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(54) **FLAVOR INHALER AND FLAVOR INHALATION SYSTEM**

(57) Provided is a flavor inhaler in which the adsorption of the flavor components or volatile fragrance components during storage is reduced. The flavor inhaler including a flavor-generating segment including a tubular first wrapper and a filling containing tobacco filled inside

the first wrapper, and a filter segment including a tubular second wrapper and a nonwoven fabric filled inside the second wrapper, wherein the nonwoven fabric is formed of fibers containing plant pulp bound together with a water-soluble binder.

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Description

TECHNICAL FIELD

5 **[0001]** The present invention relates to a flavor inhaler and a flavor inhalation system.

BACKGROUND ART

10 **[0002]** As filters for flavor inhalers provided with tobacco or the like containing flavor components, acetate filters are usually used, in which cellulose acetate fibers as a filtering material are bound with plasticizers such as triacetin and filled inside a tubular wrapper. On the other hand, filters using natural fibers instead of synthetic fibers such as cellulose acetate fibers include, for example, filters containing paper made of plant pulp as a filtering material, filters containing nonwoven fabric made of plant pulp as a filtering material (for example, Patent Literatures 1 to 3), and the like.

15 **[0003]** Various flavor components are contained within tobacco, and when tobacco is heated upon use, flavor components volatilize or pyrolyzed components of the flavor components volatilize, and they are supplied to the user. In addition, from the viewpoint of imparting favorable flavor, a flavor inhaler to which volatile fragrance components such as menthol are separately added has been known (for example, Patent Literatures 4 and 5). In the flavor inhaler, volatile fragrance components volatilize upon use and are supplied to the user together with volatilized flavor components such as those derived from tobacco.

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CITATION LIST

PATENT LITERATURE

25 **[0004]**

PTL 1: Japanese Patent Publication No. 45-10599

PTL 2: Japanese Patent Laid-Open No. 48-85874

PTL 3: Japanese Patent No. 3260059

30 PTL 4: Japanese Patent Laid-Open No. 2011-250715

PTL 5: Japanese Patent No. 6588007

SUMMARY OF INVENTION

35 TECHNICAL PROBLEM

[0005] However, in a flavor inhaler containing the flavor components contained in the tobacco or the volatile fragrance components added separately, the flavor components or volatile fragrance components volatilize in a pack housing the flavor inhaler during storage thereof, which may be adsorbed inside a material that has a high affinity to the flavor components or volatile fragrance components. The flavor components or volatile fragrance components are often li-

40 pophilic, and therefore, the flavor inhaler equipped with an acetate filter may adsorb them inside cellulose acetate fibers or plasticizers such as triacetin, which are lipophilic, during storage. Once adsorbed inside the fibers or plasticizer, the flavor components or volatile fragrance components are not supplied into a main smoke stream upon use and remain adsorbed, resulting in a decrease in the supply efficiency of the flavor components or volatile fragrance components.

45 **[0006]** An object of the present invention is to provide a flavor inhaler in which the adsorption of the flavor components or volatile fragrance components during storage is reduced and a flavor inhalation system provided with the flavor inhaler.

SOLUTION TO PROBLEM

50 **[0007]** The present invention includes the following embodiments.

[0008] The flavor inhaler according to the present embodiment includes

a flavor-generating segment including a tubular first wrapper and a filling containing tobacco filled inside the first wrapper, and

55 a filter segment including a tubular second wrapper and a nonwoven fabric filled inside the second wrapper, wherein the nonwoven fabric is formed of fibers containing plant pulp bound together with a water-soluble binder.

[0009] The flavor inhalation system according to the present embodiment is provided with the flavor inhaler according

to the present embodiment and a heater that heats the flavor inhaler.

ADVANTAGEOUS EFFECTS OF INVENTION

[0010] According to the present invention, it is possible to provide a flavor inhaler in which the adsorption of the flavor components or volatile fragrance components during storage is reduced and a flavor inhalation system provided with the flavor inhaler.

BRIEF DESCRIPTION OF DRAWINGS

[0011]

[Fig. 1] Fig. 1 is a cross-sectional view of one example of the combustion-type flavor inhaler according to the present embodiment.

[Fig. 2] Fig. 2 is a cross-sectional view of another example of the combustion-type flavor inhaler according to the present embodiment.

[Fig. 3] Fig. 3 is a cross-sectional view of an example of the non-combustion-heating-type flavor inhaler according to the present embodiment.

[Fig. 4] Fig. 4 is a cross-sectional view of another example of the non-combustion-heating-type flavor inhaler according to the present embodiment.

[Fig. 5] Fig. 5 is an example of the flavor inhalation system according to the present embodiment, illustrating (a) a state before inserting the non-combustion-heating-type flavor inhaler into the heater, and (b) a state of inserting the non-combustion-heating-type flavor inhaler into the heater and heating it.

DESCRIPTION OF EMBODIMENTS

[Flavor inhaler]

[0012] The flavor inhaler according to the present embodiment includes a flavor-generating segment including a tubular first wrapper and a filling containing tobacco filled inside the first wrapper, and a filter segment including a tubular second wrapper and a nonwoven fabric filled inside the second wrapper. Here, the nonwoven fabric is formed by fibers containing plant pulp bound together with a water-soluble binder. Preferably the filling further contains a volatile fragrance component in addition to the tobacco.

[0013] The flavor inhaler according to the present embodiment is provided with a filter segment in which the nonwoven fabric formed of fibers containing plant pulp instead of an acetate filter, bound together with a water-soluble binder, is filled inside a second wrapper. The cellulose and water-soluble binder, which are the main components of the plant pulp, are hydrophilic and thereby difficult to adsorb lipophilic flavor components and volatile fragrance components. Therefore, the flavor inhaler of the present embodiment can reduce adsorption of flavor components or volatile fragrance components during storage and can improve the supply efficiency of the flavor components or volatile fragrance components upon use. Moreover, the plant pulp that is natural fiber is dispersible and degradable in the natural environment, enabling load reduction on the natural environment of the flavor inhaler of the present embodiment. Incidentally, the "flavor component" used herein is a component contained in tobacco, which can impart a flavor to the user by being volatilized upon heating and supplied to the user. On the other hand, the "volatile fragrance component" is a fragrance component that is separately added other than tobacco, which can further impart a flavor to the user by being volatilized upon heating and supplied to the user, as is the case with the "flavor component."

[0014] Examples of the flavor inhaler of the present embodiment include a combustion-type flavor inhaler (cigarettes, cigarillos, and the like) and non-combustion-heating-type flavor inhaler. The flavor inhaler according to the present embodiment may include other segments in addition to the flavor-generating segment and the filter segment. The present embodiments will be described in detail below, however, the present embodiments are not limited thereto.

(Filter Segment)

[0015] The filter segment according to the present embodiment includes a tubular second wrapper and a nonwoven fabric filled inside the second wrapper. The nonwoven fabric is formed of fibers containing plant pulp bound together with a water-soluble binder. The filter segment is arranged downstream of the flavor-generating segment (at the inlet end) and can be arranged at the most inlet end.

[0016] Materials for the second wrapper include paper, a polymer film (cellophane film, polyolefin film, polyester film, and the like), and the like. The second wrapper is preferably tubular, with one end of the second wrapper and the other

end of the second wrapper bonded together by a water-soluble glue using a hydrophilic polymer as a substrate. The water-soluble glue as the glue further enables inhibition of the adsorption of the flavor components or volatile fragrance components. As the water-soluble glue, for example, a polyvinyl alcohol, polyvinyl acetate, ethylene vinyl acetate copolymer, starch, and the like are preferred. One type of these water-soluble glues may be used singly, or two or more thereof may be combined for use.

[0017] Further, the second wrapper that is adhered to the nonwoven fabric by a water-soluble glue, the substrate of which is the hydrophilic polymer, can fix the second wrapper and the nonwoven fabric and prevent them from shifting a position, and further inhibit the adsorption of the flavor components or volatile fragrance components, which is preferred. The water-soluble glue that is the same as the aforementioned water-soluble glue, can be used. One type of these water-soluble glues may be used singly, or two or more thereof may be used in combination.

[0018] The nonwoven fabric is preferably composed of fibers containing plant pulp and is preferably composed of fibers consisting of plant pulp. The basis weight of the nonwoven fabric is preferably 25 to 70 g/m², more preferably 30 to 60 g/m², and still more preferably 40 to 55 g/m², from the viewpoint of filter hardness and filter productivity. The fibers are bonded with a water-soluble binder. In the present embodiment, "water-soluble binder" refers to a water-volatile binder. The water-volatile binder is solidified by volatilization of water as a solvent, thereby exhibiting adhesive strength. The water-volatile binder can be classified into a water solution binder and a water dispersion binder. Compared to an organic solvent-volatile binder, the water-volatile binder needs to be dissolved in water or emulsion-dispersed in water, and thereby a binder with high affinity to water is used. As the water solution binder, a polyvinyl alcohol (PVA), glue, starch, modified starch, modified cellulose such as carboxymethyl cellulose (CMC), and the like can be exemplified. As the water dispersion binder, a polyvinyl acetate (PVAc), vinyl acetate acrylic copolymer, ethylene vinyl acetate copolymer, polysaccharide thickener, gums, acrylic resin, and the like can be exemplified. The definition of water-volatile binder can be referred to "Encyclopedia of Adhesion, supervised by Shozaburo Yamaguchi, and published by Asakura Publishing Co., Ltd." The Hansen solubility parameters (HSP) of the water-soluble binder can be denoted by $\sigma_D = 17.59$ to 19.30, $\sigma_P = 4.91$ to 10.40, $\sigma_H = 8.50$ to 26.50.

[0019] From the viewpoint that the aforementioned water-soluble binder can further inhibit the adsorption of the flavor components or volatile fragrance components, the water-soluble binder is preferably at least one type of binder selected from the group consisting of starch, modified starch, modified cellulose, a polyvinyl alcohol (PVA), polyvinyl acetate (PVAc), vinyl acetate acrylic copolymer, ethylene vinyl acetate copolymer, polysaccharide thickener, and gums with a mixture of a polyvinyl alcohol and a vinyl acetate acrylic copolymer being more preferred. The nonwoven fabric is transported at high speed on a surface of a manufacturing apparatus when wound into a cylindrical shape by a second wrapper as a filter for flavor inhaler. Selection of the vinyl acetate acrylic copolymer as one of the water-soluble binders, can prevent deterioration of the nonwoven fabric due to heat generated by friction with the apparatus surface upon high-speed transportation. Where the water-soluble binder is a mixture of the polyvinyl alcohol and the vinyl acetate acrylic copolymer, the ratio of the polyvinyl alcohol relative to 100% by mass of the total of the polyvinyl alcohol and the vinyl acetate acrylic copolymer is preferably 17% by mass or more and less than 100% by mass, more preferably 17% by mass or more and 70% by mass or less, still more preferably 17% by mass or more and less than 40% by mass, and particularly preferably 17% by mass or more and 30% by mass or less. Particularly the ratio of 17% by mass or more and less than 40% by mass can prevent the nonwoven fabric from being dissolved due to saliva upon use while sufficiently inhibiting the adsorption of the flavor components or volatile fragrance components.

[0020] The Hansen solubility parameters (HSP) of the aforementioned water-soluble binders are preferably $\sigma_D = 17.59$ to 18.16, $\sigma_P = 4.91$ to 6.74, and $\sigma_H = 8.50$ to 14.5 and more preferably $\sigma_D = 17.69$ to 17.78, $\sigma_P = 5.21$ to 5.52, and $\sigma_H = 9.50$ to 10.50. Moreover, the Hansen solubility parameters (HSP) of the aforementioned water-soluble binders can be $\sigma_D = 17.59$ to 18.92, $\sigma_P = 4.91$ to 9.18, and $\sigma_H = 8.50$ to 22.50. The HSP values within the aforementioned range sufficiently prevents the nonwoven fabric from being dissolved due to saliva upon use while sufficiently inhibiting the adsorption of the flavor components or volatile fragrance components. It is noted that the HSP values for use can be those in the HSPiP database, and HSP values of a mixture of a plural components are denoted according to the volume fraction of each component.

[0021] The content of the water-soluble binder in 100% by mass of the nonwoven fabric is preferably 10 to 25% by mass and more preferably 15 to 20% by mass. The water-soluble binder with the content of 10% by mass or more can sufficiently adhere fibers together. Moreover, the water-soluble binder with the content of 25% by mass or less can increase a fiber content in the nonwoven fabric and sufficiently inhibit the adsorption of the flavor components or volatile fragrance components.

[0022] The method for filling the inside of the second wrapper with the nonwoven fabric is not particularly limited and is preferably a method for stacking a plurality of nonwoven fabric sheets, folding them into an S-shape, and filling the inside of the tubular second wrapper therewith. Such filling of the nonwoven fabrics prevents gaps between the nonwoven fabrics from been recognized on the end faces of the filter segment, resulting in exhibiting a favorable appearance. In addition, moderate airflow resistance is obtained.

(Flavor-generating segment)

[0023] The flavor-generating segment according to the present embodiment includes a tubular first wrapper and a filling containing tobacco filled inside the first wrapper. From the viewpoint of further obtaining the effect of the present invention, preferably the filling further contains volatile fragrance components. Moreover, the flavor-generating segment that is a flavor-generating segment for a non-combustion-heating-type flavor inhaler enables the filling to further include an aerosol-generating substrate. The flavor-generating segment is arranged upstream of the filter segment (opposite the inlet end). The material of the first wrapper can be the same as that of the second wrapper.

[0024] The type of tobacco is not limited, and can be, for example, flue-cured type, burley type, orient type, native type, as well as other *Nicotiana tabacum*-based varieties or *Nicotiana rustica*-based varieties, blended as appropriate to achieve the desired taste. Details on tobacco types are disclosed in, for example, "Encyclopedia of Tobacco, Tobacco Research Center, 2009.3.31." Tobacco contains a variety of flavor components. Among these flavor components in tobacco, there are volatile flavor components. The configuration of the present embodiment inhibits the adsorption of these volatile flavor components inherent in the tobacco onto the filter. Examples of the volatile flavor components inherent in the tobacco include limonene, styrene, isoprene, and the like.

[0025] As the volatile fragrance components, a wide range of volatile fragrance components described in, for example, "Collection of Well-Known and Customary Techniques (fragrances)" (March 14, 2007, published by the Japan Patent Office), "Latest Encyclopedia of Fragrances (popular edition)" (February 25, 2012, edited by Soichi Arai, Akio Kobayashi, Izumi Yajima, and Michiaki Kawasaki, and published by Asakura Publishing Co., Ltd.), and "Tobacco Flavoring for Smoking Products" (June 1972, R. J. REYNOLDS TOBACCO COMPANY), can be used. Such volatile fragrance components include, for example, volatile fragrance components selected from the group consisting of isothiocyanates, indoles and their derivatives, ethers, esters, ketones, fatty acids, aliphatic higher alcohols, aliphatic higher aldehydes, aliphatic higher hydrocarbons, thioethers, thiols, terpene-based hydrocarbons, phenol ethers, phenols, furfural and derivatives thereof, aromatic alcohols, aromatic aldehydes, and lactones, which are used singly or in combination. The volatile fragrance components may be those generating cold/warm stimulus.

[0026] More specific examples of the volatile fragrance components include acetanisole, acetophenone, acetylpyrazine, 2-acetylthiazole, an alfalfa extract, amyl alcohol, amyl butyrate, trans-anethole, star anise oil, apple juice, Peru balsam oil, beeswax absolute, benzaldehyde, benzoin resinoid, benzyl alcohol, benzyl benzoate, benzyl phenylacetate, benzyl propionate, 2,3-butanedione, 2-butanol, butyl butyrate, butyric acid, caramel, cardamom oil, carob absolute, β -carotene, carrot juice, l-carvone, β -caryophyllene, cassia bark oil, Cedarwood oil, Celery seed oil, Chamomile oil, cinnamaldehyde, silicic acid, cinnamyl alcohol, cinnamic acid cinnamyl ester, citronella oil, DL-citronellol, clary sage extract, coffee, cognac oil, coriander oil, cuminaldehyde, davana oil, δ -decalactone, γ -decalactone, decanoic acid, dill herb oil, 3,4-dimethyl-1,2-cyclopentanedione, 4,5-dimethyl-3-hydroxy-2,5-dihydrofuran-2-one, 3,7-dimethyl-6-octenoic acid, 2,3-dimethylpyrazine, 2,5-dimethylpyrazine, 2,6-dimethylpyrazine, ethyl 2-methylbutyrate, ethyl acetate, ethyl butyrate, ethyl hexanoate, ethyl isovaleric acid, ethyl lactate, ethyl laurate, ethyl levulinate, ethyl maltol, ethyl octanoate, ethyl oleate, ethyl palmitate, ethyl phenyl acetate, ethyl propionate, ethyl stearate, ethyl valerate, ethyl vanillin, ethyl vanillin glucoside, 2-ethyl-3, (5 or 6)-dimethylpyrazine, 5-ethyl-3-hydroxy-4-methyl-2(5H)-furanone, 2-ethyl-3-methylpyrazine, eucalyptol, Fenegreek absolute, Genet absolute, Gentian Root infusion, geraniol, geranyl acetate, grape juice, guaiacol, guava extract, γ -heptalactone, γ -hexalactone, hexanoic acid, cis-3-hexen-1-ol, hexyl acetate, hexyl alcohol, hexyl phenyl acetate, honey, 4-hydroxy-3-pentenoic acid lactone, 4-hydroxy-4-(3-hydroxy-1-butenyl)-3,5,5-trimethyl-2-cyclohexen-1-on, 4-(para-hydroxyphenyl)-2-butanone, sodium 4-hydroxyundecanoate, immortelle absolute, β -ionone, isoamyl acetate, isoamyl butyrate, isoamyl phenylacetate, isobutyl acetate, isobutyl phenylacetate, jasmine absolute, Cola Nut Tincture, labdanum oil, lemon oil terpenes, candlenut extract, linalool, linalyl acetate, lovage root oil, maple syrup, menthol, limonene, cis-3-hexanol, menthone, L-menthyl acetate, paramethoxybenzaldehyde, methyl-2-pyrrolyl ketone, methyl anthranilate, methyl phenyl acetate, methyl salicylate, 4'-methylacetophenone, methylcyclopentenolone, 3-methylvaleric acid, mimosa absolute, golden syrup, myristic acid, nerol, nerolidol, γ -nonactone, nutmeg oil, δ -octalactone, octanal, octanoic acid, orange flower oil, orange oil, Orris Root oil, palmitic acid, co-pentadecalactone, peppermint oil, petitgrain paraguay oil, phenethyl alcohol, phenethyl phenyl acetate, phenylacetic acid, piperonal, plum extract, propenylguaetol, propyl acetate, 3-propylidene phthalide, prune juice, pyruvic acid, raisin extract, rose oil, rum, sage oil, sandalwood oil, spearmint oil, styrax absolute, marigold oil, tea distillate, α -terpineol, terpinyl acetate, 5,6,7,8-tetrahydroquinoxaline, 1,5,5,9-tetramethyl-1,3-oxacyclo(8. 3. 0. 0 (4.9))tridecane, 2,3,5,6-tetramethylpyrazine, thyme oil, tomato extract, 2-tridecanone, triethyl citrate, 4-(2,6,6-trimethyl-1-cyclohexenyl)2-buten-4-one, 2,6,6-trimethyl-2-cyclohexen-1,4-dione, 4-(2,6,6-trimethyl-1,3-cyclohexadienyl)2-buten-4-one, 2,3,5-trimethylpyrazine, γ -undecalactone, γ -valerolactone, vanilla extract, vanillin, veratraldehyde, Violet Leaf Absolute, citral, Mandarin oil, 4-(acetoxymethyl)toluene, 2-methyl-1-butanol, ethyl 10-undecenoate, isoamyl hexanoate, 1-phenylethyl acetate, lauric acid, 8-mercaptomenthone, sinensal, hexyl butyrate, plant powders (herb powder, flower powder, spice powder, tea powder; cocoa powder, carob powder, coriander powder, licorice powder, orange peel powder, rose pip powder, chamomile flower powder, lemon verbena powder, peppermint powder, leaf powder, spearmint powder, black tea powder, and the like), camphor, isopulegol, cineole, mint

oil, eucalyptus oil, 2-l-menthoxyethanol (COOLACT® 5), 3-l-mentoxypropane-1,2-diol (COOLACT® 10), l-menthyl-3-hydroxybutyrate (COOLACT® 20), p-menthane-3,8-diol (COOLACT® 38 D), N-(2-hydroxy-2-phenylethyl-2-isopropyl-5,5-dimethylcyclohexane-1-carboxamide (COCOLACT® 370), N-(4-(cyanomethyl)phenyl)-2-isopropyl-5,5-dimethylcyclohexanecarboxamide (COOLACT® 400), N-(3-hydroxy-4-methoxyphenyl)-2-isopropyl-5,5-dimethylcyclohexanecarboxamide, N-ethyl-p-menthane-3-carboxamide (WS-3), ethyl-2-(p-menthane-3-carboxamide)acetate (WS-5), N-(4-methoxyphenyl)-p-menthane carboxamide (WS-12), 2-isopropyl-N,2,3-trimethylbutyramide (WS-23), 3-l-menthoxy-2-methylpropan-1,2-diol, 2-l-menthoxyethan-1-ol, 3-l-menthoxypropan-1-ol, 4-l-menthoxybutan-1-ol, menthyl lactate (FEMA3748), menthone glycerin acetal (Frescolat MGA, FEMA3807, FEMA3808), 2-(2-l-menthyloxyethyl) ethanol, menthyl glyoxylate, menthyl-2-pyrrolidone-5-carboxylate, menthyl succinate (FEMA 3810), N-(2-(pyridin-2-yl)-ethyl)-3-p-menthane carboxamide (FEMA 4549), N-(ethoxycarbonylmethyl)-p-menthane-3-carboxamide, N-(4-cyanomethylphenyl)-p-menthane carboxamide, N-(4-aminocarbonylphenyl)-p-menthane, and the like. Among these, highly lipophilic components are preferred as volatile fragrance components from the viewpoint of facilitating the effects of the present invention to be obtained, and for example, menthol, limonene, cis-3-hexanol, and menthol are preferred. One type of these volatile fragrance components may be used singly, or two or more types thereof may be used in combination.

[0027] In a case in which the filling contains the volatile fragrance components, it is preferably added in an amount of 0.1 to 10% by mass relative to 100% by mass of the filling, more preferably 0.3 to 8% by mass, and still more preferably 0.5 to 5% by mass. The volatile fragrance components added in an amount of 0.1% by mass or more relative to 100% by mass of the filling facilitate the issue of adsorption of volatile fragrance components to occur and facilitate the effect of the present invention to be obtained. Moreover, the volatile fragrance components added in an amount of 10% by mass or less relative to 100% by mass of the filling can increase the content of tobacco in the filling and provide sufficient tobacco flavor upon use.

[0028] The aerosol-generating substrate is a material that can generate an aerosol upon heating and is preferably glycerin or propylene glycol. The glycerin and propylene glycol are humectants and absorb moisture during storage. In a non-combustion-heating-type flavor inhaler, the moisture evaporates to vapor when heated before use, and almost all of the vapor is supplied to the mouth of a user as mainstream smoke in the first puff upon use. Therefore, the smoke may be hot, however, the water vapor can be adsorbed and filtered out because in the present embodiment, the filter segment contains the nonwoven fabric formed of fibers containing plant pulp bound together with the water-soluble binder. This can lower the perceived temperature of the smoke in the first puff. In a case in which the flavor inhaler is a non-combustion-heating-type flavor inhaler, the aerosol-generating substrate can be added in an amount of 5 to 50% by mass relative to 100% by mass of the filling.

(Combustion-type flavor inhaler)

[0029] An example of the combustion-type flavor inhaler according to the present embodiment is shown in Fig. 1. As shown in Fig. 1, a combustion-type flavor inhaler 8 includes a flavor-generating segment 1 and a filter segment 2 arranged adjacent to flavor-generating segment 1. Flavor-generating segment 1 includes a filling 3 containing tobacco and a first wrapper 4 wrapped around filling 3. Filter segment 2 includes a nonwoven fabric 5 and a second wrapper 6 wrapped around nonwoven fabric 5. Flavor-generating segment 1 and filter segment 2 are connected by a chip paper member 7 wrapped around flavor generating segment 1 and filter segment 2. Chip paper member 7 may have a ventilation hole in the outer peripheral portion thereof. The number of ventilation holes may be one or plural, and for example, 10 to 40 holes may be formed. In the case of the number of ventilation holes being plural, the ventilation holes can be arranged annularly, for example, in a row on the outer peripheral portion of chip paper member 7. A plurality of ventilation holes can be arranged substantially constantly in intervals. The ventilation holes arranged allow air to be drawn into filter segment 2 through the ventilation holes upon inhalation. By diluting mainstream smoke with outside air through the ventilation holes, a product design with a desired tar value can be achieved.

[0030] A user can enjoy a flavor of tobacco by igniting the tip of flavor-generating segment 1 and sucking the mouthpiece end of filter segment 2 with a mouth. In combustion-type flavor inhaler 8 according to the present embodiment, the adsorption of the flavor components or volatile fragrance components is reduced during storage, so that a sufficient amount of flavor components or volatile fragrance components are supplied to the user upon use.

[0031] The combustion-type flavor inhaler according to the present embodiment may further have at least one or more other segments in addition to the flavor-generating segment and filter segment according to the present embodiment. The other segments include, for example, a filter segment filled with synthetic fibers such as acetate and polylactic acid, a segment filled with films such as acetate and polylactic acid, a segment with a hollow structure, or the like. The filter segment can also contain adsorbents such as activated carbon, silica gel, or zeolite, and can contain liquid fragrance, solid fragrance, or fragrance supported on a carrier. The filter segment can also contain a fragrance capsule with a core-shell structure, in which liquid fragrance is wrapped in a shell of gelatin, a polysaccharide, or resin. For example, a combustion-type flavor inhaler 11 shown in Fig. 2 has another filter segment 9 between flavor-generating segment 1 and filter segment 2. Filter segment 2 and another filter segment 9 are connected by a filter plug wrapper 10. Another

filter segment 9 can have a different function from that of filter segment 2 according to the present embodiment, thus enabling multiple functions to be imparted to the filter.

(Non-combustion-heating-type flavor inhaler)

[0032] An example of the non-combustion-heating-type flavor inhaler of the present embodiment is shown in Fig. 3. A non-combustion-heating-type flavor inhaler 12 shown in Fig. 3 is provided with flavor-generating segment 1 according to the present embodiment and a mouthpiece segment 13. Mouthpiece segment 13 has a cooling segment 14, a center hole segment 15, and filter segment 2 according to the present embodiment. Upon inhalation, flavor-generating segment 1 is heated, and the flavor components, aerosol-generating substrate and water contained in flavor-generating segment 1 are vaporized, transferred to mouthpiece segment 13 by inhalation, and then underwent inhalation from the end of filter segment 2.

[0033] Cooling segment 14 is configured of a tubular member 16. Tubular member 16 can be, for example, a paper tube made of cardboard processed into a cylindrical shape. Tubular member 16 and a mouthpiece lining paper 21 to be described below have perforations 17 penetrating both. The presence of perforations 17 allows outside air to be introduced into cooling segment 14 upon inhalation. This causes an aerosol vaporization component generated by heating flavor-generating segment 1 to contact the outside air and lower the temperature of the aerosol vaporization component, whereby it is liquified and formed into an aerosol. The diameter (span length) of perforation 17 is not particularly limited, and may be, for example, 0.5 to 1.5 mm. The number of perforations 17 is not particularly limited and can be one, two or more. For example, a plurality of perforations 17 may be arranged on the circumference of cooling segment 14.

[0034] A center hole segment 15 is configured of a filling layer 18 with a hollow portion, an inner plug wrapper 19 covering filling layer 18. Center hole segment 15 functions to increase the strength of mouthpiece segment 13. Filling layer 18 can be a rod with an inner diameter of $\phi 5.0$ to $\phi 1.0$ mm densely filled with, for example, cellulose acetate fibers and cured with a plasticizer containing triacetin added at 6 to 20% by mass relative to the cellulose acetate mass. Filling layer 18 has a high fiber filling density, so that air and aerosol flow only in the hollow section upon inhalation, and very little in filling layer 18. In a case in which it is desirable to lower the reduction of the aerosol components in filter segment 2 by filtration, shortening the length of filter segment 2 and replacing it with center hole segment 15 are effective to increase the delivery amount of aerosol components. Since filling layer 18 inside center hole segment 15 is a fiber-filled layer, it is pleasant to touch it from the outside upon use. As shown in Fig. 4 (a), the center hole segment may not be arranged, and filter segment 2 may be extended instead. Moreover, as shown in Fig. 4 (b), the center hole segment may be omitted and cooling segment 14 may be extended instead.

[0035] Center hole segment 15 is connected to filter segment 2 by an outer plug wrapper 20. Outer plug wrapper 20 can be, for example, cylindrical paper. In addition, flavor-generating segment 1, cooling segment 14, the connected center hole segment 15 and filter segment 2, are connected by a mouthpiece lining paper 21. They can be connected by, for example, coating the inner surface of mouthpiece lining paper 21 with the water-soluble glue as described above in which the hydrophilic polymer is a substrate and then inserting and winding the aforementioned three segments.

[0036] The axial length of the non-combustion-heating-type flavor inhaler according to the present embodiment, i.e., the horizontal length in Fig. 3, is not particularly limited, and is preferably 40 to 90 mm, more preferably 50 to 75 mm, and still more preferably 50 to 60 mm. Moreover, the circumference length of the non-combustion-heating-type flavor inhaler is preferably 16 to 25 mm, more preferably 20 to 24 mm, and still more preferably 21 and 23 mm. For example, an aspect of the length of 20 mm of flavor-generating segment 1, the length of 20 mm of cooling segment 14, the length of 8 mm of center hole segment 15, and the length of 7 mm of filter segment 2, can be included. These individual segment lengths can be appropriately changed according to suitability for manufacturing, quality requirements, and the like. In the non-combustion-heating-type flavor inhaler according to the present embodiment, the adsorption of volatile fragrance components is reduced during storage, so that a sufficient amount of volatile fragrance components is supplied to the user upon use.

[Flavor inhalation system]

[0037] The flavor inhalation system according to the present embodiment preferably has a non-combustion-heating-type flavor inhaler and a heater that heats the non-combustion-heating-type flavor inhaler, according to the present embodiment. The flavor inhalation system according to the present embodiment may have other configurations other than the non-combustion-heating-type flavor inhaler according to the present embodiment and the heater described above.

[0038] An example of the flavor inhalation system according to the present embodiment is shown in Fig. 5. The flavor inhalation system shown in Fig. 5 has a non-combustion-heating-type flavor inhaler 12 according to the present embodiment and a heater 22 that heats the flavor-generating segment of non-combustion-heating-type flavor inhaler 12 from

the outside. Fig. 5 (a) shows the state of non-combustion-heating-type flavor inhaler 12 before inserting it into heater 22, and Fig. 5 (b) shows the state of non-combustion-heating-type flavor inhaler 12 that is inserted into heater 22 and heated. Heater 22 shown in Fig. 5 is configured of a body 23, a heater 24, a metal tube 25, a battery unit 26, and a control unit 27. Body 23 has a cylindrical recessed portion 28, and heater 24 and metal tube 25 are arranged at the position of the inner side of recessed portion 28, corresponding to the flavor-generating segment of non-combustion-heating-type flavor inhaler 12 that is to be inserted into recessed portion 28. Heater 24 can be an electric resistance heater and is heated by electric power supplied from a battery unit 26 under the direction of a control unit 27 that controls temperature. The heat emitted from heater 24 is transferred to the flavor-generating segment of the non-combustion-heating-type flavor inhaler 12 through metal tube 25 with high thermal conductivity.

[0039] Fig. 5(b) is schematically illustrated, however, there is a gap between the outer circumference of non-combustion-heating-type flavor inhaler 12 and the inner circumference of metal tube 25. Actually the gap is desirably not present between the outer circumference of non-combustion-heating-type flavor inhaler 12 and the inner circumference of metal tube 25 for the purpose of transferring efficient heat. Moreover, heater 22 heats the flavor-generating segment of non-combustion-heating-type flavor inhaler 12 from outside, however it may also be a heater heated from inside. In a case in which heater 22 is heated from inside, a rigid platy, bladed, or columnar heater instead of metal tube 25 is preferably used. Heaters related thereto include, for example, a ceramic heater with molybdenum or tungsten on a ceramic substrate. **[0040]** A heating temperature by the heater is preferably 160°C or higher, more preferably 160°C or higher and 400°C or lower, and still more preferably 200°C or higher and 350°C or lower. The temperature of the filter segment may reach 160°C or higher when heating the non-combustion-heating-type flavor inhaler, however, in the present embodiment, the fibers constituting the nonwoven fabric of the filter segment contain plant pulp, thereby enabling to adequately withstand temperatures of 160°C or higher. It is noted that the glass transition temperature of cellulose acetate fiber that constitutes a normal acetate filter, is 160 to 180°C, and therefore, the molecular structure thereof may be disrupted by heating, and the heat resistance thereof is low. The heating temperature indicates the heater temperature of the heater.

EXAMPLES

[0041] The present invention will be described in detail below by way of Examples, however, the invention is not limited thereto.

[Example 1]

(Fabrication of filter segment)

(1) Production of nonwoven fabric

[0042] After wood pulp used as raw material was formed into single fibers by a coarse crusher and a defibrillator, the pulp was dropped from a web-forming apparatus onto an absorbing surface of an open-end wire mesh and transferred while forming a web. This web was sprayed with a water-soluble binder (a mixture of PVA and a vinyl acetate acrylic copolymer at a mass ratio of 17:83) dissolved in water, followed by drying, and then the same binder as described above was sprayed and dried to obtain a nonwoven fabric with a width of 240 cm. The nonwoven fabric obtained was wound up in a winder and formed into a jumbo roll. The nonwoven fabric was unwound from the jumbo roll, slit to a width of 13 cm, and then wound. Wood pulp used as raw material was wood pulp with a roughness of 0.22 mg/m (product name: NB416 manufactured by Weyerhaeuser Company). The basis weight of the nonwoven fabric was 45 g/m² and the thickness was 1.2 mm. The content of the water-soluble binder in 100% by mass of the nonwoven fabric was 18% by mass.

(2) Production of filter segment

[0043] A filter segment was produced by using a filter production apparatus for tobacco. Namely, the nonwoven fabric produced by the method described in (1) was cut into four pieces using a slitter, and the four pieces were stacked, compressed, and formed into a cylindrical shape with an S-shaped cut end. Next, the cylindrical nonwoven fabric was wrapped with a wrapper and the wrapping portion was glued, and then the wrapped nonwoven fabric was cut with a cutter to a specified length to obtain a filter segment. Polyvinyl acetate was used for gluing the wrapper ends together and for gluing the wrapper to the nonwoven fabric. The width of the nonwoven fabric before slitting was 13 cm, which was slitted into four pieces at equal intervals to obtain the width of 32 mm of each piece. A slight loss occurs upon slitting.

(Fabrication of flavor-generating segment and flavor inhaler)

[0044] The combustion-type flavor inhaler shown in Fig. 1 was fabricated by using the aforementioned filter segment.

The tobacco-containing segment for use was 57.0 mm in axial length and 24.5 mm in circumference, with the tobacco content of 675 mg. The filling of the tobacco-containing segment contains 4.6 mg of l-menthol as the volatile fragrance component in addition to tobacco. The content of l-menthol relative to 100% by mass of the filling is 0.68% by mass. The tobacco-containing segment and the filter segment were connected by tip paper member 7 with a length of 32.0 mm to fabricate a flavor inhaler. Ventilation holes for tar adjustment were not arranged at the chip paper member. A polyvinyl acetate emulsion glue was used to adhere chip paper member 7.

(Packaging of small box of flavor inhaler)

[0045] Twenty of the fabricated flavor inhaler were wrapped in aluminum laminated paper that is wrapping paper and placed in a small paper box with a length of 22 mm, a width of 56 mm, and a height of 89 mm. The outside of the small box was then covered with a PP film and sealed.

(Evaluation of flavor transfer to filter segment by storage)

[0046] The small box was stored in the aforementioned form under an environment of 22°C for one month to evaluate the effect of storage. The amount of l-menthol was measured at the start of storage, i.e., when the flavor inhaler was initially fabricated (initial period), and after one month of storage. The amount of l-menthol was measured according to the following procedure.

i) A small box was opened and 20 flavor inhalers were taken out.

ii) The flavor-generating segment and the filter segment were cut with a cutter. The flavor-generating segment and the filter segment were separately placed in a vial containing 10 ml of methanol and shaken for 30 minutes. This operation was conducted for 10 flavor inhalers.

iii) After shaking, the methanol in the vial was measured by gas chromatography (detector: FID, manufactured by Agilent Technologies Inc.). The amount of l-menthol contained in each segment was determined.

iv) The data for 10 flavor-generating segments and 10 filter segments were averaged to determine the amount of l-menthol contained in each segment.

[0047] The results are shown in Table 1.

[Example 2]

[0048] A flavor inhaler was prepared and evaluated in the same manner as in Example 1 except that PVA was used singly instead of using a mixture of PVA and a vinyl acetate acrylic copolymer as a water-soluble binder in the fabrication of the nonwoven fabric for the filter segment. The results are shown in Table 1. It is noted that the HSP values of the aforementioned water-soluble binder were $\sigma_D = 19.30$, $\sigma_P = 10.40$, and $\sigma_H = 26.50$.

[Comparative Example 1]

[0049] A flavor inhaler was prepared and evaluated in the same manner as in Example 1 except that an acetate filter in which cellulose acetate fiber bundles (filament denier: 3.5 g/9000 m, total denier: 35,000 g/9,000 mm, manufactured by Daicel Corporation) were bound by triacetin (6% by mass added relative to the mass of cellulose acetate fiber bundles) was used as a filter segment. The results are shown in Table 1.

[Table 1]

	Filter segment		Menthol content (initial period)		Menthol content (after one month)		Flavor transfer rate (%)
	Fibers	Binder	Flavor-generating segment (mg)	Filter segment (mg)	Flavor-generating segment (mg)	Filter segment (mg)	
Example 1	Plant pulp	PVA, Vinyl acetate acrylic copolymer (PVA: Vinyl acetate acrylic copolymer = 17:83)	4.55	0.00	4.10	0.45	9.8
Example 2	Plant pulp	PVA	4.57	0.00	4.55	0.02	0.4
Comparative Example 1	Cellulose acetate fibers	Triacetin	4.52	0.00	3.66	0.86	19.0

[0050] As shown in Table 1, each of Examples 1 and 2 in which the filter segment has the nonwoven fabric formed of fibers containing plant pulp bound together with the water-soluble binder, inhibited the temporal flavor transfer of menthol contained in the flavor-generating segment to the filter segment. Therefore, the adsorption of the volatile fragrance component during storage was confirmed to be reduced in Examples 1 and 2. On the other hand, Comparative Example 1 in which the acetate filter was used as the filter segment, was confirmed to exhibit the high flavor transfer rate of menthol to the acetate filter during storage and the adsorption of the volatile fragrance component during storage. Moreover, in actual use, the flavor inhaler of Example 1 was confirmed to enable more suitable use than the flavor inhaler of Example 2 because the dissolution of the filter by saliva was sufficiently inhibited.

REFERENCE SIGNS LIST

[0051]

- 1 flavor-generating segment
- 2 filter segment
- 3 filling
- 4 first wrapper
- 5 nonwoven fabric
- 6 second wrapper

Claims

1. A flavor inhaler comprising

a flavor-generating segment comprising a tubular first wrapper and a filling comprising tobacco filled inside the first wrapper, and
a filter segment comprising a tubular second wrapper and a nonwoven fabric filled inside the second wrapper, wherein
the nonwoven fabric is formed of fibers comprising plant pulp bound together with a water-soluble binder.

2. The flavor inhaler according to claim 1, wherein the filling further comprises a volatile fragrance component.

3. The flavor inhaler according to claim 1 or 2, wherein the water-soluble binder is at least one type of binder selected from the group consisting of starch, modified starch, a modified cellulose, a polyvinyl alcohol, a polyvinyl acetate, a vinyl acetate acrylic copolymer, an ethylene vinyl acetate copolymer, a polysaccharide thickener, and gum.

4. The flavor inhaler according to claim 3, wherein the water-soluble binder is a mixture of a polyvinyl alcohol and a

vinyl acetate acrylic copolymer.

5. The flavor inhaler according to claim 4, wherein the ratio of the polyvinyl alcohol to 100% by mass of a total of the polyvinyl alcohol and the vinyl acetate acrylic copolymer is 17% by mass or more and less than 100% by mass.
6. The flavor inhaler according to claim 5, wherein the ratio of the polyvinyl alcohol to 100% by mass of a total of the polyvinyl alcohol and the vinyl acetate acrylic copolymer is 17% by mass or more and less than 40% by mass.
7. The flavor inhaler according to any one of claims 1 to 6, wherein Hansen solubility parameters (HSP) of the water-soluble binder are $\sigma_D = 17.59$ to 18.92 , $\sigma_P = 4.91$ to 9.18 , and $\sigma_H = 8.50$ to 22.50 .
8. The flavor inhaler according to any one of claims 1 to 7, wherein the content of the water-soluble binder in 100% by mass of the nonwoven fabric is 10 to 25% by mass.
9. The flavor inhaler according to any of claims 1 to 8, wherein the basis weight of the nonwoven fabric is 25 to 70 g/m^2 .
10. The flavor inhaler according to any one of claims 1 to 9, wherein a plurality of the nonwoven fabrics in sheet form are stacked and folded into an S-shape and filled inside the second wrapper.
11. The flavor inhaler according to any one of claims 1 to 10, wherein the second wrapper is bonded to the nonwoven fabric by at least one type of glue selected from the group consisting of a polyvinyl alcohol, a polyvinyl acetate, an ethylene vinyl acetate copolymer, and starch.
12. The flavor inhaler according to any one of claims 1 to 11, wherein one end of the second wrapper is bonded to the other end of the second wrapper by at least one type of glue selected from the group consisting of a polyvinyl alcohol, a polyvinyl acetate, an ethylene vinyl acetate copolymer, and starch, and the second wrapper is tubular in shape.
13. The flavor inhaler according to claim 2, wherein the volatile fragrance component is at least one component selected from the group consisting of menthol, limonene, cis-3-hexanol, and menthone.
14. The flavor inhaler according to claim 2 or 13, wherein the volatile fragrance component is added in an amount of 0.1 to 10% by mass relative to 100% by mass of the filling.
15. The flavor inhaler according to any one of claims 1 to 14, being a combustion type flavor inhaler.
16. The flavor inhaler according to any one of claims 1 to 14, being a non-combustion-heating-type flavor inhaler.
17. The flavor inhaler according to claim 16, wherein the flavor-generating segment further comprises an aerosol-generating substrate.
18. The flavor inhaler according to claim 17, wherein the aerosol-generating substrate is glycerin or propylene glycol.
19. A flavor inhalation system comprising:
 - the flavor inhaler according to any one of claims 16 to 18, and
 - a heater for heating the flavor inhaler.
20. The flavor inhalation system according to claim 19, wherein a heating temperature by the heater is 160°C or higher.

Fig. 1

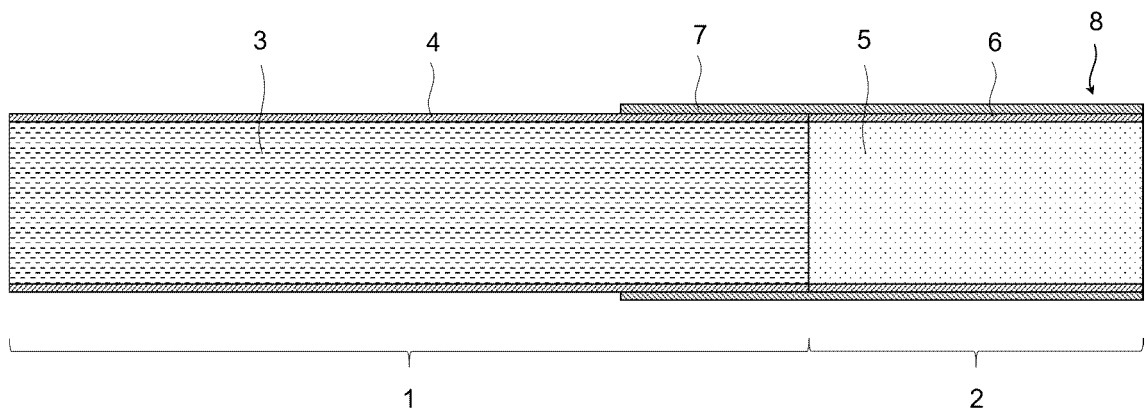


Fig. 2

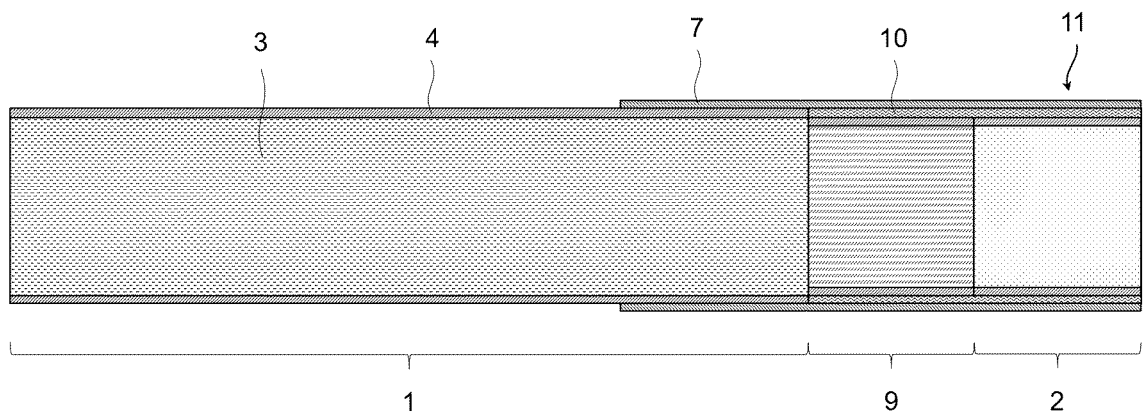


Fig. 3

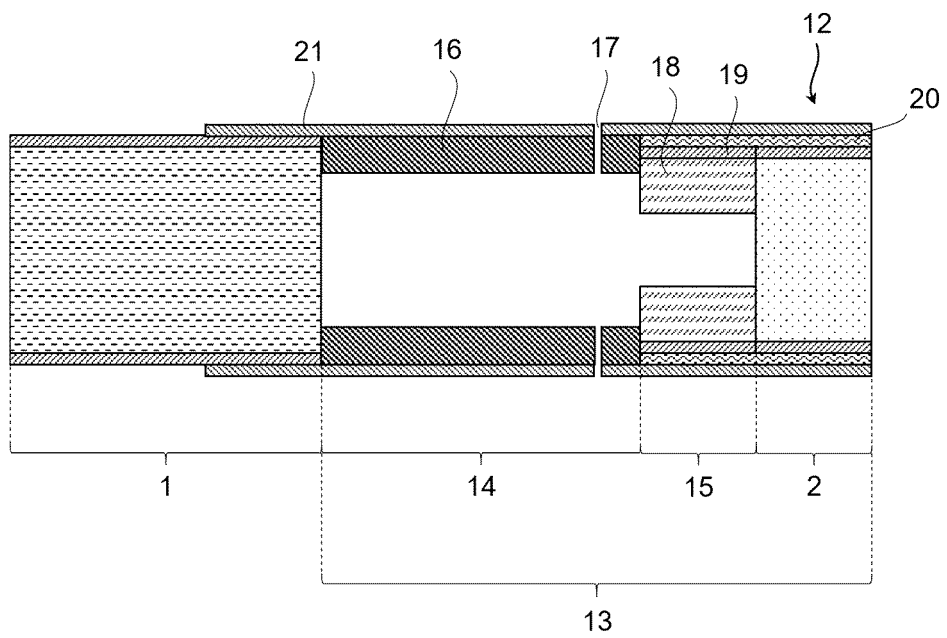


Fig. 4

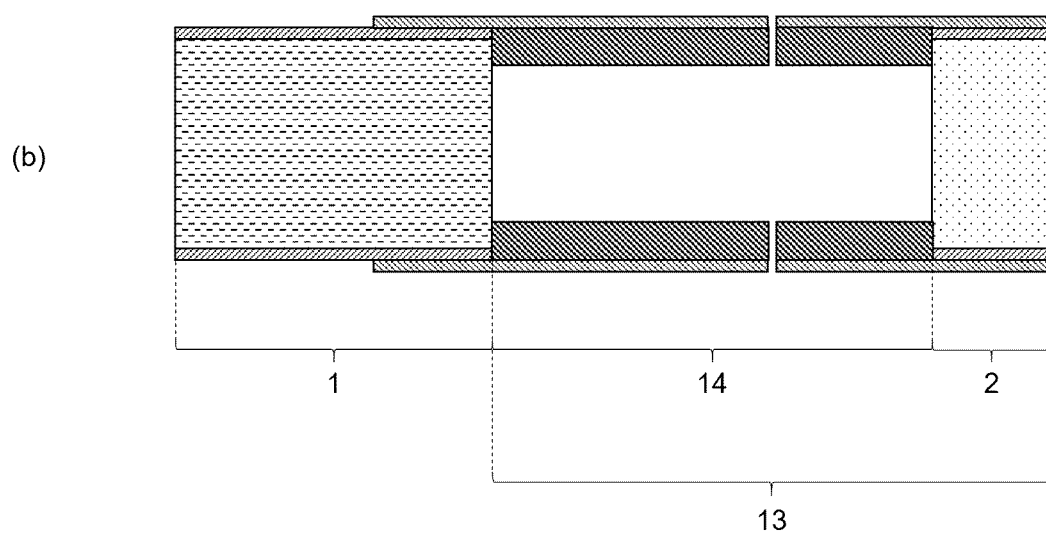
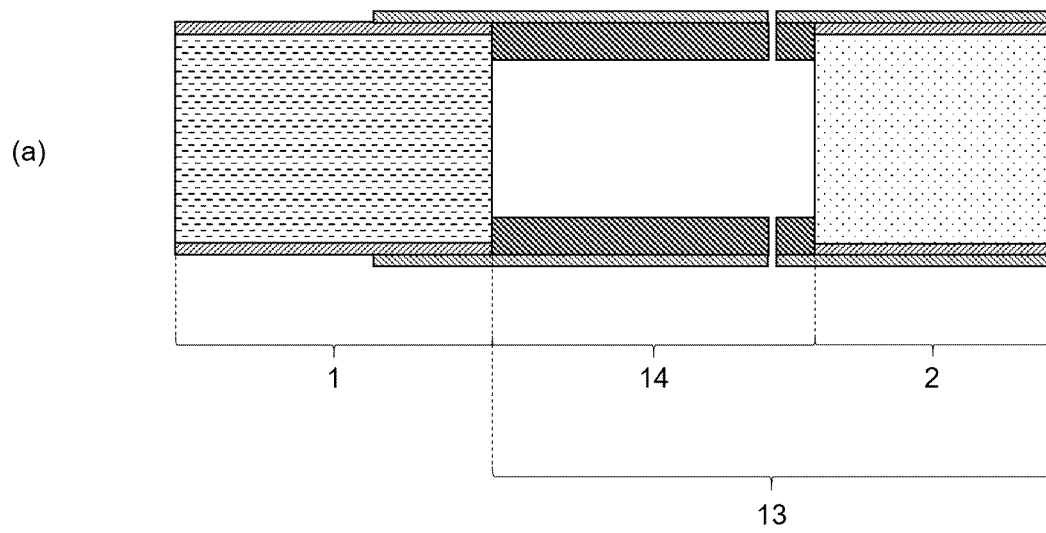
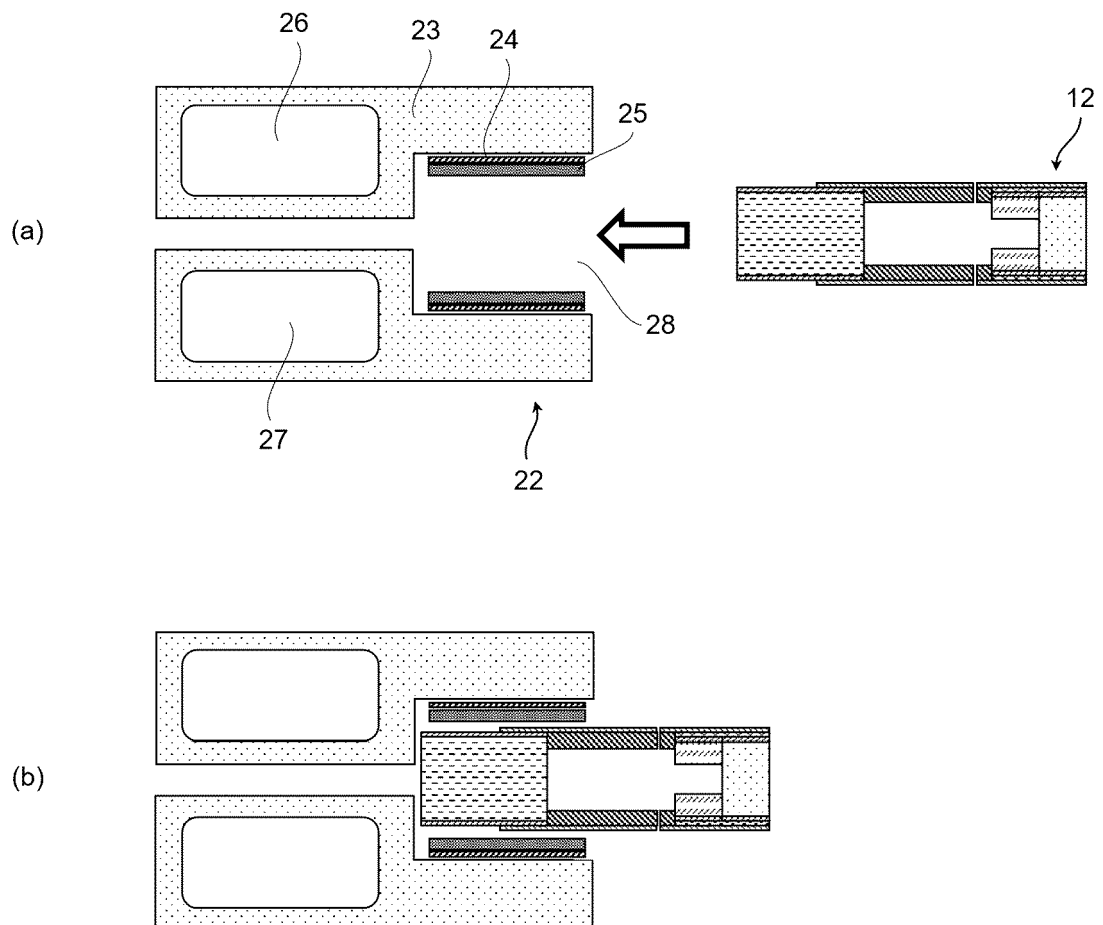


Fig. 5



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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2020/039394

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. A24D3/02 (2006.01) i, A24D3/17 (2020.01) i, A24F40/20 (2020.01) i
 FI: A24D3/02, A24D3/17, A24F40/20

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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. A24D3/02, A24D3/17, A24F40/20

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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 1971-2020

Registered utility model specifications of Japan 1996-2020

Published registered utility model applications of Japan 1994-2020

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 03-175968 A (R. J. REYNOLDS TOBACCO CO.) 31 July 1991 (1991-07-31), p. 4, lower right column, line 7 to p. 5, upper right column, line 7, p. 5, lower right column, line 7 to p. 6, upper right column, line 6, p. 6, lower left column, line 16 to p. 7, upper left column, line 1, p. 8, upper left column, line 9 to upper right column, line 6, fig. 2	1-4, 7-20 5-6
Y A	JP 2015-507937 A (ESSENTIA FILTER PRODUCTS DEVELOPMENT CO. PTE. LTD.) 16 March 2015 (2015-03- 16), paragraphs [0007], [0008], [0019]-[0023], [0027], [0033]	1-4, 7-20 5-6

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

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Date of the actual completion of the international search
26.11.2020Date of mailing of the international search report
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Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No. PCT/JP2020/039394
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	US 5345950 A (LORILLARD TOBACCO COMPANY) 13 September 1994 (1994-09-13), column 3, lines 39-48	11-12, 15-20
Y	JP 2015-508676 A (PHILIP MORRIS PRODUCTS S.A.) 23 March 2015 (2015-03-23), paragraphs [0042]-[0046], [0060]-[0062], [0073], [0074], fig. 1	16-20

Form PCT/ISA/210 (continuation of second sheet) (January 2015)

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2020/039394

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