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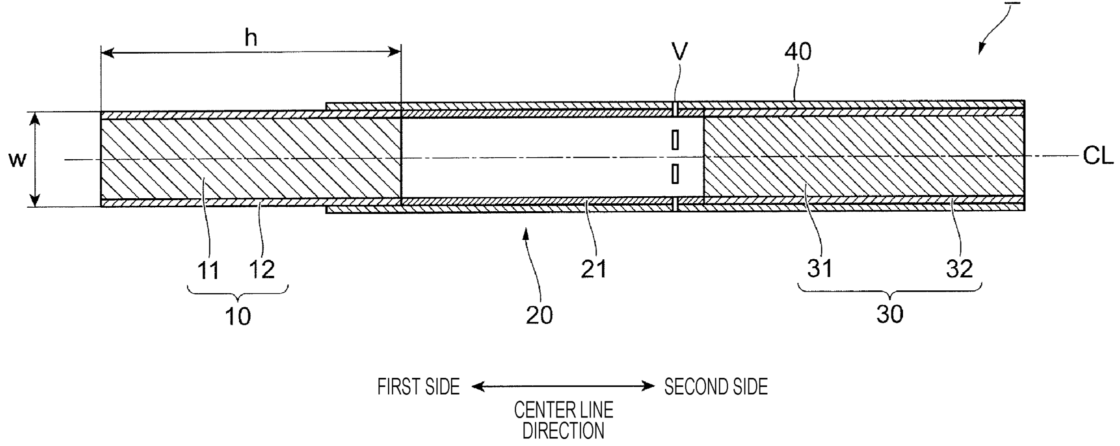
(54) NON-COMBUSTION HEATED STICK

(57) A non-combustion-heating-type stick 1 comprising: a substrate 10 that includes an aerosol source 11; a cooling portion 20 that produces an aerosol by cooling a vapor produced by heating the substrate 10; and a filter portion 30 that is disposed in an area through which the aerosol passes, wherein at least one of the substrate 10, the cooling portion 20, and the filter portion 30 contains a porous adsorbent.

FIG. 1



EP 4 449 903 A1

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Description

Technical Field

[0001] The present invention relates to a non-combustion-heating-type stick.

Background Art

[0002]

PTL 1 describes a smoke filter for a smoking article. The smoke filter for a smoking article includes a porous carbon material. The porous carbon material has a BET surface area of at least 800 m^2/g and has a pore structure including mesopores and micropores. A pore volume measured by nitrogen adsorption of the porous carbon material is at least 0.9 cm^3/g. In the smoke filter for a smoking article, a) the porous carbon material has a bulk density of less than or equal to 0.5 g/cc and/or b) 15% to 65% of the pore volume of the porous carbon material, measured by nitrogen adsorption, is mesopores.

PTL 2 describes a smoking article. The smoking article includes a smokable material and an activated carbon material downstream of the smokable material. The activated carbon material has a ratio of a narrow micropore volume to a total micropore volume of about 0.9 or less. The activated carbon material contains surface oxygen at a concentration of lower than or equal to about 5000 micromole per gram determined by a thermal desorption method.

[0003] A porous carbon material and an activated carbon material are used in PTL 1 and PTL 2; however, a combustible tobacco is described in any of specific descriptions and embodiments.

Citation List

Patent Literature

[0004]

PTL 1: Japanese Unexamined Patent Application Publication (Translation of PCT Application) No. 2008-535754
PTL 2: Japanese Unexamined Patent Application Publication (Translation of PCT Application) No. 2017-510266

Summary of Invention

Technical Problem

[0005] A non-combustion-heating-type stick that generates an aerosol by heating a substrate including an aerosol source is lower in the heating temperature of the substrate than a combustible tobacco, so the effect of a flavor and smoke taste inhibiting component like aldehydes has not been studied. However, when the heating temperature is low, it is difficult to reproduce a flavor and smoke taste like a tobacco, and it is necessary to increase the heating temperature to raise the level of user smoke taste satisfaction.

[0006] It is an object of the present invention to, in a non-combustion-heating-type stick of which a heating temperature is high, remove a flavor and smoke taste inhibiting component, such as aldehydes, while keeping the level of user smoke taste satisfaction.

Solution to Problem

[0007] A first feature of the present invention finished under the above object is a non-combustion-heating-type stick. The non-combustion-heating-type stick includes a substrate that includes an aerosol source, a cooling portion that generates an aerosol by cooling vapor generated as a result of heating the substrate, and a filter portion disposed in an area through which the aerosol passes. At least any one of the substrate, the cooling portion, and the filter portion contains a porous adsorbent.

[0008] In a second feature, the porous adsorbent may be activated carbon.

[0009] In a third feature, in the activated carbon, a ratio of a pore volume of a pore size greater than or equal to 50 nm and less than or equal to 5000 nm to a total pore volume of a pore size less than or equal to 5000 nm may be higher than or equal to 15%.

[0010] In a fourth feature, in the activated carbon, a pore volume of a pore size greater than or equal to 50 nm and less than or equal to 5000 nm may be greater than or equal to 0.2 cm^3/g and less than or equal to 0.9 cm^3/g.

[0011] In a fifth feature, in the activated carbon, a ratio of a pore volume of a pore size less than 2 nm to a total pore volume of a pore size less than or equal to 5000 nm may be lower than or equal to 70%.

[0012] In a sixth feature, a BET specific surface area of the activated carbon may be greater than or equal to 600 m^2/g and less than or equal to 1800m^2/g.

[0013] In a seventh feature, the porous adsorbent may be disposed in a place where the porous adsorbent contacts with the aerosol in the stick.

[0014] In an eighth feature, the porous adsorbent may be present at any one or more of the following locations 1) to 5),

1) in a filter of the filter portion,
2) in a paper layer of a wrapping paper wrapping the filter or a surface opposed to the filter,
3) in a hollow part of the filter portion,
4) a surface facing the hollow part, and
5) in a cavity formed between adjacent segments of a plurality of segments of the filter.

[0015] A ninth feature may be a non-combustion-heating-type stick. The non-combustion-heating-type stick includes a substrate that includes an aerosol source, and a filter portion disposed in an area through which an aerosol generated as a result of heating the substrate passes. At least any one of the substrate and the filter portion contains activated carbon in which a ratio of a pore volume of a pore size greater than or equal to 50 nm and less than or equal to 5000 nm to a total pore volume of a pore size less than or equal to 5000 nm is higher than or equal to 15%.

Advantageous Effects of Invention

[0016] According to the first feature, it is possible to provide a non-combustion-heating-type stick with which a flavor and smoke taste inhibiting component, such as aldehydes, is preferentially removed while the level of user smoke taste satisfaction is kept.

[0017] According to the second feature, it is possible to provide a non-combustion-heating-type stick with which a flavor and smoke taste inhibiting component, such as aldehydes, can be selectively reduced as compared to a case where a material other than activated carbon is used as a porous adsorbent.

[0018] According to the third feature, it is possible to provide a non-combustion-heating-type stick that is highly compatible with an aerosol and that can exert a good influence on a flavor and smoke taste as compared to a case where the activated carbon, in which the ratio of a pore volume of a pore size greater than or equal to 50 nm and less than or equal to 5000 nm to a total pore volume of a pore size less than or equal to 5000 nm is lower than 15%, is used.

[0019] According to the fourth feature, it is possible to provide a non-combustion-heating-type stick that is highly compatible with an aerosol and that can exert a good influence on a flavor and smoke taste as compared to a case where the activated carbon, in which a pore volume of a pore size greater than or equal to 50 nm and less than or equal to 5000 nm is less than 0.2 cm^3/g or greater than 0.9 cm^3/g, is used.

[0020] According to the fifth feature, it is possible to provide a non-combustion-heating-type stick with which a flavor and smoke taste inhibiting component, such as aldehydes, can be selectively reduced as compared to a case where the activated carbon, in which the ratio of a pore volume of a pore size less than 2 nm to a total pore volume of a pore size less than or equal to 5000 nm is higher than 70%, is used.

[0021] According to the sixth feature, it is possible to provide a non-combustion-heating-type stick with which a flavor and smoke taste inhibiting component, such as aldehydes, can be selectively reduced as compared to a case where the activated carbon, in which a BET specific surface area is less than 600 m^2/g or greater than 1800 m^2/g, is used.

[0022] According to the seventh feature, it is possible to provide a non-combustion-heating-type stick with which a flavor and smoke taste inhibiting component, such as aldehydes, can be selectively reduced as compared to a case where a porous adsorbent is disposed in a place where the porous adsorbent does not contact with the aerosol in the stick.

[0023] According to the eighth feature, it is possible to provide a non-combustion-heating-type stick with which a flavor and smoke taste inhibiting component, such as aldehydes, can be selectively reduced as compared to a case where a porous adsorbent is not used.

[0024] According to the ninth feature, it is possible to provide a non-combustion-heating-type stick with which a flavor and smoke taste inhibiting component, such as aldehydes, is preferentially removed while the level of user smoke taste satisfaction is kept.

Brief Description of Drawings

[0025]

[Fig. 1] Fig. 1 is a longitudinal sectional view of a non-combustion-heating-type stick according to a first embodiment.
[Fig. 2] Fig. 2 is a schematic diagram that schematically illustrates a configuration example of an inhaler device according to the first embodiment.
[Figs. 3A and 3B] Figs. 3A and 3B illustrate schematic longitudinal sectional views of a filter portion of a non-combustion-heating-type stick according to another embodiment.

Description of Embodiments

[0026] Hereinafter, an embodiment according to the present invention will be described in detail with reference to the attached drawings. Like reference signs are assigned to the same portions in the drawings.

<Non-Combustion-Heating-Type Stick>

[0027] Fig. 1 is a longitudinal sectional view of a non-combustion-heating-type stick 1 according to a first embodiment. Fig. 2 is a schematic diagram that schematically illustrates a configuration example of an inhaler device 100 according to the first embodiment.

[0028] The non-combustion-heating-type stick (hereinafter, which may be referred to as "stick") 1 according to the first embodiment includes a substrate 10, a cooling portion 20, and a filter portion 30. The substrate 10 is formed in a columnar shape. Hereinafter, the direction of a center line CL of the substrate 10 may be referred to as "center line direction". The stick 1 further includes a tipping paper 40 that unites the substrate 10, the cooling portion 20, and the filter portion 30 by wrapping the substrate 10, the cooling portion 20, and the filter portion 30 in a state of being arranged in this order in the center line direction. Hereinafter, one end side (left side in Fig. 1) in the center line direction may be referred to as first side, and the other end side (right side in Fig. 1) in the center line direction may be referred to as second side. The first side is an end side to be inserted into the inhaler device 100. The second side is opposite to the first side and is an end side that a user holds in his or her mouth for inhalation. A section taken along the center line direction is referred to as "longitudinal section", and a section taken along a plane orthogonal to the center line direction is defined as "cross section".

[Usage Mode of Stick 1]

[0029] The stick 1 according to the first embodiment is used in the non-combustion-heating-type inhaler device 100. As shown in Fig. 2, the inhaler device 100 includes a power supply 111 that stores electric power and supplies electric power to structural elements of the inhaler device 100, a sensor 112 that detects various pieces of information on the inhaler device 100, and a notifier 113 that notifies a user of information. The inhaler device 100 includes a memory 114 that stores various pieces of information for the operation of the inhaler device 100, a communicator 115 for transmitting and receiving information between the inhaler device 100 and another device, and a controller 116 that controls the overall operation in the inhaler device 100. The inhaler device 100 includes a heater 121 that heats the stick 1, a holder 140 that holds the stick 1, an opening 142 that communicates an internal space 141 with an outside, and a heat insulator 144 that prevents heat from transferring from the heater 121 to other structural elements of the inhaler device 100. In the inhaler device 100, a user inhales in a state where the stick 1 is held by the holder 140.

[0030] The heater 121 heats the substrate 10 of the stick 1. The heater 121 is made of a selected raw material, such as a metal and polyimide. For example, the heater 121 has a film-like shape and surrounds the outer circumference of the holder 140. Then, when the heater 121 is heated, an aerosol source 11 (not shown in Fig. 2) included in the stick 1 is heated from the outer circumference of the stick 1. The heater 121 produces heat when receiving electric power from the power supply 111. In an example, when the sensor 112 detects that predetermined user input is performed, electric power may be fed. When the temperature of the stick 1 heated by the heater 121 reaches a predetermined temperature, the user is allowed to inhale. After that, when the sensor 112 detects that the predetermined user input is performed, feeding of electric power may be stopped. In an example of another usage mode, in a period during which the sensor 112 detects that the user has inhaled, electric power may be fed to generate an aerosol.

[0031] The heat insulator 144 at least surrounds the outer circumference of the heater 121. For example, the heat insulator 144 is made up of a vacuum heat insulator, an aerogel heat insulator, and the like. A vacuum heat insulator is, for example, a heat insulator of which heat conduction by gas is brought close to zero as much as possible by wrapping glass wool, silica (silicon powder), and the like with a resin film into a high-vacuum state.

[Substrate 10]

[0032] The substrate 10 includes an aerosol source 11 that generates vapor to generate an aerosol when heated, and a wrapping paper 12 that surrounds the outer circumference of the aerosol source 11. The substrate 10 of Fig. 1 is an example of a substrate including an aerosol source. The substrate 10 is formed in a columnar shape in a manner such that the aerosol source 11 is wrapped with the wrapping paper 12. The aerosol source 11 may be, for example, a substance derived from tobacco, such as a processed substance obtained by forming shredded tobacco or tobacco raw material into a granular form, a sheet form, or a powder form. The aerosol source 11 may contain a substance not derived from tobacco and made from a plant other than tobacco (for example, mint, a herb, or the like). In an example, the aerosol source 11 may contain a flavor component, such as menthol. When the inhaler device 100 is a medical inhaler, the aerosol source 11 may contain a medicine for a patient to inhale. The aerosol source 11 is not limited to a solid and may be, for example, a liquid, such as polyhydric alcohol and water. Examples of the polyhydric alcohol include glycerine and propylene glycol. At least part of the substrate 10 is accommodated in the internal space 141 of the holder 140 in a state where the stick 1 is held by the holder 140 shown in Fig. 2.

[0033] The substrate 10 formed by wrapping the aerosol source 11 with the wrapping paper 12 preferably has a columnar shape that satisfies a shape of which an aspect ratio defined by the following expression 1 is higher than or equal to one.

[Expression 1]

$$\text{Aspect ratio} = h/w$$

[0034] In the expression 1, w denotes the width of a cross section of the substrate 10, h denotes the size of the substrate 10 in the center line direction, and, preferably, $h \geq w$. The shape of the cross section is not limited and may be a polygonal shape, a rounded-corner polygonal shape, a circular shape, an elliptical shape, or the like. The width w is a diameter when the cross section has a circular shape, a longitudinal diameter when the cross section has an elliptical shape, or the diameter of a circumcircle or the longitudinal diameter of a circumscribed ellipse when the cross section has a polygonal shape or a rounded-corner polygonal shape. The width of the aerosol source 11 that is a component of the substrate 10 is preferably greater than or equal to 4 mm and less than or equal to 9 mm.

[0035] The size of the substrate 10 in the center line direction can be changed as needed according to the size of a product and is commonly greater than or equal to 10 mm, preferably greater than or equal to 12 mm, more preferably greater than or equal to 15 mm, and further preferably greater than or equal to 18 mm. The size of the substrate 10 in the center line direction is commonly less than or equal to 70 mm, preferably less than or equal to 50 mm, more preferably less than or equal to 30 mm, and further preferably less than or equal to 25 mm.

[0036] In the center line direction, the percentage of the size of the substrate 10 to the size of the stick 1 is not limited. From the viewpoint of a balance between a delivery amount and an aerosol temperature, the percentage is commonly higher than or equal to 10%, preferably higher than or equal to 20%, more preferably higher than or equal to 25%, or further preferably higher than or equal to 30%. The percentage of the size of the substrate 10 to the size of the stick 1 is commonly lower than or equal to 80%, preferably lower than or equal to 70%, more preferably lower than or equal to 60%, further preferably lower than or equal to 50%, particularly preferably lower than or equal to 45%, and most preferably lower than or equal to 40%.

[0037] The content of the aerosol source 11 in the substrate 10 is not limited. The content of the aerosol source 11 may be greater than or equal to 200 mg and less than or equal to 800 mg and preferably greater than or equal to 250 mg and less than or equal to 600 mg. This range is particularly suitable for the substrate 10 with a perimeter of 22 mm and a size of 20 mm in the center line direction.

[0038] Here, the aerosol source 11 including shredded tobacco will be described. The material of shredded tobacco included in the aerosol source 11 is not limited and may be a known one, such as lamina and a leaf midrib. Alternatively, the material of shredded tobacco may be the one obtained by grinding dried tobacco leaves into ground tobacco with an average particle diameter greater than or equal to 20 μm and less than or equal to 200 μm, forming a sheet from the uniformed ground tobacco (hereinafter, also simply referred to as uniform sheet), and then shredding the uniform sheet. Alternatively, the material of shredded tobacco may be a so-called strand type in which the one obtained by shredding a uniform sheet, having a size equivalent to the size of the substrate 10 in the center line direction, substantially horizontally to the center line direction of the substrate 10 is filled into the aerosol source 11.

[0039] The width of shredded tobacco is preferably greater than or equal to 0.5 mm and less than or equal to 2.0 mm for the purpose of being filled into the aerosol source 11.

[0040] As for tobacco leaves used to manufacture the shredded tobacco and the uniform sheet, various types of tobacco may be used. Examples of the types of tobacco include a flue cured type, a burley type, an orient type, a local type, other nicotiana-tabacum-series species, nicotiana-rustica-series species, and mixtures of them. The mixtures may be used by appropriately blending the species to attain an intended taste. The details of the species of the tobaccos are disclosed in "Tobacco Dictionary, Tobacco Research Center, 2009.3.31". There is a plurality of existing methods for the method of manufacturing a uniform sheet, that is, a method of grinding tobacco leaves and working the ground tobacco leaves into a uniform sheet. The first one is a method of manufacturing a paper-made sheet by using a paper-making process. The second one is a method of casting a uniformed product onto a metal plate or a metal plate belt with a thin thickness after an appropriate solvent, such as water, is mixed with the ground tobacco leaves to be uniformed and drying the uniformed product to form a cast sheet. The third one is a method of manufacturing a rolled sheet by extruding a product obtained by mixing an appropriate solvent, such as water, with the ground tobacco leaves and uniformed, into a sheet. The type of the uniform sheet is disclosed in detail in "Tobacco Dictionary, Tobacco Research Center, 2009.3.31".

[0041] The moisture content of the aerosol source 11 may be higher than or equal to 10mass% and lower than or equal to 15mass% with respect to the total amount of the aerosol source 11 and preferably higher than or equal to 11mass% and lower than or equal to 13mass%. With such a moisture content, occurrence of wrapping stains is reduced, and rollability in manufacturing the substrate 10 is improved.

[0042] The aerosol source 11 is not limited. The aerosol source 11 may contain extracted substances from various natural products and/or components of them according to an application. Examples of the extracted substances and/or the components of them include glycerin, propylene glycol, triacetin, 1,3-butanediol, and mixtures of them.

[0043] The content of the extracted substances and/or components of them in the aerosol source 11 is not limited. From the viewpoint of sufficiently generating an aerosol and imparting a good flavor, the content of the extracted substances and/or components of them is commonly higher than or equal to 5mass% and preferably higher than or equal to 10mass% with respect to the total amount of the aerosol source 11. The content of the extracted substances and/or components of them in the aerosol source 11 is commonly lower than or equal to 50mass% and preferably higher than or equal to 15mass% and lower than or equal to 25mass%.

[0044] The aerosol source 11 may contain a flavoring agent. The type of the flavoring agent is not limited. From the viewpoint of imparting a good flavor, the type of the flavoring agent is particularly preferably menthol. One type of these flavoring agents may be used solely or two or more types may be used in combination.

[0045] The packing density in the aerosol source 11 is not limited. From the viewpoint of ensuring the performance of the stick 1 and imparting a good flavor, the packing density is commonly greater than or equal to 250 mg/cm^3 and preferably greater than or equal to 300 mg/cm^3. The packing density in the aerosol source 11 is commonly less than or equal to 400 mg/cm^3 and preferably less than or equal to 350 mg/cm^3.

[0046] The aerosol source 11 may be made from a tobacco sheet. The number of tobacco sheets may be one or may be two or more

[0047] The mode in which the aerosol source 11 is made from a tobacco sheet may be, for example, a mode in which a tobacco sheet of which one side has a size equivalent to the size of an object to be filled in the center line direction is filled in a state of being folded multiple times horizontally to the center line direction of the object to be filled (so-called gathered sheet). The mode in which the aerosol source 11 is made from a tobacco sheet may also be a mode in which a tobacco sheet of which one side has a size equivalent to the size of an object to be filled in the center line direction is filled in a state of being rolled in a direction orthogonal to the center line direction of the object to be filled.

[0048] The mode in which the aerosol source 11 is made from two or more tobacco sheets may be, for example, a mode in which a plurality of tobacco sheets of which one side has a size equivalent to the size of an object to be filled in the center line direction is filled so as to be disposed concentrically in a state of being rolled in a direction orthogonal to the center line direction of the object to be filled.

[0049] The phrase "disposed concentrically" means to be disposed such that the centers of all the tobacco sheets are substantially at the same location. The number of tobacco sheets is not limited and may be two, three, four, five, six or seven.

[0050] All of the two or more tobacco sheets may have the same composition or physical properties or one or some of all of the tobacco sheets may have different compositions or physical properties. The thickness of each tobacco sheet may be the same or may be different from each other.

[0051] The thickness of each tobacco sheet is not limited and is preferably greater than or equal to 150 μm and less than or equal to 1000 μm and more preferably greater than or equal to 200 μm and less than or equal to 600 μm due to a balance between heat transfer and strength.

[0052] The aerosol source 11 can be manufactured by preparing a laminated body in which a plurality of tobacco sheets with different widths is prepared and laminated such that the width reduces from the first side toward the second side and putting the laminated body into a forming tube for rolling.

[0053] With this manufacturing method, the plurality of tobacco sheets extends in the center line direction and is disposed concentrically about the center line CL.

[0054] In this manufacturing method, a laminated body is preferably prepared such that, after rolling, a noncontact part is formed between any adjacent tobacco sheets. When there is a noncontact part (gap) in which tobacco sheets are not in contact between the plurality of tobacco sheets, it is possible to enhance the delivery efficiency of a flavor component by ensuring a flavor flow path. On the other hand, heat from a heater can be transferred to the outside tobacco sheet via a contact part between the plurality of tobacco sheets, so high transfer efficiency can be ensured.

[0055] To provide a noncontact part where tobacco sheets are not in contact, between the plurality of tobacco sheets, examples of the method of preparing a laminated body include using embossed tobacco sheets, laminating tobacco sheets such that not the entire surfaces of adjacent tobacco sheets are bonded to each other, laminating tobacco sheets such that parts of adjacent tobacco sheets are bonded to each other, or laminating tobacco sheets such that the entire surfaces or parts of adjacent tobacco sheets are bonded to each other with a lesser strength so as to be peeled off after rolling.

[0056] When the substrate 10 including the wrapping paper 12 is prepared, the wrapping paper 12 may be disposed at the first-side end face of the laminated body.

[0057] Polyols may be added to a tobacco sheet. Examples of the polyols include glycerin, propylene glycol, and 1,3-butanediol. An additive amount to a tobacco sheet is preferably higher than or equal to 5mass% and lower than or equal to 50mass% and more preferably higher than or equal to 15mass% and lower than or equal to 25mass% with respect to the dry mass of the tobacco sheet.

[0058] A tobacco sheet may be manufactured as needed with a known method, such as sheet making, slurry, and rolling. The above-described uniform sheet may be used.

[0059] In the case of sheet making, a tobacco sheet may be manufactured with a method including the following steps. 1) roughly grinding dry tobacco leaves and performing extraction with water to be separated into water extract and residue. 2) decompressing and drying the water extract to condense the water extract. 3) adding pulp to the residue, fiberizing the material with a refiner, and then performing paper making. 4) providing a tobacco sheet by adding a condensed solution of the water extract to the sheet made and drying the sheet. In this case, a step of removing part of components, such as nitrosoamine, may be added (see Japanese Unexamined Patent Application Publication (Translation of PCT Application) No. 2004-510422).

[0060] In the case of slurry process, a tobacco sheet may be manufactured with a method including the following steps. 1) mixing water, pulp, binder, and ground tobacco leaves. 2) thinly extending (casting) the mixture and drying the mixture. In this case, a step of removing part of components, such as nitrosoamine, by applying ultraviolet irradiation or X-ray irradiation to slurry obtained by mixing water, pulp, binder, and ground tobacco leaves may be added.

[0061] Other than this, as described in International Publication No. 2014/104078, a nonwoven fabric tobacco sheet manufactured with a method including the following steps may be used. 1) mixing powder and granular tobacco leaves with binder. 2) sandwiching the mixture by a nonwoven fabric. 3) obtaining a nonwoven fabric tobacco sheet by molding the laminate into a certain shape by thermal welding.

[0062] The same types of tobacco leaves that are raw materials used in the above-described methods as those described for the aerosol source 11 including shredded tobacco may be used.

[0063] The composition of the tobacco sheet is not limited. For example, the content of tobacco raw material (tobacco leaves) is preferably higher than or equal to 50mass% and lower than or equal to 95mass% with respect to the total mass of the tobacco sheet. The tobacco sheet may contain a binder. Examples of the binder include guar gum, xanthan gum, carboxymethyl cellulose, and sodium salt of carboxymethyl cellulose. The amount of the binder is preferably higher than or equal to 1mass% and lower than or equal to 10mass% with respect to the total mass of the tobacco sheet. The tobacco sheet may further contain other additives. Examples of the other additives include a filler, such as pulp.

[0064] The configuration of the wrapping paper 12 used for the substrate 10 is not limited and may be a general mode. For example, the configuration of the wrapping paper 12 may be the one containing pulp as a main component. Not only a sheet is made from wood pulp, such as soft wood pulp and hard wood pulp, as pulp but also a sheet may be made by mixing non-wood pulp generally used in the wrapping paper 12 for a tobacco product, such as flax pulp, cannabis pulp, sisal pulp, and esparto, as pulp.

[0065] Chemical pulp, ground pulp, chemiground pulp, thermomechanical pulp, or the like obtained by kraft cooking, acid, neutral, alkali sulfite cooking, soda salt cooking, or the like may be used as the type of pulp.

[0066] During a sheet making process performed by a fourdrinier paper machine, a cylinder paper machine, a cylinder-tanmo complex paper machine, or the like by using the pulp, formation is uniformed to produce the wrapping paper 12. Where necessary, a wet strength agent may be added to impart the wrapping paper 12 with water resistance or a sizing agent may be added to adjust the printing condition of the wrapping paper 12. Furthermore, a paper internal agent, such as aluminum sulfate, various anionic, cationic, nonionic, or amphoteric yield enhancement agents, a freeness enhancement agent, and a paper strengthening agent, and a paper making additive, such as dye, a pH adjustor, an antifoamer, a pitch control agent, and a slime control agent, may be added.

[0067] The basis weight of the base paper of the wrapping paper 12 is, for example, commonly greater than or equal to 20 gsm and preferably greater than or equal to 25 gsm. On the other hand, the basis weight is commonly less than or equal to 65 gsm, preferably less than or equal to 50 gsm, or more preferably less than or equal to 45 gsm.

[0068] The thickness of the wrapping paper 12 is not limited. From the viewpoint of stiffness, air permeability, and easiness of adjustment during paper manufacturing, the thickness of the wrapping paper 12 is commonly greater than or equal to 10 μm, preferably greater than or equal to 20 μm, and more preferably greater than or equal to 30 μm. The thickness of the wrapping paper 12 is commonly less than or equal to 100 μm, preferably less than or equal to 75 μm, and more preferably less than or equal to 50 μm.

[0069] Examples of the shape of the wrapping paper 12 for manufacturing the substrate 10 include a square shape and a rectangular shape.

[0070] When used as the wrapping paper 12 for wrapping the aerosol source 11, the length of one side may range from about 12 mm to about 70 mm, the length of another one side may range from 15 mm to 28 mm, the preferred length of another one side may range from 22 mm to 24 mm, and the further preferred length may be about 23 mm. When the aerosol source 11 is wrapped with the wrapping paper 12 into a columnar shape, for example, one end of the wrapping paper 12 in the circumferential direction and its opposite-side end of the wrapping paper 12 are overlapped with about 2 mm to be bonded into a cylindrical paper core shape, and the aerosol source 11 fills the inside. The size of the rectangular wrapping paper 12 can be determined by the size of the substrate 10.

[0071] In addition to the above-described pulp, the wrapping paper 12 may contain a filler. The content of the filler may be higher than or equal to 10mass% and lower than 60wt% and preferably higher than or equal to 15mass% and lower than or equal to 45mass% with respect to the total mass of the wrapping paper 12.

[0072] In the wrapping paper 12, the content of the filler is preferably higher than or equal to 15mass% and lower than or equal to 45mass% within the preferable basis weight range (greater than or equal to 25 gsm and less than or equal to 45 gsm).

[0073] Furthermore, when the basis weight is greater than or equal to 25 gsm and less than or equal to 35 gsm, the filler is preferably higher than or equal to 15mass% and lower than or equal to 45mass%. When the basis weight is greater than or equal to 35 gsm and less than or equal to 45 gsm, the filler is preferably higher than or equal to 25mass% and lower than or equal to 45mass%.

[0074] Examples of the filler include calcium carbonate, titanium dioxide, and kaolin. From the viewpoint of enhancing flavor and whiteness, or other viewpoints, calcium carbonate is preferably used.

[0075] The wrapping paper 12 may be added with various aids in addition to base paper and a filler and may be added with, for example, a water resistance improving agent for improvement in water resistance. The water resistance improving agent includes a wet strength agent (WS agent) and a sizing agent. Examples of the wet strength agent include urea formaldehyde resin, melamine-formaldehyde resin, and polyamide-epichlorohydrin (PAE). Examples of the sizing agent include rosin soap, alkyl ketene dimer (AKD), alkenyl succinic anhydride (ASA), and high-saponification polyvinyl alcohol with a saponification degree of higher than or equal to 90%.

[0076] A paper strengthening agent may be added as an aid. Examples of the paper strengthening agent include polyacrylamide, cationic starch, oxidized starch, CMC, polyamide epichlorohydrin resin, and polyvinyl alcohol. Particularly, as for oxidized starch, it is known that air permeability improves when a very small amount is used (Japanese Unexamined Patent Application Publication No. 2017-218699).

[0077] A coating agent may be added to at least one side of the two front and back sides of the wrapping paper 12. The coating agent is not limited and is preferably a coating agent capable of forming a film on the surface of paper and reducing liquid permeability. Examples of the coating agent include polysaccharides, such as alginic acid and its salts (for example, sodium salt), and pectin, cellulose derivatives, such as ethyl cellulose, methyl cellulose, carboxymethyl cellulose, and nitrocellulose, and starches and their derivatives (for example, ether derivatives, such as carboxymethyl starch, hydroxyalkyl starch, and cationic starch, and ester derivatives, such as starch acetate, starch phosphate, and starch octenyl succinate).

[Cooling Portion 20]

[0078] The cooling portion 20 is a member disposed adjacent to the substrate 10 and the filter portion 30 and formed such that the cross section of a cylinder and the like becomes hollow (cavity) when a forming paper 21 is wrapped.

[0079] The size of the cooling portion 20 in the center line direction can be changed as needed according to the size of a product and is commonly greater than or equal to 5 mm, preferably greater than or equal to 10 mm, and more preferably greater than or equal to 15 mm. The size of the cooling portion 20 in the center line direction is commonly less than or equal to 35 mm, preferably less than or equal to 30 mm, and more preferably less than or equal to 25 mm. When the size of the cooling portion 20 in the center line direction is greater than or equal to the above-described lower limit, it is possible to obtain a good flavor while ensuring a sufficient cooling function. When the size of the cooling portion 20 in the center line direction is less than or equal to the above-described upper limit, it is possible to reduce losses due to adhesion of generated vapor and aerosol to the forming paper 21.

[0080] The cooling portion 20 desirably has a large inner surface area. The forming paper 21 for forming the cooling portion 20 may be provided with creases to form channels and then may be made up of a sheet of a thin material, pleated, gathered, or folded. When there are many folds or pleats in a given volume of an element, the total surface area of the cooling portion 20 increases.

[0081] The thickness of the forming paper 21 is not limited and, for example, may be greater than or equal to 5 μm and less than or equal to 500 μm and may be greater than or equal to 10 μm and less than or equal to 250 μm. The material of the forming paper 21 is not limited and may be, for example, the one containing pulp as a main component, may be the one containing any one of polyethylene, polypropylene, polyvinyl chloride, polyethylene terephthalate, polylactate, cellulose acetate, and aluminum foil as a main component, or a selected combination of them.

[0082] The cooling portion 20 has perforations V (in the technical field, also referred to as "ventilation filter (Vf)") in the circumferential direction and concentrically. The perforations V are present in a region into which air can flow from an outside of the stick 1, in other words, a region that projects from the opening 142 in a state where the stick 1 is held by the holder 140 of the inhaler device 100.

[0083] With the perforations V, air flows from the outside to the inside of the cooling portion 20 during inhalation to make it possible to decrease the temperature of vapor and air flowing in from the substrate 10. Furthermore, the location where the cooling portion 20 is provided is set within a region 4 mm or longer away from the boundary between the cooling portion 20 and the filter portion 30 in a direction toward the cooling portion 20. Thus, it is possible to not only improve cooling capacity but also reduce stagnation of an object to be generated by heating (product) in the cooling portion 20 and improve the delivery amount of the product.

[0084] Vapor generated by using an aerosol as condensation nuclei as a result of heating the substrate 10 contacts with air from the outside to decrease in temperature and liquefies, with the result that generation of an aerosol is facilitated. The cooling portion 20 is an example of a cooling portion that cools vapor generated as a result of heating a substrate to generate an aerosol.

[0085] In the cooling portion 20, when the perforations V present concentrically are regarded as one perforation group, the number of perforation groups may be one or may be two or more. When the number of perforation groups is two or more, from the viewpoint improvement in the delivery amount of a component generated by heating, a perforation group is preferably not provided in a region shorter than 4 mm in a direction toward the cooling portion 20 from a boundary between the cooling portion 20 and the filter portion 30.

[0086] When the stick 1 is in a mode in which the substrate 10, the cooling portion 20, and the filter portion 30 are wrapped with the tipping paper 40, perforations are preferably provided in the tipping paper 40 at locations just above the perforations V provided in the cooling portion 20. When the thus configured stick 1 is manufactured, the tipping paper 40 provided with perforations that overlap the perforations V may be prepared for wrapping. From the viewpoint of ease of manufacturing, preferably, after the stick 1 with no perforation V is manufactured, holes that extend through the cooling portion 20 and the tipping paper 40 at the same time are perforated.

[0087] The region in which the perforations V are present is not limited as long as the region is 4 mm or longer away from the boundary between the cooling portion 20 and the filter portion 30 in a direction toward the cooling portion 20 from the viewpoint of improvement in product delivery caused by heating. Furthermore, from the viewpoint of improvement in delivery of a product, the region is preferably 4.5 mm or longer away, more preferably 5 mm or longer away, or further preferably 5.5 mm or longer away. The region in which the perforations V are present is preferably a region 15 mm or shorter away, more preferably a region 10 mm or shorter away, and further preferably a region 7 mm or shorter away, from the viewpoint of ensuring cooling function.

[0088] The region in which the perforations V are present is preferably a region 24 mm or longer away from the first-side end face of the stick 1 in a direction toward the cooling portion 20, preferably a region 24.5 mm or longer away, preferably a region 25 mm or longer away, and more preferably a region 25.5 mm or longer away, from the viewpoint of improvement in delivery of a product by heating. The region in which the perforations V are present is preferably a region 35 mm or shorter away, more preferably a region 30 mm or shorter away, and further preferably a region 27 mm or shorter away, from the viewpoint of ensuring cooling function.

[0089] Assuming that the boundary between the cooling portion 20 and the substrate 10 is a reference, when the size of the cooling portion 20 in the center line direction is greater than or equal to 20 mm, the region in which the perforations V are present is preferably a region 5 mm or longer away from the boundary between the cooling portion 20 and the substrate 10 in a direction toward the cooling portion 20, preferably a region 10 mm or longer away, and further preferably a region 13 mm or longer away, from the viewpoint of ensuring cooling function. The region in which the perforations V are present is preferably a region 16 mm or shorter away from the boundary between the cooling portion 20 and the substrate 10 in a direction toward the cooling portion 20, more preferably a region 15.5 mm or shorter away, further preferably a region 15 mm or shorter away, and particularly preferably a region 14.5 mm or shorter away, from the viewpoint of improvement in delivery of a product by heating.

[0090] The perforations V are provided such that the air inflow rate through the perforations V at the time when inhalation is performed with an automatic smoking machine at a rate of 17.5 ml/s is higher than or equal to 10vol% and lower than or equal to 90vol%. The "air inflow rate" is a volume percent of air flowing in through the perforations V where the percent of air inhaled from an inhalation port end is 100vol%. The air inflow rate is preferably higher than or equal to 50vol% and lower than or equal to 80vol% and more preferably higher than or equal to 55vol% and lower than or equal to 75vol%. For example, the number of perforations V per perforation group is selected from the range of five to 50, the diameter of each perforation V is selected from the range of 0.1 mm to 0.5 mm, and the above air inflow rates can be achieved by combinations of these selections.

[0091] The air inflow rate can be measured with a method compliant with ISO9512 with an automatic smoking machine (for example, a single-barreling automatic smoking machine manufactured by Borgwaldt).

[Tipping Paper 40]

[0092] The configuration of the tipping paper 40 is not limited and may be a general mode. For example, the configuration of the tipping paper 40 may be the one containing pulp as a main component. Not only a sheet is made from wood pulp, such as soft wood pulp and hard wood pulp, as pulp but also a sheet may be made by mixing non-wood pulp generally used in a wrapping paper for a tobacco article, such as flax pulp, cannabis pulp, sisal pulp, and esparto, as pulp. One type of these pulps may be used solely or multiple types may be used in combination at a selected ratio.

[0093] The tipping paper 40 may be made up of a single sheet or may be made up of a plurality of sheets or more.

[0094] Chemical pulp, ground pulp, chemiground pulp, thermomechanical pulp, or the like obtained by kraft cooking, acid, neutral, alkali sulfite cooking, soda salt cooking, or the like may be used as the mode of pulp.

[0095] The tipping paper 40 may be manufactured with a manufacturing method (described later) or may be obtained by using a commercial product.

[0096] The shape of the tipping paper 40 is not limited and may be a square shape or a rectangular shape.

[0097] The basis weight of the tipping paper 40 is not limited. The basis weight is commonly greater than or equal to 32 gsm and less than or equal to 60 gsm, preferably greater than or equal to 33 gsm and less than or equal to 55 gsm, and more preferably greater than or equal to 34 gsm and less than or equal to 53 gsm.

[0098] The air permeability of the tipping paper 40 is not limited. The air permeability is commonly higher than or equal to 0 CORESTA Unit and lower than or equal to 30000 CORESTA Unit, and preferably higher than 0 CORESTA Unit and lower than or equal to 10000 CORESTA Unit. Air permeability is a value measured in compliant with ISO2965:2009, and indicates the flow rate (cm^3) of gas that passes through an area 1 cm^2 per one minute when the pressure difference between both sides is 1 kPa. One CORESTA Unit (1 C.U.) is $cm^3/(min \cdot cm^2)$ under 1 kPa.

[0099] The tipping paper 40 may contain a filler in addition to the above-described pulp. Examples of the filler include a metal carbonate, such as calcium carbonate and magnesium carbonate, a metal oxide, such as titanium oxide, titanium dioxide, and aluminum oxide, a metal sulfate, such as barium sulfate and calcium sulfate, a metal sulfide, such as zinc sulfide, quartz, kaolin, talc, diatom earth, and gypsum. Particularly, the tipping paper 40 preferably contains calcium carbonate from the viewpoint of improving whiteness and opacity and increasing a heating rate. One of these fillers may be used solely or two or more of these fillers may be used in combination.

[0100] The tipping paper 40 may be added with various aids in addition to the above-described pulp and/or fillers and may have, for example, a water resistance improving agent for improvement in water resistance. The water resistance improving agent includes a wet strength agent (WS agent) and a sizing agent. Examples of the wet strength agent include urea formaldehyde resin, melamine-formaldehyde resin, and polyamide-epichlorohydrin (PAE). Examples of the sizing agent include rosin soap, alkyl ketene dimer (AKD), alkenyl succinic anhydride (ASA), and high-saponification polyvinyl alcohol with a saponification degree of higher than or equal to 90%.

[0101] A coating agent may be added to at least one side of the two front and back sides of the tipping paper 40. The coating agent is not limited and is preferably a coating agent capable of forming a film on the surface of paper and reducing liquid permeability.

[0102] Part of an outer surface of the tipping paper 40 may be coated with a lip-release material. A lip-release material means a material configured to, when a user puts the filter portion 30 of the stick 1 in the mouth, aid contact between the lip and the tipping paper 40 to easily separate without substantial adhesion. Examples of the lip-release material may include ethyl cellulose and methyl cellulose. For example, the outer surface of the tipping paper 40 may be coated with a lip-release material by applying ethyl cellulose ink or methyl cellulose ink to the outer surface of the tipping paper 40.

[Filter Portion 30]

[0103] The filter portion 30 is connected to the second side of the cooling portion 20 via the tipping paper 40. The tipping paper 40 integrally wraps the second-side end of the cooling portion 20 and the first-side end of the filter portion 30 to connect (couple) these ends.

[0104] The filter portion 30 has the filter 31 as a main structural element.

[0105] The filter 31 is not limited as long as the filter 31 has a general function of filter. Examples of the general function of filter include adjusting the amount of air to be mixed when an aerosol or the like is inhaled, reducing a flavor, and reducing nicotine and tar; however, the filter does not need to have all of these functions. In the non-combustion-heating-type stick 1 that tends to have a smaller amount of component generated and a lower packing fraction of the aerosol source 11 as compared to a cigarette product, it is also one of important functions to reduce falling of the aerosol source 11 while suppressing a filtering function. The filter 31 commonly has a filter material. The filter material is, for example, the one obtained by forming a filler, such as cellulose acetate fibers, acetate fibers, charcoal fibers, nonwoven fabric, and pulp paper, in a columnar shape as a filter medium. A mode in which a paper filter filled with sheet pulp paper is used may be applied.

[0106] The density of the filter material is not limited. The density of the filter material is commonly greater than or equal to

0.10 g/cm^3 and less than or equal to 0.25 g/cm^3, preferably greater than or equal to 0.11 g/cm^3 and less than or equal to 0.24 g/cm^3, and more preferably greater than or equal to 0.12 g/cm^3 and less than or equal to 0.23 g/cm^3.

[0107] The filter 31 may include a breakable additive releasing container (for example, a capsule) including a breakable outer shell, such as gelatin. The mode of the additive releasing container, such as a capsule, is not limited. A known mode may be adopted. In the case of the capsule, when the capsule is broken by the user before use, during use, or after use, the capsule releases liquid or substance (commonly, flavor agent) contained in the capsule. Subsequently, the liquid or the substance is transferred by the aerosol while the stick is being used, and is transferred to an ambient environment after use.

[0108] The form of the capsule is not limited. Examples of the form of the capsule include an easily breakable capsule and the shape of the capsule is preferably spherical. An additive contained in the capsule may include a selected additive and particularly preferably includes a flavor agent and activated carbon. One or more kinds of materials that help filter aerosol may be added as an additive. The mode of the additive is not limited and is commonly liquid or solid. An easily breakable capsule and its manufacturing method may be known ones.

[0109] Examples of the flavor agent may include menthol, spearmint, peppermint, fenugreek, clove, and medium-chain triglyceride (MCT). One of these or a combination of some of these may be used.

[0110] The filter may further contain another component, such as inorganic fine powder (kaolin, talc, diatom earth, quartz, calcium carbonate, barium sulfate, titanium oxide, alumina, or the like), a thermal stabilizer (alkali, salt of alkaline earth metal, or the like), a colorant, a whiteness improving agent, an oil, a yield enhancement agent, a sizing agent, a biodegradation or photodegradation accelerator (anatase-type titanium dioxide or the like), a natural polymer or its derivative (cellulose powder or the like), or the like. Another component may be used solely or a combination of two or more kinds of other components may be used.

[0111] The cross section of the filter 31 of the filter portion 30 is substantially circular, and the diameter of the circle can be changed as needed according to the size of a product. The diameter of the circle is commonly greater than or equal to 4.0 mm and less than or equal to 9.0 mm, preferably greater than or equal to 4.5 mm and less than or equal to 8.5 mm, and more preferably greater than or equal to 5.0 mm and less than or equal to 8.0 mm. When the cross section is not in a circular shape, a diameter of a circle having the same area as the area of the cross section is applied as the diameter

[0112] The circumferential length of the cross section of the filter 31 can be changed as needed according to the size of a product. The circumferential length of the cross section of the filter 31 is commonly greater than or equal to 14.0 mm and less than or equal to 27.0 mm, preferably greater than or equal to 15.0 mm and less than or equal to 26.0 mm, and more preferably greater than or equal to 16.0 mm and less than or equal to 25.0 mm.

[0113] The size of the filter portion 30 in the center line direction can be changed as needed according to the size of a product. The size of the filter portion 30 in the center line direction is commonly greater than or equal to 5 mm and less than or equal to 30 mm, preferably greater than or equal to 12.5 mm and less than or equal to 27.5 mm, and more preferably greater than or equal to 15.0 mm and less than or equal to 25.0 mm. The shape and dimensions of the filter 31, other structures included in the filter portion 30, and the like can be adjusted as needed such that the shape and dimensions of the filter portion 30 respectively fall within the above-described ranges.

[0114] The air-flow resistance of the filter portion 30 per size 120 mm in the center line direction is not limited. The air-flow resistance of the filter portion 30 is commonly higher than or equal to 40 mmH_2O and lower than or equal to 300 mmH_2O, preferably higher than or equal to 70 mmH_2O and lower than or equal to 280 mmH_2O, and more preferably higher than or equal to 90 mmH_2O and lower than or equal to 260 mmH_2O.

[0115] The air-flow resistance is measured with, for example, a filter air-flow resistance measuring device made by Cerulean in compliant with an ISO standard method (ISO6565). The air-flow resistance of the filter portion 30 indicates a difference in air pressure between the first side and the second side when air is flowed at a predetermined air flow rate (17.5 cc/min) from the first side to the second side in a state where permeation of air does not occur at the side of the filter portion 30. The unit is commonly mmH_2O.

[0116] The filter portion 30 preferably includes a wrapping paper 32 for wrapping the filter 31 and the like from the viewpoint of improvement in strength and structural stiffness. The mode of the wrapping paper 32 is not limited and may include a joint including one or more lines of an adhesive. The adhesive may include a hot-melt adhesive. In addition, the hot-melt adhesive can contain polyvinyl alcohol. When the filter segment is made up of two or more segments, a wrapping paper preferably wraps these two or more segments together.

[0117] The material of the wrapping paper 32 is not limited. A known material may be used. Also, the material of the wrapping paper 32 may contain a filler, such as calcium carbonate, or the like.

[0118] The thickness of the wrapping paper 32 is not limited. The thickness of the wrapping paper 32 is commonly greater than or equal to 20 μm and less than or equal to 140 μm, preferably greater than or equal to 30 μm and less than or equal to 130 μm, or more preferably greater than or equal to 30 μm and less than or equal to 120 μm.

[0119] The basis weight of the wrapping paper 32 is not limited. The basis weight of the wrapping paper 32 is commonly greater than or equal to 20 gsm and less than or equal to 100 gsm, preferably greater than or equal to 22 gsm and less than or equal to 95 gsm, and more preferably greater than or equal to 23 gsm and less than or equal to 90 gsm.

[0120] The wrapping paper 32 may be coated or not coated. From the viewpoint of imparting a function other than strength or structural stiffness, the wrapping paper 32 is preferably coated with a desired material.

[0121] The filter portion 30 may further include a center hole part having one or multiple hollow parts.

[0122] Fig. 3A illustrates a view including a center hole part 35 as a schematic longitudinal sectional view of the filter portion 30 of a non-combustion-heating-type stick according to a second embodiment. The left side of Fig. 3A is a cooling portion 20 side (first side), and the right side is an end side (second side) that a user holds in his or her mouth for inhalation.

[0123] The center hole part 35 is commonly disposed on the cooling portion 20 side with respect to the filter 31 as shown in the drawing and preferably disposed adjacent to the cooling portion 20.

[0124] The center hole part 35 is made up of a filling layer 33 having one or multiple hollow parts and an inner wrapping paper 34 covering the filling layer 33. The center hole part 35 has a function to enhance the strength of the filter portion 30. The filling layer 33 may be, for example, a rod with an inside diameter of greater than or equal to 1.0 mm and less than or equal to 5.0 mm, filled with cellulose acetate fibers with a high density and added with a plasticizer containing triacetin at 6mass% or higher and 20mass% or lower with respect to the mass of cellulose acetate and cured. Since the filling layer 33 has a high packing density of fibers, air and aerosol flow through only the hollow part and almost do not flow through the filling layer 33 during inhalation. Since the filling layer 33 in the center hole part 35 is a fiber filling layer, a touch feeling from outside during use is less likely to make a user feel a sense of discomfort. The center hole part 35 may be held in shape by heat molding without the inner wrapping paper 34.

[0125] The center hole part 35 and the filter 31 may be connected by, for example, an outer wrapping paper 36. The outer wrapping paper 36 may be, for example, a cylindrical paper. The substrate 10, the cooling portion 20, and the connected center hole part 35 and filter 31 may be connected by, for example, the tipping paper 40. These connections can be made by, for example, applying a paste, such as a paste of vinyl acetate or the like, on the inner surface of the outer wrapping paper 36 and rolling the outer wrapping paper 36 with the substrate 10, the cooling portion 20, and the connected center hole part 35 and filter 31 placed inside. These may be connected separately with a plurality of pieces of paper multiple times.

[0126] Similar articles regarding the mode, material, thickness, basis weight, and the like of the wrapping paper 32 may be used for the inner wrapping paper 34, used for the center hole part 35, and the outer wrapping paper 36. The inner wrapping paper 34 does not need to be used.

[0127] The filter 31 of the filter portion 30 may be divided into two or more multiple segments, and a cavity may be formed between the filters.

[0128] Fig. 3B illustrates a view in which a cavity 37 is formed between the filters 31 as a schematic longitudinal sectional view of the filter portion 30 of a non-combustion-heating-type stick according to a third embodiment. In Fig. 3B, as in the case of Fig. 3A, the left side of the drawing is a cooling portion 20 side (first side), and the right side is an end side (second side) that a user holds in his or her mouth for inhalation.

[0129] In Fig. 3B, the filter 31 has two segments, and a hollow cavity 37 is present between the two filters. The cavity 37 is formed when the two filter segments are wrapped with the wrapping paper 32 in a state where the two filter segments are disposed at desired locations. Commonly, part of the substrate 10, the cooling portion 20, and the filter portion 30 are further wrapped with an outer tipping paper (not shown in the drawing) of the wrapping paper 32.

[0130] A breakable additive releasing container (for example, a capsule) including a breakable outer shell, such as gelatin, similar to the one contained in the filter 31, may be incorporated in the cavity 37. When one capsule is disposed in the cavity 37, the size of the capsule should be less than or equal to 5 mm and less than or equal to the inside diameter of the cavity 37. When two or more capsules are disposed in the cavity 37, the size of the capsule should be less than or equal to 3.5 mm and less than or equal to the inside diameter of the cavity 37.

[0131] A porous adsorbent, such as activated carbon (described later), may be disposed in the cavity 37.

[Porous Adsorbent]

[0132] In the above-described embodiments, at least any one of the substrate 10, the cooling portion 20, and the filter portion 30 contains a porous adsorbent. The porous adsorbent is commonly disposed in a place where the porous adsorbent contacts with the aerosol in the stick 1. The porous adsorbent is preferably contained in at least one of the cooling portion 20 and the filter portion 30 and most preferably contained in at least the filter portion 30.

[0133] The porous adsorbent is not limited. The porous adsorbent may be an inorganic material or may be an organic material. Examples of the usable adsorbent as an inorganic porous adsorbent include activated carbon, sepiolite, palygorskite, zeolite, activated carbon fiber, activated alumina, sepiolite mixed paper, silica gel, activated clay, vermiculite, and diatom earth. Examples of the organic porous adsorbent include polymer porous bodies, such as pulp, various fibers, and ion exchange resins. For these porous adsorbents, from the viewpoint of making it possible to further remove a flavor and smoke taste inhibiting component, such as aldehydes, aniline compounds, hydrazine compounds, or amino compounds having reactivity with aldehydes may be, for example, adsorbed and held in pores of the porous adsorbent and used together with the porous adsorbent.

[0134] Among these porous adsorbents, from the viewpoint of not adversely affecting a flavor and smoke taste, improving a flavor and smoke taste in some cases, and making it possible to adsorb flavor and smoke taste inhibiting components, such as aldehydes, at the same time, activated carbon is preferably. Hereinafter, activated carbon will be described, for example.

[0135] For activated carbon, from the viewpoint of increasing the ratio of pores compatible with the size of aerosol particles (commonly, greater than or equal to 1 nm and less than or equal to 100 μm) generated by the non-combustion-heating-type stick in order to enhance absorptivity for aldehydes and the like, the ratio of the pore volume of a pore size greater than or equal to 50 nm and less than or equal to 5000 nm (macropores) to the total pore volume of a pore size less than or equal to 5000 nm is preferably higher than or equal to 15%. The ratio is more preferably higher than or equal to 20%, further preferably higher than or equal to 30%, and particularly preferably higher than or equal to 40%. The ratio of the pore volume of a pore size greater than or equal to 50 nm and less than or equal to 5000 nm is preferably lower than or equal to 99% and particularly preferably lower than or equal to 95%.

[0136] The "ratio of the pore volume of a pore size greater than or equal to 50 nm and less than or equal to 5000 nm to the total pore volume of a pore size less than or equal to 5000 nm" is measured as follows.

[0137] The total pore volume of a pore size less than or equal to 5000 nm, and a pore size distribution of a pore size less than 2 nm (micropores) and a pore size greater than or equal to 2 nm and less than or equal to 50 nm (mesopores) are measured with a nitrogen gas adsorption method (BET multipoint method). The total pore volume measured from an adsorption gas amount under $P/P_0 = 0.998$ on the assumption that the pores are filled with liquid nitrogen. An accumulated pore volume of a pore size greater than or equal to 6.5 nm and less than or equal to 5000 nm is measured with a mercury intrusion method. Then, the results of the two methods are combined together. Thus, the "ratio of the pore volume of a pore size greater than or equal to 50 nm and less than or equal to 5000 nm to the total pore volume of a pore size less than or equal to 5000 nm" was obtained.

[0138] For activated carbon, from the viewpoint of increasing the pore volume compatible with the size of aerosol particles generated by the non-combustion-heating-type stick in order to enhance absorptivity for aldehydes and the like, the pore volume of a pore size greater than or equal to 50 nm and less than or equal to 5000 nm (macropores) is preferably greater than or equal to 0.2 cm^3/g and less than or equal to 0.9 cm^3/g. The pore volume of the above range is further preferably greater than or equal to 0.3 cm^3/g and particularly preferably greater than or equal to 0.4 cm^3/g. The pore volume of the above range is more preferably less than or equal to 0.8 cm^3/g and further preferably less than or equal to 0.7 cm^3/g.

[0139] The "ratio of the pore volume of a pore size greater than or equal to 50 nm and less than or equal to 5000 nm (macropores)" is obtained through measurement of a pore size distribution using a mercury intrusion method.

[0140] In the present embodiment, a pore volume ratio of (micropores of) activated carbon is preferably not excessively large, so the ratio of the pore volume of a pore size less than or equal to 50 nm to the total pore volume of a pore size less than or equal to 5000 nm is preferably lower than or equal to 70%, and more preferably lower than or equal to 65%. In the non-combustion-heating-type stick, macropores of a pore size greater than or equal to 50 nm and less than or equal to 5000 nm exercise a main function of activated carbon, so the non-combustion-heating-type stick can be used even when the ratio of the pore volume of a pore size less than or equal to 2 nm is 0%.

[0141] The ratio of the pore volume of a pore size less than 2 nm is obtained from the pore volume of a pore size less than 2 nm (micropores) with a nitrogen gas adsorption method and the total pore volume of a pore size less than or equal to 5000 nm with the above-described nitrogen gas adsorption method.

[0142] ABETspecific surface area of the activated carbon is commonly greater than or equal to 600 m^2/g and less than or equal to 1800 m^2/g.

[0143] The BETspecific surface areas of most of activated carbons are greater than or equal to 800 m^2/g and less than or equal to 1300 m^2/g, and these activated carbons may be used.

[0144] As activated carbon that can be used in the present embodiment, an accumulated 10vol% particle size (particle size D10) of activated carbon particles is preferably greater than or equal to 250 μm and less than or equal to 1200 μm. An accumulated 50vol% particle size (particle size D50) of activated carbon particles is preferably greater than or equal to 350 μm and less than or equal to 1500 μm. D10 and D50 are measured with a laser diffraction scattering method.

[0145] A preparation method for activated carbon is not limited. Examples of a source material include carbonaceous materials, such as lumber, lignite, coal, the husk or shell of coconut, peat, pitch, polymer, cellulose fiber, and polymer fiber.

[0146] Adsorption performance is imparted to a source material with an appropriately selected process, such as physical activation (activation) or chemical activation (activation), and activated carbon can be manufactured.

[0147] In physical activation, high-temperature gas is used for a source material into activated carbon by a) carbonization, b) activation/oxidation, or c) carbonization and activation/oxidation. a) The carbonization process includes a step of thermally decomposing a source material generally at a high temperature in the range of higher than or equal to about 600°C and lower than or equal to about 900°C without oxygen. b) The activation/oxidation includes a step of exposing a carbonized material at a temperature exceeding 250°C in an oxidation atmosphere of vapor, carbon dioxide, oxygen, or the like. The temperature of activation/oxidation is generally in the range higher than or equal to about 600°C and lower than or equal to about 1200°C. c) The carbonization and activation/oxidation includes processes of both a) carbonization process and b) activation/oxidation.

[0148] The chemical activation includes a step of impregnating a predetermined chemical agent, such as acids, bases, and salts including phosphoric acid, potassium hydroxide, sodium hydroxide, calcium chloride, zinc chloride, or the like to an unprocessed raw material. A material impregnated with a chemical agent is subsequently generally carbonized at a temperature lower than that of physical activation carbonization. For example, the temperature of a chemical activation carbonization can be in the range of higher than or equal to about 450°C and lower than or equal to 900°C. Carbonization and activation can occur at the same time.

[0149] It is possible to manufacture activated carbon having a desired pore characteristic or the like by adjusting the activation process physically or chemically appropriate for a source material. A commercial product suitable for a stick scheduled to be implemented may be selected and used.

[0150] Examples of activated carbon usable in the present embodiment are shown in the following Table 1 together with major physical properties of each of the activated carbons.

[Table 1]

	Pore Distribution (Ratio to Total Pore Volume)%		Volume of Pore 50 nm or Greater and 5000 nm or Less (cm^3/g)	BET Specific Surface Area (m^2/g)
	50 nm or Greater and 5000 nm or Less	Pore Size Less Than 2 nm		
Activated Carbon A	42.0	41.8	0.475	1347
Activated Carbon B	33.1	54.0	0.287	1283
Activated Carbon C	24.3	57.7	0.268	1767
Activated Carbon D	23.1	61.0	0.182	1211
Activated Carbon E	18.2	66.3	0.175	955
Activated Carbon F	18.1	64.5	0.197	1797
Activated Carbon G	11.0	74.3	0.071	1248

[0151] In the Table, a pore distribution is the ratio of the pore volume of a pore size greater than or equal to 50 nm and less than or equal to 5000 nm to the total pore volume of a pore size less than or equal to 5000 nm, and another pore distribution is the ratio of the pore volume of a pore size less than 2 nm to the total pore volume of a pore size less than or equal to 5000 nm.

[Location where Porous Adsorbent Is Disposed]

[0152] As described above, in the stick 1, a porous adsorbent is contained in at least any one of the substrate 10, the cooling portion 20, and the filter portion 30. A porous adsorbent is preferably disposed in any one or both of the cooling portion 20 and the filter portion 30 and is preferably disposed in the filter 31 of the filter portion 30. As described above, a porous adsorbent used is preferably activated carbon having desired pore physical properties and the like.

[0153] A location and mode in which a porous adsorbent, such as activated carbon, is present are not limited, and major locations and modes are as follows. In Figs. 1 to 3, activated carbon is not shown.

1) In Filter 31 of Filter Portion 30

[0154] Activated carbon is most typically contained in the filter 31. In this case, commonly, activated carbon is contained in the filter material.

[0155] When the filter 31 is made up of one segment as shown in Fig. 1, activated carbon may be uniformly contained in the filter or may be provided with a concentration gradient or may be present at a specific location in the filter at a high concentration. When the concentration gradient is provided or when the concentration at a specific location is increased, it is preferable to remove a flavor and smoke taste inhibiting component in a product at a location far from a user, so a larger amount of activated carbon is preferably present at the cooling portion 20 side (first side) in the filter 31.

[0156] When the filter 31 is made up of a plurality of segments, activated carbon may be present in any segment. However, from the viewpoint of removing a flavor and smoke taste inhibiting component, such as aldehydes, at a location far from a user as described above, a larger amount of activated carbon is preferably present in the segment adjacent to the cooling portion 20 (first side) in the filter 31.

2) In a paper layer of the wrapping paper 32 wrapping the filter 31 or a surface facing the filter 31.

[0157] Activated carbon may be contained in the wrapping paper 32 wrapping the filter 31. In this case, preferably, when the wrapping paper 32 is manufactured, the wrapping paper 32 is manufactured while activated carbon with a particle size less than the thickness of the wrapping paper 32 is added to incorporate the activated carbon in the layer of paper that is a component of the wrapping paper 32.

[0158] Alternatively, activated carbon may be disposed on a surface facing the filter 31 of the wrapping paper 32. In this case, activated carbon may be stuck by an adhesive to a surface, facing the filter, of the wrapping paper 32, or activated carbon may be present on a desired surface at the time of manufacturing activated carbon together with a coating agent when a coating agent is applied to the surface of the wrapping paper 32.

3) In Hollow Part of Filter Portion 30

[0159] Activated carbon may be present in the hollow part of the filter portion 30. The hollow part may be a hollow part provided at the center hole part 35 shown in the schematic diagram of Fig. 3A or may be another hollow part. Activated carbon may be present in the hollow part of a through-hole extending through the filter portion 30.

[0160] In these cases, activated carbon may be filled in all the hollow parts or may be filled in one or some of the hollow parts. When the hollow part has an opening for the cooling portion 20 as shown in Fig. 3A, the opening of the hollow part is preferably closed by thin paper, filter element, or the like so as to suppress leakage to the cooling portion 20.

4) On Surface Facing Hollow Part of Filter Portion 30

[0161] Activated carbon may be present on the surface of the hollow part of the filter portion 30. The hollow part may be a hollow part provided at the center hole part 35 shown in Fig. 3A or may be another hollow part. In this case, activated carbon may be stuck to a hollow part side of the filling layer 33 of the center hole part with an adhesive or the like or activated carbon may be molded so as to cover part or the entire of the hollow part of the filling layer 33.

5) In Cavity 37 Formed between Adjacent Segments of Plurality of Segments of Filter 31.

[0162] Activated carbon may be disposed in the cavity 37 formed between the filters 31 made up of a plurality of segments as shown in the schematic diagram of Fig. 3B. In this case, activated carbon in a granular form may be filled in the cavity 37, or activated carbon may be formed into the shape of a cavity and disposed in order of filter and activated carbon filter.

[0163] In Fig. 3B, the filter 31 has two segments. Alternatively, the filter 31 may have three or more segments, and activated carbon may be disposed in each of a plurality of cavities 37 each formed between any adjacent two of the filters.

6) Others

[0164] Activated carbon may be present in the cooling portion 20. When the perforations V are present in the cooling portion 20, activated carbon having a particle size greater than the width of the perforation V or activated carbon formed to be larger than the width of the perforation V is preferably used from the viewpoint of not exiting to outside the stick. A layer of a porous molded body made of activated carbon may be disposed between the cooling portion 20 and the filter portion 30 so as to cover the filter 31, or the molded body may be disposed in the cooling portion 20 and the substrate 10.

[0165] The molded body may be present in the forming paper 21 for forming the cooling portion 20. For example, activated carbon having a smaller particle size than the thickness of the forming paper 21 may be used at the time of manufacturing and present in the paper layer of the forming paper 21, or may be stuck by an adhesive to the inner sides of creases, pleats, or the like at the time of forming, or may be present together with a treatment at the time of application of a surface treatment agent, such as a coating agent.

[0166] Furthermore, part of activated carbon may be present together with the aerosol source 11 or the like of the substrate 10 and may be in contact with activated carbon in the substrate with a heated product in the substrate.

[0167] When activated carbon is present in the stick at these locations in these modes, it is possible to remove a flavor and smoke taste inhibiting component, such as aldehydes, while keeping the level of user smoke taste satisfaction in the non-combustion-heating-type stick of which the heating temperature is high.

[Addition of Porous Adsorbent]

[0168] A case where activated carbon that is a preferred example for addition of a porous adsorbent is used for the filter 31 will be described.

[0169] The additive amount to the filter material of the filter 31 is preferably greater than or equal to 15.0 m^2/cm^2 and less than or equal to 80.0 m^2/cm^2 as a value of (Specific surface area of activated carbon) × (Weight of activated carbon)/(Sectional area of the filter material in a direction perpendicular to the ventilation direction) for a non-combustion-heating-type stick. The value is more preferably greater than or equal to 17.0 m^2/cm^2 and further preferably greater than or equal to 35.0 m^2/cm^2. The value is more preferably less than or equal to 77.0 m^2/cm^2 and further preferably less than or equal to 73.0 m^2/cm^2.

[0170] The above "(Specific surface area of activated carbon) × (Weight of activated carbon)/(Sectional area of the filter material in a direction perpendicular to the ventilation direction)" may be referred to as "the surface area of activated carbon per unit sectional area" for the sake of convenience, hereinafter.

[0171] In the present embodiment, when the surface area of activated carbon per unit sectional area falls within a preferred range as in the case of the above range, a desired amount of component generated by heating can be delivered to a user, and a desired flavor feeling can be imparted to the user. When the surface area of activated carbon per unit sectional area is too small, the effect caused by addition of activated carbon tends to be not sufficiently obtained. On the other hand, when the surface area of activated carbon per unit sectional area is too large, a component generated by heating tends to reduce more than necessary.

[0172] The surface area of activated carbon per unit sectional area can be adjusted by adjusting, for example, the specific surface area and additive amount of activated carbon and the sectional area of the filter material in a direction perpendicular to the ventilation direction.

[0173] The surface area of activated carbon per unit sectional area can be calculated in accordance with the specific surface area of activated carbon added to the filter material of a non-combustion-heating-type stick, the weight of activated carbon added, and the sectional area of the filter material. When the filter portion 30 is made up of a plurality of filters 31, the sectional area and length of only the filter material to which activated carbon is added are referenced. Activated carbon can be dispersed not uniformly in a filter material to which the activated carbon is added, and fulfillment of the above range is difficult in all the section of the filter material (the section in a direction perpendicular to the ventilation direction), and an average value in the entire section just needs to fall within the above range.

[0174] The additive amount of activated carbon per unit length of the filter material added with activated carbon in the ventilation direction is preferably greater than or equal to 5 mg/cm and less than or equal to 50 mg/cm, more preferably greater than or equal to 8 mg/cm and less than or equal to 40 mg/cm, and further preferably greater than or equal to 10 mg/cm and less than or equal to 35 mg/cm.

[0175] The additive amount of activated carbon as a weight with respect to the overall filter portion 30 may be, for example, greater than or equal to 4.0 mg and less than or equal to 24.0 mg, preferably greater than or equal to 4.5 mg and less than or equal to 23.0 mg, and further preferably greater than or equal to 10.5 mg and less than or equal to 22.0 mg.

Reference Signs List

[0176]

1	non-combustion-heating-type stick
10	substrate
11	aerosol source
20	cooling portion
30	filter portion
31	filter
33	filling layer
35	center hole part
37	cavity
40	tipping paper

Claims

1. A non-combustion-heating-type stick comprising:

a substrate that includes an aerosol source;
a cooling portion that generates an aerosol by cooling vapor generated as a result of heating the substrate; and
a filter portion disposed in an area through which the aerosol passes, wherein
at least any one of the substrate, the cooling portion, and the filter portion contains a porous adsorbent.

2. The non-combustion-heating-type stick according to claim 1, wherein the porous adsorbent is activated carbon.

3. The non-combustion-heating-type stick according to claim 2, wherein in the activated carbon, a ratio of a pore volume of a pore size greater than or equal to 50 nm and less than or equal to 5000 nm to a total pore volume of a pore size less than or equal to 5000 nm is higher than or equal to 15%.

4. The non-combustion-heating-type stick according to claim 2 or 3, wherein in the activated carbon, a pore volume of a pore size greater than or equal to 50 nm and less than or equal to 5000 nm is greater than or equal to 0.2 cm^3/g and less than or equal to 0.9 cm^3/g.

5. The non-combustion-heating-type stick according to any one of claims 2 to 4, wherein in the activated carbon, a ratio of a pore volume of a pore size less than 2 nm to a total pore volume of a pore size less than or equal to 5000 nm is lower than or equal to 70%.

6. The non-combustion-heating-type stick according to any one of claims 2 to 5, wherein a BET specific surface area of the activated carbon is greater than or equal to 600 m^2/g and less than or equal to 1800m^2/g.

7. The non-combustion-heating-type stick according to any one of claims 1 to 6, wherein the porous adsorbent is disposed in a place where the porous adsorbent contacts with the aerosol in the stick.

8. The non-combustion-heating-type stick according to claim 7, wherein the porous adsorbent is present at any one or more of the following locations 1) to 5),

1) in a filter of the filter portion,
2) in a paper layer of a wrapping paper wrapping the filter or a surface opposed to the filter,
3) in a hollow part of the filter portion,
4) a surface facing the hollow part, and
5) in a cavity formed between adjacent segments of a plurality of segments of the filter.

9. A non-combustion-heating-type stick comprising:

a substrate that includes an aerosol source; and
a filter portion disposed in an area through which an aerosol generated as a result of heating the substrate passes, wherein
at least any one of the substrate and the filter portion contains activated carbon in which a ratio of a pore volume of a pore size greater than or equal to 50 nm and less than or equal to 5000 nm to a total pore volume of a pore size less than or equal to 5000 nm is higher than or equal to 15%.

FIG. 1

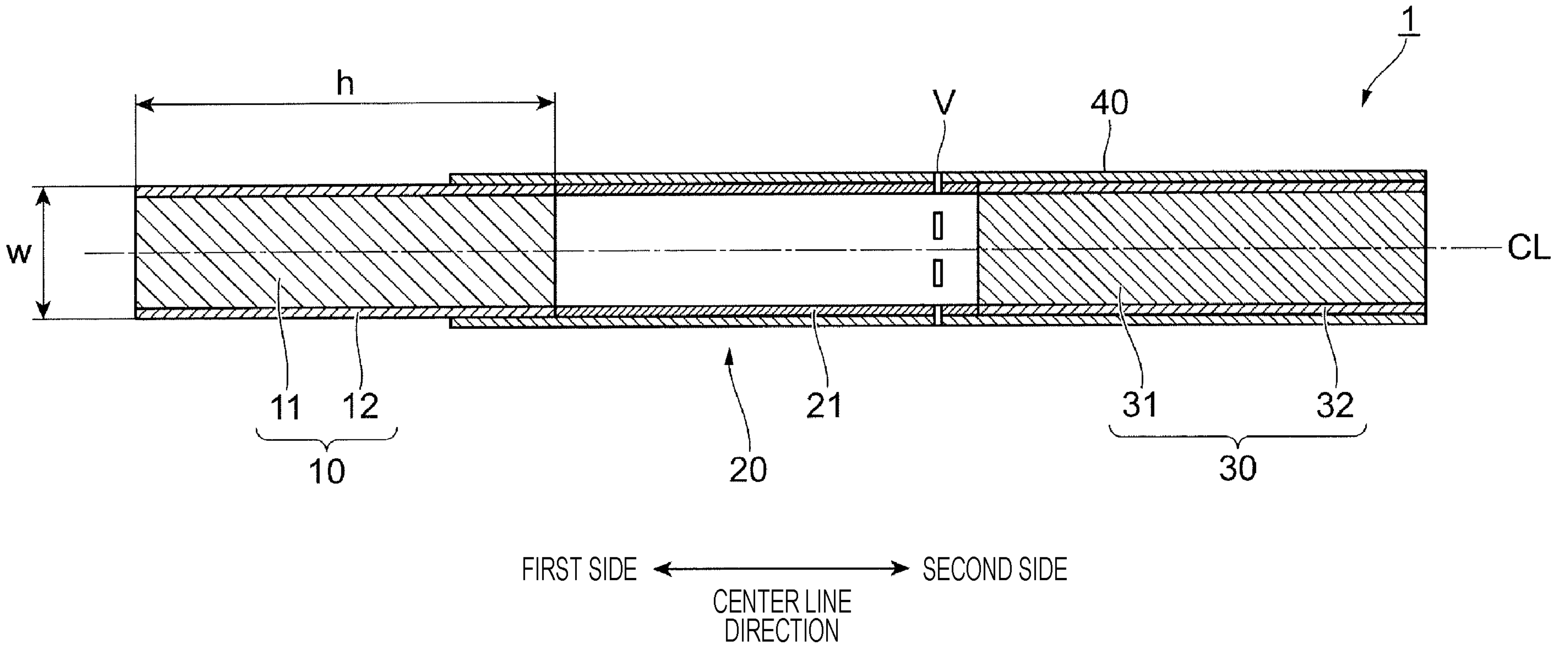
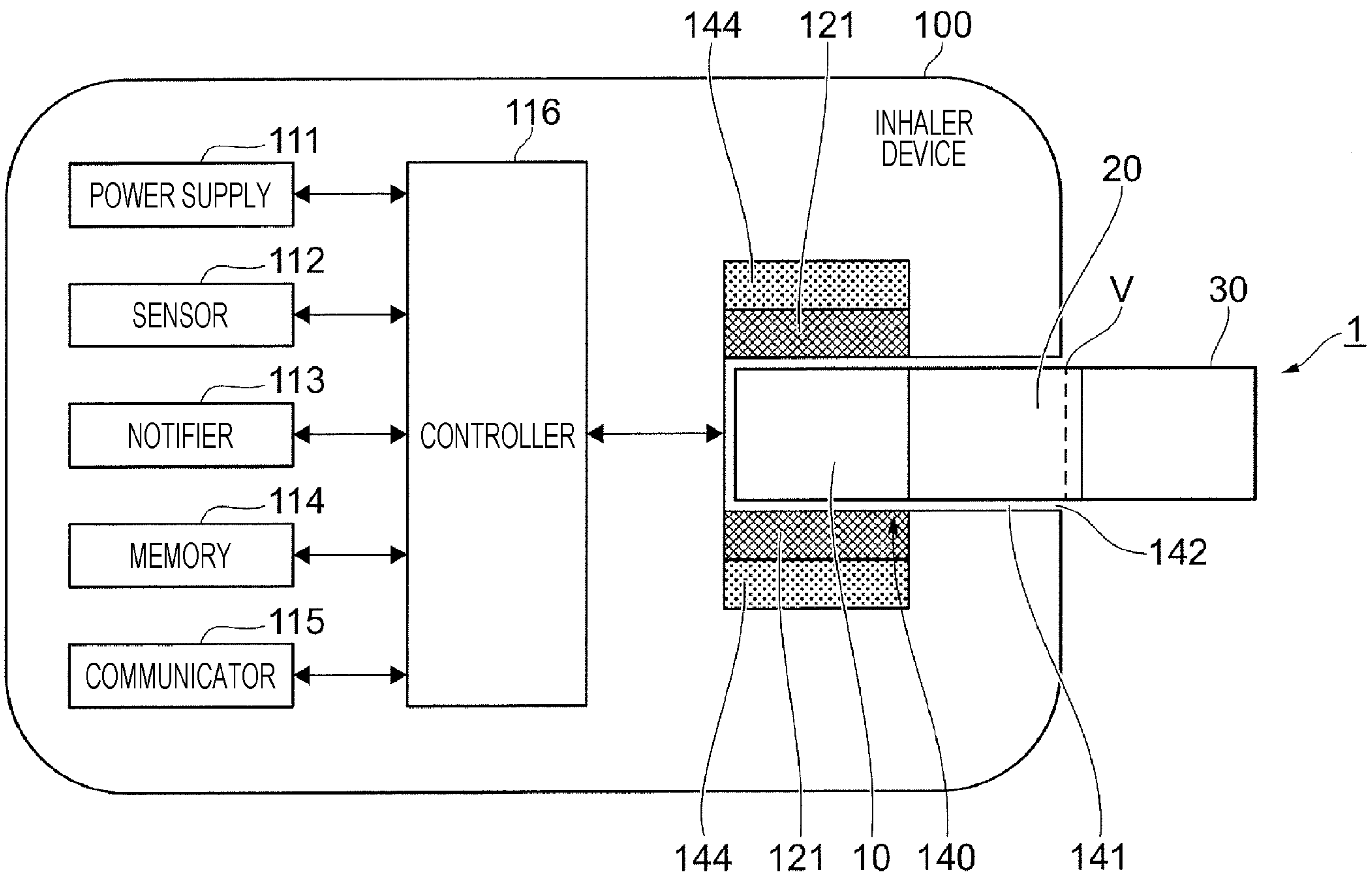

h
V
40
1
w
CL
11
12
10
20
21
31
32
30
FIRST SIDE
SECOND SIDE
CENTER LINE
DIRECTION

FIG. 2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100
INHALER DEVICE
111
POWER SUPPLY
112
SENSOR
113
NOTIFIER
114
MEMORY
115
COMMUNICATOR
116
CONTROLLER
144
121
20
V
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142
144
121
10
140
141

FIG.3A

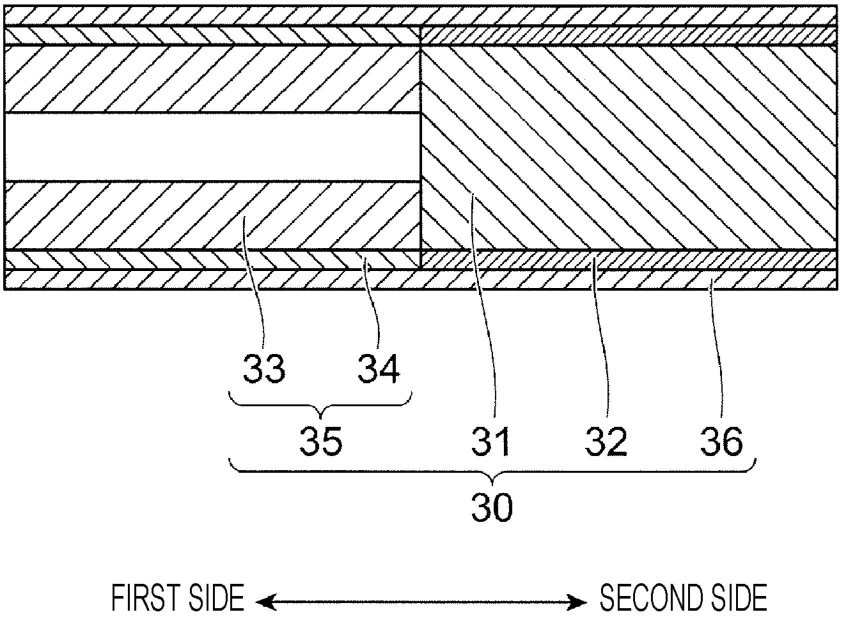
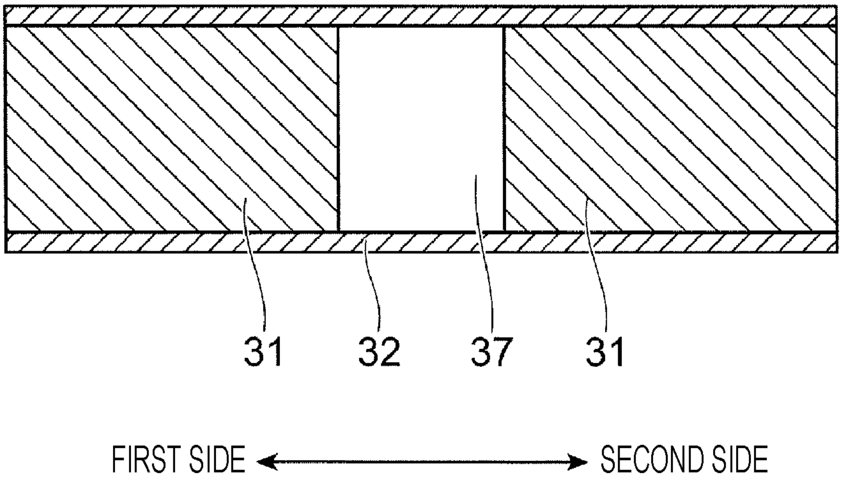

33
34
35
31
32
36
30
FIRST SIDE
SECOND SIDE

FIG.3B


31
32
37
31
FIRST SIDE
SECOND SIDE

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2021/046070

A. CLASSIFICATION OF SUBJECT MATTER

A24D 3/17(2020.01)i; ***A24D 1/20***(2020.01)i
FI: A24D3/17; A24D1/20

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)

A24D3/17; A24D1/20

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 1971-2022
Registered utility model specifications of Japan 1996-2022
Published registered utility model applications of Japan 1994-2022

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	JP 2006-504431 A (PHILIP MORRIS PRODUCTS SOCIETE ANONYME) 09 February 2006 (2006-02-09) paragraphs [0025]-[0049], fig. 1-3	1-2, 7-8
Y		3-6, 9
Y	WO 2013/001288 A1 (BRITISH AMERICAN TOBACCO (INVESTMENTS) LIMITED) 03 January 2013 (2013-01-03) page 5, line 22 to page 6, line 24, page 15, line 8 to page 20, line 16, fig. 1-2	3-6, 9
A	JP 2014-515937 A (BRITISH AMERICAN TOBACCO (INVESTMENTS) LIMITED) 07 July 2014 (2014-07-07) entire text, all drawings	1-9
A	JP 2018-530318 A (PHILIP MORRIS PRODUCTS SOCIETE ANONYME) 18 October 2018 (2018-10-18) entire text, all drawings	1-9

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

* Special categories of cited documents:
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"&" document member of the same patent family

Date of the actual completion of the international search **03 February 2022**	Date of mailing of the international search report **15 February 2022**
Name and mailing address of the ISA/JP **Japan Patent Office (ISA/JP)** **3-4-3 Kasumigaseki, Chiyoda-ku, Tokyo 100-8915** **Japan**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2021/046070

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- JP 2004510422 W **[0059]**
- WO 2014104078 A **[0061]**
- JP 2017218699 A **[0076]**

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