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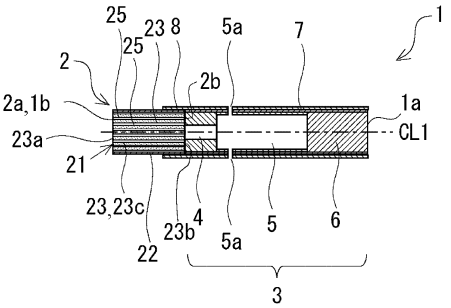
# (54) HEATING-TYPE TOBACCO, HEATING-TYPE TOBACCO PRODUCT, AND METHOD AND DEVICE FOR PRODUCING TOBACCO ROD FOR HEATING-TYPE TOBACCO

(57) Provided is a technique that is used for a heating-type tobacco provided with a tobacco rod having a tobacco filler containing a tobacco raw material and an aerosol generating substrate and a rolling paper for rolling the tobacco filler and a production method therefor to ensure delivery of a large amount of aerosol and enable a heater to be smoothly inserted into the tobacco filler. This heating-type tobacco is provided with a tobacco rod having a tobacco filler and a rolling paper for rolling the tobacco filler. The tobacco filler has multiple tobacco strands containing an aerosol generating substrate and a tobacco raw material and each having a strand shape. The multiple tobacco strands are aligned and arranged to extend in the longitudinal direction of the tobacco rod.

FIG. 1

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## Description

Technical Field

**[0001]** The present invention relates to a heating-type tobacco, a heating-type tobacco product, and a method and a device for producing a tobacco rod for a heating-type tobacco.

Background Art

**[0002]** There is a known heating-type tobacco including a tobacco rod formed by filling the inside of wrapping paper with a tobacco filler containing a tobacco raw material (for example, tobacco shreds, tobacco granules, a reconstituted tobacco material, and the like) and an aerosol-source material (glycerin, propylene glycol, and the like) (for example, refer to PTL 1). A heating-type tobacco of such a type is a tobacco article of a type that heats a tobacco filler by a heater of a heating device without burning the tobacco filler and delivers an aerosol generated at the tobacco filler to a user. As the heater, heaters having various shapes, such as a blade shape and a rod shape, have been practically used. Such a heater is inserted for use from the leading end surface of the tobacco rod, and the tobacco rod is thereby attached to a heating device.

Citation List

Patent documents

**[0003]**

Patent document 1: Japanese Patent No. 5920744
Patent document 2: Japanese Patent No. 6000451
Patent document 3: Japanese Patent No. 6017546
Patent document 4: Japanese Unexamined Patent Application Publication No. 62-272962

Summary of Invention

Technical Problem

**[0004]** Here, in a tobacco rod for an existing heating-type tobacco, a tobacco raw material of a tobacco filler is oriented randomly. Thus, it may be difficult to smoothly insert a heater with respect to the tobacco filler when attaching the heating-type tobacco to a heating device. In addition, in formation of a tobacco rod for a heating-type tobacco by using a tobacco filler in which a tobacco raw material is oriented randomly, an aerosol generated as a result of an aerosol-source material volatilizing is easily condensed by being exposed to a low-temperature part of the randomly oriented tobacco raw material and is easily filtered by the tobacco raw material, and the delivery amount of the aerosol into an oral cavity may decrease.

**[0005]** The present invention has been made in consideration of the aforementioned circumstances. An object of the present invention is to provide a technique that is excellent in terms of the delivery amount of an aerosol and that enables smooth insertion of a heater into a tobacco filler, in a heating-type tobacco that includes a tobacco rod including the tobacco filler containing a tobacco raw material and an aerosol-source material and wrapping paper that wraps the tobacco filler, and a method for producing the heating-type tobacco.

Solution to Problem

**[0006]** To solve the aforementioned problems, the present invention employs a structure in which a large number of long tobacco strands obtained by forming a tobacco raw material into a strand shape are disposed to extend in the longitudinal direction of the tobacco rod.

**[0007]** More specifically, the present invention is a method for producing a tobacco rod for a heating-type tobacco, the method including a cut-out step of cutting out a tobacco-raw-material sheet, while conveying the tobacco-raw-material sheet along a conveyance path, successively along the conveyance path into a plurality of strand-shaped tobacco-strand continuous bodies, a formation step of enclosing the plurality of tobacco-strand continuous bodies obtained in the cut-out step by wrapping paper in a state in which the plurality of tobacco-strand continuous bodies are aligned along the conveyance path, thereby forming a rod-shaped tobacco-rod continuous body, and a cut-off step of sequentially cutting off the tobacco-rod continuous body obtained in the formation step into individual tobacco rods.

**[0008]** Here, the tobacco-raw-material sheet may be obtained by forming a tobacco raw material containing an aerosol-source material into a sheet shape.

**[0009]** In addition, the tobacco-raw-material sheet may be wound around a bobbin, and the tobacco-raw-material sheet that is successively sent out from the bobbin may be conveyed along the conveyance path.

**[0010]** In the method for producing the tobacco rod for the heating-type tobacco, in the cut-out step, the tobacco-raw-material sheet may be cut out to obtain a plurality of tobacco-strand continuous bodies each having a fixed width.

**[0011]** In addition, the method for producing the tobacco rod for the heating-type tobacco may further include a calendering step of performing calendering with respect to the tobacco-raw-material sheet to thereby increase a density of the tobacco-raw-material sheet. In the cut-out step, while the tobacco-raw-material sheet to which the calendering has been performed is conveyed along the conveyance path, the tobacco-raw-material sheet may be cut out successively along the conveyance path into the plurality of strand-shaped tobacco-strand continuous bodies.

**[0012]** In addition, the method for producing the tobacco rod for the heating-type tobacco may further include

an addition step of adding at least one of a flavor and an aerosol-source material to the plurality of tobacco-strand continuous bodies obtained in the cut-out step. In this case, in the addition step, at least one of the flavor and the aerosol-source material may be added to the plurality of tobacco-strand continuous bodies in a process of enclosing the plurality of tobacco-strand continuous bodies by the wrapping paper in the formation step.

**[0013]** In addition, the present invention is a device for producing a tobacco rod for a heating-type tobacco. The device includes: a bobbin around which a tobacco-raw-material sheet is wound; a cut-out section that is disposed at a conveyance path for the tobacco-raw-material sheet sent out successively from the bobbin and that cuts out the tobacco-raw-material sheet successively along the conveyance path into a plurality of strand-shaped tobacco-strand continuous bodies; a formation section that is disposed on a downstream of the cut-out section at the conveyance path and that encloses the plurality of tobacco-strand continuous bodies in a state aligned along the conveyance path by wrapping paper, thereby forming a rod-shaped tobacco-rod continuous body; a cut-off section that is disposed on a downstream of the formation section at the conveyance path and that sequentially cuts off the tobacco-rod continuous body into individual tobacco rods each having a predetermined length.

**[0014]** Here, the cut-out section may cut out the tobacco-raw-material sheet such that the plurality of tobacco-strand continuous bodies each having a fixed width are obtained.

**[0015]** In addition, the cut-out section may include a cutter disposed parallel to the conveyance path. The tobacco-raw-material sheet may pass through the cutter along the conveyance path, and the tobacco-raw-material sheet may be thereby successively cut out by the cutter into the plurality of tobacco-strand continuous bodies.

**[0016]** In addition, the present invention is a heating-type tobacco including a tobacco rod that includes a tobacco filler and wrapping paper that wraps the tobacco filler. The tobacco filler includes a plurality of tobacco strands that each contain an aerosol-source material and a tobacco raw material and have a strand shape. The plurality of tobacco strands are aligned and disposed to extend along a longitudinal direction of the tobacco rod.

**[0017]** Here, the tobacco strands may be disposed parallel to each other in the longitudinal direction of the tobacco rod.

**[0018]** In addition, the tobacco strands may be disposed to extend from a front end to a rear end of the tobacco rod.

**[0019]** In addition, the tobacco strands may each have a strip shape.

**[0020]** In addition, the tobacco strands may each have a rectangular cross-section orthogonal to a longitudinal direction thereof.

**[0021]** In addition, in each of the tobacco strands, a width dimension of a cross-section orthogonal to the longitudinal direction thereof may be 0.4 mm or more and 3 mm or less.

**[0022]** In addition, in each of the tobacco strands, a thickness dimension of a cross-section orthogonal to the longitudinal direction thereof may be 0.02 mm or more and 1.3 mm or less.

**[0023]** In addition, in each of the tobacco strands, a length dimension in the longitudinal direction thereof may be 10 mm or more and 50 mm or less.

**[0024]** In addition, a diameter of the tobacco rod may be 5 mm or more and 8 mm or less.

**[0025]** In addition, in each of the tobacco strands, an area of a cross-section orthogonal to the longitudinal direction thereof may be equal over an entire length thereof.

**[0026]** In addition, a content percentage of the aerosol-source material in the tobacco rod may be 10 wt% or more and 25 wt% or less.

**[0027]** In addition, the heating-type tobacco may have a mouthpiece portion coaxially coupled to a base end side of the tobacco rod, and the mouthpiece portion may include a cooling portion for cooling a volatile substance emitted from the aerosol-source material.

**[0028]** In addition, the mouthpiece portion may include a support portion disposed at a connection end connected to the base end side of the tobacco rod, the support portion suppressing the tobacco strands from being pressed to a region on a side of the mouthpiece portion.

**[0029]** In addition, the mouthpiece portion may include a filter portion disposed at a mouthpiece end side of the mouthpiece portion.

**[0030]** In addition, a volume filling ratio of the tobacco strands occupying the tobacco rod may be 50 vol% or more and 80 vol% or less.

**[0031]** In addition, in the heating-type tobacco, a volume filling ratio of the tobacco strands occupying the tobacco rod may be 60 vol% or more and 80 vol% or less when a heater of a heating device to which the heating-type tobacco is applied is an external heating-type heater.

**[0032]** In addition, in the heating-type tobacco, a volume filling ratio of the tobacco strands occupying the tobacco rod may be 50 vol% or more and 75 vol% or less when a heater of a heating device to which the heating-type tobacco is applied is an internal heating-type heater.

**[0033]** In addition, the present invention may be a heating-type tobacco product including any one of the heating-type tobaccos described above, and a heating device to which the heating-type tobacco is applied.

**[0034]** In the heating-type tobacco product according to the present invention, the heating device may have a rod housing portion to which the tobacco rod for the heating-type tobacco is attachable, and a heater provided at the rod housing portion. When the heater is an internal heating-type heater that is inserted from a distal end side of the tobacco rod to attach the tobacco rod to the rod housing portion, in a state in which the tobacco rod is attached to the rod housing portion, a volume filling ratio

of the tobacco strands occupying the tobacco rod may be 60 vol% or more and 80 vol% or less.

**[0035]** In addition, in the heating-type tobacco product according to the present invention, a ratio of a maximum diameter of the heater to a diameter of a cross-section orthogonal to the longitudinal direction of the tobacco rod may be 0.3 or more and 0.6 or less.

**[0036]** Note that means for solving problems in the present invention can be employed in combination as far as possible. Advantageous Effects of Invention

**[0037]** According to the present invention, it is possible to provide a technique that is excellent in terms of the delivery amount of an aerosol and that enables smooth insertion of a heater into a tobacco filler, in a heating-type tobacco that includes a tobacco rod including the tobacco filler containing a tobacco raw material and an aerosol-source material and wrapping paper that wraps the tobacco filler.

Brief Description of Drawings

**[0038]**

[Fig. 1] Fig. 1 is a view schematically illustrating an internal structure of a heating-type tobacco according to Embodiment 1.

[Fig. 2] Fig. 2 is a perspective view illustrating an example of a tobacco strand.

[Fig. 3] Fig. 3 is a schematic configuration view of a heating device to which a heating-type tobacco is to be applied.

[Fig. 4] Fig. 4 is a view illustrating a modification of a heating device to which a heating-type tobacco is to be applied.

[Fig. 5] Fig. 5 is a view illustrating a device for producing a tobacco rod in Embodiment 1.

[Fig. 6] Fig. 6 is a diagram indicating a method for producing a tobacco rod in Embodiment 1.

[Fig. 7] Fig. 7 is a view illustrating a detailed structure of a slitter in a cut-out section.

[Fig. 8] Fig. 8 is a view describing calendering with respect to a tobacco-raw-material sheet.

[Fig. 9] Fig. 9 is a diagram describing a method for producing a tobacco-raw-material sheet by a paper making method.

[Fig. 10] Fig. 10 is a diagram describing a method for producing a tobacco-raw-material sheet by a casting method.

[Fig. 11] Fig. 11 is a view illustrating a tobacco strand according to a modification.

Description of Embodiments

**[0039]** Hereinafter, embodiments of a heating-type tobacco, and a device and a method for producing a tobacco rod for a heating-type tobacco according to the present invention will be described on the basis of the drawings. Dimensions, materials, and shapes of components described in the present embodiments, the relative arrangement thereof, and the like are not intended to limit the technical scope of the invention thereto only unless specific description is provided in particular.

<Embodiment 1>

[Heating-type Tobacco]

**[0040]** Fig. 1 is a view schematically illustrating an internal structure of a heating-type tobacco 1 according to Embodiment 1. The heating-type tobacco 1 is a tobacco article of a type that heats a tobacco filler without burning the tobacco filler and delivers an aerosol generated at the tobacco filler to a user.

**[0041]** The heating-type tobacco 1 includes a tobacco rod 2 and a mouthpiece portion 3 that are arranged by being aligned coaxially. The heating-type tobacco 1 has a mouthpiece end 1a that is inserted by a user into the oral cavity during use, and a distal end 1b at an end portion opposite to the mouthpiece end 1a. The mouthpiece portion 3 includes a support portion 4, a cooling portion 5, and a filter portion 6 that are arranged by being aligned coaxially. These members are disposed in this order from the distal end side of the mouthpiece portion 3. The support portion 4, the cooling portion 5, and the filter portion 6 of the mouthpiece portion 3 are wrapped integrally by a wrapper 7. Further, the tobacco rod 2 and the mouthpiece portion 3 are coupled integrally by being wrapped by tip paper 8. Portions of the support portion 4, the cooling portion 5, and the filter portion 6 constituting the mouthpiece portion 3 may be wrapped integrally by the wrapper. In this case, the portions that are integrally wrapped by the wrapper may be then wrapped together with the other parts by one or more sheets of tip paper. The sign CL1 in Fig. 1 indicates the center axis of the heating-type tobacco 1. The tobacco rod 2 and the mouthpiece portion 3 of the heating-type tobacco 1 are disposed coaxially, and the center axis CL1 can be considered as the center axis of the tobacco rod 2 and the mouthpiece portion 3. The sign 2a in Fig. 1 indicates the front end surface of the tobacco rod 2. The sign 2b indicates the rear end surface of the tobacco rod 2.

**[0042]** During the use of the heating-type tobacco 1, air is sucked by a user from the distal end 1b to the mouthpiece end 1a through the heating-type tobacco 1. The distal end 1b of the heating-type tobacco 1 can be regarded as the distal end or the upstream end of the tobacco rod 2. The mouthpiece end 1a of the heating-type tobacco 1 can be regarded as the rear end or the downstream end of the mouthpiece portion 3.

**[0043]** The tobacco rod 2 is disposed at the distal end 1b of the heating-type tobacco 1. The tobacco rod 2 is a bar-shaped member wrapped by wrapping paper 22 such that a side surface of a tobacco filler 21 that contains a tobacco raw material and an aerosol-source material is covered. In the present embodiment, the tobacco filler 21 includes a plurality of strand-shaped tobacco strands

23 that are tobacco raw materials each containing an aerosol-source material. In the present description, "strand shape" denotes a long elongated shape extending in the longitudinal direction orthogonal to the cross-sectional direction, compared with a cross-section, and includes, for example, a belt shape, a strip shape, a string shape, a bar shape, and the like. The "strand shape" is not limited to a strand shape extending linearly in the longitudinal direction and may extend in a meandering shape or a wavy shape. The aerosol-source material contained in each tobacco strand 23 of the tobacco filler 21 is a substance that generates an aerosol when a volatile substance volatilized and emitted when being heated by a heater is cooled. The type of the aerosol-source material is not particularly limited, and substances extracted from various natural products can be selected, as appropriate, in accordance with intended uses. Examples of the aerosol-source material are glycerin, propylene glycol, triacetin, 1,3-butanediol, mixture thereof, and the like. The tobacco strands 23 of the tobacco filler 21 may contain a flavor. The type of the flavor is not particularly limited. In the present embodiment, an example of the content percentage of the aerosol-source material in the tobacco rod 2 is 10 wt% or more and 25 wt% or less.

**[0044]** Fig. 2 is a perspective view illustrating an example of the tobacco strands 23. In the example illustrated in Fig. 2, the tobacco strand 23 has a strip shape (for example, a thin rectangular parallelepiped shape). As illustrated in Fig. 2, the tobacco strand 23 can be regarded to have a belt shape. At the tobacco filler 21 of the tobacco rod 2 in the present embodiment, a large number (plurality) of tobacco strands 23 are oriented and disposed. The tobacco strands 23 are aligned to extend in the longitudinal direction (the direction of the center axis CL1) of the tobacco rod 2. In each tobacco strand 23, a cross-section orthogonal to the longitudinal direction thereof has a rectangular shape.

**[0045]** The sign 23a in Fig. 2 indicates a front end surface of the tobacco strand 23, and the sign 23b indicates a rear end surface of the tobacco strand 23. The front end surface 23a of the tobacco strand 23 is an end surface that faces the distal end 1b of the heating-type tobacco 1. The rear end surface 23b of the tobacco strand 23 is an end surface opposite to the front end surface 23a in the longitudinal direction (extension direction) of the tobacco strand 23. In the present embodiment, the rear end surface 23b of each tobacco strand 23 is disposed to face the front end surface of the support portion 4 disposed at the front end of the mouthpiece portion 3. The sign 23c in Fig. 2 indicates a side surface of the tobacco strand 23. In the tobacco strand 23 illustrated in Fig. 2, each of a width dimension, a thickness dimension, and the like is equal from the front end surface 23a to the rear end surface 23b. In other words, the tobacco strand 23 illustrated in Fig. 2 has a uniform cross-sectional area over the entire length thereof.

**[0046]** As illustrated in Fig. 1, the tobacco strands 23 aligned to extend in the longitudinal direction of the tobacco rod 2 are disposed with respective side surfaces 23c facing each other. In the example illustrated in Fig. 1, the tobacco strands 23 are disposed parallel to each other in the longitudinal direction of the tobacco rod 2. The tobacco strands 23 are disposed to extend from the front end surface 2a to the rear end surface 2b of the tobacco rod 2. The sign 25 in Fig. 1 indicates aerosol flow paths that are formed by gaps between the tobacco strands 23. In the present embodiment, the tobacco strands 23 are disposed parallel to each other in the longitudinal direction of the tobacco rod 2, and thus, the aerosol flow paths 25 are formed, for example, to extend in the longitudinal direction of the tobacco rod 2.

**[0047]** Here, the tobacco strands 23 and the tobacco rod 2 including the tobacco strands 23 can be obtained by, for example, cutting out, through slitting by a slitter or the like, a raw material sheet obtained by forming a tobacco raw material containing an aerosol-source material into a sheet shape. Details of a method for producing the tobacco strands 23 and the tobacco rod 2 will be described later. The aforementioned tobacco-raw-material sheet may be a so-called reconstituted tobacco sheet. The reconstituted tobacco sheet may be, for example, a sheet obtained by adding a binding agent, a gelling agent, a crosslinking agent, a flavor, a viscosity modifier, a moisturizing agent, a reinforcement material, and the like as additives to a homogenized tobacco, kneading the homogenized tobacco, forming the homogenized tobacco into a sheet shape by an appropriate method, such as a paper making method (sheet making method), a casting method (slurry method), a rolling method, or an extruding method, and drying the homogenized tobacco. The homogenized tobacco is a tobacco material that is obtained by pulverizing, grinding, and mixing, for example, a leaf tobacco, dried tobacco leaves, tobacco shreds, an expanded tobacco, a regenerated tobacco, and the like.

**[0048]** Next, the mouthpiece portion 3 will be described. The support portion 4 is a segment that is positioned on the front end side of the mouthpiece portion 3 and positioned at a connection end at which the mouthpiece portion 3 is connected to the tobacco rod 2. The support portion 4 is positioned on the immediate downstream side of the tobacco rod 2 and disposed in a state of being in contact with the rear end of the tobacco rod 2. The support portion 4 may be, for example, a hollow cellulose-acetate pipe body. In other words, the support portion 4 may be a columnar cellulose-acetate fiber bundle with a center hole formed at the center of a cross-section of the cellulose-acetate fiber bundle to pass therethrough. As another form, the support portion 4 may be a paper filter, a paper pipe, or the like filled with cellroll fibers. A paper pipe having a certain thickness can function effectively as the support portion 4. The support portion 4 is a segment for preventing the tobacco filler 21 from being pressed to the downstream side toward the cooling portion 5 in the heating-type tobacco 1 when an electric heater of a heating device to which the heating-type tobacco 1 is applied is inserted into the tobacco rod

2. The support portion 4 also functions as a spacer for spacing the cooling portion 5 of the heating-type tobacco 1 from the tobacco rod 2.

**[0049]** The cooling portion 5 is positioned on the immediate downstream side of the support portion 4 and disposed in contact with the rear end of the support portion 4. During the use of the heating-type tobacco 1, a volatile substance emitted from the tobacco rod 2 (tobacco filler 21) flows along the cooling portion 5 toward the downstream side. The volatile substance that has been emitted from the tobacco rod 2 (tobacco filler 21) is cooled at the cooling portion 5 and thereby forms an aerosol that is to be sucked by a user. In the form illustrated in Fig. 1, the cooling portion 5 is formed of a hollow paper pipe having air holes 5a through which outside air can be introduced. The cooling portion 5, however, may have no air holes 5a. In addition, the cooling portion 5 may include a heat absorbing agent disposed not to obstruct the flow of the volatile substance and the aerosol. The cooling portion 5 may be formed by, for example, a filter material having a large number of flow paths (through holes) formed in the longitudinal direction (axial direction) of the mouthpiece portion 3.

**[0050]** The filter portion 6 is a segment that is positioned at the rear end of the mouthpiece portion 3, that is, on the side of the mouthpiece end 1a. The filter portion 6 may be positioned on the immediate downstream side of the cooling portion 5 and disposed in a state of being in contact with the rear end of the cooling portion 5. In the form illustrated in Fig. 1, the filter portion 6 may include, for example, a filter material that is formed by cellulose-acetate fibers formed in a columnar shape. In addition, the filter portion 6 may be a center hole filter or a paper filter filled with cellulose fibers or may be a paper pipe containing no filtering medium. The filter portion 6 may be formed by any of a solid filter material including a filtering medium, a center hole filter, a paper filter, and a paper pipe including no filtering medium or may be formed by combining a plurality of them selectively.

**[0051]** Fig. 3 is a schematic configuration view of a heating device 100 to which the heating-type tobacco 1 according to Embodiment 1 is to be applied. The heating device 100 includes a housing 102 that is a housing for housing various types of constituent parts. In the housing 102, an electric heater 103, a controller (control unit) 104, a power source 105, and the like are housed. The housing 102 has a housing cavity 107 including an opening portion 106 into which the tobacco rod 2 of the heating-type tobacco 1 is to be inserted. The housing cavity 107 is a columnar cavity portion for housing the tobacco rod 2 and corresponds to a rod housing portion to which the tobacco rod 2 is attachable. The present invention can be provided as a heating-type tobacco product including the heating-type tobacco 1 and the heating device 100 to which the heating-type tobacco 1 is applied.

**[0052]** As illustrated in Fig. 3, the electric heater 103 is provided in the housing cavity 107. The electric heater 103 illustrated in Fig. 3 has a columnar shape and projects vertically from a center portion of a bottom portion 107a of the housing cavity 107 toward the side of the opening portion 106. The shape of the electric heater 103 is, however, not particularly limited. For example, the distal end side of the electric heater 103 may be pointed. For example, the electric heater 103 may have a conical shape and may be tapered gradually from the base end portion thereof connected to the bottom portion 107a of the housing cavity 107 toward the side of the leading end portion thereof. In addition, the electric heater 103 may have a frustoconical shape (truncated cone shape) or may have a blade shape. In addition, the electric heater 103 may have the other shapes. The center axis of the electric heater 103 in the present embodiment may be coaxial with the center axis of the housing cavity 107. The type of the electric heater 103 is not particularly limited. For example, a steel material on which a heating wire (for example, nichrome, iron chrome, iron nickel, and the like) is laid and disposed, or a ceramic heater, a sheath heater (Sheathed Heater), and the like can be used. Note that the sheath heater is a heater in which a heat wire is covered together with a filling agent by a metal pipe.

**[0053]** The electric heater 103 of the heating device 100 configured as described above is a so-called an internal heating-type heater. That is, in attaching the tobacco rod 2 to the housing cavity 107 for the use of the heating-type tobacco 1, the electric heater 103 is fitted or inserted into the tobacco filler 21 from the side of the front end surface 2a of the tobacco rod 2 of the heating-type tobacco 1, and the tobacco filler 21 is heated from the inside thereof by the electric heater 103 in which heat is generated. The controller (control unit) 104 controls energization from the power source 105 to the electric heater 103, and the electric heater 103 generates heat and thereby heats the tobacco filler 21 (tobacco strands 23) of the tobacco rod 2 attached to the housing cavity 107. As a result, the aerosol-source material contained in the tobacco filler 21 (tobacco strands 23) is volatilized, an aerosol is thereby generated, and the aerosol is supplied into the oral cavity of a user that sucks the mouthpiece portion 3.

**[0054]** According to the heating-type tobacco 1 in the present embodiment, the tobacco strands 23 of the tobacco rod 2 are oriented and disposed to extend in the longitudinal direction (the direction of the center axis CL1) of the tobacco rod 2, and the tobacco strands 23 are aligned to extend in the longitudinal direction (the direction of the center axis CL1) of the tobacco rod 2. Furthermore, in the tobacco rod 2 in the present embodiment, the aerosol flow paths 25, which are the gaps between the tobacco strands 23, are formed to extend in the longitudinal direction of the tobacco rod 2. Thus, the aerosol that has been generated as a result of the aerosol-source material contained in the tobacco strands 23 being volatilized when heated by the electric heater 103 is enabled to be guided to the mouthpiece portion 3 through the aerosol flow paths 25. Consequently, the aerosol gener-

ated at the tobacco rod 2 is not easily condensed due to contact with the tobacco strands 23 and is not easily filtered by the tobacco strands 23. Therefore, according to the heating-type tobacco 1 in the present embodiment, it is possible to increase the delivery amount of the aerosol into the oral cavity of a user more than before.

**[0055]** In addition, according to the heating-type tobacco 1 in the present embodiment, due to the tobacco strands 23 of the tobacco rod 2 being aligned in the longitudinal direction (the direction of the center axis CL1) of the tobacco rod 2, fitting or insertion of the electric heater 103 from the side of the distal end 1b of the tobacco rod 2 is easy, compared with when a tobacco raw material is conventionally oriented randomly. Consequently, the electric heater 103 is easily fitted or inserted into the tobacco rod 2, and it is possible to provide the heating-type tobacco 1 excellent for a user in terms of usability. As described above, the tobacco rod 2 of the heating-type tobacco 1 in the present embodiment is excellent in terms of the delivery amount of the aerosol and, moreover, enables smooth insertion of the electric heater 103 with respect to the tobacco filler 21.

**[0056]** The heating device that is to be applied to the heating-type tobacco 1 in the present embodiment may include an external heating-type heater, such as that illustrated in Fig. 4, instead of the internal heating-type heater, such as that illustrated in Fig. 3. The heating device 100 illustrated in Fig. 4 has the same structure as that of the heating device 100 illustrated in Fig. 3 except that the electric heater 103 is of an external heating-type. The electric heater 103 illustrated in Fig. 4 is a ring-shaped external heating-type heater formed along a cavity side peripheral wall 107b of the housing cavity 107. The electric heater 103 illustrated in Fig. 4 may be disposed along the cavity side peripheral wall 107b, for example, to be flush with the cavity side peripheral wall 107A. When the heating-type tobacco 1 is applied to the heating device 100 including the external heating-type electric heater 103, such as that illustrated in Fig. 4, the tobacco filler 21 is heated by the electric heater 103 during the use of the heating-type tobacco 1 from the outer side of the tobacco rod 2 attached to the housing cavity 107.

**[0057]** Here, a preferable range of the volume filling ratio of the tobacco strands 23 occupying the tobacco rod 2 will be described. The volume filling ratio of the tobacco strands 23 described here is a ratio of the total volume of all of the tobacco strands 23 included in the tobacco rod 2, with respect to the volume of the tobacco rod 2. When the volume filling ratio of the tobacco strands 23 is excessively large, there is a concern of airflow resistance of the tobacco rod 2 (tobacco filler 21) increasing excessively. As a result, there is a concern of the aerosol generated at the tobacco rod 2 during use being filtered (caught) by the tobacco strands 23 of the tobacco rod 2 before introduced into the mouthpiece portion 3, resulting in a decrease in the delivery amount of the aerosol. Meanwhile, when the volume filling ratio of the tobacco strands 23 is excessively small, there is a concern of the efficiency of heat transfer to the tobacco strands 23 decreasing during heating by the electric heater 103, resulting in a decrease in the delivery amount of the aerosol. For example, when the internal heating-type electric heater 103 illustrated in Fig. 3 is used, there is a possibility of the contact between the electric heater 103 and the tobacco strands 23 becoming insufficient in a state in which the electric heater 103 is inserted into the tobacco rod 2, resulting in insufficient heating of the tobacco strands 23.

**[0058]** In consideration of the aforementioned circumstances, as a result of extensive studies, the present inventors have acquired knowledge that the volume filling ratio of the tobacco strands 23 occupying the tobacco rod 2 is preferably 50 vol% or more and 80 vol% or less. Consequently, it is possible to suppress the efficiency of heat transfer from the electric heater 103 to the tobacco strands 23 from decreasing, while suppressing the airflow resistance of the tobacco rod 2 (tobacco filler 21) from increasing excessively. As a result, it is possible to suppress the delivery amount of the aerosol during use from decreasing. In addition, when the volume filling ratio of the tobacco strands 23 is less than 50 vol%, there is a possibility of the production suitability of the tobacco rod 2 decreasing, in addition to the decrease in the efficiency of heat transfer from the electric heater 103 to the tobacco strands 23. In addition, when the volume filling ratio of the tobacco strands 23 exceeds 80 vol%, there is a possibility of the aerosol being trapped (caught) midway, in addition to the insertion of the electric heater 103 into the tobacco rod 2 becoming difficult and the airflow resistance easily increasing, resulting in a decrease in the efficiency in the delivery of the aerosol. For the above reasons, the volume filling ratio of the tobacco strands 23 occupying the tobacco rod 2 is preferably in the range of 50 vol% or more and 80 vol% or less.

**[0059]** The preferable range of the volume filling ratio of the tobacco strands 23 occupying the tobacco rod 2 differs depending on a difference (the internal heating-type heater or the external heating-type heater) in the heating type of the electric heater 103 of the heating device 100 to which the heating-type tobacco 1 is applied. When the electric heater 103 is of the internal heating-type, the preferable range of the volume filling ratio of the tobacco strands 23 differs also depending on whether the electric heater 103 is in a state of being inserted into the tobacco rod 2 (a state in which the tobacco rod 2 is attached to the heating device 100). For example, when the electric heater 103 of the heating device 100 to which the heating-type tobacco 1 is applied is the external heating-type heater, the volume filling ratio of the tobacco strands 23 occupying the tobacco rod 2 is preferably 60 vol% or more and 80 vol% or less.

**[0060]** When the electric heater 103 of the heating device 100 to which the heating-type tobacco 1 is applied is the internal heating-type heater, the volume filling ratio of the tobacco strands 23 occupying the tobacco rod 2 is preferably 50 vol% or more and 75 vol% or less and

more preferably 60 vol%. Regarding the above-described volume filling ratio, a preferable range of the volume filling ratio of the tobacco strands 23 before the tobacco rod 2 is attached to the housing cavity 107 of the heating device 100 has been described. When the electric heater 103 is the internal heating-type heater, the tobacco strands 23 in the tobacco rod 2 are pressed to be expanded toward the outer peripheral side of the tobacco rod 2 by the electric heater 103 as a result of the electric heater 103 being inserted into the tobacco rod 2. In consideration of this, the preferable range (50 vol% or more and 75 vol% or less) of the volume filling ratio of the tobacco strands 23 when the electric heater 103 of the heating device 100 to which the heating-type tobacco 1 is applied is the internal heating-type heater is lower than the preferable range (60 vol% or more and 80 vol% or less) of the volume filling ratio of the tobacco strands 23 when the electric heater 103 is the external heating-type heater.

**[0061]** When the electric heater 103 of the heating device 100 to which the heating-type tobacco 1 is applied is the internal heating-type heater, the volume filling ratio of the tobacco strands 23 in a state in which the tobacco rod 2 is attached to the housing cavity 107, that is, a state in which the internal heating-type heater is inserted into the tobacco rod 2 is preferably 60 vol% or more and 80 vol% or less. Here, the volume filling ratio of the tobacco strands 23 in the state in which the tobacco rod 2 is attached to the housing cavity 107 is a ratio of the total volume of the tobacco strands 23 to a volume that is calculated by subtracting the volume of the electric heater 103 occupying the tobacco rod 2 from the capacity of the tobacco rod 2.

**[0062]** In comparison under a condition that the volumes of the tobacco strands 23 included in the tobacco rod 2 in the present embodiment be equal to each other, as the surface areas of the tobacco strands 23 increase, the delivery amount of the aerosol increases. When the width of each of the tobacco strands 23 is large, there is a possibility of the volume filling ratio of the tobacco strands 23 easily becoming nonuniform in the cross-section of the tobacco rod 2 when the internal heating-type electric heater 103 is inserted into the tobacco rod 2, which easily causes variations in aerosol delivery characteristics. Accordingly, from the point of view of increasing the delivery amount of the aerosol and making the aerosol delivery characteristics uniform, it is preferable to dispose a larger number of the tobacco strands 23 each having a small cross sectional area at the tobacco rod 2. However, when the cross sectional area of each tobacco strand 23 is excessively small, the tensile strength of the tobacco strands 23 becomes excessively small, and there is a concern of the production suitability of the tobacco rod 2 decreasing. Thus, from the point of view of ensuring all of an improvement in the delivery amount of the aerosol, uniform delivery of the aerosol, and an improvement in the production suitability of the tobacco rod 2 in a balanced manner, the width dimension of the cross-section of each tobacco strand 23 is preferably 0.4 mm or more and 3 mm or less, and the thickness dimension of the cross-section of each tobacco strand 23 is preferably 0.02 mm or more and 1.3 mm or less. Note that an example of the length dimension of each tobacco strand 23 in the longitudinal direction is 10 mm or more and 50 mm or less. As described above, the tobacco strands 23 in the present embodiment each have a uniform cross sectional area over the entire length thereof and thus, when the tobacco strands 23 are heated by the electric heater 103, variations in the generation amount of the aerosol in the longitudinal direction of the tobacco strands 23 are not easily generated.

**[0063]** In the present embodiment, dimensions of each tobacco rod 2 are not particularly limited. An example of the length of the tobacco rod 2 in the longitudinal direction is 10 mm or more and 50 mm or less, and an example of the diameter of the cross-section orthogonal to the longitudinal direction of the tobacco rod 2 is 5.0 or more and 8.0 mm or less. An example of the maximum diameter of the electric heater 103 in the heating device 100 to which the heating-type tobacco 1 is applied is 2.5 mm or more and 3.2 mm or less. In addition, an example of the ratio of the maximum diameter of the electric heater 103 to the diameter of the cross-section of the tobacco rod 2 is 0.3 or more and 0.6 or less. Further, an example of the length in the longitudinal direction of each tobacco strand 23 disposed at the tobacco rod 2 is a dimension substantially equal to the length in the longitudinal direction of the tobacco rod 2.

<Device and Method for Producing Tobacco Rod>

**[0064]** Next, a device and a method for producing the tobacco rod 2 of the heating-type tobacco 1 will be described. Fig. 5 is a view illustrating a device (hereinafter referred to as "rod producing device") 1000 for producing the tobacco rod 2 in Embodiment 1. Fig. 6 is a diagram indicating a method for producing the tobacco rod 2 of the heating-type tobacco 1.

**[0065]** The rod producing device 1000 includes a first bobbin 1100 around which a tobacco-raw-material sheet 200 is wound in a roll shape, a cut-out section 1200, a formation section 1300, a cut-off section 1400, and the like. The tobacco-raw-material sheet 200 wound around the first bobbin 1100 is a sheet material that is obtained by forming a tobacco-raw-material sheet containing an aerosol-source material into a sheet shape. The tobacco raw material is, for example, tobacco shreds, tobacco granules, a reconstituted tobacco material, or the like. In the present embodiment, an example in which a sheet that is obtained by forming a reconstituted tobacco into a sheet shape is used as the tobacco-raw-material sheet 200 will be described. The tobacco-raw-material sheet 200 is cut out at the cut-out section 1200, cut off at the cut-off section 1400, and thereby becomes the tobacco strands 23 of the tobacco rod 2 described above.

**[0066]** In the rod producing device 1000, the first bob-

bin 1100 is rotatably held by a bobbin holder 1110. The tobacco-raw-material sheet 200 wound around the first bobbin 1100 is successively sent out by a feeding roller disposed at an appropriate position and is delivered along a conveyance path P. As illustrated in Fig. 5, the cut-out section 1200 in the rod producing device 1000 is disposed at an intermediate portion of the conveyance path P. In the present description, the front side and the rear side in the flow direction of the conveyance path P are defined as "downstream" and "upstream", respectively. In the arrangement example illustrated in Fig. 5, the formation section 1300 is disposed on the downstream side (later stage) of the cut-out section 1200, and the cut-off section 1400 is disposed on the further downstream side (later stage) of the formation section 1300. Note that, regarding the sheet-shaped tobacco-raw-material sheet 200, the direction along the conveyance path P is referred to as "sheet-length direction (longitudinal direction)", and the direction orthogonal to the conveyance path P is referred to as "sheet-width direction". In addition, regarding the rod producing device 1000, the direction orthogonal to the conveyance path P is referred to as "device-width direction". The sign 1500 in Fig. 5 indicates a conveyance tray extending along the conveyance path P. The sheet-shaped tobacco-raw-material sheet 200 is introduced into the cut-out section 1200 while being moved along the conveyance path P on the conveyance tray 1500.

**[0067]** The cut-out section 1200 is a unit that cuts out the tobacco-raw-material sheet 200 successively along the conveyance path into a plurality of strand-shaped tobacco-strand continuous bodies 300. Fig. 7 is a view illustrating a detailed structure of a slitter 1210 in the cut-out section 1200 and illustrates a state in which the slitter 1210 is viewed from above. The slitter 1210 includes a plurality of circular cutter disks 1220. The plurality of circular cutter disks 1220 are coupled to each other at respective centers by a rotary shaft member 1230. The rotary shaft member 1230 is rotatably supported at a base of the rod producing device 1000 such that the cutter disks 1220 are rotatable integrally about the rotary shaft member 1230. The rotary shaft member 1230 of the slitter 1210 extends horizontally in a direction orthogonal to the conveyance path P in the rod producing device 1000, that is, in the device-width direction. In addition, as illustrated in Fig. 7, the cutter disks 1220 of the slitter 1210 are disposed in a direction orthogonal to the rotary shaft member 1230 to be parallel to the conveyance path P. The cutter disks 1220 of the slitter 1210 are disposed at regular intervals in the direction (device-width direction) orthogonal to the conveyance path P.

**[0068]** In a method for producing the tobacco rod 2 in the present embodiment, while the tobacco-raw-material sheet 200 obtained by forming a tobacco raw material containing an aerosol-source material into a sheet shape is conveyed along the conveyance path P from the first bobbin 1100, the tobacco-raw-material sheet 200 is cut out in a cut-out step (S101 in Fig. 6) successively along the conveyance path P into a plurality of strand-shaped tobacco-strand continuous bodies 300. That is, as a result of the tobacco-raw-material sheet 200 passing through the cut-out section 1200 (the cutter disks 1220 disposed parallel to the conveyance path P) along the conveyance path P, the tobacco-raw-material sheet 200 is successively cut out into the plurality of tobacco-strand continuous bodies 300 by the cutter disks 1220.

**[0069]** In the slitter 1210 of the cut-out section 1200, a large number of the cutter disks 1220 are disposed at regular intervals in the direction orthogonal to the conveyance path P. Thus, in the cut-out section 1200, the tobacco-raw-material sheet 200 is cut out into the plurality of tobacco-strand continuous bodies 300 each having a fixed width. Each tobacco-strand continuous body 300 is a long tobacco material extending along the conveyance path P. The slitter 1210 may be simply able to cut out the tobacco-raw-material sheet 200 successively along the conveyance path P into a plurality of the strand-shaped tobacco-strand continuous bodies 300 and may cut out the tobacco-raw-material sheet 200 by a member that differs from the cutter disks 1220. For example, the slitter 1210 may include a roll cutter having comb blades disposed in the device-width direction at regular intervals.

**[0070]** The plurality of tobacco-strand continuous bodies 300 cut out from the tobacco-raw-material sheet 200 in the cut-out section 1200 are sent in a state of being aligned in the width direction of the conveyance tray 1500 along the conveyance path P to the formation section 1300 at a later stage.

**[0071]** The formation section 1300 includes a second bobbin 1310 around which a long wrapping paper web 400 is wound into a roll shape. The wrapping paper web 400 is a long web material that becomes the wrapping paper 22 for the tobacco rod 2. The formation section 1300 further includes a convergence portion 1320, a packaging mechanism 1330, an adhesive applicator 1340, and the like. The convergence portion 1320 is disposed near an entrance of the formation section 1300 and gathers and forms the plurality of tobacco-strand continuous bodies 300 sent from the upstream side into a cylindrical shape (that is, a rod shape). The convergence portion 1320 can be in, for example, a form in which a tongue member and a horn are combined together, a convergence funnel form, a conveyance jet form, or the like.

**[0072]** The packaging mechanism 1330 in the formation section 1300 is provided at a later stage of the convergence portion 1320. The packaging mechanism 1330 includes an endless garniture belt 1350. The garniture belt 1350 is constituted by a woven material, a woven web, and the like and is caused by a driving drum 1360 to move at a fixed speed in the arrow direction in Fig. 5. The long wrapping paper web 400 that has been sent out from the second bobbin 1310 is supplied successively onto the garniture belt 1350 in the formation section 1300.

**[0073]** The plurality of tobacco-strand continuous bodies 300 that have been shaped into the rod shape in the

convergence portion 1320 in the formation section 1300 are superposed on the long wrapping paper web 400 on the garniture belt 1350. In a process in which the plurality of tobacco-strand continuous bodies 300 that have been thus superposed on the long wrapping paper web 400 on the garniture belt 1350 are conveyed along the conveyance path P by the garniture belt 1350, the wrapping paper web 400 is wrapped around the outer periphery of the plurality of tobacco-strand continuous bodies 300 aligned in a rod shape, and the plurality of tobacco-strand continuous bodies 300 are enclosed by the wrapping paper web 400. Then, at the adhesive applicator 1340, an adhesive (for example, a hot-melt adhesive, CMC (carboxymethyl cellulose), PVA (polyvinyl alcohol), EVA (ethylene-vinyl acetate copolymer resin), and the like) is applied to a junction portion formed by both edge portions of the wrapping paper web 400 overlapping each other. Consequently, the rod-shaped long tobacco-rod continuous body 500 is formed (formation step; S102 in Fig. 6).

**[0074]** The method for producing the tobacco rod 2 in the present embodiment may further include an addition step in which at least one of a flavor and an aerosol-source material is added to the plurality of tobacco-strand continuous bodies 300 obtained in the cut-out step (cut-out section 1200). For example, in the aforementioned addition step, at least one of a flavor and an aerosol-source material may be added to the plurality of tobacco-strand continuous bodies 300 in a process in which the plurality of tobacco-strand continuous bodies 300 are enclosed by the wrapping paper (wrapping paper web 400) in the formation step (formation section 1300). The method for adding a flavor and an aerosol-source material to the plurality of tobacco-strand continuous bodies 300 is not particularly limited. A flavor and an aerosol-source material may be discharged through an addition nozzle to be added to the tobacco-strand continuous bodies 300. Of course, an addition nozzle for adding a flavor and an addition nozzle for adding an aerosol-source material may be provided separately. The flavor is, for example, menthol or the like; however, other flavors may be added. When, as described above, a flavor and an aerosol-source material are to be added to the tobacco-strand continuous bodies 300 in the process in which the plurality of tobacco-strand continuous bodies 300 are thus enclosed by the wrapping paper (wrapping paper web 400) in the formation step (formation section 1300), an addition nozzle may be simply installed at an appropriate position in the formation section 1300. The addition nozzle that adds a flavor and aerosol-source material to the tobacco-strand continuous bodies 300 may be provided at a portion between the cut-out section 1200 and the formation section 1300 at the conveyance path P.

**[0075]** The tobacco-rod continuous body 500 obtained in the formation section 1300 (formation step) is sent to the cut-off section 1400 positioned at a later stage of the formation section 1300. The cut-off section 1400 includes a cut-off means, such as a rotary cutter, a knife, or the like. The long tobacco-rod continuous body 500 is cut off to a fixed length in the cut-off section 1400. That is, in the cut-off step (S103 in Fig. 6), the tobacco-rod continuous body 500 obtained in the formation step (S102 in Fig. 6) is sequentially cut off into individual tobacco rods, and tobacco rods for the heating-type tobacco 1 are thereby obtained. As clear in the above-described description, the plurality of tobacco-strand continuous bodies 300 cut out from the tobacco-raw-material sheet 200 in the cut-out section 1200 are connected to each other in the conveyance direction of the conveyance path P until the tobacco-strand continuous bodies 300 are cut off in the axial direction in the cut-off section 1400.

**[0076]** As described above, according to the method for producing the tobacco rod 2 in the present embodiment and the rod producing device 1000, it is possible to suitably produce the tobacco rod 2 for the heating-type tobacco 1. In particular, the method for producing the tobacco rod 2 in the present embodiment and the rod producing device 1000 are characterized in that, after the tobacco-raw-material sheet 200 is successively cut out in the cut-out section 1200 into the plurality of tobacco-strand continuous bodies 300 and before the tobacco-strand continuous bodies 300 are cut off to a short length in the cut-off section 1400, the tobacco-strand continuous bodies 300 in a state of being aligned along the conveyance path P are enclosed by the wrapping paper (wrapping paper web 400) in the formation section 1300 and formed into the long tobacco-rod continuous body 500. Consequently, it is possible to align and disposed the plurality of tobacco strands 23 such that the plurality of tobacco strands 23 extend in the axial direction of the tobacco rod 2. That is, it is possible to easily produce the tobacco rod 2 in which the plurality of tobacco strands 23 are disposed parallel to each other in the longitudinal direction of the tobacco rod 2.

**[0077]** By adjusting the thickness of the tobacco-raw-material sheet 200 wound around the first bobbin 1100 in the rod producing device 1000, it is possible to obtain the tobacco strands 23 each having a desired thickness. In addition, by adjusting intervals between the cutter disks 1220 of the slitter 1210 disposed in the cut-out section 1200, it is possible to obtain the tobacco strands 23 each having a desired width. In addition, in the present embodiment, in cutting-out of the tobacco-raw-material sheet 200 in the cut-out section 1200 (cut-out step), the tobacco-raw-material sheet 200 is cut out into the plurality of tobacco-strand continuous bodies 300 each having a fixed width. Therefore, the cross-sectional areas (width dimensions) of the tobacco strands 23 disposed at the tobacco rod 2 can be uniform. Consequently, it is easy to suppress generation of a portion in which the aerosol delivery characteristics are nonuniform in the cross-section of the tobacco rod 2 during the use of the heating-type tobacco 1, and it is possible to supply an aerosol stably to a user.

**[0078]** The method for producing the tobacco rod 2 in the present embodiment may include a calendering step in which calendering is previously performed with respect

to the tobacco-raw-material sheet 200 to be used for producing the tobacco rod 2 to thereby increase density of the tobacco-raw-material sheet 200, and a winding step in which the tobacco-raw-material sheet 200 after subjected to the calendering is wound around the first bobbin 1100.

**[0079]** Fig. 8 is a view describing calendering with respect to the tobacco-raw-material sheet 200. Calendering is performed by, for example, causing the tobacco-raw-material sheet 200 to pass successively between a pair of press rollers 600 and 600, such as that illustrated in Fig. 7, to thereby press the tobacco-raw-material sheet 200. As a result of the tobacco-raw-material sheet 200 being subjected to calendering, the tobacco-raw-material sheet 200 becomes densely solid and can increase the density thereof. As a result, it is possible to increase the weight of the tobacco strands 23 while suppressing the volume filling ratio of the tobacco strands 23 included in the tobacco rod 2 after production from excessively increasing and suppressing the airflow resistance of the tobacco rod 2 from excessively increasing. As a result, it is possible to further increase the aerosol delivery amount in the tobacco rod 2.

**[0080]** The tobacco-raw-material sheet 200 after subjected to the calendering as described above is wound around the first bobbin 1100 in the winding step. The tobacco-raw-material sheet 200 wound around the first bobbin 1100 is used for the production of the tobacco rod 2 by being pulled out successively along the conveyance path P as described with Fig. 5 and Fig. 6.

**[0081]** As described above, an appropriate method, such as a paper making method (sheet making method), a casting method (slurry method), a rolling method, an extruding method, or the like, can be employed as a method for producing the tobacco-raw-material sheet 200.

**[0082]** Fig. 8 is a diagram describing a method for producing the tobacco-raw-material sheet 200 by a paper making method (sheet making method). As illustrated in Fig. 8, first, in the step S201, a tobacco raw material containing tobacco stems, tobacco laminas, tobacco shreds, tobacco fine powder, and the like is extracted with water (extraction step). In the extraction step, with respect to the tobacco raw material, for example, water of an amount ten times the amount of the tobacco raw material is added and heated while being stirred at a predetermined temperature for a predetermined period to thereby obtain a mixture. In the step S202, the mixture obtained in the extraction step is compressed by using, for example, a screw press dewatering machine or the like and separated into an aqueous tobacco extraction liquid (liquid) and an insoluble tobacco residue (solid) (separation step). Next, in the step S203, after water and pulp (cellulose fibers) are added to the insoluble tobacco residue obtained in the separation step, the insoluble tobacco residue is beat with, for example, a refiner so that the fiber length is adjusted, fibers are fluffed, and the insoluble tobacco residue is thereby fiberized (beating step).

**[0083]** Next, in the step S204, the insoluble tobacco residue and the pulp fiberized in the beating step are made to be sheet-shaped paper by a paper making machine and dried, thereby obtaining a base sheet (paper making step). Next, in the step S205, a concentrated liquid of the aqueous tobacco extraction liquid obtained in the aforementioned separation step and an addition liquid containing an aerosol-source material, such as glycerin, propylene glycol, and the like, are added to the base sheet (flavor addition step). In the flavor addition step, the concentrated liquid of the aqueous tobacco extraction liquid added to the base sheet is obtained by, for example, concentrating the aqueous tobacco extraction liquid with an evaporator. Next, in the step S206, the flavored base sheet obtained in the flavor addition step is dried (drying step).

**[0084]** Through the above production method, the tobacco-raw-material sheet 200 can be produced by a paper making method (sheet making method). Note that the aforementioned production method is, however, exemplary, and addition, omission, replacement of steps can be performed, as appropriate. In an example, the content of the aerosol-source material is 15.0 wt%, the content of the tobacco raw material is 79.05 wt%, and the content of the pulp is 5.95 wt% in the tobacco-raw-material sheet 200 produced by the paper making method (sheet making method). Needless to say, the example is a non-limiting example. In the tobacco-raw-material sheet 200 produced by the paper making method (sheet making method), the content of the aerosol-source material is preferably 10 wt% or more and 25 wt% or less.

**[0085]** Fig. 9 is a diagram describing a method for producing the tobacco-raw-material sheet 200 by a casting method (slurry method). As illustrated in Fig. 9, first, in the step S301, a tobacco raw material containing tobacco stems, tobacco laminas, tobacco shreds, tobacco fine powder, and the like is pulverized and then, for example, in a stirring tank, mixed with a small amount of each of a binder (binding agent) and a reinforcing agent (loosen fabric of pulp and the like) and a predetermined amount of each of an aerosol-source material (glycerin, propylene glycol, and the like) and water, thereby obtaining slurry (suspension) (slurry obtaining step). The binder (binding agent) is, for example, guar gum, xanthan gum, CMC (methylol fiber element), or the like.

**[0086]** Next, in the step S302, the slurry obtained in the slurry obtaining step is cast (drawn) into a sheet shape on, for example, a steel belt (support body), thereby obtaining a slurry web (casting step). Next, in the step S303, the sheet-shaped slurry web drawn into the sheet shape is dried (drying step). Through the above steps, the tobacco-raw-material sheet 200 is obtained. In an example, the content of the aerosol-source material (for example, glycerin) is 15.0 wt%, the content of the tobacco raw material is 76.0 wt%, the content of the pulp is 6.0 wt%, and the content of the binder is 3.0 wt% in the tobacco-raw-material sheet 200 produced by the casting method. Needless to say, the example is a non-limiting

example.

**[0087]** Embodiments according to the present invention have been described above. The heating-type tobacco, the heating-type tobacco product, the method and the device for producing the tobacco rod for the heating-type tobacco according to the present invention are, however, not limited thereto. For example, with Fig. 1 and Fig. 2 mentioned above, an example in which each of the strand-shaped tobacco strands 23 disposed at the tobacco rod 2 has a linear shape without a bent portion has been described. However, the other shape may be employed for the tobacco strands 23 as long as having a long elongated shape extending in the longitudinal direction. Fig. 11 is a view illustrating a tobacco strand 23A according to a modification. The tobacco strand 23A illustrated in Fig. 11 has a meandering shape (zigzag shape). The tobacco strand 23A thus extending in the meandering shape is aligned and disposed in the tobacco rod 2 such that the longitudinal direction (extension direction) thereof extends in the longitudinal direction of the tobacco rod 2. The tobacco strand 23A having such a meandering shape (zigzag shape) can suppress displacement of the tobacco strand 23A in the longitudinal direction of the tobacco rod 2 from easily occurring, even when the tobacco strand 23A is pressed by the electric heater 103 during insertion of the electric heater 103 of the heating device 100 into the tobacco rod 2. As a result, it is possible to suitably suppress the tobacco strand 23A from coming off from the tobacco rod 2 during insertion of the electric heater 103 into the tobacco rod 2.

**[0088]** In the tobacco strand 23A illustrated in Fig. 11, the flow paths for the aerosol that is generated at the tobacco rod 2 through heating by the electric heater 103 are easily obstructed relatively, compared with the linear tobacco strands 23 illustrated in Fig. 1 and Fig. 2. However, compared with a case in which the tobacco raw material is randomly oriented conventionally, the tobacco strand 23A can relatively suppress condensation and filtration of the aerosol generated at the tobacco rod 2 from easily occurring and increase the aerosol delivery amount more than before.

**[0089]** When a meandering shape (zigzag shape) such as that illustrated in Fig. 11 is employed, the width of the tobacco strand 23A is preferably uniform from the front end surface 23a to the rear end surface 23b. That is, it is preferable that, as illustrated in Fig. 11, a width dimension W1 of a part of the tobacco strand 23A parallel to the longitudinal direction and a width dimension W2 of a part thereof extending in a direction orthogonal to the longitudinal direction be equal to each other. Consequently, the tobacco strand 23A is enabled to have a cross-sectional area that is uniform over the entire length thereof. As a result, it is possible to suitably suppress variations in the aerosol generation amount in the longitudinal direction of the tobacco strand 23A during heating of the tobacco strand 23A by the electric heater 103. The tobacco strand 23A illustrated in Fig. 11 has a meandering shape (zigzag shape) but may have a wavy shape or the other shapes.

Reference Signs List

**[0090]**

| | |
|---|---|
| 1 | heating-type tobacco |
| 2 | tobacco rod |
| 3 | mouthpiece portion |
| 4 | support portion |
| 5 | cooling portion |
| 6 | filter portion |
| 21 | tobacco filler |
| 22 | wrapping paper |
| 23 | tobacco strand |
| 25 | aerosol flow path |
| 100 | heating device |
| 103 | electric heater |
| 200 | tobacco-raw-material sheet |
| 300 | tobacco-strand continuous body |
| 500 | tobacco-rod continuous body |
| 1000 | rod producing device |
| 1100 | first bobbin |
| 1200 | cut-out section |
| 1300 | formation section |
| 1400 | cut-off section |

## Claims

1. A method for producing a tobacco rod for a heating-type tobacco, the method comprising:

   a cut-out step of cutting out a tobacco-raw-material sheet, while conveying the tobacco-raw-material sheet along a conveyance path, successively along the conveyance path into a plurality of strand-shaped tobacco-strand continuous bodies,
   a formation step of enclosing the plurality of tobacco-strand continuous bodies obtained in the cut-out step by wrapping paper in a state in which the plurality of tobacco-strand continuous bodies are aligned along the conveyance path, thereby forming a rod-shaped tobacco-rod continuous body, and
   a cut-off step of sequentially cutting off the tobacco-rod continuous body obtained in the formation step into individual tobacco rods.

2. The method for producing the tobacco rod for the heating-type tobacco according to claim 1,
   wherein the tobacco-raw-material sheet is obtained by forming a tobacco raw material containing an aerosol-source material into a sheet shape.

3. The method for producing the tobacco rod for the heating-type tobacco according to claim 1 or claim 2,

wherein the tobacco-raw-material sheet is wound around a bobbin, and the tobacco-raw-material sheet that is successively sent out from the bobbin is conveyed along the conveyance path.

**4.** The method for producing the tobacco rod for the heating-type tobacco according to any one of claims 1 to 3, wherein, in the cut-out step, the tobacco-raw-material sheet is cut out to obtain the plurality of tobacco-strand continuous bodies each having a fixed width.

**5.** The method for producing the tobacco rod for the heating-type tobacco according to any one of claims 1 to 4, the method further comprising:

a calendering step of performing calendering with respect to the tobacco-raw-material sheet to thereby increase a density of the tobacco-raw-material sheet,
wherein, in the cut-out step, while the tobacco-raw-material sheet to which the calendering has been performed is conveyed along the conveyance path, the tobacco-raw-material sheet is cut out successively along the conveyance path into the plurality of strand-shaped tobacco-strand continuous bodies.

**6.** The method for producing the tobacco rod for the heating-type tobacco according to any one of claims 1 to 5, the method further comprising:
an addition step of adding at least one of a flavor and an aerosol-source material to the plurality of tobacco-strand continuous bodies obtained in the cut-out step.

**7.** The method for producing the tobacco rod for the heating-type tobacco according to claim 6,
wherein, in the addition step, at least one of the flavor and the aerosol-source material is added to the plurality of tobacco-strand continuous bodies in a process of enclosing the plurality of tobacco-strand continuous bodies by the wrapping paper in the formation step.

**8.** A device for producing a tobacco rod for a heating-type tobacco, the device comprising:

a bobbin around which a tobacco-raw-material sheet is wound;
a cut-out section that is disposed at a conveyance path for the tobacco-raw-material sheet sent out successively from the bobbin and that cuts out the tobacco-raw-material sheet successively along the conveyance path into a plurality of strand-shaped tobacco-strand continuous bodies;
a formation section that is disposed on a downstream of the cut-out section at the conveyance path and that encloses the plurality of tobacco-strand continuous bodies in a state aligned along the conveyance path by wrapping paper, thereby forming a rod-shaped tobacco-rod continuous body; and
a cut-off section that is disposed on a downstream of the formation section at the conveyance path and that sequentially cuts off the tobacco-rod continuous body into individual tobacco rods each having a predetermined length.

**9.** The device for producing the tobacco rod for the heating-type tobacco according to claim 8,
wherein the tobacco-raw-material sheet is obtained by forming a tobacco raw material containing an aerosol-source material into a sheet shape.

**10.** The device for producing the tobacco rod for the heating-type tobacco according to claim 8 or claim 9,
wherein the cut-out section cuts out the tobacco-raw-material sheet such that the plurality of tobacco-strand continuous bodies each having a fixed width are obtained.

**11.** The device for producing the tobacco rod for the heating-type tobacco according to any one of claims 8 to 10, wherein the cut-out section includes a cutter disposed parallel to the conveyance path, and
wherein the tobacco-raw-material sheet passes through the cutter along the conveyance path, and the tobacco-raw-material sheet is thereby successively cut out by the cutter into the plurality of tobacco-strand continuous bodies.

**12.** A heating-type tobacco comprising a tobacco rod that has a tobacco filler and wrapping paper that wraps the tobacco filler,

wherein the tobacco filler includes a plurality of tobacco strands that each contain an aerosol-source material and a tobacco raw material and have a strand shape, and
wherein the plurality of tobacco strands are aligned and disposed to extend along a longitudinal direction of the tobacco rod.

**13.** The heating-type tobacco according to claim 12,
wherein the tobacco strands are disposed parallel to each other in the longitudinal direction of the tobacco rod.

**14.** The heating-type tobacco according to claim 12 or claim 13,
wherein the tobacco strands are disposed to extend from a front end to a rear end of the tobacco rod.

**15.** The heating-type tobacco according to any one of

claims 12 to 14,
wherein the tobacco strands each have a strip shape.

**16.** The heating-type tobacco according to any one of claims 12 to 15,
wherein the tobacco strands each have a rectangular cross-section orthogonal to a longitudinal direction thereof.

**17.** The heating-type tobacco according to any one of claims 12 to 16,
wherein, in each of the tobacco strands, a width dimension of a cross-section orthogonal to the longitudinal direction thereof is 0.4 mm or more and 3 mm or less.

**18.** The heating-type tobacco according to any one of claims 12 to 17,
wherein, in each of the tobacco strands, a thickness dimension of a cross-section orthogonal to the longitudinal direction thereof is 0.02 mm or more and 1.3 mm or less.

**19.** The heating-type tobacco according to any one of claims 12 to 18,
wherein, in each of the tobacco strands, a length dimension in the longitudinal direction thereof is 10 mm or more and 50 mm or less.

**20.** The heating-type tobacco according to any one of claims 12 to 19,
wherein a diameter of the tobacco rod is 5 mm or more and 8 mm or less.

**21.** The heating-type tobacco according to any one of claims 12 to 20,
wherein, in each of the tobacco strands, an area of a cross-section orthogonal to the longitudinal direction thereof is equal over an entire length thereof.

**22.** The heating-type tobacco according to any one of claims 12 to 21,
wherein a content percentage of the aerosol-source material in the tobacco rod is 10 wt% or more and 25 wt% or less.

**23.** The heating-type tobacco according to any one of claims 12 to 22,

wherein the heating-type tobacco includes a mouthpiece portion coaxially coupled to a base end side of the tobacco rod, and
wherein the mouthpiece portion includes a cooling portion for cooling a volatile substance emitted from the aerosol-source material.

**24.** The heating-type tobacco according to claim 23,
wherein the mouthpiece portion includes a support portion disposed at a connection end connected to the base end side of the tobacco rod, the support portion suppressing the tobacco strands from being pressed to a region on a side of the mouthpiece portion.

**25.** The heating-type tobacco according to claim 23 or claim 24,
wherein the mouthpiece portion includes a filter portion disposed at a mouthpiece end side of the mouthpiece portion.

**26.** The heating-type tobacco according to any one of claims 12 to 25,
wherein a volume filling ratio of the tobacco strands occupying the tobacco rod is 50 vol% or more and 80 vol% or less.

**27.** The heating-type tobacco according to any one of claims 12 to 26,
wherein, in the heating-type tobacco, a volume filling ratio of the tobacco strands occupying the tobacco rod is 60 vol% or more and 80 vol% or less when a heater of a heating device to which the heating-type tobacco is applied is an external heating-type heater.

**28.** The heating-type tobacco according to any one of claims 12 to 27,
wherein, in the heating-type tobacco, a volume filling ratio of the tobacco strands occupying the tobacco rod is 50 vol% or more and 75 vol% or less when a heater of a heating device to which the heating-type tobacco is applied is an internal heating-type heater.

**29.** A heating-type tobacco product comprising the heating-type tobacco according to any one of claims 12 to 25, and a heating device to which the heating-type tobacco is applied.

**30.** The heating-type tobacco product according to claim 29,

wherein the heating device includes a rod housing portion to which the tobacco rod for the heating-type tobacco is attachable, and a heater provided at the rod housing portion,
wherein, when the heater is an internal heating-type heater that is inserted from a distal end side of the tobacco rod to attach the tobacco rod to the rod housing portion,
in a state in which the tobacco rod is attached to the rod housing portion, a volume filling ratio of the tobacco strands occupying the tobacco rod is 60 vol% or more and 80 vol% or less.

**31.** The heating-type tobacco product according to claim 29 or claim 30,

wherein a ratio of a maximum diameter of the heater to a diameter of a cross-section orthogonal to the longitudinal direction of the tobacco rod is 0.3 or more and 0.6 or less.

FIG. 1

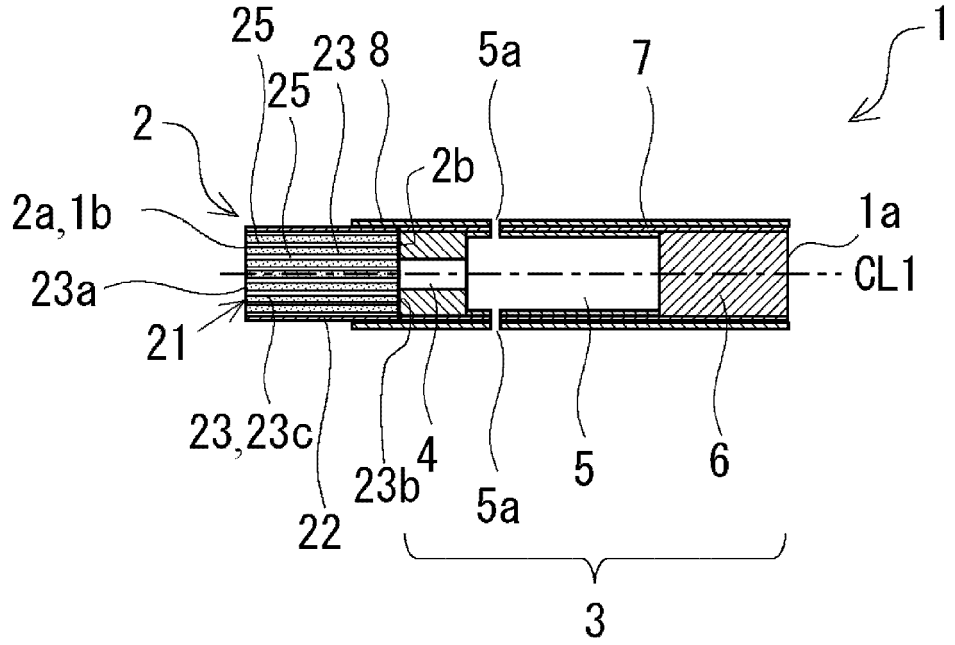
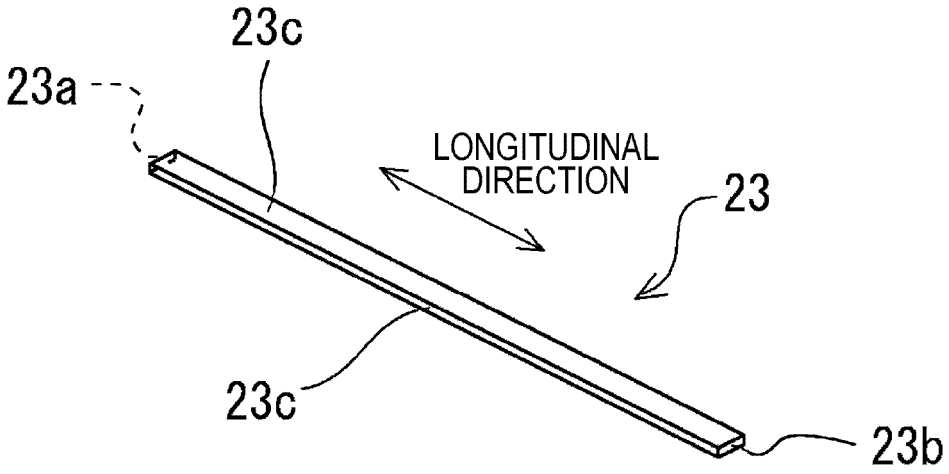

25
23
8
5a
7
1
25
2
2b
2a,1b
1a
23a
CL1
21
23,23c
4
5
6
23b
5a
22
3

FIG. 2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23a
LONGITUDINAL
DIRECTION
23
23c
23b

FIG. 3

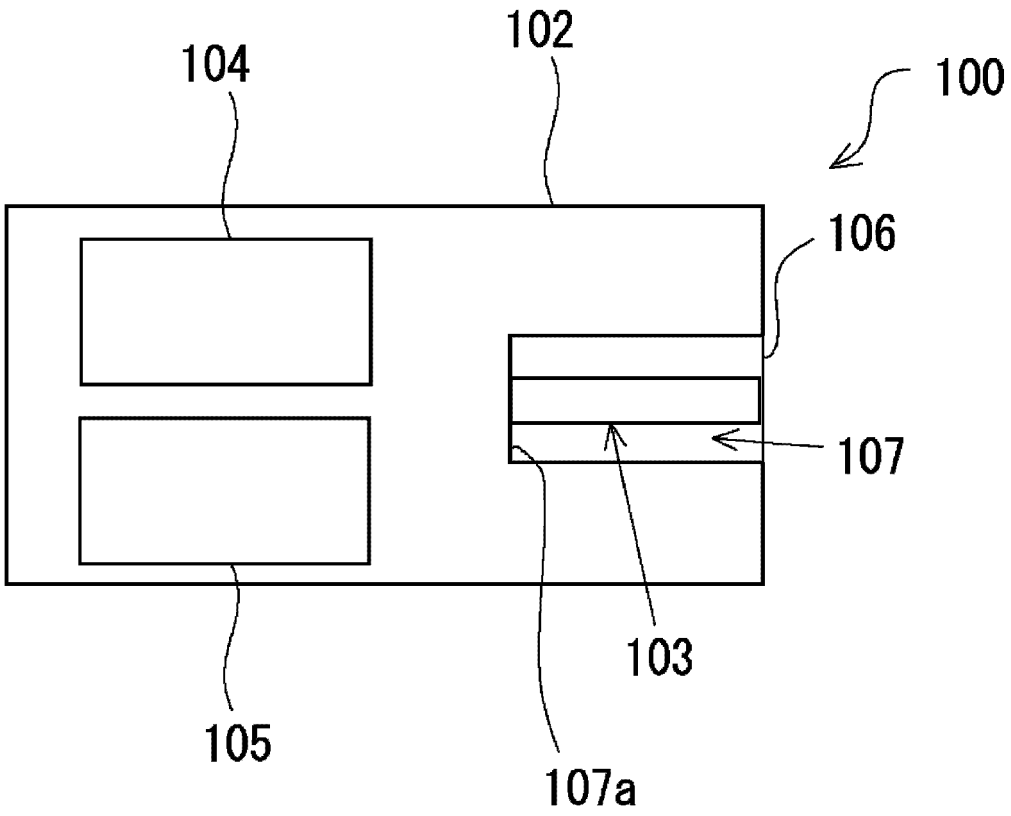


FIG. 4

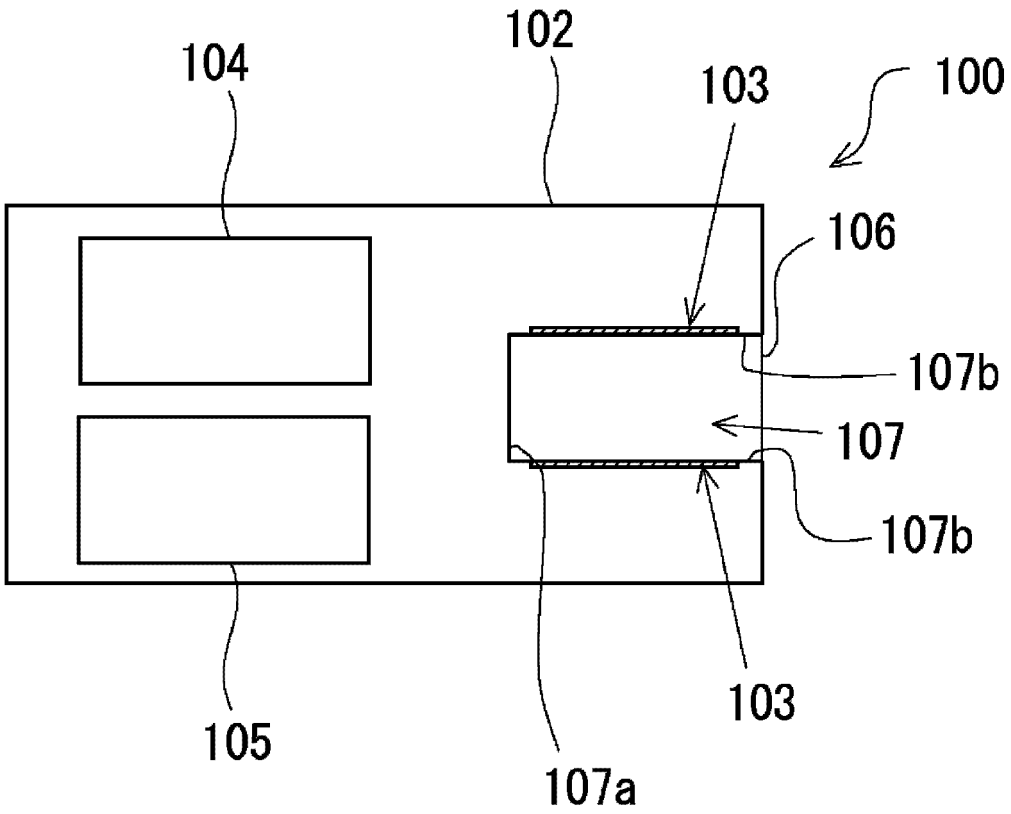
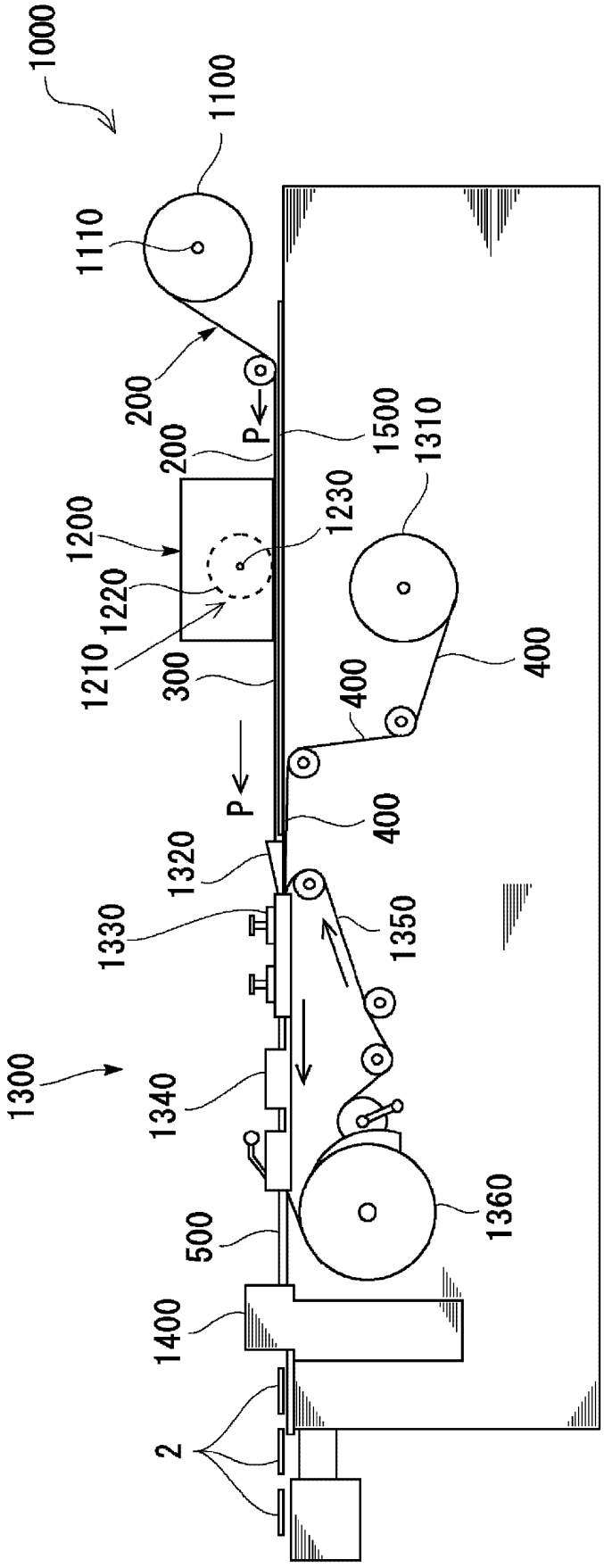


FIG. 5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P
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1340
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500
1400
2

FIG. 6

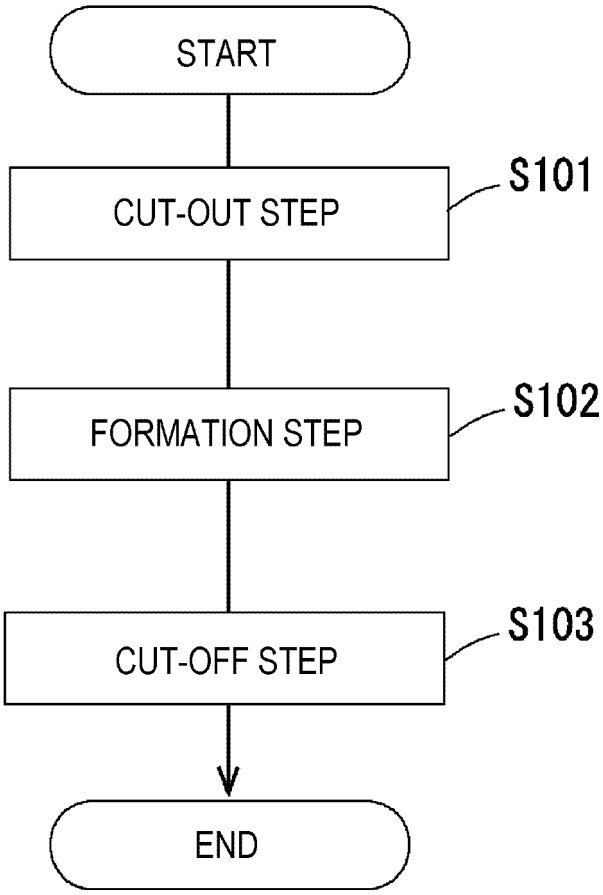
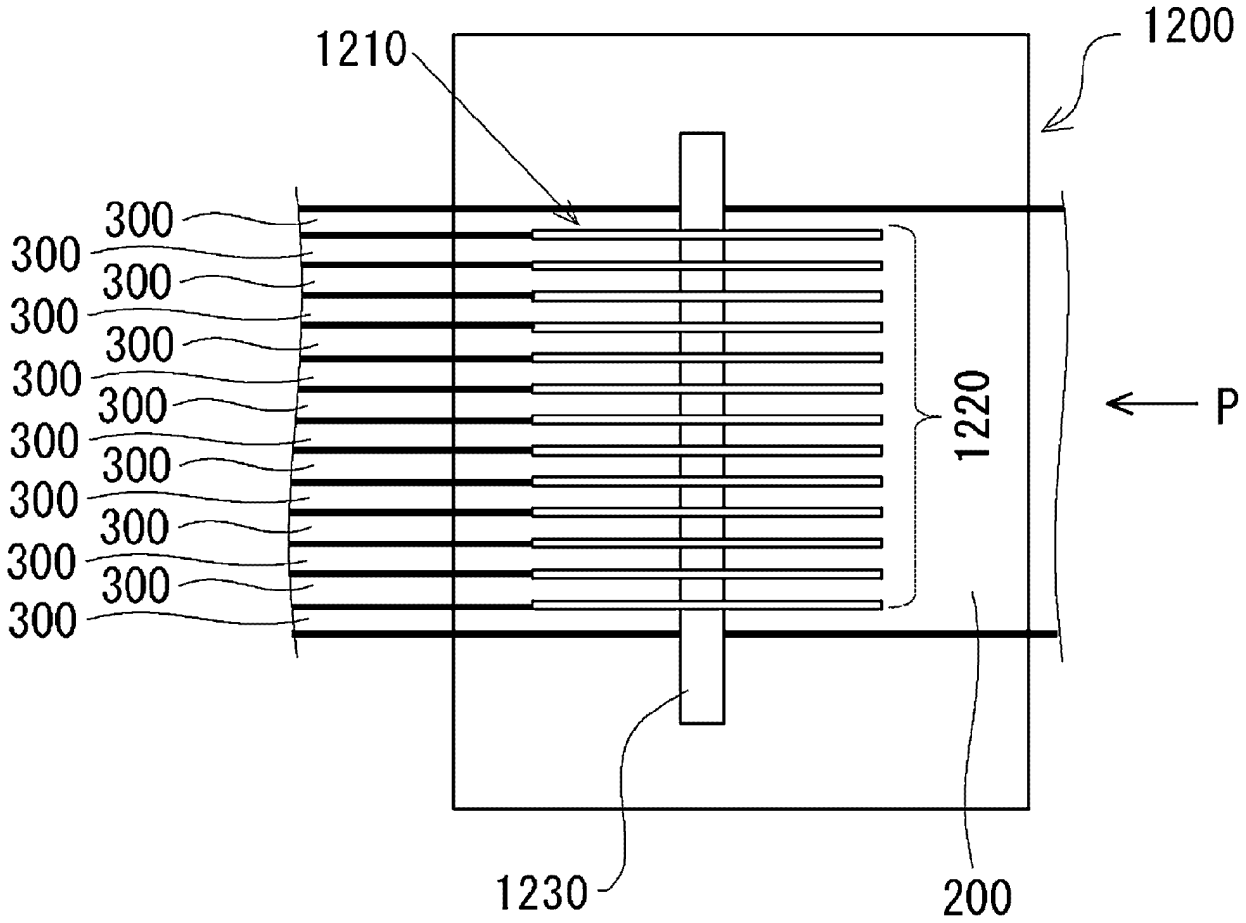

START
CUT-OUT STEP
S101
FORMATION STEP
S102
CUT-OFF STEP
S103
END

FIG. 7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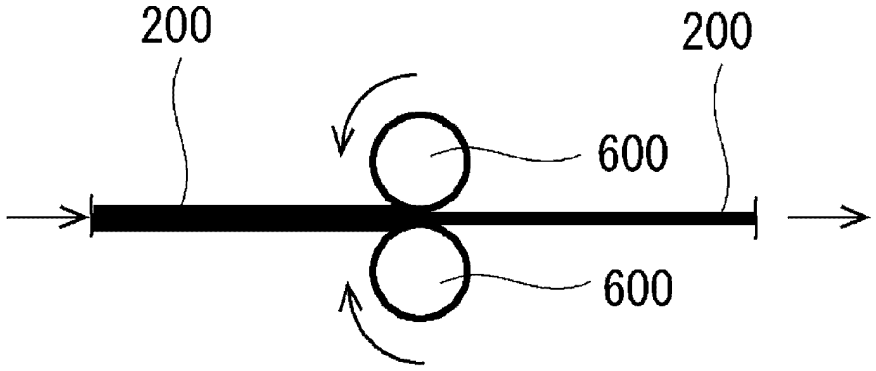
300
300
300
300
300
300
300
300
300
300
1220
P
1230
200

FIG. 8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200
600
600

FIG. 9

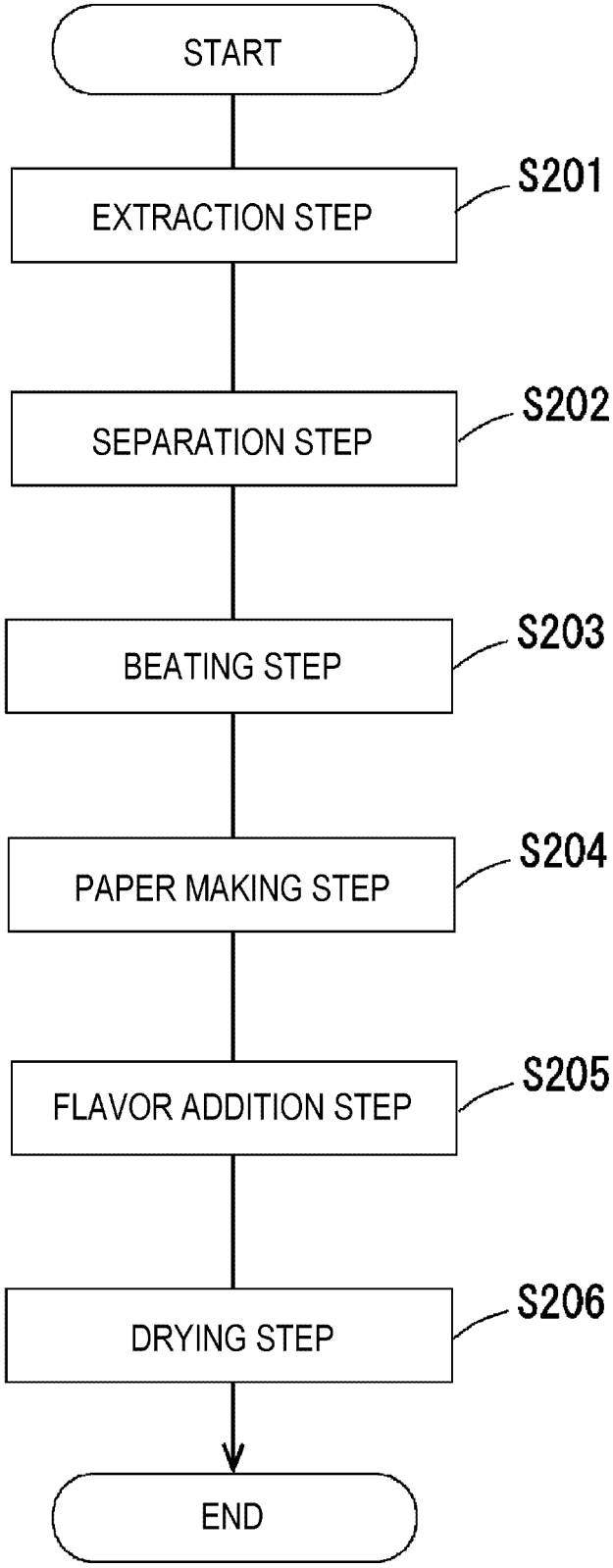

START
EXTRACTION STEP
S201
SEPARATION STEP
S202
BEATING STEP
S203
PAPER MAKING STEP
S204
FLAVOR ADDITION STEP
S205
DRYING STEP
S206
END

FIG. 10

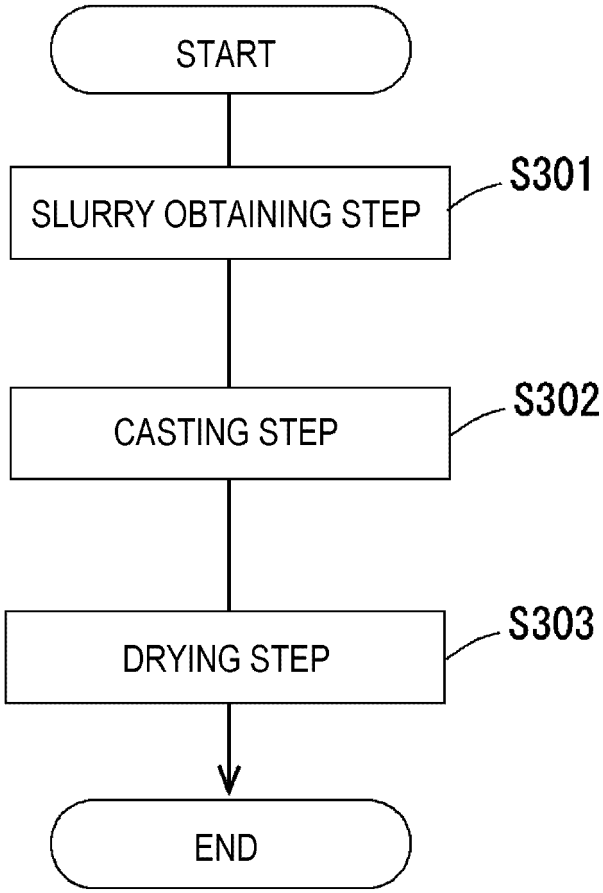
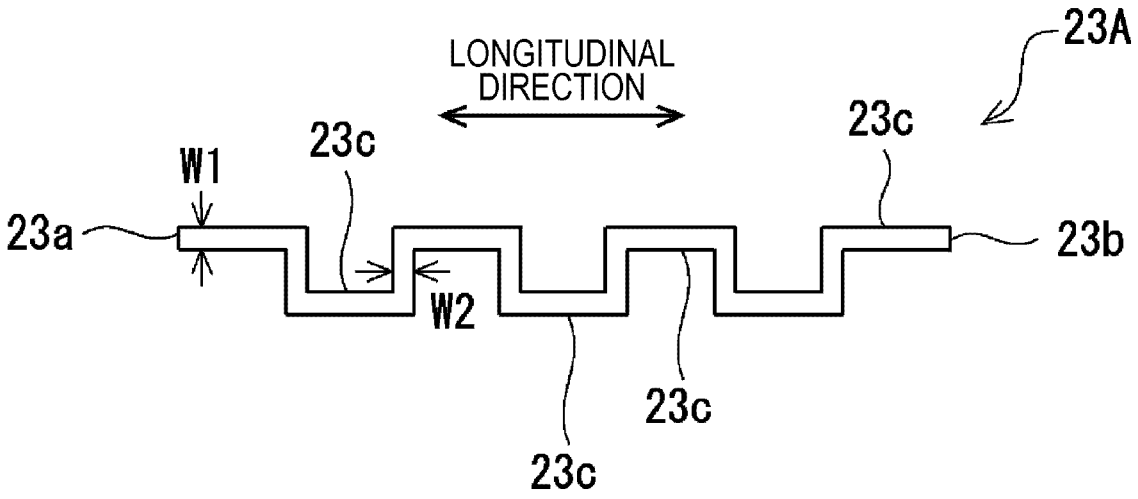

START
SLURRY OBTAINING STEP
S301
CASTING STEP
S302
DRYING STEP
S303
END

FIG. 11



**INTERNATIONAL SEARCH REPORT**

International application No.
PCT/JP2019/013706

A. CLASSIFICATION OF SUBJECT MATTER
Int. Cl. A24F47/00(2006.01)i, A24B3/14(2006.01)i, A24C5/14(2006.01)i, A24C5/18(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, A24B3/00-15/42, A24C5/00-5/60

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. |
|---|---|---|
| X<br>Y | JP 2013-519384 A (PHILIP MORRIS PRODUCTS S.A.) 30 May 2013, paragraphs [0042]-[0062], [0082]-[0092], [0104] & US 2012/0006343 A1, paragraphs [0046]-[0061], [0078]-[0086], [0096] & WO 2011/101164 A1 & EP 2361516 A1 & AR 80650 A1 & AU 2011217492 A1 & CA 2787140 A1 & SG 183244 A1 & CN 102762118 A & IL 220900 A & MX 2012009603 A & EA 201290809 A1 & KR 10-2013-0024886 A & NZ 601274 A & UA 106412 C2 & ZA 201205266 B | 12-22, 29<br>1-11, 23-28, 30-31 |

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

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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"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 |
|---|---|
| 14.06.2019 | 25.06.2019 |
| Name and mailing address of the ISA/<br>Japan Patent Office<br>3-4-3, Kasumigaseki, Chiyoda-ku,<br>Tokyo 100-8915, Japan | Authorized officer<br><br>Telephone No. |

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**INTERNATIONAL SEARCH REPORT**

International application No.
PCT/JP2019/013706

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| Y | JP 62-272962 A (R. J. REYNOLDS TOBACCO COMPANY) 27 November 1987, page 6, lower right column, line 11 to page 9, upper right column, line 10, fig. 1, 2 & US 4889143 A, column 5, line 21 to column 8, line 32, fig. 1, 2 & EP 246107 A2 & PH 24844 A & AU 7269887 A & BR 8702470 A & CA 1280946 C & CN 87103233 A | 1-11 |
| Y | JP 2016-536008 A (PHILIP MORRIS PRODUCTS S.A.) 24 November 2016, paragraphs [0120]-[0123] & US 2016/0213063 A1, paragraphs [0117]-[0120] & WO 2015/055567 A1 & EP 3057452 A1 & TW 201521609 A & CN 105578906 A & KR 10-2016-0072091 A & AR 98008 A1 & RU 2016118003 A | 6-7 |
| Y | WO 2019/030276 A1 (PHILIP MORRIS PRODUCTS S.A.) 14 February 2019, description, page 11, lines 17-37 (Family: none) | 6-7 |
| Y | JP 6371928 B1 (TOA INDUSTRY CO., LTD.) 08 August 2018, paragraphs [0074], [0105]-[0133], fig. 1-4, 6 (Family: none) | 23-28, 30-31 |
| E, X | WO 2019/057796 A1 (BRITISH AMERICAN TOBACCO (INVESTMENTS) LIMITED) LIMITED) 28 March 2019, description, page 6, line 4 to page 23, line 19, fig. 1-5b (Family: none) | 1-4, 8-21, 29 |
| A | US 2039298 A (DAVIDSON, Glenn) 05 May 1936, description, page 2, left column, lines 47-70, fig. 2 (Family: none) | 1-31 |

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## REFERENCES CITED IN THE DESCRIPTION

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- JP 6000451 B **[0003]**
- JP 6017546 B **[0003]**
- JP 62272962 A **[0003]**