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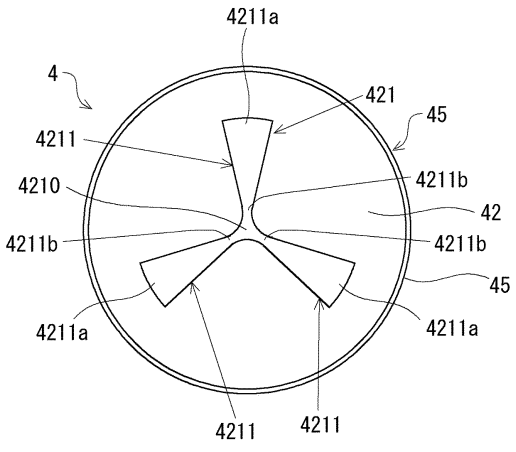
# (54) TOBACCO PRODUCT, AND FILTER FOR TOBACCO PRODUCT

(57) This filter for a tobacco product has: a fine-powder-containing article in which there is clumped a raw powder including a taste component and/or an aroma component, the fine-powder-containing article being formed into a powder by the application of force; a cavity in which the fine-powder-containing article is disposed; and a suction port filter part installed downstream of the cavity, the suction port filter part enabling communication between the cavity and an end of a suction port and having formed along the axial direction thereof a fine powder supply path for supplying fine powder from the cavity to the end of the suction port. The fine powder supply path includes a central connection part positioned at the center of a transverse cross-section of the suction port filter part, and a plurality of hole parts extending in mutually different directions from the central connection part toward the outer periphery of the transverse cross-section.

FIG. 3

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## Description

[Technical Field]

**[0001]** The present invention relates to a smoking article and a filter for a smoking article.

[Background Art]

**[0002]** There is known a cigarette that allows powder in a filter to be inhaled to enjoy a taste, a scent, or both. For example, Patent document 1 discloses a smoking article with a filter including: a powder content that is a lump of base powder containing at least either one of a taste component or a flavoring component, the powder content being turned into powder by applying an external force thereto; a cavity where the powder content is accommodated; and a flow path through which the cavity is in communication with a mouthpiece end, the flow path letting the powder through.

[Citation List]

[Patent document]

**[0003]** [Patent document 1] International Publication No. WO 2016/181843

[Summary of Invention]

[Technical Problem]

**[0004]** Regarding the filter described in Patent document 1, an inner diameter of the flow path for the powder is reduced to be smaller than an outer diameter of the lump of powder content, thereby making it possible to reduce powder spillage, that is, spilling of the powder at an unintended timing such as during production or transportation.

**[0005]** Here, an increase in a cross-sectional area of the flow path for the powder in the filter is more favorable in terms of an increase in a delivery amount (supply amount) of the powder. Accordingly, Patent document 1 discloses an embodiment where a plurality of flow paths penetrate through a mouthpiece-side filter in the axial direction. It is true that the plurality of flow paths provided in the filter increase a total cross-sectional area of the flow path for the powder, making it easy to ensure the delivery amount of the powder. However, to independently arrange the plurality of flow paths in a cross section of the filter, it is necessary to produce the filter using a plurality of mandrels. Since it is difficult to evenly fill spaces between the mandrels with a filter fiber, a production quality of the filter is likely to be unstable.

**[0006]** It should be noted that the above problems are not limited to a cigarette but may apply to any types of smoking articles including a cigar, a cigarillo, a smoking tool using electronic device heating, carbon heat source, or the like, and a non-heated smoking tool for tobacco.

**[0007]** In view of the above problems, an object of the present invention, which relates to a filter for a smoking article that allows powder containing at least either one of a test component or a flavoring component to be inhaled, is to provide a technology that enables ensuring a delivery amount of the powder during inhale while reducing powder spillage not during inhale, and stabilizing a production quality of the filter.

[Solution to Problem]

**[0008]** To solve the above problems, according to the present invention, base powder containing at least either one of a taste component or a flavoring component is formed in a lump of powder content that is turned into powder by application of an external force, and a powder supply path provided in a mouthpiece filter unit has a central connection portion located at a central side of a cross section of the mouthpiece filter unit and a plurality of holes that extend in mutually different directions from the central connection portion toward an outer peripheral side of the cross section.

**[0009]** More specifically, a smoking article according to the present invention includes: a tobacco rod including tobacco shreds; and a filter coupled to an end portion of the tobacco rod via a tipping paper, in which the filter includes: a powder content that includes a lump of base powder containing at least either one of a taste component or a flavoring component and is turned into powder by application of an external force; a cavity where the powder content is accommodated; and a mouthpiece filter unit that is located continuously at a downstream side of the cavity, and is provided with a powder supply path formed along an axial direction for allowing a mouthpiece end to communicate with the cavity and supplying the powder from the cavity to the mouthpiece end, and in a cross section of the mouthpiece filter unit, the powder supply path has a central connection portion located at a central side of the cross section of the mouthpiece filter unit and a plurality of holes that extend in mutually different directions from the central connection portion toward an outer peripheral side of the cross section.

**[0010]** Examples of the smoking article include a cigarette, a cigar, a cigarillo, a smoking tool that allows for inhaling a smoke flavor, an aroma, or both of tobacco using electronic device heating, carbon heat source, or the like, and a non-heated smoking tool that allows for inhaling a smoke flavor, an aroma, or both of tobacco.

**[0011]** Further, each of the holes of the powder supply path may have a relatively large opening width at an outer peripheral region located at the outer peripheral side of the cross section of the mouthpiece filter unit as compared with at a central region located at the central side of the cross section.

**[0012]** Further, the powder supply path may have the holes that are at least three and not more than five in number.

**[0013]** Further, the plurality of holes of the powder supply path may radially extend from the central connection portion.

**[0014]** Further, in the cross section of the mouthpiece filter unit, a filter fiber that provides the mouthpiece filter unit may be interposed between a distal end of each of the holes of the powder supply path and a wrapping paper of the mouthpiece filter unit.

**[0015]** Here, the present invention may be identified as a filter for the above smoking article. Specifically, a filter for a smoking article according to the present invention includes: a powder content that includes a lump of base powder including at least either one of a taste component or a flavoring component and is turned into powder by application of an external force; a cavity where the powder content is accommodated; and a mouthpiece filter unit that is located continuously at a downstream side of the cavity, and is provided with a powder supply path formed along an axial direction for allowing a mouthpiece end to communicate with the cavity and supplying the powder from the cavity to the mouthpiece end, and in a cross section of the mouthpiece filter unit, the powder supply path has a central connection portion located at a central side of the cross section of the mouthpiece filter unit and a plurality of holes that extend in mutually different directions from the central connection portion toward an outer peripheral side of the cross section.

**[0016]** It should be noted that the means for solving the problems according to the present invention may be employed in combination as much as possible.

[Advantageous Effects of Invention]

**[0017]** According to the present invention, regarding a filter for a smoking article that allows a smoker to inhale powder containing at least either one of a taste component or a flavoring component at a desired timing, it is possible to ensure a delivery amount of the powder during inhale while reducing powder spillage not during inhale and to stabilize a production quality of the filter.

[Brief Description of Drawings]

**[0018]**

[FIG.1] Fig. 1 illustrates an exterior perspective view of a cigarette according to Embodiment 1.

[FIG.2] Fig. 2 illustrates a longitudinal sectional view of a relevant portion of the cigarette according to Embodiment 1.

[FIG.3] Fig. 3 is a view illustrating a cross-sectional shape of a powder supply path in a cross section of a mouthpiece filter unit according to Embodiment 1.

[FIG.4] Fig. 4 is a view indicating results of an evaluation test of powder delivery amounts and powder spillage amounts according to Examples and Comparative Examples.

[FIG.5] Fig. 5 is a view illustrating shapes of powder supply paths according to Examples and Comparative Examples.

[FIG.6] Fig. 6 is a view illustrating a smoking machine used for measuring the powder delivery amounts of Examples and Comparative Examples.

[FIG.7] Fig. 7 illustrates a longitudinal sectional view of a relevant portion of a cigarette according to Embodiment 2.

[FIG.8] Fig. 8 illustrates a longitudinal sectional view of a relevant portion of a cigarette according to Embodiment 3.

[Description of Embodiments]

**[0019]** Detailed description will be made below on an embodiment of a filter-equipped cigarette, that is, an example of a smoking article according to the present invention, with reference to the drawings. Regarding dimensions, materials, shapes, relative locations, etc. of components described in the present embodiment, the technical scope of the invention is by no means limited only thereto unless otherwise specified.

<Embodiment 1>

**[0020]** Fig. 1 is an exterior perspective view of a cigarette 1 according to Embodiment 1. Fig. 2 is a longitudinal sectional view of a relevant portion of the cigarette 1 according to Embodiment 1. The cigarette 1 is a filter-equipped cigarette including a tobacco rod 2 and a filter 4 coupled to an end of the tobacco rod 2 via a tipping paper 3.

**[0021]** The tobacco rod 2 includes tobacco shreds 21 wrapped with a cigarette paper 22, being formed in a columnar shape (stick shape) . The filter 4 is a member for filtering, when letting a mainstream smoke caused by smoking the cigarette 1 through, a smoke component from the mainstream smoke, and is formed in a columnar shape with substantially the same diameter as that of the tobacco rod 2.

**[0022]** The filter 4 is wrapped with a wrapping paper 45 and the tipping paper 3 and coupled to a rear end side of the tobacco rod 2 via the tipping paper 3. The tipping paper 3 wraps an end portion of the tobacco rod 2 and the filter 4 into one piece, thereby coupling (uniting) them. The end portion to be coupled to the filter 4 in a longitudinal direction (axial direction) of the tobacco rod 2 is hereinafter referred to as a "rear end" and an end portion opposite thereto as a "front end" (distal end). Further, an end portion to be coupled to the tobacco rod 2 in a longitudinal direction (axial direction) of the filter 4 is referred to as a "front end" and an end portion opposite to the front end as a "mouthpiece end." Further, a cross section along a longitudinal direction (axial direction) of the cigarette 1 (tobacco rod 2, filter 4) is defined as a " longitudinal section" and a cross section along a direction orthogonal thereto as a "cross section." Further, "upstream" and "downstream" refer to relative positional re-

lationships based on a stream of the mainstream smoke. It should be noted that a reference symbol CL in Fig. 2 denotes a center axis of the cigarette 1 (tobacco rod 2, filter 4).

**[0023]** The filter 4 includes an upstream filter unit 41 coupled to the rear end side of the tobacco rod 2, a mouthpiece filter unit 42 located at a mouthpiece end side, a hollow cavity 43 defined between the upstream filter unit 41 and the mouthpiece filter unit 42, and a powder content 44 accommodated in the cavity 43. The powder content 44, which is a lump of base powder containing at least either one of a taste component or a flavoring component, is turned into powder when crushed by a smoker.

**[0024]** The upstream filter unit 41 and the mouthpiece filter unit 42 each include a filter fiber such as acetate formed in a columnar shape, for example. The upstream filter unit 41 and the mouthpiece filter unit 42 are wrapped into one piece with the wrapping paper 45. The wrapping paper 45 used for the filter 4 may be a breathable(air-permeable) wrapping paper usable for typical products or a non-breathable wrapping paper. A paper produced from a plant fiber is typically used as a material of the wrapping paper 45 but a sheet of a chemical fiber of a polymer (polypropylene, polyethylene, nylon, etc.) or a polymer sheet may be used or a metal foil such as aluminum foil may be used. It should be noted that a so-called non-wrap filter may be used as the filter 4. The non-wrap filter includes a filter material and an outer shell layer with which the filter material is formed in a cylindrical shape, and the outer shell layer can be obtained by thermoforming the filter material. In a case of using the non-wrap filter, a wrapping paper may be omitted.

**[0025]** A powder supply path 421 is provided in the mouthpiece filter unit 42 located at the mouthpiece end side, penetrating through the mouthpiece filter unit 42 in the axial direction, and the cavity 43 and the mouthpiece end are in communication with each other through the powder supply path 421. Further, the filter 4 is wrapped with the tipping paper 3, thereby being united with the tobacco rod 2 into one piece.

**[0026]** A paper produced from a plant fiber is typically used as the tipping paper 3A but a sheet of a chemical fiber of a polymer (polypropylene, polyethylene, nylon, etc.) or a polymer sheet may be used or a metal foil such as aluminum foil may be used. It should be noted that the filter 4 may contain a flavoring agent such as menthol. A method of adding the flavoring agent is not limited to a particular one; a known method is providing a string-shaped substance with the flavoring agent adsorbed thereto in the filter 4, containing the flavoring agent in a filling in the filter 4, or providing a material prepared by solidifying the flavoring agent, such as a capsule, in the filter 4, for example.

**[0027]** A plurality of vents (hereinafter referred to as "cavity region vent") 31, through which air (outside air) for ventilation is introduced into the filter 4 to dilute the mainstream smoke, are annularly formed in the tipping paper 3 at a position corresponding to the cavity 43. In this case, an appropriate wrapping paper with a high breathability(high air-permeability) is used as the wrapping paper 45, thereby allowing the air introduced from the outside through the cavity region vent 31 of the tipping paper 3 to pass therethrough, entering the cavity 43. This is beneficial in increasing a strength of the wrapping paper 45 and making it less bendable. However, a wrapping paper that is not breathable or less breathable may be used as the wrapping paper 45. In this case, the wrapping paper 45 desirably has a vent that is open at a position corresponding to the cavity region vent 31. It should be noted that a pre-holed tipping paper, that is, the tipping paper 3 with the cavity region vent 31 formed in advance, is preferably used in the present embodiment. This makes it unlikely to cause damage to the powder content 44 accommodated in the cavity 43 as compared with a case where the cavity region vent 31 is formed using, for example, an on-machine laser. Further, by adjusting an opening area of the cavity region vent 31 (in a case of providing a plurality of cavity region vents 31, a total opening area), it is possible to adjust a Vf value (a ratio of an inflow rate of air from the filter to a total airflow rate). A tar value of the cigarette is designed in accordance with the Vf value, thereby allowing the powder formed by crushing the powder content 44 to be delivered as much as possible.

**[0028]** The cavity 43 is a space defined inside the filter 4, in particular, a columnar space surrounded by a surface of a rear end of the upstream filter unit 41, a surface of a front end of the mouthpiece filter unit 42, and the wrapping paper 45. The cavity 43 only has to have a size sufficient to accommodate the powder content 44. In a case of accommodating a plurality of powder contents 44, the cavity 43 needs to have a size sufficient to accommodate the plurality of powder contents 44. Further, a shape of the cavity 43 is not limited to a particular one.

**[0029]** The powder content 44 is a spherical lump of the base powder and turned into powder when an external force is applied thereto. The external force is, for example, a force stronger than a force to be applied during production or transportation or a force stronger than an inhale force during smoking. The external force is exemplified by a force (crushing force) applied by a smoker with his or her fingers. For example, a breaking strength for powdering the powder content 44 is in a range from 5N to 60N. The breaking strength for powdering the powder content 44 is preferably in a range from 20N to 30N, and more preferably in a range from 20N to 25N. Further, a shape of the powder content 44 is not limited to a particular one and may be an ellipsoid, a column, a hollow cylinder, a circular cone, a polygonal pyramid, a torus, a polyhedron such as a cube or a rectangular parallelepiped, or a combination thereof. Further, the base powder that constitutes the powder content 44 at least partly has a particle size allowing for passing through the powder supply path 421. For example, the particle size of the base powder may be set in a range from 10 $\mu$m to 300 $\mu$m.

**[0030]** The powder content 44 may be produced by

mixing a nucleating agent, that is, the base powder, with an adequate amount of water added thereto and then forming and drying it. Further, a binder may be added as a material of the powder content 44. Further, a flavoring agent may be added to the nucleating agent along with water. As the nucleating agent, monosaccharide, disaccharide, polysaccharide, or derivatives thereof is usable. Examples include ketotriose (dihydroxyacetone), aldotriose (glyceraldehyde), ketotetrose (erythrulose), aldotetrose (erythrose, threose), pentose ketopentose (ribulose, xylulose), aldopentose (ribose, arabinose, xylose, lyxose), deoxysugar (deoxyribose), ketohexose (psicose, fructose, sorbose, tagatose), aldohexose (allose, altrose, glucose, mannose, gulose, idose, galactose, talose), deoxysugar (fucose, fuculose, rhamnose), sedoheptulose, sucrose, lactose, maltose, trehalose, turanose, cellobiose, raffinose, melezitose, maltotriose, acarbose, stachyose, glucose, starch (amylose, amylopectin), cellulose, dextrin, glucan, and fructose. These monosaccharide, disaccharide, polysaccharide, or derivatives thereof may be used solely or mixed in use. The nucleating agent is preferably substantially soluble in a mouth.

**[0031]** Further, as the binder, water soluble polymers such as dextrin, gelatin, gum arabic, polyvinyl alcohol, and carboxymethyl cellulose are usable. An addition amount of the binder is preferably 10 wt% or less with respect to the nucleating agent.

**[0032]** The flavoring agent being added to the nucleating agent is not limited to a particular one and an existing flavoring agent may be used; however, a powder flavoring agent and an oil flavoring agent are particularly suitable. Typical examples of the powder flavoring agent include chamomile, fenugreek, menthol, mint, cinnamon, and herb that are in powder form. Further, typical examples of the oil flavoring agent include lavender, cinnamon, cardamom, celery, clove, cascarilla, nutmeg, sandalwood, bergamot, geranium, honey essence, rose oil, vanilla, lemon, orange, mint, cinnamon, caraway, cognac, jasmine, chamomile, menthol, cassia, ylang-ylang, sage, spearmint, fennel, pimento, ginger, anise, coriander, and coffee. These powder flavoring agents and oil flavoring agents may be used solely or mixed in use. In a case of using the powder flavoring agent, a grain size thereof is preferably 500 μm or less. The flavoring agent is preferably substantially soluble in liquid or a mouth. Further, an addition amount of the flavoring component is preferably 10 wt% or less with respect to the nucleating agent.

**[0033]** Examples of the taste component include citric acid, tartaric acid, glutamic acid Na, neotame, thaumatin, stevia, sorbitol, xylitol, erythritol, aspartame, rutin, hesperidin, oxalic acid, tannic acid, catechin, naringin, quinine, quinic acid, limonin, caffeine, capsaicin, vitamins, amino acids, polyphenols, alginic acid, flavonoid, and lecithin. The taste component is preferably substantially soluble in liquid or a mouth. An addition amount of the taste component is preferably 10 wt% or less with respect to the nucleating agent. It should be noted that the powder content 44 may be in a form of a plastic capsule containing powder, a tablet compact, or granules.

**[0034]** Here, Fig. 3 is a view illustrating a cross-sectional shape of the powder supply path 421 in a cross section of the mouthpiece filter unit 42 according to Embodiment 1. As illustrated in Fig. 3, the cross section of the powder supply path 421 according to the present embodiment is in a form of an opening having a shape of a single windmill as a whole. More specifically, in the cross section of the mouthpiece filter unit 42, the powder supply path 421 has a central connection portion 4210 located at a central side of the cross section of the mouthpiece filter unit 42 and a plurality of holes 4211 that extend from the central connection portion 4210 toward an outer peripheral side of the cross section of the mouthpiece filter unit 42. Here, an opening area of each of the holes 4211 is relatively large as compared with an opening area of the central connection portion 4210.

**[0035]** The plurality of holes 4211 of the powder supply path 421, each of which is in a blade shape, radially extend in mutually different directions from the central connection portion 4210. Further, distal ends (end portions at a side opposite to the central connection portion 4210) of the holes 4211 are located at positions spaced from the wrapping paper 45 of the mouthpiece filter unit 42 with the filter fiber, which constitutes the mouthpiece filter unit 42, interposed between the distal ends of the holes 4211 and the wrapping paper 45. Further, in an example illustrated in Fig. 3, the powder supply path 421 has three holes 4211 that radially extend from the central connection portion 4210 toward the outer peripheral side. Further, an opening width of each of the holes 4211 of the powder supply path 421 is gradually widened from a side of the base end (an end portion connected with the central connection portion 4210) toward a side of the distal end. For this reason, each of the holes 4211 of the powder supply path 421 has a relatively wide (large) opening width at an outer peripheral region 4211a located at the outer peripheral side of the cross section of the mouthpiece filter unit 42 as compared with at a central region 4211b located at the central side of the cross section.

<Effects>

**[0036]** In the cigarette 1 according to the present embodiment, the powder supply path 421 of the mouthpiece filter unit 42 has the cross section that does not allows the powder content 44 in lump form to pass therethrough. For this reason, since the powder content 44 in lump form accommodated in the cavity 43 does not pass through the powder supply path 421, it is possible to reduce discharge of the powder content 44 in lump form out of the filter 4 through the powder supply path 421. Meanwhile, when a smoker crushes the powder content 44 in lump form by, for example, applying an external force, turning the powder content 44 into powder form, the powder of the powder content 44 is allowed to pass through the powder supply path 421. As a result, the smoker is al-

lowed to easily inhale the powder at a desired timing, enjoying a taste from the taste component, a scent from the flavoring component, or both.

**[0037]** Moreover, the powder supply path 421 according to the present embodiment has the plurality of holes 4211 that extend in mutually different directions from the central connection portion 4210, which is located at the central side of the cross section of the mouthpiece filter unit 42, toward the outer peripheral side. Here, although an increase in a cross-sectional area of the powder supply path 421 is favorable in terms of an increase in a delivery amount (supply amount) of the powder during inhale by the smoker, simply increasing the cross-sectional area of the powder supply path 421 leads to frequent occurrence of unintended spilling of the powder (powder spillage) not during inhale by the smoker. Examples of the above unintended powder spillage include a case where the powder spills outside through the powder supply path 421 as a mouthpiece side of the filter 4 is turned downward while the smoker does not put the filter 4 in his or her mouth.

**[0038]** Accordingly, regarding the powder supply path 421 according to the present embodiment, the plurality of holes 4211 extend in mutually different directions from the central connection portion 4210, which is located at the central side of the cross section of the mouthpiece filter unit 42, toward the outer peripheral side, thus allowing opening regions not to be concentrated at one spot in the cross section of the mouthpiece filter unit 42 but to be distributed at the outer peripheral side. This makes it possible to ensure, after the powder content 44 in lump form is crushed into powder form, a total opening area enough to ensure a sufficient delivery amount (supply amount) of the powder during inhale while reducing unintended powder spillage not during inhale. In particular, the powder supply path 421 according to the present embodiment has the plurality of holes 4211 that radially extend from the central connection portion 4210 toward the outer peripheral side, so that the opening regions can be more favorably distributed in the cross section of the mouthpiece filter unit 42, making it much easier to ensure the delivery amount of the powder during inhale while favorably reducing unintended powder spillage after the powder content 44 is crushed.

**[0039]** Here, when the smoker puts the filter 4 of the cigarette 1 in his or her mouth for inhale, the powder of the crushed powder content 44 in the cavity 43 is accumulated at the outer peripheral side of the cavity 43 (wrapping paper 45). Thus, distributing the opening regions of the powder supply path 421 more at the outer peripheral side of the mouthpiece filter unit 42 is favorable in terms of an increase in the delivery amount of the powder during inhale. Accordingly, since the central connection portion 4210 is relatively small and the holes 4211 each have a larger opening area than the central connection portion 4210, the powder supply path 421 according to the present embodiment allows for increasing the delivery amount of the powder during inhale. Moreover, since each of the holes 4211 of the powder supply path 421 has a relatively wide opening width at the outer peripheral region 4211a as compared with at the central region 4211b, a large opening area is easily ensured at the outer peripheral side of the cross section of the mouthpiece filter unit 42. As a result, it is possible to further increase the delivery amount of the powder during inhale.

**[0040]** Next, description will be made on the number of the holes 4211 of the powder supply path 421. Here, in a case where the number of the holes 4211 is three or more, it is possible to reduce variation in the delivery amount of the powder during inhale due to a posture of a smoker who holds the filter 4. That is, the three or more holes 4211 extending from the central connection portion 4210 makes it possible to stably deliver the powder during inhale irrespective of any posture taken when the filter 4 is held. Further, the holes 4211 of the powder supply path 421 according to the present embodiment are located every constant angle (120°) in a circumferential direction of the mouthpiece filter unit 42. In other words, the holes 4211 radially extend from the central connection portion 4210 at regular intervals in the circumferential direction of the mouthpiece filter unit 42. This makes it possible to stably deliver the powder during inhale irrespective of the posture of a smoker who holds the filter 4.

**[0041]** It should be noted that an upper limit of the number of the holes 4211 of the powder supply path 421 is not limited to a particular one. However, in a case where the number of the holes 4211 is six or more, majority of the mouthpiece filter unit 42 becomes the opening region, making it likely to reduce an effect in reducing powder spillage not during inhale. Accordingly, in terms of ensuring the delivery amount of the powder during inhale while reducing unintended powder spillage not during inhale, the number of the holes 4211 that extend from the central connection portion 4210 is preferably in a range from three to five.

**[0042]** Further, the distal ends of the holes 4211 of the powder supply path 421 are spaced from the wrapping paper 45 of the mouthpiece filter unit 42 with the filter fiber interposed between each of the distal ends of the holes 4211 and the wrapping paper 45. Since the holes 4211 are formed in a manner not to extend until the distal ends of the holes 4211 reach the wrapping paper 45 as described above, an edge portion (outermost peripheral portion) of the mouthpiece filter unit 42 does not become an opening and, thus, it is possible to further reduce unintended powder spillage not during inhale.

**[0043]** Further, regarding the powder supply path 421 according to the present embodiment, the base ends of the plurality of holes 4211 are connected to each other via the central connection portion 4210, becoming a continuous opening. For this reason, in producing the mouthpiece filter unit 42, it is possible to produce the mouthpiece filter unit 42 using a single mandrel and evenly fill a region other than the powder supply path 421 in the cross section of the mouthpiece filter unit 42 with the filter

fiber. That is, it is possible to stabilize a production quality of the mouthpiece filter unit 42.

**[0044]** It should be noted that a circumferential length of the filter 4 according to the present embodiment is preferably in a range from 16 mm to 25 mm, more preferably in a range from 22 to 25 mm. Further, although the powder supply path 421 with a shorter length makes it easier to inhale the powder, the mouthpiece filter unit 42 with an extremely reduced length is likely to be united with the upstream filter unit 41 into one piece with the wrapping paper 45 with less accuracy. Accordingly, the length of the mouthpiece filter unit 42 is preferably in a range from 5 mm to 15 mm, more preferably in a range from 7 to 10 mm. Further, a length of the upstream filter unit 41, which is given by subtracting a length of the cavity 43 and a length of the powder supply path 421 from a total length (27 to 30 mm), is preferably in a range from 6 mm to 17 mm, more preferably in a range from 11 to 17 mm.

**[0045]** Further, a diameter of the powder content in lump form accommodated in the cavity 43 is not particularly limited as long as it is smaller than the diameter and length of the cavity 43; however, a larger ratio of a volume of the powder content 44 in lump form to a volume of the cavity 43 allows the powder to be accumulated higher when the powder content 44 in lump form is crushed, making the delivery easier during inhale. Accordingly, in a case where the length of the cavity 43 is 6 mm, an example is an embodiment where the diameter of the powder content 44 in lump form is at least 4 mm and less than 6 mm.

**[0046]** Here, examples of combination of the lengths of the portions of the filter 4 are given. In a case where the total length of the filter 4 is 27 mm, the upstream filter unit 41 may be 14 mm, the cavity 43 may be 6 mm, and the mouthpiece filter unit 42 may be 7 mm. Likewise, in a case where the total length of the filter 4 is 27 mm, the upstream filter unit 41 may be 11 mm, the cavity 43 may be 6 mm, and the mouthpiece filter unit 42 may be 10 mm. Further, in a case where the total length of the filter 4 is 30 mm, the upstream filter unit 41 may be 17 mm, the cavity 43 may be 6 mm, and the mouthpiece filter unit 42 may be 7 mm. Further, in a case where the total length of the filter 4 is 30 mm, the upstream filter unit 41 may be 14 mm, the cavity 43 may be 6 mm, and the mouthpiece filter unit 42 may be 10 mm.

**[0047]** Further, specifications that cause less bend or crease when a smoker crushes the powder content 44 in lump form by applying an external force thereto are preferably selected for the wrapping paper 45 of the filter 4. For example, a basis weight of the wrapping paper 45 is preferably in a range from 50 to 200 g/m$^2$ and more preferably determined in a range from 50 to 110 g/m$^2$. Further, the air-permeability (breathability) of the wrapping paper 45 is preferably 1000 to 10000 [C.U]. Further, in a case of using a pre-holed tipping paper, that is, the tipping paper 3 with the cavity region vent 31 formed in advance, the air permeability of the wrapping paper 45 is preferably 200 to 3000 [C.U].

<Examples>

**[0048]** Next, the present invention will be further specifically described with reference to Examples but the present invention is by no means limited to the description of Examples below insofar as being within the spirit thereof. The above cigarette 1 was produced and an evaluation test was performed to measure a powder delivery amount during inhale and a powder spillage amount not during inhale. Regarding the filter 4 of the cigarette 1 used for the evaluation test, the length of the upstream filter unit 41 was 14 mm, the length of the cavity 43 was 7 mm, and the length of the mouthpiece filter unit 42 was 6 mm. Further, the base powder of the powder content 44 was accommodated in the cavity 43 on the assumption of a crushed state of the powder content 44. As the base powder of the powder content 44, 50 mg lactose (Pharmatose 100M, manufactured by DFE pharma) was used.

**[0049]** Fig. 4 indicates results of the evaluation test of the powder delivery amount and the powder spillage amount according to Examples and Comparative Examples. Targets for the evaluation test were Examples 1 to 5 and Comparative Examples 1 and 2. Fig. 5 illustrates shapes of the powder supply path according to Examples and Comparative Examples. Comparative Example 1 is a center hole filter including a mouthpiece filter unit with a single powder supply path. Comparative Example 2 includes a mouthpiece filter unit with three powder supply paths that penetrate in an axial direction.

**[0050]** A smoking machine illustrated in Fig. 6 was used to measure the powder delivery amount. In Examples, an inhale experiment was performed in an unlit state using a single-holder smoking machine manufactured by Borgwaldt KC GmbH and the powder delivery amount was measured. In performing the inhale experiment, an inhale flow rate was 35 mL/2 sec, the number of inhale actions was five, and the number of cigarettes for measurement was three. Further, a powder collecting pad (Cambridge pad) was removed every inhale and measured in weight with an electronic balance and the powder delivery amount was calculated from a difference in weight between before and after inhale. Further, the powder spillage amount was measured using a powder content produced by adding 80 wt% lactose to water and forming it in a sphere with a weight of 50 mg and a diameter of 4.5 mm and then drying it stepwise at 25°C for five minutes, at 70°C for four minutes, and at 200°C for four minutes. In a measurement test of the powder spillage amount, the powder content 44 in lump form was vibrated for five times after crushed with a filter side in a cigarette form turned downward and the powder spillage amount was measured with an electronic balance. The number of cigarettes for measurement was three.

**[0051]** As indicated in the test results of Fig. 4, in comparison with Comparative Example 1 with the single center hole as the powder supply path, it has been found that

Examples can each ensure a larger delivery amount of the powder than that of Comparative Example 1, while none of Examples is considerably different in powder spillage amount. Further, as compared with Comparative Example 2 with three independent powder supply paths, none of Examples is significantly different in either delivery amount of the powder or powder spillage amount. However, Comparative Example 2, which has the three independent powder supply paths, requires the use of three mandrels for producing the mouthpiece filter unit. Thus, it is supposed to be difficult to evenly fill spaces between the mandrels with the filter fiber. Therefore, as compared with Comparative Example 2, Examples are excellent in being able to provide a mouthpiece filter unit with stable quality.

<Embodiment 2>

**[0052]** Next, a cigarette 1A according to Embodiment 2 will be described. Here, the description will be made focusing on a difference from the cigarette 1 according to Embodiment 1 illustrated in Fig. 1 to Fig. 3. Fig. 7 is a schematic configuration view of the cigarette 1A according to Embodiment 2. Regarding the filter 4 of the cigarette 1A is provided with a vent (hereinafter, referred to as "upstream filter unit region vent") 31A that penetrates at a position, in the tipping paper 3 and the wrapping paper 45, corresponding to the upstream filter unit 41.

<Embodiment 3>

**[0053]** Next, a cigarette 1B according to Embodiment 3 will be described. Here, the description will be made focusing on a difference from the cigarette 1 according to Embodiment 1 illustrated in Fig. 1 to Fig. 3 and the cigarette 1A according to Embodiment 2 illustrated in Fig. 7. Fig. 8 is a schematic configuration view of the cigarette 1B according to Embodiment 3. The filter 4 of the cigarette 1B is provided with the cavity region vent 31 illustrated in Fig. 2 and the upstream filter unit region vent 31A illustrated in Fig. 7 in the tipping paper 3.

**[0054]** The filter 4 of the cigarette 1B according to the present embodiment is provided with the vents for intake of dilution air on both the cavity 43 and the upstream filter unit 41. Thus, by adjusting a balance of air inflow through these vents, it is possible to change the delivery amount of the powder (for example, flavoring powder) formed by crushing the powder content 44 without changing the Vf value of the filter 4 as a whole. This makes it possible to optimally design a gustatory (taste) strength provided by the flavoring powder while keeping a tar value of the cigarette 1B constant, for example.

**[0055]** The preferred embodiments of the present invention have been described above; however, a filter for a smoking article according to the present invention may be implemented by combining the embodiments as much as possible.

[Reference Signs List]

**[0056]**

| | |
|---|---|
| 1 | cigarette |
| 2 | tobacco rod |
| 3 | tipping paper |
| 4 | filter |
| 41 | upstream filter unit |
| 42 | mouthpiece filter unit |
| 43 | cavity |
| 44 | powder content |
| 45 | wrapping paper |
| 421 | powder supply path |
| 4210 | central connection portion |
| 4211 | hole |

**Claims**

**1.** A smoking article comprising:

a tobacco rod including tobacco shreds; and
a filter coupled to an end portion of the tobacco rod via a tipping paper, wherein
the filter includes:

a powder content that includes a lump of base powder including at least either one of a taste component or a flavoring component and is turned into powder by application of an external force;
a cavity where the powder content is accommodated; and
a mouthpiece filter unit that is located continuously at a downstream side of the cavity, and is provided with a powder supply path formed along an axial direction for allowing a mouthpiece end to communicate with the cavity and supplying the powder from the cavity to the mouthpiece end, and
in a cross section of the mouthpiece filter unit, the powder supply path has a central connection portion located at a central side of the cross section of the mouthpiece filter unit and a plurality of holes that extend in mutually different directions from the central connection portion toward an outer peripheral side of the cross section.

**2.** The smoking article according to claim 1, wherein each of the holes of the powder supply path has a relatively large opening width at an outer peripheral region located at the outer peripheral side of the cross section of the mouthpiece filter unit as compared with at a central region located at the central side of the cross section.

3. The smoking article according to claim 1 or 2, wherein the powder supply path has the holes that are at least three and not more than five in number.

4. The smoking article according to any one of claims 1 to 3, wherein the plurality of holes of the powder supply path radially extend from the central connection portion.

5. The smoking article according to any one of claims 1 to 4, wherein in the cross section of the mouthpiece filter unit, a filter fiber that provides the mouthpiece filter unit is interposed between a distal end of each of the holes of the powder supply path and a wrapping paper of the mouthpiece filter unit.

6. A filter for a smoking article, the filter comprising:

a powder content that includes a lump of base powder including at least either one of a taste component or a flavoring component and is turned into powder by application of an external force;
a cavity where the powder content is accommodated; and
a mouthpiece filter unit that is located continuously at a downstream side of the cavity, and is provided with a powder supply path formed along an axial direction for allowing a mouthpiece end to communicate with the cavity and supplying the powder from the cavity to the mouthpiece end, and
in a cross section of the mouthpiece filter unit, the powder supply path has a central connection portion located at a central side of the cross section of the mouthpiece filter unit and a plurality of holes that extend in mutually different directions from the central connection portion toward an outer peripheral side of the cross section.

FIG. 1

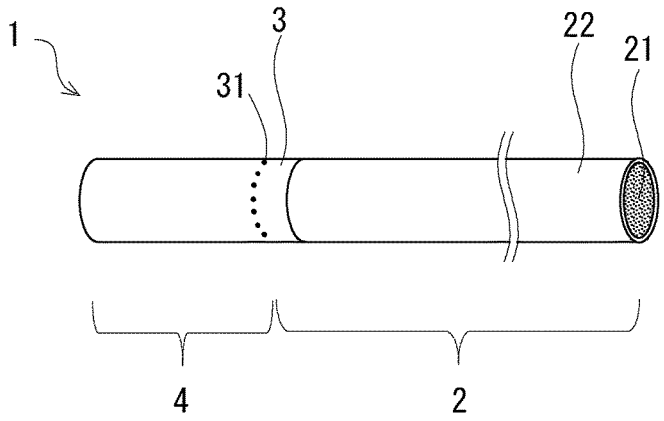



FIG. 2

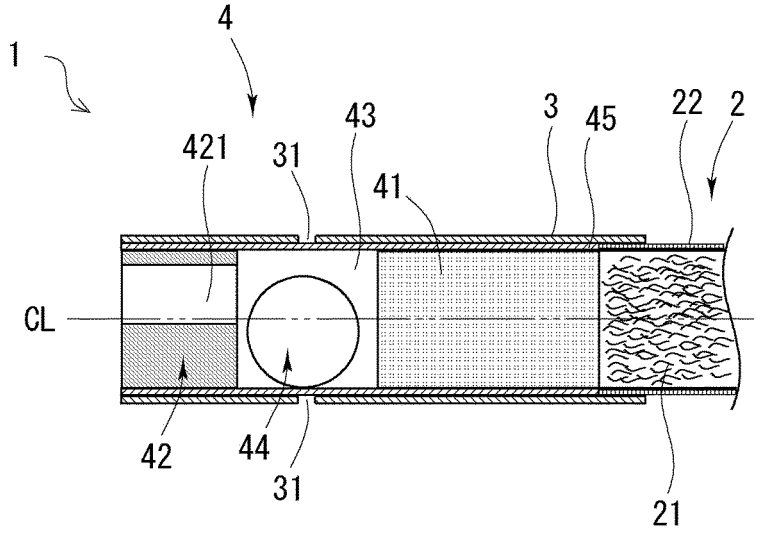


FIG. 3

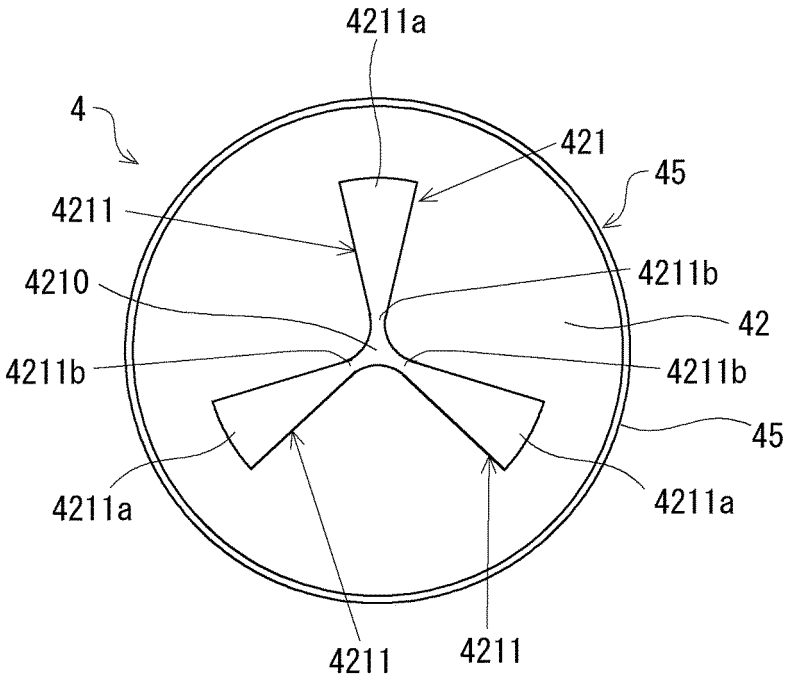
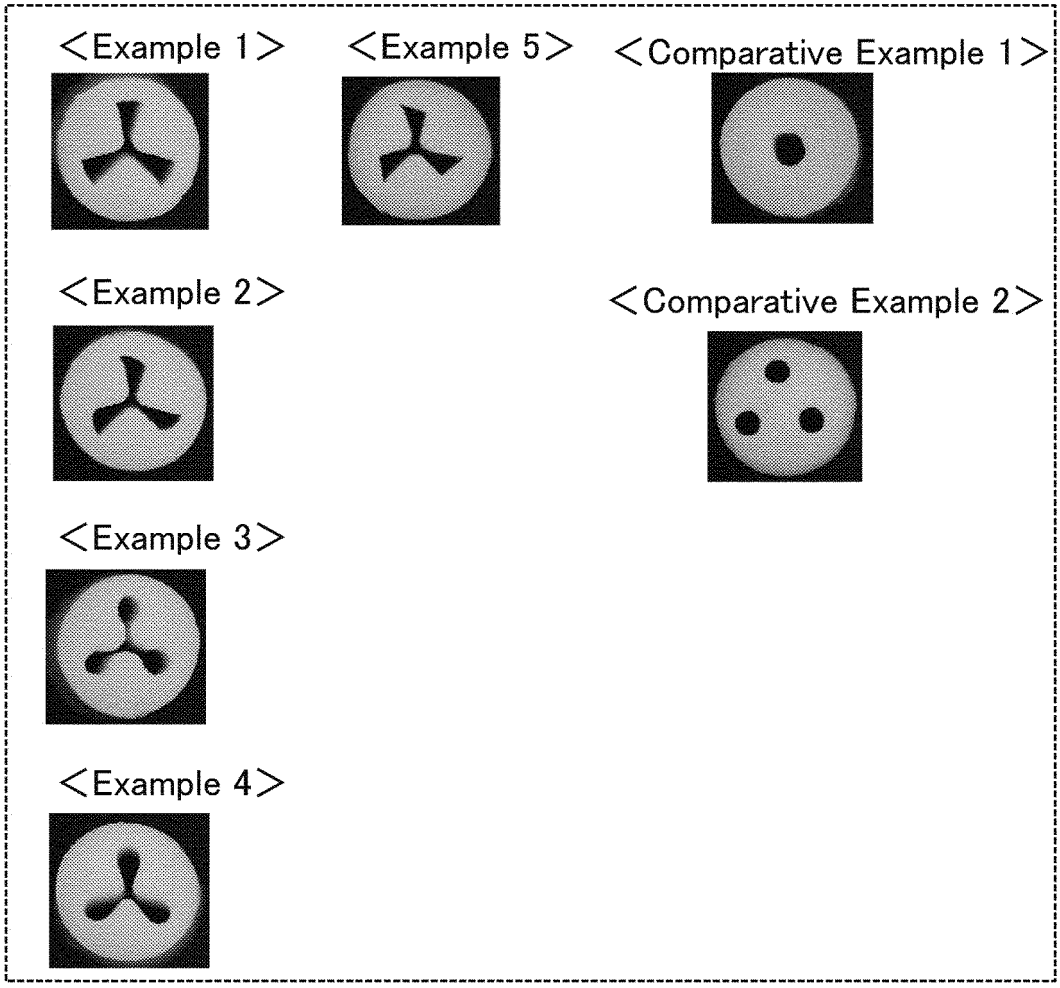



FIG. 4

| | Powder Spillage Amount [mg] | Powder Delivery Amount [mg] |
|---|---|---|
| Example 1 | 1.9 | 26.5 |
| Example 2 | 1.4 | 25.6 |
| Example 3 | 2.2 | 27.0 |
| Example 4 | 2.9 | 23.0 |
| Example 5 | 1.5 | 25.9 |
| Comparative Example 1 | 2.3 | 11.7 |
| Comparative Example 2 | 2.1 | 24.3 |

FIG. 5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<Example 5>
<Comparative Example 1>
<Example 2>
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<Example 3>
<Example 4>

FIG. 6

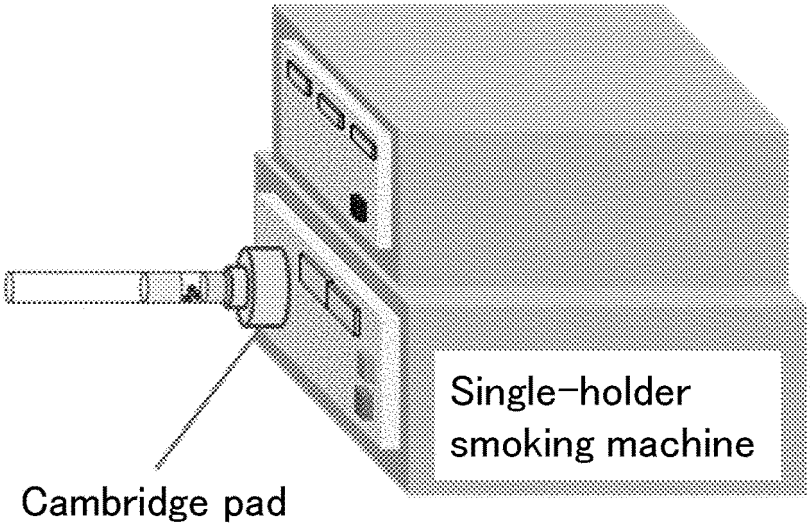

Single-holder
smoking machine
Cambridge pad

FIG. 7

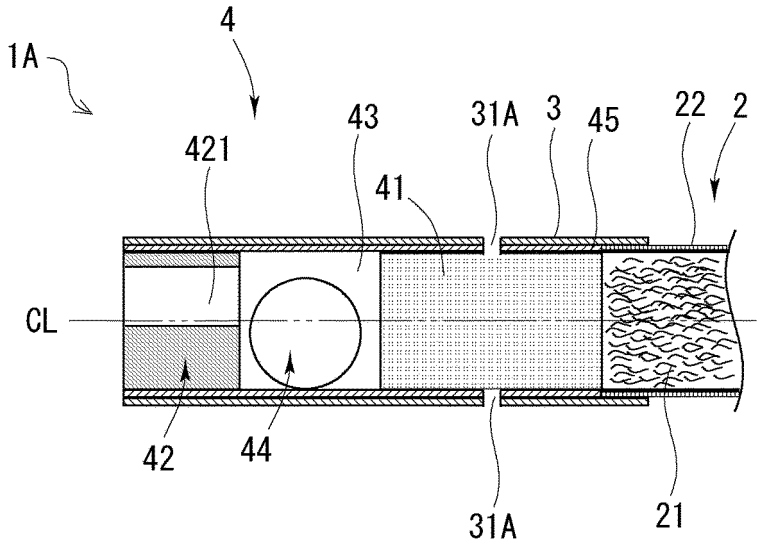
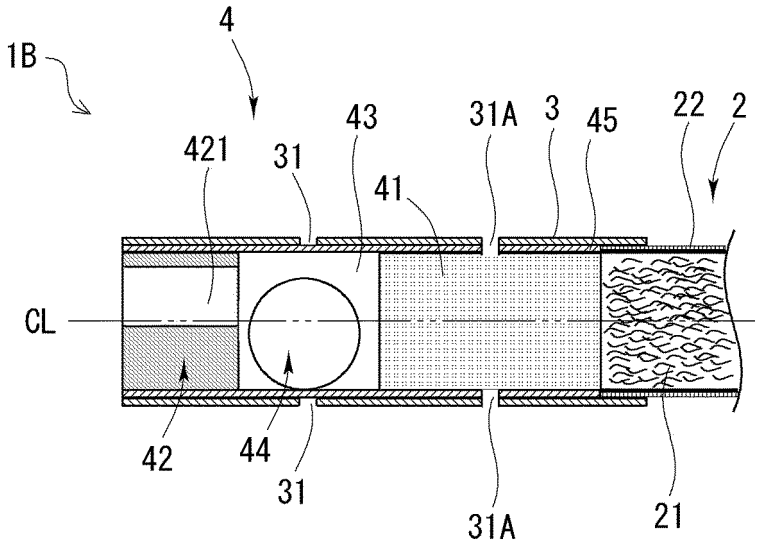

4
1A
43
31A
3
45
22
2
421
41
CL
42
44
31A
21

FIG. 8



## INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2017/046187

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl. A24D3/04(2006.01)i, A24D3/08(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int. Cl. A24D1/00-3/18

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 | 1971-2018 |
| Registered utility model specifications of Japan | 1996-2018 |
| Published registered utility model applications of Japan | 1994-2018 |

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X<br>Y | WO 2016/181843 A1 (JAPAN TOBACCO INC.) 17 November 2016, paragraphs [0026]-[0035], fig. 1-3 (Family: none) | 1, 6<br>2-5 |
| Y | US 3370594 A (HASLAM, Fred) 27 February 1968, column 2, lines 29-45, fig. 7 (Family: none) | 2-5 |
| Y | JP 2015-507935 A (JT INTERNATIONAL SA) 16 March 2015, paragraphs [0028]-[0032], fig. 1, 2 & WO 2013/124377 A2 | 5 |
| A | JP 46-5039 B1 (ESTIFUL COMPANY ESTABLISHMENT) 06 February 1971, entire text, all drawings (Family: none) | 1-6 |

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

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"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 14.02.2018 | 27.02.2018 |
| Name and mailing address of the ISA/<br>Japan Patent Office<br>3-4-3, Kasumigaseki, Chiyoda-ku,<br>Tokyo 100-8915, Japan | Authorized officer<br><br>Telephone No. |

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**INTERNATIONAL SEARCH REPORT**

International application No.
PCT/JP2017/046187

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | US 2695617 A (WARNBERG, Archie E.) 30 November 1954, entire text, all drawings (Family: none) | 1-6 |

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## REFERENCES CITED IN THE DESCRIPTION

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### Patent documents cited in the description


- WO 2016181843 A **[0003]**