxymethyl cellulose | 4 parts by mass |
| Methyl cellulose | 15 parts by mass |
| Xylitol aqueous solution | 8 parts by mass |
| Glucomannan | 1 part by mass |

**[0201]** A three-roll mill was used in the step (means) for molding a sheet. A step for loading the above composition into a three-roll mill, adding 20 parts by mass of pure water while observing the state of the sheet, and collecting a sheet-shaped product by pressing a doctor blade against a roll was repeated 8 times, and a final sheet-shaped non-tobacco plant composition was obtained. When a three-roll mill is used, while kneading, dispersion, and the like are performed by a compression force from pressing between close rolls and a shear force from the roll speed difference, the desired sheet thickness can be obtained using the doctor blade, and it is possible to produce a sheet that is more uniform than a sheet fabricated by a slurry paper-making step (means). Besides a three-roll mill, a press roller or press machine can also be suitably used.

**[0202]** In the sheet molding step (means) S1, a non-tobacco plant, an aerosol former, a perfume, an antimicrobial preservative, a binder or thickener, water, or the like may be added as needed.

**[0203]** The pure water used in the present invention is preferably pure water which has been sterilized or from which microbes have been removed, but the pure water may also be obtained using a reverse osmosis membrane, ion exchange, or the like.

**[0204]** A sheet having a thickness of approximately 0.5 mm was molded in the sheet molding step (means) S1. The thickness of the sheet may be in the range of 0.1-1.0 mm or 0.1-0.5 mm.

**[0205]** This aroma-generating sheet to be heated having a thickness of 0.5 mm was then cut into an aroma-generating sheet to be heated and an aroma-generating filler to be heated, in the same manner as in (Production Example 2), and was then processed into an aroma generator to be heated, and assembled into an aroma cartridge. When <<Evaluation 1>> thereof was performed, a result of Rank A was obtained, and it was clear that the aroma-generating sheet to be heated that was produced by this method (device) also functions as a gas-generation-maintaining material for the aroma-generating substrate to be heated.

**[0206]** In an aroma-generating base material to be heated that uses a non-tobacco material, the component compositions and the properties thereof are diverse, and it has become clear that nonuniformity of mixing, dispersal, and solution state thereof results in changes over time such as bleed-out of the aerosol former from the aroma-generating base material to be heated, and causes the quantity of gas released from the aroma-generating base material to be heated to decrease and the gas aspiration quantity during smoking to decrease. Consequently, the problem of a change in the gas aspiration quantity over time is solved by improving the nonuniformity.

**[0207]** Furthermore, the binder or thickener, which is one of the constituent materials of an aroma-generating base material to be heated that uses a non-tobacco material, was discovered to be a cause of problems that are specific to an aroma cartridge that uses a non-tobacco material. The binder or thickener is added to prevent fusion within the aroma-generating base material to be heated or between aroma-generating base materials to be heated and to prevent the aggregated state thereof from being disrupted due to the inability to include a large quantity of fibers. However, it was learned that the density of the aroma-generating base material to be heated increases when the added amount of the binder or thickener is increased, and although the aggregated state thereof can be maintained, the aroma-generating base material to be heated shrinks over time, and bleed-out of the aerosol former becomes severe. As a result of investigating the added amount of the binder, the addition method (device), and the type of the binder, it was discovered that the problems described above can be solved by an aroma-generating base material to be heated that is produced by the method (device) illustrated in FIG. 31.

**[0208]** Specifically, an aggregated state can be stably maintained, and there is no blockage of gas flow passages in an aroma-generating base material to be heated that is produced by: steps (means) Z1 and 2 for preparing a dried and pulverized non-tobacco material; a step (means) M1 for producing a first binder aqueous solution in which a first binder is dissolved in pure water; a first wet mixing step (means) M1 for mixing a material prepared by steps (means) Z4 and 5 for preparing a material selected from an aerosol former, crosslinked PVP, a perfume, a non-tobacco material extract, $\beta$-cyclodextrin, microcrystalline cellulose, and an antimicrobial preservative; an aging step (means) Y1 for stabilizing a mixture produced by the first wet mixing step (means); a second wet mixing step (means) M2 for mixing an aged mixture produced by the aging step (means) and a second binder aqueous solution produced by a step (means) Z6 for dissolving a second binder in pure water; a sheet molding step (means) S1 for producing an aroma-generating sheet to be heated, by compression from the material produced by the second wet mixing step (means); and a sheet processing step (means) H1 for cutting or folding the aroma-generating sheet to be heated. Fusion over time between the aroma-generating base materials to be heated was also not observed.

(Production Example 5) is presented as a specific example of this production method (device).

(Production Example 5)

**[0209]** In the step (means) Z1 for drying and pulverizing the raw material non-tobacco plant, the moisture content is preferably adjusted to facilitate absorption or support of the aerosol former, pure water, and other components, and the drying temperature is preferably 60-80°C or lower. When the drying temperature is in this range, it is easy to reach the

desired moisture content while avoiding dissipation of necessary flavor components. The desired moisture content is even easier to reach when the drying temperature is 65°C or above, and dissipation of necessary flavor components can be further prevented when the drying temperature is 75°C or below. The moisture content after drying/pulverization is preferably 5% by mass or less, and slurry formation in the subsequent step (means) is thereby facilitated. A moisture content after drying/pulverization of 3% by mass or less is more preferred. However, compatibility with water, etc., decreases when the moisture content is 0.1% by mass or greater. By further providing a sieving step (means) for sieving the dried pulverized product, a non-tobacco plant having the desired particle size can be supplied to the first wet mixing step (means) M3, and slurry formation is facilitated.

**[0210]** Celluloses, konjac mannan (glucomannan), guar gum, pectin, carrageenan, tamarind seed gum, gum arabic, soybean polysaccharide, locust bean gum, karaya gum, xanthan gum, agar, corn starch, and the like can be cited as examples of the first binder used in the preparation step (means) Z3 for dissolving a first binder in pure water, but celluloses are preferred. Regarding viscosity, mixing with the non-tobacco plant is favorable when the solution viscosity is 300 mPa·s or greater. A solution viscosity of 5000 mPa·s or greater is appropriate for binding of a non-tobacco plant. The solution viscosity is a value measured using a Brookfield viscometer at 10-30 rpm in a 25°C environment, by preparing a 1% aqueous solution, starting rotation of the rotor, and taking the measurement value when the display value stabilizes. Here, although the upper limit of measurement by the Brookfield viscometer is 100,000 mPa·s, a viscosity exceeding this upper limit is within the viscosity range described above.

**[0211]** Celluloses that are preferred as the first binder generally include cellulose, cellulose derivatives, and metal salts thereof, but a water-soluble cellulose is particularly preferred in the present invention from the perspective of binding a non-tobacco plant. Examples of such celluloses can include methyl cellulose, ethyl cellulose, carboxymethyl cellulose, carboxyethyl cellulose, hydroxymethyl cellulose, hydroxyethyl cellulose, hydroxypropyl cellulose, and sodium salts, potassium salts, calcium salts, and other metal salts of these celluloses. Among the above examples, metal salts of celluloses are more preferred, and sodium carboxymethyl cellulose is even more preferred.

**[0212]** Glycerin, propylene glycol, sorbitol, triethylene glycol, lactic acid, diacetin (glycerin diacetal), triacetin (glycerin triacetate), triethylene glycol diacetate, triethyl citrate, isopropyl myristate, methyl stearate, dimethyl dodecane dioate, dimethyl tetradecanedioate, or the like can be used as the aerosol former used in the step (means) Z4 for preparing the aerosol former, but glycerin and propylene glycol are particularly preferred. These aerosol formers are used in a range of 1-80% by mass, particularly preferably 10-40% by mass, with respect to the composition of the aroma-generating base material to be heated.

**[0213]** In a step (means) Z5 for preparing a component used in addition to the above components, menthol, peppermint, cocoa, coffee, black tea essence, or another flavoring agent for adding flavor as needed, crosslinked PVP or $\beta$-cyclodextrin having a function for causing temporary residence of the flavoring agent, microcrystalline cellulose having moldability and ease of release from a die or the like, sorbic acid, potassium sorbate, benzoic acid, sodium benzoate, or another food antimicrobial preservative for storage stability, or the like can be added.

**[0214]** The materials prepared as described above are mixed in the first wet mixing step (means) M1. The mixer need not be specialized, and may be a mixer in which materials in a mixing tank are mixed while a shear force is applied thereto by an impeller, for example, and it is also possible to knead and further intensify mixing using a roll mill, a kneader, or an extruder. The mixing temperature in this step (means) is preferably 40°C or lower, and more preferably 30°C or lower, and maintaining the temperature at about 25°C is even more preferred. The reason for this is that there is a risk of dissipation of fragrance components when excessive heat is applied during mixing. The temperature of the mixing tank must therefore be controlled.

**[0215]** A first mixture produced by the first wet mixing step (means) M1 preferably undergoes an aging step (means) Y1 for leaving the first mixture to stand for a predetermined time at a predetermined temperature, but this step (means) is not essential. However, addition of the binder must be divided into a first mixing step (means) and a second mixing step (means). When a non-tobacco material mixture in which the binder is dividedly added and which is not subjected to an aging step (means) Y1, and an aged mixture subjected to the aging step (means) Y1 are processed into an aroma cartridge as the aroma-generating base material to be heated, and smoking evaluation thereof is performed using the heating-type smoking appliance illustrated in FIG. 2, for example, the initial aspiration quantity and flavor are both improved. When the aroma cartridge is evaluated for storage stability in a high-temperature and high-humidity environment, there is no fusion within the aroma-generating base material to be heated or between aroma-generating base materials to be heated, and there is no change over time in the released quantities, i.e., the aspiration quantities, of aerosol smoke and fragrance components of the non-tobacco material during initial smoking, and a change in flavor is also not recognized. The above effects are prominent particularly when a tea is used as the non-tobacco material, and teas are therefore preferred. However, the aging step (means) Y1 can further increase these effects.

**[0216]** The temperature in the aging step (means) Y1 is preferably 15-30°C, and more preferably 18-24°C. The reason for this is that the flavor improvement described above is increased when the temperature is 15°C or higher, and change in flavor and change in aspiration quantity over time are suppressed and improvement of flavor change over time is maintained when the temperature is 30°C or below. These effects are more pronounced when the temperature is 18-24°C.

The time for the aging step (means) Y1 is preferably 72-336 hours, and more preferably 96-192 hours. The reason for this is that an improvement of flavor is observed when the time is 72 hours or more, and change in flavor and change in aspiration quantity over time are suppressed and improvement of flavor change over time is maintained when the time is 336 hours or less. These effects are more pronounced when the time is 96-192 hours. Aging is preferably performed with the mixture from the first wet mixing in a sealed condition. This is to prevent dissipation of flavor.

**[0217]** The mixture immediately after the first wet mixing and the mixture aged after the first wet step (means) are inputted to the second wet mixing step (means) M2. The second wet mixing step (means) M2 has the feature of adding a second binder and mixing. The effect of divided addition of the first binder and the second binder is that, in addition to the effect of improving initial aspiration quantity and flavor and reducing a change in aspiration quantity and flavor over time, molding into a desired form is facilitated in the sheet molding step (means) H1. The reason for this is that mixing is easier than during addition in the first step (means), the time until the viscosity of the mixture becomes even can be shortened, and viscosity adjustment is facilitated.

**[0218]** As in the case of the first binder, celluloses, konjac mannan (glucomannan), guar gum, pectin, carrageenan, tamarind seed gum, gum arabic, soybean polysaccharide, locust bean gum, karaya gum, xanthan gum, agar, starch, corn starch, and the like can be used as the second binder, but polysaccharides other than cellulose are preferred. Regarding viscosity, mixing with the non-tobacco plant is favorable when the solution viscosity is 300 mPa·s or greater, as in the case of the first binder. A solution viscosity of 5000 mPa·s or greater is appropriate for binding of a non-tobacco plant. This viscosity is also measured by the method (device) described above. Here, although the upper limit of measurement by the Brookfield viscometer is 100,000 mPa·s, a viscosity exceeding this upper limit is within the viscosity range described above.

**[0219]** A polysaccharide is preferred for use as the second binder. Among polysaccharides, a polysaccharide that is water soluble or that includes water and swells or forms a gel is particularly preferred for use. Through use of such a polysaccharide, the molded aroma-generating base material to be heated maintains an aggregated state, molding workability thereof is increased, and the occurrence of sheet breakage, dislodgement of the non-tobacco material, and other problems in the sheet molding step (means) H1 is reduced. Glucomannan, guar gum, pectin, carrageenan, locust bean gum, and agar are cited as examples of such a polysaccharide. When these polysaccharides are added for use, the solution viscosity thereof is preferably increased so as to be greater than the solution viscosity of the first binder. Use of the binder in this manner further enhances the suitability thereof in the sheet molding step (means) H1. Among the above polysaccharides, glucomannan is most preferred.

**[0220]** It is sometimes preferred to adopt a production method (device) in which the second wet mixing step (means) M2 is also configured so that menthol, peppermint, cocoa, coffee, black tea essence, or another flavoring agent, crosslinked PVP or $\beta$-cyclodextrin having a function for causing temporary residence of the flavoring agent, microcrystalline cellulose having moldability and ease of release from a die or the like, sorbic acid, potassium sorbate, benzoic acid, sodium benzoate, or another food antimicrobial preservative for storage stability, or the like is prepared in the same manner as in step (means) Z5 and added as needed.

**[0221]** An ordinary wet mixer can also be used when materials prepared as described above are mixed in the second wet mixing step (means) M2, the same as in the first wet mixing step (means) M1. For example, the mixer may be a mixer in which materials in a mixing tank are mixed while a shear force is applied thereto by an impeller, and it is also possible to knead and further intensify mixing using a roll mill, a kneader, or an extruder. The mixing temperature in this step (means) is preferably 40°C or lower, and more preferably 30°C or lower, and maintaining the temperature at about 25°C is even more preferred. The reason for this is that there is a risk of dissipation of fragrance components when excessive heat is applied during mixing. The temperature of the mixing tank must therefore be controlled.

**[0222]** The composition for an aroma-generating base material to be heated including a non-tobacco material produced in the second wet mixing M2 is then inputted to the sheet molding step (means) H1 and molded to the desired form. In order for the composition to be used as an aroma-generating base material to be heated, roll molding, press molding, or another sheet molding process is preferably applied thereto, but these processes are not limiting. A method (device) whereby the composition is passed through an orifice and molded by compression, or a method (device) whereby the composition is dried and then pulverized into granular form may be employed.

**[0223]** Sheet molding that is suitable for producing the aroma-generating base material to be heated is described below. In one method (device), a sheet is molded using a three-roll mill. When a three-roll mill is used, while kneading, dispersion, and the like are performed by a compression force from pressing between close rolls and a shear force from the roll speed difference, the desired sheet thickness can be obtained using a doctor blade, and a three-roll mill is particularly preferred for molding a sheet of the composition of the present invention, in which various materials having different properties are mixed. A press roller or press machine may also be jointly used in fabricating a sheet. The three-roll mill works the composition into a sheet shape while kneading and dispersing the composition, and therefore complements the first and second wet mixing steps, and a more preferred state of mixing and dispersion can be obtained. Consequently, when a three-roll mill is used in the second wet mixing step (means) M2, this means that there is no device distinction between the second wet mixing step (means) M2 and the sheet molding step (means) H1, and mixing

and molding are performed in the same process.

**[0224]** Mixing and dispersion can thus be performed in sheet molding which uses a three-roll mill, and it is therefore possible to configure the production method (device) so that a non-tobacco material, an aerosol former, a binder or thickener, a perfume, crosslinked PVP, β-cyclodextrin, microcrystalline cellulose, an antimicrobial preservative, pure water, or the like is also added as needed.

**[0225]** In order to clarify the feature wherein a first binder and a second binder such as are described above are dividedly added in the method (device) for producing an aroma-generating base material to be heated, the method (device) was evaluated in comparison with the conventional production method (device) using the same materials across both methods and limiting the form of the aroma-generating base material to be heated to a filler. The evaluation is described using Production Examples and working examples of the present invention.

(Production Example A)

**[0226]** The materials below were agitation-mixed, and a xylitol/aqueous solution was obtained.

| | |
|---|---|
| Xylitol | 100 parts by mass |
| Water | 400 parts by mass |

**[0227]** Black tea leaves dried at 70°C, pulverized, and passed through an 80 mesh sieve were used. The moisture content thereof was 2% by mass. A dried jiaogulan product pulverized and passed through an 80 mesh sieve was likewise used.

| | |
|---|---|
| Black tea dry pulverized product | 80 parts by mass |
| Jiaogulan dry pulverized product | 20 parts by mass |
| Methyl cellulose | 15 parts by mass |
| Glycerin | 30 parts by mass |
| Propylene glycol | 30 parts by mass |
| Sodium carboxymethyl cellulose | 4 parts by mass |
| Xylitol/aqueous solution | 8 parts by mass |

**[0228]** The above materials were loaded into a mixer and mixed for 15 minutes (first wet mixing step (means) M1), and a first mixture was obtained.

**[0229]** The resultant first mixture was inputted to the second wet mixing step (means) M2. While 100 parts by mass of the first mixture was loaded in a three-roll mill, 0.5 part by mass of glucomannan and 20 parts by mass of water were added. A step (means) for collecting a sheet-shaped product by pressing a doctor blade against a roll was repeated 8 times. In this step (means), the second wet mixing step (means) M2 and the sheet molding step (means) H1 are performed by the same device, in which the first half of mixing can be regarded as the second mixing step (means) M2, and the second half of mixing can be regarded as the sheet molding step (means) H1. A sheet having the desired thickness was produced while kneading and dispersion were accomplished at the same time in the three-roll mill.

**[0230]** The aroma-generating sheet to be heated which was produced by these steps (means) was molded so as to have a thickness of 0.3 mm. The sheet was cut into a rectangle 150 mm in length × 240 mm in width, which was supplied to a rotary cutter and processed to a shape having a width of 1.5 mm, a length of 240 mm, and a thickness of 0.3 mm, and an aroma-generating filler to be heated was obtained. Fifty units of the filler were bundled and arranged lengthwise, and paper having a basis weight of 34 g/m$^2$ was wound thereon and sized to produce a cylindrical aroma-generating processing object to be heated. The inside diameter of the processing object was 6.9 mm. The processing object was furthermore cut to a length of 12.0 mm to form an aroma generator to be heated. The mass of the aroma generator to be heated was 0.29 g, and the volume filling ratio of the filler with respect to the volume of the aroma generator to be heated was 0.60. The longitudinal direction of the rectangle into which the aroma-generating sheet to be heated was cut was parallel to the rotational axis of the roll, and the transverse direction thereof was the rotation direction of the roll (the same hereinbelow).

**[0231]** The aqueous solution viscosity of the sodium carboxymethyl cellulose used in the present Production Example was 650 mPa·s (Brookfield viscometer, 1% aqueous solution, 25°C), and the aqueous solution viscosity of the glucomannan polysaccharide was 44000 mPa·s (Brookfield viscometer, 1% aqueous solution, 25°C).

(Production Example B)

**[0232]** Until the first wet mixing step (means) M1, a first mixture was produced in the same manner as in (Production Example A). The first mixture was sealed in a polyethylene bag and aged for 6 days (144 hours) at a temperature of 20°C to produce an aged mixture. The apparent volume after the aging step (means) Y1 was approximately 1.5 times larger. When a second aged mixture was confirmed after the aging step (means) Y1, separation of brown pulverized material appeared to have decreased relative to before aging, and the aging was considered to have led to a stable and uniform dispersion state. The mixture produced by the aging step (means) Y1 was inputted to the second wet mixing step (means) M2, and an aroma generator to be heated was produced.

(Production Example C)

**[0233]** In the same manner as in (Production Example B), an aged mixture was inputted to the second wet mixing step (means) M2, and an aroma-generating sheet to be heated was fabricated by the sheet molding step (means) H1. However, in the present Production Example, processing conditions in the second wet mixing step (means) and the sheet molding step (means) H1 were changed, and an aroma-generating sheet to be heated was fabricated by molding so that the thickness thereof was 0.1 mm. The sheet was cut into a rectangle 150 mm in length × 240 mm in width, which was supplied to a rotary cutter and processed to a shape having a width of 1.0 mm, a length of 240 mm, and a thickness of 0.1 mm, and an aroma-generating filler to be heated was obtained. Two hundred twenty five units of the filler were bundled and arranged lengthwise, and paper having a basis weight of 34 g/m$^2$ was wound thereon and sized to produce a cylindrical aroma-generating processing object to be heated. The inside diameter of the processing object was 6.9 mm. The processing object was furthermore cut to a length of 12.0 mm to form an aroma generator to be heated. The mass of the aroma generator to be heated was 0.29 g, and the volume filling ratio of the filler with respect to the volume of the aroma generator to be heated was 0.60.

(Production Example D)

**[0234]** In the same manner as in (Production Example B), an aged mixture was inputted to the second wet mixing step (means) M2, and an aroma-generating sheet to be heated was fabricated by the sheet molding step (means) H1. However, in the present Production Example, processing conditions in the second wet mixing step (means) and the sheet molding step (means) H1 were changed, and an aroma-generating sheet to be heated was fabricated by molding so that the thickness thereof was 0.5 mm. The aroma-generating sheet to be heated was cut into a rectangle 150 mm in length × 240 mm in width, which was supplied to a rotary cutter and processed to a shape having a width of 1.0 mm, a length of 240 mm, and a thickness of 0.5 mm, and an aroma-generating filler to be heated was obtained. Two hundred twenty five units of the filler were bundled and arranged lengthwise, and paper having a basis weight of 34 g/m$^2$ was wound thereon and sized to produce a cylindrical aroma-generating processing object to be heated. The inside diameter of the processing object was 6.9 mm. The processing object was furthermore cut to a length of 12.0 mm to form an aroma generator to be heated. The mass of the aroma generator to be heated was 0.29 g, and the volume filling ratio of the filler with respect to the volume of the aroma generator to be heated was 0.60.

**[0235]** An aroma generator to be heated was fabricated for comparison, in which methyl cellulose and carboxymethyl cellulose as first binders and glucomannan as a second binder were added en bloc.

(Comparative Production Example)

**[0236]** The materials below were agitation-mixed, and a xylitol/aqueous solution was obtained.

| | |
|---|---|
| Xylitol | 100 parts by mass |
| Water | 400 parts by mass |

**[0237]** Black tea leaves dried at 70°C, pulverized, and passed through an 80 mesh sieve were used. The moisture content thereof was 2% by mass. A dried jiaogulan product pulverized and passed through an 80 mesh sieve was likewise used.

| | |
|---|---|
| Black tea dry pulverized product | 80 parts by mass |
| Jiaogulan dry pulverized product | 20 parts by mass |
| Methyl cellulose | 15 parts by mass |
| Glycerin | 30 parts by mass |

(continued)

| | |
|---|---|
| Propylene glycol | 30 parts by mass |
| Sodium carboxymethyl cellulose | 4 parts by mass |
| Xylitol/aqueous solution | 8 parts by mass |
| Glucomannan | 0.5 part by mass |
| Water | 20 parts by mass |

**[0238]** The above materials were loaded into a mixer and mixed for 15 minutes, and a mixture including glucomannan and all the other materials above was obtained.

**[0239]** The mixture produced as described above was mixed in a three-roll mill, and an aroma-generating sheet to be heated having a thickness of 0.3 mm was fabricated while a step (means) for collecting a sheet-shaped product by pressing a doctor blade against a roll was repeated 8 times to accomplish kneading and dispersion of the mixture at the same time. There was difficulty in forming a sheet during molding using the three-roll mill. Although a sheet was formed, measurement thereof according to Evaluation A was not possible.

**[0240]** The resultant aroma-generating sheet to be heated was cut into a rectangle 150 mm in length $\times$ 240 mm in width, which was supplied to a rotary cutter and processed to a shape having a width of 1.5 mm, a length of 240 mm, and a thickness of 0.3 mm, and an aroma-generating filler to be heated was obtained. Fifty units of the filler were bundled and arranged lengthwise, and paper having a basis weight of 34 g/m$^2$ was wound thereon and sized to produce a cylindrical aroma-generating processing object to be heated. The inside diameter of the processing object was 6.9 mm. The processing object was furthermore cut to a length of 12.0 mm to form an aroma generator to be heated. The mass of the aroma generator to be heated was 0.29 g, and the volume filling ratio of the filler with respect to the volume of the aroma generator to be heated was 0.60.

(Example A)

**[0241]** Using the aroma generator to be heated that was fabricated in (Production Example A), an aroma cartridge of the type illustrated in FIG. 13, in which an aroma generator to be heated is joined to a mouthpiece provided with a support member and a filter, was fabricated. A PE tube in which a through hole having an inside diameter of 4.0 mm is provided in a cylinder having an outside diameter of 6.9 mm was used as the support member. A filter having a length of 23 mm, obtained by molding acetyl cellulose fibers into a cylindrical shape and winding paper having a basis weight of 34 g/m$^2$ thereon, was used as the filter. Using paper having a basis weight of 38 g/m$^2$, the cartridge exterior body was formed by half-winding the paper twice to give an inside diameter of 6.9 mm and sizing the paper. When a paper pipe formed by twice half-winding paper having a basis weight of 32-45 g/m$^2$ is used as the cartridge exterior body, an aroma cartridge is obtained that is suitable for use in which the aroma generator to be heated portion thereof is inserted on the heating element of a heating-type smoking appliance. An aroma cartridge was produced by inserting the support member and the filter from one end of the cartridge exterior body to form a mouthpiece, inserting the aroma generator to be heated from the other end of the cartridge exterior body, and then winding paper having a basis weight of 40 g/m$^2$ thereon so as to overlap with the mouthpiece portion. However, in order to clarify the effect of the production method (device) on the aroma-generating base material to be heated, i.e., the difference in function of the gas-generation-maintaining material, a filter in which a cavity was not formed as an aspiration optimization means was used as the filter.

(Example B)

**[0242]** An aroma cartridge was fabricated in the same manner as in (Example A), except that the aroma generator to be heated that was fabricated in (Production Example B) was used.

(Example C)

**[0243]** An aroma cartridge was fabricated in the same manner as in (Example A), except that the aroma generator to be heated that was fabricated in (Production Example C) was used.

(Example D)

**[0244]** An aroma cartridge was fabricated in the same manner as in (Example A), except that the aroma generator to be heated that was fabricated in (Production Example D) was used.

(Comparative Example)

**[0245]** An aroma cartridge was fabricated in the same manner as in (Example A), except that the aroma generator to be heated that was fabricated in (Comparative Production Example) was used. However, in fabrication of the aroma cartridge, the aroma-generating filler to be heated was too soft, and fabrication was difficult.

**[0246]** The evaluations described below were performed for the aroma-generating sheets to be heated and the aroma cartridges fabricated as described above. <<Evaluation 1» was also performed in addition to the evaluations below.

<<Evaluation A>>

**[0247]** A tensile strength of the aroma-generating sheet to be heated was tested. A commonly used tensile strength tester was used for tensile strength testing. A sample having a width of 10.0 cm and a length of 22.0 cm cut from the aroma-generating sheet to be heated was used as a sample, and tensile strength was measured at a cross head speed of 10 cm/min and a distance of 20.0 cm between clamps of the tensile tester. The testing environment was a room temperature of 20°C and a humidity of 50%. An aroma-generating sheet to be heated fabricated by each production method (device) was evaluated by comparing a breaking strength thereof, and it was learned that a breaking strength of 3.9 $N/mm^2$ or greater, preferably 5.0 $N/mm^2$ or greater, was preferred comprehensively in terms of such characteristics as molding, aroma cartridge fabrication, initial aspiration quantity, initial flavor, and change over time in aspiration quantity and flavor.

<<Evaluation B>>

**[0248]** The heating-type smoking appliance used was an IQOS (registered trademark) heating-type electronic tobacco device, produced by Philip Morris, of the type illustrated in FIG. 2A. The heating element thereof has a width of 4.5 mm, a length to a tip thereof of 12 mm, and a thickness of 0.4 mm. Since the inside diameter of the chamber thereof is 7 mm, the outside diameter of the aroma cartridge is set to 6.9 mm so that the aroma cartridge could be inserted therein while leaving no gap. The heating element is heated by electric power supplied from a battery provided in a heating-type electronic tobacco body, and reaches about 350°C. Through use of a built-in control system, with a conventional electronic tobacco cartridge, consumption of a single cartridge is completed after 14 aspirations. When the smoking tobacco cartridge of the present example is inserted, the aroma cartridge portion that appears on the outside from a downstream side of the electronic cigarette device body has a length of approximately 20 mm. The aroma cartridges of the present example and the comparative Production Example were inserted in the chamber of the electronic cigarette device, and a smoking test was performed. Aspiration quantity and flavor were both evaluated by sensory evaluation in the mouth during smoking, and flavor in particular, with regard to tea scent, was evaluated immediately after aroma cartridge fabrication and after leaving to stand in <<Evaluation 1>>. The sensory test was performed by five test subjects. The evaluation criteria are described below.

| | |
|---|---|
| Rank A: | During smoking, aspiration quantity is adequate, there is no resistance to aspiration, and an enjoyable level of tea scent is present. |
| Rank B: | During smoking, aspiration quantity is inadequate, there is resistance to aspiration, and there is an unsatisfactory level of tea scent. |

<<Evaluation C>>

**[0249]** Dislodgement of smoked filler was evaluated. The evaluation method (device) comprises directing the aroma-generator-to-be-heated side of the smoked aroma cartridge vertically downward and observing whether the aroma-generating filler to be heated falls out. The evaluation criteria are as described below.

Rank A: No falling material observed.
Rank B: Part of the filler falls out.

**[0250]** Test results are shown in Table 1. As is clear from Table 1, divided addition of binders is recognized as having an effect on each of molding, aroma cartridge fabrication, initial aspiration quantity and flavor, change in aspiration quantity and flavor over time, and fusion over time of the aroma-generating filler to be heated, and this effect can be further increased by aging. Consequently, it is obvious that the aroma-generating base material to be heated in which binders are dividedly added, as well as the aroma-generating base material to be heated in which an aging step (means) is applied in the fabrication thereof, function as gas-generation-maintaining materials in the aroma cartridge.

[Table 1]

| Effect of Production method on Gas Generation Maintenance Ability of Aroma-generating Base Material to Be Heated | | | | | | |
|---|---|---|---|---|---|---|
| | Aroma-generating filler to be heated | | Evaluation B | | EvaluaTion C | EvaluaTion 1 |
| | | Evaluation A | Immediately after fabricati on | After leaving to stand | | |
| Example A | Production Example A | 5.5 N/mm$^2$ | A:3, B:2 | A:2, B:3 | A | B |
| Example B | Production Example B | 5.8 N/mm$^2$ | A:5, B:0 | A:4, B:1 | A | A |
| Example C | Production Example C | 4.5 N/mm$^2$ | A:5, B:0 | A:5, B:0 | A | A |
| Example D | Production Example D | 3.9 N/mm$^2$ | A:5, B:0 | A:4, B:1 | A | A |
| Comparative Example | Comparative Production Example | Unable to evaluate | A:1, B:4 | A:0, B:5 | B | C |

**[0251]** Based on the above, it was recognized that the production method (device) has an effect on the internal structure of the aroma-generating base material to be heated, and that the aroma-generating base material to be heated fabricated by the appropriate production method (device) functions as a gas-generation-maintaining material for the aroma cartridge that is fabricated using the aroma-generating base material to be heated. In the present invention, another material that functions as a gas-generation-maintaining material was discovered. This material consists of inorganic particles.

**[0252]** The effect of the inorganic particles will be described in specific examples. (Production Example 1) was employed as the conventionally used production method (device), and the effect of various inorganic particles on the gas generation maintenance ability of the aroma-generating base material to be heated, which was fabricated by this production method (device), was evaluated as described below.

**[0253]** An aroma generator to be heated was fabricated and an aroma cartridge was assembled in accordance with (Production Example 1), but in the present example, after the aroma-generating sheet to be heated which was fabricated in (Production Example 1) was cut to a length of 12 mm and a width of 1.5 mm (and a thickness of 0.5 mm) to fabricate an aroma-generating filler to be heated, a step (means) for adding predetermined amounts of various inorganic particles and spraying and coating with the inorganic particles so as to evenly adhere the inorganic particles to the surface of the aroma-generating filler to be heated was added, as indicated by the spraying step (means) H2 in FIG. 32. The purpose of this step (means) was to evenly adhere the inorganic particles to the surface of the aroma-generating filler to be heated. In this step (means), in order to confirm that the inorganic particles were adhering to the surface of the aroma-generating filler to be heated, the surface was observed using a microscope. The aroma-generating filler to be heated, the inorganic particles adhering thereto, was processed into an aroma generator to be heated, which was assembled into an aroma cartridge in accordance with (Production Example 1). The filling ratio was also increased in order to clarify the effect of the inorganic particles. <<Evaluation 1» was performed for the aroma cartridge thus fabricated. <<Evaluation 2>> described below was furthermore performed using the heating-type electronic cigarette device described in <<Evaluation B>>.

<<Evaluation 2>>

**[0254]** The evaluation described below was performed after confirming the presence of fouling adhering to the heating element 113 after use of the aroma cartridge in the manner illustrated in FIG. 2C. First, using the aroma cartridge of Comparative Example 1, 14 aspirations per aroma cartridge were performed, fouling adhering to the heating element after completion of aspiration for 10, 20, 30, 40, and 50 aroma cartridges was wiped off using a gauze impregnated with ethanol, and the degree of fouling was recorded. Fouling after aspiration of 50 of the various aroma cartridges of the present example, fabricated using the aroma-generating filler to be heated having various inorganic particles adhering to the surface thereof, was wiped off in the same manner as in Comparative Example 1, and the degree thereof was evaluated in comparison with the degree of fouling recorded in Comparative Example 1. The evaluation index is an expression of the degree of fouling after aspiration of 50 of the various aroma cartridges of the present example in terms of the number of aroma cartridges of Comparative Example 1 aspirated to give a matching degree of fouling. A smaller number is therefore preferred for this index.

(Example I)

**[0255]** Calcium carbonate powder having an average particle diameter of 15 μm, in the amount of 1 part by mass with respect to 100 parts by mass of an aroma-generating filler to be heated which was cut as described above from the aroma-generating sheet to be heated fabricated in (Production Example 1), was sprayed so as to adhere to the entire surface of the aroma-generating filler to be heated, and said entire surface was coated with the calcium carbonate powder. After confirming by microscopy that calcium carbonate particles having a diameter of 10-50 μm were adhering to the aroma-generating filler to be heated, an aroma generator to be heated was fabricated using 0.29 g of the aroma-generating filler to be heated having calcium carbonate particles on the surface thereof. An aroma cartridge was assembled from a mouthpiece and the aroma generator to be heated. The measured filling ratio of the filler in this case was 81%.

(Example II)

**[0256]** Magnesium carbonate powder having an average particle diameter of 10 μm, in the amount of 1 part by mass with respect to 100 parts by mass of an aroma-generating filler to be heated which was cut as described above from the aroma-generating sheet to be heated fabricated in (Production Example 1), was sprayed so as to adhere to the entire surface of the aroma-generating filler to be heated, and said entire surface was coated with the calcium carbonate powder. After confirming by microscopy that magnesium carbonate particles having a diameter of 10-50 μm were adhering to the aroma-generating filler to be heated, an aroma generator to be heated was fabricated using 0.29 g of the aroma-generating filler to be heated having magnesium carbonate particles on the surface thereof. An aroma cartridge was assembled from a mouthpiece and the aroma generator to be heated. The measured filling ratio of the filler in this case was 80%.

(Example III)

**[0257]** Silicon oxide powder having an average particle diameter of 20 μm, in the amount of 1 part by mass with respect to 100 parts by mass of an aroma-generating filler to be heated which was cut as described above from the aroma-generating sheet to be heated fabricated in (Production Example 1), was sprayed so as to adhere to the entire surface of the aroma-generating filler to be heated, and said entire surface was coated with the silicon oxide powder. After confirming by microscopy that silicon oxide particles having a diameter of 10-50 μm were adhering to the aroma-generating filler to be heated, an aroma generator to be heated was fabricated using 0.29 g of the aroma-generating filler to be heated having silicon oxide particles on the surface thereof. An aroma cartridge was assembled from a mouthpiece and the aroma generator to be heated. The measured filling ratio of the filler in this case was 80%.

(Example IV)

**[0258]** Alumina particles having an average particle diameter of 5 μm, in the amount of 1 part by mass with respect to 100 parts by mass of an aroma-generating filler to be heated which was cut as described above from the aroma-generating sheet to be heated fabricated in (Production Example 1), were sprayed so as to adhere to the entire surface of the aroma-generating filler to be heated, and said entire surface was coated with the alumina particles. After confirming by microscopy that alumina particles having a diameter of 10-50 μm were adhering to the aroma-generating filler to be heated, an aroma generator to be heated was fabricated using 0.29 g of the aroma-generating filler to be heated having alumina particles on the surface thereof. An aroma cartridge was assembled from a mouthpiece and the aroma generator to be heated. The measured filling ratio of the filler in this case was 81%.

(Example V)

**[0259]** Alumina particles having an average particle diameter of 2 μm, in the amount of 1 part by mass with respect to 100 parts by mass of an aroma-generating filler to be heated which was cut as described above from the aroma-generating sheet to be heated fabricated in (Production Example 1), were sprayed so as to adhere to the entire surface of the aroma-generating filler to be heated, and said entire surface was coated with the alumina particles. Although it could not be confirmed by microscopy in this case that alumina particles having a diameter of 10-50 μm were adhering to the aroma-generating filler to be heated, an aroma generator to be heated was fabricated using 0.29 g of the aroma-generating filler to be heated which was coated with alumina particles. An aroma cartridge was assembled from a mouthpiece and the aroma generator to be heated. The measured filling ratio of the filler in this case was 81%.

(Example VI)

**[0260]** Silicon oxide particles having an average particle diameter of 0.5 μm, in the amount of 1 part by mass with respect to 100 parts by mass of an aroma-generating filler to be heated which was cut as described above from the aroma-generating sheet to be heated fabricated in (Production Example 1), were sprayed so as to adhere to the entire surface of the aroma-generating filler to be heated, and said entire surface was coated with the silicon oxide particles. Although it could also not be confirmed by microscopy in this case that silicon oxide particles having a diameter of 10-50 μm were adhering to the aroma-generating filler to be heated, an aroma generator to be heated was fabricated using 0.29 g of the aroma-generating filler to be heated which was coated with silicon oxide particles. An aroma cartridge was assembled from a mouthpiece and the aroma generator to be heated. The measured filling ratio of the filler in this case was 81%.

(Example VII)

**[0261]** Silicon oxide particles having an average particle diameter of 47 μm, in the amount of 1 part by mass with respect to 100 parts by mass of an aroma-generating filler to be heated which was cut as described above from the aroma-generating sheet to be heated fabricated in (Production Example 1), were sprayed so as to adhere to the entire surface of the aroma-generating filler to be heated, and said entire surface was coated with the silicon oxide particles. After confirming by microscopy that silicon oxide particles having a diameter of 10-50 μm were adhering to the aroma-generating filler to be heated, an aroma generator to be heated was fabricated using 0.29 g of the aroma-generating filler to be heated which was coated with silicon oxide particles. An aroma cartridge was assembled from a mouthpiece and the aroma generator to be heated. The measured filling ratio of the filler in this case was 65%.

(Comparative Example I)

**[0262]** An aroma generator to be heated was fabricated using, without modification thereof, 0.29 g of the aroma-generating filler to be heated which was cut as described above from the aroma-generating sheet to be heated fabricated in (Production Example 1). An aroma cartridge was assembled from a mouthpiece and the aroma generator to be heated. The measured filling ratio of the filler in this case was 81%.

**[0263]** Results of the evaluations described above are shown in Table 2. As is clear from Table 2, inorganic particles having a wide range of particle diameters function as gas-generation-maintaining materials, regardless of the material properties thereof. As is clear from the results of <<Evaluation 1», there was no fusion over time of the aroma-generating filler to be heated, and there was little change over time in the released quantity of gas, i.e., in both gas aspiration quantity and flavor. The reason for such a result is not known for certain, but may be as follows. It is possible that when inorganic particles are present on the surface of the filler, the inorganic particles act as spacers to reduce the contact area between fillers, and have the effect of inhibiting fusion of the fillers due to bleed-out of the aerosol former even when placed in a high-temperature state for a long time, and the inorganic particles have such effects as suppressing bleed-out of the aerosol former.

[Table 2]

| Effect of Inorganic Particles on Gas Generation Maintenance Ability of Aroma-generating Base Material to Be Heated | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Aroma-generating sheet to be heated | Inorganic particles | Particle diameter (μm) | Added quantity (parts by mass) | Filling ratio (%) | Evaluation 1 | Evaluation 2 (Cartridges) |
| Example I | Production Example I | Calcium carbonate | 15 | 1 | 81 | A | 10 |
| Example II | Production Example I | Magnesium carbonate | 10 | 1 | 80 | A | 20 |
| Example III | Production Example I | Silicon oxide | 20 | 1 | 80 | A | 15 |
| Example IV | Production Example I | Alumina | 5 | 1 | 81 | A | 30 |

(continued)

| Effect of Inorganic Particles on Gas Generation Maintenance Ability of Aroma-generating Base Material to Be Heated | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Aroma-generating sheet to be heated | Inorganic particles | Particle diameter (μm) | Added quantity(parts by mass) | Filling ratio (%) | Evaluation 1 | Evaluation 2 (Cartridges) |
| Example V | Production Example I | Alumina | 2 | 1 | 81 | B | 35 |
| Example VI | Production Example I | Silicon oxi | de 0.5 | 1 | 81 | B | 40 |
| Example VII | Production Example I | Silicon oxide | 47 | 1 | 65 | A | 10 |
| Comparative Example I | Production Example I | None | - | - | 81 | C | - |

**[0264]** As is clear from <<Evaluation 2>>, the inorganic particles also have the effects of preventing contamination of the heating element. In particular, a good effect is obtained when the average particle diameter of an added inorganic powder is 1-50 μm, and prevention of contamination is further increased when the average particle diameter is 5 μm or greater. A good effect is obtained when the added quantity an added inorganic powder is 0.01-5 parts by mass, and prevention of contamination is further increased when the added quantity is 0.1 part by mass or greater. The reason that the inorganic particles have the effect of preventing contamination of the heating element is not known for certain, but such reasons as the following can be conjectured. An inorganic material is not readily decomposed by heating, the inorganic particles polish the surface of the heating element and remove contaminating matter when the aroma cartridge is installed on and removed from the heating element, and the inorganic particles reduce the area of contact between the heating element surface and the aroma-generating filler to be heated.

**[0265]** In order to obtain the above results, the inorganic particles preferably have an average particle diameter of 1-100 μm. The effect of the inorganic particles decreases when the average particle diameter thereof is less than 1 μm. An average particle diameter of 5 μm or greater is preferred, because the effect of the inorganic particles is thereby increased. For the same reason, an average particle diameter of 10 μm or greater is more preferred. The filling ratio of the filler decreases the larger the average particle diameter is, but when the average particle diameter is 50 μm or less, the inorganic particles have a large effect, and the minimum necessary filling ratio can be ensured.

**[0266]** The minimum necessary filling ratio herein is closely related to the aspiration quantity of gas generated by heating. When the filling ratio is less than 60%, an adequate quantity of gas is not released by heating, the quantity of gas aspirated by the smoker is inadequate, and the sensation of inhalation is unsatisfactory. Consequently, the necessary filling ratio is more preferably 65% or greater, and even more preferably 70% or greater. Conversely, when the filling ratio exceeds 90%, problems arise in that gaps between fillers are decreased, smoking is difficult, and insertion on the heating element also becomes difficult.

**[0267]** This filling ratio can be evaluated by a method for calculating the area ratio of the aroma-generating base material to be heated with respect to a cross section of the aroma generator to be heated. The filling ratio was determined by evaluating a filler and a gap portion including no filler, using a digital microscope. An image was projected on a display at a magnification of 100 using a digital microscope (VHX-2000, produced by KEYENCE CORPORATION). A range of the image to be analyzed was set to a region in which only the filler and the gap portion including no filler appeared. In this case, for an observation sample having a diameter of 7.0 mm, the range was set to 3.5 mm horizontally and 2.6 mm vertically. For image analysis in the range described above, an "extraction mode" was set to "luminance" in an "automatic measurement mode" using included software. In measurement, "standard" was selected, an "extraction parameter" was set to "bright," and a "threshold value" was selected so that the observed filler and gap were separated. The filling ratio was determined as the ratio of the entire measurement region that was occupied by the filler.

**[0268]** The average particle diameter of the inorganic particles in the present invention was determined by a wet method using a laser diffraction/scattering-type particle diameter distribution measuring device. In the present invention, a Microtrac MT3300III produced by MICROTRACBEL CORPORATION was used. The average particle diameter in the present invention indicates the median diameter $D_{50}$ at 50% of a volume-based distribution accumulated for a range of 0.02 μm to 2000 μm.

**[0269]** The presence of inorganic particles in the present invention was confirmed not only by microscope observation in the producing steps (means), but also by observation of the filler surface using an optical microscope or an electron

microscope. The presence of inorganic particles was also confirmed by microscope or electron microscope observation of residue from thermal decomposition of the filler, from results of about 10 observations in a visual field of 100 μm × 100 μm at an appropriate magnification. Confirmation that inorganic particles in a residue were the added inorganic particles was obtained using a scanning electron microscope capable of X-ray microanalysis (XMA).

**[0270]** The added quantity of inorganic particles must be at least 0.001 part by mass with respect to 100 parts by mass of the filler in order for the effect of the inorganic particles to manifest, and is more preferably 0.01 part by mass or greater, and even more preferably 0.05 part by mass or greater. Conversely, when the added quantity exceeds 10 parts by mass with respect to 100 parts by mass of the filler, the filling ratio of the filler decreases, which affects gas aspiration quantity or flavor. From this perspective, an added quantity of 5 parts by mass or less is more preferred, and an added quantity of 2 parts by mass or less is even more preferred.

**[0271]** Inorganic substances that can be used as the inorganic particles of the present invention are not particularly limited, but sodium chloride, potassium chloride, and other metal chlorides, magnesium oxide, calcium oxide, titanium oxide, iron oxide, alumina, and other metal oxides, magnesium carbonate, calcium carbonate, and other metal carbonates, magnesium sulfate, calcium sulfate, and other metal sulfates, calcium phosphate and other metal phosphates, and potassium titanate, magnesium titanate, and other titanates can be used singly, or two or more of the above substances can be selected for use. Zeolite, colloidal silica, fumed silica, and other silicon oxides, and natural materials such as diatomaceous earth and vermiculite can also be used. Magnesium carbonate, calcium carbonate, silicon oxide, and alumina are particularly preferred.

**[0272]** The inorganic particles can be attached to the aroma-generating base material to be heated in the spraying step (means) H2 in FIG. 32, but can also be attached in the spraying step (means) S4 in FIG. 32. An aroma-generating base material to be heated that includes inorganic particles can also be fabricated by adding inorganic particles in an aroma-generating composition to be heated, as indicated in FIGS. 28-31. When this method (device) is used, the inorganic particles are not present only the surface of the aroma-generating base material to be heated, but the effect of the inorganic particles is confirmed. It is therefore conjectured that the inorganic particles function as a gas-generation-maintaining material by not only inhibiting fusion between aroma-generating base materials to be heated by acting as spacers to reduce the contact area therebetween, but by hindering movement of the aerosol former, the non-tobacco material, the binders, and other constituent materials within the aroma-generating base material to be heated. This conjecture is based on the fact that inorganic particles added as a bulking agent in a polymer material serve as crosslinking points, enhancing heat resistance, chemical resistance, and other chemical characteristics, and tensile strength, elastic modulus, and other physical characteristics.

**[0273]** Through the present invention described above, by improving a production method (device), it is possible to provide an aroma generator to be heated in which an aroma-generating base material to be heated functions as a gas-generation-maintaining material, and an aroma generator to be heated in which inorganic particles function as a gas-generation-maintaining material. Consequently, it is also possible to provide an aroma cartridge in which there is no need to provide a gas aspiration optimization means to a mouthpiece, as illustrated in FIG. 33. Of course, it is also possible to provide an aroma cartridge in which an aroma generator to be heated provided with a gas-generation-maintaining material and a mouthpiece provided with a gas aspiration optimization means are combined.

## INDUSTRIAL APPLICABILITY

**[0274]** The present invention can provide an aroma cartridge of tobacco of genus Nicotiana of the family Solanaceae and a plant of the same genus, and of a harmless aroma which is derived from a plant or the like not including a tobacco component, whereby smoking can be enjoyed with a cigarette sensation not only by an experienced flame-type smoker but also by a first-time smoker. The present invention is therefore a novel smoking appliance whereby smoking that is devoid of adverse health effects on the smoker as well as on surrounding non-smokers can be enjoyed, and which induces α waves in the brain, has a soothing effect, and helps to promote health and beauty. The aroma cartridge of the present invention is also provided with a gas aspiration optimization means and a gas-generation-maintaining material, and therefore has the feature that no change in flavor or aspiration quantity of smoke and a fragrance component occurs even when the aroma cartridge is stored for a long time. Consequently, technology relating to the aroma cartridge of the present invention has broad applicability in incense sticks, incense burning, incense powder, rubbing incense, and the like, or in aromatherapy and the like.

## KEY TO SYMBOLS

**[0275]**

11 Electric heating-type smoking appliance (1)
111 Casing

112 Chamber
113 Electrically controlled heating element
1131 Electric control unit
114 Aroma cartridge insertion port
115 Inlet port
12 Electric heating-type smoking appliance (2)
121 Casing
122 Chamber
123 Electrically controlled heating element
1231 Electric control unit
124 Aroma cartridge insertion port
125 Inlet hole
2 Aroma cartridge
2-1 through 2-19 Aroma cartridges (1) through (19)
21 Aroma generator to be heated
21-p Interior material for aroma generator to be heated
211 Cover material
212 Partition wall material
213 Aroma-generating sheet to be heated
214 Aroma-generating filler to be heated
22 Mouthpiece
22-p Mouthpiece interior material
221 Mouthpiece having cavity
221-1 Mouthpiece (1) having cylindrical cavity
221-1-c1 Cylindrical cavity (1)
221-2 Mouthpiece (2) having cylindrical cavity
221-2-c2 Cylindrical cavity (2)
221-2-c3 Cylindrical cavity (3)
221-3 Mouthpiece (3) having cylindrical cavity
221-3-c4 Cylindrical cavity (4)
221-4 Mouthpiece (4) having cylindrical cavity
221-4-c5 Cylindrical cavity (5)
221-4-c6 Cylindrical cavity (6)
221-5 Mouthpiece (1) having circular conical cavity
221-5-d1 Circular conical cavity (1)
221-6 Mouthpiece (2) having circular conical cavity
221-6-d2 Circular conical cavity (2)
221-7 Mouthpiece (1) having void and cylindrical cavity
2211 Filter (1) having cavity
221-7-c7 Cylindrical cavity (7)
221-7-v1 Void (1)
221-8 Mouthpiece (2) having void and cylindrical cavity
2212 Filter (2) having cavity
221-8-c8 Cylindrical cavity (8)
221-8-v2 Void (2)
222 Mouthpiece having support member
222-1 Mouthpiece (1) having support member
2221 Support member
2221-h Through hole
2222 Filter (3) having cavity
2222-c1 Cavity (1)
223 Mouthpiece having support member/cooling member
2231 Support member
2231-h Through hole
2232 Cooling member
2233 Filter (4) having cavity
2233-c1 Cavity (1)
224 Mouthpiece having cooling member

2241 Cooling member
2242 Filter (5) having cavity
2242-c1 Cavity (1)
225 Mouthpiece having reinforcing support member
225-1 Mouthpiece (1) having reinforcing support member
2251-1 Reinforcing support member (1)
2251-1-s1 Plate-shaped reinforcing material
2251-1-h Through hole
2252-1 Filter (1)
225-2 Mouthpiece (2) having reinforcing support member
2251-2 Reinforcing support member (2)
2251-2-s2 Plate-shaped reinforcing material
2251-2-h Through hole
2252-2 Filter (2)
225-3 Mouthpiece (3) having reinforcing support member
2251-3 Reinforcing support member (3)
2251-3-s3 Plate-shaped reinforcing material
2251-3-s4 Tubular reinforcing material
2252-3 Filter (3)
225-4 Mouthpiece (4) having reinforcing support member
2251-4-s3 Plate-shaped reinforcing material
2251-4-s4 Columnar reinforcing material
2252-4 Filter (4)
225-5 Mouthpiece (5) having reinforcing support member
2251-5-s3 Plate-shaped reinforcing material
2251-5-s4 Tubular reinforcing material
2251-5-h Through hole
2252-5 Filter (5)
2252-5-c1 Cavity
226 Mouthpiece having reinforcing support member/cooling member
2261 Reinforcing support member
2261-s3 Plate-shaped reinforcing material
2261-s6 Tubular reinforcing material
2262 Cooling member
2263 Filter (6) having cavity
2263-c1 Cavity (1)
227 Mouthpiece having heat insulation member
2271 Heat insulation member
2272 Filter
228 Mouthpiece having heat insulation member/cooling member
2281 Heat insulation member
2282 Cooling member
2283 Filter
23 Cartridge exterior body (1)
24 Cartridge exterior body (2)
W Air flow
o Center axis of right circular cylinder of aroma cartridge
j Outside diameter of aroma cartridge
k Length of aroma cartridge
a Length of aroma generator to be heated
m Length of mouthpiece
f Length of filter
b Inside diameter of bottom surface of cavity
c Height of cylindrical cavity
d Height of circular conical cavity
v Length of void
s Length of support member
r Length of cooling member

x Width of aroma-generating filler to be heated
y Thickness of aroma-generating base material to be heated
z Length of aroma-generating base material to be heated

## Claims

**1.** An aroma cartridge comprising:

an aroma generator to be heated, in which is wound an aroma-generating substrate to be heated which is in contact with a heating element and which includes an aerosol former and a fragrance component;
a mouthpiece comprising a filter for filtering an aerosol smoke and a fragrance component released from the aroma generator to be heated due to heating by the heating element; and
a cartridge exterior body wound so as to connect the aroma generator to be heated and the mouthpiece adjacent to each other in a longitudinal direction,
at least one of means for optimizing aspiration of the smoke and the fragrance component and a gas-generation-maintaining material for maintaining generation of the smoke and the fragrance component is included in at least one of the aroma generator to be heated and the mouthpiece .

**2.** The aroma cartridge according to claim 1,
the filter being obtained by molding fibers into a cylindrical shape, and the filter constituting all or a portion of the mouthpiece, and
the aspiration optimization means including a cavity provided in the filter in the longitudinal direction so as not to penetrate through the filter.

**3.** The aroma cartridge according to claim 2, the filter constituting a portion of the mouthpiece, and a portion remaining within the mouthpiece other than the filter being a void formed by the cartridge exterior body.

**4.** The aroma cartridge according to claim 2 or 3, at least one of the cavity being arranged in at least either end part in the longitudinal direction of the filter.

**5.** The aroma cartridge according to any of claims 2 through 4, the cavity being arranged in rotationally symmetrical positions about a center axis of a cylinder existing in the longitudinal direction of the filter.

**6.** The aroma cartridge according to any of claims 2 through 5, a shape of the cavity being columnar or conical.

**7.** The aroma cartridge according to claim 1,
the mouthpiece having:

a support member for preventing the aroma generator to be heated from moving toward the mouthpiece; and
the filter according to any of claims 2 through 6, adjacent to the support member in the longitudinal direction.

**8.** The aroma cartridge according to claim 1,
the mouthpiece having:

a cooling member for cooling a component that is volatilized upon heating of the aroma generator to be heated; and
the filter according to any of claims 2 through 6, adjacent to the cooling member in the longitudinal direction.

**9.** The aroma cartridge according to claim 1,
the mouthpiece having:

a support member for preventing the aroma generator to be heated from moving toward the mouthpiece, the support member being adjacent in the longitudinal direction to the aroma generator to be heated;
a cooling member for cooling a component that is volatilized upon heating of the aroma generator to be heated, the cooling member being adjacent to the support member in the longitudinal direction; and
the filter according to any of claims 2 through 6, adjacent to the cooling member in the longitudinal direction.

**10.** The aroma cartridge according to claim 1,
the mouthpiece having a support member including a through hole, for preventing the aroma generator to be heated from moving toward the mouthpiece,
center axes of the support member and a cylinder of the through hole substantially coinciding, and
the aspiration optimization means including a shape reinforcement member fixedly or movably arranged in the through hole.

**11.** The aroma cartridge according to claim 10,
the shape reinforcement member
having the center axis in a plane thereof, and
comprising one or more plate-shaped members in contact with an inner wall of the through hole.

**12.** The aroma cartridge according to claim 10,
the shape reinforcement member comprising
a concentric cylinder having substantially the same center axis as the center axis and having a radius smaller than a radius of the through hole, and
a plate-shaped member arranged on an external peripheral side of the concentric cylinder so as to contact an inner wall of the through hole in a radial direction of the concentric cylinder.

**13.** The aroma cartridge according to claim 12, the concentric cylinder being hollow.

**14.** The aroma cartridge according to claim 1,
the mouthpiece comprising:

the support member according to any of claims 10 through 13; and
a filter obtained by molding fibers into a cylindrical shape, the filter being adjacent to the support member in the longitudinal direction.

**15.** The aroma cartridge according to claim 1,
the mouthpiece comprising:

the support member according to any of claims 10 through 13;
a cooling member for cooling a component that is volatilized upon heating of the aroma generator to be heated, the cooling member being adjacent to the support member in the longitudinal direction; and
a filter obtained by molding fibers into a cylindrical shape, the filter being adjacent to the cooling member in the longitudinal direction.

**16.** The aroma cartridge according to claim 14 or 15, the cavity according to any of claims 2 through 6 being arranged in the filter.

**17.** The aroma cartridge according to any of claims 1 through 16, the aspiration optimization means including a heat insulation member arranged so as to be interposed between the aroma generator to be heated and the mouthpiece.

**18.** The aroma cartridge according to claims 1 through 18, the aspiration optimization means including at least any of
a partition wall material arranged on an end part on the mouthpiece side of the aroma generator to be heated, and
a cover material arranged on an end part of the aroma generator to be heated on an opposite side to the mouthpiece.

**19.** The aroma cartridge according to claim 1,
the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced by
a production method comprising:

a dry mixing step for mixing a dried and pulverized non-tobacco material;
a first wet mixing step for mixing, in an alcohol and pure water mixture,
the non-tobacco material produced by the dry mixing step, and a material selected from an aerosol former, a binder or thickener, crosslinked polyvinylpyrrolidone (PVP), a perfume, a non-tobacco extract, $\beta$-cyclodextrin, microcrystalline cellulose, and an antimicrobial preservative;
a second wet mixing step for producing a slurry including the non-tobacco material, etc., by adding additional pure water and/or alcohol to the alcohol and pure water mixture including the non-tobacco material, etc., produced

by the first wet mixing step;
a paper-making step for producing a water-containing sheet from the slurry produced by the second wet mixing step;
a sheet molding step for compressing the water-containing sheet to obtain a sheet;
a drying step for drying the sheet produced by the sheet molding step to produce an aroma-generating sheet to be heated; and
a sheet processing step for cutting or folding the aroma-generating sheet to be heated.

**20.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced using a lower monoalcohol as the alcohol in the second wet mixing step according to claim 19.

**21.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced using 0.1-10 parts by mass of the lower monoalcohol according to claim 20 with respect to 100 parts by mass of the non-tobacco material.

**22.** The aroma cartridge according to claim 1,
the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced by a production method comprising:

a dry mixing step for mixing a dried and pulverized non-tobacco material;
a first wet mixing step for mixing, in an alcohol and pure water mixture, the non-tobacco material produced by the dry mixing step, and a material selected from an aerosol former, a binder or thickener, crosslinked PVP, a perfume, a non-tobacco extract, $\beta$-cyclodextrin, microcrystalline cellulose, and an antimicrobial preservative;
a second wet mixing step for producing a slurry including the non-tobacco material, etc., by adding additional pure water and/or alcohol to the alcohol and pure water mixture including the non-tobacco material, etc., produced by the first wet mixing step;
a paper-making step for producing a water-containing sheet from the slurry produced by the second wet mixing step;
a sheet molding step for compressing or casting the water-containing sheet to obtain a sheet;
an aerosol former absorption step for coating the water-containing sheet with, or dipping the sheet into, the aerosol former, a moisture content of the water-containing sheet being reduced to less than 50% by mass by the sheet molding step;
a drying step for drying the sheet produced by the aerosol former absorption step and producing an aroma-generating sheet to be heated; and
a sheet processing step for cutting or folding the aroma-generating sheet to be heated.

**23.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced using a lower monoalcohol as the alcohol in the second wet mixing step according to claim 22.

**24.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced using 0.1-10 parts by mass of the lower monoalcohol according to claim 23 with respect to 100 parts by mass of the non-tobacco material.

**25.** The aroma cartridge according to claim 1,
the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced from:

a wet mixing step for producing a slurry of a non-tobacco material by mixing a dried and pulverized non-tobacco material with pure water;
a paper-making step for producing a water-containing sheet from the slurry produced by the wet mixing step;
a sheet molding step for compressing or casting the water-containing sheet to obtain a sheet;
a drying step for reducing the moisture content of the sheet produced by the sheet molding step to less than 50% by mass;
an absorption and adsorption step for coating the sheet produced by the drying step with, or dipping the sheet into, an alcohol and pure water mixture of a material selected from an aerosol former, a binder or thickener, crosslinked PVP, a perfume, a non-tobacco material extract, $\beta$-cyclodextrin, microcrystalline cellulose, a concentrate of water discharged in the sheet molding step, and an antimicrobial preservative;

a drying step for drying the sheet produced by the absorption and adsorption step to produce an aroma-generating sheet to be heated; and
a sheet processing step for cutting or folding the aroma-generating sheet to be heated.

**26.** The aroma cartridge according to claim 1,
the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced by a production method comprising:

a non-tobacco-material preparation step for drying and pulverizing a non-tobacco material;
a perfume and/or non-tobacco extract mixing step for mixing at least a perfume and/or a non-tobacco material extract and crosslinked PVP and/or $\beta$-cyclodextrin in alcohol to cause the perfume and/or non-tobacco extract to reside in the crosslinked PVP and/or $\beta$-cyclodextrin;
an aerosol former dissolving step for mixing at least an aerosol former and a binder or thickener with pure water;
a wet mixing step for mixing a material produced by the non-tobacco material preparation step, a material produced by the perfume and/or non-tobacco extract mixing step, and a material produced by the aerosol former dissolving step;
a sheet molding step for producing an aroma-generating sheet to be heated, by compression from a material produced by the wet mixing step; and
a sheet processing step for cutting or folding the aroma-generating sheet to be heated.

**27.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being an aroma generator to be heated that is produced using menthol and/or xylitol as the perfume according to claim 26.

**28.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being an aroma generator to be heated that is produced by adding, in the sheet molding step according to claim 26, a step for adding a material selected from a non-tobacco material, an aerosol former, a binder or thickener, crosslinked PVP, a perfume, a non-tobacco extract, $\beta$-cyclodextrin, microcrystalline cellulose, an antimicrobial preservative, and pure water.

**29.** The aroma cartridge according to claim 1,
the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced by a production method comprising:

a first wet mixing step for mixing a dried and pulverized non-tobacco material, a first binder aqueous solution in which a first binder is dissolved in pure water, and a material selected from an aerosol former, crosslinked PVP, a perfume, a non-tobacco extract, $\beta$-cyclodextrin, microcrystalline cellulose, and an antimicrobial preservative;
a second wet mixing step for mixing a second binder aqueous solution in which a second binder is dissolved in pure water with a material produced by the first wet mixing step;
a sheet molding step for producing an aroma-generating sheet to be heated, by compression from a material produced by the second wet mixing step; and
a sheet processing step for cutting or folding the aroma-generating sheet to be heated.

**30.** The aroma cartridge according to claim 1,
the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced by a production method comprising:

a first wet mixing step for mixing a dried and pulverized non-tobacco material, a first binder aqueous solution in which a first binder is dissolved in pure water, and a material selected from an aerosol former, crosslinked PVP, a perfume, a non-tobacco extract, $\beta$-cyclodextrin, microcrystalline cellulose, and an antimicrobial preservative;
an aging step for stabilizing a mixture produced by the first wet mixing step;
a second wet mixing step for mixing an aged mixture produced by the aging step and a second binder aqueous solution in which a second binder is dissolved in pure water;
a sheet molding step for producing an aroma-generating sheet to be heated, by compression from a material produced by the second wet mixing step; and
a sheet processing step for cutting or folding the aroma-generating sheet to be heated.

**31.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being an aroma-generating base

material to be heated that is produced by adding, in the sheet molding step according to claim 29 or 30, a step for adding a material selected from a non-tobacco material, an aerosol former, a binder or thickener, crosslinked PVP, a perfume, a non-tobacco extract, $\beta$-cyclodextrin, microcrystalline cellulose, an antimicrobial preservative, and pure water.

**32.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced using a modified cellulose polymer as the first binder according to any of claims 29 through 31, and using a non-cellulose-based polysaccharide-based polymer as the second binder according to any of claims 29 through 31.

**33.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced using any one or more of methyl cellulose, ethyl cellulose, carboxymethyl cellulose, carboxyethyl cellulose, hydroxymethyl cellulose, hydroxyethyl cellulose, hydroxypropyl cellulose, and a sodium salt, a potassium salt, or a calcium salt of carboxymethyl cellulose or carboxyethyl cellulose as the modified cellulose polymer according to claim 32, and using any one or more of konjac mannan (glucomannan), guar gum, pectin, carrageenan, tamarind seed gum, gum arabic, soybean polysaccharide, locust bean gum, karaya gum, xanthan gum, and agar as the polysaccharide-based polymer according to claim 32.

**34.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced using 5-20 parts by mass of the first binder according to claim 32 or 33 and 0.1-5 parts by mass of the second binder according to claim 32 or 33 with respect to 100 parts by mass of the non-tobacco material according to claims 29 through 31.

**35.** The aroma cartridge according to claim 1, said gas-generation-maintaining material being an aroma-generating base material to be heated that is produced by performing the aging step according to claim 30 at 15-30°C for 72-336 hours.

**36.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being inorganic particles included in the aroma generator to be heated.

**37.** The aroma cartridge according to claim 36, the inorganic particles being present inside or on a surface of the aroma-generating base material to be heated.

**38.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced by further adding inorganic particles as a material of any of claims 19 through 35.

**39.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being an aroma-generating sheet to be heated that is produced by adding a step for spraying inorganic particles on the aroma-generating sheet to be heated, after the step whereby the aroma-generating sheet to be heated according to any of claims 19 through 35 is produced.

**40.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced by adding a step for spraying inorganic particles on the aroma-generating base material to be heated, after the sheet processing step whereby the aroma-generating base material to be heated according to any one of claims 19 through 35 is produced.

**41.** The aroma cartridge according to any of claims 36 through 40, the inorganic particles being magnesium oxide, calcium oxide, titanium oxide, iron oxide, alumina, or another metal oxide; magnesium carbonate, calcium carbonate, or another metal carbonate; calcium phosphate or another metal phosphate; potassium titanate, magnesium titanate, or another titanate; zeolite, colloidal silica, fumed silica, or another silicon oxide, or the like.

**42.** The aroma cartridge according to any of claims 36 through 41, an average particle diameter of the inorganic particles being 1-100 $\mu$m.

**43.** The aroma cartridge according to any of claims 36 through 42, the inorganic particles being added in an amount of 0.1-10 parts by mass with respect to 100 parts by mass of the non-tobacco material.

**44.** The aroma cartridge according to any of claims 1 through 43, the aroma-generating base material to be heated

being columnar and being wound so as to be arranged lengthwise.

**45.** The aroma cartridge according to any of claims 1 through 44, a filling ratio of the aroma-generating base material to be heated constituting the aroma generator to be heated being 60-90%.

**46.** The aroma cartridge according to any of claims 19 through 45, the aerosol former being 50-80 parts by mass with respect to 100 parts by mass of the non-tobacco material included in the aroma-generating base material to be heated.

**47.** The aroma cartridge according to any of claims 19 through 46, the crosslinked polyvinylpyrrolidone being 7-25 parts by mass with respect to 100 parts by mass of the non-tobacco material included in the aroma-generating base material to be heated.

**48.** The aroma cartridge according to any of claims 19 through 47, the microcrystalline cellulose being 7-25 parts by mass with respect to 100 parts by mass of the non-tobacco material included in the aroma-generating base material to be heated.

**49.** The aroma cartridge according to any of claims 19 through 48, the $\beta$-cyclodextrin being 0.2-1.0 part by mass with respect to 100 parts by mass of the non-tobacco material included in the aroma-generating base material to be heated.

**50.** A method for producing an aroma-generating base material to be heated, comprising:

a dry mixing step for mixing a dried and pulverized non-tobacco material;
a first wet mixing step for mixing, in an alcohol and pure water mixture, the non-tobacco material produced by the dry mixing step, and a material selected from an aerosol former, a binder or thickener, crosslinked polyvinylpyrrolidone (PVP), a perfume, a non-tobacco extract, $\beta$-cyclodextrin, microcrystalline cellulose, and an antimicrobial preservative;
a second wet mixing step for producing a slurry including the non-tobacco material, etc., by adding additional pure water and/or alcohol to the alcohol and pure water mixture including the non-tobacco material, etc., produced by the first wet mixing step;
a paper-making step for producing a water-containing sheet from the slurry produced by the second wet mixing step;
a sheet molding step for compressing the water-containing sheet to obtain a sheet;
a drying step for drying the sheet produced by the sheet molding step to produce an aroma-generating sheet to be heated; and
a sheet processing step for cutting or folding the aroma-generating sheet to be heated.

**51.** A method for producing an aroma-generating base material to be heated, using a lower monoalcohol as the alcohol in the second wet mixing step according to claim 50.

**52.** A method for producing an aroma-generating base material to be heated, using 0.1-10 parts by mass of the lower monoalcohol according to claim 50 with respect to 100 parts by mass of the non-tobacco material.

**53.** A method for producing an aroma-generating base material to be heated, comprising:

a dry mixing step for mixing a dried and pulverized non-tobacco material;
a first wet mixing step for mixing, in an alcohol and pure water mixture, the non-tobacco material produced by the dry mixing step, and a material selected from an aerosol former, a binder or thickener, crosslinked PVP, a perfume, a non-tobacco extract, $\beta$-cyclodextrin, microcrystalline cellulose, and an antimicrobial preservative;
a second wet mixing step for producing a slurry including the non-tobacco material, etc., by adding additional pure water and/or alcohol to the alcohol and pure water mixture including the non-tobacco material, etc., produced by the first wet mixing step;
a paper-making step for producing a water-containing sheet from the slurry produced by the second wet mixing step;
a sheet molding step for compressing or casting the water-containing sheet to obtain a sheet;
an aerosol former absorption step for coating the water-containing sheet with, or dipping the sheet into, the aerosol former, a moisture content of the water-containing sheet being reduced to less than 50% by mass by the sheet molding step;
a drying step for drying the sheet produced by the aerosol former absorption step and producing an aroma-

generating sheet to be heated; and
a sheet processing step for cutting or folding the aroma-generating sheet to be heated.

**54.** A method for producing an aroma-generating base material to be heated, using a lower monoalcohol as the alcohol in the second wet mixing step according to claim 53.

**55.** A method for producing an aroma-generating base material to be heated, using 0.1-10 parts by mass of the lower monoalcohol according to claim 53 with respect to 100 parts by mass of the non-tobacco material.

**56.** A method for producing an aroma-generating base material to be heated, comprising:

a wet mixing step for producing a slurry of a non-tobacco material by mixing a dried and pulverized non-tobacco material with pure water;
a paper-making step for producing a water-containing sheet from the slurry produced by the wet mixing step;
a sheet molding step for compressing or casting the water-containing sheet to obtain a sheet;
a drying step for reducing the moisture content of the sheet produced by the sheet molding step to less than 50% by mass;
an absorption and adsorption step for coating the sheet produced by the drying step with, or dipping the sheet into, an alcohol and pure water mixture of a material selected from an aerosol former, a binder or thickener, crosslinked PVP, a perfume, a non-tobacco material extract, $\beta$-cyclodextrin, microcrystalline cellulose, a concentrate of water discharged in the sheet molding step, and an antimicrobial preservative;
a drying step for drying the sheet produced by the absorption and adsorption step to produce an aroma-generating sheet to be heated; and
a sheet processing step for cutting or folding the aroma-generating sheet to be heated.

**57.** A method for producing an aroma-generating base material to be heated, comprising:

a non-tobacco-material preparation step for drying and pulverizing a non-tobacco material;
a perfume and/or non-tobacco extract mixing step for mixing at least a perfume and/or a non-tobacco material extract and crosslinked PVP and/or $\beta$-cyclodextrin in alcohol to cause the perfume and/or non-tobacco extract to reside in the crosslinked PVP and/or $\beta$-cyclodextrin;
an aerosol former dissolving step for mixing at least an aerosol former and a binder or thickener with pure water;
a wet mixing step for mixing a material produced by the non-tobacco material preparation step, a material produced by the perfume and/or non-tobacco extract mixing step, and a material produced by the aerosol former dissolving step;
a sheet molding step for producing an aroma-generating sheet to be heated, by compression from a material produced by the wet mixing step; and
a sheet processing step for cutting or folding the aroma-generating sheet to be heated.

**58.** A method for producing an aroma-generating base material to be heated, using menthol and/or xylitol as the perfume according to claim 57.

**59.** A method for producing an aroma generator to be heated, by adding in the sheet molding step according to claim 57, a step for adding a material selected from a non-tobacco material, an aerosol former, a binder or thickener, crosslinked PVP, a perfume, a non-tobacco extract, $\beta$-cyclodextrin, microcrystalline cellulose, an antimicrobial preservative, and pure water.

**60.** A method for producing an aroma-generating base material to be heated, comprising:

a first wet mixing step for mixing a dried and pulverized non-tobacco material, a first binder aqueous solution in which a first binder is dissolved in pure water, and a material selected from an aerosol former, crosslinked PVP, a perfume, a non-tobacco extract, $\beta$-cyclodextrin, microcrystalline cellulose, and an antimicrobial preservative;
a second wet mixing step for mixing a second binder aqueous solution in which a second binder is dissolved in pure water with a mixture produced by the first wet mixing step;
a sheet molding step for producing an aroma-generating sheet to be heated, by compression from a material produced by the second wet mixing step; and
a sheet processing step for cutting or folding the aroma-generating sheet to be heated.

**61.** A method for producing an aroma-generating base material to be heated, comprising:

a first wet mixing step for mixing a dried and pulverized non-tobacco material, a first binder aqueous solution in which a first binder is dissolved in pure water, and a material selected from an aerosol former, crosslinked PVP, a perfume, a non-tobacco extract, β-cyclodextrin, microcrystalline cellulose, and an antimicrobial preservative;
an aging step for stabilizing a mixture produced by the first wet mixing step;
a second wet mixing step for mixing an aged mixture produced by the aging step and a second binder aqueous solution in which a second binder is dissolved in pure water;
a sheet molding step for producing an aroma-generating sheet to be heated, by compression from a material produced by the second wet mixing step; and
a sheet processing step for cutting or folding the aroma-generating sheet to be heated.

**62.** A method for producing an aroma-generating base material to be heated, by adding in the sheet molding step according to claim 60 or 61, a step for adding a material selected from a non-tobacco material, an aerosol former, a binder or thickener, crosslinked PVP, a perfume, a non-tobacco extract, β-cyclodextrin, microcrystalline cellulose, an antimicrobial preservative, and pure water.

**63.** A method for producing an aroma-generating base material to be heated, using a modified cellulose polymer as the first binder according to claim 60 or 61, and using a non-cellulose-based polysaccharide-based polymer as the second binder according to claim 60 or 61.

**64.** A method for producing an aroma-generating base material to be heated, using any one or more of methyl cellulose, ethyl cellulose, carboxymethyl cellulose, carboxyethyl cellulose, hydroxymethyl cellulose, hydroxyethyl cellulose, hydroxypropyl cellulose, and a sodium salt, a potassium salt, or a calcium salt of carboxymethyl cellulose or carboxyethyl cellulose as the modified cellulose polymer according to claim 63, and using any one or more of konjac mannan (glucomannan), guar gum, pectin, carrageenan, tamarind seed gum, gum arabic, soybean polysaccharide, locust bean gum, karaya gum, xanthan gum, and agar as the polysaccharide-based polymer according to claim 63.

**65.** A method for producing an aroma-generating base material to be heated, using 5-20 parts by mass of the first binder according to claim 60 or 61 and 0.1-5 parts by mass of the second binder according to claim 60 or 61 with respect to 100 parts by mass of the non-tobacco material according to claim 60 or 61.

**66.** A method for producing an aroma-generating base material to be heated, in which the aging step according to claim 61 is performed at 15-30°C for 72-336 hours.

**67.** A method for producing an aroma-generating base material to be heated as the gas-generation-maintaining material, by further adding inorganic particles as a material of any of claims 19 through 35.

**68.** A method for producing an aroma-generating sheet to be heated, by adding a step for spraying inorganic particles on the aroma-generating sheet to be heated, after the step whereby the aroma-generating sheet to be heated according to any of claims 50 through 66 is produced.

**69.** A method for producing an aroma-generating base material to be heated, by adding a step for spraying inorganic particles on the aroma-generating base material to be heated, after the sheet processing step whereby the aroma-generating base material to be heated according to any of claims 50 through 66 is produced.

**70.** The aroma cartridge according to claim 1,
the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced by a producing device comprising:

dry mixing means for mixing a dried and pulverized non-tobacco material;
first wet mixing means for mixing, in an alcohol and pure water mixture,
the non-tobacco material produced by the dry mixing means, and a material selected from an aerosol former, a binder or thickener, crosslinked polyvinylpyrrolidone (PVP), a perfume, a non-tobacco extract, β-cyclodextrin, microcrystalline cellulose, and an antimicrobial preservative;
second wet mixing means for producing a slurry including the non-tobacco material, etc., by adding additional pure water and/or alcohol to the alcohol and pure water mixture including the non-tobacco material, etc., produced

by the first wet mixing means;
paper-making means for producing a water-containing sheet from the slurry produced by the second wet mixing means;
sheet molding means for compressing the water-containing sheet to obtain a sheet;
drying means for drying the sheet produced by the sheet molding means to produce an aroma-generating sheet to be heated; and
sheet processing means for cutting or folding the aroma-generating sheet to be heated.

**71.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced using a lower monoalcohol as the alcohol in the second wet mixing means according to claim 70.

**72.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced using 0.1-10 parts by mass of the lower monoalcohol according to claim 71 with respect to 100 parts by mass of the non-tobacco material.

**73.** The aroma cartridge according to claim 1,
the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced by a producing device comprising:

dry mixing means for mixing a dried and pulverized non-tobacco material;
first wet mixing means for mixing, in an alcohol and pure water mixture, the non-tobacco material produced by the dry mixing means, and a material selected from an aerosol former, a binder or thickener, crosslinked PVP, a perfume, a non-tobacco extract, $\beta$-cyclodextrin,microcrystalline cellulose, and an antimicrobial preservative;
second wet mixing means for producing a slurry including the non-tobacco material, etc., by adding additional pure water and/or alcohol to the alcohol and pure water mixture including the non-tobacco material, etc., produced by the first wet mixing means;
paper-making means for producing a water-containing sheet from the slurry produced by the second wet mixing means;
sheet molding means for compressing or casting the water-containing sheet to obtain a sheet;
aerosol former absorption means for coating the water-containing sheet with, or dipping the sheet into, the aerosol former, a moisture content of the water-containing sheet being reduced to less than 50% by mass by the sheet molding means;
drying means for drying the sheet produced by the aerosol former absorption means and producing an aroma-generating sheet to be heated; and
sheet processing means for cutting or folding the aroma-generating sheet to be heated.

**74.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced using a lower monoalcohol as the alcohol in the second wet mixing step according to claim 73.

**75.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced using 0.1-10 parts by mass of the lower monoalcohol according to claim 74 with respect to 100 parts by mass of the non-tobacco material.

**76.** The aroma cartridge according to claim 1,
the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced by a producing device comprising:

wet mixing means for producing a slurry of a non-tobacco material by mixing a dried and pulverized non-tobacco material with pure water;
paper-making means for producing a water-containing sheet from the slurry produced by the wet mixing means;
sheet molding means for compressing or casting the water-containing sheet to obtain a sheet;
drying means for reducing the moisture content of the sheet produced by the sheet molding means to less than 50% by mass;
absorption and adsorption means for coating the sheet produced by the drying means with, or dipping the sheet into, an alcohol and pure water mixture of a material selected from an aerosol former, a binder or thickener, crosslinked PVP, a perfume, a non-tobacco material extract, $\beta$-cyclodextrin, microcrystalline cellulose, a con-

centrate of water discharged in the sheet molding means, and an antimicrobial preservative;
drying means for drying the sheet produced by the absorption and adsorption means to produce an aroma-generating sheet to be heated; and
sheet processing means for cutting or folding the aroma-generating sheet to be heated.

**77.** The aroma cartridge according to claim 1,
the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced by a producing device comprising:

non-tobacco-material preparation means for drying and pulverizing a non-tobacco material;
perfume and/or non-tobacco extract mixing means for mixing at least a perfume and/or a non-tobacco material extract and crosslinked PVP and/or $\beta$-cyclodextrin in alcohol to cause the perfume and/or non-tobacco extract to reside in the crosslinked PVP and/or $\beta$-cyclodextrin;
aerosol former dissolving means for mixing at least an aerosol former and a binder or thickener with pure water;
wet mixing means for mixing a material produced by the non-tobacco material preparation means, a material produced by the perfume and/or non-tobacco extract mixing means, and a material produced by the aerosol former dissolving means;
sheet molding means for producing an aroma-generating sheet to be heated, by compression from a material produced by the wet mixing means; and
sheet processing means for cutting or folding the aroma-generating sheet to be heated.

**78.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being an aroma generator to be heated that is produced using menthol and/or xylitol as the perfume according to claim 77.

**79.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being an aroma generator to be heated that is produced by adding, in the sheet molding means according to claim 77, means for adding a material selected from a non-tobacco material, an aerosol former, a binder or thickener, crosslinked PVP, a perfume, a non-tobacco extract, $\beta$-cyclodextrin,microcrystalline cellulose, an antimicrobial preservative, and pure water.

**80.** The aroma cartridge according to claim 1,
the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced by a producing device comprising:

first wet mixing means for mixing a dried and pulverized non-tobacco material, a first binder aqueous solution in which a first binder is dissolved in pure water, and a material selected from an aerosol former, crosslinked PVP, a perfume, a non-tobacco extract, $\beta$-cyclodextrin,microcrystalline cellulose, and an antimicrobial preservative;
second wet mixing means for mixing a second binder aqueous solution in which a second binder is dissolved in pure water with a material produced by the first wet mixing means;
sheet molding means for producing an aroma-generating sheet to be heated, by compression from a material produced by the second wet mixing means; and
sheet processing means for cutting or folding the aroma-generating sheet to be heated.

**81.** The aroma cartridge according to claim 1,
the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced by a producing device comprising:

first wet mixing means for mixing a dried and pulverized non-tobacco material, a first binder aqueous solution in which a first binder is dissolved in pure water, and a material selected from an aerosol former, crosslinked PVP, a perfume, a non-tobacco extract, $\beta$-cyclodextrin,microcrystalline cellulose, and an antimicrobial preservative;
aging means for stabilizing a mixture produced by the first wet mixing means;
second wet mixing means for mixing an aged mixture produced by the aging means and a second binder aqueous solution in which a second binder is dissolved in pure water;
sheet molding means for producing an aroma-generating sheet to be heated, by compression from a material produced by the second wet mixing means; and
sheet processing means for cutting or folding the aroma-generating sheet to be heated.

**82.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced by adding, in the sheet molding means according to claim 80 or 81, means for adding a material selected from a non-tobacco material, an aerosol former, a binder or thickener, crosslinked PVP, a perfume, a non-tobacco extract, $\beta$-cyclodextrin,microcrystalline cellulose, an antimicrobial preservative, and pure water.

**83.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced using a modified cellulose polymer as the first binder according to any of claims 80 through 82, and using a non-cellulose-based polysaccharide-based polymer as the second binder according to any of claims 80 through 82.

**84.** The aroma cartridge according to claim 1, said gas-generation-maintaining material being an aroma-generating base material to be heated that is produced using any one or more of methyl cellulose, ethyl cellulose, carboxymethyl cellulose, carboxyethyl cellulose, hydroxymethyl cellulose, hydroxyethyl cellulose, hydroxypropyl cellulose, and a sodium salt, a potassium salt, or a calcium salt of carboxymethyl cellulose or carboxyethyl cellulose as the modified cellulose polymer according to claim 83, and using any one or more of konjac mannan (glucomannan), guar gum, pectin, carrageenan, tamarind seed gum, gum arabic, soybean polysaccharide, locust bean gum, karaya gum, xanthan gum, and agar as the polysaccharide-based polymer according to claim 82.

**85.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced using 5-20 parts by mass of the first binder according to claim 83 or 84 and 0.1-5 parts by mass of the second binder according to claim 83 or 84 with respect to 100 parts by mass of the non-tobacco material according to claims 80 through 82.

**86.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced by applying the aging means according to claim 81 at 15-30°C for 72-336 hours.

**87.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being, as the material of any of claims 70 through 86, an aroma-generating base material to be heated that is produced by further adding inorganic particles.

**88.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being an aroma-generating sheet to be heated that is produced by adding means for spraying inorganic particles on the aroma-generating sheet to be heated, after the means whereby the aroma-generating sheet to be heated according to any of claims 70 through 86 is produced.

**89.** The aroma cartridge according to claim 1, the gas-generation-maintaining material being an aroma-generating base material to be heated that is produced by adding means for spraying inorganic particles on the aroma-generating base material to be heated, after the sheet processing means whereby the aroma-generating base material to be heated according to any one of claims 70 through 86 is produced.

**90.** The aroma cartridge according to any of claims 87 through 89, the inorganic particles being magnesium oxide, calcium oxide, titanium oxide, iron oxide, alumina, or another metal oxide; magnesium carbonate, calcium carbonate, or another metal carbonate; calcium phosphate or another metal phosphate; potassium titanate, magnesium titanate, or another titanate; zeolite, colloidal silica, fumed silica, or another silicon oxide, or the like.

**91.** The aroma cartridge according to any of claims 87 through 90, an average particle diameter of the inorganic particles being 1-100 $\mu$m.

**92.** The aroma cartridge according to any of claims 87 through 91, the inorganic particles being added in an amount of 0.1-10 parts by mass with respect to 100 parts by mass of the non-tobacco material.

**93.** The aroma cartridge according to any of claims 70 through 92, the aroma-generating base material to be heated being columnar, being wound so as to be arranged lengthwise, and constituting the aroma generator to be heated.

**94.** The aroma cartridge according to any of claims 70 through 93, a filling ratio of the aroma-generating base material to be heated constituting the aroma generator to be heated being 60-90%.

**95.** The aroma cartridge according to any of claims 70 through 94, the aerosol former being 50-80 parts by mass with respect to 100 parts by mass of the non-tobacco material included in the aroma-generating base material to be heated.

**96.** The aroma cartridge according to any of claims 70 through 95, the crosslinked polyvinylpyrrolidone being 7-25 parts by mass with respect to 100 parts by mass of the non-tobacco material included in the aroma-generating base material to be heated.

**97.** The aroma cartridge according to any of claims 70 through 96, the microcrystalline cellulose being 7-25 parts by mass with respect to 100 parts by mass of the non-tobacco material included in the aroma-generating base material to be heated.

**98.** The aroma cartridge according to any of claims 70 through 97, the $\beta$-cyclodextrin being 0.2-1.0 part by mass with respect to 100 parts by mass of the non-tobacco material included in the aroma-generating base material to be heated.

**99.** A device for producing an aroma-generating base material to be heated, comprising:

dry mixing means for mixing a dried and pulverized non-tobacco material;
first wet mixing means for mixing, in an alcohol and pure water mixture, the non-tobacco material produced by the dry mixing means, and a material selected from an aerosol former, a binder or thickener, crosslinked polyvinylpyrrolidone (PVP), a perfume, a non-tobacco extract, $\beta$-cyclodextrin, microcrystalline cellulose, and an antimicrobial preservative;
second wet mixing means for producing a slurry including the non-tobacco material, etc., by adding additional pure water and/or alcohol to the alcohol and pure water mixture including the non-tobacco material, etc., produced by the first wet mixing means;
paper-making means for producing a water-containing sheet from the slurry produced by the second wet mixing means;
sheet molding means for compressing the water-containing sheet to obtain a sheet;
drying means for drying the sheet produced by the sheet molding means to produce an aroma-generating sheet to be heated; and
sheet processing means for cutting or folding the aroma-generating sheet to be heated.

**100.** A device for producing an aroma-generating base material to be heated, using a lower monoalcohol as the alcohol in the second wet mixing means according to claim 99.

**101.** A device for producing an aroma-generating base material to be heated, using 0.1-10 parts by mass of the lower monoalcohol according to claim 99 with respect to 100 parts by mass of the non-tobacco material.

**102.** A device for producing an aroma-generating base material to be heated, comprising:

dry mixing means for mixing a dried and pulverized non-tobacco material;
first wet mixing means for mixing, in an alcohol and pure water mixture, the non-tobacco material produced by the dry mixing means, and a material selected from an aerosol former, a binder or thickener, crosslinked PVP, a perfume, a non-tobacco extract, $\beta$-cyclodextrin,microcrystalline cellulose, and an antimicrobial preservative;
second wet mixing means for producing a slurry including the non-tobacco material, etc., by adding additional pure water and/or alcohol to the alcohol and pure water mixture including the non-tobacco material, etc., produced by the first wet mixing means;
paper-making means for producing a water-containing sheet from the slurry produced by the second wet mixing means;
sheet molding means for compressing or casting the water-containing sheet to obtain a sheet;
aerosol former absorption means for coating the water-containing sheet with, or dipping the sheet into, the aerosol former, a moisture content of the water-containing sheet being reduced to less than 50% by mass by the sheet molding means;
drying means for drying the sheet produced by the aerosol former absorption means and producing an aroma-generating sheet to be heated; and
sheet processing means for cutting or folding the aroma-generating sheet to be heated.

**103.** A device for producing an aroma-generating base material to be heated, using a lower monoalcohol as the alcohol in the second wet mixing means according to claim 102.

**104.** A device for producing an aroma-generating base material to be heated, using 0.1-10 parts by mass of the lower monoalcohol according to claim 102 with respect to 100 parts by mass of the non-tobacco material.

**105.** A device for producing an aroma-generating base material to be heated, comprising:

wet mixing means for producing a slurry of a non-tobacco material by mixing a dried and pulverized non-tobacco material with pure water;
paper-making means for producing a water-containing sheet from the slurry produced by the wet mixing means;
sheet molding means for compressing or casting the water-containing sheet to obtain a sheet;
drying means for reducing the moisture content of the sheet produced by the sheet molding means to less than 50% by mass;
absorption and adsorption means for coating the sheet produced by the drying means with, or dipping the sheet into, an alcohol and pure water mixture of a material selected from an aerosol former, a binder or thickener, crosslinked PVP, a perfume, a non-tobacco material extract, β-cyclodextrin, microcrystalline cellulose, a concentrate of water discharged in the sheet molding means, and an antimicrobial preservative;
drying means for drying the sheet produced by the absorption and adsorption means to produce an aroma-generating sheet to be heated; and
sheet processing means for cutting or folding the aroma-generating sheet to be heated.

**106.** A device for producing an aroma-generating base material to be heated, comprising:

non-tobacco-material preparation means for drying and pulverizing a non-tobacco material;
perfume and/or non-tobacco extract mixing means for mixing at least a perfume and/or a non-tobacco material extract and crosslinked PVP and/or β-cyclodextrin in alcohol to cause the perfume and/or non-tobacco extract to reside in the crosslinked PVP and/or β-cyclodextrin;
aerosol former dissolving means for mixing at least an aerosol former and a binder or thickener with pure water;
wet mixing means for mixing a material produced by the non-tobacco material preparation means, a material produced by the perfume and/or non-tobacco extract mixing means, and a material produced by the aerosol former dissolving means;
sheet molding means for producing an aroma-generating sheet to be heated, by compression from a material produced by the wet mixing means; and
sheet processing means for cutting or folding the aroma-generating sheet to be heated.

**107.** A device for producing an aroma-generating base material to be heated, using menthol and/or xylitol as the perfume according to claim 106.

**108.** A device for producing an aroma generator to be heated, by adding in the sheet molding means according to claim 106, means for adding a material selected from a non-tobacco material, an aerosol former, a binder or thickener, crosslinked PVP, a perfume, a non-tobacco extract, β-cyclodextrin, microcrystalline cellulose, an antimicrobial preservative, and pure water.

**109.** A device for producing an aroma-generating base material to be heated, comprising:

first wet mixing means for mixing a dried and pulverized non-tobacco material, a first binder aqueous solution in which a first binder is dissolved in pure water, and a material selected from an aerosol former, crosslinked PVP, a perfume, a non-tobacco extract, β-cyclodextrin,microcrystalline cellulose, and an antimicrobial preservative;
second wet mixing means for mixing a second binder aqueous solution in which a second binder is dissolved in pure water with a mixture produced by said first wet mixing means;
sheet molding means for producing an aroma-generating sheet to be heated, by compression from a material produced by said second wet mixing means; and
sheet processing means for cutting or folding said aroma-generating sheet to be heated.

**110.** A device for producing an aroma-generating base material to be heated, comprising:

first wet mixing means for mixing a dried and pulverized non-tobacco material, a first binder aqueous solution in which a first binder is dissolved in pure water, and a material selected from an aerosol former, crosslinked PVP, a perfume, a non-tobacco extract, β-cyclodextrin,microcrystalline cellulose, and an antimicrobial preserv-

ative;
aging means for stabilizing a mixture produced by the first wet mixing means;
second wet mixing means for mixing an aged mixture produced by the aging means and a second binder aqueous solution in which a second binder is dissolved in pure water;
sheet molding means for producing an aroma-generating sheet to be heated, by compression from a material produced by the second wet mixing means; and
sheet processing means for cutting or folding the aroma-generating sheet to be heated.

**111.** A device for producing an aroma-generating base material to be heated, by adding in the sheet molding means according to claim 109 or 110, means for adding a material selected from a non-tobacco material, an aerosol former, a binder or thickener, crosslinked PVP, a perfume, a non-tobacco extract, $\beta$-cyclodextrin,microcrystalline cellulose, an antimicrobial preservative, and pure water.

**112.** A device for producing an aroma-generating base material to be heated, using a modified cellulose polymer as the first binder according to claim 109 or 110, and using a non-cellulose-based polysaccharide-based polymer as the second binder according to claim 109 or 110.

**113.** A device for producing an aroma-generating base material to be heated, using any one or more of methyl cellulose, ethyl cellulose, carboxymethyl cellulose, carboxyethyl cellulose, hydroxymethyl cellulose, hydroxyethyl cellulose, hydroxypropyl cellulose, and a sodium salt, a potassium salt, or a calcium salt of carboxymethyl cellulose or carboxyethyl cellulose as the modified cellulose polymer according to claim 112, and using any one or more of konjac mannan (glucomannan), guar gum, pectin, carrageenan, tamarind seed gum, gum arabic, soybean polysaccharide, locust bean gum, karaya gum, xanthan gum, and agar as the polysaccharide-based polymer according to claim 112.

**114.** A device for producing an aroma-generating base material to be heated, using 5-20 parts by mass of the first binder according to claim 110 or 111 and 0.1-5 parts by mass of the second binder according to claim 108 or 109 with respect to 100 parts by mass of the non-tobacco material according to claim 110 or 111.

**115.** A device for producing an aroma-generating base material to be heated, in which the aging means according to claim 110 is applied at 15-30°C for 72-336 hours.

**116.** A device for producing an aroma-generating base material to be heated as said gas-generation-maintaining material, by further adding inorganic particles as a material of any of claims 70 through 86.

**117.** A device for producing an aroma-generating sheet to be heated, by adding means for spraying inorganic particles on said aroma-generating sheet to be heated, after the means whereby the aroma-generating sheet to be heated according to any of claims 99 through 115 is produced.

**118.** A device for producing an aroma-generating base material to be heated, by adding means for spraying inorganic particles on said aroma-generating base material to be heated, after the sheet processing means whereby the aroma-generating base material to be heated according to any of claims 99 through 115 is produced.

FIG.1

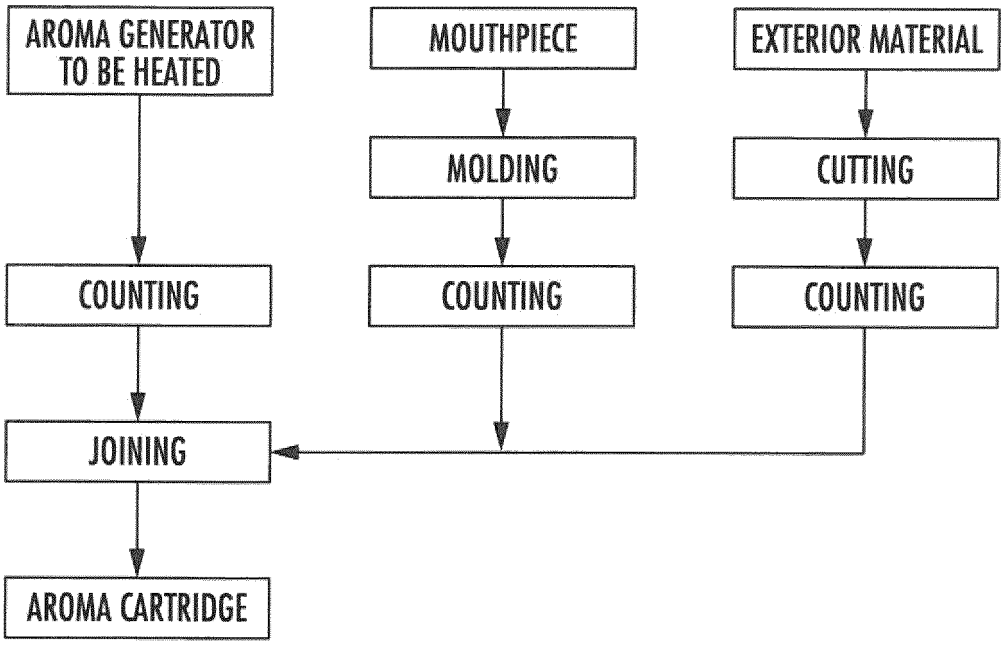

AROMA GENERATOR TO BE HEATED
MOUTHPIECE
EXTERIOR MATERIAL
MOLDING
CUTTING
COUNTING
COUNTING
COUNTING
JOINING
AROMA CARTRIDGE

FIG.2A

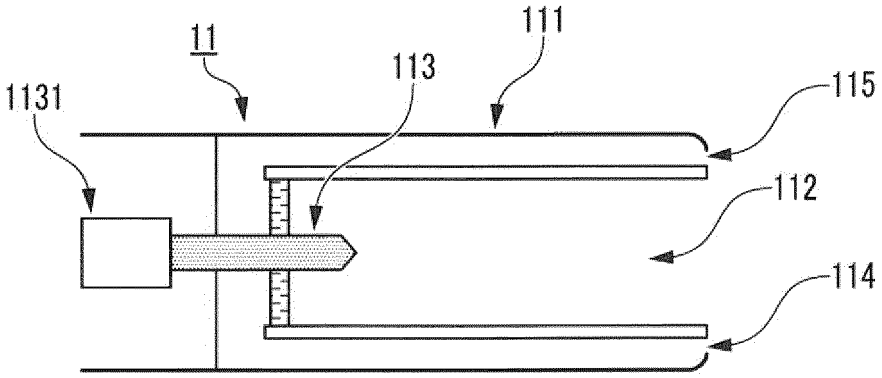



FIG.2B

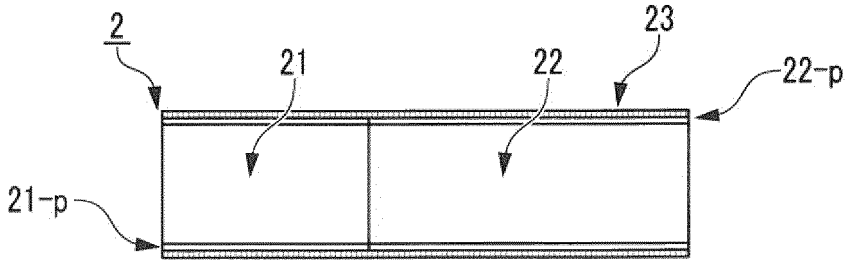



FIG.2C

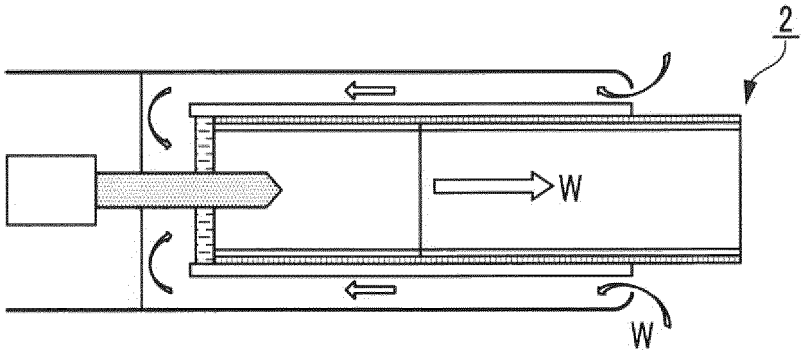


FIG.3A

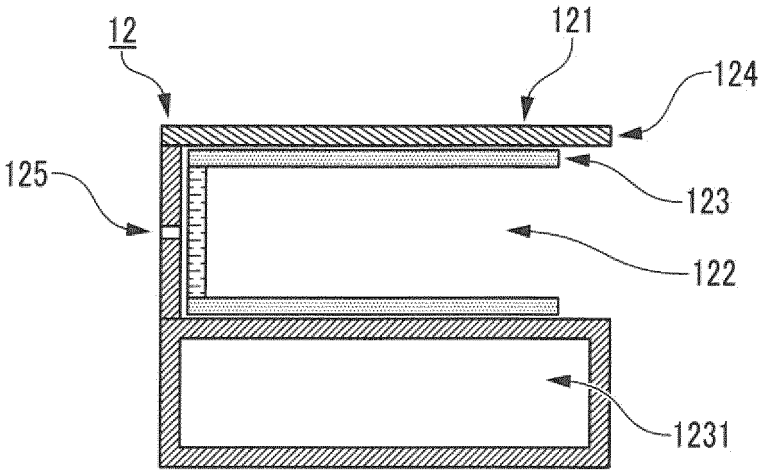



FIG.3B

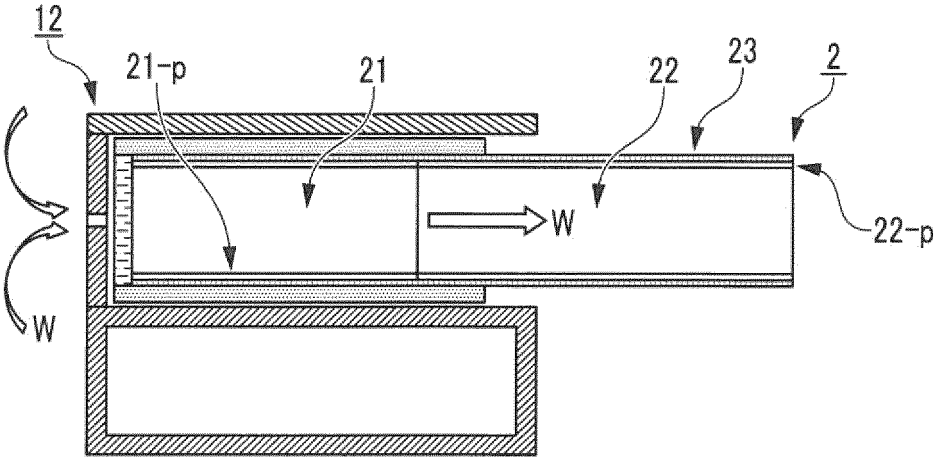


FIG.4

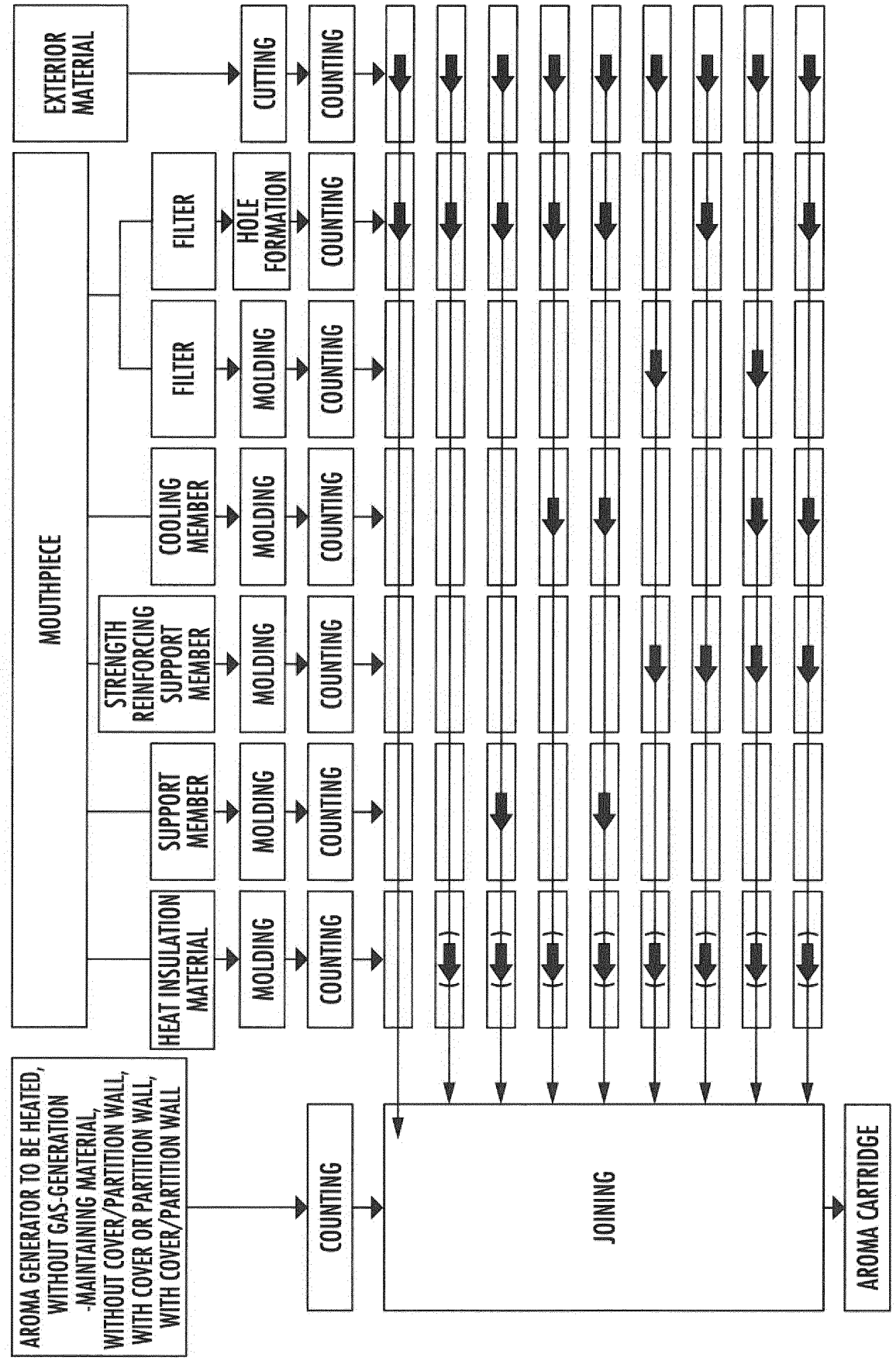

AROMA GENERATOR TO BE HEATED, WITHOUT GAS-GENERATION -MAINTAINING MATERIAL, WITHOUT COVER/PARTITION WALL, WITH COVER OR PARTITION WALL, WITH COVER/PARTITION WALL
MOUTHPIECE
HEAT INSULATION MATERIAL
SUPPORT MEMBER
STRENGTH REINFORCING SUPPORT MEMBER
COOLING MEMBER
FILTER
FILTER
EXTERIOR MATERIAL
MOLDING
COUNTING
MOLDING
COUNTING
MOLDING
COUNTING
MOLDING
COUNTING
MOLDING
COUNTING
HOLE FORMATION
COUNTING
CUTTING
COUNTING
COUNTING
JOINING
AROMA CARTRIDGE

FIG.5

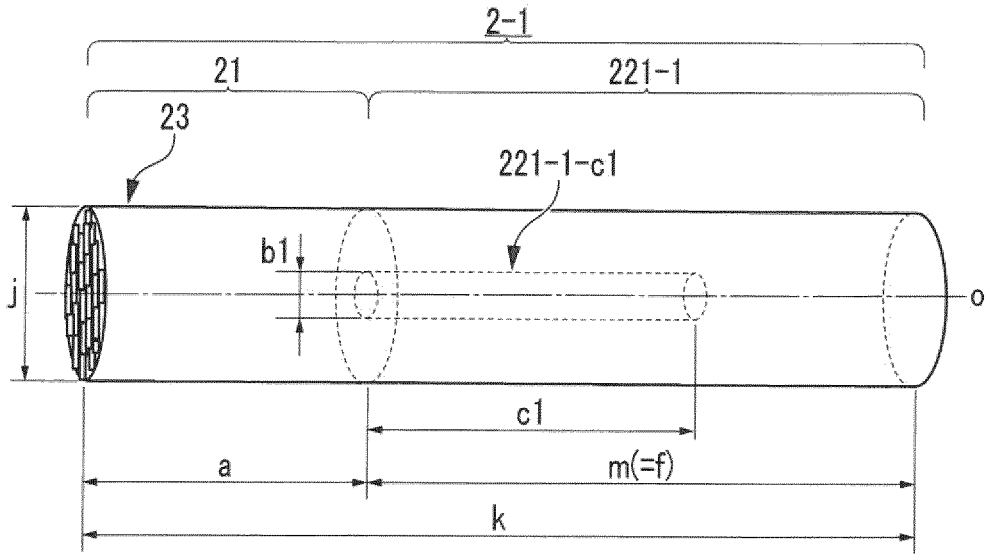

2-1
21
221-1
23
221-1-c1
b1
j
o
c1
a
m(=f)
k

FIG.6

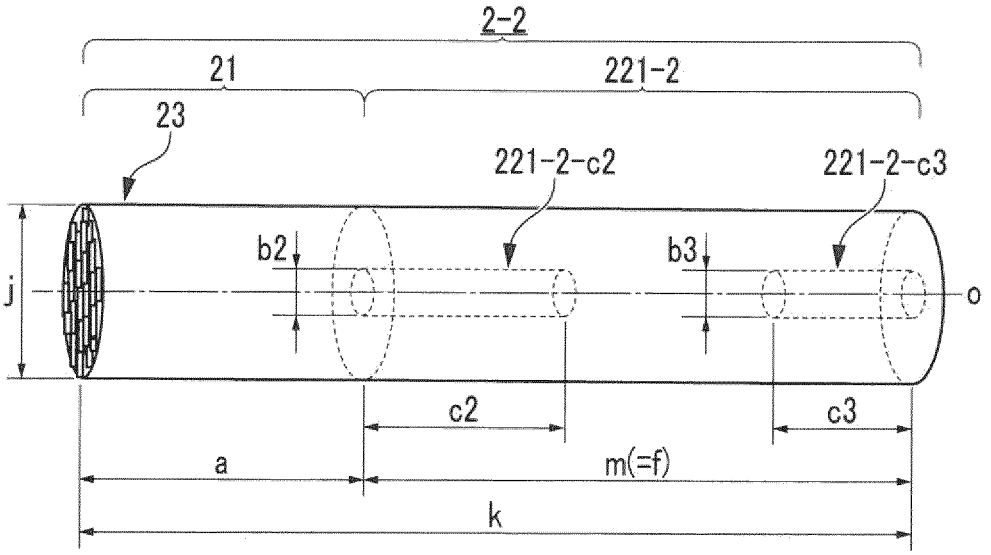

2-2
21
221-2
23
221-2-c2
221-2-c3
b2
b3
j
o
c2
c3
a
m(=f)
k

FIG.7

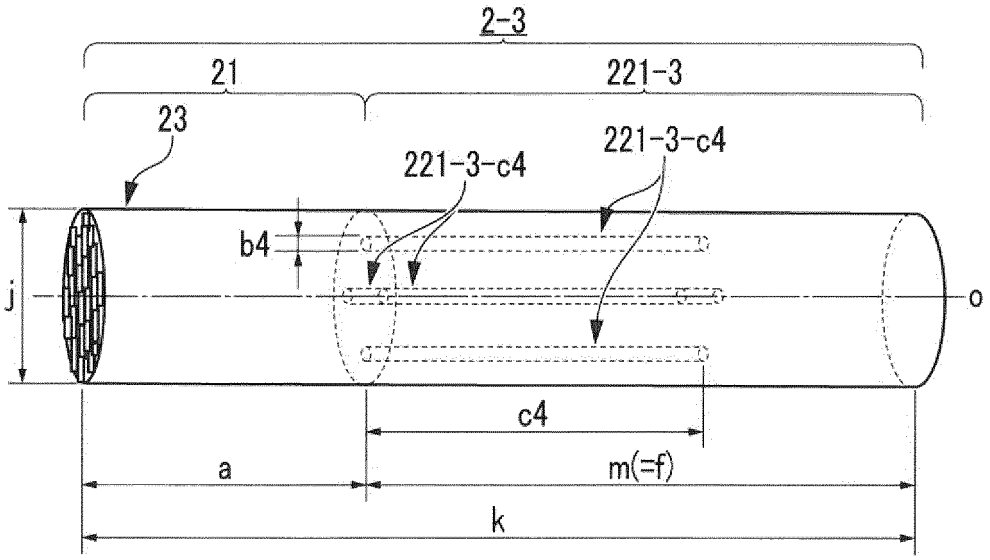

2-3
21
221-3
23
221-3-c4
221-3-c4
b4
j
o
c4
a
m(=f)
k

FIG.8

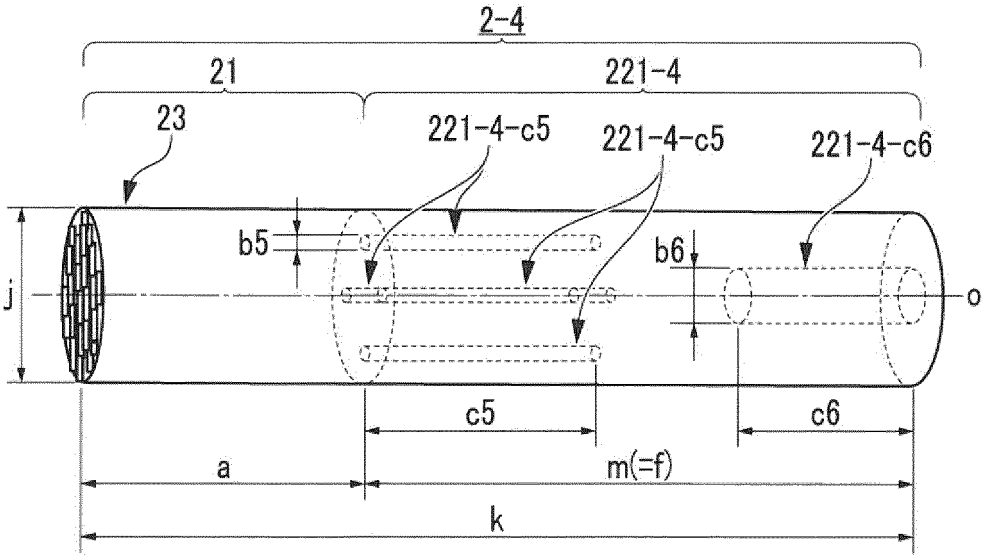

2-4
21
221-4
23
221-4-c5
221-4-c5
221-4-c6
b5
b6
j
o
c5
c6
a
m(=f)
k

FIG.9

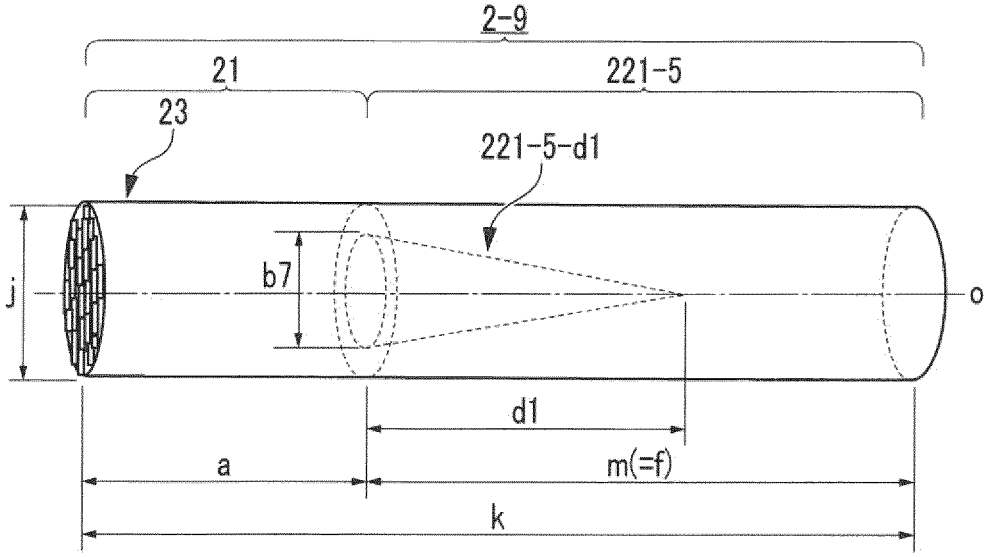

2-9
21
221-5
23
221-5-d1
j
b7
o
d1
a
m(=f)
k

FIG.10

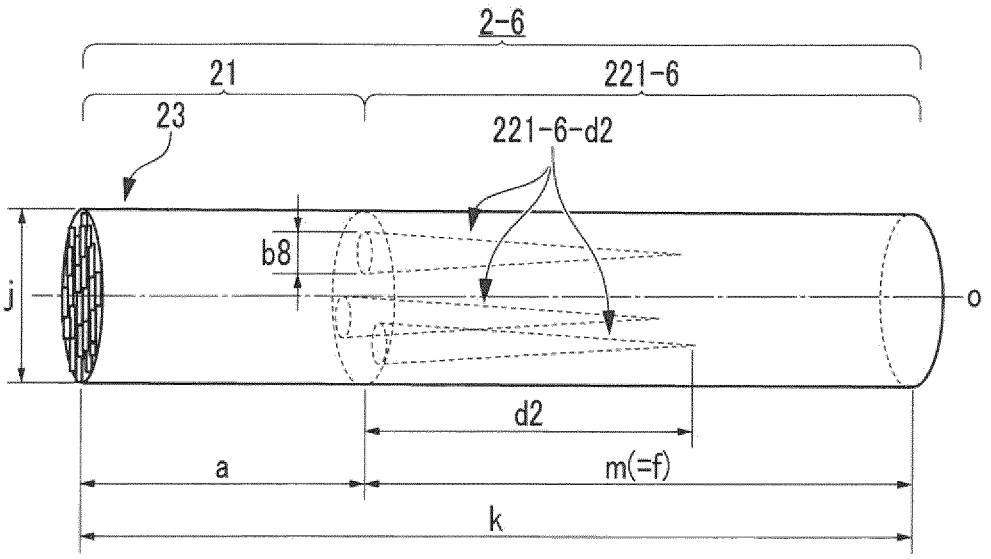

2-6
21
221-6
23
221-6-d2
j
b8
o
d2
a
m(=f)
k

FIG.11

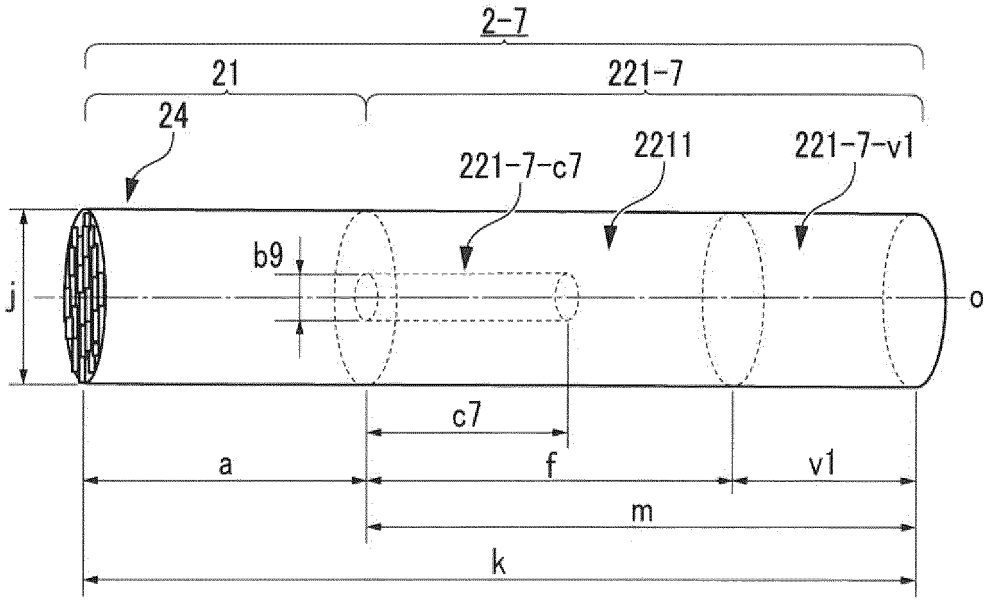

2-7
21
221-7
24
221-7-c7
2211
221-7-v1
b9
j
o
c7
a
f
v1
m
k

FIG.12

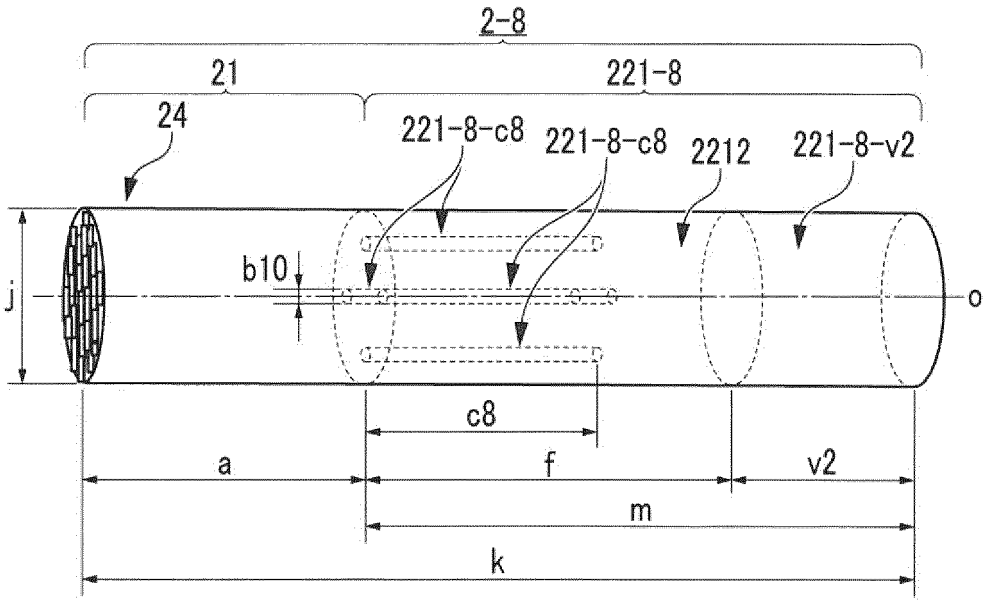

2-8
21
221-8
24
221-8-c8
221-8-c8
2212
221-8-v2
b10
j
o
c8
a
f
v2
m
k

FIG.13

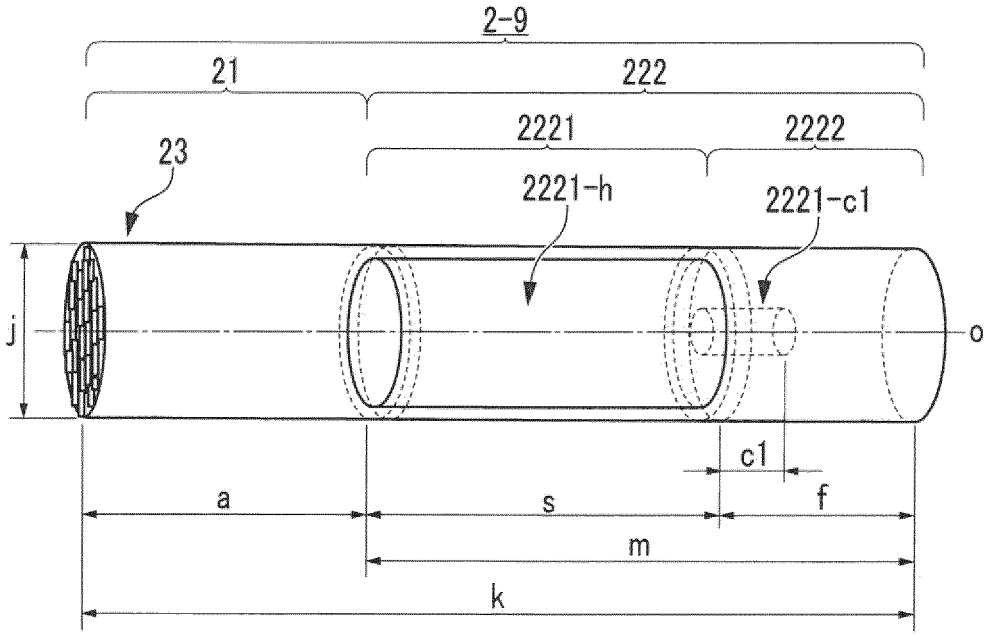

2-9
21
222
2221
2222
23
2221-h
2221-c1
j
o
c1
a
s
f
m
k

FIG.14

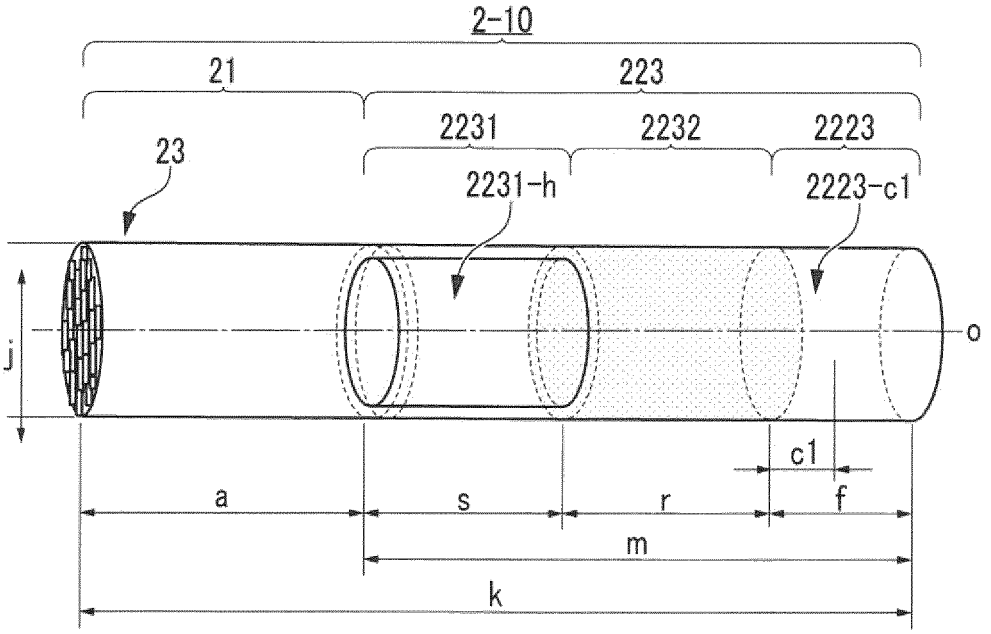

2-10
21
223
2231
2232
2223
23
2231-h
2223-c1
j
o
c1
a
s
r
f
m
k

FIG.15

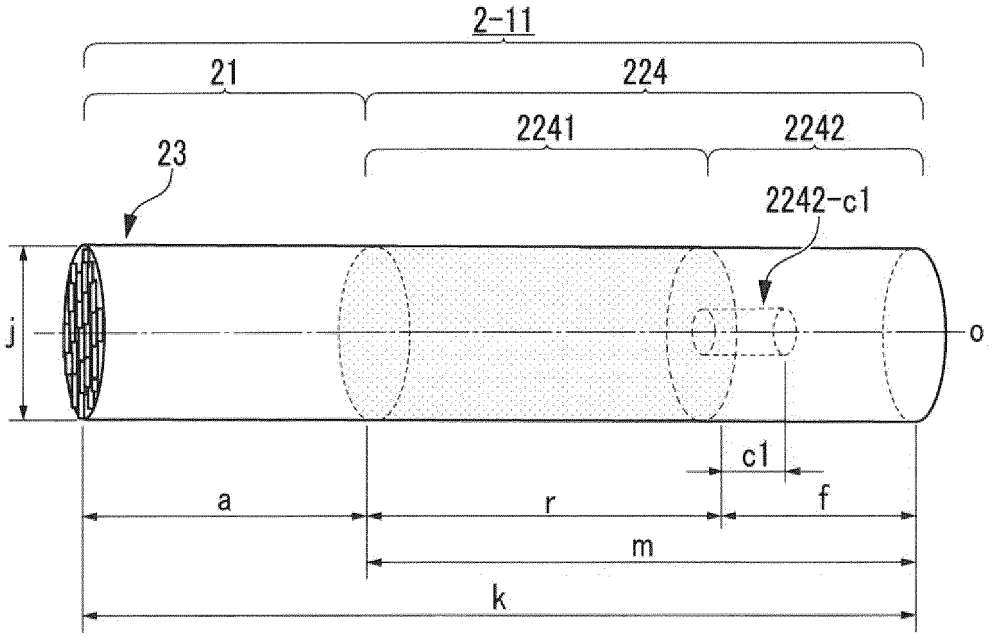

2-11
21
224
2241
2242
23
2242-c1
j
o
c1
a
r
f
m
k

FIG.16

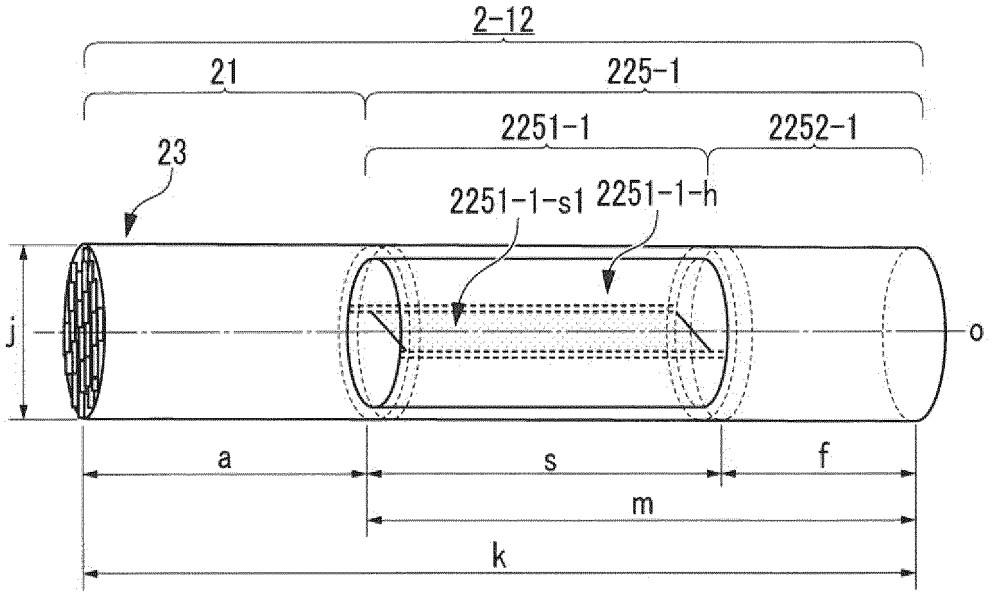

2-12
21
225-1
2251-1
2252-1
23
2251-1-s1
2251-1-h
j
o
a
s
f
m
k

FIG.17

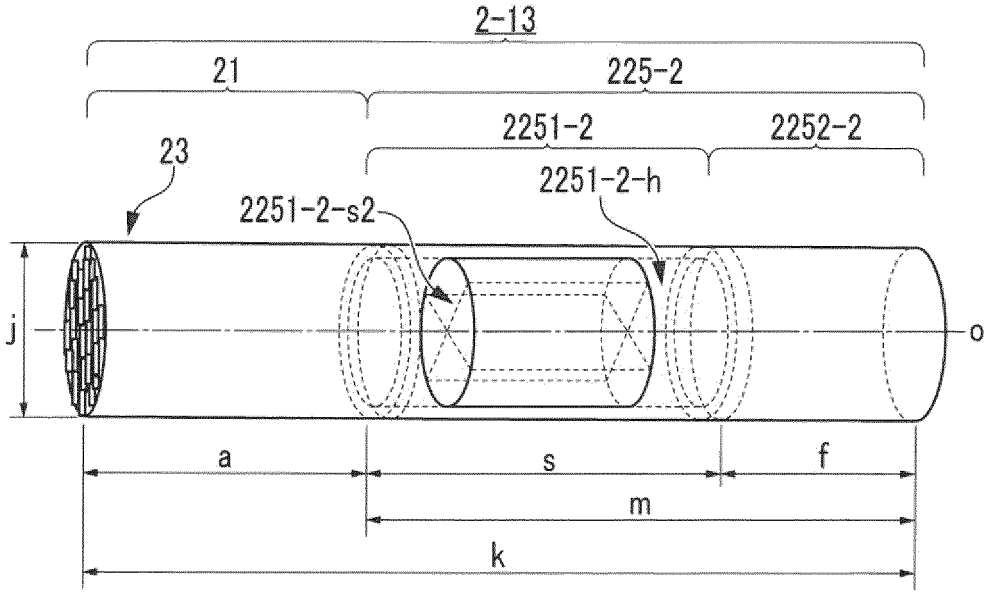

2-13
21
225-2
2251-2
2252-2
23
2251-2-h
2251-2-s2
j
o
a
s
f
m
k

FIG.18

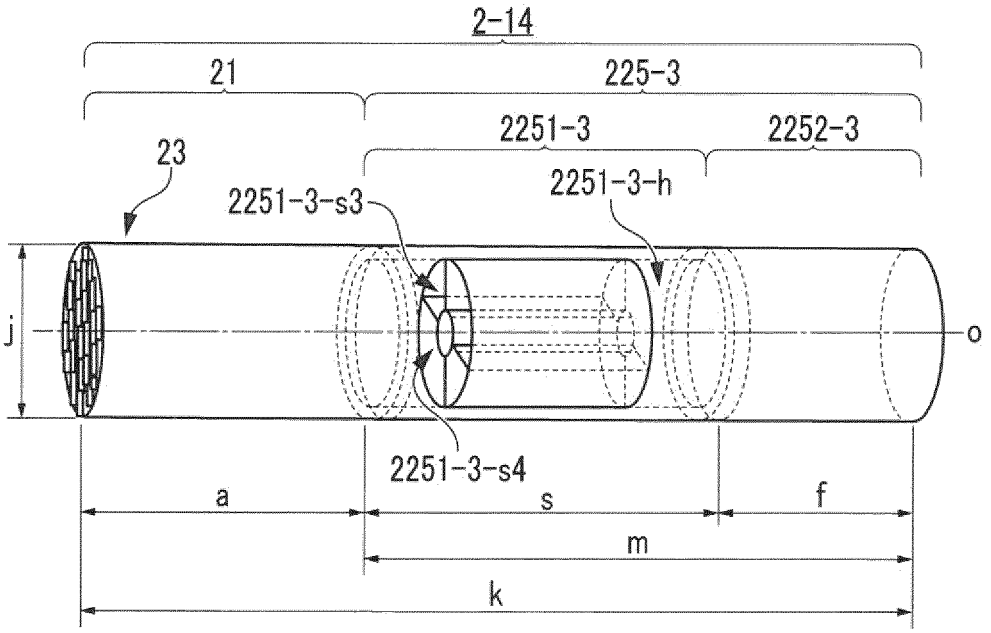

2-14
21
225-3
2251-3
2252-3
23
2251-3-h
2251-3-s3
j
o
2251-3-s4
a
s
f
m
k

FIG.19

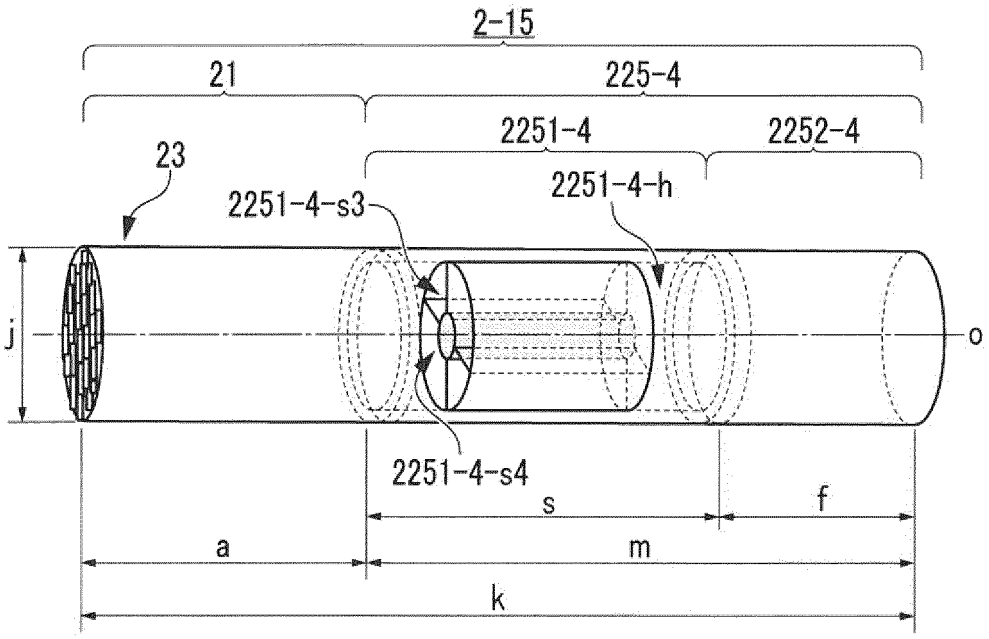

2-15
21
225-4
2251-4
2252-4
23
2251-4-s3
2251-4-h
j
o
2251-4-s4
s
f
a
m
k

FIG.20

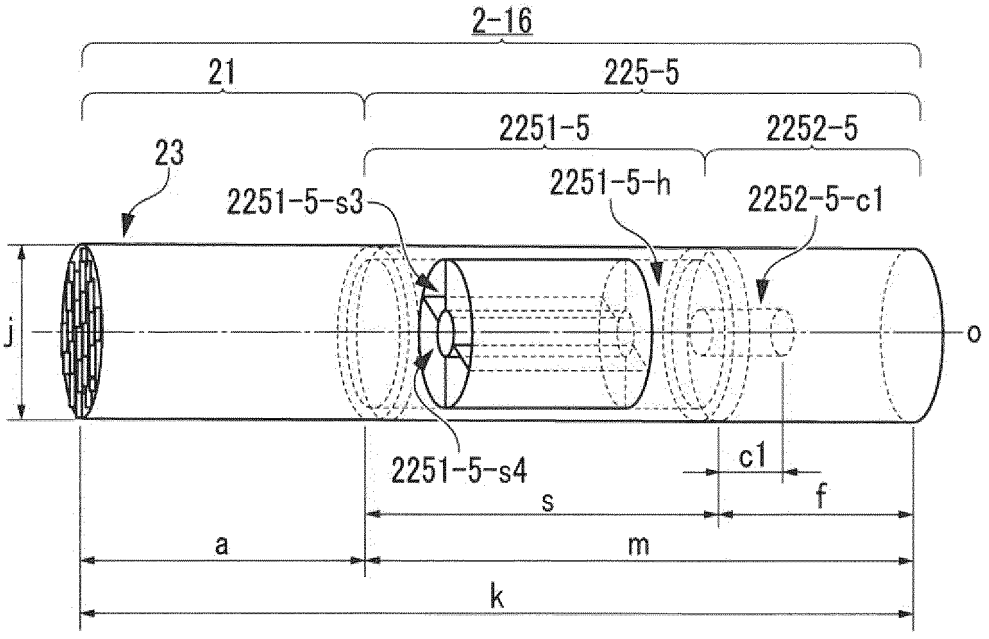

2-16
21
225-5
2251-5
2252-5
23
2251-5-s3
2251-5-h
2252-5-c1
j
o
2251-5-s4
c1
s
f
a
m
k

FIG.21

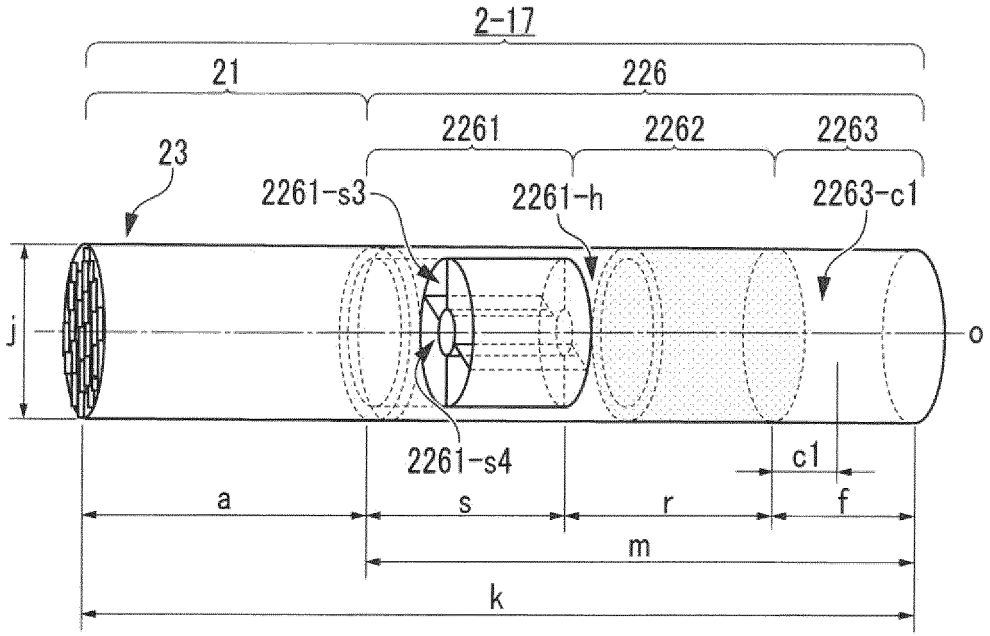

2-17
21
226
2261
2262
2263
23
2261-s3
2261-h
2263-c1
j
o
2261-s4
c1
a
s
r
f
m
k

FIG.22

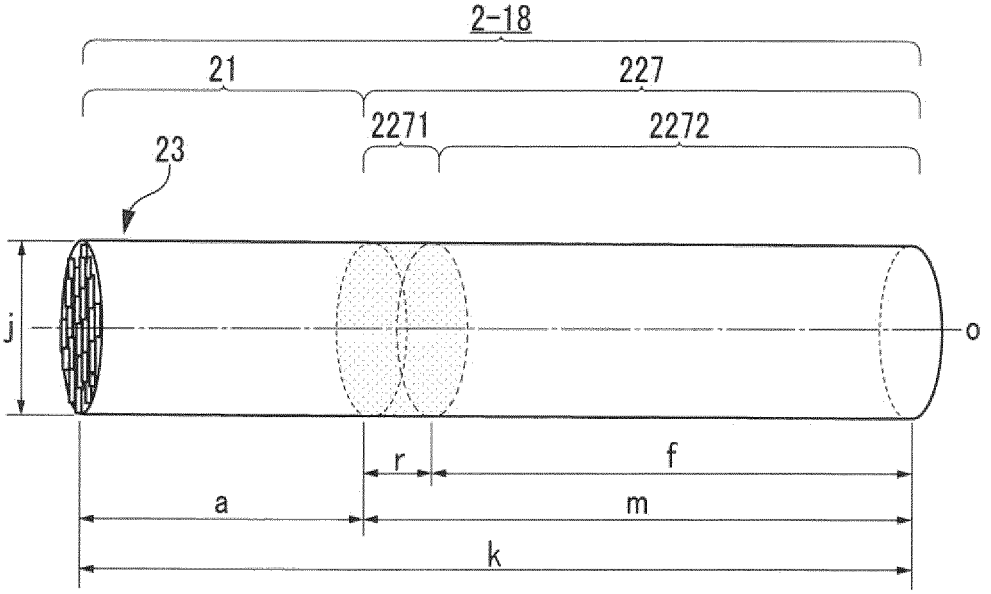

2-18
21
227
2271
2272
23
j
o
r
f
a
m
k

FIG.23

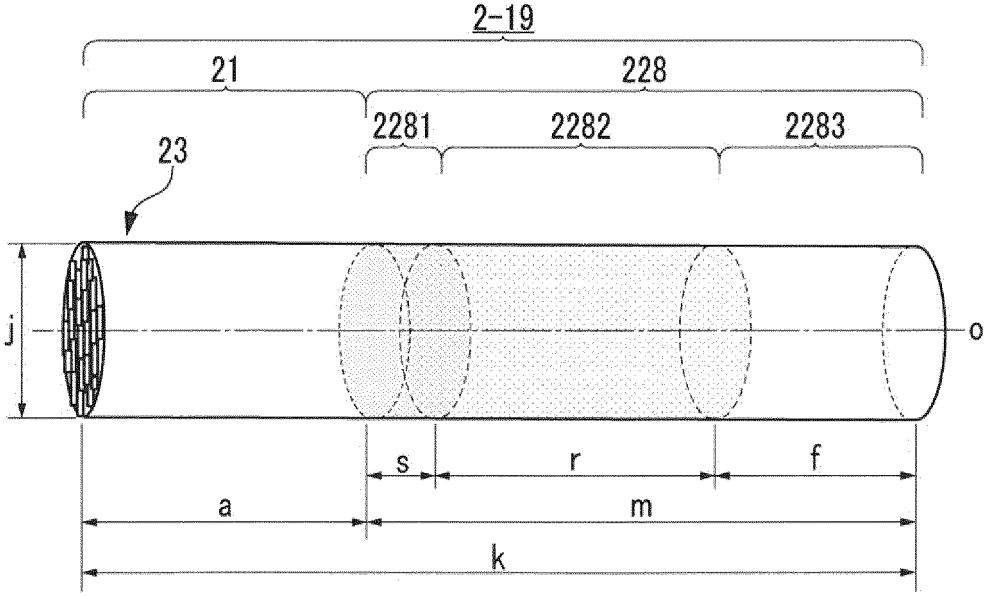


FIG.24A

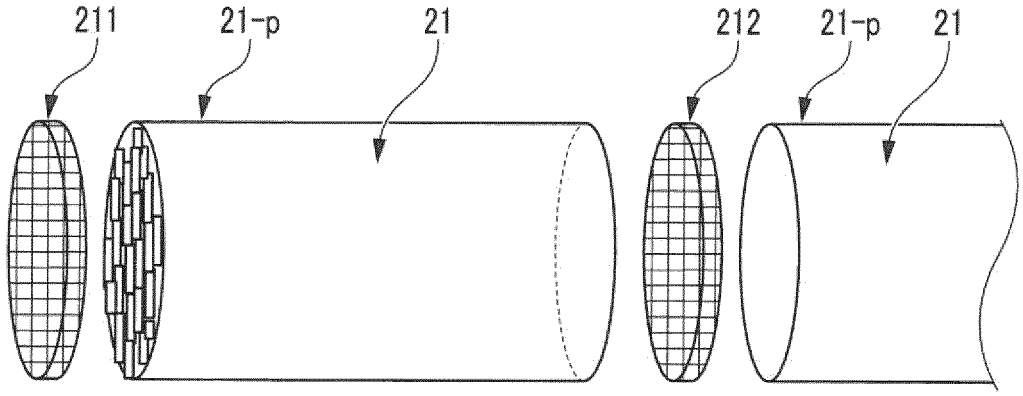



FIG.24B

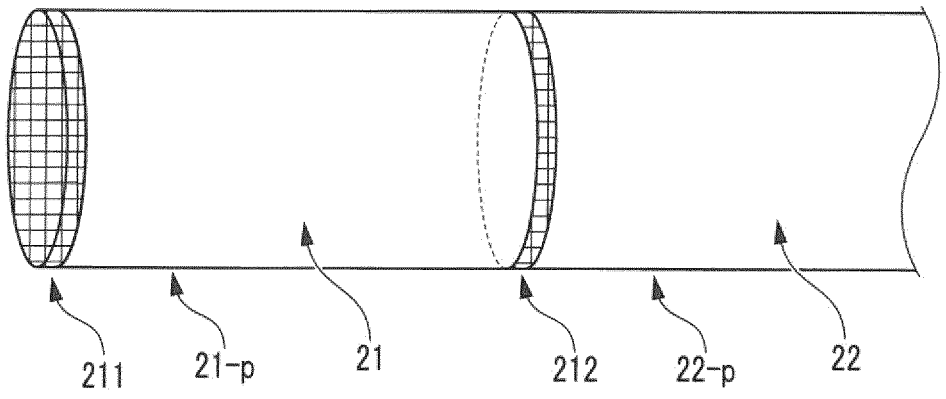


FIG.25A

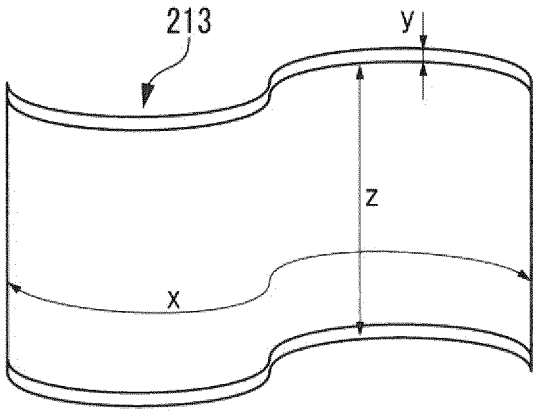



FIG.25B

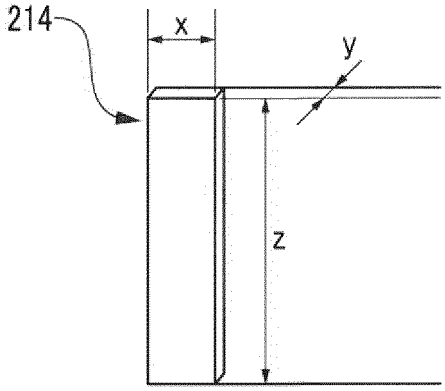


FIG.26A

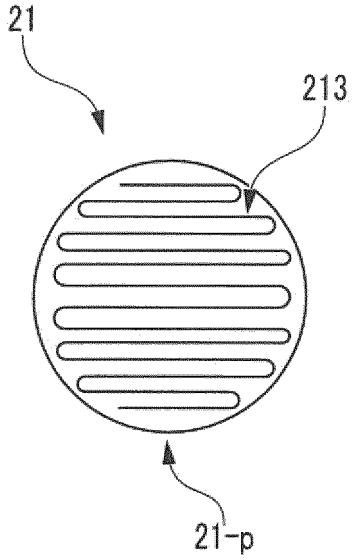



FIG.26B

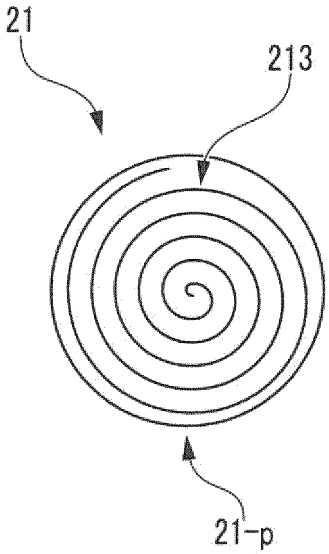


FIG.26c

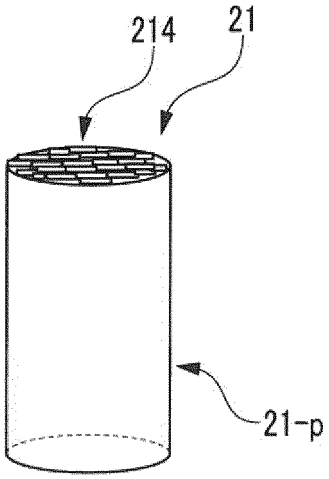


FIG.27

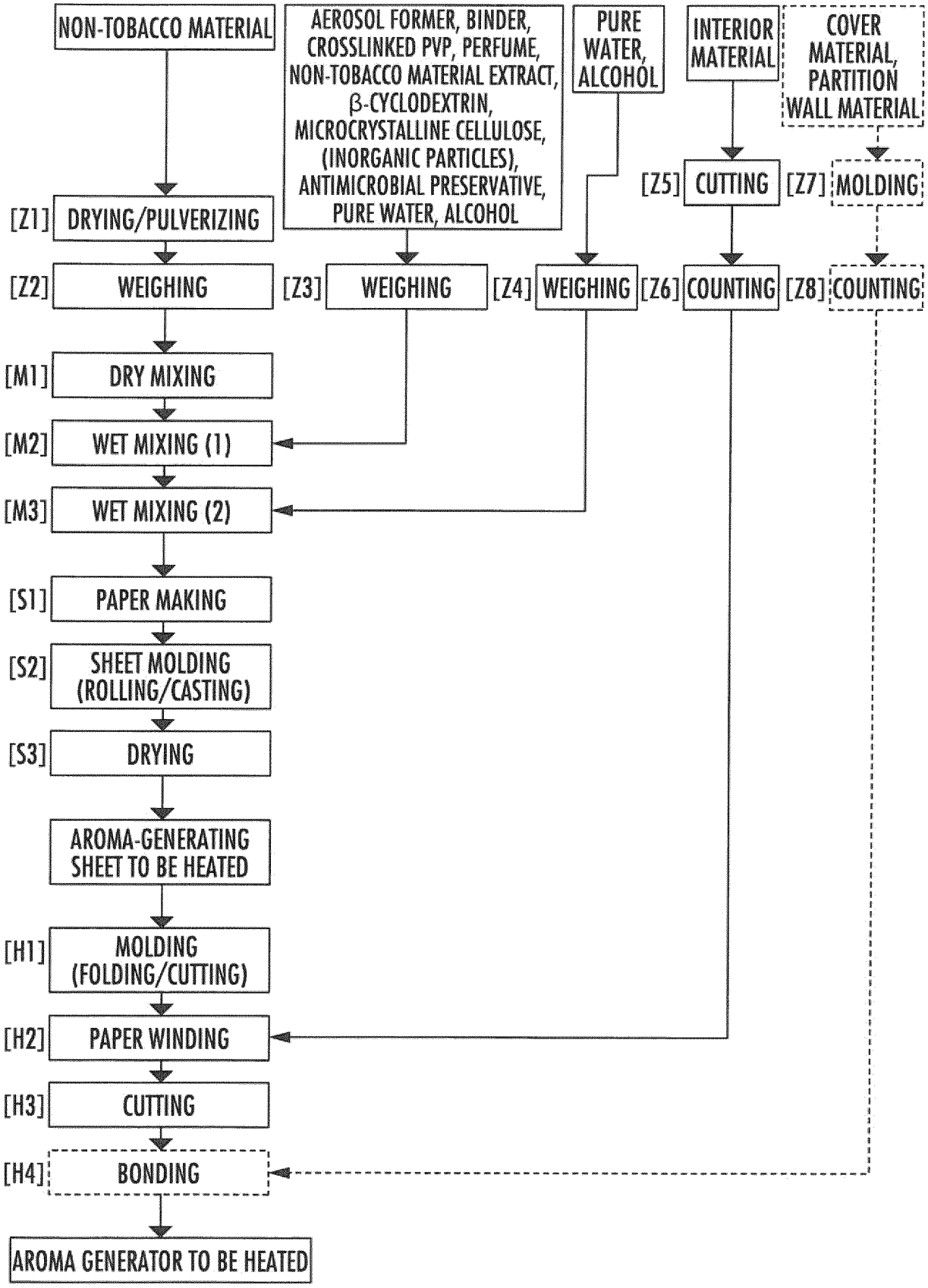

NON-TOBACCO MATERIAL
AEROSOL FORMER, BINDER, CROSSLINKED PVP, PERFUME, NON-TOBACCO MATERIAL EXTRACT, β-CYCLODEXTRIN, MICROCRYSTALLINE CELLULOSE, (INORGANIC PARTICLES), ANTIMICROBIAL PRESERVATIVE, PURE WATER, ALCOHOL
PURE WATER, ALCOHOL
INTERIOR MATERIAL
COVER MATERIAL, PARTITION WALL MATERIAL
[Z1] DRYING/PULVERIZING
[Z5] CUTTING
[Z7] MOLDING
[Z2] WEIGHING
[Z3] WEIGHING
[Z4] WEIGHING
[Z6] COUNTING
[Z8] COUNTING
[M1] DRY MIXING
[M2] WET MIXING (1)
[M3] WET MIXING (2)
[S1] PAPER MAKING
[S2] SHEET MOLDING (ROLLING/CASTING)
[S3] DRYING
AROMA-GENERATING SHEET TO BE HEATED
[H1] MOLDING (FOLDING/CUTTING)
[H2] PAPER WINDING
[H3] CUTTING
[H4] BONDING
AROMA GENERATOR TO BE HEATED

FIG.28

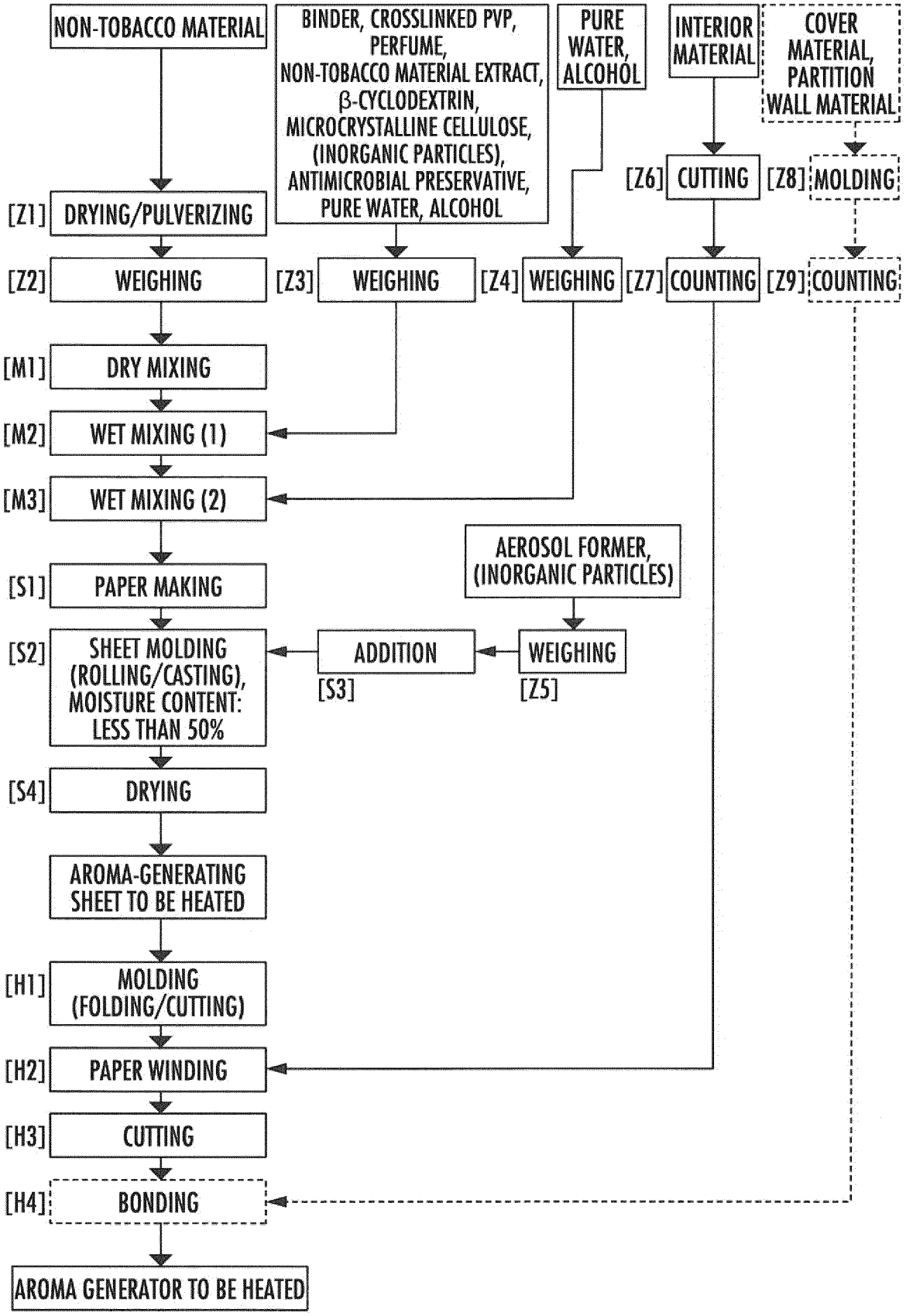

NON-TOBACCO MATERIAL
BINDER, CROSSLINKED PVP, PERFUME, NON-TOBACCO MATERIAL EXTRACT, β-CYCLODEXTRIN, MICROCRYSTALLINE CELLULOSE, (INORGANIC PARTICLES), ANTIMICROBIAL PRESERVATIVE, PURE WATER, ALCOHOL
PURE WATER, ALCOHOL
INTERIOR MATERIAL
COVER MATERIAL, PARTITION WALL MATERIAL
[Z1] DRYING/PULVERIZING
[Z6] CUTTING
[Z8] MOLDING
[Z2] WEIGHING
[Z3] WEIGHING
[Z4] WEIGHING
[Z7] COUNTING
[Z9] COUNTING
[M1] DRY MIXING
[M2] WET MIXING (1)
[M3] WET MIXING (2)
AEROSOL FORMER, (INORGANIC PARTICLES)
[S1] PAPER MAKING
[S2] SHEET MOLDING (ROLLING/CASTING), MOISTURE CONTENT: LESS THAN 50%
ADDITION
[S3]
WEIGHING
[Z5]
[S4] DRYING
AROMA-GENERATING SHEET TO BE HEATED
[H1] MOLDING (FOLDING/CUTTING)
[H2] PAPER WINDING
[H3] CUTTING
[H4] BONDING
AROMA GENERATOR TO BE HEATED

FIG.29

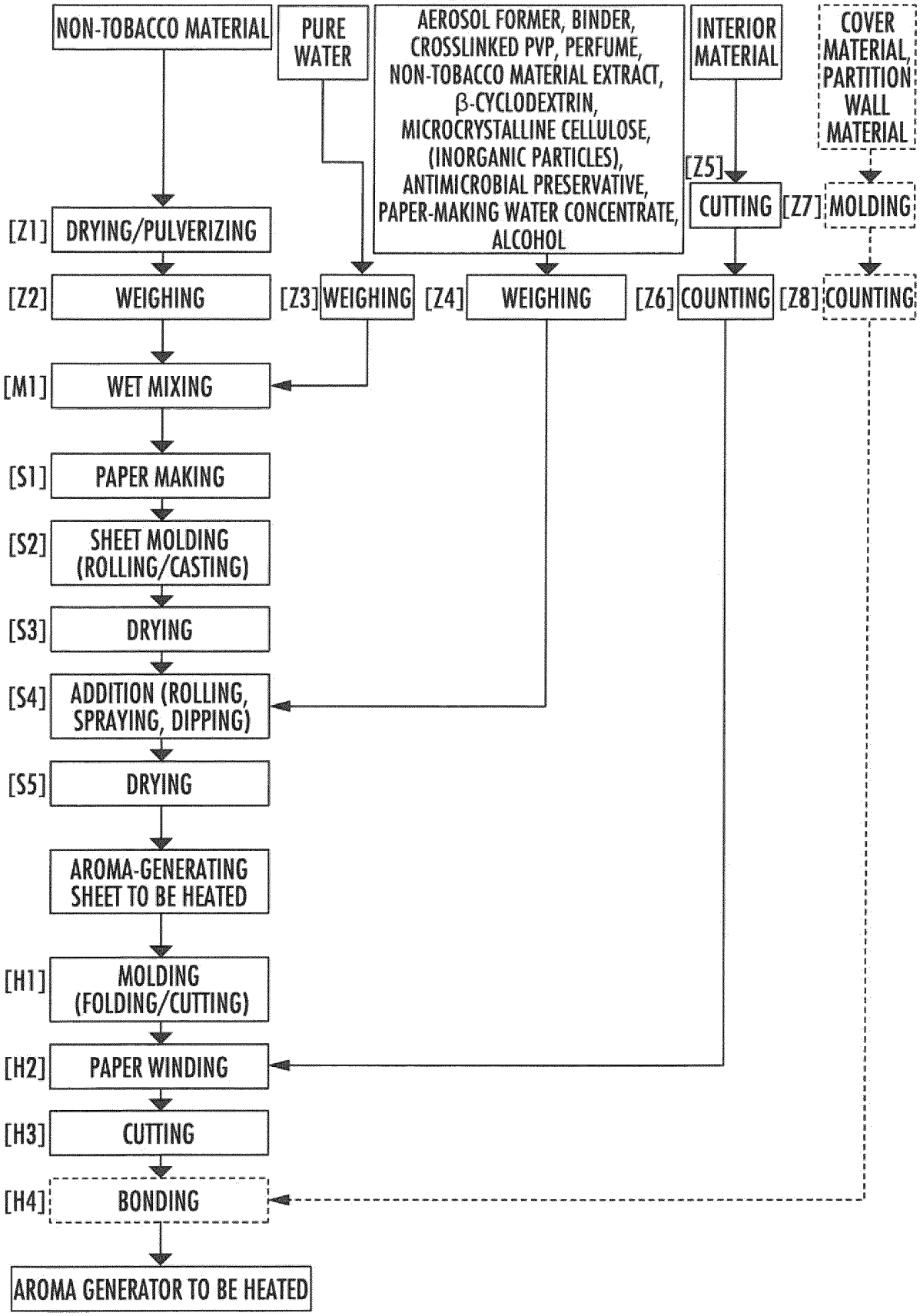

NON-TOBACCO MATERIAL
PURE WATER
AEROSOL FORMER, BINDER, CROSSLINKED PVP, PERFUME, NON-TOBACCO MATERIAL EXTRACT, β-CYCLODEXTRIN, MICROCRYSTALLINE CELLULOSE, (INORGANIC PARTICLES), ANTIMICROBIAL PRESERVATIVE, PAPER-MAKING WATER CONCENTRATE, ALCOHOL
INTERIOR MATERIAL
COVER MATERIAL, PARTITION WALL MATERIAL
[Z1] DRYING/PULVERIZING
[Z2] WEIGHING
[Z3] WEIGHING
[Z4] WEIGHING
[Z5] CUTTING
[Z6] COUNTING
[Z7] MOLDING
[Z8] COUNTING
[M1] WET MIXING
[S1] PAPER MAKING
[S2] SHEET MOLDING (ROLLING/CASTING)
[S3] DRYING
[S4] ADDITION (ROLLING, SPRAYING, DIPPING)
[S5] DRYING
AROMA-GENERATING SHEET TO BE HEATED
[H1] MOLDING (FOLDING/CUTTING)
[H2] PAPER WINDING
[H3] CUTTING
[H4] BONDING
AROMA GENERATOR TO BE HEATED

FIG.30

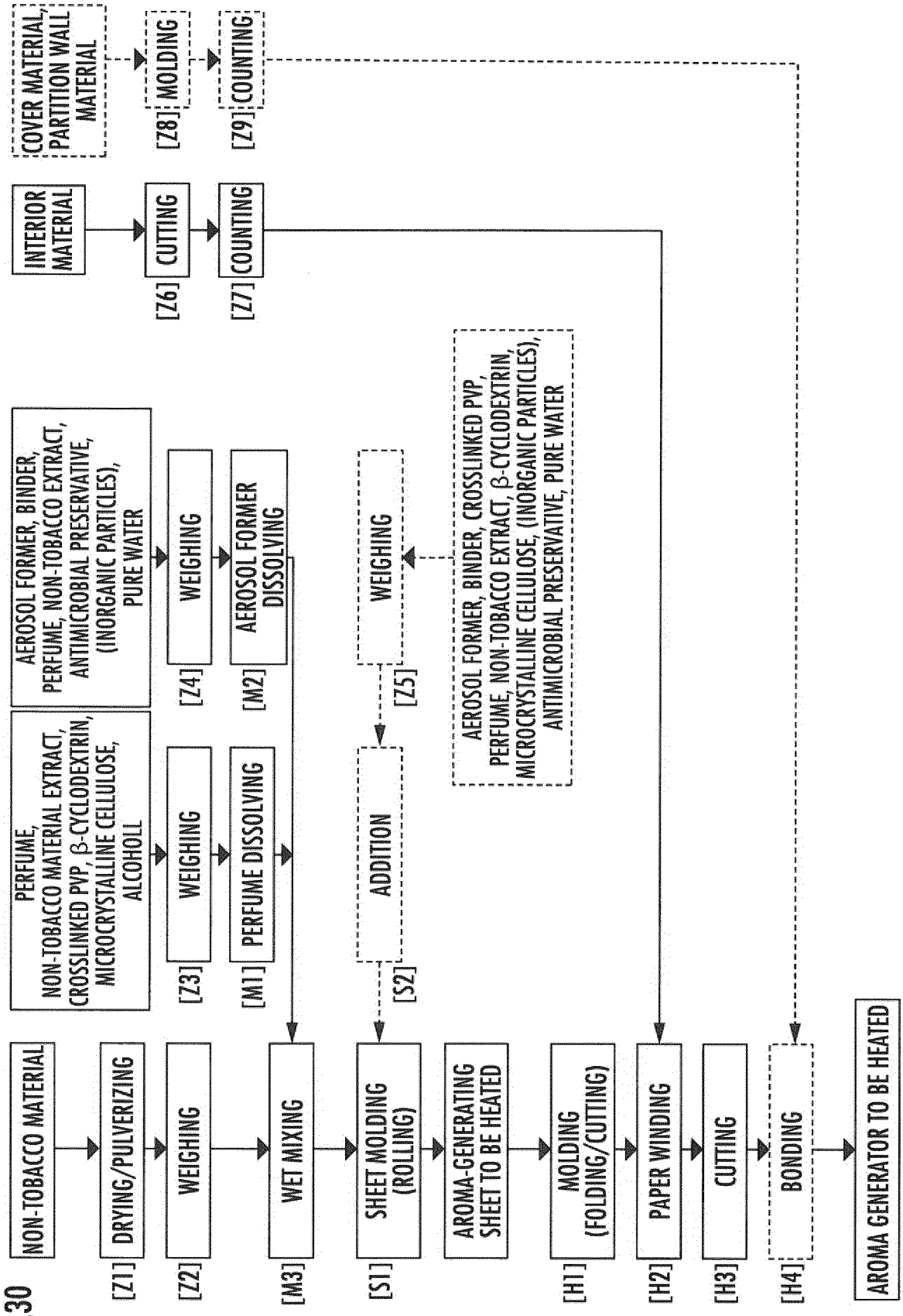

NON-TOBACCO MATERIAL
[Z1] DRYING/PULVERIZING
[Z2] WEIGHING
[M3] WET MIXING
[S1] SHEET MOLDING (ROLLING)
AROMA-GENERATING SHEET TO BE HEATED
[H1] MOLDING (FOLDING/CUTTING)
[H2] PAPER WINDING
[H3] CUTTING
[H4] BONDING
AROMA GENERATOR TO BE HEATED
PERFUME, NON-TOBACCO MATERIAL EXTRACT, CROSSLINKED PVP, β-CYCLODEXTRIN, MICROCRYSTALLINE CELLULOSE, ALCOHOLL
[Z3] WEIGHING
[M1] PERFUME DISSOLVING
AEROSOL FORMER, BINDER, PERFUME, NON-TOBACCO EXTRACT, ANTIMICROBIAL PRESERVATIVE, (INORGANIC PARTICLES), PURE WATER
[Z4] WEIGHING
[M2] AEROSOL FORMER DISSOLVING
[S2] ADDITION
[Z5] WEIGHING
AEROSOL FORMER, BINDER, CROSSLINKED PVP, PERFUME, NON-TOBACCO EXTRACT, β-CYCLODEXTRIN, MICROCRYSTALLINE CELLULOSE, (INORGANIC PARTICLES), ANTIMICROBIAL PRESERVATIVE, PURE WATER
INTERIOR MATERIAL
[Z6] CUTTING
[Z7] COUNTING
COVER MATERIAL, PARTITION WALL MATERIAL
[Z8] MOLDING
[Z9] COUNTING

FIG.31

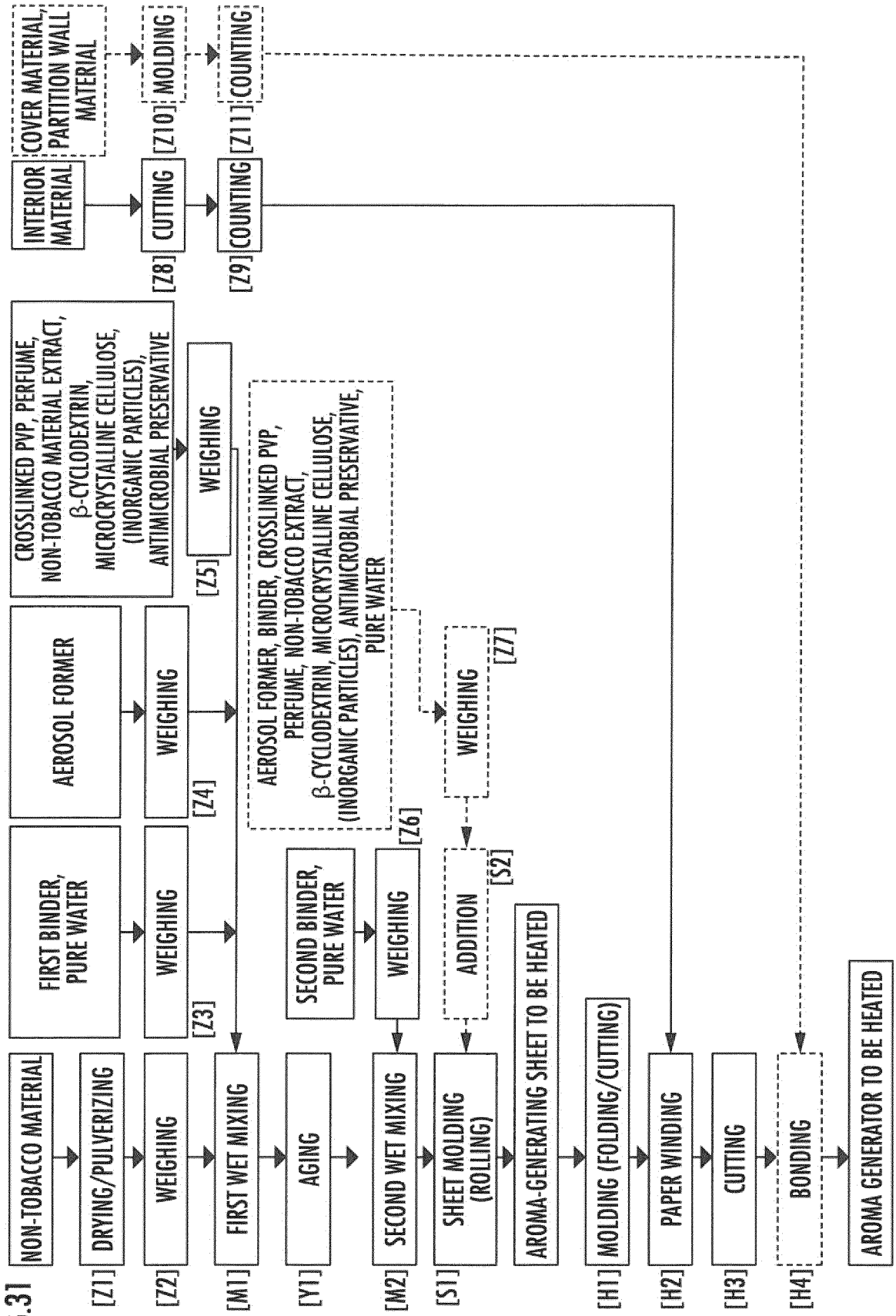

NON-TOBACCO MATERIAL
DRYING/PULVERIZING
[Z1]
WEIGHING
[Z2]
FIRST WET MIXING
[M1]
AGING
[Y1]
SECOND WET MIXING
[M2]
SHEET MOLDING (ROLLING)
[S1]
AROMA-GENERATING SHEET TO BE HEATED
MOLDING (FOLDING/CUTTING)
[H1]
PAPER WINDING
[H2]
CUTTING
[H3]
BONDING
[H4]
AROMA GENERATOR TO BE HEATED
FIRST BINDER, PURE WATER
WEIGHING
[Z3]
SECOND BINDER, PURE WATER
WEIGHING
[Z6]
ADDITION
[S2]
WEIGHING
[Z7]
AEROSOL FORMER
WEIGHING
[Z4]
CROSSLINKED PVP, PERFUME, NON-TOBACCO MATERIAL EXTRACT, β-CYCLODEXTRIN, MICROCRYSTALLINE CELLULOSE, (INORGANIC PARTICLES), ANTIMICROBIAL PRESERVATIVE
WEIGHING
[Z5]
AEROSOL FORMER, BINDER, CROSSLINKED PVP, PERFUME, NON-TOBACCO EXTRACT, β-CYCLODEXTRIN, MICROCRYSTALLINE CELLULOSE, (INORGANIC PARTICLES), ANTIMICROBIAL PRESERVATIVE, PURE WATER
INTERIOR MATERIAL
COVER MATERIAL, PARTITION WALL MATERIAL
CUTTING
[Z8]
MOLDING
[Z10]
COUNTING
[Z9]
COUNTING
[Z11]

FIG.32

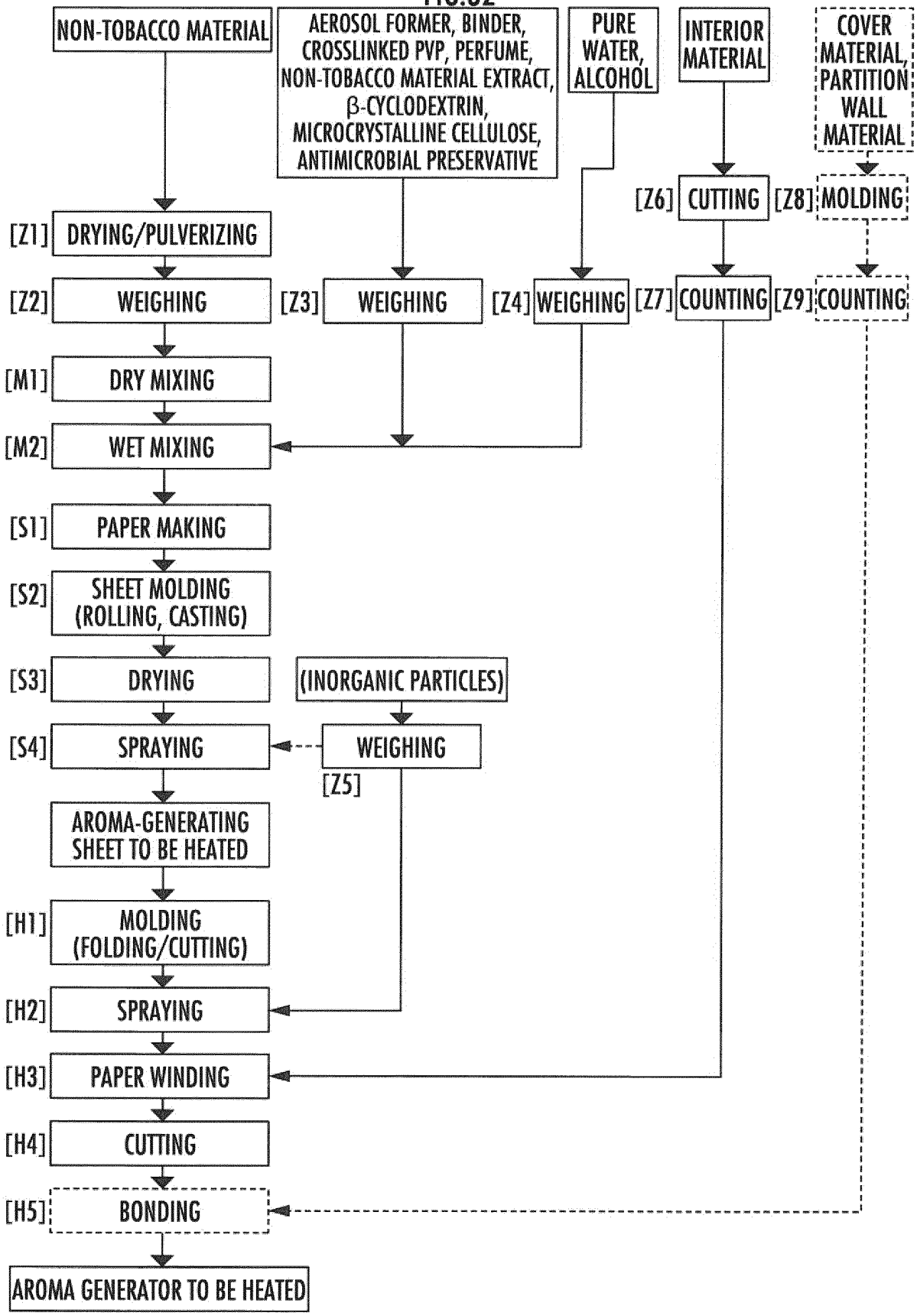
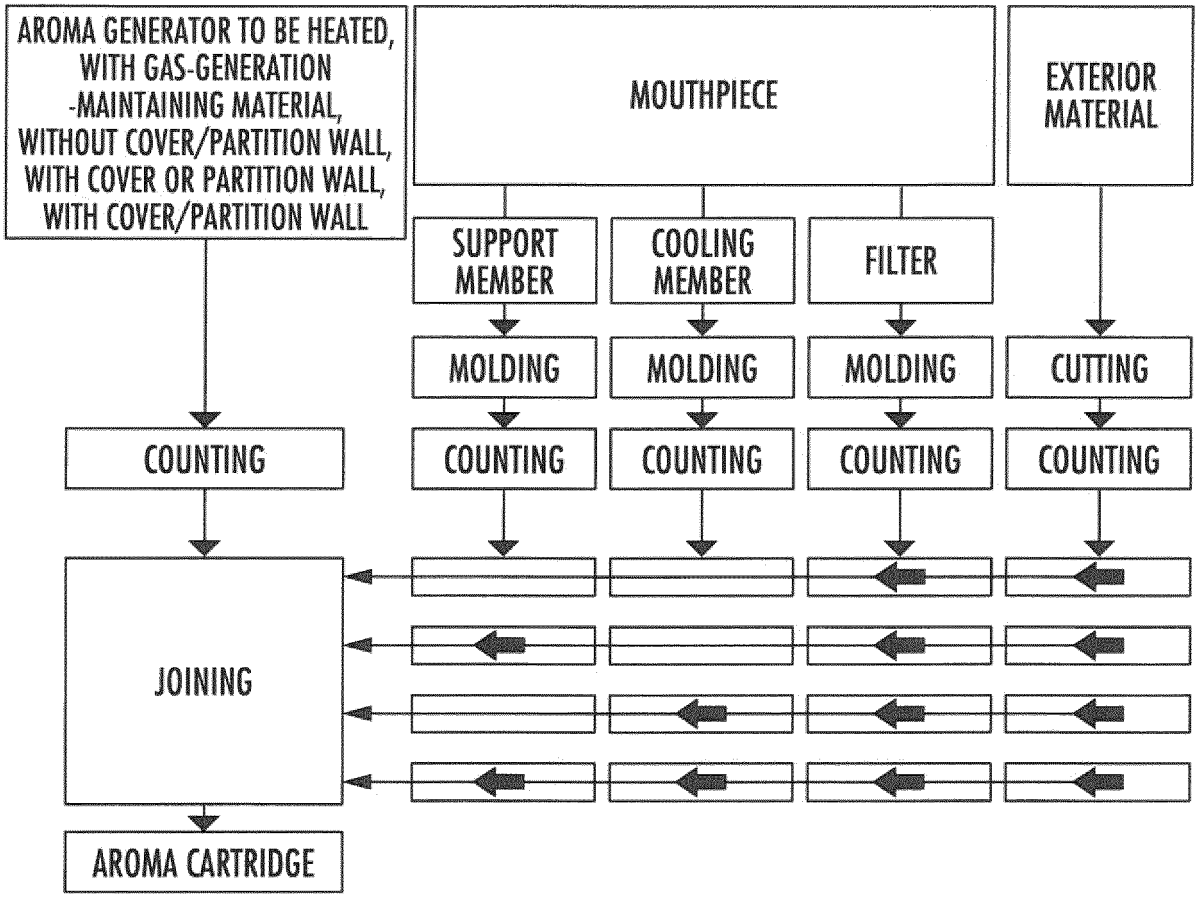

NON-TOBACCO MATERIAL
AEROSOL FORMER, BINDER, CROSSLINKED PVP, PERFUME, NON-TOBACCO MATERIAL EXTRACT, β-CYCLODEXTRIN, MICROCRYSTALLINE CELLULOSE, ANTIMICROBIAL PRESERVATIVE
PURE WATER, ALCOHOL
INTERIOR MATERIAL
COVER MATERIAL, PARTITION WALL MATERIAL
[Z6] CUTTING
[Z8] MOLDING
[Z1] DRYING/PULVERIZING
[Z2] WEIGHING
[Z3] WEIGHING
[Z4] WEIGHING
[Z7] COUNTING
[Z9] COUNTING
[M1] DRY MIXING
[M2] WET MIXING
[S1] PAPER MAKING
[S2] SHEET MOLDING (ROLLING, CASTING)
[S3] DRYING
(INORGANIC PARTICLES)
[S4] SPRAYING
WEIGHING
[Z5]
AROMA-GENERATING SHEET TO BE HEATED
[H1] MOLDING (FOLDING/CUTTING)
[H2] SPRAYING
[H3] PAPER WINDING
[H4] CUTTING
[H5] BONDING
AROMA GENERATOR TO BE HEATED

FIG.33


AROMA GENERATOR TO BE HEATED, WITH GAS-GENERATION -MAINTAINING MATERIAL, WITHOUT COVER/PARTITION WALL, WITH COVER OR PARTITION WALL, WITH COVER/PARTITION WALL
MOUTHPIECE
EXTERIOR MATERIAL
SUPPORT MEMBER
COOLING MEMBER
FILTER
MOLDING
MOLDING
MOLDING
CUTTING
COUNTING
COUNTING
COUNTING
COUNTING
COUNTING
JOINING
AROMA CARTRIDGE

## INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2019/017530

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl. A24F47/00(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl. A24F47/00

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

| | |
|---|---|
| Published examined utility model applications of Japan | 1922-1996 |
| Published unexamined utility model applications of Japan | 1971-2019 |
| Registered utility model specifications of Japan | 1996-2019 |
| Published registered utility model applications of Japan | 1994-2019 |

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X<br>Y<br>A | JP 2008-518614 A (PHILIP MORRIS PRODUCTS S.A.) 05 June 2008, paragraphs [0026]-[0036], [0051]-[0095], fig. 1-2, 4-6 & US 2005/0172976 A1, paragraphs [0031]-[0041], [0056]-[0100], fig. 1-2, 4-6 & WO 2006/048774 A1 & EP 1827146 A1 & KR 10-2007-0073962 A & CN 101043827 A | 1, 19-35, 38-40, 67<br>2-18, 36-37, 41-49<br>50-66, 68-118 |

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

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

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 24 July 2019 (24.07.2019) | 06 August 2019 (06.08.2019) |

| Name and mailing address of the ISA/ | Authorized officer |
|---|---|
| Japan Patent Office<br>3-4-3, Kasumigaseki, Chiyoda-ku,<br>Tokyo 100-8915, Japan | Telephone No. |

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2019/017530

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| Y | JP 51-016520 A (KATA MANUFACTURING AND FILTERING COMPANY) 25 May 1976, page 7, left column, line 39 to page 8, right column, line 36, fig. 1-4 (Family: none) | 2-18, 44-49 |
| Y | JP 2016-538848 A (PHILIP MORRIS PRODUCTS S.A.) 15 December 2016, paragraphs [0118]-[0125], fig. 1 & US 2016/0331032 A1, paragraphs [0121]-[0128], fig. 1 & WO 2015/082649 A1 & EP 3076815 A1 & CN 105722416 A & KR 10-2016-0094938 A | 8-18, 44-49 |
| Y | JP 2017-518041 A (BRITISH AMERICAN TOBACCO (INVESTMENTS) LTD.) 06 July 2017, paragraphs [0056]-[0071], fig. 5-8 & US 2017/0042221 A1, paragraphs [0071]-[0086], fig. 5-8 & WO 2015/166245 A2 & EP 3136885 A2 & CN 106255431 A | 10-18, 44-49 |
| Y | JP 2009-148233 A (JAPAN TOBACCO INC.) 09 July 2009, paragraph [0042] (Family: none) | 36-37, 41-49 |
| Y | JP 62-272962 A (R.J. REYNOLDS TOBACCO COMPANY) 27 November 1987, page 9, upper left column, line 16 to upper right column, line 10, fig. 2 & US 4889143 A, column 8, lines 17-32, fig. 2 & EP 246107 A2 & CN 87103233 A | 44-49 |
| Y | WO 2017/187628 A1 (JAPAN TOBACCO INC.) 02 November 2017, paragraph [0049] & EP 3449739 A1, paragraph [0049] & KR 10-2018-0135022 A & CN 109310143 A | 45-49 |
| Y | WO 2016/075747 A1 (JAPAN TOBACCO INC.) 19 May 2016, paragraphs [0041], [0055] & US 2017/0238606 A1, paragraphs [0078], [0092] & EP 3207811 A1 & KR 10-2017-0076768 A & CN 107072319 A | 45-49 |
| A | JP 2010-520764 A (PHILIP MORRIS PRODUCTS S.A.) 17 June 2010, entire text, all drawings & US 2008/0216854 A1, entire text, all drawings & WO 2008/110932 A2 & EP 2134203 A2 & CN 101631478 A & KR 10-2009-0130031 A | 19-118 |
| A | JP 3-180165 A (R.J. REYNOLDS TOBACCO COMPANY) 06 August 1991, entire text, all drawings & US 5074321 A, entire text, all drawings & EP 419733 A2 & KR 10-0155148 B & CN 1050491 A | 19-118 |
| A | CN 105105317 A (CHINA TOBACCO GUIZHOU IND CO.) 02 December 2015, entire text, all drawings (Family: none) | 19-118 |

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**INTERNATIONAL SEARCH REPORT**

International application No.
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**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:
See extra sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest**

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☒ No protest accompanied the payment of additional search fees.

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**INTERNATIONAL SEARCH REPORT**

International application No.
PCT/JP2019/017530

<Continuation of Box No. III>

Document 1: JP 2008-518614 A (PHILIP MORRIS PRODUCTS S.A.) 05 June 2008, paragraphs [0026]-[0036], [0051]-[0095], fig. 1-2, 4-6 & US 2005/0172976 A1, paragraphs [0031]-[0041], [0056]-[0100], fig. 1-2, 4-6 & WO 2006/048774 A1 & EP 1827146 A1 & KR 10-2007-0073962 A & CN 101043827 A

(Invention 1) Claims 1-18

Document 1 discloses an aroma cartridge provided with: a heated aroma generator in which a heated aroma generation substrate (film including a tobacco column 82 or the tobacco column 82 and a flavor release additive) containing an aerosol former in contact with a heating body (heating element 37) and an aroma component (film including tobacco flavor or flavor release additive) is wound on an internal wrap 84; a mouthpiece (filter tip 62) provided with a filter (free flow filter 94) that filters smoke and aroma components of aerosol released from the heated aroma generator by heating the heating body (heating element 37); and a cartridge exterior (tip paper 64) wound so as to connect the heated aroma generator and the mouthpiece (filter tip 62) to be adjacent to each other in the longitudinal direction, wherein the mouthpiece has a means for optimizing the suction of the smoke and aroma components (a structure that allows air to pass through in a state where the pressure drop is extremely low)." In addition, the film including a tobacco column 82 or the tobacco column 82 and a flavor release additive clearly continues to release the smoke and aroma components, and is thus recognized to be a sustainable gas generation material. Thus, claim 1 lacks novelty in light of document 1 and thus does not have a special technical feature.

However, claim 2 dependent on claim 1 has the special technical feature of an "aroma cartridge in which the means for optimizing the suction comprises a cavity provided in the filter such that the smoke and aroma components do not penetrate in the longitudinal direction," and claims 3-9 and 16-18 also have the same special technical feature as claim 2. Thus, claims 1-9 and 16-18 are classified as invention 1.

In addition, claims 10-15 dependent on claim 1 are inventively related to claim 1 and are thus classified as invention 1.

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(Invention 2) Claims 19-24, 36-43, 46-55, 67-75, 87-92, 95-104, and 116-118

Claims 19-24, 38-43, 46-49, and 67 cannot be said to have an identical or corresponding special technical feature to claim 2 classified as invention 1.

In addition, claims 19-24, 38-43, 46-49, and 67 are dependent on claim 1 classified as invention 1, but the technical feature added to claim 1, "the sustainable gas generation material is a heated aroma generation substrate manufactured by a manufacturing method comprising … a dry mixing step, … a first wet mixing step, … a second wet mixing step, … a paper making step, … a sheet forming step, … a drying step, and a sheet processing step" has low technical relevance to the technical feature of claim 1, "an aroma cartridge wherein the mouthpiece has a means for optimizing the suction of the smoke and aroma components." Thus, claims 19-24, 38-43, 46-49, and 67 are not recognized to be inventively related to claim 1.

In addition, claims 19-24, 38-43, 46-49, and 67 are not substantially identical or equivalent to any of the claims classified as invention 1.

Thus, claims 19-24, 38-43, 46-49, and 67 cannot be classified as invention 1.

In addition, claims 19-24, 38-43, 46-49, and 67 have the special technical feature of "an aroma cartridge … wherein the sustainable gas generation material is a heated aroma generation substrate manufactured by a manufacturing method comprising … a dry mixing step, … a first wet mixing step, … a second wet mixing step, … a paper making step, … a sheet forming step, … a drying step, and a sheet processing step," and are thus classified as invention 2.

In addition, claims 36-37, 50-55, 68-75, 87-92, 95-104, and 116-118 are substantially identical or equivalent to claims 19-24, 38-43, 46-49, and 67 and are thus classified as invention 2.

(Invention 3) Claims 25, 56, 76, and 105

Claim 25 cannot be said to have an identical or corresponding special technical feature to claim 2 classified as invention 1.

In addition, claim 25 is dependent on claim 1 classified as invention 1, but the technical feature added to claim 1, "the sustainable gas generation material is a heated aroma generation substrate manufactured by a manufacturing method comprising … a wet mixing step, … a paper making step, … a sheet forming step, … a drying step, … an absorbing and adsorbing step, … a drying step, and a sheet processing step" has low technical relevance to the technical feature of claim 1, "an aroma cartridge wherein the mouthpiece has a means for optimizing the suction of the smoke and aroma components." Thus, claim 25 is not recognized to be inventively related to claim 1.

In addition, claim 25 is not substantially identical or equivalent to any of the claims classified as invention 1.

Thus, claim 25 cannot be classified as invention 1.

In addition, claim 25 has the special technical feature of "an aroma cartridge … wherein the sustainable gas generation material is a heated aroma generation substrate manufactured by a manufacturing method comprising … a wet mixing step, … a paper making step, … a sheet forming step, … a drying step, … an absorbing and adsorbing step, … a drying step, and a sheet processing step," and is thus classified as invention 3.

In addition, claims 56, 76, and 105 are substantially identical or equivalent to claim 25, and are thus classified as invention 3.

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INTERNATIONAL SEARCH REPORT

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(Invention 4) Claims 26-28, 57-59, 77-79, and 106-108

Claims 26-28 cannot be said to have an identical or corresponding special technical feature to claim 2 classified as invention 1.

In addition, claims 26-28 are dependent on claim 1 classified as invention 1, but the technical feature added to claim 1, "the sustainable gas generation material is a heated aroma generation substrate manufactured by a manufacturing method comprising … a non-tabacco material preparing step, … an aroma and/or non-tabacco extract mixing step, … an aerosol former dissolution step, … a wet mixing step, … a sheet forming step, and a sheet processing step" has low technical relevance to the technical feature of claim 1, "an aroma cartridge wherein the mouthpiece has a means for optimizing the suction of the smoke and aroma components." Thus, claims 26-28 are not recognized to be inventively related to claim 1.

In addition, claims 26-28 are not substantially identical or equivalent to any of the claims classified as invention 1.

Thus, claims 26-28 cannot be classified as invention 1.

In addition, claims 26-28 have the special technical feature of "an aroma cartridge … wherein the sustainable gas generation material is a heated aroma generation substrate manufactured by a manufacturing method comprising … a non-tabacco material preparing step, … an aroma and/or non-tabacco extract mixing step, … an aerosol former dissolution step, … a wet mixing step, … a sheet forming step, and a sheet processing step," and are thus classified as invention 4.

In addition, claims 57-59, 77-79, and 106-108 are substantially identical or equivalent to claims 26-28, and are thus classified as invention 4.

(Invention 5) Claims 29-35, 60-66, 80-86, and 109-115

Claims 29-35 cannot be said to have an identical or corresponding special technical feature to claim 2 classified as invention 1.

In addition, claims 29-35 are dependent on claim 1 classified as invention 1, but the technical feature added to claim 1, "the sustainable gas generation material is a heated aroma generation substrate manufactured by a manufacturing method comprising … a first wet mixing step, … a second wet mixing step, … a sheet forming step, and a sheet processing step" has low technical relevance to the technical feature of claim 1, "an aroma cartridge wherein the mouthpiece has a means for optimizing the suction of the smoke and aroma components." Thus, claims 29-35 are not recognized to be inventively related to claim 1.

In addition, claims 29-35 are not substantially identical or equivalent to any of the claims classified as invention 1.

Thus, claims 29-35 cannot be classified as invention 1.

In addition, claims 29-35 have the special technical feature of "an aroma cartridge … wherein the sustainable gas generation material is a heated aroma generation substrate manufactured by a manufacturing method comprising … a first wet mixing step, … a second wet mixing step, … a sheet forming step, and a sheet processing step," and are thus classified as invention 5.

In addition, claims 60-66, 80-86, and 109-115 are substantially identical or equivalent to claims 26-29, and are thus classified as invention 5.

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**INTERNATIONAL SEARCH REPORT**

International application No.
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(Invention 6) Claims 44 and 93

Claims 44 and 93 cannot be said to have an identical or corresponding special technical feature to claim 2 classified as invention 1.

In addition, claims 44 and 93 are dependent on claim 1 classified as invention 1, but the technical feature added to claim 1, "the heated aroma generating substrate is columnar and is wound in line in the longitudinal direction" has low technical relevance to the technical feature of claim 1, "an aroma cartridge wherein the mouthpiece has a means for optimizing the suction of the smoke and aroma components." Thus, claims 44 and 93 are not recognized to be inventively related to claim 1.

In addition, claims 44 and 93 are not substantially identical or equivalent to any of the claims classified as invention 1.

Thus, claims 44 and 93 cannot be classified as invention 1.

In addition, claims 44 and 93 have the special technical feature in which "the heated aroma generating substrate is columnar and is wound in line in the longitudinal direction," and are thus classified as invention 6.

(Invention 7) Claims 45 and 94

Claims 45 and 94 cannot be said to have an identical or corresponding special technical feature to claim 2 classified as invention 1.

In addition, claims 44 and 93 are dependent on claim 1 classified as invention 1, but the technical feature added to claim 1, "the filling rate of the heated aroma generating substrate constituting the heated aroma generator is 60-90%" has low technical relevance to the technical feature of claim 1, "an aroma cartridge wherein the mouthpiece has a means for optimizing the suction of the smoke and aroma components." Thus, claims 45 and 94 are not recognized to be inventively related to claim 1.

In addition, claims 45 and 94 are not substantially identical or equivalent to any of the claims classified as invention 1.

Thus, claims 45 and 94 cannot be classified as invention 1.

In addition, claims 45 and 94 have the special technical feature of "an aroma cartridge wherein the filling rate of the heated aroma generating substrate constituting the heated aroma generator is 60-90%," and are thus classified as invention 7.

## REFERENCES CITED IN THE DESCRIPTION

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

### Patent documents cited in the description


- JP 2010520764 A **[0012]**
- JP 2013519384 A **[0012]**
- JP 2016538848 A **[0012]**
- JP 6371928 B **[0012]**