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(54) **FLAVOR SOURCE-CONTAINING ROD COMPRISING CAP MEMBER AT TIP END**

(57) Provided is a flavor source-containing rod comprising a cap member at a tip end that is opposite of a mouthpiece end and a flavor source-filled object downstream of the cap member, wherein the cap member includes a natural fiber-containing sheet and the sheet is disposed such that a main surface thereof is roughly parallel to the longitudinal direction of the flavor source-containing rod.

Fig. 1A

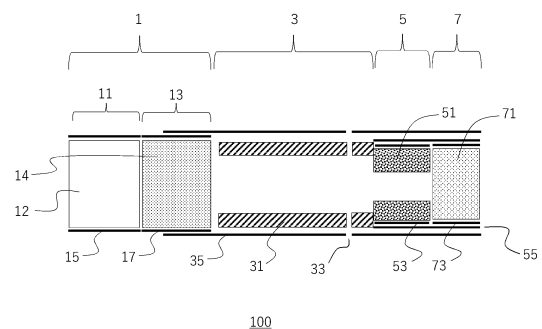
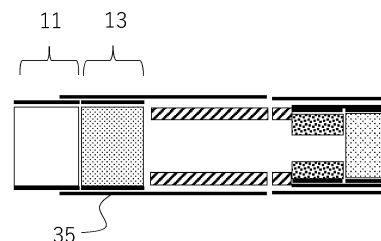


Fig. 1B



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Description

TECHNICAL FIELD

5 **[0001]** The present invention relates to a flavor source-containing rod that includes a cap member disposed at the end thereof.

BACKGROUND ART

10 **[0002]** Non-combustion-heating-type flavor inhalation articles for inhaling an aerosol generated by heating a tobacco rod are known. A technique of forming a front plug at the end of the tobacco rod in order to prevent the tobacco rod from releasing an aerosol-forming material during transportation or the like of the flavor inhalation articles has been proposed (PTL 1).

15 CITATION LIST

PATENT LITERATURE

20 **[0003]** PTL 1: Japanese Patent No. 6227555

SUMMARY OF INVENTION

TECHNICAL PROBLEM

25 **[0004]** A flavor source-containing rod, such as a tobacco rod, needs to have a channel that serves an airflow path. In order to achieve a satisfactory smoke taste, it is preferable that a plurality of channels having a relatively small diameter be present. Since formation of channels having an unnecessarily large diameter makes it impossible to achieve a satisfactory smoke taste, formation of unnecessary channels needs to be avoided. Examples of non-combustion-heating-type flavor inhalation articles include internal heating-type flavor inhalation articles in which a heater is inserted into a tobacco rod to heat the tobacco rod and external heating-type flavor inhalation articles in which a heater is arranged on the periphery of a tobacco rod to heat the tobacco rod. For internal heating-type flavor inhalation articles, it is necessary that the heater can be readily inserted into the cap member disposed at the end of a tobacco rod in consideration of usability. In addition, it is necessary to avoid unnecessary channels from being formed in the tobacco rod as a result of the insertion of the heater. On the other hand, the tobacco rod of an external heating-type flavor inhalation article may become deformed as a result of the heater arranged on the periphery of the tobacco rod coming into contact with the tobacco rod. Thus, it is necessary to avoid unnecessary channels from being formed in the above timing for achieving a satisfactory smoke taste. In these regards, there is room for improving the non-combustion-heating-type flavor inhalation articles known in the related art. In light of the above circumstances, an object of the present invention is to provide a flavor source-containing rod that includes a cap member disposed at the end thereof with which excellent usability and an excellent smoke taste can be achieved.

SOLUTION TO PROBLEM

45 **[0005]** The inventors of the present invention found that the above object can be achieved by a cap member that includes channels having a relatively small diameter and does not include channels having an excessively large diameter. Specifically, the object can be achieved by the present invention described below.

Aspect 1

50 **[0006]** A flavor source-containing rod comprising a cap member disposed at an end of the flavor source-containing rod, the end being opposite to mouthpiece end; and a flavor source filler disposed downstream of the cap member, the cap member including a sheet including a natural fiber, the sheet being arranged such that a principal surface of the sheet is substantially parallel to a longitudinal direction of the flavor source-containing rod.

55 Aspect 2

[0007] The flavor source-containing rod according to aspect 1, wherein the sheet includes a dry-laid or wet-laid non-woven fabric.

Aspect 3

[0008] The flavor source-containing rod according to aspect 1 or 2, wherein the cap member includes a wrapper, and the sheet is filled inside the wrapper.

Aspect 4

[0009] The flavor source-containing rod according to aspect 3, wherein the sheet is a dry-laid nonwoven fabric; and a compression rate (A) of the dry-laid nonwoven fabric filled inside the wrapper, the compression rate (A) being calculated using a method below, is 20% or more and less than 100%,

{Method for Calculating Compression Rate (A)}

[0010] Cross-sectional area (A1): a cross-sectional area of the dry-laid nonwoven fabric perpendicular to an axial direction of the cap member, which is measured after the wrapper has been removed from the cap member and the dry-laid nonwoven fabric has been taken from the cap member,

[0011] Cross-sectional area (A2): a cross-sectional area of an inside of the cap member perpendicular to the axial direction of the cap member,

$$\text{Compression rate (A)(\%)} = (\text{Cross-sectional area (A2)}/\text{Cross-sectional area (A1)}) \times 100.$$

Aspect 5

[0012] The flavor source-containing rod according to aspect 3 or 4, wherein the sheet is a dry-laid nonwoven fabric; and a plurality of layers of the dry-laid nonwoven fabric are filled inside the wrapper in a compressed state while stacked on top of one another and folded in an S-like shape.

Aspect 6

[0013] The flavor source-containing rod according to aspect 3 or 4, wherein the sheet is a dry-laid nonwoven fabric that has been subjected to a gathering process; a layer of the gathered dry-laid nonwoven fabric is filled inside the wrapper while folded or a plurality of layers of the gathered dry-laid nonwoven fabric are filled inside the wrapper while stacked on top of one another and folded; and a ridge line formed by the gathering process is substantially parallel to an axial direction of the cap member.

Aspect 7

[0014] The flavor source-containing rod according to any one of aspects 2 to 6, wherein a gap is not visually identified between layers of the dry-laid nonwoven fabric at an end surface of the cap member in an axial direction of the cap member.

Aspect 8

[0015] The flavor source-containing rod according to aspect 2 or 3, wherein the sheet is a wet-laid nonwoven fabric; and a volume occupancy (X) of the wet-laid nonwoven fabric filled inside the wrapper, the volume occupancy (X) being calculated using a method below, is 10% or more and less than 60%,

{Method for Calculating Volume Occupancy (X)}

[0016] Cross-sectional area (X1): a total area of the wet-laid nonwoven fabric in a cross section of the cap member perpendicular to an axial direction of the cap member,

[0017] Cross-sectional area (X2): a cross-sectional area of the inside of the cap member in a cross section of the cap member perpendicular to the axial direction of the cap member,

$$\text{Volume occupancy (X)(\%)} = (\text{Cross-sectional area (X1)}/\text{Cross-sectional area (X2)}) \times 100.$$

Aspect 9

[0018] The flavor source-containing rod according to aspect 2, 3, or 8, wherein the sheet is a wet-laid nonwoven fabric that has been subjected to a gathering process;
5 a layer of the gathered dry-laid nonwoven fabric is filled inside the wrapper while folded; and a ridge line formed by the gathering process is substantially parallel to an axial direction of the cap member.

Aspect 10

[0019] The flavor source-containing rod according to any one of aspects 1 to 9, wherein the natural fiber is at least one fiber selected from the group consisting of silk, wool, cotton, hemp, and a plant pulp.

Aspect 11

[0020] The flavor source-containing rod according to aspect 10, wherein the natural fiber is a plant pulp.

Aspect 12

[0021] The flavor source-containing rod according to any one of aspects 1 to 11, wherein the cap member has an
20 airflow resistance of 2 to 30 mmH₂O.

Aspect 13

[0022] The flavor source-containing rod according to any one of aspects 1 to 12, further comprising another cap member disposed downstream of the flavor source filler.

Aspect 14

[0023] The flavor source-containing rod according to any one of aspects 1 to 13, wherein the flavor source filler includes
30 shredded tobacco, a tobacco sheet, or tobacco granules.

Aspect 15

[0024] The flavor source-containing rod according to any one of aspects 1 to 14, wherein the flavor source filler includes
35 a material derived from a non-tobacco plant.

Aspect 16

[0025] The flavor source-containing rod according to any one of aspects 1 to 15, wherein the flavor source filler includes
40 a porous material made from a non-tobacco plant fiber.

Aspect 17

[0026] The flavor source-containing rod according to any one of aspects 1 to 16, wherein the flavor source filler includes
45 a material derived from a polysaccharide.

Aspect 18

[0027] A non-combustion-heating-type flavor inhaler comprising the flavor source-containing rod according to any one
50 of aspects 1 to 17.

ADVANTAGEOUS EFFECTS OF INVENTION

[0028] According to the present invention, it becomes possible to provide a flavor source-containing rod that includes
55 a cap member disposed at the end thereof with which excellent usability and an excellent smoke taste can be achieved.

BRIEF DESCRIPTION OF DRAWINGS

[0029]

[Fig. 1A] Fig. 1A is a schematic diagram illustrating a non-combustion-heating-type flavor inhaler.
 [Fig. 1B] Fig. 1B is a schematic diagram illustrating a non-combustion-heating-type flavor inhaler according to another embodiment.
 [Fig. 1C] Fig. 1C is a schematic diagram illustrating a non-combustion-heating-type flavor inhaler according to still another embodiment.
 [Fig. 2A] Fig. 2A includes conceptual diagrams illustrating a cap member.
 [Fig. 2B] Fig. 2B is a conceptual diagram illustrating a cap member according to another embodiment.
 [Fig. 2C] Fig. 2C is a conceptual diagram illustrating a cap member according to still another embodiment.
 [Fig. 3] Fig. 3 is a conceptual diagram illustrating a device used in a nonwoven fabric filling step.
 [Fig. 4] Fig. 4 is a conceptual diagram illustrating a nonwoven fabric processing device.
 [Fig. 5] Fig. 5 is a diagram illustrating a step of cutting a nonwoven fabric.
 [Fig. 6] Fig. 6 is a step of arranging a nonwoven fabric.
 [Fig. 7] Fig. 7 includes diagrams illustrating a step of folding a nonwoven fabric.
 [Fig. 8] Fig. 8 includes diagrams illustrating a step of forming a nonwoven fabric.
 [Fig. 9] Fig. 9 is a diagram illustrating a step of forming a nonwoven fabric.
 [Fig. 10] Fig. 10 is a conceptual diagram illustrating a non-combustion-heating-type flavor inhalation system.
 [Fig. 11] Fig. 11 is a conceptual diagram illustrating a non-combustion-heating-type flavor inhalation system.
 [Fig. 12] Fig. 12 is a diagram illustrating a paper tube according to an embodiment.

DESCRIPTION OF EMBODIMENTS

[0030] Details of the present invention are described below. Note that, in the present invention, a range expressed as "X to Y" includes the lower and upper limits, that is, X and Y.

[0031] Fig. 1A illustrates a non-combustion-heating-type flavor inhaler according to an embodiment. In the drawing, Reference Numeral 100 denotes a non-combustion-heating-type flavor inhaler, Reference Numeral 1 denotes a flavor source-containing rod, Reference Numeral 3 denotes a first mouthpiece segment, Reference Numeral 5 denotes a second mouthpiece segment, and Reference Numeral 7 denotes a third mouthpiece segment. Each of the above segments is described below with reference to the attached drawings.

1. Flavor Source-Containing Rod

[0032] The flavor source-containing rod includes a cap member 11 disposed at an end of the flavor source-containing rod which is opposite to mouthpiece end and a flavor source rod 13 disposed downstream of the cap member 11.

(1) Cap Member

[0033] The cap member 11 includes a sheet including a natural fiber which is arranged such that the principal surface of the sheet is substantially parallel to the longitudinal direction of the flavor source-containing rod. In other words, the normal line to the principal surface of the sheet is orthogonal to the longitudinal direction (i.e., the axial direction) of the flavor source-containing rod. Fig. 2 includes conceptual diagrams illustrating this embodiment. Arranging the sheet such that the principal surface of the sheet is substantially parallel to the longitudinal direction of the flavor source-containing rod allows channels to be formed in an adequate manner and enables excellent usability and an excellent smoke taste to be achieved. Arranging the sheet in the above-described manner also allows a heater to be readily inserted into the cap member 11. The cap member 11 may include a wrapper, and the inside of the wrapper may be filled with the sheet (Fig. 2). Alternatively, the cap member 11 may be formed by bonding the sheets to one another without using the wrapper. The former embodiment is preferable in terms of ease of production.

[0034] The length of the cap member 11 in the axial direction is preferably 6 to 20 mm and is more preferably 6 to 10 mm. The outer circumference (i.e., circumference) of the cap member 11 may be 15 to 30 mm. Limiting the length of the cap member 11 in the axial direction to fall within the above range enables the mass production of the cap member. If the above length in the axial direction is less than the lower limit, a component volatilized from the flavor source filler cannot be trapped and leaks outside and, consequently, the device may become contaminated. If the above length in the axial direction is excessively large, the airflow resistance of the cap member is increased, and the airflow resistance of the entire non-combustion-heating-type flavor inhaler is increased accordingly. This reduces ease of inhalation during use.

[0035] In addition to the cap member 11 disposed upstream of the flavor source-containing rod 1, another cap member 11 may be disposed downstream of the flavor source-containing rod 1. Note that the axial direction of the cap member 11 is a direction parallel to the longitudinal direction (i.e., axial direction) of the flavor source-containing rod when the cap member 11 is included in the flavor source-containing rod and is the horizontal direction in Fig. 1. Arranging another cap member 11 downstream of the flavor source-containing rod 1 reduces the possibility of the flavor source filler spilling toward the mouthpiece segment during transportation. In addition, in the case where an internal heating-type flavor inhalation article includes such a flavor source-containing rod, the possibility of the flavor source filler spilling toward the mouthpiece segment when the heater is inserted into the rod can be reduced.

(1-1) Sheet

[0036] The natural fiber-containing sheet 12 is preferably a sheet capable of forming a cap member that includes channels having a relatively small diameter and does not include channels having an excessively large diameter. Specifically, the natural fiber-containing sheet 12 may be a sheet including a woven or nonwoven fabric or a sheet including a polymer matrix and any of the above fibers. A woven fabric is a fabric made by weaving yarns produced from fibers, such as cotton or silk. The thickness of the woven fabric is preferably 0.5 to 1.5 mm. A nonwoven fabric is a fabric made by bonding or interlocking fibers together in a sheet-like form without weaving them. Nonwoven fabrics are broadly divided into wet-laid nonwoven fabrics made from fibers dispersed in a liquid medium and dry-laid nonwoven fabrics made without using a liquid medium. Examples of wet-laid nonwoven fabrics include a paper sheet, and the thickness thereof may be 0.03 to 0.50 mm. The thickness of the dry-laid nonwoven fabric may be 0.5 to 1.5 mm. While all of the woven fabric, wet-laid nonwoven fabric, and dry-laid nonwoven fabric include a natural fiber, they may further include a semisynthetic fiber, a synthetic fiber, or a liquid or solid additive.

[0037] In the present invention, the sheet 12 is preferably a nonwoven fabric in consideration of ease of availability and the like. The dry-laid and wet-laid nonwoven fabrics are described separately below.

[Dry-Laid Nonwoven Fabric]

[0038] The dry-laid nonwoven fabric is suitable for being filled inside the wrapper in a compressed state. Therefore, in this embodiment, it is particularly preferable that a plurality of sheets of the nonwoven fabric 12 be filled inside the wrapper 15 in a compressed state while stacked on top of one another and folded in an S-like shape (Fig. 2A (1)), a sheet of the nonwoven fabric 12 be filled inside the wrapper 15 in a compressed state while folded, or a plurality of sheets of the nonwoven fabric 12 be filled inside the wrapper 15 in a compressed state while stacked on top of one another (Fig. 2A (2)). In consideration of appearance, it is preferable that gaps be not visually identified between the folded sheets of the nonwoven fabric at the end surface of the cap member 11 viewed in the axial direction in order to enhance appearance. The above cap member 11 produced by filling the nonwoven fabric into the wrapper in the above-described manner is also advantageous in that a heater can be readily inserted into the cap member 11 because a plurality of gaps are present between the sheets of the nonwoven fabric.

[0039] In the case where a plurality of sheets of the nonwoven fabric 12 are filled inside the wrapper 15, the compression rate (A) of the nonwoven fabric 12 is preferably 20% or more and less than 100%.

{Method for Calculating Compression Rate (A)}

[0040] Cross-sectional area (A1): the cross-sectional area of the dry-laid nonwoven fabric perpendicular to the axial direction of the cap member, which is measured after the wrapper has been removed from the cap member and the dry-laid nonwoven fabric has been taken from the cap member,

[0041] Cross-sectional area (A2): the cross-sectional area of the inside of the cap member perpendicular to the axial direction of the cap member, Compression rate (A)(%) = (Cross-sectional area (A2)/Cross-sectional area (A1)) × 100.

[0042] The lower the compression rate (A), the higher the degree of compression of the dry-laid nonwoven fabric. The compression rate (A) is preferably 20% or more and less than 100%, is more preferably 30% to 80%, and is further preferably 45% to 70%. When the compression rate (A) falls within the above range, an increase in the airflow resistance of the cap member 11 can be limited to an adequate degree. The above cross-sectional area (A1) is the area of a figure (substantially circular) created by projecting the pillar-shaped body composed of a nonwoven fabric on a plane perpendicular to the axial direction after the wrapper has been removed. When the wrapper is removed, the nonwoven fabric is released from the compressive force and the area of the figure created by the nonwoven fabric is commonly increased compared with the area of the figure measured when the nonwoven fabric is filled inside the wrapper. The above cross-sectional area (A1) is measured by the following method. The cap member 11 is left to stand at 22°C and a relative humidity of 60% for 24 hours. Subsequently, the wrapper is removed from the cap member 11 and the nonwoven fabric is taken. An image of a cross section of the nonwoven fabric is taken with a microscope, and the vertical and horizontal

lengths are determined on an operation monitor in order to calculate a cross-sectional area (A1). For taking an image of a cross section of the nonwoven fabric, the cross section may be taken by cutting the cap member 11 at any position in the axial direction. The cross-sectional area (A2) is determined by measuring the outer circumference (i.e., circumference) of the cap member 11 using a filter circumference meter (product name: SODIMAX, produced by SODIM), measuring the thickness of the wrapper using a paper thickness meter, and performing a calculation using the above measurement values.

[0043] The number of sheets of the nonwoven fabric may be only one. In order to achieve suitable appearance and adequate airflow resistance, the number of sheets of the nonwoven fabric is preferably 1 to 7, although it depends on the thickness of the nonwoven fabric. Although a plurality of sheets of the nonwoven fabric are filled inside the wrapper in a compressed state while folded in an S-like shape in Fig. 2A (1), they may be filled inside the wrapper in a compressed state while folded in a shape other than an S-like shape, such as a scroll-like shape, an accordion-like shape, or a gathered shape. It is particularly preferable that the dry-laid nonwoven fabric be subjected to a gathering process. It is preferable that a sheet of the gathered dry-laid nonwoven fabric be filled inside the wrapper while folded. It is also preferable that a plurality of the gathered dry-laid nonwoven fabric be filled inside the wrapper while stacked on top of one another and folded. In the above embodiments, a ridge line formed by the gathering process extends substantially parallel to the axial direction of the cap member.

[0044] In this embodiment, the thickness of the nonwoven fabric 12 that has not been filled inside the wrapper is not limited and may be, for example, 0.5 to 1.5 mm. The grammage of the nonwoven fabric 12 that has not been filled inside the wrapper is not limited and may be, for example, 35 to 60 g/m². Note that the above grammage is determined in conformity with JIS P 8124:2011.

[0045] The pack density of the nonwoven fabric 12 filled inside the wrapper 15 is preferably 50 to 150 mg/cm³, is more preferably 60 to 140 mg/cm³, and is further preferably 70 to 130 mg/cm³ in order to achieve certain airflow resistance suitable for inhalation of a flavor component, which is described above, in a further easy manner. In the case where, for example, the cap member 11 is cylindrical, the nonwoven fabric has a weight of W (mg), the length of the cap member 11 in the axial direction is b (mm), and the circumference of the cap member 11 is c (mm), the pack density of the nonwoven fabric can be calculated using the formula below.

$$\text{Pack density (mg/cm}^3\text{)} = W / ((b/10) * (((c/10/\pi/2)^2) * \pi))$$

[0046] Examples of the natural fiber included in the sheet 12 include silk, wool, cotton, hemp, and a plant pulp. The above natural fibers may be used alone or in combination of two or more. The cap member 11 is exposed to high temperatures since it is present in the vicinity of the heater. Therefore, it is preferable that the natural fiber do not melt or do not generate a large amount of volatile component even when heated to about 350°C. At the above temperatures, a cellulose acetate fiber, which is commonly used for filters, becomes melted and disadvantageously generates a volatile component having an odor that may affect the flavor generated from the flavor source. The natural fiber is preferably a plant pulp since it has further high dispersibility and further high degradability in natural environment and makes it easier to achieve certain airflow resistance suitable for inhalation of a flavor component.

[0047] The coarseness of the plant pulp is preferably 0.15 to 0.25 mg/m, is more preferably 0.16 to 0.24 mg/m, and is further preferably 0.18 to 0.22 mg/m in order to achieve certain airflow resistance suitable for inhalation of a flavor component, which is described above, in a further easy manner. Note that the above coarseness is determined in conformity with JIS P 8120:1998.

[0048] The sheet 12 may further include, in addition to the natural fiber, a chemosynthetic fiber. Examples of the chemosynthetic fiber include an acetate fiber, a rayon fiber, a polyamide fiber, an acrylic fiber, a polyurethane fiber, a polylactic acid fiber, a polyethylene fiber, a polypropylene fiber, a polyester fiber, a polyethylene terephthalate fiber, a polyvinyl alcohol fiber, a polyvinyl acetate fiber, and an ethylene vinyl acetate copolymer fiber. The above chemosynthetic fibers may be used alone or in combination of two or more. In the case where the sheet includes the chemosynthetic fiber, the content of the chemosynthetic fiber in the sheet is preferably 50% by weight or less and is more preferably 30% by weight or less.

[Wet-Laid Nonwoven Fabric]

[0049] In this embodiment, it is preferable that the wet-laid nonwoven fabric 12 be filled inside the wrapper 15 while randomly folded and pleated as illustrated in Fig. 2B or 2C. The ridge lines (i.e., fold lines) are substantially parallel to the axial direction of the cap member. It is more preferable that the wet-laid nonwoven fabric 12 be subjected to a gathering process and filled inside the wrapper 15 while randomly folded such that the ridge lines are substantially parallel to the axial direction of the cap member. Gaps are present between the sheets of the wet-laid nonwoven fabric 12 filled inside the wrapper. The sizes of the gaps are preferably uniform in order to reduce the possibility of a component

volatilized from the flavor source filler being not trapped and leaking outside to contaminate the device. The sizes of the gaps can be each determined as the diameter of a circle equivalent to the gap.

[0050] The wet-laid nonwoven fabric may include the above-described natural fiber and the above-described chem-synthetic fiber. However, in this embodiment, the wet-laid nonwoven fabric 12 is preferably a paper sheet. In this case, the thickness of the wet-laid nonwoven fabric 12 is preferably 0.03 to 0.50 mm, and the basis weight of the wet-laid nonwoven fabric 12 is preferably 40 to 400 g/m². The volume occupancy [%] of the wet-laid nonwoven fabric 12 is 10% or more and less than 60%, is preferably 20% or more and less than 60%, and is further preferably 20% to 40% in order to achieve certain airflow resistance suitable for inhalation of a flavor component in a further easy manner. The above volume occupancy is determined by the thickness and area of the wet-laid nonwoven fabric filled inside the cap member. Specifically, the volume occupancy is determined using the following formula.

{Method for Calculating Volume Occupancy (X)}

[0051] Cross-sectional area (X1): the total area of the wet-laid nonwoven fabric in a cross section of the cap member perpendicular to the axial direction of the cap member,

[0052] Cross-sectional area (X2): the cross-sectional area of the inside of the cap member in a cross section of the cap member perpendicular to the axial direction of the cap member,

$$\text{Volume occupancy (X)(\%)} = (\text{Cross-sectional area (X1)} / \text{Cross-sectional area (X2)}) \times 100.$$

[0053] The cross-sectional area (X1) is the total area of the nonwoven fabric. For example, in Fig. 2C, the cross-sectional area (X1) can be determined from the product of the thickness and width of the nonwoven fabric 12. Note that the term "width" used herein refers to the length of the nonwoven fabric 12 which is measured in a direction parallel to the radial direction of the flavor source-containing rod after the creases of the sheet have been smoothed down. The cross-sectional area (X2) is the area of the portion surrounded by the wrapper 15.

[0054] The airflow resistance of the cap member 11 is preferably 0 to 50 mmH₂O and is more preferably 2 to 30 mmH₂O in consideration of suitability for inhalation of a flavor component, regardless of the type of the material used. The above airflow resistance is measured using a filter quality gage (Product name: SODIMAX produced by SODIM). Specifically, the above resistance is the pressure difference (mmH₂O) between the end surfaces of a sample which occurs when the side surfaces of the sample are covered with an air-impermeable rubber in order to prevent air entrance and inhalation is performed at a flow rate of 17.5 cm³/sec from one of the side surfaces.

(1-2) Wrapper

[0055] Examples of the material for the wrapper 15 include a paper sheet. A wrapper having a basis weight of 20 to 120 g/m² and a thickness of 30 to 150 μm can be used. Limiting the basis weight of the wrapper to 20 g/m² or more reduces the possibility of the circumference of the tube varying as a result of elongation caused by a repulsive force of the nonwoven fabric filled inside the tube. The airflow properties of the wrapper are not limited; for example, a high-air permeable paper sheet having an air permeability of 100 C.U. or more or a low-air permeable paper sheet having an air permeability of less than 100 C.U. can be used. A wrapper having a basis weight of 20 to 100 g/m² and a thickness of 30 to 120 μm can also be used. Examples thereof include, but are not limited to, LPWS-OLL (air permeability: 1300 C.U., basis weight: 26.5 g/m², thickness: 48 μm), P-10000C (air permeability: 10000 C.U., basis weight: 24.0 g/m², thickness: 60 μm), S-52-7000 (air permeability: 7000 C.U., basis weight: 52.0 g/m², thickness: 110 μm), and plain paper (air permeability: 0 C.U., basis weight: 24 g/m², thickness: 32 μm) produced by Nippon Paper Papyrus Co., Ltd. The number of sheets of the wrapper may be two or more.

(2) Flavor Source-Containing Segment

[0056] As illustrated in Fig. 1, the flavor source-containing segment 13 is a segment formed by wrapping a flavor source filler 14 with a wrapper 17 in a cylindrical form. The flavor source-containing segment preferably has a cylindrical columnar shape. The circumference of the flavor source-containing segment is preferably the same as that of the cap member 11 and is specifically 15 to 30 mm. The length of the flavor source-containing segment in the axial direction (i.e., the length of the flavor source-containing segment in the horizontal direction of the drawing) is preferably 6 to 70 mm and is more preferably 10 to 30 mm.

(2-1) Flavor Source Filler

[0057] The flavor source filler 14 is a material that generates a flavor and may include a tobacco material, a non-tobacco material, a volatile flavoring agent component, and water. The tobacco material is a material that generates a flavor and that is derived from a tobacco plant, while a non-tobacco material is a material that generates a flavor and that is not derived from a tobacco plant. Hereinafter, a flavor source filler that includes a tobacco material is also referred to as "tobacco filler", and a flavor source filler that includes a non-tobacco material is also referred to as "non-tobacco filler".

[Tobacco Filler]

[0058] The size of tobacco used as a tobacco filler and the method for preparing the tobacco are not limited. For example, shredded tobacco, a tobacco sheet, or tobacco granules can be used. The shredded tobacco may be prepared by shredding dried tobacco leaves to a width of 0.8 to 1.2 mm. In the case where tobacco leaves are shredded to the above width, the resulting shreds have a length of about 5 to 20 mm. The shredded tobacco may also be prepared by pulverizing dried tobacco leaves to an average grain size of about 20 to 200 μm , homogenizing the resulting tobacco grains, forming the tobacco grains into a sheet, and shredding the sheet to a width of about 0.8 to 1.2 mm and a length of about 2 to 4 mm. Alternatively, a material prepared by subjecting the above sheet to a gathering process without shredding may be used as a filler. In another case, a plurality of cylindrical sheets may be arranged in a concentric manner. Regardless of whether dried tobacco leaves are shredded or pulverized to form a homogenized sheet, various types of tobacco can be used as tobacco included in the flavor source filler 14. Flue-cured species, Burley species, orient species, domestic species, and *Nicotiana tabacum* species and *Nicotiana rustica* species other than the above can be blended with one another as needed in order to produce an intended taste. Details of the above tobacco species are disclosed in "Encyclopedia of Tobacco, Tobacco Academic Studies Center, 2009.3.31".

[0059] There are a plurality of methods for pulverizing tobacco and forming the pulverized tobacco into a homogenized sheet. A first example is a method in which a sheet is prepared using a papermaking process. A second example is a method in which an appropriate solvent, such as water, is mixed with pulverized tobacco, the resulting mixture is homogenized, the homogenized material is cast on a metal plate or a metal plate belt to form a thin layer, and the thin layer is dried to form a cast sheet. A third example is a method in which an appropriate solvent, such as water, is mixed with pulverized tobacco, the resulting mixture is homogenized, and the homogenized material is extrusion-molded into a sheet-like shape to form a rolled sheet. Details of types of the homogenized sheets are disclosed in "Encyclopedia of Tobacco, Tobacco Academic Studies Center, 2009.3.31".

[0060] The pack density of the tobacco filler 14 is not limited. In order to achieve the intended performance of the non-combustion-heating-type flavor inhaler and impart a suitable flavor, the pack density of the tobacco filler 14 is commonly 250 mg/cm^3 or more and is preferably 320 mg/cm^3 or more; and is commonly 520 mg/cm^3 or less and is preferably 420 mg/cm^3 or less. Specifically, in the case where the tobacco-containing segment has a circumference of 22 mm and a length of 20 mm, the content of the flavor source filler in the tobacco-containing segment 13 is commonly 200 to 450 mg and is preferably 280 to 400 mg per tobacco-containing segment.

[0061] An aerosol-source material may be added to the tobacco raw material, such as tobacco leaves, such that the amount of the aerosol-source material is 10% to 50% by weight and is preferably 15% to 30% by weight of the amount of the tobacco raw material. The aerosol-source material is a material capable of generating an aerosol when heated. Examples of the aerosol-source material include, but are not limited to, glycerine, propylene glycol (PG), triethyl citrate (TEC), triacetin, and 1,3-butanediol. The above aerosol-source materials may be used alone or in combination of two or more.

[0062] The type of the volatile flavoring agent component is not limited. In order to impart a suitable flavor, the following volatile flavoring agent components may be used: acetanisoole, acetophenone, acetylpyrazine, 2-acetylthiazole, an alfalfa extract, amyl alcohol, amyl butyrate, trans-anethole, a star anise oil, an apple juice, a Peru balsam oil, a beeswax absolute, benzaldehyde, benzoin resinoid, benzyl alcohol, benzyl benzoate, benzyl phenylacetate, benzyl propionate, 2,3-butanedione, 2-butanol, butyl butyrate, butyric acid, caramel, a cardamom oil, a carob absolute, β -carotene, a carrot juice, L-carvone, β -caryophyllene, a cassia bark oil, a cedarwood oil, a celery seed oil, a chamomile oil, cinnamaldehyde, cinnamic acid, cinnamyl alcohol, cinnamyl cinnamate, a citronella oil, DL-citronellol, a clary sage extract, cocoa, coffee, a cognac oil, a coriander oil, cuminaldehyde, a davana oil, δ -decalactone, γ -decalactone, decanoic acid, a dill herb oil, 3,4-dimethyl-1,2-cyclopentanedione, 4,5-dimethyl-3-hydroxy-2,5-dihydrofuran-2-one, 3,7-dimethyl-6-octenoic acid, 2,3-dimethylpyrazine, 2,5-dimethylpyrazine, 2,6-dimethylpyrazine, ethyl 2-methylbutyrate, ethyl acetate, ethyl butyrate, ethyl hexanoate, ethyl 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, a fenugreek absolute, a genet absolute, gentian root infusion, geraniol, geranyl acetate, a grape juice, guaicol, a 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 lactone, 4-hydroxy-4-(3-hydroxy-1-butenyl)-3,5,5-trimethyl-2-cyclohexen-1-one, 4-(para-hydroxyphenyl)-2-butanone, sodium 4-hydroxyundecanoate, an immortelle absolute, β -ionone, isoamyl acetate, isoamyl butyrate, isoamyl phenylacetate, isobutyl acetate, isobutyl phenylacetate, a jasmine absolute, kola nut tincture, a labdanum oil, lemon oil terpeneless, a glycyrrhiza extract, linalool, linalyl acetate, a lovage root oil, maltol, maple syrup, menthol, menthone, L-menthyl acetate, para-methoxy benzaldehyde, methyl-2-pyrrolyl ketone, methyl anthranilate, methyl phenylacetate, methyl salicylate, 4'-methylacetophenone, methylcyclopentenolone, 3-methylvaleric acid, a mimosa absolute, molasses, myristic acid, nerol, nerolidol, γ -nonalactone, a nutmeg oil, δ -octalactone, octanal, octanoic acid, an orange flower oil, an orange oil, an orris root oil, palmitic acid, ω -pentadecalactone, a peppermint oil, a petitgrain oil Paraguay, phenethyl alcohol, phenethyl phenylacetate, phenylacetic acid, piperonal, a plum extract, propenyl guaethol, propyl acetate, 3-propylidene phthalide, a prune juice, pyruvic acid, a raisin extract, a rose oil, rum, a sage oil, a sandalwood oil, a spearmint oil, a styrax absolute, a 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, a thyme oil, a tomato extract, 2-tridecanone, triethyl citrate, 4-(2,6,6-trimethyl-1-cyclohexenyl)2-buten-4-one, 2,6,6-trimethyl-2-cyclohexene-1,4-dione, 4-(2,6,6-trimethyl-1,3-cyclohexadienyl)2-buten-4-one, 2,3,5-trimethylpyrazine, γ -undecalactone, γ -valerolactone, a vanilla extract, vanillin, veratric aldehyde, a violet leaf absolute, and extracts of tobacco plants (e.g., tobacco leaves, tobacco stems, tobacco flowers, tobacco roots, and tobacco seeds). Menthol is particularly preferable. The above volatile flavoring agent components may be used alone or in combination of two or more.

[Non-Tobacco Filler]

[0063] Materials derived from non-tobacco plants can be used as a non-tobacco filler. Examples of the materials derived from non-tobacco plants include aromatic plants, such as herb plants (e.g., mint, basil, thyme, coriander, rosemary, parsley, fennel, lemongrass, and cinnamon) and tea leaves. The plant may be selected from "List of original source plants and animals of natural flavoring agents" (Consumer Affairs Agency Food Labeling Division Notification No. 337 of 2010, Appendix 2).

[0064] The above plants are dried, cut to a width of about 0.5 to 1.5 mm, and formed into shreds having a length of about 5 to 20 mm. The shreds can be filled inside the cylindrical columnar wrapper while aligned randomly. Alternatively, the shreds may be filled inside the wrapper such that the longitudinal direction of the shreds is substantially parallel to the axial direction of the flavor source-containing segment. A plurality of types of plants may be blended with one another in accordance with an intended taste and flavor.

[0065] The non-tobacco filler may be a porous material made from a non-tobacco plant fiber. The porous material can be produced using the method described in Dry-Laid Nonwoven Fabric and Wet-Laid Nonwoven Fabric. It is preferable to add a flavor source, such as a flavoring agent, to the porous material. The above porous material can be cut to a width of about 0.5 to 1.5 mm and formed into shreds having a length of about 5 to 20 mm, and the shreds can be filled inside the cylindrical columnar wrapper while aligned randomly. Alternatively, the above shreds may be filled inside the wrapper such that the longitudinal direction of the shreds is substantially parallel to the axial direction of the cap member. In another case, the porous material may be filled inside the cylindrical columnar wrapper in the form of a sheet while folded. In this case, the porous material may be filled inside the wrapper in a gathered shape (i.e., while creased).

[0066] The non-tobacco filler can be a material derived from a polysaccharide. Examples of the material derived from a polysaccharide include thickening polysaccharides (e.g., gellan gum, carrageenan, pectin, and agar). These polysaccharides are mixed with water, and the resulting mixture is homogenized and then dried to form a sheet. For performing drying, any of normal temperature (i.e., air drying), vacuum heating, and freeze drying may be used. For filling the sheet inside the wrapper, the above-described method may be used. Alternatively, the homogenized mixture of the material derived from a polysaccharide and water may be formed into granules and the granules may be filled inside the wrapper.

[0067] Moreover, a low-density porous gel (i.e., a gel having open-pore structure) may be produced by homogenizing a material derived from a polysaccharide, a gelling agent, a gelation accelerator, and water to prepare a wet gel having a crosslinked structure and subsequently performing a supercritical carbon dioxide treatment or freeze-drying treatment to remove water while maintaining the crosslinked structure. Details of the above method are disclosed in International Publication No. 2019/111536. Optionally, a flavor source (e.g., a flavor, a tobacco extract, or ground tobacco) may be added to the above raw materials when homogenization is performed in the preparation of the wet gel. The flavor source may be added to the above porous gel.

(2-2) Wrapper

[0068] The flavor source filler 14 is wrapped with a wrapper 17. The wrapper 17 may be composed of the same material as the wrapper 15 described above. In the case where the filler includes a large amount of moisture or aerosol-source material, it is desirable that the strength of the wrapper be not reduced when the wrapper is impregnated with the above liquid. In order to limit the strength reduction, a wrapper produced by laminating the material constituting the wrapper

15 described above, a paper sheet, and a metal foil on top of one another, a wrapper produced by laminating the material constituting the wrapper 15, a paper sheet, and a polymer film on top of one another, and the like are preferably used.

2. First Mouthpiece Segment

[0069] The first mouthpiece segment 3 is disposed downstream of the flavor source-containing rod 1. The first mouthpiece segment 3 is composed of a tubular member 31 and is preferably composed of a paper tube 31. Publicly known types of paper can be used. The thickness of the paper is preferably 200 to 1000 μm . The first mouthpiece segment 3 is connected to the flavor source-containing rod 1 with a mouthpiece lining paper 35. The mouthpiece lining paper 35 and the tubular member 31 have perforations 33 arranged to penetrate through both mouthpiece lining paper 35 and tubular member 31. The presence of the perforations 33 allows outside air to be introduced into the segment 3 when inhalation is performed. Consequently, a vaporized aerosol component generated upon heating of the flavor source-containing segment 13 is brought into contact with outside air. As a result of a reduction in the temperature of the aerosol component, the aerosol component liquefies to form an aerosol. Thus, the first mouthpiece segment 3 serves as a cooling segment. The diameter of the perforations 33 (i.e., the distance across the perforations 33) is not limited and may be, for example, 0.5 to 1.5 mm. The number of the perforations 33 is not limited and may be one or more. For example, a plurality of perforations 33 may be formed on the periphery of the first mouthpiece segment 3.

[0070] When a heater 91 is inserted into the end of the flavor source-containing segment 13, a part of the flavor source filler 14 may be squeezed into the first mouthpiece segment. In order to prevent this, it is preferable to form the paper tube 31 using a paper sheet having a larger thickness than the paper sheet constituting the wrapper 17, with which the flavor source filler 14 is wrapped. Alternatively, a liner may be arranged inside the paper tube 31 in order to prevent the phenomenon in which the flavor source filler 14 is squeezed. The liner may be composed of a paper sheet comparable to that constituting the paper tube 31. Fig. 12 illustrates paper tubes according to embodiments which include a liner. Note that, in the drawings, L denotes a liner, and B denotes an adhesive.

3. Second Mouthpiece Segment

[0071] The second mouthpiece segment 5 is disposed downstream of the first mouthpiece segment 3. The second mouthpiece segment 5 increases the strength of the flavor inhaler. Specifically, the second mouthpiece segment 5 includes a center-hole segment 51 that includes a packed layer in which a cellulose acetate fiber is filled at a high density and has a hollow formed at the center of the center-hole segment 51. The second mouthpiece segment 5 is wrapped with an inner plug wrapper 53. The center-hole segment 51 may be a rod having an inside diameter of 5.0 to 1.0 mm which is prepared by adding a plasticizer including triacetin to a cellulose acetate fiber such that the amount of the plasticizer is 6% to 20% by weight of the amount of cellulose acetate and curing the resulting mixture. Since the packed layer is filled with fibers at a high pack density, air and the aerosol flow through only the hollow during inhalation; little air and the aerosol flow through the packed layer. The packed layer may be impregnated with a volatile flavoring agent. In such a case, the volatile flavoring agent can be added to the air or aerosol that flows through the hollow.

4. Third Mouthpiece Segment

[0072] The third mouthpiece segment 7 is disposed downstream of the second mouthpiece segment 5. The third mouthpiece segment 7 is a solid-core member that serves as a filter. The third mouthpiece segment 7 includes a filter segment 71 composed of a solid-core layer filled with a cellulose acetate fiber and is wrapped with an inner plug wrapper 73. The second mouthpiece segment 5 and the third mouthpiece segment 7 are connected to each other with an outer plug wrapper 55. Since a non-combustion-heating-type flavor inhaler including the third mouthpiece segment 7 includes a fiber-packed layer arranged to reach the inhalation end, the flavor inhaler has the same appearance as common cigarettes.

[0073] The positions of the second and third mouthpiece segments are interchangeable. Only one of the second and third mouthpiece segments may be formed.

[0074] The third mouthpiece segment is not necessarily the solid-core segment filled with a cellulose acetate fiber as described above and may be a segment filled with a wet-laid or dry-laid nonwoven fabric, similarly to the cap member 11.

[0075] One or a plurality of flavoring agent capsules having a substantially spherical shape may be disposed in a bundle of the fibers filled in the third mouthpiece segment. The flavoring agent capsules include a shell containing a saccharide or a protein and a core containing a liquid flavoring agent component. For example, the flavoring agent capsules may be seamless capsules prepared by coaxial nozzle dropping. It is desirable that the diameter of the substantially spherical capsules be smaller than that of the bottom of the cylindrical third mouthpiece segment.

5. Non-Combustion-Heating-Type Flavor Inhaler

[0076] The flavor source-containing rod 1, the first mouthpiece segment 3, the second mouthpiece segment 5, and the third mouthpiece segment 7 are connected to one another to form a non-combustion-heating-type flavor inhaler 100. The above segments are connected with a mouthpiece lining paper 35. The above segments can be connected by, for example, applying an adhesive, such as a vinyl acetate-based adhesive, onto the inner surface of the mouthpiece lining paper 35 and wrapping the mouthpiece lining paper 35 around the above segments.

6. Method for Producing Cap Member 11

[0077] A method for producing the cap member 11 according to this embodiment preferably includes a step of filling a nonwoven fabric including a natural fiber inside a wrapper in a compressed state (hereinafter, this step is also referred to as "nonwoven fabric filling step"). The above method preferably further include a step of forming a nonwoven fabric by a carding- or airlaid-type dry process, a wet process, spunbonding, or meltblowing (hereinafter, this step is also referred to as "nonwoven fabric forming step") prior to the nonwoven fabric filling step. Using the above method, it is possible to produce the cap member 11 according to this embodiment in an easy and efficient manner. Each of the above steps is described below taking, as examples, the case where a dry-laid nonwoven fabric is formed and the case where a wet-laid nonwoven fabric is formed.

[Case Where Dry-Laid Nonwoven Fabric is Formed]

(1) Nonwoven Fabric Forming Step

[0078] In this step, a nonwoven fabric is formed by a carding- or airlaid-type dry process, a wet process, spunbonding, or meltblowing. In the formation of the nonwoven fabric, for bonding fibers including a natural fiber together, thermal bonding, chemical bonding, needle punching, a spunlace method (hydroentangling), stitch bonding, and a steam jet method can be used.

[0079] In this step, it is particularly preferable that the dry-laid nonwoven fabric be formed using an airlaid-type dry process and fibers including a natural fiber be bonded together by chemical bonding. The airlaid-type dry process enables a low-density fiber layer to be formed using a stream of air. In chemical bonding, a binder is blown to the fiber layer, which causes the fibers to be bonded together while the low density is maintained. Examples of the binder used in chemical bonding include starch, polyvinyl alcohol, polyvinyl acetate, an ethylene vinyl acetate copolymer, and a vinyl acetate acrylic copolymer. The above binders may be used alone or in combination of two or more. In the case where the nonwoven fabric is formed using spunbonding or meltblowing, or in the case where the fibers including a natural fiber are bonded together using thermal bonding, the fibers may further include, in addition to the natural fiber, a thermoplastic fiber.

(2) Nonwoven Fabric Filling Step

[0080] In this step, the dry-laid nonwoven fabric including a natural fiber is filled inside the wrapper in a compressed state. This step preferably includes stacking a plurality of sheets of the sheet-like nonwoven fabric on top of one another, folding the sheets of the nonwoven fabric in an S-like shape, and filling the sheets of the nonwoven fabric folded in an S-like shape inside a wrapper in a compressed state.

[0081] When the nonwoven fabric is compressed, the compression rate (B) calculated using the following method is preferably 20% or more and less than 100%, is more preferably 20% to 60%, and is further preferably 25% to 40%. When the compression rate (B) is 20% or more and less than 100%, the compression rate (A) of the cap member 11, which is described above, is likely to fall within the range of 20% or more and less than 100%.

{Method for Calculating Compression Rate (B)}

[0082] Cross-sectional area (B1): The cross-sectional area of the nonwoven fabric perpendicular to the axial direction of the cap member 11, which is measured immediately before the nonwoven fabric is compressed.

[0083] Cross-sectional area (B2): The cross-sectional area of the nonwoven fabric portion perpendicular to the axial direction of the cap member 11.

$$\text{Compression rate (B) (\%)} = (\text{Cross-sectional area (B2)} / \text{Cross-sectional area (B1)}) \times 100$$

[0084] The cross-sectional area (B1) is determined by taking an image of the cross section of the nonwoven fabric with a microscope immediately before the nonwoven fabric is compressed, measuring vertical and horizontal lengths on the operation monitor, and calculating the cross-sectional area of the nonwoven fabric which is perpendicular to the axial direction of the cap member 11. The cross-sectional area (B2) is determined by measuring the outer circumference (i.e., circumference) of the cap member 11 using a filter circumference meter (product name: SODIMAX, produced by SODIM), measuring the thickness of the wrapper using a paper thickness meter, and calculating the cross-sectional area using the above values.

[0085] This step can be conducted using, for example, the filter segment manufacturing apparatus illustrated in Fig. 3. This apparatus includes a nonwoven fabric feed device S, a nonwoven fabric processing device W, and a filter segment forming device F. The nonwoven fabric feed device S may be a device that feeds a nonwoven fabric produced in the nonwoven fabric forming step described above to the nonwoven fabric processing device W in a continuous manner.

[0086] Fig. 4 illustrates details of the nonwoven fabric processing device W. This device includes a slitter W8, a pass part W9, a level control roller W10, vertical rollers W11, an S-shaped guide W12, a rotor tube W13, and a forming member W14. A sheet-like nonwoven fabric W16, which is continuously fed from the nonwoven fabric feed device S, is cut into four parts in the machine direction with the slitter W8. Specifically, as illustrated in Fig. 5, the nonwoven fabric W16 is cut into four equal parts in the machine direction with three slit knives W15. Although the nonwoven fabric is cut into four parts in this device, the number of parts into which the nonwoven fabric is cut is not limited.

[0087] The four sheets of the nonwoven fabric W16 which has been cut with the slitter W8 are made out-of-phase with one another using the pass part W9. Subsequently, the heights of the sheets of the nonwoven fabric W16 are adjusted using the level control roller W10, and the directions of the sheets of the nonwoven fabric W16 are changed using the vertical rollers W11. Specifically, as illustrated in Fig. 6, when the nonwoven fabric W16 is passed through the vertical rollers W11, the directions of the sheets are changed and the sheets of the nonwoven fabric W16 are arranged to overlap one another with a slight displacement being left therebetween. Subsequently, when the nonwoven fabric W16 is passed through the S-shaped guide W12, it is folded in an S-like shape. Specifically, as illustrated in Figs. 7(a) and 7(b), since the shape of the S-shaped guide W12 changes in the direction from the upstream part illustrated in Fig. 7(a) to the downstream part illustrated in Fig. 7(b), the four sheets of the nonwoven fabric W16, which are stacked on top of one another with a slight displacement being left therebetween, are finally folded in an S-like shape as illustrated in Fig. 7(b). Fig. 7(a) is a cross-sectional view taken along the dotted line (a) of Fig. 4, viewed from the direction in which the sheet W16 is transported (i.e., the left-hand side of Fig. 4), while Fig. 7(b) is a cross-sectional view taken along the dotted line (b) of Fig. 4, viewed from the direction in which the sheet W16 is transported (i.e., the left-hand side of Fig. 4).

[0088] The nonwoven fabric W16 folded in an S-like shape is then compression-molded into a cylindrical shape with the rotor tube W13. Specifically, as illustrated in Fig. 8, the nonwoven fabric W16 folded in an S-like shape is inserted into the rotating rotor tube W13 (Fig. 8(b)). Due to the rotation of the rotor tube W13, the nonwoven fabric W16 is compressed while maintaining its S-like shape. Simultaneously, the outer periphery of the nonwoven fabric W16 is formed into a cylindrical shape (Fig. 8(a)). The nonwoven fabric W16 formed into a cylindrical shape by compression molding is subjected to the forming member W14 in order to make the S-like shape stronger and perform further compression. As illustrated in Fig. 9, a plurality of series of rotating hourglass-shaped rollers W17, which are disposed in the forming member W14, are driven by a forming tape. The series of hourglass-shaped rollers W17 may be arranged such that the inside diameters of the hourglass-shaped rollers gradually reduce in the machine direction of the nonwoven fabric W16. When the nonwoven fabric W16 is passed through the hourglass-shaped rollers W17 disposed in the forming portion, the S-like shape can be made stronger and the nonwoven fabric W16 can be further compression-molded in a cylindrical shape. The compression rate (B) can be adjusted to fall within the above range by appropriately setting the length and rotation speed of the rotor tube W13, the inside diameter and number of the hourglass-shaped rollers W17, and the thickness and width of the forming tape.

[0089] The nonwoven fabric formed in a cylindrical shape by compression molding is fed to the filter segment forming device F illustrated in Fig. 3. A wrapper 15 is wrapped around the outer circumference of the nonwoven fabric. After bonding has been performed using an adhesive, it is cut to an adequate length. Hereby, a cap member 11 is produced.

(3) Connection Step

[0090] The cap member 11 is fixed to the end of the flavor source-containing segment 14 with a mouthpiece lining paper 35 (see Fig. 1B). In another case, the cap member 11 is connected to the flavor source-containing segment with an outer wrapper 34 and subsequently connected to the mouthpiece segment with a mouthpiece lining paper 35 (see Fig. 1C).

[Case Where Wet-Laid Nonwoven Fabric is Formed]

(1) Nonwoven Fabric Forming Step

[0091] In this embodiment, it is preferable to form a paper sheet as a wet-laid nonwoven fabric. Publicly known methods can be used for producing the paper sheet. The paper sheet can be produced with a common paper-making machine, such as a cylinder-mould papermaking machine, a Tanmo papermaking machine, a Fourdrinier papermaking machine, an inclined wire papermaking machine, using a bleached or unbleached wood pulp as a main raw material. The paper sheet may be either a low-air permeability paper sheet having an air permeability of less than 100 CU or a high-air permeability paper sheet having an air permeability of 100 CU or more. The paper sheet may include a natural fiber other than wood, in addition to wood pulp. The paper sheet may include a small amount of chemosynthetic fiber in order to increase the strength of the paper sheet.

(2) Nonwoven Fabric Filling Step

[0092] In this step, the wet-laid nonwoven fabric is subjected to a gathering process, and a sheet of the gathered dry-laid nonwoven fabric is folded and filled inside the wrapper (see Fig. 2C). The ridge lines formed by the gathering process are substantially parallel to the axial direction of the cap member. The subsequent connection step is as described above.

7. Non-Combustion-Heating-Type Flavor Inhalation System

[0093] The non-combustion-heating-type flavor inhalation system preferably includes a non-combustion-heating-type flavor inhaler and a heating apparatus for performing heating. The non-combustion-heating-type flavor inhalation system may have a structure different from the above-described one.

[0094] Fig. 10 illustrates an example of the non-combustion-heating-type flavor inhalation system. In the drawing, the non-combustion-heating-type flavor inhalation system includes a non-combustion-heating-type flavor inhaler 100 and a heating apparatus 300 that heats the outside of the flavor source-containing segment 13 of the inhaler. The flavor source-containing segment 13 may be a tobacco-containing segment. Fig. 10 illustrates an embodiment in which the non-combustion-heating-type flavor inhaler 100 is inserted into the heating apparatus 300. The heating apparatus 300 is an external heating-type heating apparatus that includes a heater 91, a metal pipe 93, a body 95, a battery unit 97, and a control unit 99. The body 95 has a tubular recess formed therein. The heater 91 and the metal pipe 93 are disposed on the inside surface of the recess at the position which faces the flavor source-containing segment 13 of the non-combustion-heating-type flavor inhaler 100 when the non-combustion-heating-type flavor inhaler 100 is inserted in the recess. The heater 91 may be an electric resistance heater. Electric power is fed from the battery unit 97 upon a command being given by the control unit 99 responsible for temperature control. Heat generated by the heater 91 is transferred to the flavor source-containing segment 13 of the non-combustion-heating-type flavor inhaler 100 through the metal pipe 93 having a high thermal conductivity.

[0095] The cap member 11 disposed at the end of the non-combustion-heating-type flavor inhaler 100 may be heated and is not necessarily heated. Even if the cap member 11 according to this embodiment is heated, it does not generate a volatile component as described above. As illustrated in the lower part of Fig. 10, the heater 91 may be arranged such that the interval between the opposing portions of the heater 91 reduces in the direction toward the closed end of the recess in order to enhance the holding capability. In such a case, the cap member 11 becomes deformed. However, unwanted channels are not created in the cap member 11 according to this embodiment, because the cap member 11 is filled with the nonwoven fabric at an adequate compressive force.

[0096] Fig. 11 illustrates a non-combustion-heating-type flavor inhalation system according to another embodiment. The heating apparatus 300 is an internal heating-type heating apparatus that includes a heater 91 that can be inserted into the non-combustion-heating-type flavor inhaler 100. The heater 91 is preferably a tabular, blade-shaped, or pillar-shaped heater having certain stiffness. Examples of the heater include a ceramic heater that includes a ceramic substrate and molybdenum, tungsten, or the like deposited on the ceramic substrate. The heater 91 can be easily inserted into the non-combustion-heating-type flavor inhaler 100 without confirming the positions of the gaps, because the cap member 11 according to this embodiment is filled with a nonwoven fabric such that the principal surface of the nonwoven fabric is substantially parallel to the axial direction and a plurality of gaps are present between sheets of the nonwoven fabric. It is preferable that the above gaps cannot be visually identified. Such a non-combustion-heating-type flavor inhaler is excellent also in terms of appearance.

[0097] The heating temperature of the heating apparatus is preferably, but not limited to, 400°C or less, is more preferably 150°C to 400°C, and is further preferably 200°C to 350°C. Note that the term "heating temperature" used herein refers to the temperature of the heater of the heating apparatus.

EXAMPLES

[Example 1] Preparation of Cap Members A to L

(1) Preparation of Nonwoven Fabrics

[0098] Nonwoven fabrics were prepared using an airlaid-type dry process. Specifically, a wood pulp used as a raw material was formed into filaments with a crusher and a defibrator. Subsequently, the pulp was dropped from a web-forming device onto an absorbing surface of an endless wire net in order to form a web while transported. A binder solution including polyvinyl alcohol and a polyvinyl acetate acrylic copolymer was sprayed to the web. Subsequently, the drying was performed. Then, the binder solution was further sprayed to the web, and drying was performed. Hereby, a nonwoven fabric having a width of 240 cm was prepared (chemical bonding). The nonwoven fabric was coiled with a coiling device to form a jumbo roll. Then, the nonwoven fabric was drawn from the jumbo roll, slit to a width of 13 cm, and subsequently coiled. As for the cap members A to F, a wood pulp having a coarseness of 0.22 mg/m (Product name: NB416, produced by Weyerhaeuser) was used as a raw material wood pulp. As for the cap members G to L, a wood pulp having a coarseness of 0.18 mg/m (Product name: BioBright, produced by UPMRaumacell) was used as a raw material wood pulp. The basis weights of the nonwoven fabrics included in the cap members A to L were adjusted as needed.

(2) Preparation of Cap Member Precursors

[0099] Cap members were prepared using a device for manufacturing filters for tobacco. Specifically, the nonwoven fabrics prepared by the method described in (1) were each torn into four sheets with a slitter, and the four sheets were stacked on top of one another. The resulting multilayer body was formed into a cylinder having an S-shaped cross section by compression molding. The cylindrical nonwoven fabric was wrapped with a wrapper (LPWS-OLL produced by Nippon Paper Papyrus Co., Ltd. (air permeability: 1300 C.U., basis weight: 26.5 g/m², thickness: 48 μm)). After the wrapped portion had been bonded with an adhesive, the cylindrical body was cut to a predetermined length set by the filter manufacturing device with a cutter. Hereby, a cap member precursor was formed. The width of the nonwoven fabric that had not been slit was 130 cm. After the nonwoven fabric had been slit into four sheets at equal intervals, each of the sheets had a width of 32 mm. That is, a slight loss occurred when the nonwoven fabric was slit. The cap member precursors listed in Table 1 were prepared in the above-described manner. The length of the precursors in the axial direction was 27.0 mm. The circumference of the precursors was 24.1 mm. Each of the precursors was filled with four sheets of nonwoven fabric which had a width of 32 mm and a length of 27 mm. Each of the precursors was cut to a length of 8 mm in the axial direction. Hereby, cap members were prepared. Table below lists the physical properties of the cap members.

[Table 1]

	Airflow resistance per 27 mm length and 24.1 mm circumference (precursor)	Airflow resistance per 8 mm length and 24.1 mm circumference
	mmH ₂ O	mmH ₂ O
A	46.1	13.7
B	76.9	22.8
C	73.0	21.6
D	71.8	21.3
E	104.2	30.9
F	109.9	32.6
G	99.9	29.6
H	121.2	35.9
I	115.0	34.1
J	145.7	43.2
K	153.3	45.4

(continued)

	Airflow resistance per 27 mm length and 24.1 mm circumference (precursor)	Airflow resistance per 8 mm length and 24.1 mm circumference
	mmH ₂ O	mmH ₂ O
L	202.8	60.1

[Example 2] Preparation of Cap Members

(1) Wet-Laid Nonwoven Fabrics (Paper Sheets)

[0100] The following paper sheets were prepared.

- 1) Produced by delfort, name: Brown 205232, basis weight: 33 [g/m²], thickness: 50 [μm], air permeability: 0 [CORESTA], color: brown
- 2) Produced by delfort, name: BCPW 10003728, basis weight: 35 [g/m²], thickness: 37 [μm], air permeability: 0 [CORESTA], color: white
- 3) Produced by Glatz, name: Stiff PW 8969, basis weight: 82 [g/m²], thickness: 100 [μm], air permeability: 0 [CORESTA], color: white
- 4) Produced by Glatz, name: Stiff PW 8993, basis weight: 100 [g/m²], thickness: 125 [μm], air permeability: 0 [CORESTA], color: white
- 5) Produced by Nippon Paper Industries Co., Ltd., name: Extra-thick White Glassine, basis weight: 40 [g/m²], thickness: 37 [μm], air permeability: 0 [CORESTA], color: white

(2) Shaping and Preparation of Cap Members

[0101] Each of the paper sheets was subjected to a long-fold creasing process using a filter winding machine (FR4-PF, produced by Sanjo Machine Works, Ltd.) and subsequently wrapped with a wrapper. Hereby, cap members were prepared. The creasing process was performed under the following conditions.

Pitch of long-fold creasing lines: 1 mm pitch

Depth of creping of long-fold creasing lines (i.e., depth of mesh of creasing metal rollers): 0.15 to 0.20 mm

The wrapper used was a plug wrap produced by Michael (air permeability: 0 [CORESTA], basis weight: 36 [g/m²], thickness: 43 [μm], paper width: 24.3 mm). The final size of the cap members was as follows: circumference: 22.0 mm, length: 8 mm.

[0102] The conditions of the fillers were as follows.

- 1) width: 180 mm, volume occupancy: 24%, 2.5 mmH₂O
- 2) width: 200 mm, volume occupancy: 20%, 2.5 mmH₂O
- 3) width: 80 mm, volume occupancy: 27%, 3.5 mmH₂O
- 4) width: 100 mm, volume occupancy: 27%, 3.5 mmH₂O
- 5) width: 180 mm, volume occupancy: 24%, 2.5 mmH₂O

REFERENCE SIGNS LIST

[0103]

- | | |
|-----|--|
| 100 | non-combustion-heating-type flavor inhaler |
| 1 | flavor source-containing rod |
| 3 | first mouthpiece segment |
| 5 | second mouthpiece segment |
| 7 | third mouthpiece segment |
| 11 | cap member |
| 12 | sheet, nonwoven fabric |
| 13 | flavor source-containing segment, tobacco-containing segment |

	14	flavor source filler
	15, 17	wrapper
	31	tubular member, paper tube
	33	perforation
5	34	outer wrapper
	35	mouthpiece lining paper
	51	center-hole segment
	53	inner plug wrapper
10	S	nonwoven fabric feed device
	W	nonwoven fabric processing device
	W8	slitter
	W9	pass part
	W10	level control roller
15	W11	vertical rollers
	W12	S-shaped guide
	W13	rotor tube
	W14	forming member
	W15	slit knife
20	W16	nonwoven fabric W
	F	filter segment forming device
	300	heating apparatus
	91	heater
25	93	metal pipe
	95	body
	97	battery unit
	99	control unit
30	L	liner
	B	adhesive

Claims

- 35
1. A flavor source-containing rod comprising a cap member disposed at an end of the flavor source-containing rod, the end being opposite to mouthpiece end; and a flavor source filler disposed downstream of the cap member, the cap member including a sheet including a natural fiber, the sheet being arranged such that a principal surface of the sheet is substantially parallel to a longitudinal direction of the flavor source-containing rod.
 - 40 2. The flavor source-containing rod according to claim 1, wherein the sheet includes a dry-laid or wet-laid nonwoven fabric.
 - 45 3. The flavor source-containing rod according to claim 1 or 2, wherein the cap member includes a wrapper, and the sheet is filled inside the wrapper.
 - 50 4. The flavor source-containing rod according to claim 3, wherein the sheet is a dry-laid nonwoven fabric; and a compression rate (A) of the dry-laid nonwoven fabric filled inside the wrapper, the compression rate (A) being calculated using a method below, is 20% or more and less than 100%,
{Method for Calculating Compression Rate (A)}

55 Cross-sectional area (A1): a cross-sectional area of the dry-laid nonwoven fabric perpendicular to an axial direction of the cap member, which is measured after the wrapper has been removed from the cap member and the dry-laid nonwoven fabric has been taken from the cap member,
Cross-sectional area (A2): a cross-sectional area of an inside of the cap member perpendicular to the axial direction of the cap member,

$$\text{Compression rate (A)(\%)} = (\text{Cross-sectional area (A2)}/\text{Cross-sectional area (A1)}) \times 100.$$

5. The flavor source-containing rod according to claim 3 or 4, wherein the sheet is a dry-laid nonwoven fabric; and a plurality of layers of the dry-laid nonwoven fabric are filled inside the wrapper in a compressed state while stacked on top of one another and folded in an S-like shape.
6. The flavor source-containing rod according to claim 3 or 4, wherein the sheet is a dry-laid nonwoven fabric that has been subjected to a gathering process:
a layer of the gathered dry-laid nonwoven fabric is filled inside the wrapper while folded or a plurality of layers of the gathered dry-laid nonwoven fabric are filled inside the wrapper while stacked on top of one another and folded; and a ridge line formed by the gathering process is substantially parallel to an axial direction of the cap member.
7. The flavor source-containing rod according to any one of claims 2 to 6, wherein a gap is not visually identified between layers of the dry-laid nonwoven fabric at an end surface of the cap member in an axial direction of the cap member.
8. The flavor source-containing rod according to claim 2 or 3, wherein the sheet is a wet-laid nonwoven fabric; and a volume occupancy (X) of the wet-laid nonwoven fabric filled inside the wrapper, the volume occupancy (X) being calculated using a method below, is 10% or more and less than 60%,
{Method for Calculating Volume Occupancy (X)}

Cross-sectional area (X1): a total area of the wet-laid nonwoven fabric in a cross section of the cap member perpendicular to an axial direction of the cap member,

Cross-sectional area (X2): a cross-sectional area of the inside of the cap member in a cross section of the cap member perpendicular to the axial direction of the cap member,

$$\text{Volume occupancy (X)(\%)} = (\text{Cross-sectional area (X1)}/\text{Cross-sectional area (X2)}) \times 100.$$

9. The flavor source-containing rod according to claim 2, 3, or 8, wherein the sheet is a wet-laid nonwoven fabric that has been subjected to a gathering process;
a layer of the gathered wet-laid nonwoven fabric is filled inside the wrapper while folded; and a ridge line formed by the gathering process is substantially parallel to an axial direction of the cap member.
10. The flavor source-containing rod according to any one of claims 1 to 9, wherein the natural fiber is at least one fiber selected from the group consisting of silk, wool, cotton, hemp, and a plant pulp.
11. The flavor source-containing rod according to claim 10, wherein the natural fiber is a plant pulp.
12. The flavor source-containing rod according to any one of claims 1 to 11, wherein the cap member has an airflow resistance of 2 to 30 mmH₂O.
13. The flavor source-containing rod according to any one of claims 1 to 12, further comprising another cap member disposed downstream of the flavor source filler.
14. The flavor source-containing rod according to any one of claims 1 to 13, wherein the flavor source filler includes shredded tobacco, a tobacco sheet, or tobacco granules.
15. The flavor source-containing rod according to any one of claims 1 to 14, wherein the flavor source filler includes a material derived from a non-tobacco plant.
16. The flavor source-containing rod according to any one of claims 1 to 15, wherein the flavor source filler includes a porous material made from a non-tobacco plant fiber.
17. The flavor source-containing rod according to any one of claims 1 to 16, wherein the flavor source filler includes a material derived from a polysaccharide.

- 18.** A non-combustion-heating-type flavor inhaler comprising the flavor source-containing rod according to any one of claims 1 to 17.

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Fig. 1A

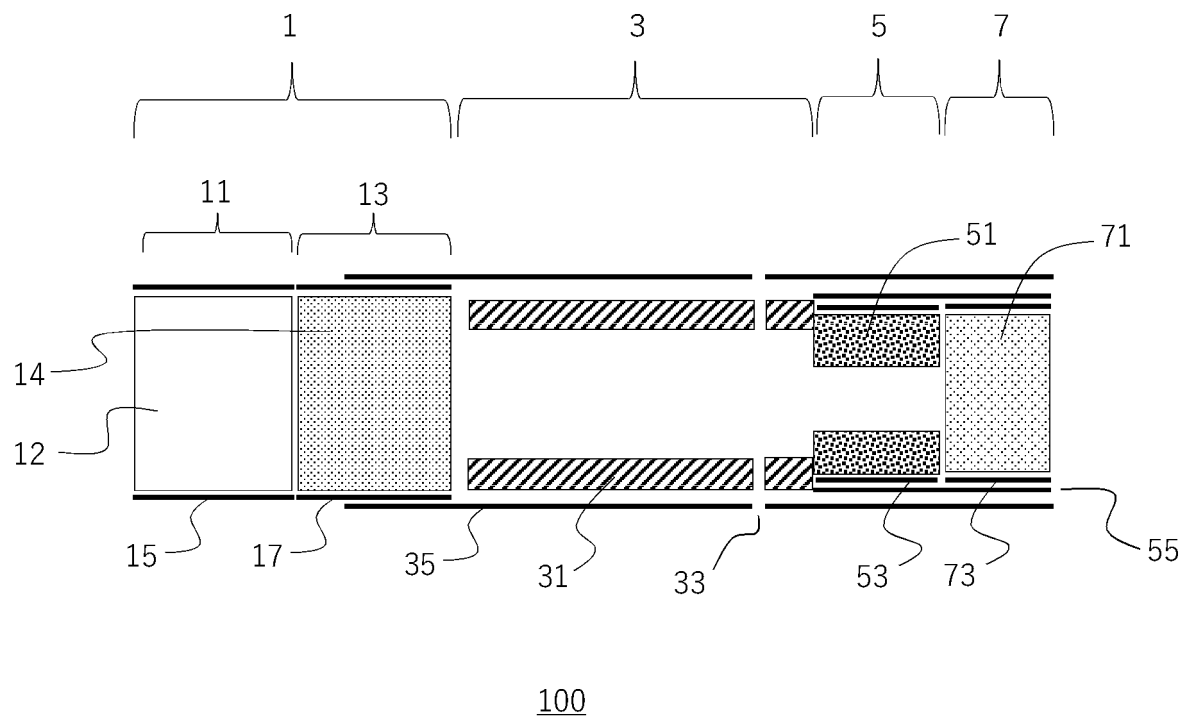


Fig. 1B

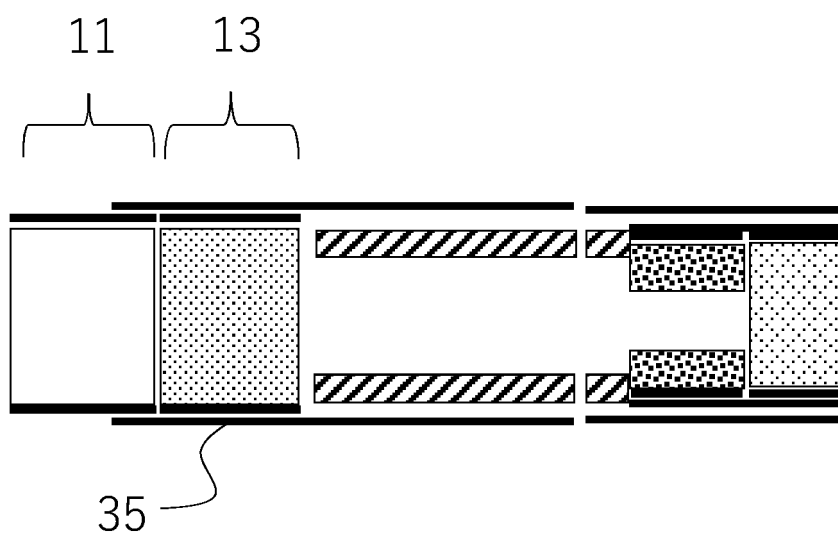


Fig. 1C

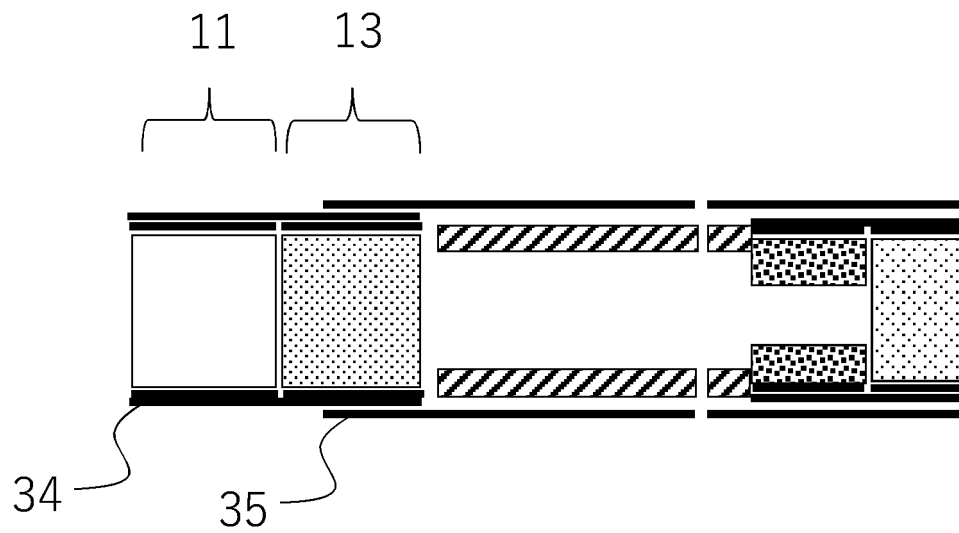


Fig. 2A

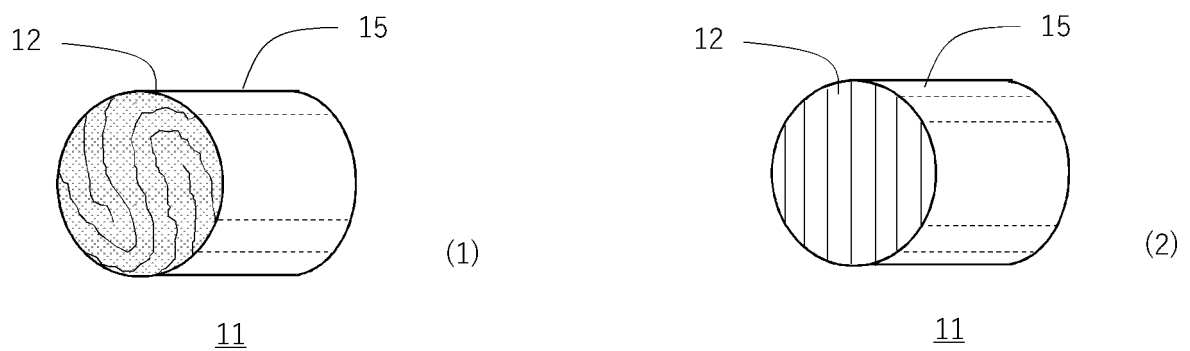


Fig. 2B

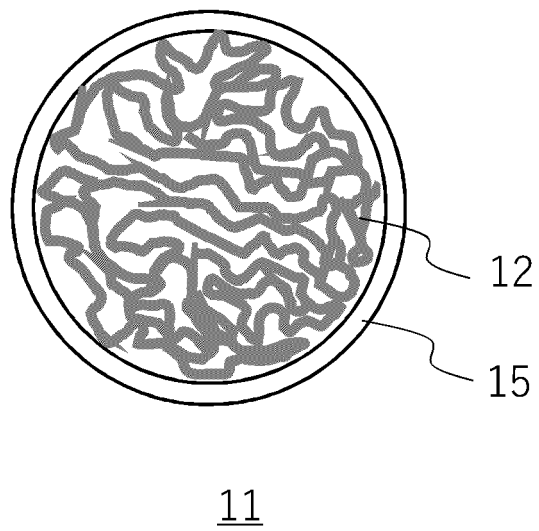


Fig. 2C

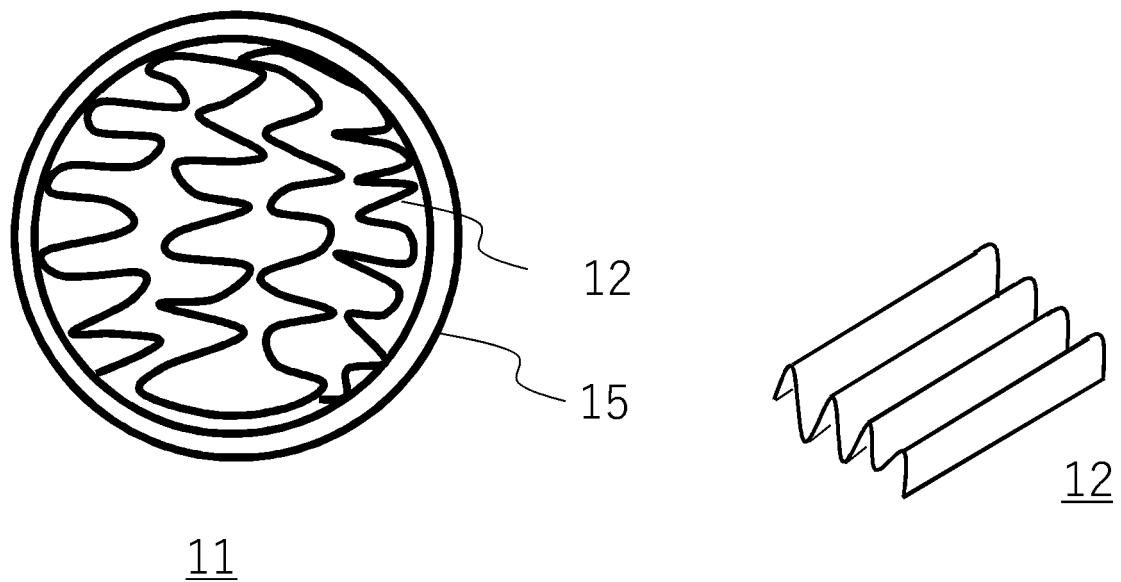


Fig. 3

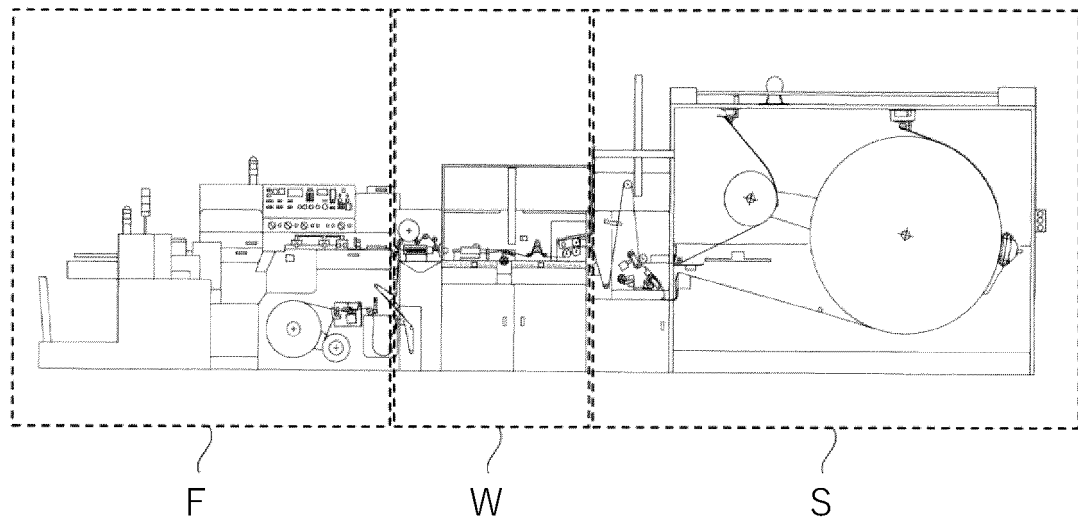


Fig. 4

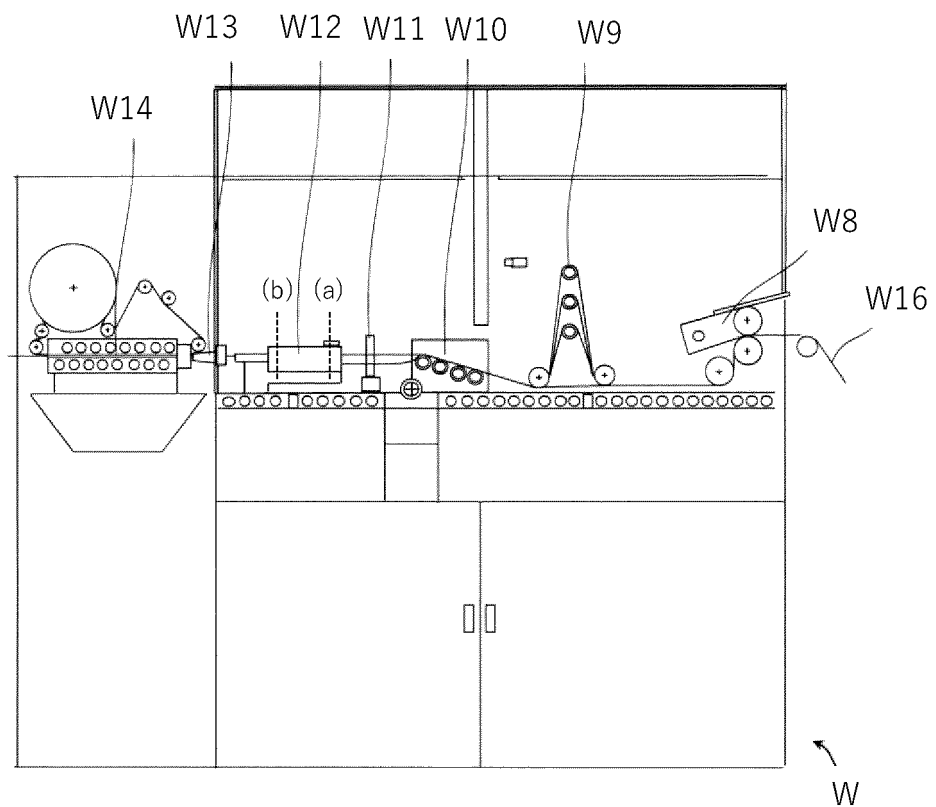


Fig. 5

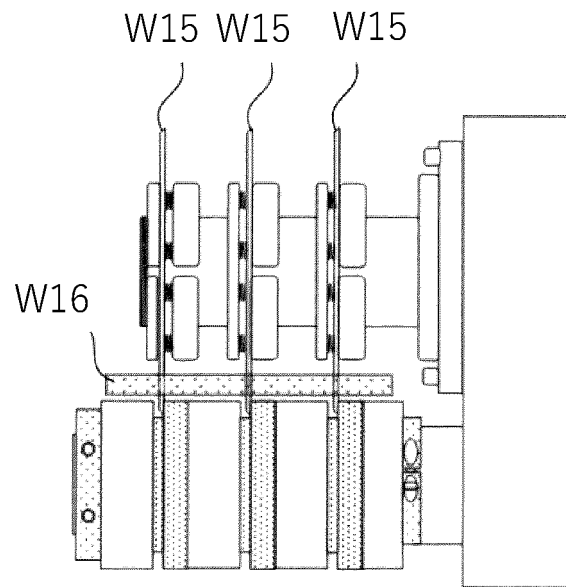


Fig. 6

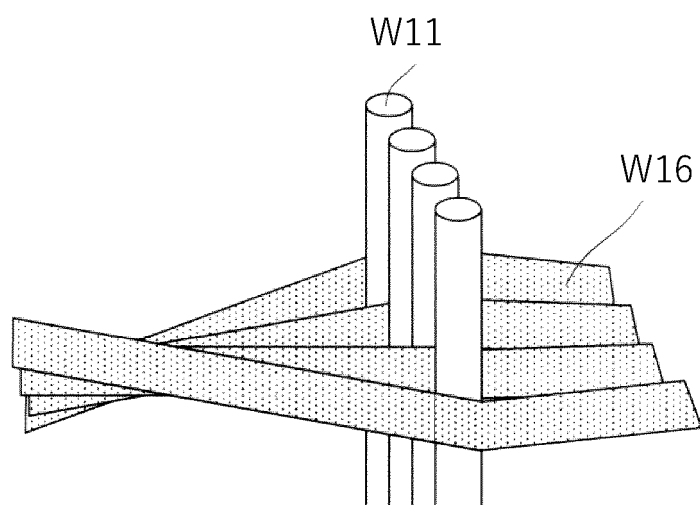


Fig. 7

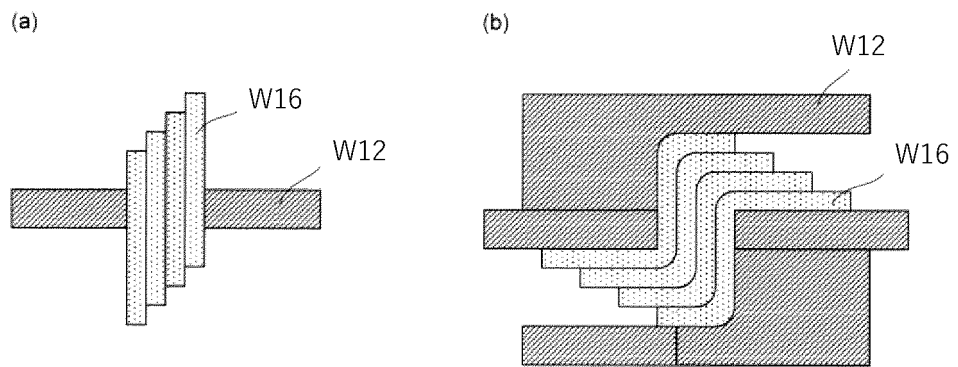


Fig. 8

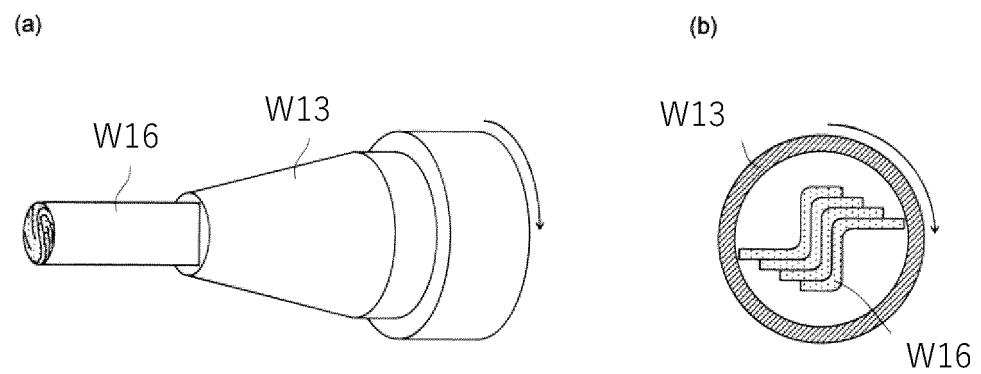


Fig. 9

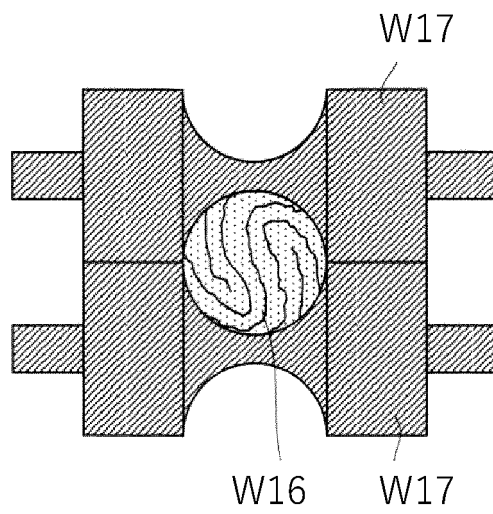


Fig. 10

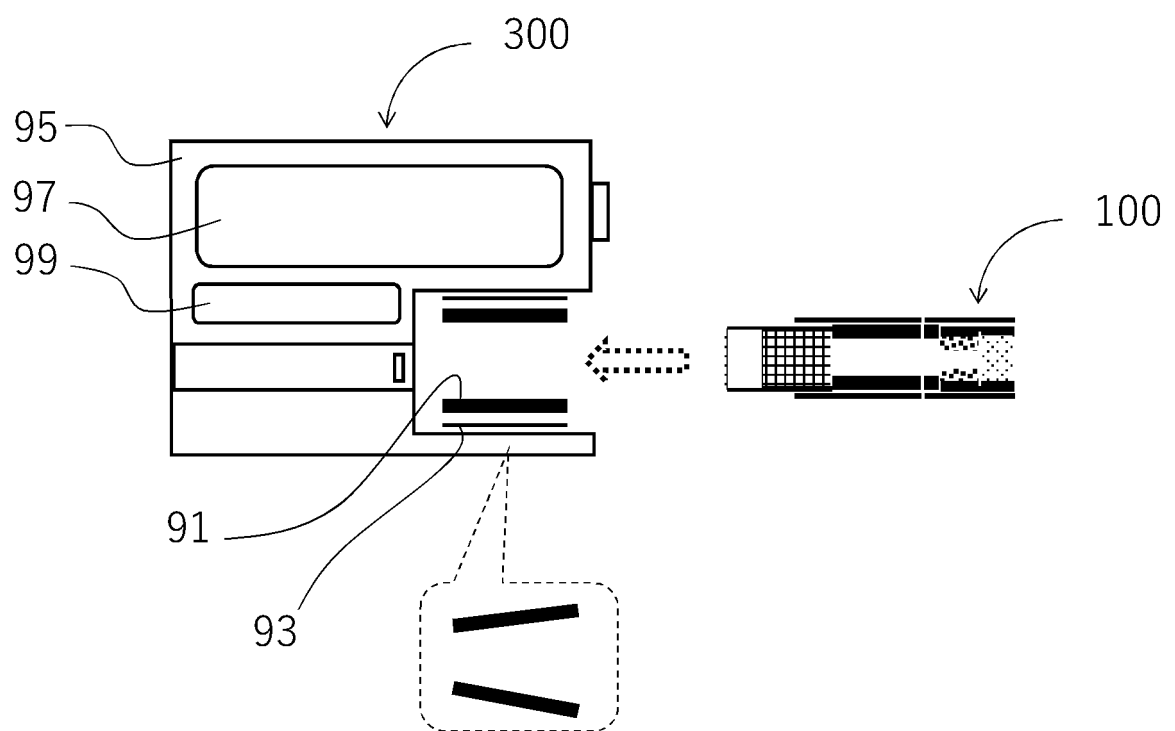


Fig. 11

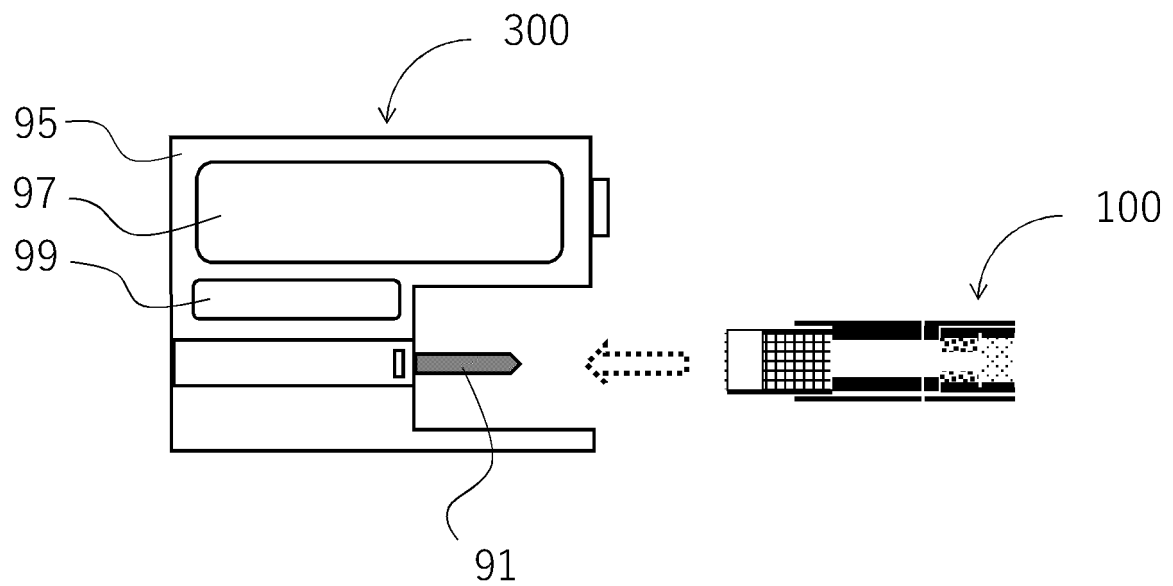
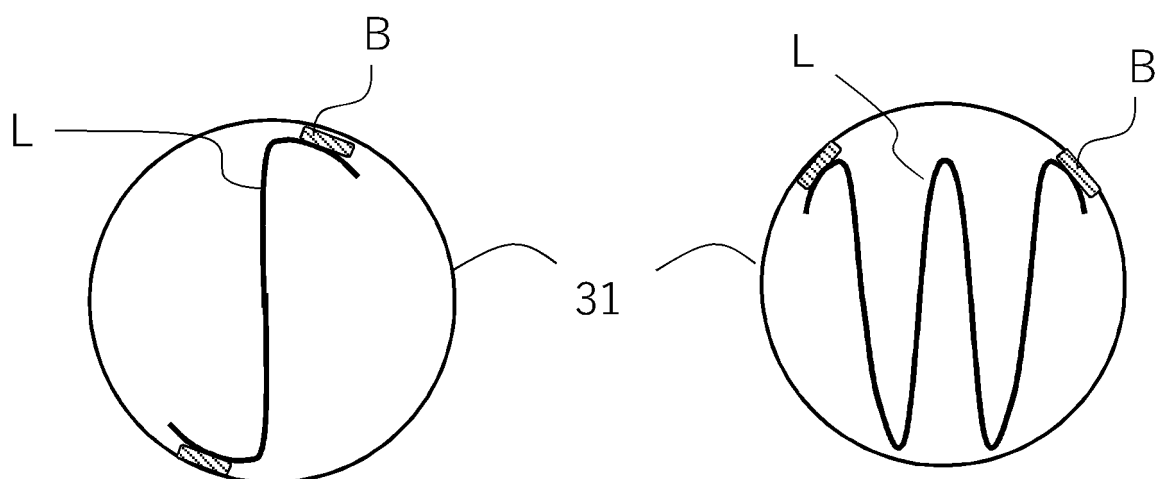


Fig. 12



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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2021/022248

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A. CLASSIFICATION OF SUBJECT MATTER

A24D 1/20(2020.01)i

FI: A24D1/20

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A24D1/20; A24F40/00-47/00

15

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 1971-2021

Registered utility model specifications of Japan 1996-2021

Published registered utility model applications of Japan 1994-2021

20

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

25

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2019-126290 A (NIPPON PAPER PAPYLIA CO LTD) 01 August 2019 (2019-08-01) in particular, see paragraphs [0001], [0018], fig. 1	1-6, 8-18
A	entire text, all drawings	7
Y	US 2001709 A (DAVIDSON, Glenn) 21 May 1935 (1935-05-21) in particular, see page 1, right column, lines 35-52, fig. 1-2, 14	1-6, 8-18
A	entire text, all drawings	7
A	US 2020/0077696 A1 (ALTRIA CLIENT SERVICES LLC) 12 March 2020 (2020-03-12) entire text, all drawings	1-18

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

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"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

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Date of the actual completion of the international search

20 July 2021 (20.07.2021)

Date of mailing of the international search report

03 August 2021 (03.08.2021)

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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

Information on patent family members

International application No.

PCT/JP2021/022248

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
JP 2019-126290 A	01 Aug. 2019	(Family: none)	
US 2001709 A	21 May 1935	(Family: none)	
US 2020/0077696 A1	12 Mar. 2020	WO 2020/049168 A1 entire text, all drawings	

REFERENCES CITED IN THE DESCRIPTION

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- WO 2019111536 A [0067]

Non-patent literature cited in the description

- Encyclopedia of Tobacco. Tobacco Academic Studies Center, 31 March 2009 [0058] [0059]
- List of original source plants and animals of natural flavoring agents. *Consumer Affairs Agency Food Labeling Division Notification*, 2010, (337 [0063])