(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 957 197 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
23.02.2022 Bulletin 2022/08

(21) Application number: **19924890.7**

(22) Date of filing: **18.04.2019**

(51) International Patent Classification (IPC):
A24F 47/00 *(2020.01)*

(52) Cooperative Patent Classification (CPC):
A24F 47/00

(86) International application number:
PCT/JP2019/016711

(87) International publication number:
WO 2020/213144 (22.10.2020 Gazette 2020/43)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(71) Applicant: **Japan Tobacco Inc.**
Tokyo 105-6927 (JP)

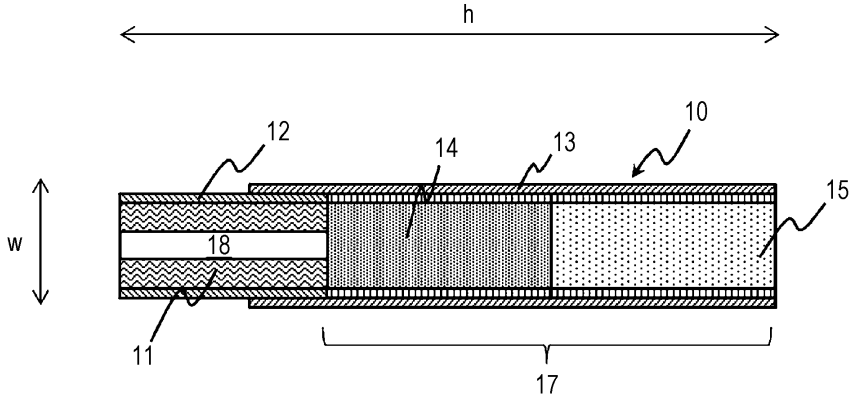
(72) Inventors:
- **YAMAMICHI, Keiji**
  Tokyo 130-8603 (JP)
- **HARUKI, Keisuke**
  Tokyo 130-8603 (JP)
- **SENDO, Makoto**
  Tokyo 130-8603 (JP)
- **TOKITSU, Naohiro**
  Tokyo 130-8603 (JP)
- **UEMATSU, Hiromi**
  Tokyo 130-8603 (JP)
- **MANABE, Tetsuya**
  Tokyo 130-8603 (JP)

(74) Representative: **Hoffmann Eitle**
Patent- und Rechtsanwälte PartmbB
Arabellastraße 30
81925 München (DE)

(54) HEAT-NOT-BURN TOBACCO PRODUCT AND ELECTRICALLY HEATED TOBACCO PRODUCT

(57) Provided is a heat-not-burn tobacco product having a tobacco rod in which a tobacco filling material comprising cut tobacco and an aerosol generating material is wrapped with rolling paper. The tobacco rod has an opening part that is open on the distal end surface side of the tobacco rod and extends in the axial direction of the tobacco rod, and a coating agent is added on at least the surface of the rolling paper in contact with the filling material.

FIG. 2



EP 3 957 197 A1

Description

[Technical Field]

[0001] The present invention relates to a heat-not-burn tobacco product and an electrically heated tobacco product.

[Background Art]

[0002] An electrically heated tobacco product including an electrical heating device and a heat-not-burn tobacco product has been developed. The electrical heating device includes a heater member, a battery unit serving as a power source for the heater member, and a control unit for controlling the heater member. The heat-not-burn tobacco product is inserted in such a manner as to come into contact with the heater member. The heat-not-burn tobacco product includes a tobacco rod including tobacco shreds and an aerosol-source material that are wrapped with a wrapping paper. The heater member typically has a planar or circular cylindrical shape.

[0003] Before use of the electrically heated tobacco product, the heat-not-burn tobacco product is inserted into the electrical heating device in such a manner that the heater member is stuck into the heat-not-burn tobacco product. By causing the heater member to generate heat, the tobacco rod is internally heated by heat originating at a point in contact with the heater member, so that a flavor smoke taste component as well as the aerosol-source material contained in the tobacco rod is delivered to the user.

[Summary of Invention]

[Technical Problem]

[0004] As described above, the tobacco rod constituting the heat-not-burn tobacco product contains the aerosol-source material. The aerosol-source material is typically composed of a liquid component. Therefore, when a wrapping paper used for wrapping the tobacco rod in conventional cigarettes is used as the wrapping paper in the heat-not-burn tobacco product, the aerosol-source material may permeate the wrapping paper, create stains, and damage the appearance. Additionally, if the aerosol-source material permeates the wrapping paper, heat from the heater member is not easily transferred to part of the tobacco shreds in the tobacco rod located adjacent to the wrapping paper distant from the heater member. As a result, the aerosol-source material permeating the wrapping paper may not vaporize and may remain in the wrapping paper after use. This may make it difficult to deliver a sufficient amount of aerosol to the user.

[0005] As described above, before use of the electrically heated tobacco product, the user inserts the heat-not-burn tobacco product into the electrical heating device to bring it into contact with the heater member. When the heater member is stuck into the tobacco rod of the heat-not-burn tobacco product, the tobacco shreds contained in the tobacco rod are subjected to radial pressure from the heater member or in other words, subjected to pressure in a direction in which the tobacco shreds are pressed against the wrapping paper with which to wrap the tobacco rod. The tobacco shreds and the aerosol-source material contained in the tobacco rod are thus pressed against the wrapping paper. This makes it more likely that the aerosol-source material will permeate the wrapping paper. The degree to which the tobacco shreds are pressed against the wrapping paper around the tobacco rod varies depending on how the user handles the tobacco rod to allow the heater member to be stuck into the tobacco rod. If the tobacco shreds are pressed hard against the wrapping paper, the amount of the aerosol-source material permeating the wrapping paper will increase.

[0006] Accordingly, there is demand for heat-not-burn tobacco products that do not create such situations and can prevent the aerosol-source material from permeating the wrapping paper, maintain good appearance, and deliver a sufficient amount of aerosol during heating.

[0007] The present invention aims to provide a heat-not-burn tobacco product that can prevent the aerosol-source material from permeating the wrapping paper, maintain good appearance, and deliver a sufficient amount of aerosol during heating.

[Solution to Problem]

[0008] To solve the problems described above, the present inventors devised a technique in which a filler (also referred to as a tobacco filler) containing tobacco shreds forming a tobacco rod has a predetermined cavity in a region into which a heater member of an electrical heating device is stuck. Typically, a tobacco rod of a heat-not-burn tobacco product is composed of a tobacco filler and a wrapping paper, and the tobacco filler is formed by tobacco shreds substantially uniformly filled therein.

[0009] In the present invention, however, the tobacco filler is not formed by tobacco shreds substantially uniformly filled therein. The filling of the tobacco filler was modified to reduce resistance to insertion of the heater member, and also to allow the heater member to be stuck into the tobacco rod at a predetermined position regardless of how the user handled the tobacco rod to bring in the heater member. Specifically, a cavity was provided which opens at a distal end of the tobacco rod.

[0010] It was thus found that with this configuration, it is possible to minimize the possibility that the tobacco shreds and the aerosol-source material forming the tobacco filler will be pressed against the wrapping paper by insertion of the heat-not-burn tobacco product into the electrical heating device, and thus to reduce the chance of permeation of the aerosol-source material into the wrapping paper.

[0011] The present inventors also focused on the wrapping paper with which to wrap the tobacco filler containing the tobacco shreds forming the heat-not-burn tobacco product. Specifically, the present inventors devised a technique in which, of two surfaces of the wrapping paper, at least a surface in contact with the tobacco filler (also simply referred to as a filler contact surface) has a coating agent added thereto. It was found that by applying the coating agent to at least the filler contact surface of the wrapping paper, even when the aerosol-source material contained in the tobacco filler comes into contact with the wrapping paper, the aerosol-source material is prevented from permeating the wrapping paper and thus from leaking out of the tobacco rod.

[0012] The problems to be solved by the present invention are specific to heat-not-burn tobacco products heated by electrical heating devices, and have not occurred in conventional smoking articles (e.g., cigarettes).

[0013] The present invention is summarized below.

[1] A heat-not-bum tobacco product includes a tobacco rod in which a tobacco filler containing tobacco shreds and an aerosol-source material is wrapped with a wrapping paper which wraps the tobacco filler. The tobacco rod has therein a cavity that is open at a distal end of the tobacco rod and extends in an axial direction of the tobacco rod. A coating agent is added at least to a surface of the wrapping paper in contact with the tobacco filler.

[2] In the heat-not-burn tobacco product according to [1], the cavity is a non-penetrating recess, and the non-penetrating recess is in the shape of a non-penetrating circular cylinder, or a circular cone or a truncated circular cone with a diameter reduced from the distal end toward a proximal end of the tobacco rod.

[3] In the heat-not-burn tobacco product according to [2], the recess has a hardened layer therearound.

[4] In the heat-not-burn tobacco product according to [1], the filler is composed of a plurality of tobacco sheets. The plurality of tobacco sheets extend in a longitudinal direction and are concentrically arranged around an axis in the longitudinal direction. A through-hole extending in the longitudinal direction is provided as the cavity between the axis in the longitudinal direction and an innermost tobacco sheet.

[5] The heat-not-burn tobacco product according to any one of [1] to [4] further includes a mouthpiece portion constituting an end portion opposite the tobacco rod.

[6] In the heat-not-burn tobacco product according to any one of [1] to [5], the coating agent contains nitrocellulose.

[7] An electrically heated tobacco product includes an electrical heating device and the heat-not-burn tobacco product according to any one of [1] to [6]. The electrical heating device includes a heater member, a battery unit serving as a power source for the heater member, and a control unit for controlling the heater member. The heat-not-burn tobacco product is inserted in such a manner as to come into contact with the heater member.

[Effects of Invention]

[0014] The present invention provides a heat-not-burn tobacco product that can prevent the aerosol-source material from permeating the wrapping paper, maintain good appearance, and deliver a sufficient amount of aerosol during heating.

[Brief Description of the Drawings]

[0015]

[Fig. 1] Fig. 1 is a schematic diagram illustrating an embodiment of a heat-not-burn tobacco product.

[Fig. 2] Fig. 2 is a schematic diagram illustrating a modification of the embodiment of the heat-not-burn tobacco product illustrated in Fig. 1.

[Fig. 3] Fig. 3 is an enlarged schematic diagram illustrating another modification of the embodiment of the heat-not-burn tobacco product illustrated in Fig. 1.

[Fig. 4] Fig. 4 is a schematic diagram illustrating an embodiment of an electrically heated tobacco product.

[Fig. 5] Fig. 5 is a diagram showing the results of measurement of the amount of aerosol (or glycerin) delivered during a use test of heat-not-burn tobacco products prepared in experimental examples 1 to 3.

[Description of Embodiments]

[0016] Although the present invention will be described in detail by showing embodiments and examples, the present invention is not limited to the embodiments and examples described below. The present invention may be implemented in any modified form within the scope of the present invention.

<Wrapping Paper for Heat-Not-Burn Tobacco Product>

[0017] In the present specification, "wrapping paper for heat-not-burn tobacco product" refers to a wrapping paper used in a heat-not-burn tobacco product described below, and may hereinafter be simply referred to as a wrapping paper according to an embodiment of the present invention. For applications of the wrapping paper according to the embodiment of the present invention, the wrapping paper "for heat-not-burn tobacco product" means that the wrapping paper is used to wrap a tobacco filler containing tobacco shreds to make a tobacco rod, or is used to wrap the outer peripheries of the tobacco rod and a component adjacent thereto to connect the tobacco rod and the adjacent component together.

[0018] Examples of the wrapping paper according to

the embodiment of the present invention include one that is composed mainly of pulp. The wrapping paper may be made from wood pulp, such as softwood pulp or hardwood pulp, or may be made by mixing, with wood pulp, any of non-wood pulps, such as flax pulp, hemp pulp, sisal pulp, and esparto typically used to make wrapping paper for smoking articles.

[0019] Types of pulp that can be used include chemical pulp, ground pulp, chemical ground pulp, and thermomechanical pulp produced by a pulping process, such as kraft pulping, acidic/neutral/alkaline sulfite pulping, or soda pulping.

[0020] In a papermaking process using, for example, a Fourdrinier paper machine, a cylinder paper machine, or a short cylinder combination paper machine, the formation of the pulp described above is adjusted to ensure uniform fiber distribution in the wrapping paper. A wet strengthening agent may be added as needed to make the wrapping paper resistant to water, or a sizing agent may be added as needed to adjust the quality of printing on the wrapping paper. Also, aids in papermaking, such as aluminum sulfate, anionic, cationic, nonionic, or amphoteric retention aids, drainage aids, and strengthening agents, and additives for papermaking, such as dyes, pH adjusters, antifoaming agents, pitch control agents, and slime control agents, may also be added.

[0021] The base paper of the wrapping paper according to the embodiment of the present invention typically has a basis weight of, for example, 20 gsm or more, and preferably 25 gsm or more. At the same time, the basis weight is typically 65 gsm or less, preferably 50 gsm or less, and more preferably 45 gsm or less.

[0022] The thickness of the wrapping paper having the characteristics described above is not limited to a particular value. For stiffness, ventilation, and ease of adjustment during papermaking, the thickness of the wrapping paper is typically 10 μm or more, preferably 20 μm or more, and more preferably 30 μm or more. At the same time, the thickness is typically 100 μm or less, preferably 75 μm or less, and more preferably 50 μm.

[0023] The wrapping paper for the heat-not-burn tobacco product is, for example, square or rectangular in shape. When the wrapping paper is used for wrapping the tobacco filler (i.e., for making a tobacco rod), for example, the wrapping paper may be about 12 mm to 70 mm long on one side and about 15 mm to 28 mm, preferably about 22 mm to 24 mm, and more preferably about 23 mm on the other side. When the tobacco filler is wrapped with the wrapping paper in a columnar shape, for example, the opposite end portions of the wrapping paper in the direction of w in Fig. 1 are pasted together, with an overlap of about 2 mm, into a columnar paper tube, in which the tobacco filler is filled. The size of the wrapping paper of a rectangular shape may be determined depending on the size of the finished tobacco rod.

[0024] When, as in the case of the tipping paper, the paper is one that is used to connect and wrap the tobacco rod and another component adjacent to the tobacco rod, for example, the paper may be 20 mm to 60 mm long on one side and 15 mm to 28 mm long on the other side.

[0025] The wrapping paper according to the embodiment of the present invention may contain a filler in addition to the pulp described above. The content of the filler may be 10% or more and less than 60%, and preferably 15% to 45%, by weight of the total weight of the wrapping paper according to the embodiment of the present invention.

[0026] In the wrapping paper according to the embodiment of the invention, the filler is preferably 15% to 45% by weight in the preferable range of the basis weight (25 gsm to 45 gsm).

[0027] The filler is preferably 15% to 45% by weight when the basis weight is 25 gsm or more and 35 gsm or less, and the filler is preferably 25% to 45% by weight when the basis weight exceeds 35 gsm and does not exceed 45 gsm.

[0028] Examples of the filler include calcium carbonate, titanium dioxide, and kaoline. To improve smoke taste and the degree of whiteness, it is preferable to use calcium carbonate.

<Coating Agent Applied to Wrapping Paper of Embodiment of Present Invention>

[0029] A coating agent is added at least to a filler contact surface of two surfaces (front and back sides) of the wrapping paper according to the embodiment of the present invention. With the coating agent added at least to the filler contact surface, the aerosol-source material contained in the tobacco filler is prevented from permeating the wrapping paper and is further prevented from vaporizing out of the tobacco rod.

[0030] The coating agent is not limited to a particular type, but is preferably a coating agent that can form a film on the surface of paper to reduce liquid permeability. Examples of the coating agent include alginic acid and its salt (e.g., sodium salt), polysaccharide such as pectin, cellulose derivatives such as ethyl cellulose, methyl cellulose, carboxymethyl cellulose, and nitrocellulose, and starches and their derivatives (e.g., ether derivatives such as carboxymethyl starch, hydroxyalkyl starch, and cationic starch, and ester derivatives such as starch acetate, starch phosphate, and starch octenylsuccinate). It is particularly preferable to use at least nitrocellulose in that it is capable of reducing liquid permeability, capable of being applied easily, and has less impact on flavor during use.

[0031] Any of the coating agents described above may be used as a material that typically constitutes 1.0% to 30.0% by weight of a water solution or ethyl acetate solution. By using an appropriate printing technique, such as gravure printing, the water solution or ethyl acetate solution, described above, can be added at least to the filler contact surface of the wrapping paper according to the embodiment of the present invention. Any known means, other than printing, may be used to apply the

coating agent to the wrapping paper according to the embodiment of the present invention.

[0032] It is preferable that the coating agent of 0.5 g/m^2 to 3.0 g/m^2 on dry weight basis be added to the surface of the wrapping paper.

[0033] More specifically, when the coating agent is a cellulose derivative, the amount of the coating agent added may be about 0.4 g/m^2 to 0.6 g/m^2, and when the coating agent is polysaccharide, the amount of the coating agent added may be about 0.9 g/m^2 to 2.5 g/m^2.

[0034] The coating agent may be added not only to the filler contact surface, but also to the surface opposite the filler contact surface. The coating agent is preferably added to the entire filler contact surface.

<Tobacco Filler>

[0035] Examples of the tobacco filler forming the tobacco rod include a tobacco filler formed by a composition containing tobacco shreds (hereinafter also referred to as a first tobacco filler), and another tobacco filler formed by a plurality of tobacco sheets described below (hereinafter also referred to as a second tobacco filler).

[0036] In the present invention, the longitudinal direction of the heat-not-burn tobacco product is the direction indicated by h in Fig. 1. Since the heat-not-burn tobacco product is rod-shaped, the longitudinal direction of the heat-not-burn tobacco product may be considered the same as the longitudinal direction of the tobacco rod. The tobacco rod of the heat-not-burn tobacco product according to the present invention preferably has a columnar shape having an aspect ratio of 1 or more. The aspect ratio is defined as follows:

$$\text{aspect ratio} = h/w,$$

where w is the width of the bottom face of a columnar body, h is the height of the columnar body, and $h \geq w$ is preferably satisfied. In the present invention, as described above, the longitudinal direction is defined as a direction indicated by h. Therefore, even in the case of $w \geq h$, the direction indicated by h is referred to as a longitudinal direction for convenience. The shape of the bottom face is not limited to a particular one and may be, for example, a polygon, a polygon with rounded corners, a circle, or an ellipse. When the bottom face is circular, the width w is the diameter, whereas when the bottom face is elliptical, the width w is the length of the major axis. When the bottom face is in the shape of a polygon or a polygon with rounded corners, the width w is the diameter of the circumscribed circle or the length of the major axis of the circumscribed ellipse. For example, in the embodiment illustrated in Fig. 1, where the bottom face is circular, the width w is the diameter of the circle. The diameter is the width w, and a length orthogonal to the width w is the height h. The height h of the tobacco filler forming the tobacco rod is preferably about 12 mm to 70 mm, and the width w is preferably about 4 mm to 9 mm

[0037] The first filler will now be described. The material of the tobacco shreds contained in the first filler is not limited to a particular one, and a known material, such as lamina or midrib, may be used. The tobacco shreds may be produced by crushing dried tobacco leaves into an average particle size of about 20 μm to 200 μm, homogenizing and processing them into a sheet (which may hereinafter be simply referred as a homogeneous sheet), and shredding the sheet. For filling the tobacco rod, the tobacco shreds preferably have a width of about 0.5 mm to 2.0 mm. When the tobacco rod is 22 mm in circumference and 20 mm in length, the content of the tobacco filler in the tobacco rod may be 200 mg/rod to 800 mg/rod and preferably 250 mg/rod to 600 mg/rod. Various types of tobacco leaves may be used to make the tobacco shreds and the homogeneous sheet. Examples of the types of tobacco leaves include flue-cured tobacco, burley tobacco, oriental tobacco, domestic tobacco, nicotiana tabacum leaves, nicotiana rustica leaves, and their mixtures. The mixtures are made by appropriately blending various types of leaves, such as those described above, to provide intended taste. Details of the types of tobacco described above are disclosed in Tabako-no-Jiten (Encyclopedia of Tobacco) by Tobacco Academic Studies Center, March 31, 2009. For production of the homogeneous sheet described above, there are a plurality of conventional methods in which tobacco leaves are crushed and processed into a homogeneous sheet. The first method involves making a sheet using a papermaking process. The second method involves mixing an appropriate solvent, such as water, into crushed tobacco leaves to form a homogeneous material, casting a thin layer of the homogeneous material over a metal plate or metal plate belt, and drying the material into a cast sheet. The third method involves mixing an appropriate solvent, such as water, into crushed tobacco leaves to form a homogeneous material, and extruding the material into a sheet form through extrusion molding to form a rolled sheet. Details of the types of the homogeneous sheet are disclosed in Tabako-no-Jiten (Encyclopedia of Tobacco) by Tobacco Academic Studies Center, March 31, 2009.

[0038] The water content of the tobacco filler may be 10% to 15%, preferably 11% to 13%, by weight of the total amount of the tobacco filler. With this water content, it is possible to reduce the occurrence of stains in the wrapping paper and achieve good machinability during tobacco rod production.

[0039] The size and preparation of the tobacco shreds contained in the first tobacco filler are not particularly limited. For example, dried tobacco leaves cut to a width of 0.5 mm to 2.0 mm may be used.

[0040] In the case of using tobacco shreds obtained by crushing a homogeneous sheet, the tobacco shreds may be produced by crushing dried tobacco leaves into an average particle size of about 20 μm to 200 μm, ho-

mogenizing and processing them into a sheet, and shredding the sheet into a width of 0.5 mm to 2.0 mm

[0041] The first tobacco filler contains an aerosol-source material for generating aerosol smoke. The aerosol-source material is not limited to a particular type, and may be selected from substances extracted from various natural products and/or constituents of the substances depending on the application. Examples of the aerosol-source material may include glycerin, propylene glycol, triacetin, 1,3-butanediol, and their mixtures.

[0042] The content of the aerosol-source material in the first tobacco filler is not limited to a particular value. To generate a sufficient amount of aerosol and ensure good smoke taste, the aerosol-source material may be typically 5% or more and preferably 10% or more by weight of the total amount of the tobacco filler, and may be typically 50% or less and preferably 15% to 25% by weight of the total amount of the tobacco filler.

[0043] The first tobacco filler may contain flavors. The flavors are not limited to particular types. Examples of the flavors for providing good smoke taste include acetanisole, acetophenone, acetylpyradine, 2-acetylthiazole, alfalfa extract, amyl alcohol, amyl butyrate, trans-anethole, star anise oil, apple juice, Peru balsam oil, yellow-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, cumin aldehyde, 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, 2-methyl ethyl butyrate, 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 valerianate, 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, eucalyptole, fenugreek absolute, genet absolute, gentian root infusion, geraniol, geranyl acetate, grape juice, guaiacol, guava extract, γ-hepta-lactone, γ-hexylactone, hexanoic acid, cis-3-hexen-1-ol, hexyl acetate, hexyl alcohol, hexyl phenylacetate, honey, 4-hydroxy-3-pentenoic acid lactone, 4-hydroxy-4-(3-hydroxy-1-butenyl)-3,5,5-trimethyl-2-cyclohexene-1-one, 4-(para-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, terpenless oil of lemon, liquorice extract, linalool, linalyl acetate, lovage root oil, maltol, maple syrup, menthol, menthone, L-menthyl acetate, para-methoxybenzaldehyde, methyl-2-pyrrolyl ketone, methyl anthranilate, methyl phenyl acetate, 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, orris root oil, palmitic acid, ω-pentadecalactone, peppermint oil, petit-grain Paraguay oil, phenethyl alcohol, phenethyl phenylacetate, phenylacetic acid, piperonal, plum extract, propenyl guaethol, propyl acetate, 3-propylidenephthalide, 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-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-butene-4-one, 2,6,6-trimethyl-2-cyclohexene-1,4-dione, 4-(2,6,6-trimethyl-1,3-cyclohexadienyl)-2-butene-4-one, 2,3,5-trimethylpyrazine, γ-undecalactone, γ-valerolactone, vanilla extract, vanillin, veratrum aldehyde, violet leaf absolute, N-ethyl-p-menthane-3-carboxamide (WS-3), and ethyl-2-(p-menthane-3-carboxamide) acetate (WS-5). Using menthol is particularly preferable. Any of these flavors may be used alone, or two or more of them may be used in combination.

[0044] The flavor content of the first tobacco filler is not limited to a particular value. To ensure good smoke taste, the flavor content is typically 10000 ppm or more, preferably 20000 ppm or more, and more preferably 25000 ppm or more and is typically 50000 ppm or less, preferably 40000 ppm or less, and more preferably 33000 ppm or less.

[0045] The filling density in the first tobacco filler, outside the cavity, is not limited to a particular value. To ensure performance of the heat-not-burn tobacco product and provide good smoke taste, the filling density is typically 250 mg/cm^3 or more and preferably 320 mg/cm^3 or more, and is typically 800 mg/cm^3 or less and preferably 600 mg/cm^3 or less.

[0046] The first tobacco filler is wrapped in the wrapping paper therearound to form the tobacco rod. The coating agent is added at least to the filler contact surface of two surfaces of the wrapping paper.

[0047] The second tobacco filler is formed by a plurality of tobacco sheets concentrically wound. In the present invention, being concentrically wound means that all the tobacco sheets are arranged around substantially the same center. In the present invention, the term "sheet" refers to one that has a pair of substantially parallel principal surfaces and side faces. The sheet is preferably produced by a papermaking process. The second filler is formed by concentrically winding a plurality of tobacco sheets in a direction orthogonal to the longitudinal direction of the heat-not-burn tobacco product.

[0048] Examples of the sheet material include tobacco

ingredients, such as tobacco powders. It is preferable in the present invention that the sheet material be constituted by tobacco ingredients. The tobacco sheet is preferably formed by carrying, on a base material sheet of tobacco ingredients, components that can generate flavor as needed. The tobacco sheet generates aerosol when being heated. An aerosol source, such as a polyol (e.g., glycerin, propylene glycol, or 1,3-butanediol), is added as the aerosol-source material. The amount of the aerosol-source material added is preferably 5% to 50%, more preferably 15% to 25%, by weight of the dry weight of the tobacco sheet.

[0049] The tobacco sheet (which has yet to be concentrically wound) will now be described as a material.

[0050] The tobacco sheet is appropriately produced by a known method, such as a papermaking process, a slurry process, or a rolling process. A homogeneous sheet for the first tobacco filler described above may be used here.

[0051] In the papermaking process, a tobacco sheet is produced by a method including the following steps: 1) dried tobacco leaves are crushed, extracted with water, and separated into water extracts and residues; 2) the water extracts are dried under reduced pressure and condensed; 3) pulp is added to the residues, processed into fibers by a refiner, and formed into a sheet; and 4) a concentrate of the water extracts is added to the sheet and dried into a tobacco sheet. In this case, an additional step may be performed to remove some component, such as nitrosamine (see, e.g., Japanese Unexamined Patent Application Publication (Translation of PCT Application) No. 2004-510422).

[0052] In the slurry process, a tobacco sheet can be produced by a method including the following steps: 1) water, pulp, and a binder are mixed with crushed tobacco leaves; and 2) the mixture is spread out (cast) in a thin layer and dried. In this case, an additional step may be performed to remove some component, such as nitrosamine. Specifically, the additional step involves irradiating slurry containing the mixture of water, pulp, binder, and crushed tobacco leaves with ultraviolet light or X-rays.

[0053] As described in International Publication No. 2014/104078, a nonwoven tobacco sheet produced by a method including the following steps may be used: 1) granular tobacco is mixed with a binding agent; 2) the mixture is sandwiched between nonwoven fabrics; and 3) the resulting laminate is formed into a predetermined shape by heat fusion to obtain a nonwoven tobacco sheet.

[0054] The type of raw material tobacco leaves used in the methods described above may be the same as that for the first filler described above.

[0055] The composition of the tobacco sheet is not limited to a particular one, but the tobacco raw material (tobacco leaf) content is preferably, for example, 50% to 95% by weight of the total weight of the tobacco sheet. The tobacco sheet may contain a binder. Examples of the binder include guar gum, xanthan gum, carboxymethylcellulose (CMC), and carboxymethylcellulose sodium salt (CMC-Na). The amount of the binder is preferably 1% to 20% by weight of the total weight of the tobacco sheet. The tobacco sheet may further contain other additives. Examples of the additives include a filler, such as pulp. A plurality of tobacco sheets used in the present invention may all have the same composition or properties, or some or all of the tobacco sheets may have different compositions or properties.

[0056] The second tobacco filler is produced by preparing a plurality of tobacco sheets of different widths, forming a laminate of the tobacco sheets reduced in width from the bottom to the top, and winding the laminate by inserting it into a winding tube. With this production method, the plurality of tobacco sheets extending in the longitudinal direction and concentrically arranged around the axis in the longitudinal direction are obtained. At the same time, a through-hole extending in the longitudinal direction is formed as the cavity between the axis in the longitudinal direction and an innermost tobacco sheet.

[0057] In this production method, the laminate is preferably made such that adjacent ones of wound tobacco sheets have a non-contact portion therebetween.

[0058] With the non-contact portion (gap) where adjacent ones of tobacco sheets are not in contact, it is possible to secure a passage of flavor and improve the efficiency of delivering flavor components. At the same time, since heat from the heater is transferred to outer tobacco sheets through a contact portion between adjacent tobacco sheets, it is possible to ensure high efficiency of heat transfer.

[0059] The non-contact portion between adjacent ones of the tobacco sheets may be made, for example, by using embossed tobacco sheets, or by forming a laminate without bonding adjacent tobacco sheets at all, with adjacent tobacco sheets partially bonded, or with adjacent tobacco sheets partially or entirely bonded lightly in such a way that they are separated after being wound.

[0060] In the preparation of a tobacco rod including a wrapping paper, the wrapping paper may be placed at the bottom of the laminate. In this case, the wrapping paper is placed such that the surface having the coating agent added thereto is in contact with the tobacco sheet.

[0061] The cavity may be made by placing a cylindrical dummy, such as a mandrel, at the top of the laminate, forming the second tobacco filler, and removing the dummy thereafter.

[0062] The thickness of each tobacco sheet is not limited to a particular value. For balance between heat transfer efficiency and strength, however, it is preferable that each tobacco sheet be 200 μm to 600 μm thick. The tobacco sheets may either have the same or different thicknesses.

[0063] The number of tobacco sheets forming the second tobacco filler may be any number greater than one, but may be for example two, three, four, five, or six.

<Heat-Not-Burn Tobacco Product>

[0064] A heat-not-burn tobacco product according to an embodiment of the present invention has a configuration such as that illustrated in Fig. 1.

[0065] A heat-not-burn tobacco product 10 illustrated in Fig. 1 includes a tobacco rod composed of a tobacco filler 11 and a first wrapping paper 12 with which to wrap the tobacco filler 11, and a mouthpiece portion 17 constituting an end portion opposite the tobacco rod. The tobacco rod and the mouthpiece are connected together using a second wrapping paper 13 (tipping paper in Fig. 1) which is either the same as, or different from, the wrapping paper for wrapping the tobacco filler.

[0066] An embodiment illustrated in Fig. 1 is one that uses the first tobacco filler (described above) as a tobacco filler. Shreds contained in the first tobacco filler (e.g., 0.5 mm to 2.0 mm wide shreds obtained by cutting tobacco leaves or homogeneous sheet) are typically about 1.0 mm to 4.0 mm long, and are often randomly oriented in the tobacco filler. The shreds may be processed into substantially the same length as the tobacco rod, and arranged in the longitudinal direction of the tobacco rod to fill the tobacco rod.

[0067] The embodiment illustrated in Fig. 1 has a cavity 18 that is formed after the tobacco filler is in place. The cavity 18 is open at the distal end of the tobacco rod and extends along the axial direction of the tobacco rod. In the embodiment illustrated in Fig. 1, the cavity 18 is a non-penetrating recess, which is in the shape of a circular cone with a diameter reduced from the distal end toward the proximal end of the tobacco rod. The shape of the cavity 18 is not limited to a particular one, as described below.

[0068] In the embodiment illustrated in Fig. 1, the mouthpiece 17 includes a support portion 16, an aerosol cooling portion 14, and a filter portion 15. As a second wrapping paper for connecting these components, the mouthpiece 17 also includes the tipping paper 13. Although the mouthpiece 17 is composed of three segments in Fig. 1, the mouthpiece 17 may be composed of a single segment, two segments as in Fig. 2, or may be composed of four or more segments. The segments constituting the mouthpiece may be configured to include both the aerosol cooling portion and the filter portion, or may be configured to include only one of them.

[0069] In Fig. 1, the support portion 16 is located immediately downstream of the tobacco rod and disposed in contact with the proximal end of the tobacco rod. The support portion 16 may be, for example, a hollow cellulose acetate tube. In other words, the support portion 16 may be a circular columnar cellulose acetate fiber bundle, with a center hole formed therethrough in the center of the cross-section. The support portion may be a metallic mesh, for example, with a sieve of 5 mesh to 35 mesh. When a heater member of an electrical heating device to which the heat-not-burn tobacco product is applied is inserted into the tobacco rod, the support portion 16 serves as an element for preventing the tobacco filler in the heat-not-burn tobacco product from being pushed in the downstream direction toward the aerosol cooling portion 14. In addition to having the function of preventing the tobacco filler from being pushed in the downstream direction, the support portion 16 preferably has low ventilation resistance and low aerosol filtration performance. The support portion 16 also functions as a spacer for spacing the aerosol cooling portion 14 of the heat-not-burn tobacco product from the tobacco rod.

[0070] As vapor produced by heating the tobacco rod and containing the aerosol-source material and the tobacco flavor component passes through the aerosol cooling portion 14, the vapor comes into contact with air in the aerosol cooling portion 14, so that it is cooled and liquefied into aerosol.

[0071] In the heat-not-burn tobacco product 10 illustrated in Fig. 1, perforations (not shown) for taking in outside air may be formed in part of the aerosol cooling portion 14 and the second wrapping paper 13 (tipping paper) wrapped around the aerosol cooling portion 14. The perforations allow outside air to flow into the aerosol cooling portion 14 during use. Vapor produced by heating the tobacco rod and containing the aerosol-source material and the tobacco flavor component comes into contact with the outside air, so that the vapor is more reliably reduced in temperature and liquefied into aerosol. The perforations preferably have a diameter of 100 μm to 1000 μm. It is preferable that the perforations be substantially circular or substantially elliptical in shape. When the perforations are substantially elliptical, the diameter described above represents the length of the major axis. There may be either one or more perforations. When a plurality of perforations are provided, they are preferably arranged in a row on the circumference of the second wrapping paper (tipping paper).

[0072] The aerosol cooling portion 14 may be, for example, a circular cylindrical member made of thick paper. In this case, the circular cylinder has a hollow space therein. Vapor containing the aerosol-source material and the tobacco flavor component comes into contact with air in the hollow space and is cooled. When the perforations are provided, the vapor in the hollow space also comes into contact with outside air, and this enhances the cooling effect. A gathered sheet member, such as paper, polymer film, or metal foil, may be filled in the circular cylinder. In this case, the vapor may be cooled by using the specific heat of such a sheet member.

[0073] The filter portion 15 may be made of, for example, cellulose acetate tow. The filament denier and the total denier of the cellulose acetate tow are not particularly limited. In the case of the filter portion with a circumference of 22 mm, it is preferable that the filament denier be 5 g to 12 g/9000 m, and that the total fineness be 12000 g to 30000 g/9000 m. The cellulose acetate tow fibers may have either a Y-shaped cross-section or an R-shaped cross-section. In the case of a filter filled with cellulose acetate tow, triacetin constituting 5% to 10%

by weight of the cellulose acetate tow may be added to improve filter hardness.

[0074] Although the filter portion 15 is composed of a single segment in Fig. 1, it may be composed of a plurality of segments. When composed of a plurality of segments, for example, the filter portion 15 may include a hollow segment on the upstream side and another segment having a cross-section filled with cellulose acetate tow on the downstream side (i.e., at an end of the mouthpiece to be held in the user's mouth). This embodiment prevents needless loss of generated aerosol and improves the appearance of the heat-not-burn tobacco product.

[0075] Also, it is possible, in the production of the filter, to appropriately design the adjustment of ventilation resistance and the addition of additives (e.g., known absorbents, flavors, or flavor retaining materials).

[0076] Materials used to make the second wrapping paper 13 (tipping paper) are not limited to particular types. The second wrapping paper 13 may be partially or entirely made of the wrapping paper according to the embodiment of the present invention. After being wrapped around the tobacco rod, the aerosol cooling portion 14, the filter portion 15, and the support portion 16 as needed, the second wrapping paper 13 may be secured in place using, for example, a vinyl acetate adhesive.

[0077] An embodiment illustrated in Fig. 2 has the same configuration as the embodiment illustrated in Fig. 1, except that the second tobacco filler described above is used as the tobacco filler 11 and that the support portion 17 is absent. In the embodiment illustrated in Fig. 2, a plurality of tobacco sheets forming the second tobacco filler extend in the longitudinal direction and are concentrically arranged around the axis in the longitudinal direction. As the cavity 18, a through-hole extending in the longitudinal direction is provided between the axis in the longitudinal direction and the innermost tobacco sheet. The embodiment illustrated in Fig. 2 does not necessarily need to include the support portion 16 illustrated in Fig. 1, but may include the support portion 16.

[0078] In the embodiments illustrated in Fig. 1 and Fig. 2, the coating agent is added at least to the filler contact surface of the first wrapping paper 12. Even when the first wrapping paper and the second wrapping paper each are formed only by a single sheet in the embodiments of the present invention, they are not burned off by heating. Being formed only by a single sheet is preferable for cost reduction.

[0079] In the embodiments illustrated in Fig. 1 and Fig. 2, the length of the heat-not-burn tobacco product 10 in the longitudinal direction is preferably 40 mm to 100 mm, more preferably 40 mm to 80 mm, and still more preferably 45 mm to 60 mm The circumference of the heat-not-burn tobacco product is preferably 15 mm to 25 mm, more preferably 17 mm to 24 mm, and still more preferably 21 mm to 23 mm In the embodiment illustrated in Fig. 1, the tobacco rod may be 12 mm long, the aerosol cooling portion may be 20 mm long, the support portion may be 8 mm long, and the filter portion may be 7 mm long. The lengths of these segments may be appropriately changed depending on, for example, the machinability during production and the level of quality required.

[0080] In the production of the heat-not-burn tobacco product according to any embodiment of the present invention, the wrapping paper according to the embodiment of the present invention described above may be used. Specifically, after the tobacco filler containing the tobacco shreds and the aerosol-source material is formed, the resulting filler is wrapped with the wrapping paper according to the embodiment of the present invention to obtain the tobacco rod. Then, the tobacco rod and components constituting the mouthpiece is wrapped with the tipping paper (or wrapping paper according to the embodiment of the present invention) to obtain the heat-not-burn tobacco product. Note that a known wrapping device may be used for the wrapping.

[0081] When the tobacco filler 11 is the first tobacco filler in the embodiment of the present invention, the cavity 18 is preferably a non-penetrating recess as illustrated in Fig. 1. The non-penetrating recess is preferably in the shape of a non-penetrating circular cylinder, or a circular cone or truncated circular cone with a diameter reduced from the distal end toward the proximal end of the tobacco rod. Note that the non-penetrating recess may be substantially in the shape of a circular cylinder, a circular cone, or a truncated circular cone.

[0082] When the cavity is a non-penetrating recess, a hardened layer is preferably formed around (or lateral to) the recess. With the hardened layer, the recess in the tobacco rod (tobacco filler) is prevented from being closed by adhesion of the tobacco shreds contained in the tobacco filler.

[0083] The first tobacco filler forming the tobacco rod is an elastic body, not a plastic body. Therefore, when the recess is simply bored in the tobacco rod from the distal end of the tobacco rod, the tobacco filler may elastically deform in the direction in which the recess is closed (i.e., in the direction in which the transverse cross-section of the recess is reduced) immediately after completion of the boring. Then when, for example, the heat-not-burn tobacco product is stored over a long period of time, the recess in the tobacco rod may be closed.

[0084] Therefore, it is preferable that the hardened layer for preventing closure of the recess in the tobacco rod (tobacco filler) be formed around the recess.

[0085] The corresponding embodiment is illustrated in Fig. 3. The embodiment illustrated in Fig. 3 is obtained by modifying part of the embodiment illustrated in Fig. 1. Like the embodiment illustrated in Fig. 1, the cavity 18 is a non-penetrating recess in the shape of a circular cone with a diameter reduced from the distal end toward the proximal end of the tobacco rod. In the embodiment illustrated in Fig. 3, however, a hardened layer 19 is formed around (or lateral to) the recess. With the hardened layer 19, the closure of the recess after production of the product is effectively prevented.

[0086] The hardened layer is formed by adding a hard-

ening agent to the tobacco filler. The hardening agent is for preventing deformation of the tobacco rod in the direction in which the recess is closed. Various materials may be used as the hardening agent. Examples of the hardening agent include calcium carbonate, sodium silicate, agar, gelatin, CMC, PVA, EVA, pectin, karaya gum, gellan gum, guar gum, gum arabic, xanthan gum, corn starch, alginic acid sodium salt, polyurethane, polyamide, hydroxyl-containing compounds, dextrin or dextrin derivatives, hydroxypropyl cellulose, hydroxyethyl cellulose, hydroxypropyl methyl cellulose, methyl cellulose, konjak, collagen, inulin, soybean protein, milk serum protein, casein, wheat gluten, carrageenan, alginate, propylene glycol alginate, pullulan, curdlan, locust bean gum, tara gum, tragacanth gum, zein, psyllium seed, chitin, chitosan, acacia gum, polyvinylpyrrolidone, and polyethylene oxide. Any one or a mixture of the materials described above may be used.

[0087] For ease of handling of the hardening agent, ease of attaching the tobacco filler to the heater member during insertion of the heater member into the recess, resistance to heat, and avoiding impact of volatile components on flavor during heating of the heater, it is preferable to add, as the hardening agent, a water solution containing calcium carbonate, or a water solution containing sodium silicate (liquid glass).

[0088] The amount of hardening agent added to each tobacco rod is not limited to a particular value. For example, a hardening agent with a dry weight of 5 mg to 60 mg may be added. Specifically, the amount of hardening agent to be added may be determined depending on, for example, the diameter and length of the tobacco filler contained in the tobacco rod, and also the filling density and properties of the tobacco shreds filling the tobacco rod.

[0089] When the tobacco filler is the second tobacco filler (formed by a plurality of tobacco sheets) in the embodiment of the present invention, the cavity for insertion of the heater member is preferably a through-hole extending in the axis in the longitudinal direction and is preferably circular cylindrical in shape. Note here that being circular cylindrical may also mean being substantially circular cylindrical.

[0090] The tobacco filler has therein the cavity described above. Therefore, when the heat-not-burn tobacco product is used, or specifically when the tobacco rod is pushed against the heater member of the electrically heated tobacco product (described below), the tobacco filler is prevented from being excessively compressed by the heater member. This prevents the tobacco filler pushed against the wrapping paper therearound from causing the aerosol-source material contained in the tobacco filler to permeate the wrapping paper.

<Electrically Heated Tobacco Product>

[0091] An embodiment of the electrically heated tobacco product is illustrated in Fig. 4. An electrically heated tobacco product 30 is used by inserting the heat-not-burn tobacco product 10 described above in such a way that the heat-not-burn tobacco product 10 comes into contact with a heater member 24 disposed inside an electrical heating device 20.

[0092] The electrical heating device 20 includes a battery unit 21 and a control unit 22 in a frame 23 made of, for example, resin.

[0093] The heat-not-burn tobacco product 10 includes the tobacco rod composed of the tobacco filler 11 and the first wrapping paper 12 with which to wrap the tobacco filler 11, and the mouthpiece 17 constituting an end portion opposite the tobacco rod. The tobacco rod and the mouthpiece are connected together using the second wrapping paper which is either the same as, or different from, the wrapping paper for wrapping the filler. The mouthpiece 17 of the heat-not-burn tobacco product may include the aerosol cooling portion 14, the filter portion 15, and the support portion 16 as illustrated in Fig. 1, or may be configured without the support portion 16 between the tobacco rod and the aerosol cooling portion 14 as illustrated in Fig. 2. Although the heat-not-burn tobacco product illustrated in Fig. 1 (where the tobacco filler 11 is the first tobacco filler) is used as the heat-not-burn tobacco product in Fig. 4, the heat-not-burn tobacco product illustrated in Fig. 2 (where the tobacco filler 11 is the second tobacco filler) may be used instead.

[0094] When the heat-not-burn tobacco product is inserted into the electrical heating device, the distal end of the tobacco rod reaches the heater member 24 of the electrical heating device 20, and the cavity of the tobacco rod comes into contact with the heater member.

[0095] The heater member 24 of the electrical heating device 20 generates heat under control of the control unit 22. By transfer of the heat to the tobacco rod of the heat-not-burn tobacco product, the aerosol-source material and the flavor component contained in the tobacco filler 11 of the tobacco rod are both vaporized.

[0096] The heater member 24 may be, for example, a sheet heater, a planar heater, or a cylindrical heater. The sheet heater is a flexible sheet-shaped heater. For example, the sheet heater may be a heater including a heat-resistant polymer film, such as a polyimide film (about 20 μm to 225 μm thick). The planar heater is a rigid plate-shaped heater (about 200 μm to 500 μm thick). For example, the planar heater may be a heater including a planar substrate having thereon a resistance circuit serving as a heat generating portion. The cylindrical heater is a hollow or solid cylindrical heater. For example, the cylindrical heater may be a heater including, on the outer surface thereof, a resistance circuit serving as a heat generating portion. The cross-section of the cylindrical heater may be in the shape of, for example, a circle, an ellipse, a polygon, or a polygon with rounded corners.

[0097] The tobacco rod is heated by the heater member 24 to as high as about 150°C to 250°C.

[0098] Vapor produced by heating and containing the aerosol-source material and the flavor component is

turned into aerosol in the aerosol cooling portion 14 by the mechanism described above, and transmitted through the filter portion 15 of the heat-not-burn tobacco product 10 into the mouth of the user.

[EXAMPLES]

[0099] The present invention will now be more specifically described using examples. The present invention is not limited by the description of the examples as long as the examples are within the scope of the present invention.

<Preparation of Wrapping Paper>

[0100] As a wrapping paper, a commonly used cigarette wrapping paper including 100% virgin pulp (70% by weight) and calcium carbonate (PCX850 manufactured by Shiraishi Kogyo Kaisha, Ltd., 30% by weight) serving as a filler was prepared, and nitrocellulose was added as a coating agent to the filler contact surface of the cigarette wrapping paper. The amount of nitrocellulose added to the surface of the wrapping paper was 0.5 g/m^2 by dry weight. The nitrocellulose was prepared as an ethyl acetate solution, which was applied by gravure printing to the entire surface of one side of the wrapping paper.

<Preparation of Tobacco Rod>

[0101] A tobacco filler was prepared in advance by mixing a flavor of 2 g/100 g and an aerosol-source material (glycerin) of 40 g/100 g into shredded sheet tobacco. The tobacco filler was wrapped with the wrapping paper using a high-speed wrapping machine in such a way that the filler contact surface is the surface having the coating agent added thereto.

[0102] The shreds weighed 0.8 g per rod, and the shreds wrapped in each rod were 22 mm in circumference and 68 mm in length.

[0103] After the wrapping, tobacco rods were kept in sets of 200 by grade in plastic airtight containers. The surfaces of the tobacco rods were checked for stains immediately after completion of wrapping.

[0104] These tobacco rods were used in experimental example 1.

[0105] As a wrapping paper used in experimental example 2, a commonly used cigarette wrapping paper having no coating agent added thereto was prepared. The tobacco filler was wrapped in the same manner as in experimental example 1, and tobacco rods with the same dimensions as those in experimental example 1 were made.

[0106] As a wrapping paper used in experimental example 3, a commonly used cigarette wrapping paper having a commercially available Scotch tape (not the coating agent) applied thereto was prepared. The Scotch tape was applied only to a surface of the cigarette wrapping paper not in contact in contact with the tobacco filler. The tobacco filler was wrapped in the same manner as in experimental example 1, and tobacco rods with the same dimensions as those in experimental example 1 were made.

<Preparation of Heat-Not-Burn Tobacco Product>

[0107] The tobacco rods prepared for experimental examples 1 to 3 by the methods described above were cut to a length of 12 mm, and a non-penetrating recess was formed by piercing one end of each tobacco rod with a metal stick. Then, liquid glass was applied to the periphery of the recess to form a hardened layer, so as to stabilize the shape (substantially circular cylindrical shape) of the recess. With the wrapping paper, the 12-mm-long tobacco rod having a recess at the distal end was manually connected to an 8-mm-long support portion formed by a center hole filter having a through-hole, a 20-mm-long cooling portion formed by a paper tube having dilution air holes in the outer periphery thereof, and a 7-mm-long filter portion filled with cellulose acetate fibers to make a heat-not-burn tobacco product.

<Use Test>

[0108] The heat-not-burn tobacco products prepared in experimental examples 1 to 3 were each subjected to a use test. An electrically heated tobacco product having the configuration described above was used in the use test. Before the use test, the heater temperature at the time of insertion of the tobacco rod of the heat-not-burn tobacco product was set at 350°C. The use test was performed using a single-port automatic smoking machine from Borgwaldt, with a puff volume of 55 ml/2 seconds, at intervals of 30 seconds. The outside air induction holes in the outer periphery of the cooling portion were not closed during the use test. Mainstream smoke produced during the use test was collected on a Cambridge filter pad. The Cambridge filter pad was removed after 12 puffs. This was followed by weight measurement, and measurement of the amount of water and glycerin using gas chromatography.

<Test Results>

[0109] Fig. 5 shows the results of measurement of the amount of aerosol (or glycerin) delivered from the tobacco rod during the use test. A larger numerical value on the vertical axis of Fig. 5 means a larger amount of glycerin delivered. As shown in Fig. 5, the amounts of aerosol delivered from the tobacco rods in experimental examples 2 and 3 were much smaller than that from the tobacco rod in experimental example 1.

[0110] In the use test, heating in the tobacco filler takes place mainly in the area in contact with the heater member and its neighboring area. The aerosol-source material contained in the tobacco filler is thus vaporized into aerosol. The generated aerosol moves outward from the

axial center of the tobacco filler toward the wrapping paper, or in other words, toward the outside of the tobacco rod. The wrapping paper prepared in experimental example 1 has a coating agent added thereto. This allows the generated aerosol to remain in the tobacco rod as aerosol without permeating the wrapping paper. However, the generated aerosol permeates the wrapping paper used in experimental example 2 due to the absence of the coating agent acting on the wrapping paper. This means that the electrically heated tobacco product cannot deliver a sufficient amount of aerosol to the user.

[0111] The wrapping paper prepared in experimental example 3 has a Scotch tape applied to the surface thereof not in contact with the tobacco filler. This cannot prevent aerosol from permeating the wrapping paper. Since the wrapping paper of the tobacco rod is lower in temperature than the heated portion, the aerosol permeating the wrapping paper is condensed at the point of permeation. Since the aerosol can no longer exist in the form of aerosol in the tobacco rod, the electrically heated tobacco product cannot deliver a sufficient amount of aerosol to the user.

[Reference Signs List]

[0112]

10 heat-not-burn tobacco product
11 filler
12 first wrapping paper
13 second wrapping paper (tipping paper)
14 aerosol cooling portion
15 filter portion
16 support portion
17 mouthpiece portion
18 cavity
19 hardened layer
20 electrical heating device
21 battery unit
22 control unit
23 frame
24 heater member
30 electrically heated tobacco product

Claims

1. A heat-not-burn tobacco product comprising a tobacco rod in which a tobacco filler containing tobacco shreds and an aerosol-source material is wrapped with a wrapping paper which wraps the tobacco filler,

wherein the tobacco rod has therein a cavity that is open at a distal end of the tobacco rod and extends in an axial direction of the tobacco rod; and
a coating agent is added at least to a surface of the wrapping paper, the surface being in contact with the tobacco filler.

2. The heat-not-burn tobacco product according to Claim 1, wherein the cavity is a non-penetrating recess, and the non-penetrating recess is in the shape of a non-penetrating circular cylinder, or a circular cone or a truncated circular cone with a diameter reduced from the distal end toward a proximal end of the tobacco rod.

3. The heat-not-burn tobacco product according to Claim 2, wherein the recess has a hardened layer therearound.

4. The heat-not-burn tobacco product according to Claim 1, wherein the filler is composed of a plurality of tobacco sheets; the plurality of tobacco sheets extends in a longitudinal direction and are concentrically arranged around an axis in the longitudinal direction; and a through-hole extending in the longitudinal direction is provided as the cavity between the axis in the longitudinal direction and an innermost tobacco sheet.

5. The heat-not-burn tobacco product according to any one of Claims 1 to 4, further comprising a mouthpiece portion constituting an end portion opposite the tobacco rod.

6. The heat-not-burn tobacco product according to any one of Claims 1 to 5, wherein the coating agent contains nitrocellulose.

7. An electrically heated tobacco product comprising:

an electrical heating device including a heater member, a battery unit serving as a power source for the heater member, and a control unit for controlling the heater member; and
the heat-not-bum tobacco product according to any one of Claims 1 to 6, the heat-not-burn tobacco product being inserted in such a manner as to come into contact with the heater member.

FIG. 1

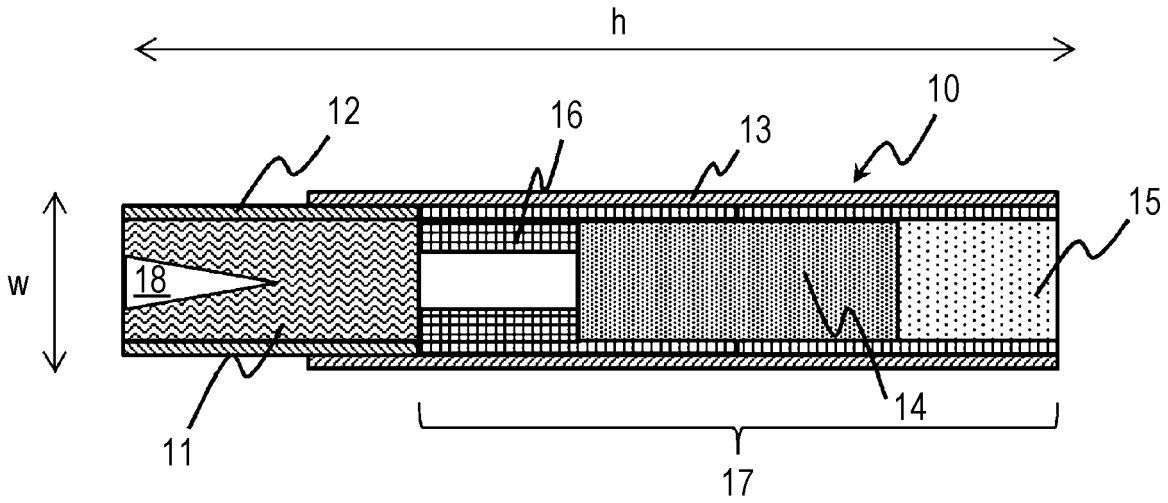


FIG. 2

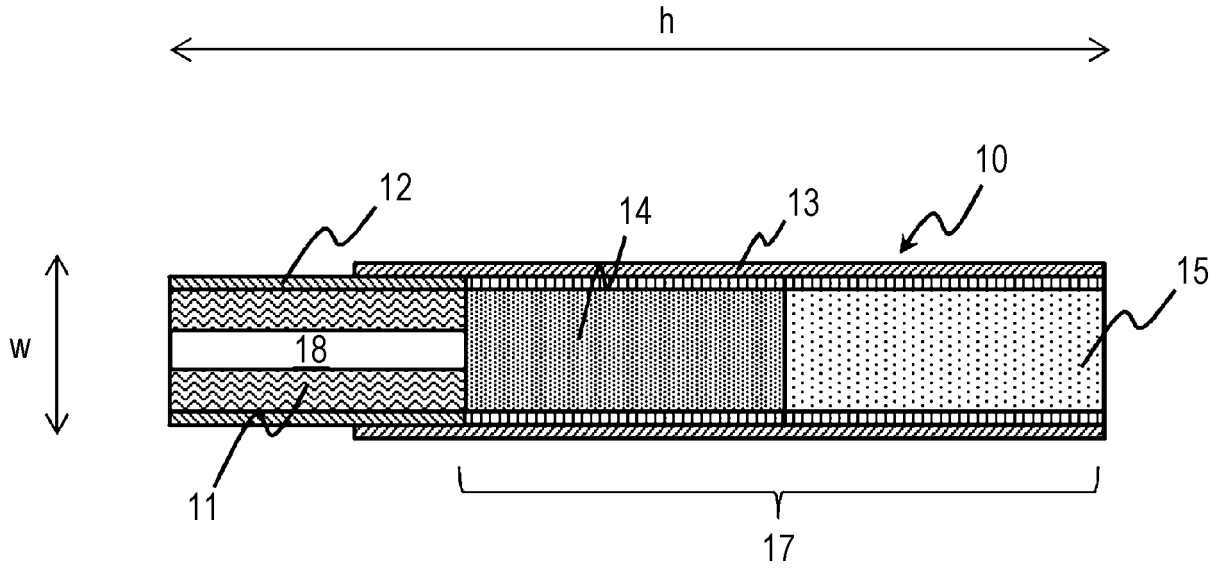


FIG. 3

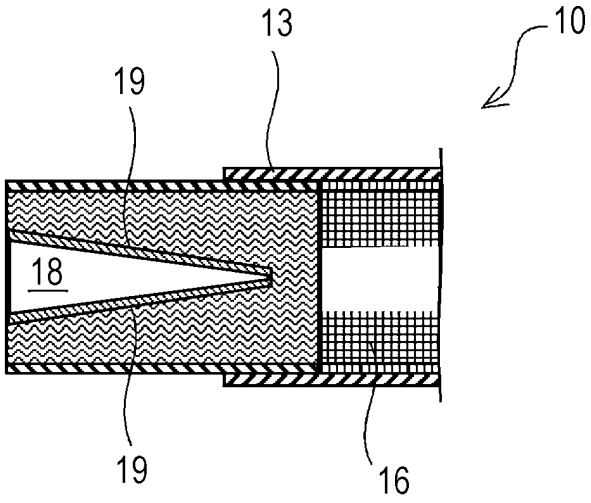


FIG. 4

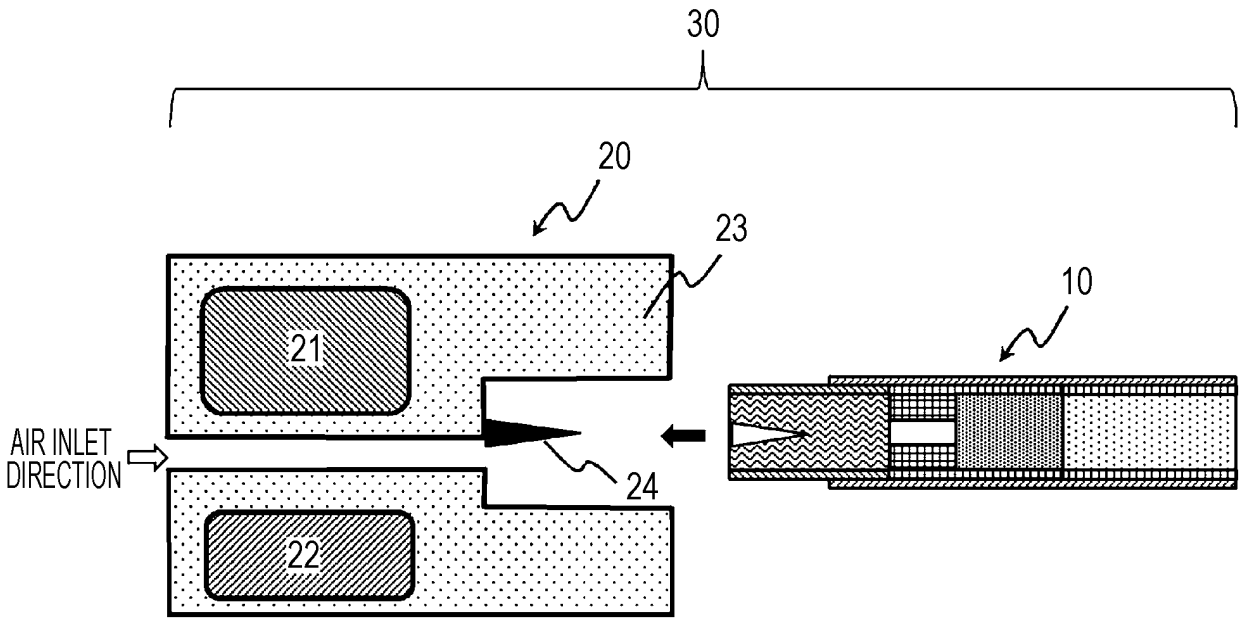
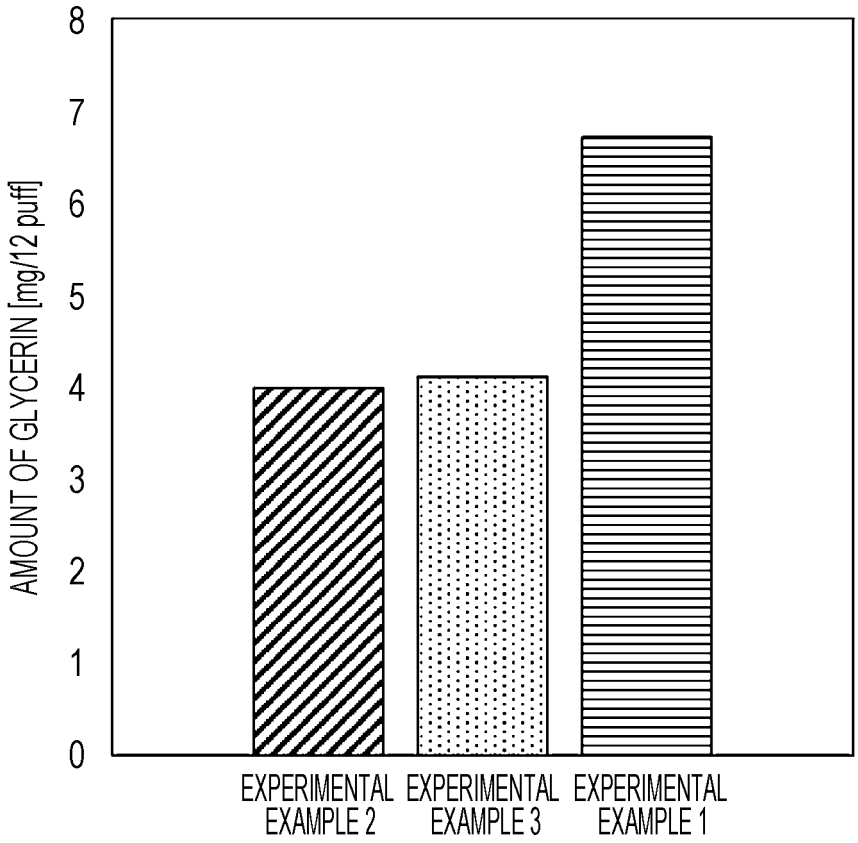


FIG. 5


AMOUNT OF GLYCERIN [mg/12 puff]
0
1
2
3
4
5
6
7
8
EXPERIMENTAL EXAMPLE 2
EXPERIMENTAL EXAMPLE 3
EXPERIMENTAL EXAMPLE 1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2019/016711

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

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

B. FIELDS SEARCHED

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

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2019
Registered utility model specifications of Japan 1996-2019
Published registered utility model applications of Japan 1994-2019

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2015-503337 A (PHILIP MORRIS PRODUCTS S.A.) 02 February 2015, paragraphs [0015]-[0017], [0026], [0028], [0037] & US 2014/0345634 A1, paragraphs [0014]-[0016], [0025], [0027], [0036], fig. 3 & EP 2797450 A2 & CN 104039183 A	1-7
Y	JP 2015-536154 A (PHILIP MORRIS PRODUCTS S.A.) 21 December 2015, paragraphs [0046], [0048] & US 2015/0296875 A1, paragraphs [0046], [0048] & EP 2928329 A2 & CN 104837377 A & KR 10-2015-0091118 A	1-7
Y	JP 2018-512142 A (BRITISH AMERICAN TOBCCO (INVESTMENTS) LIMITED) 17 May 2018, fig. 4, paragraphs [0079], [0093] & US 2018/0338520 A1, paragraphs [0087], [0101] & CN 107427088 A	3, 5-7

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

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

Date of the actual completion of the international search	Date of mailing of the international search report
03.06.2019	11.06.2019
Name and mailing address of the ISA/ Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Authorized officer Telephone No.

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2019/016711

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 2018/235956 A1 (JAPAN TOBACCO INC.) 27 December 2018, fig. 2A, 3, 4 (Family: none)	3-7

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

REFERENCES CITED IN THE DESCRIPTION

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

Patent documents cited in the description

- JP 2004510422 W **[0051]**
- WO 2014104078 A **[0053]**

Non-patent literature cited in the description

- **TABAKO-NO-JITEN.** Encyclopedia of Tobacco. Tobacco Academic Studies Center, 31 March 2009 **[0037]**