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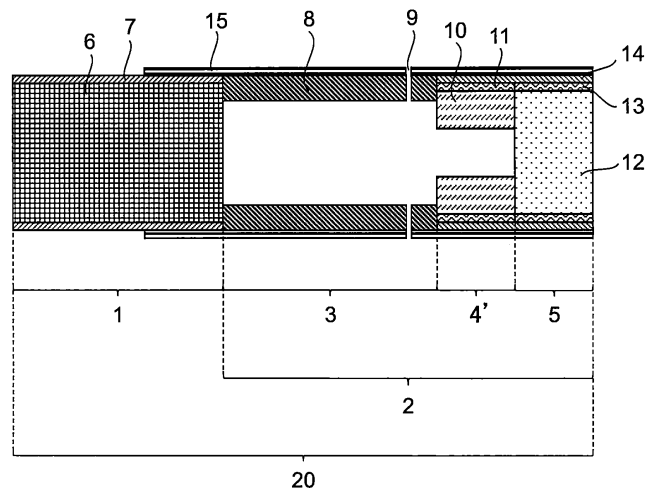
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(54) **NON-COMBUSTION HEATED SMOKING ARTICLE AND NON-COMBUSTION HEATED SMOKING SYSTEM**

(57) A heat-not-burn smoking article includes: a tobacco-containing segment containing tobacco and an aerosol former; a tubular cooling segment having one or more perforations on the perimeter; and a tubular member having an inner diameter smaller than the cooling

segment, where the cooling segment is joined at the end in the mouth end direction to the member; and the perforations are provided at a position 2 to 4 mm from the joined face.

Fig. 2



Description

TECHNICAL FIELD

5 **[0001]** The present invention relates to a heat-not-burn smoking article and a heat-not-burn smoking system.

BACKGROUND ART

10 **[0002]** A common combustion smoking article (cigarette) for smoking through combustion includes a tobacco-containing segment, in which a tobacco filler of dry tobacco leaves shredded into a width of about 1 mm and added with a flavor, a humectant, an appropriate amount of moisture, and so forth is wrapped cylindrically in a paper wrapper; and a mouthpiece segment, in which a corrugated paper or fibers of cellulose acetate or the like are wrapped cylindrically in a paper wrapper. The tobacco-containing segment and the mouthpiece segment are connected with a lining paper. A user smokes by igniting the end of the tobacco-containing segment with a lighter or the like and inhaling from the end of the mouthpiece segment. The leading end of the tobacco-containing segment burns at a temperature exceeding 800°C.

15 **[0003]** As a substitute for such a common combustion smoking article, a heat-not-burn smoking article and a heat-not-burn smoking system, which utilize heating in place of combustion, have been developed (Patent Literature (PTL) 1 to 6, for example). The heating temperature is lower than the burning temperature in a combustion smoking article and is 400°C or lower, for example. In a heat-not-burn smoking article, a tobacco filler of a tobacco-containing segment contains an aerosol former, such as glycerol, propylene glycol (PG), triethyl citrate (TEC), or triacetin. Such an aerosol former is vaporized upon heating, moved to a cooling segment within a mouthpiece segment through inhalation, and cooled to generate an aerosol further reliably. Since the aerosol is inhaled together during inhalation from a filter segment that is provided in the mouth side end within the mouthpiece segment, it is possible to ensure a satisfactory sensation for a user.

25 **[0004]** A heat-not-burn smoking system typically includes a cylindrical heat-not-burn smoking article having a shape similar to a common combustion smoking article; and a heating device equipped with a battery, a controller, a heater, and so forth. Exemplary heaters include an electric resistance heater and an induction heater. Exemplary heating methods by an electric resistance heater include a method of heating a heat-not-burn smoking article with a heater from the outside and a method of heating by inserting a needle-like or blade-like heater from the leading end of a heat-not-burn smoking article into a tobacco-containing segment that includes a tobacco filler.

CITATION LIST

PATENT LITERATURE

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[0005]

PTL 1: Japanese Patent No. 5292410

PTL 2: Japanese Patent No. 5771338

40 PTL 3: Japanese Unexamined Patent Application Publication (Translation of PCT Application) No. 2013-507906

PTL 4: WO 2017/198838

PTL 5: Japanese Patent No. 5877618

PTL 6: Japanese Unexamined Patent Application Publication (Translation of PCT Application) No. 2016-506729

45 SUMMARY OF INVENTION

TECHNICAL PROBLEM

50 **[0006]** As mentioned above, an aerosol former vaporized upon heating (hereinafter, also referred to as "vaporized aerosol component") cools primarily in a cooling segment and condenses from the vapor into particles, thereby forming an aerosol.

[0007] Here, the vaporized aerosol component needs to be cooled sufficiently to allow inhalation by a user from a filter segment provided in the mouth side end. As a cooling segment for a heat-not-burn smoking article, for example, PTL 4 discloses a feature in which perforations are provided on the outer perimeter of a hollow cylindrical part to introduce external air from the perforations during inhalation and to cool a vaporized aerosol component through contact with external air.

55 **[0008]** However, when a vaporized aerosol component is cooled solely by external air introduced from the perforations that are provided in the cooling segment, a large amount of external air needs to be introduced for sufficient cooling.

Consequently, a smoking flavor is destroyed. For this reason, there is a need for developing a method that allows sufficient cooling of a vaporized aerosol component without destroying a smoking flavor.

[0009] An object of the present invention is to provide a heat-not-burn smoking article that allows sufficient cooling of a vaporized aerosol component without destroying a smoking flavor and to provide a heat-not-burn smoking system including the heat-not-burn smoking article.

SOLUTION TO PROBLEM

[0010] The inventors resolved the above-mentioned problem by limiting, within a specific range, a position at which perforations are provided in a cooling segment. In other words, the problem is resolved by the following present invention.

(1) A heat-not-burn smoking article including:

a tobacco-containing segment containing tobacco and an aerosol former;
a tubular cooling segment having one or more perforations on the perimeter; and
a tubular member having an inner diameter smaller than the cooling segment, where the cooling segment is joined at the end in the mouth end direction to the member; and the perforations are provided at a position 2 to 4 mm from the joined face.

(2) The heat-not-burn smoking article according to (1), where the member is a center hole segment.

(3) The heat-not-burn smoking article according to (1) or (2), further including a filter segment downstream of the member in the mouth end direction.

(4) The heat-not-burn smoking article according to any of (1) to (3), where a plurality of the perforations are provided on the perimeter of the cooling segment.

(5) The heat-not-burn smoking article according to any of (1) to (4), where the perforations are provided at a position 17 to 19 mm from the mouth end.

(6) The heat-not-burn smoking article according to any of (2) to (5), where

the filter segment includes a filler, an inner plug wrapper that is wrapped around the filler, and an outer plug wrapper that is wrapped around the inner plug wrapper; and
at least either the inner plug wrapper or the outer plug wrapper is a paper having a basis weight of 40 g/m² or more and a thickness of 100 μm or more.

(7) A heat-not-burn smoking system including

the heat-not-burn smoking article according to any of (1) to (6); and
a heating device for heating the tobacco-containing segment.

(8) The heat-not-burn smoking system according to (7), where a heating temperature by the heating device is 150°C to 400°C.

ADVANTAGEOUS EFFECTS OF INVENTION

[0011] According to the present invention, it is possible to provide a heat-not-burn smoking article that allows sufficient cooling of a vaporized aerosol component without destroying a smoking flavor and to provide a heat-not-burn smoking system including the heat-not-burn smoking article.

BRIEF DESCRIPTION OF DRAWINGS

[0012]

Fig. 1 is a schematic view illustrating the outline of the present invention.

Fig. 2 is a cross-sectional view of an exemplary heat-not-burn smoking article according to the present invention.

Fig. 3 is a schematic view of an exemplary heat-not-burn smoking system according to the present invention in (a) the state before inserting a heat-not-burn smoking article into a heating device and in (b) the state of heating the heat-not-burn smoking article inserted into the heating device.

DESCRIPTION OF EMBODIMENTS

[Heat-not-burn Smoking Article]

5 **[0013]** A heat-not-burn smoking article according to the present invention includes: a tobacco-containing segment containing tobacco and an aerosol former; a tubular cooling segment having one or more perforations on the perimeter; and a tubular member having an inner diameter smaller than the cooling segment, where the cooling segment is joined at the end in the mouth end direction to the member; and the perforations are provided at a position 2 to 4 mm from the joined face. The distance is a distance between the center of the perforations and the joined face. Fig. 1 illustrates the outline of the present invention. In Fig. 1, 1 is a tobacco-containing segment, 3 is a cooling segment, 4 is a tubular member having an inner diameter smaller than the cooling segment, 9 is a perforation, O is a joined face between the cooling segment 3 and the member 4, and t is a distance between the joined face O and the center of the perforation. A vaporized aerosol component generated in the tobacco-containing segment 1 is cooled in the cooling segment 3 to form an aerosol and introduced into the member 4. On this occasion, the aerosol is further cooled through mixing with air introduced from the perforation 9. Since the inner diameter suddenly decreases downstream of the joined face O in the mouth end direction (hereinafter, also simply referred to as "downstream"), the flow of a mixed stream of the aerosol and air (hereinafter, also simply referred to as "mixed stream") changes. In the present invention, the perforation 9 is provided at a specific position from the joined face O. Due to such a perforation 9, it is possible to enhance mixing efficiency of the aerosol and air. In this view, the upper limit of t is 4 mm or less. Meanwhile, when the perforation 9 is excessively close to the joined face O, the strength of a heat-not-burn smoking article decreases. In this view, the lower limit of t is 2 mm or more. Accordingly, when t falls within the above-mentioned range, the balance between cooling efficiency and strength can be optimized. Moreover, since excessive air need not be introduced from the perforation 9, the present invention also exerts the effects of enabling efficient cooling of an aerosol without reducing a smoking flavor. In this view, t is preferably 2.5 to 3.5 mm.

25 **[0014]** From a viewpoint of suddenly changing the flow of the mixed stream at the joined face O as a boundary, d/D is preferably 0.4 to 0.7 and more preferably 0.5 to 0.7 where d is the inner diameter of the member 4 and D is the inner diameter of the cooling segment 3. When d/D falls within these ranges, it is possible to change the flow of the mixed stream from a laminar flow to a turbulent flow at the joined face O as a boundary. The inner diameter d is not limited but is typically and preferably 2.8 to 4.8 mm

30 **[0015]** The heat-not-burn smoking article of the present invention may be provided, downstream of the member 4, with a filter segment or other members. Accordingly, the distance from the mouth end to the center of the perforation 9 varies depending on the size of a member to be disposed downstream. In an embodiment, the distance is preferably 17 to 19 mm.

35 **[0016]** The member 4 is preferably a center hole segment, and a filter segment is preferably disposed downstream of the member 4. Fig. 2 illustrates a preferable embodiment of the heat-not-burn smoking article of the present invention.

[0017] In Fig. 2, 20 is a heat-not-burn smoking article, 1 is a tobacco-containing segment, and 2 is a mouthpiece segment. The mouthpiece segment 2 includes a cooling segment 3, a center hole segment 4' as the member, and a filter segment 5. During smoking, the tobacco-containing segment 1 is heated and inhalation takes place at the end of the filter segment 5.

40 **[0018]** The tobacco-containing segment 1 includes a tobacco filler 6 containing tobacco and an aerosol former; and a tubular wrapper 7 that covers the tobacco filler 6. The tobacco filler 6 may further contain a volatile flavor component and/or water. The size of tobacco used as a filler or a preparation method therefor is not limited. For example, dry tobacco leaves shredded into a width of 0.8 to 1.2 mm may be used. In this case, the shreds have a length of about 5 to 20 mm. Moreover, those prepared by uniformly pulverizing dry tobacco leaves into an average particle size of about 20 to 200 μm , forming into sheets, and shredding the sheets into a width of 0.8 to 1.2 mm may also be used. In this case, the shreds have a length of about 5 to 20 mm. Further, the above-mentioned formed sheets may be gathered without shredding and used as a filler. Furthermore, a plurality of cylindrical sheets may be arranged concentrically. In either case of using dry tobacco leaves as shreds or as sheets formed after uniform pulverization, various types of tobacco may be employed for a tobacco filler. Flue-cured, burley, oriental, and domestic, regardless of *Nicotiana tabacum* varieties or *Nicotiana rustica* varieties, may be blended as appropriate for an intended taste and used. The details of the varieties of tobacco are disclosed in "Tobacco no Jiten (Dictionary of Tobacco), Tobacco Academic Studies Center, March 31, 2009."

50 **[0019]** There are a plurality of conventional methods for pulverizing tobacco and forming into uniform sheets. Such sheets include a sheet made by a papermaking process; a cast sheet made by uniformly mixing with a suitable solvent, such as water, thinly casting the resulting uniform mixture on a metal sheet or a metal sheet belt, and drying; and a rolled sheet formed by extruding a uniform mixture with a suitable solvent, such as water, into a sheet shape. The details of the types of uniform sheets are disclosed in "Tobacco no Jiten (Dictionary of Tobacco), Tobacco Academic Studies Center, March 31, 2009."

[0020] The filling density of the tobacco filler 6 is not particularly limited but is typically 250 mg/cm³ or more, preferably 320 mg/cm³ or more and typically 520 mg/cm³ or less, preferably 420 mg/cm³ or less from a viewpoint of ensuring the performance of the heat-not-burn smoking article 20 and imparting a satisfactory smoking flavor. Specifically, in the case of the tobacco-containing segment 1 of 22 mm in circumference and 20 mm in length, the content range of the tobacco filler 6 in the tobacco-containing segment 1 may be 200 to 450 mg and is preferably 280 to 400 mg per tobacco-containing segment 1.

[0021] The aerosol former is a material that can generate an aerosol upon heating. Examples include, but are not particularly limited to, glycerol, propylene glycol (PG), triethyl citrate (TEC), triacetin, and 1,3-butanediol. These may be used alone or in combination.

[0022] The volatile flavor component is not particularly limited and examples include, from a viewpoint of imparting a satisfactory smoking flavor, acetanisole, acetophenone, acetylpyrazine, 2-acetylthiazole, 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, cinnamic acid, cinnamyl alcohol, cinnamyl cinnamate, citronella oil, DL-citronellol, clary sage extract, cocoa, coffee, cognac oil, coriander oil, cuminaldehyde, davana oil, δ -decalactone, γ -decalactone, decanoic acid, dill 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 isovalerate, ethyl lactate, ethyl laurate, ethyl levulinate, ethyl maltol, ethyl octanoate, ethyl oleate, ethyl palmitate, ethyl phenylacetate, 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, fenugreek 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 phenylacetate, honey, 4-hydroxy-3-pentenoic acid γ -lactone, 4-hydroxy-4-(3-hydroxy-1-butenyl)-3,5,5-trimethyl-2-cyclohexen-1-one, 4-(p-hydroxyphenyl)-2-butanone, 4-hydroxyundecanoic acid sodium salt, immortelle absolute, β -ionone, isoamyl acetate, isoamyl butyrate, isoamyl phenylacetate, isobutyl acetate, isobutyl phenylacetate, jasmine absolute, kola nut tincture, labdanum oil, terpeneless lemon oil, licorice extract, linalool, linalyl acetate, lovage root oil, maltol, maple syrup, menthol, menthone, L-menthyl acetate, p-methoxybenzaldehyde, methyl 2-pyrrolyl ketone, methyl anthranilate, methyl phenylacetate, methyl salicylate, 4'-methylacetophenone, methyl cyclopentenolone, 3-methylvaleric acid, mimosa absolute, molasses, myristic acid, nerol, nerolidol, γ -nonalactone, nutmeg oil, δ -octalactone, octanal, octanoic acid, orange flower oil, orange oil, oris root oil, palmitic acid, ω -pentadecalactone, peppermint oil, petitgrain Paraguay oil, phenethyl alcohol, phenethyl phenylacetate, phenylacetic acid, piperonal, plum extract, propenylguaethol, propyl acetate, 3-propylideneephthalide, 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-13-oxatricyclo[8.3.0.0.(4.9)]tridecane, 2,3,5,6-tetramethylpyrazine, thyme oil, tomato extract, 2-tridecanone, triethyl citrate, 4-(2,6,6-trimethylcyclohex-1-enyl)but-2-en-4-one, 2,6,6-trimethylcyclohex-2-ene-1,4-dione, 4-(2,6,6-trimethylcyclohexa-1,3-dienyl)but-2-en-4-one, 2,3,5-trimethylpyrazine, γ -undecalactone, γ -valerolactone, vanilla extract, vanillin, veratraldehyde, violet leaf absolute, and extracts of tobacco plants (tobacco leaf, tobacco stem, tobacco flower, tobacco root, and tobacco seed). Among these, menthol is particularly preferable. These volatile flavor components may be used alone or in combination.

[0023] The content of an aerosol former in the tobacco filler 6 is not particularly limited but is typically 5 to 50 mass% and preferably 10 to 20 mass% from a viewpoint of generating an aerosol sufficiently and imparting a satisfactory smoking flavor. When the tobacco filler 6 contains a volatile flavor component, the content of the volatile flavor component in the tobacco filler is not particularly limited but is, from a viewpoint of imparting a satisfactory smoking flavor, typically 10,000 ppm or more, preferably 20,000 ppm or more, more preferably 25,000 ppm or more and typically 50,000 ppm or less, preferably 40,000 ppm or less, and more preferably 33,000 ppm or less based on the mass of the tobacco filler.

[0024] A method of packing the tobacco filler 6 within the wrapper 7 is not particularly limited. For example, the tobacco filler 6 may be wrapped in the wrapper 7 or the tubular wrapper 7 may be filled with the tobacco filler 6. When the shape of tobacco has a longitudinal direction as in a rectangle, tobacco may be packed with the longitudinal direction randomly aligned within the wrapper 7 or may be packed with the longitudinal direction aligned with the axial direction or the direction perpendicular to the axial direction of the tobacco-containing segment 1. A tobacco component, an aerosol former, and water contained in the tobacco filler 6 are vaporized by heating the tobacco-containing segment 1 and moved to the mouthpiece segment 2 through inhalation.

[0025] The cooling segment 3 comprises a tubular member 8. The tubular member 8 may be a paper tube of cylindrically processed cardboard, for example. The tubular member 8 and a mouthpiece lining paper 15 described hereinafter are provided with a perforation 9 passing therethrough. Through the perforation 9, air is introduced into the cooling segment 3 from the outside during inhalation. Consequently, a vaporized aerosol component generated through heating of the tobacco-containing segment 1 comes into contact with external air and liquefies due to the lowering temperature, thereby

forming an aerosol. The size (diameter) of the perforation 9 is not particularly limited and may be 0.5 to 1.5 mm, for example. The number of the perforation 9 is also not particularly limited and may be one or two or more. For example, a plurality of perforations 9 may be provided on the perimeter of the cooling segment 3. The amount of external air introduced from the perforation(s) 9 is preferably 85 volume% or less and more preferably 80 volume% or less based on the total volume of gas inhaled by a user. The lower limit is preferably 55 volume% or more and more preferably 60 volume% or more. When the proportion of the external air falls within these ranges, it is possible to satisfactorily suppress reduction in smoking flavor due to dilution with external air.

[0026] The center hole segment comprises a filling layer having a hollow portion and an inner plug wrapper that covers the filling layer. For example, the center hole segment 4' comprises a first filling layer 10 having a hollow portion and a first inner plug wrapper 11 that covers the first filling layer 10. The center hole segment 4' also acts to increase the strength of the mouthpiece segment 2. The first filling layer 10 may be, for example, a hollow rod formed by hardening highly densely packed cellulose acetate fibers added with 6 to 20 mass%, based on the mass of cellulose acetate, of a plasticizer including triacetin. Since the first filling layer 10 has a high filling density of fibers, air and an aerosol flow only through the hollow portion and hardly flow within the first filling layer 10 during inhalation. Since the first filling layer 10 inside the center hole segment 4' is a fiber-filled layer, a user rarely feels odd by touch from the outside during use. The center hole segment 4' is preferably wrapped further in an outer plug wrapper 14. As illustrated in Fig. 2, the outer plug wrapper 14 may be wrapped around the center hole segment 4' and the filter segment 5 simultaneously.

[0027] The configuration of a filter segment in the present invention is not particularly limited. For example, as the filter segment 5 in Fig. 2, a filter segment comprises a second filling layer 12 and a second inner plug wrapper 13 that covers the second filling layer 12. Since the second filling layer 12 is present all the way up to the mouth end in the filter segment 5, the end has an appearance similar to a common combustion smoking article. At least either the inner plug wrapper 13 or the outer plug wrapper 14 is preferably a paper having a basis weight of 40 g/m² or more and a thickness of 100 μm or more. Such paper exhibits satisfactory thermal insulation due to the relatively high basis weight and large thickness. Consequently, a smoker feels a temperature further suitable for smoking by the lips during smoking. In this view, both the inner plug wrapper and the outer plug wrapper are preferably made of the above-mentioned paper. The basis weight is more preferably 60 g/m² or more. Meanwhile, the upper limit is not limited but is preferably 150 g/m² or less and more preferably 130 g/m² or less. The thickness is more preferably 110 μm or more. Meanwhile, the upper limit is not limited but is preferably 150 μm or less and more preferably 130 μm or less. When the basis weight and the thickness fall within these ranges, the manufacture of a heat-not-burn smoking article also becomes easy. To further enhance thermal insulation efficiency, either or both of the inner plug wrapper 11 and the outer plug wrapper 14, which constitute the center hole segment 4, are also preferably made of the above-mentioned paper. The center hole segment 4 and the filter segment 5 may be connected with one outer plug wrapper 14.

[0028] The perimeter length of the filter segment 5 is not particularly limited but is preferably 16 to 25 mm, more preferably 20 to 24 mm, and further preferably 21 to 23 mm. The length of the filter segment 5 in the axial direction (horizontal direction in Fig. 2) is not particularly limited but is preferably 3 to 15 mm and more preferably 5 to 10 mm. The cross-sectional shape of the filter segment 5 is not particularly limited and may be circular, elliptic, or polygonal, for example.

[0029] As mentioned above, the center hole segment 4' and the filter segment 5 may be connected with one outer plug wrapper 14. The tobacco-containing segment 1, the cooling segment 3, and the joined center hole segment 4 and filter segment 5 are connected with a mouthpiece lining paper 15. These three segments may be connected, for example, by applying a glue, such as a vinyl acetate-based glue, to the inner surface of the mouthpiece lining paper 15 and wrapping the lining paper around these segments.

[0030] The length of the heat-not-burn smoking article according to the present invention in the axial direction, in other words, the horizontal direction in Fig. 2 is not particularly limited but is preferably 40 mm to 90 mm, more preferably 50 mm to 75 mm, and further preferably 50 mm to 60 mm. The perimeter length of the heat-not-burn smoking article is preferably 16 mm to 25 mm, more preferably 20 mm to 24 mm, and further preferably 21 mm to 23 mm. In an exemplary embodiment, the length of the tobacco-containing segment 1 is 20 mm, the length of the cooling segment 3 is 20 mm, the length of the center hole segment 4 is 8 mm, and the length of the filter segment 5 is 7 mm. Here, the length of the filter segment 1 can be selected within the range of 4 to 10 mm. The length is selected such that the filter segment 1 has a resistance to draw per segment of 15 to 60 mmH₂O/seg. The lengths of these individual segments may be changed appropriately depending on manufacturing feasibility, required quality, and so forth. Further, even an article in which only a filter segment is disposed downstream of a cooling segment without a center hole segment can also act as a heat-not-burn smoking article.

[Heat-not-burn Smoking System]

[0031] A heat-not-burn smoking system according to the present invention includes the heat-not-burn smoking article according to the present invention and a heating device for heating a tobacco-containing segment. Since the heat-not-

burn smoking article according to the present invention is included, the heat-not-burn smoking system allows sufficient cooling of a vaporized aerosol component without destroying a smoking flavor. The heat-not-burn smoking system according to the present invention is not particularly limited provided that the heat-not-burn smoking article according to the present invention and the heating device are included and may have other configurations.

5 **[0032]** Fig. 3 illustrates an exemplary heat-not-burn smoking system according to the present invention. The heat-not-burn smoking system illustrated in Fig. 3 includes the heat-not-burn smoking article 20 according to the present invention and a heating device 21 for heating a tobacco-containing segment of the heat-not-burn smoking article 20 from the outside. Fig. 3 (a) illustrates the state before inserting the heat-not-burn smoking article 20 into the heating device 21, and Fig. 3 (b) illustrates the state of heating the heat-not-burn smoking article 20 inserted into the heating device 21. 10 The heating device 21 illustrated in Fig. 3 includes a body 22, a heater 23, a metal tube 24, a battery unit 25, and a control unit 26. The body 22 has a tubular recess 27, and the heater 23 and the metal tube 24 are arranged on the inner side surface of the recess 27 at a position corresponding to the tobacco-containing segment of the heat-not-burn smoking article 20 inserted into the recess 27. The heater 23 may be an electric resistance heater, and heating by the heater 23 is performed by supplying power from the battery unit 25 in accordance with instructions from the control unit 26, which 15 controls temperature. Heat generated by the heater 23 is transferred to the tobacco-containing segment of the heat-not-burn smoking article 20 through the metal tube 24 having a high thermal conductivity. In the schematic view of Fig. 3 (b), a gap exists between the outer perimeter of the heat-not-burn smoking article 20 and the inner perimeter of the metal tube 24. However, such a gap between the outer perimeter of the heat-not-burn smoking article 20 and the inner perimeter of the metal tube 24 is actually and desirably absent for the purpose of efficient heat transfer. Although the heating device 21 heats the tobacco-containing segment of the heat-not-burn smoking article 20 from the outside, the heating device may be a heating device for heating from the inside. 20

[0033] The heating temperature by the heating device is not particularly limited but is preferably 400°C or lower, more preferably 150°C or higher and 400°C or lower, and further preferably 200°C or higher and 350°C or lower. Herein, the heating temperature means the temperature of the heater in the heating device. 25

EXAMPLES

[Examples 1 to 3]

30 **[0034]** Heat-not-burn smoking articles of 55 mm in total length each comprising a tobacco-containing segment, a cooling segment, a center hole segment, and a filter segment joined in this order as illustrated in Fig. 2 were prepared. The dimensions of each segment are shown in Table 1.

[Table 1]

35 **[0035]**

Table 1 Dimensions of Each Segment

	Tobacco-containing segment	Cooling segment	Center hole segment	Filter segment
Length (mm)	20	20	8	7
Outer diameter (mm)	7.0	6.9	6.9	6.9
Inner diameter (mm)	-	6.5	4.0	-

40 **[0036]** A row of 15 perforations was provided around the outer perimeter of the cooling segment. The perforations were placed at regular intervals to satisfy Vf of about 70 volume%. Herein, Vf is defined as a ratio of the amount of external air introduced from the perforations 9 to the total amount of gas inhaled by a user. The distance from the joined face between the cooling segment and the center hole segment to the perforations was set to 2 to 4 mm 45

50 **[0037]** The filter segment of each heat-not-burn smoking article was connected to a smoking machine through a tube. A thermocouple was inserted from the outer perimeter portion of the tube such that the tip of the thermocouple was placed at a position 5 mm from the mouth end on the central axis of the heat-not-burn smoking article. The heat-not-burn smoking article was heated, in its tobacco-containing segment, by a heater and inhaled by the smoking machine. Heating by the heater was performed by holding at 230°C for 50 seconds, holding at 200°C for 130 seconds, and then 55 holding at 170°C. The inhalation was performed as 5 puffs in total at 55 mL/puff for 2 seconds (30 second interval for each puff, i.e. 2 seconds for inhaling and 28 seconds for waiting) in accordance with the CIR (Canadian intense smoking regimen). A maximum temperature among temperatures in the respective puffs was recorded as a tip temperature. The

results are shown in Table 2.

[Table 2]

5 **[0038]**

Table 2 Results

10

15

		Ex. 1	Ex. 2	Ex. 3
Tip temperature (°C)		52.5	50.5	47
Position of perforations (mm)		4	2	2
Inner plug wrapper*	Basis weight (g/m ²)	24	24	52
	Thickness (μm)	32	32	110
Outer plug wrapper*	Basis weight (g/m ²)	27	27	52
	Thickness (μm)	40	40	110
*Wrapper for the filter segment and the center hole segment				

20

[0039] In these Examples, smoking was possible at a suitable sensed temperature without destroying a smoking flavor.

REFERENCE SIGNS LIST

25 **[0040]**

- 1 Tobacco-containing segment
- 2 Mouthpiece segment
- 3 Cooling segment
- 30 4 Tubular member having small inner diameter
- 4' Center hole segment
- 5 Filter segment
- 6 Tobacco filler
- 7 Wrapper
- 35 8 Tubular member
- 9 Perforation
- 10 First filling layer
- 11 First inner plug wrapper
- 12 Second filling layer
- 40 13 Second inner plug wrapper
- 14 Outer plug wrapper
- 15 Mouthpiece lining paper
- 20 Heat-not-burn smoking article
- 21 Heating device
- 45 22 Body
- 23 Heater
- 24 Metal tube
- 25 Battery unit
- 26 Control unit
- 50 27 Recess

Claims

55 1. A heat-not-burn smoking article comprising:

- a tobacco-containing segment containing tobacco and an aerosol former;
- a tubular cooling segment having one or more perforations on the perimeter; and

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a tubular member having an inner diameter smaller than the cooling segment, wherein the cooling segment is joined at the end in the mouth end direction to the member; and the perforations are provided at a position 2 to 4 mm from the joined face.

- 5 **2.** The heat-not-burn smoking article according to Claim 1, wherein the member is a center hole segment.
- 3.** The heat-not-burn smoking article according to Claim 1 or 2, further comprising a filter segment downstream of the member in the mouth end direction.
- 10 **4.** The heat-not-burn smoking article according to any of Claims 1 to 3, wherein a plurality of the perforations are provided on the perimeter of the cooling segment.
- 5.** The heat-not-burn smoking article according to any of Claims 1 to 4, wherein the perforations are provided at a position 17 to 19 mm from the mouth end.
- 15 **6.** The heat-not-burn smoking article according to any of Claims 2 to 5, wherein
- the filter segment includes a filler, an inner plug wrapper that is wrapped around the filler, and an outer plug wrapper that is wrapped around the inner plug wrapper; and
- 20 at least either the inner plug wrapper or the outer plug wrapper is a paper having a basis weight of 40 g/m² or more and a thickness of 100 μm or more.
- 7.** A heat-not-burn smoking system comprising
- 25 the heat-not-burn smoking article according to any of Claims 1 to 6; and
- a heating device for heating the tobacco-containing segment.
- 8.** The heat-not-burn smoking system according to Claim 7, wherein a heating temperature by the heating device is 150°C to 400°C.
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Fig. 1

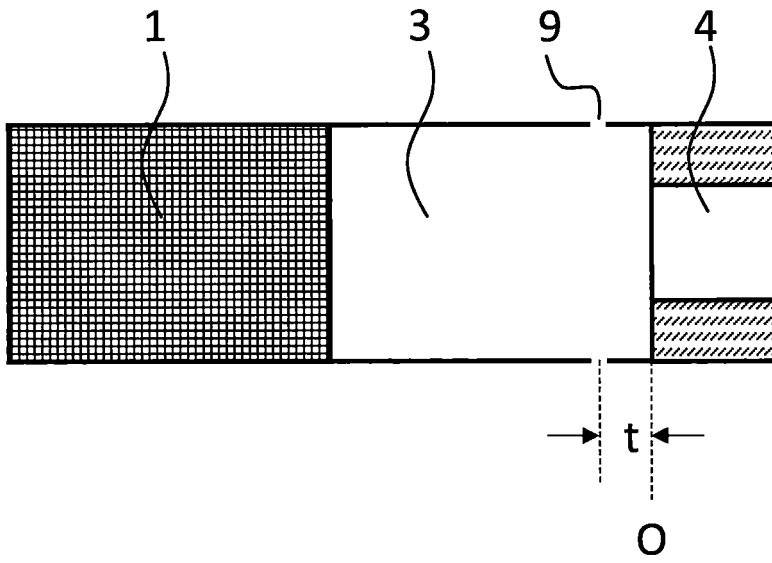


Fig. 2

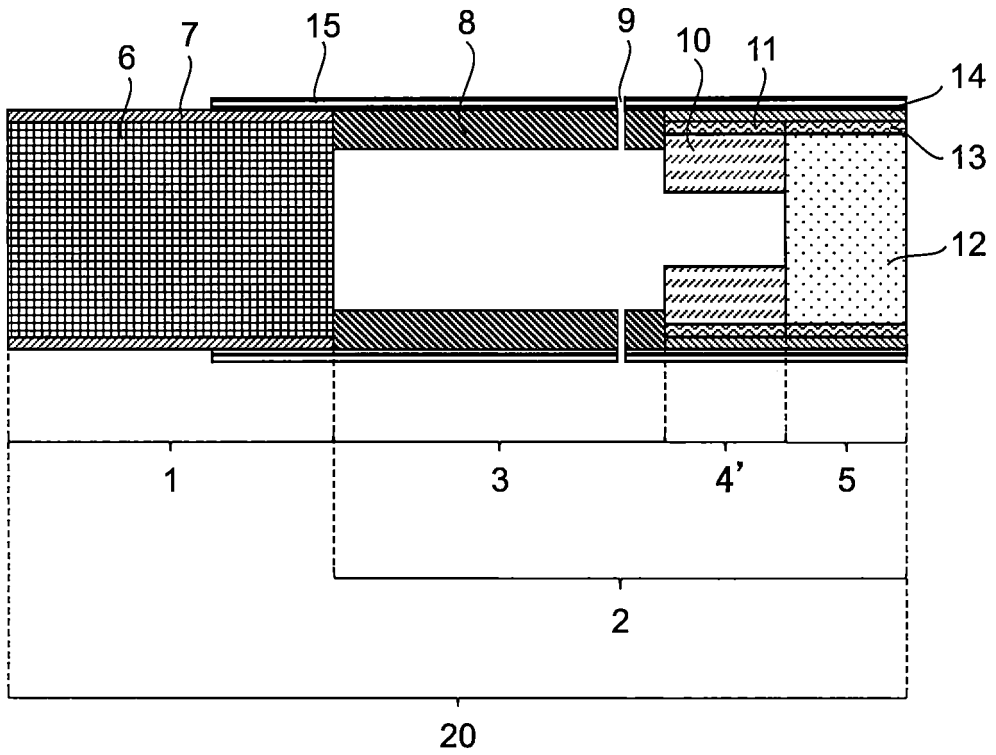
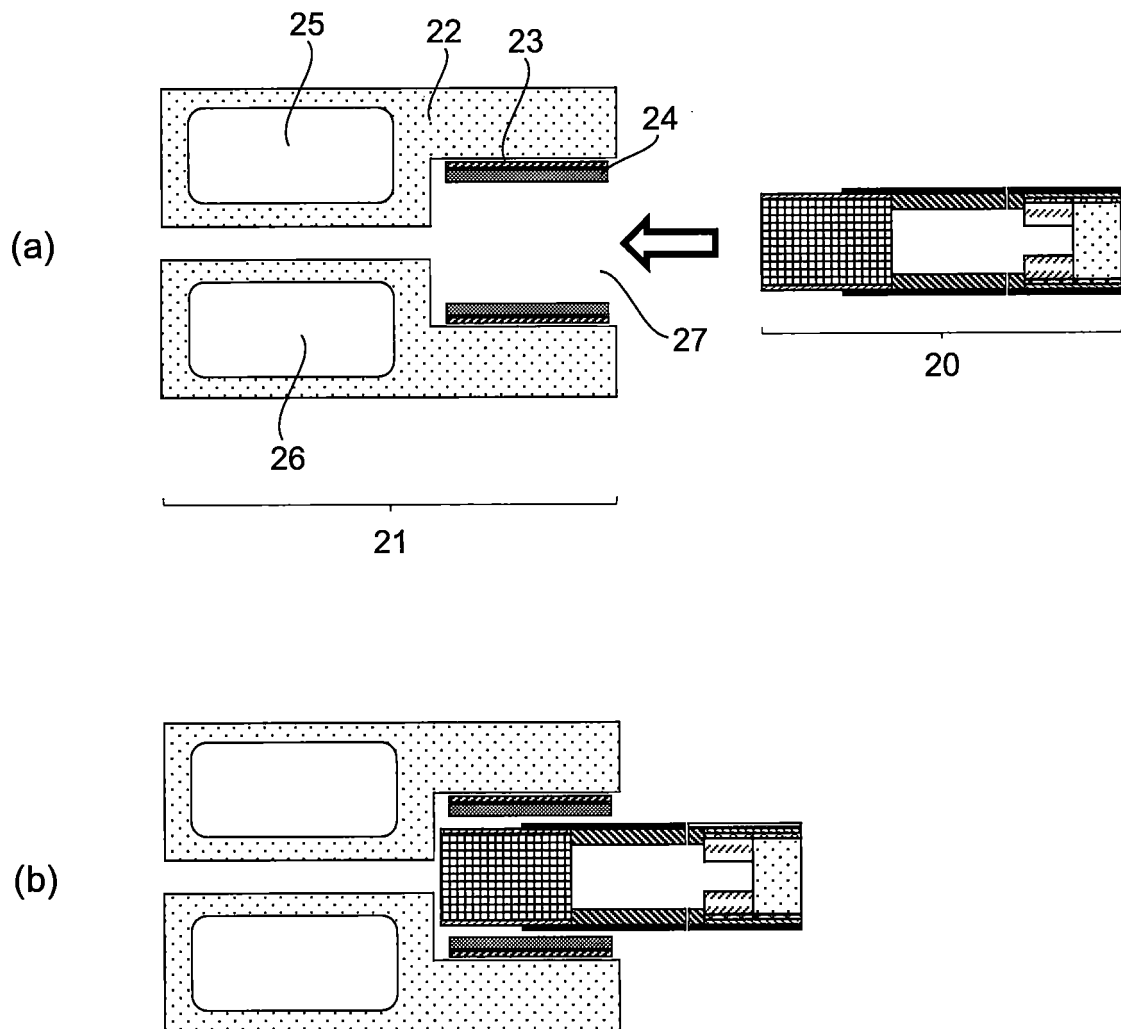


Fig. 3



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2019/044484

A. CLASSIFICATION OF SUBJECT MATTER

Int.Cl. A24F47/00 (2006.01) i, A24D3/04 (2006.01) i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Int.Cl. A24F47/00, A24D3/04

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

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2016-503307 A (PHILIP MORRIS PRODUCTS S.A.) 04 February 2016, paragraphs [0073]-[0085], fig. 1	1-8
Y	JP 11-507234 A (PHILIP MORRIS PRODUCTS INC.) 29 June 1999, fig. 2	1-8
Y	JP 2008-525009 A (PHILIP MORRIS PRODUCTS S.A.) 17 July 2008, fig. 1C	1-8

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

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"&" document member of the same patent family

Date of the actual completion of the international search

16.12.2019

Date of mailing of the international search report

24.12.2019

Name and mailing address of the ISA/

Japan Patent Office
3-4-3, Kasumigaseki, Chiyoda-ku,
Tokyo 100-8915, Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2019/044484

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2017/198837 A1 (BRITISH AMERICAN TOBACCO (INVESTMENTS) LIMITED) 23 November 2017, column 8, line 30 to column 9, line 6, fig. 3, 4	1-8
Y	JP 2017-506879 A (PHILIP MORRIS PRODUCTS S.A.) 16 March 2017, paragraphs [0003], [0021], [0024], [0026], [0028], [0047]	1-8

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No. PCT/JP2019/044484
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JP 11-507234 A	29 June 1999	US 5666976 A fig. 2 WO 1996/039880 A1
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WO 2017/198837 A1	23 November 2017	JP 2019-523639 A US 2019/0116874 A1 EP 3457874 A1 KR 10-2018-0090897 A CN 109414058 A
JP 2017-506879 A	16 March 2017	US 2017/0231269 A1 paragraphs [0003], [0021], [0024], [0026], [0028], [0047] WO 2016/063181 A1 EP 3086670 A1 KR 10-2016-0082262 A CN 105873460 A

REFERENCES CITED IN THE DESCRIPTION

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