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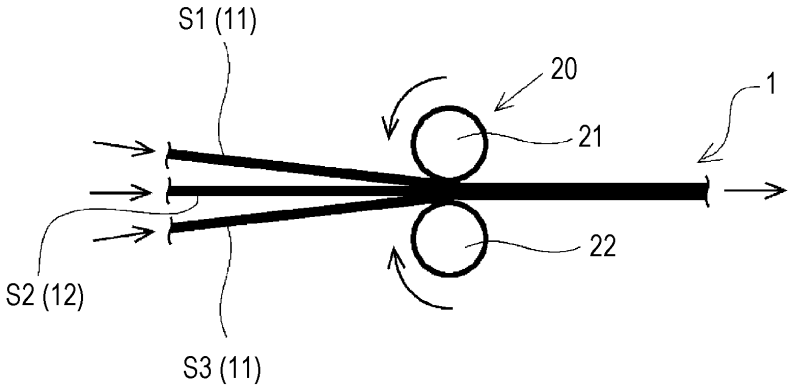
(54) **METHOD FOR PRODUCING LAMINATED RECONSTITUTED TOBACCO SHEET**

(57) In the process for producing a reconstituted tobacco sheet comprising a tobacco raw material and an aerosol-forming agent, a technique is provided whereby it becomes possible to improve production suitability and mechanical strength and to secure the content of an aerosol formation solution per a unit area satisfactorily. A method for producing a laminated reconstituted tobacco sheet comprises a sheet feeding step of feeding a plurality of reconstituted tobacco sheets each containing an aerosol-forming agent and water and a pressure-bonding step of allowing the plurality of reconstituted tobacco sheets to pass between pressing rollers continuously while keeping the plurality of reconstituted tobacco sheets in a laminated form to pressure-bond the reconstituted tobacco sheets to each other, wherein at least one of the reconstituted tobacco sheets is a tobacco sheet which is produced by a paper-making technique in such a manner that a tobacco raw material is extracted with water to separate the tobacco raw material into a water-based tobacco extract and a water-insoluble tobacco residue, then pulp is blended to the insoluble tobacco residue, then a base sheet is made from the resultant blended product by a paper-making technique and then the water-based tobacco extract is added to the base sheet.

FIG. 5



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Description

Technical Field

[0001] The present invention relates to a method for producing a laminated reconstituted tobacco sheet.

Background Art

[0002] There are known non-combustion heating-type smoking articles having a tobacco rod formed by filling the inside of wrapping paper with a tobacco filler containing a tobacco raw material (such as tobacco midribs, tobacco laminae, shredded tobacco, and tobacco fine powder) and an aerosol-source material (such as glycerol or propylene glycol). Such a non-combustion heating-type smoking article is a smoking article configured to use the heating unit of the smoking device, such as an electric heater, to heat the tobacco filler without causing combustion, to deliver an aerosol generated from the tobacco filler to the smoker.

[0003] As the tobacco filler for non-combustion heating-type smoking articles, a reconstituted tobacco raw material is known. The reconstituted tobacco raw material is provided by subjecting a tobacco raw material to kneading with additives such as a binder, a gelling agent, a crosslinking agent, a flavor, a hydrophilic flavor, an oleophilic flavor, a viscosity modifier, a humectant, or a reinforcing material, and to molding and drying by a papermaking process (papermaking), a casting process, a rolling process, or an extrusion process; examples of the reconstituted tobacco raw material include sheet tobacco, shredded tobacco of the sheet tobacco, and tobacco granules. To the tobacco filler, a flavor may be further added. The type of the flavor is not particularly limited.

[0004] As the methods for producing such a reconstituted tobacco sheet, known examples include a method of performing a papermaking (paper manufacturing) process to produce a tobacco sheet, a method of performing a slurry (casting) process to produce a tobacco sheet, a method of performing a rolling (roll) process to produce a tobacco sheet, and a method of performing an extrusion process to produce a tobacco sheet.

Citation List

Patent document

[0005]

Patent document 1: Japanese Unexamined Patent Application Publication (Translation of PCT Application) No. 2015-517817

Patent document 2: Japanese Unexamined Patent Application Publication (Translation of PCT Application) No. 2018-516536

Patent document 3: Japanese Patent No. 4860634

Summary of Invention

Technical Problem

[0006] Reconstituted tobacco sheets used as tobacco fillers in non-combustion heating-type smoking articles are desirably produced to have increased generation amount of aerosol (delivery) to enrich smoking experience. In general, tobacco slurry sheets obtained by the slurry (casting) process are known to have high capacity for containing aerosol-source materials such as glycerol, but tend to have low mechanical strength (such as tensile strength or breaking strength) for resisting mechanical stress. On the other hand, tobacco paper sheets obtained by the papermaking process tend to have high mechanical strength due to intertwinement of pulp fibers, but tend to have lower capacity for containing (holding) aerosol-source materials than tobacco slurry sheets. Thus, a technique may be devised: tobacco paper sheets are provided so as to have increased thickness, to thereby increase the capacity for aerosol-source materials contained in the tobacco paper sheets.

[0007] However, in such a case of trying to simply increase the thickness of the base sheets of tobacco paper sheets, the permeation rate of aerosol-source materials applied to the base sheets decreases, which is actually not suitable for practical steps.

[0008] Under such circumstances, the present invention has been made; an object is to provide a technique of, during the production process of a reconstituted tobacco sheet containing a tobacco raw material and an aerosol-source material, providing high production suitability and high mechanical strength, and ensuring a sufficient aerosol-source material content per unit area of the reconstituted tobacco sheet.

Solution to Problem

[0009] In order to achieve the above-described object, a method for producing a laminated reconstituted tobacco sheet according to the present invention includes a sheet feeding step of feeding a plurality of reconstituted tobacco sheets containing an aerosol-source material and moisture; and a pressure-bonding step of continuously passing, through a pressure roller, the plurality of reconstituted tobacco sheets being stacked, to pressure-bond together the reconstituted tobacco sheets, wherein at least one of the reconstituted tobacco sheets is a tobacco paper sheet obtained such that a tobacco raw material is extracted with water and separated into a water-based tobacco extract and an insoluble tobacco residue, the insoluble tobacco residue is mixed with pulp and subjected to papermaking to provide a base sheet, and subsequently the water-based tobacco extract is added to the base sheet. This provides a laminated reconstituted tobacco sheet that has high production suitability and

high mechanical strength, and has a high aerosol-source material content per unit area.

[0010] In the pressure-bonding step, the reconstituted tobacco sheets may be pressure-bonded together without applying additional adhesive or binder.

[0011] The plurality of reconstituted tobacco sheets may include a tobacco slurry sheet obtained by spreading, into a sheet shape over a support, a slurry containing a tobacco raw material, pulp, water, and an aerosol-source material, and drying the slurry

[0012] In the plurality of reconstituted tobacco sheets fed in the sheet feeding step, the tobacco slurry sheet may have an aerosol-source material content higher than an aerosol-source material content of the tobacco paper sheet.

[0013] The tobacco paper sheet may have an aerosol-source material content of 12 to 25 wt%.

[0014] The tobacco slurry sheet may have an aerosol-source material content of 12 to 65 wt%.

[0015] In the pressure-bonding step, of the plurality of reconstituted tobacco sheets passed through the pressure roller, reconstituted tobacco sheets positioned in an uppermost layer and a lowermost layer may be formed of the tobacco paper sheet.

[0016] In the pressure-bonding step, of the plurality of reconstituted tobacco sheets passed through the pressure roller, between the tobacco paper sheets positioned in the uppermost layer and the lowermost layer, a tobacco slurry sheet may be sandwiched, the tobacco slurry sheet being obtained by spreading, into a sheet shape over a support, a slurry containing a tobacco raw material, pulp, water, and an aerosol-source material, and drying the slurry. Furthermore, between the tobacco paper sheets, a tobacco rolled sheet and/or a tobacco extrusion sheet may be sandwiched. The extrusion sheet is a reconstituted tobacco sheet that can be produced by, for example, mixing a tobacco raw material containing tobacco midribs, tobacco laminae, shredded tobacco, tobacco fine powder, and the like with a binder (binding agent), an aerosol-source material (such as glycerol or propylene glycol), water, and the like within a stirring tank, subsequently extruding the mixed raw material, under application of pressure, through a die, and drying the mixed raw material.

[0017] In the pressure-bonding step, of the plurality of reconstituted tobacco sheets passed through the pressure roller, between the tobacco paper sheets in the lowermost layer and the uppermost layer, a flavor-containing sheet containing a liquid, powdery, or granular flavor may be sandwiched.

[0018] The reconstituted tobacco sheets fed in the sheet feeding step may each have a moisture content adjusted to be in a range of 12 to 25 wt%.

[0019] In the pressure-bonding step, the reconstituted tobacco sheets may be pressure-bonded together while the reconstituted tobacco sheets have sheet temperatures controlled to be ordinary temperature to 80°C.

[0020] In the pressure-bonding step, the pressure roller may be set to nip the reconstituted tobacco sheets at a nip pressure of 200 to 1300 N/cm.

[0021] The pressure roller may be set to have a roller clearance that is 20 to 80% of a total thickness of the plurality of reconstituted tobacco sheets passed through the pressure roller in the pressure-bonding step.

[0022] Note that, in the present invention, features for achieving the object can be employed in combination as long as possible.

Advantageous Effects of Invention

[0023] The present invention provides a technique of, during the production process of a reconstituted tobacco sheet containing shredded tobacco and an aerosol-source material, providing high production suitability and high mechanical strength, and ensuring a sufficient aerosol-source material content per unit area.

Brief Description of Drawings

[0024]

[Fig. 1] Fig. 1 illustrates a method for producing a laminated reconstituted tobacco sheet according to Embodiment 1.

[Fig. 2] Fig. 2 illustrates the layer structure of a laminated reconstituted tobacco sheet 1 according to Embodiment 1.

[Fig. 3] Fig. 3 is an explanatory view illustrating a method for producing a tobacco paper sheet according to Embodiment 1.

[Fig. 4] Fig. 4 is an explanatory view illustrating a method for producing a tobacco slurry sheet according to Embodiment 1.

[Fig. 5] Fig. 5 is an explanatory view illustrating a pressure-bonding step in a method for producing a laminated reconstituted tobacco sheet in Embodiment 1.

[Fig. 6] Fig. 6 is an explanatory view illustrating a pressure-bonding step in a method for producing a laminated reconstituted tobacco sheet according to Modification 1.

[Fig. 7] Fig. 7 is an explanatory view illustrating a pressure-bonding step in a method for producing a laminated reconstituted tobacco sheet according to Modification 2.

[Fig. 8] Fig. 8 is an explanatory view illustrating a pressure-bonding step in a method for producing a laminated reconstituted tobacco sheet according to Modification 3.

Description of Embodiments

[0025] Hereinafter, embodiments of a method for producing a laminated reconstituted tobacco sheet according to the present invention will be described with reference to drawings. Incidentally, the dimensions, materi-

als, shapes, relative positions, and the like of elements described in the embodiments are not intended to limit the technical scope of the invention thereto unless otherwise specified.

<Embodiment 1>

[0026] Fig. 1 illustrates a method for producing a laminated reconstituted tobacco sheet according to Embodiment 1. The method for producing a laminated reconstituted tobacco sheet in Embodiment 1 includes a sheet feeding step (Step S101) of feeding a plurality of reconstituted tobacco sheets containing an aerosol-source material and water, and a pressure-bonding step (Step S102) of continuously passing, through a pressure roller, the plurality of reconstituted tobacco sheets being stacked to pressure-bond together the reconstituted tobacco sheets, wherein at least one of the reconstituted tobacco sheets is a tobacco paper sheet.

[0027] Fig. 2 illustrates the layer structure of a laminated reconstituted tobacco sheet 1 obtained by the production method illustrated in Fig. 1. The laminated reconstituted tobacco sheet 1 illustrated in Fig. 2 has a trilayer structure in which a first reconstituted tobacco sheet S1, a second reconstituted tobacco sheet S2, and a third reconstituted tobacco sheet S3 are stacked and the sheets are pressure-bonded together. In the laminated reconstituted tobacco sheet 1, the first reconstituted tobacco sheet S1 forming the uppermost layer and the third reconstituted tobacco sheet S3 forming the lowermost layer are formed of tobacco paper sheets 11. The second reconstituted tobacco sheet S2 forming the intermediate layer is formed of a tobacco slurry sheet 12. The laminated reconstituted tobacco sheet 1 is used as a tobacco filler for filling the inside of the wrapping paper of a tobacco rod of a non-combustion heating-type smoking article. For example, the laminated reconstituted tobacco sheet 1 is cut into various shapes such as fine cut, fine granules, flakes, or strips, and subsequently filled, as a tobacco filler, into the inside of wrapping paper to thereby form a tobacco rod. However, it is apparent that the laminated reconstituted tobacco sheet 1 is not limited to the above-described shapes and may be folded into a gathering shape and subsequently filled into the inside of the wrapping paper of a tobacco rod. Alternatively, the laminated reconstituted tobacco sheet 1 may be processed such that, in its surface, a plurality of grooves extending in the longitudinal direction are formed at constant intervals by laser processing, for example. Subsequently, the laminated reconstituted tobacco sheet 1 may be rolled into a cylindrical shape such that the grooves formed in the surface extend in the axial direction of the tobacco rod, and a plurality of such cylinders may be piled to form a plurality of layers in the inside of the wrapping paper of the tobacco rod of a non-combustion heating-type smoking article.

[0028] Hereinafter, the tobacco paper sheets 11 and the slurry sheet 12 constituting the laminated reconstituted tobacco sheet 1 will be described. Such a tobacco paper sheet 11 is a reconstituted tobacco sheet obtained such that a tobacco raw material is extracted with water and separated into a water-based tobacco extract and an insoluble tobacco residue, the insoluble tobacco residue is mixed with pulp (cellulose fibers) and subjected to papermaking to provide a base sheet, and subsequently the water-based extract is added to the base sheet. The slurry sheet 12 is a reconstituted tobacco sheet obtained such that a slurry raw material at least containing a tobacco raw material, pulp, water, and an aerosol-source material is spread into a sheet shape over a support, and dried.

[0029] Fig. 3 is an explanatory view illustrating a method for producing the tobacco paper sheet 11 according to Embodiment 1. As illustrated in Fig. 3, first, in Step S201, a tobacco raw material containing, for example, tobacco midribs, tobacco laminae, shredded tobacco, and tobacco fine powder is extracted with water (extraction step). In the extraction step, for example, the tobacco raw material is mixed with an amount of water 10 times the amount of the tobacco raw material, and, under stirring, heated at a predetermined temperature for a predetermined time to obtain a mixture. Subsequently, in Step S202, the mixture obtained in the extraction step is squeezed with, for example, a screw press dehydrator, to achieve separation into a water-based tobacco extract (liquid) and an insoluble tobacco residue (solid) (separation step). Subsequently, in Step S203, to the insoluble tobacco residue obtained in the separation step, water and pulp (cellulose fibers) are added, and the insoluble tobacco residue is refined with, for example, a refiner, so as to adjust fiber length or cause fibrillation of the fibers to thereby achieve fiberization (refining step).

[0030] Subsequently, in Step S204, the insoluble tobacco residue and pulp fiberized in the refining step are processed with a paper machine into a sheet shape, and dried to obtain a base sheet (papermaking step). Subsequently, in Step S205, to the base sheet, an addition solution containing a concentrated solution of the water-based tobacco extract obtained in the separation step, and an aerosol-source material such as glycerol or propylene glycol is added (flavoring step). Incidentally, the concentrated solution of the water-based tobacco extract added to the base sheet in the flavoring step can be obtained by using, for example, an evaporator, to concentrate the water-based tobacco extract. Subsequently, in Step S206, the flavored base sheet obtained in the flavoring step is dried (drying step).

[0031] The production method having been described so far provides the tobacco paper sheet 11. Incidentally, the tobacco paper sheet 11 in this embodiment has an aerosol-source material content adjusted to be 12 to 25 wt%. The tobacco paper sheet 11 has a moisture content adjusted to be in a range of 12 to 25 wt%. In such a case where, for the tobacco paper sheet 11, the aerosol-source material content is set to 12 wt% or more, the resultant tobacco paper sheet 11 can supply a necessary

and sufficient amount of aerosol. In such a case where, for the tobacco paper sheet 11, the aerosol-source material content is set to 25 wt% or less, the aerosol-source material can be prevented from being supplied, to the base sheet, in an excessively large amount beyond the capacity of holding the aerosol-source material in the base sheet. This prevents, for example, the surface of the base sheet from becoming sticky due to the aerosol-source material.

[0032] Hereinafter, a method for producing the tobacco slurry sheet 12 of the laminated reconstituted tobacco sheet 1 will be described. Fig. 4 is an explanatory view illustrating the method for producing the tobacco slurry sheet 12 according to Embodiment 1. As illustrated in Fig. 4, first, in Step S301, a tobacco raw material containing, for example, tobacco midribs, tobacco laminae, shredded tobacco, and tobacco fine powder is pulverized, and subsequently mixed with small amounts of a binder (binding agent) and a reinforcing agent (such as defibrated pulp) and predetermined amounts of an aerosol-source material (such as glycerol or propylene glycol) and water within, for example, a stirring tank, to thereby obtain a slurry (suspension) (slurry obtaining step). Examples of the binder (binding agent) include guar gum, xanthan gum, and CMC (methylol cellulose).

[0033] Subsequently, in Step S302, the slurry obtained in the slurry obtaining step is cast (spread) over, for example, a steel belt (support), into a sheet shape, to thereby obtain a slurry web (casting step). Subsequently, in Step S303, the sheet-shaped slurry web spread to the sheet shape is dried (drying step). The steps having been described so far provide the tobacco slurry sheet 12. The tobacco slurry sheet 12 in this embodiment has an aerosol-source material content adjusted to be 12 to 65 wt%. The tobacco slurry sheet 12 has a moisture content adjusted to be in a range of 12 to 25 wt%. In such a case where, for the tobacco slurry sheet 12, the aerosol-source material content is set to 12 wt% or more, the resultant tobacco slurry sheet 12 can supply a necessary and sufficient amount of aerosol. In such a case where, for the tobacco slurry sheet 12, the aerosol-source material content is set to 65 wt% or less, the aerosol-source material can be prevented from being supplied, to the tobacco slurry sheet 12, in an excessively large amount beyond the capacity of holding the aerosol-source material in the tobacco slurry sheet 12. This prevents the following problems: for example, the surface of the tobacco slurry sheet 12 becomes sticky due to the aerosol-source material to cause accidental adhesion during storage. Incidentally, the tobacco slurry sheet 12 has higher capacity of holding the aerosol-source material than the tobacco paper sheet 11.

[0034] In this embodiment, the tobacco slurry sheet 12 has higher aerosol-source material content than the tobacco paper sheet 11. The tobacco slurry sheet 12 has, due to the characteristics of the production steps, a low degree of intertwinement of pulp fibers, and hence has a feature of having lower mechanical strength (such as tensile strength or breaking strength) than the tobacco paper sheet 11. By contrast, the tobacco paper sheet 11 has, as described above, lower capacity for containing the aerosol-source material than the tobacco slurry sheet 12, but has a higher degree of intertwinement of pulp fibers, and hence has a feature of having higher mechanical strength (such as tensile strength or breaking strength) than the tobacco slurry sheet 12.

[0035] In this embodiment, the laminated reconstituted tobacco sheet 1 has a laminated sheet structure in which the tobacco paper sheet 11 and the tobacco slurry sheet 12, which have different features as described above, are laminated together. Referring again to Fig. 1, the method for producing the laminated reconstituted tobacco sheet 1 will be specifically described: in the tobacco sheet feeding step (in Fig. 1, Step S101), two tobacco paper sheets 11 and one tobacco slurry sheet 12 produced by the methods having been described with reference to Fig. 3 and Fig. 4 are prepared. Incidentally, the tobacco paper sheets 11 produced by the production method having been described with reference to Fig. 3 and the tobacco slurry sheet 12 produced by the production method having been described with reference to Fig. 4 may be wound into roll shapes such as bobbins.

[0036] Fig. 5 is an explanatory view illustrating the pressure-bonding step in the method for producing the laminated reconstituted tobacco sheet 1 in Embodiment 1. In the pressure-bonding step (in Fig. 1, Step S102), the reconstituted tobacco sheets S1 to S3 being stacked such that, in the laminated reconstituted tobacco sheet 1, the tobacco slurry sheet 12 forming the second reconstituted tobacco sheet S2 (intermediate layer) is sandwiched between the tobacco paper sheet 11 forming the first reconstituted tobacco sheet S1 (uppermost layer) and the tobacco paper sheet 11 forming the third reconstituted tobacco sheet S3 (lowermost layer), are continuously passed through a pressure roller 20, to thereby pressure-bond together the reconstituted tobacco sheets S1 to S3. The pressure roller 20 includes at least a pair of roller members 21 and 22; between the pair of roller members 21 and 22, the reconstituted tobacco sheets S1 to S3 being stacked are continuously passed, so that the reconstituted tobacco sheets S1 to S3 are subjected to a compressive force in the layer direction (thickness direction). In this embodiment, the pair of roller members 21 and 22 are used to flatten the plurality of reconstituted tobacco sheets S1 to S3 being stacked, during which hydrogen bonds between the tobacco raw materials are utilized to achieve pressure-bonding together of the reconstituted tobacco sheets S1 to S3. More specifically, hydrogen bonds between the tobacco raw materials of the first reconstituted tobacco sheet S1 (tobacco paper sheet 11) and the second reconstituted tobacco sheet S2 (tobacco slurry sheet 12) are used to pressure-bond together the first reconstituted tobacco sheet S1 (tobacco paper sheet 11) and the second reconstituted tobacco sheet S2 (tobacco slurry sheet 12). Hydrogen bonds between the tobacco raw materials of the third reconstituted

tobacco sheet S3 (tobacco paper sheet 11) and the second reconstituted tobacco sheet S2 (tobacco slurry sheet 12) are used to pressure-bond together the third reconstituted tobacco sheet S3 (tobacco paper sheet 11) and the second reconstituted tobacco sheet S2 (tobacco slurry sheet 12). Such a hydrogen bond (hydrogen bond) is a noncovalent attractive interaction provided between a hydrogen atom covalently bonded to a highly electronegative atom (negative atom) and a lone electron-pair of, for example, N, O, S, F, or a π electron system positioned adjacent to the hydrogen atom. The method for producing the laminated reconstituted tobacco sheet 1 according to this embodiment utilizes, in the pressure-bonding step, hydrogen bonds between the tobacco raw materials, to thereby achieve, without applying additional adhesive or binder, pressure-bonding together of the reconstituted tobacco sheets S1 to S3.

[0037] Incidentally, in the pressure-bonding step of this embodiment, the pressure roller 20 (the pair of roller members 21 and 22) nips the reconstituted tobacco sheets S1 to S3 at a nip pressure set to be 200 to 1300 N/cm. When the nip pressure of the pressure roller 20 is excessively high, the reconstituted tobacco sheets S1 and S3 tend to adhere to the pressure roller 20 (the pair of roller members 21 and 22); when the nip pressure is excessively low, the reconstituted tobacco sheets S1 to S3 are less likely to be pressure-bonded together. By contrast, when the nip pressure of the pressure roller 20 (the pair of roller members 21 and 22) is adjusted to be in a range of 200 to 1300 N/cm, the reconstituted tobacco sheets S1 to S3 can be pressure-bonded together with more certainty, and reconstituted tobacco sheets (in this embodiment, in the laminated reconstituted tobacco sheet 1, the first reconstituted tobacco sheet S1 forming the uppermost layer and the third reconstituted tobacco sheet S3 forming the lowermost layer) passing between the roller members 21 and 22 in the pressure roller 20 can be suitably prevented from adhering to the roller members 21 and 22.

[0038] When the roller clearance RC in the pressure roller 20 (between the pair of roller members 21 and 22) is excessively small, in the pressure-bonding step, it may become difficult to smoothly send the reconstituted tobacco sheets S1 to S3 being stacked, into between the pair of roller members 21 and 22, or slipping of the pair of roller members 21 and 22 tends to wrinkle the sheets or tends to cause the sheets to break, for example. On the other hand, when the roller clearance RC is excessively large, the reconstituted tobacco sheets S1 to S3 may be weakly pressure-bonded together. Thus, in this embodiment, the roller clearance RC is set to be 20 to 80% of the total thickness of the plurality of reconstituted tobacco sheets S1 to S3 passed through the pressure roller 20 (between the pair of roller members 21 and 22) in the pressure-bonding step. When the roller clearance RC is set to be in such a preferred range, the above-described problems are less likely to occur. Specifically, in the pressure-bonding step, the reconstituted tobacco sheets S1 to S3 can be smoothly sent into between the pair of roller members 21 and 22, and occurrence of wrinkling, breakage, and the like of the reconstituted tobacco sheets S1 to S3 can be suitably prevented.

[0039] During, in the pressure-bonding step, pressure-bonding together of the reconstituted tobacco sheets S1 to S3, when the reconstituted tobacco sheets S1 to S3 have excessively high sheet temperatures, the first reconstituted tobacco sheet S1 or the third reconstituted tobacco sheet S3 sheet tends to adhere to the pair of roller members 21 and 22 in the pressure roller 20; when the sheet temperatures are excessively low, the reconstituted tobacco sheets S1 to S3 may become less likely to be pressure-bonded together. Thus, in this embodiment, in the pressure-bonding step, the reconstituted tobacco sheets S1 to S3 are pressure-bonded together at sheet temperatures controlled to be ordinary temperature to 80°. For example, in the pressure-bonding step, the reconstituted tobacco sheets S1 to S3 may have sheet temperatures controlled to be in a range of 20 to 80°C. In this case, the above-described problems can be suitably prevented. Specifically, in the pressure-bonding step, while the reconstituted tobacco sheets S1 to S3 can be prevented from adhering to the pair of roller members 21 and 22, the reconstituted tobacco sheets S1 to S3 can be suitably pressure-bonded together.

[0040] In this embodiment, the reconstituted tobacco sheets S 1 to S3 fed in the sheet feeding step each have a moisture content adjusted to be in a range of 12 to 25 wt%. When the reconstituted tobacco sheets S1 to S3 pressure-bonded together in the pressure-bonding step are each provided to have a moisture content in the above-described range, while the first reconstituted tobacco sheet S1 or the third reconstituted tobacco sheet S3 is prevented from adhering to the pair of roller members 21 and 22 in the pressure roller 20, hydrogen bonds between the tobacco raw materials of the reconstituted tobacco sheets S1 to S3 are easily formed to thereby suitably pressure-bond together the sheets. When the reconstituted tobacco sheets S1 to S3 have an excessively high moisture content, the tobacco raw materials tend to undergo putrefaction or deterioration, for example; when the moisture content is excessively low, the sheets may have high rigidity and tend to fragment. Thus, the reconstituted tobacco sheets S1 to S3 are each provided to have a moisture content in the above-described range of 12 to 25 wt% to thereby suitably prevent the above-described problems.

[0041] As has been described so far, in the production method in this embodiment, a plurality of reconstituted tobacco sheets S1 to S3 are pressure-bonded together to provide the laminated reconstituted tobacco sheet 1, to thereby achieve an increase in the basis weight of the laminated reconstituted tobacco sheet 1. This facilitates an increase in the aerosol-source material content per unit area of the laminated reconstituted tobacco sheet 1. As a result, when a non-combustion heating-type smoking article using the laminated reconstituted tobacco

sheet 1 as the tobacco filler in the tobacco rod is provided, during smoking of the non-combustion heating-type smoking article, a sufficient delivery amount of generated aerosol is ensured, to enrich smoking experience.

[0042] In the method for producing the laminated reconstituted tobacco sheet 1 according to this embodiment, as described above, at least one of the plurality of reconstituted tobacco sheets S1 to S3 pressure-bonded together in the pressure-bonding step is a tobacco paper sheet, which ensures, in the laminated reconstituted tobacco sheet 1, sufficient mechanical strength (such as tensile strength or breaking strength).

[0043] In the method for producing the laminated reconstituted tobacco sheet 1 according to this embodiment, in the pressure-bonding step, a plurality of reconstituted tobacco sheets can be pressure-bonded together without applying additional adhesive or binder. When a plurality of reconstituted tobacco sheets are bonded together with a water-insoluble adhesive, from the viewpoint of preventing generation of off-flavor or off-odor during smoking of the non-combustion heating-type smoking article, it is difficult to use a large amount of water-insoluble adhesive. Alternatively, when a plurality of reconstituted tobacco sheets are bonded together with a water-soluble adhesive, the resultant reconstituted tobacco sheets have increased moisture content, so that a re-drying step may become necessary. By contrast, in the method for producing the laminated reconstituted tobacco sheet 1 according to this embodiment, in the pressure-bonding step, without applying additional adhesive or binder, a plurality of reconstituted tobacco sheets can be pressure-bonded together utilizing hydrogen bonds between tobacco raw materials, so that occurrence of the above-described problems can be prevented.

[0044] Furthermore, in the method for producing the laminated reconstituted tobacco sheet 1 according to this embodiment, even when reconstituted tobacco sheets pressure-bonded together in the pressure-bonding step each have a small sheet thickness, the number of sheets stacked can be increased, to thereby ensure a sufficient aerosol-source material content per unit area of the laminated reconstituted tobacco sheet 1. Thus, during production of the tobacco paper sheets 11 for forming the first reconstituted tobacco sheet S1 and the third reconstituted tobacco sheet S3, the thickness of the base sheets can be set to an appropriate thickness such that, at the time of adding, in the flavoring step, the concentrated solution of the water-based tobacco extract or the aerosol-source material to the base sheets, the addition solution containing the concentrated solution of the water-based tobacco extract and the like permeates the base sheets uniformly in the thickness direction within the time determined by, for example, production conditions of the production apparatus (actual apparatus). As a result, the tobacco paper sheets 11 serving as constituent materials of the laminated reconstituted tobacco sheet 1 have excellent production suitability. Therefore, the production method according to this embodiment provides the laminated reconstituted tobacco sheet 1 that has high production suitability and high mechanical strength, and ensures a sufficient aerosol-source material content per unit area.

[0045] In the method for producing the laminated reconstituted tobacco sheet 1 according to this embodiment, at least one of the plurality of reconstituted tobacco sheets S1 to S3 pressure-bonded together in the pressure-bonding step is the tobacco slurry sheet 12. The tobacco slurry sheet 12 has high capacity for holding the aerosol-source material, and hence can contain and hold a larger amount of aerosol-source material. Thus, the tobacco slurry sheet 12 having high capacity for containing the aerosol-source material and the tobacco paper sheet 11 having high mechanical strength are combined together as a laminated structure to form the laminated reconstituted tobacco sheet 1, so that, in the laminated reconstituted tobacco sheet 1, mechanical strength is ensured and increased aerosol-source material content is achieved.

[0046] Furthermore, in the method for producing the laminated reconstituted tobacco sheet 1 according to this embodiment, in the pressure-bonding step, of the plurality of reconstituted tobacco sheets S1 to S3 passed between the pair of roller members 21 and 22 in the pressure roller 20, the first reconstituted tobacco sheet S1 positioned in the uppermost layer and the third reconstituted tobacco sheet S3 positioned in the lowermost layer are formed of the tobacco paper sheets 11, and the second reconstituted tobacco sheet S2 positioned in the intermediate layer is formed of the tobacco slurry sheet 12. The tobacco slurry sheet 12 has a higher aerosol-source material content than the tobacco paper sheets 11, and tends to have a stickier surface than the tobacco paper sheets 11. In order to address this, in the method for producing the laminated reconstituted tobacco sheet 1 according to this embodiment, the tobacco slurry sheet 12 is sandwiched between the tobacco paper sheets 11 to form the laminated reconstituted tobacco sheet 1 having outer layers formed of the tobacco paper sheets 11, to thereby prevent the laminated reconstituted tobacco sheet 1 from having a sticky surface. Thus, during production of the laminated reconstituted tobacco sheet 1, at the time of, in the pressure-bonding step, flattening of the plurality of stacked reconstituted tobacco sheets using the pressure roller 20 (the pair of roller members 21 and 22), for example, adhesion of the reconstituted tobacco sheets to the roller members 21 and 22 and wrinkling, breakage, and the like of the reconstituted tobacco sheets can be more suitably prevented. The outer layers of the laminated reconstituted tobacco sheet 1 are formed of the tobacco paper sheets 11 having high mechanical strength, and the tobacco slurry sheet 12 having lower mechanical strength than the tobacco paper sheets 11 is disposed in the intermediate layer of the laminated reconstituted tobacco sheet 1, to thereby facilitate post-production cutting of the laminated reconstituted tobacco sheet 1 into various shapes such as fine cut, fine gran-

ules, flakes, or strips, and wrapping using a wrapping machine. More specifically, the laminated reconstituted tobacco sheet 1 employing the above-described laminate structure has increased mechanical strength to thereby achieve prevention of unintentional breakage or fragmentation, to provide improved cutting suitability. The outer layers of the laminated reconstituted tobacco sheet 1 are formed of the tobacco paper sheets 11, so that the surface of the laminated reconstituted tobacco sheet 1 is prevented from becoming sticky, and hence improved slidability is achieved in the wrapping unit and the raw material can be smoothly conveyed. This results in improved machinability in the wrapping machine for wrapping the laminated reconstituted tobacco sheet 1.

[0047] As the method for producing the laminated reconstituted tobacco sheet 1 according to this embodiment, various modifications can be employed. For example, Fig. 6 is an explanatory view illustrating the pressure-bonding step in the method for producing the laminated reconstituted tobacco sheet 1 according to Modification 1. In the method for producing the laminated reconstituted tobacco sheet 1 according to this embodiment, as long as at least one of a plurality of reconstituted tobacco sheets is a tobacco paper sheet, and the reconstituted tobacco sheets being stacked are continuously passed through a pressure roller to thereby pressure-bond together the sheets, the number of the reconstituted tobacco sheets stacked is not particularly limited. The laminated reconstituted tobacco sheet 1 may include a single tobacco paper sheet. In Modification 1 illustrated in Fig. 6, the laminated reconstituted tobacco sheet 1 has a bilayer structure in which a single tobacco paper sheet 11 and a single tobacco slurry sheet 12 are stacked and pressure-bonded together. In the method for producing the laminated reconstituted tobacco sheet 1 according to Modification 1, the laminated reconstituted tobacco sheet 1 can also be formed so as to have a laminate structure of a combination of the tobacco slurry sheet 12 having high capacity for containing the aerosol-source material and the tobacco paper sheet 11 having high mechanical strength, to thereby achieve suitable increase in the mechanical strength and the capacity for containing the aerosol-source material of the laminated reconstituted tobacco sheet 1.

[0048] Alternatively, the laminated reconstituted tobacco sheet 1 may be formed by pressure-bonding together a plurality of tobacco paper sheets 11. Fig. 7 is an explanatory view illustrating the pressure-bonding step in the method for producing the laminated reconstituted tobacco sheet 1 according to Modification 2. In Modification 2 illustrated in Fig. 7, four tobacco paper sheets 11 being stacked are passed through the pressure roller 20 (the pair of roller members 21 and 22) to thereby be pressure-bonded together. This Modification provides the laminated reconstituted tobacco sheet 1 having very high mechanical strength. However, it is apparent that the number of tobacco paper sheets 11 stacked may be adjusted in accordance with, for example, the desired mechanical strength or aerosol-source material content of the laminated reconstituted tobacco sheet 1.

[0049] Fig. 8 is an explanatory view illustrating the pressure-bonding step in the method for producing the laminated reconstituted tobacco sheet 1 according to Modification 3. The laminated reconstituted tobacco sheet 1 according to Modification 3 has a trilayer structure in which a flavor-containing sheet 13 is sandwiched between the tobacco paper sheet 11 and the tobacco slurry sheet 12. In the pressure-bonding step according to Modification 3, the tobacco paper sheet 11, the flavor-containing sheet 13, and the tobacco slurry sheet 12 being stacked are passed through the pressure roller 20 (the pair of roller members 21 and 22), to pressure-bond the sheets together.

[0050] The flavor-containing sheet 13 is a sheet material in which a flavor is covered with a polysaccharide gel not containing any gelling agent. Examples of the flavor contained in the flavor-containing sheet 13 include various flavors; for example, menthol can be used. The flavor contained in the flavor-containing sheet 13 may have the form of liquid, powder, or granules.

[0051] In the flavor-containing sheet 13, examples of the covering agent for covering the flavor include the following polysaccharides: carrageenan (in Japanese, written in a few forms slightly different from each other) or agar extracted from red marine algae; locust bean gum (carob gum), which is galactomannan extracted from tree seeds; guar gum; tara gum; cassia gum; tamarind gum, which is extracted from resin seeds and has the structure of xyloglucan; psyllium seed gum, which is an acidic polysaccharide extracted from resin seeds and having a structure having xylan as the main chain and arabinose and the like as side chains; xanthan gum or gellan gum (in Japanese, gellan gum is written in a few forms slightly different from each other), which are metabolic polysaccharides of microorganisms; konjak-glucomannan, which is extracted from tuberous roots of konjak; and starch (encompassing products varying in raw material and solubility). Of these, carrageenan, gellan gum, tamarind gum, psyllium seed gum, konjak-glucomannan, or agar can be used as a mono-component. In the flavor-containing sheet 13, the polysaccharide used as the covering agent for covering the flavor may be a composite of a combination of two or more components selected from the above-described polysaccharide group.

[0052] The method for preparing the flavor-containing sheet 13 is, for example, as follows. First, a polysaccharide (a mono-component or a composite) is dissolved in water under heating. The resultant aqueous solution is mixed with an emulsifying agent and a flavor in a liquid state (or a molten state) at a heating temperature of, for example, 60 to 90°C, and kneaded and emulsified. Subsequently, this emulsion kept in the emulsion state is cast onto a support, and water for dissolving the polysaccharide is evaporated to thereby prepare the flavor-containing sheet 13.

[0053] The laminated reconstituted tobacco sheet 1 in-

cluding the flavor-containing sheet 13 prepared in the above-described manner can be used as the tobacco filler in the tobacco rod of a non-combustion heating-type smoking article, to thereby prepare a tobacco rod having a high flavor content for a non-combustion heating-type smoking article. The polysaccharide can be caused to gel simply by heating, which eliminates the necessity of use of a gelling agent. Thus, the flavor-containing sheet 13 does not contain a gelling agent such as a metal chloride, and has advantages of not generating undesirable decomposition products of the chloride in the aerosol during, for example, smoking of the non-combustion heating-type smoking article.

[0054] Incidentally, in Modification 3, the order of stacking the tobacco paper sheet 11, the flavor-containing sheet 13, and the tobacco slurry sheet 12 can be appropriately changed. In addition, in Modification 3, the type and the number of reconstituted tobacco sheets laminated in the laminated reconstituted tobacco sheet 1 can be appropriately changed.

[0055] Some embodiments according to the present invention have been described so far; however, the method for producing a laminated reconstituted tobacco sheet according to the present invention is not limited to these. For example, the laminated reconstituted tobacco sheet 1 may include a tobacco rolled sheet, which is a reconstituted tobacco sheet produced by a rolling (roll) process. The tobacco rolled sheet is a reconstituted tobacco sheet produced by, for example, mixing a tobacco raw material containing tobacco midribs, tobacco laminae, shredded tobacco, tobacco fine powder, and the like with a binder (binding agent), a reinforcing agent (such as defibrated pulp), an aerosol-source material (such as glycerol or propylene glycol), water, and the like within a stirring tank, subsequently rolling the mixture into a sheet shape using a pair of rollers or the like, and drying the mixture.

Reference Signs List

[0056]

1	laminated reconstituted tobacco sheet
11	tobacco paper sheet
12	tobacco slurry sheet
13	flavor-containing sheet
20	pressure roller
S1	first reconstituted tobacco sheet
S2	second reconstituted tobacco sheet
S3	third reconstituted tobacco sheet

Claims

1. A method for producing a laminated reconstituted tobacco sheet, the method comprising:

a sheet feeding step of feeding a plurality of reconstituted tobacco sheets containing an aerosol-source material and moisture; and

a pressure-bonding step of continuously passing, through a pressure roller, the plurality of reconstituted tobacco sheets being stacked, to pressure-bond together the reconstituted tobacco sheets,

wherein at least one of the reconstituted tobacco sheets is a tobacco paper sheet obtained such that a tobacco raw material is extracted with water and separated into a water-based tobacco extract and an insoluble tobacco residue, the insoluble tobacco residue is mixed with pulp and subjected to papermaking to provide a base sheet, and subsequently the water-based tobacco extract is added to the base sheet.

2. The method for producing a laminated reconstituted tobacco sheet according to Claim 1,
wherein, in the pressure-bonding step, the reconstituted tobacco sheets are pressure-bonded together without applying additional adhesive or binder.

3. The method for producing a laminated reconstituted tobacco sheet according to Claim 1 or 2,
wherein the plurality of reconstituted tobacco sheets include a tobacco slurry sheet obtained by spreading, into a sheet shape over a support, a slurry containing a tobacco raw material, pulp, water, and an aerosol-source material, and drying the slurry

4. The method for producing a laminated reconstituted tobacco sheet according to Claim 3,
wherein, in the plurality of reconstituted tobacco sheets fed in the sheet feeding step, the tobacco slurry sheet has an aerosol-source material content higher than an aerosol-source material content of the tobacco paper sheet.

5. The method for producing a laminated reconstituted tobacco sheet according to Claim 4,
wherein the tobacco paper sheet has an aerosol-source material content of 12 to 25 wt%.

6. The method for producing a laminated reconstituted tobacco sheet according to Claim 4 or 5,
wherein the tobacco slurry sheet has an aerosol-source material content of 12 to 65 wt%.

7. The method for producing a laminated reconstituted tobacco sheet according to any one of Claims 1 to 6,
wherein, in the pressure-bonding step, of the plurality of reconstituted tobacco sheets passed through the pressure roller, reconstituted tobacco sheets positioned in an uppermost layer and a lowermost layer are formed of the tobacco paper sheet.

8. The method for producing a laminated reconstituted

tobacco sheet according to Claim 7, wherein, in the pressure-bonding step, of the plurality of reconstituted tobacco sheets passed through the pressure roller, between the tobacco paper sheets positioned in the uppermost layer and the lowermost layer, a tobacco slurry sheet is sandwiched, the tobacco slurry sheet being obtained by spreading, into a sheet shape over a support, a slurry containing a tobacco raw material, pulp, water, and an aerosol-source material, and drying the slurry.

9. The method for producing a laminated reconstituted tobacco sheet according to Claim 7 or 8, wherein, in the pressure-bonding step, of the plurality of reconstituted tobacco sheets passed through the pressure roller, between the tobacco paper sheets in the lowermost layer and the uppermost layer, a flavor-containing sheet containing a liquid, powdery, or granular flavor is sandwiched.

10. The method for producing a laminated reconstituted tobacco sheet according to any one of Claims 1 to 9, wherein the reconstituted tobacco sheets fed in the sheet feeding step each have a moisture content adjusted to be in a range of 12 to 25 wt%.

11. The method for producing a laminated reconstituted tobacco sheet according to any one of Claims 1 to 10, wherein, in the pressure-bonding step, the reconstituted tobacco sheets are pressure-bonded together while the reconstituted tobacco sheets have sheet temperatures controlled to be ordinary temperature to 80°C.

12. The method for producing a laminated reconstituted tobacco sheet according to any one of Claims 1 to 11, wherein, in the pressure-bonding step, the pressure roller is set to nip the reconstituted tobacco sheets at a nip pressure of 200 to 1300 N/cm.

13. The method for producing a laminated reconstituted tobacco sheet according to any one of Claims 1 to 12, wherein the pressure roller is set to have a roller clearance that is 20 to 80% of a total thickness of the plurality of reconstituted tobacco sheets passed through the pressure roller in the pressure-bonding step.

FIG. 1

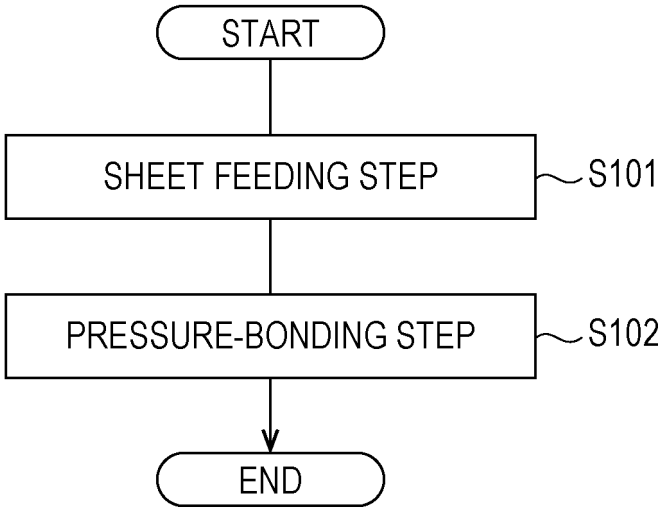

START
SHEET FEEDING STEP
S101
PRESSURE-BONDING STEP
S102
END

FIG. 2

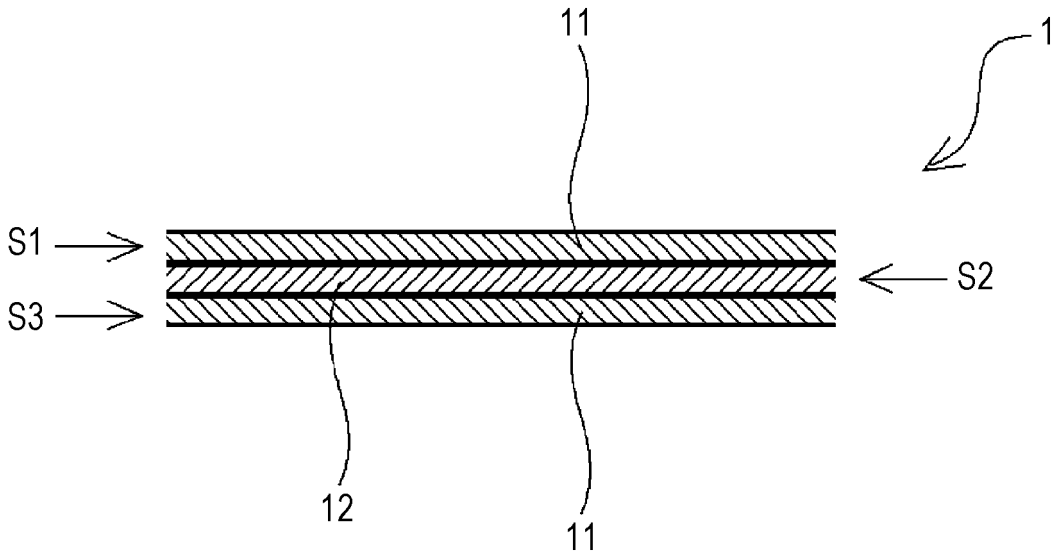
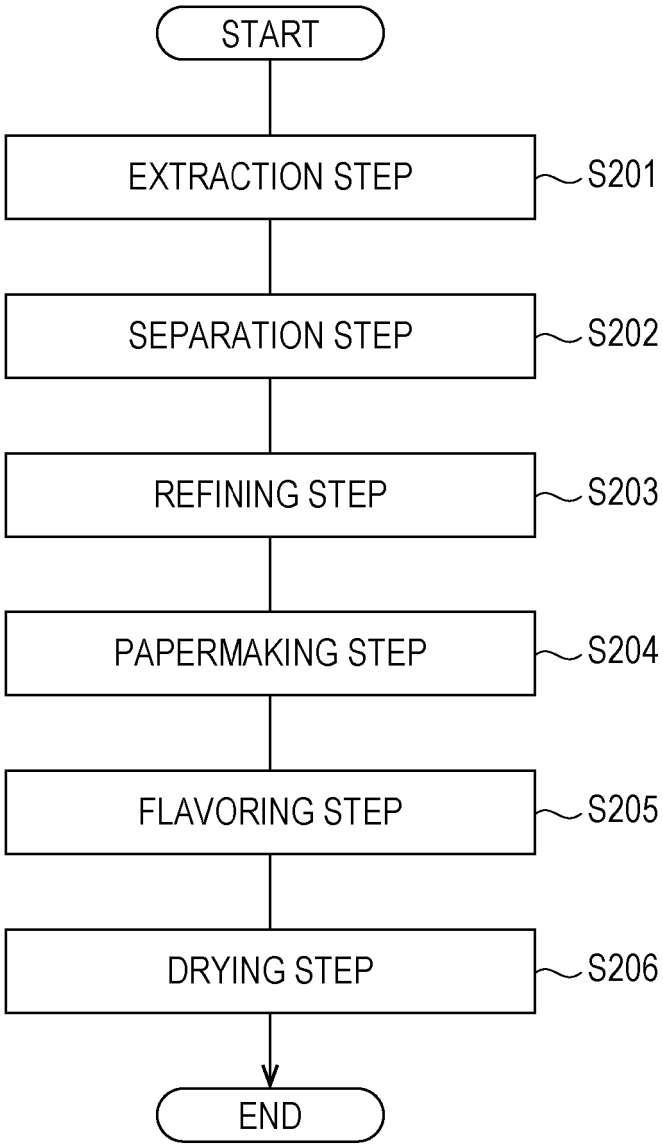


FIG. 3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EXTRACTION STEP
S201
SEPARATION STEP
S202
REFINING STEP
S203
PAPERMAKING STEP
S204
FLAVORING STEP
S205
DRYING STEP
S206
END

FIG. 4

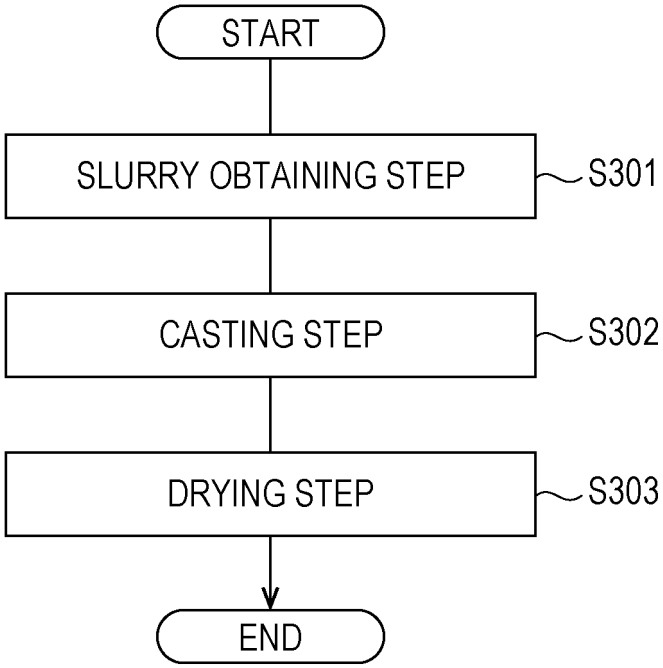

START
SLURRY OBTAINING STEP
S301
CASTING STEP
S302
DRYING STEP
S303
END

FIG. 5

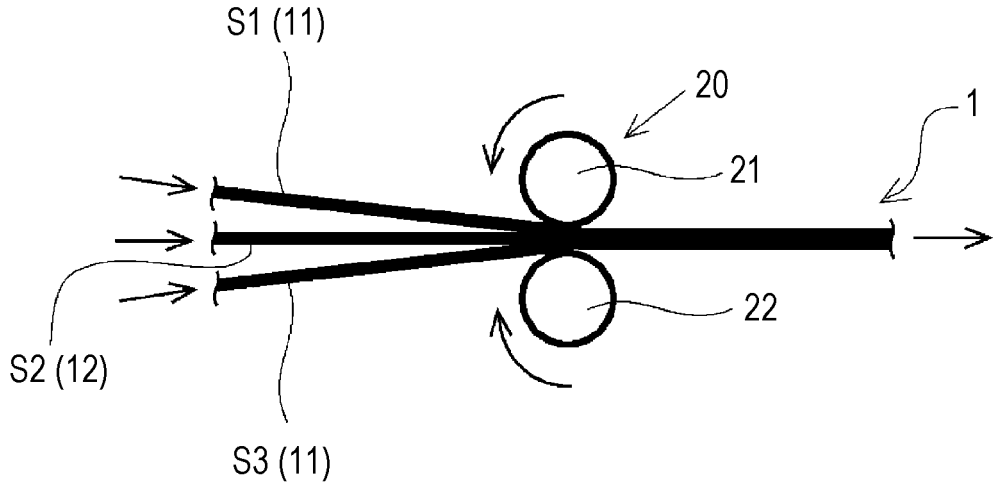


FIG. 6

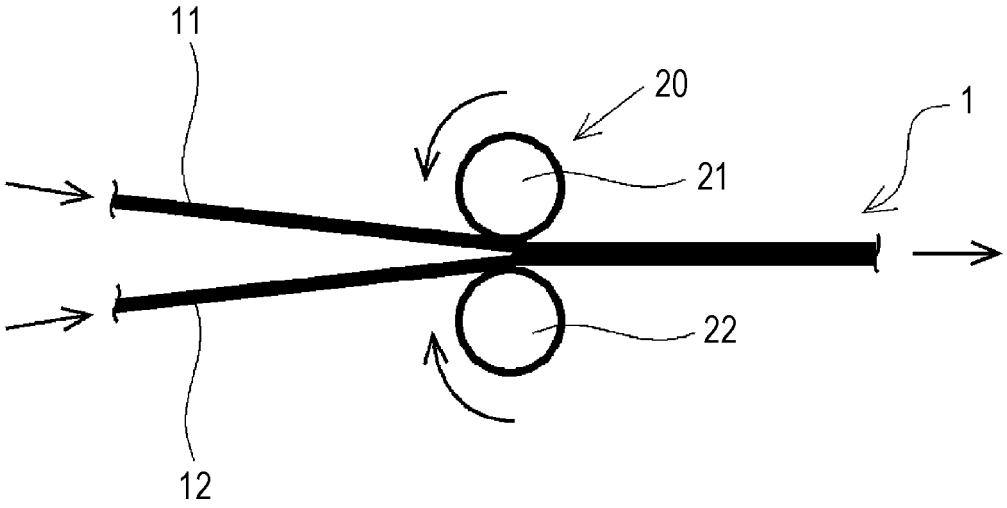


FIG. 7

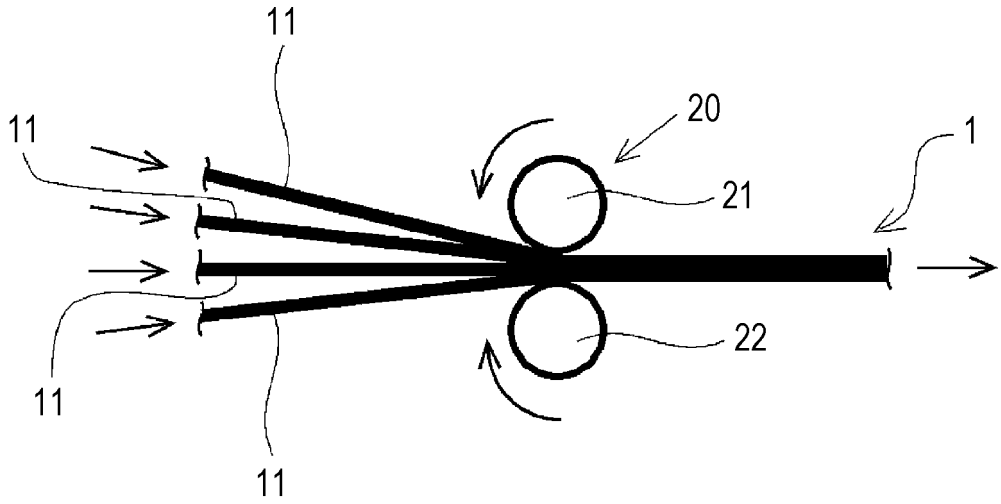
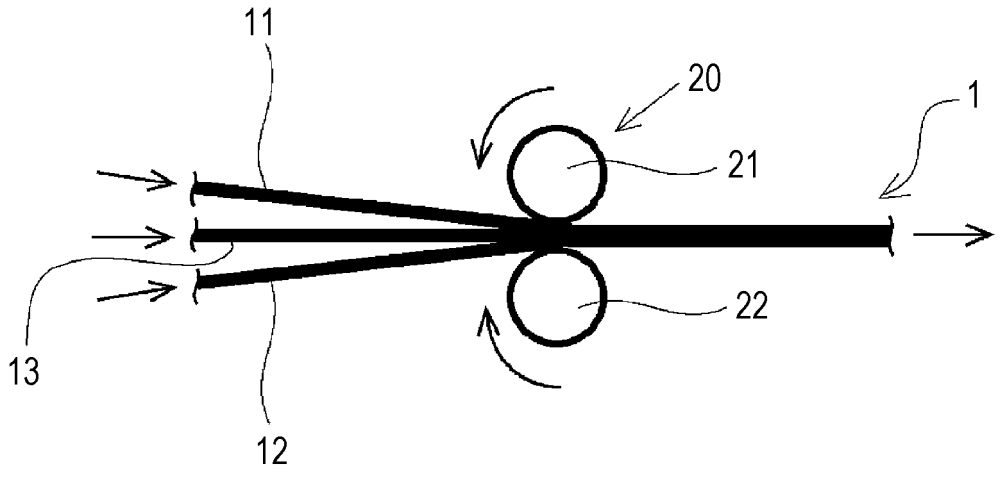


FIG. 8



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2019/001532

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl. A24F47/00(2006.01)i, A24B15/24(2006.01)i
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

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

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

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 2015-517817 A (PHILIP MORRIS PRODUCTS S.A.) 25 June 2015, paragraphs [0089]-[0100], [0123]-[0136], fig. 1-4 & US 2015/0150302 A1, paragraphs [0088]-[0099], [0124]-[0137], fig. 1-4 & WO 2013/178766 A1 & EP 2854576 A1 & CN 104411191 A & KR 10-2015-0024324 A	1-7, 9-13 8
Y A	WO 2018/235959 A1 (JAPAN TOBACCO INC.) 27 December 2018, paragraphs [0012]-[0015] & WO 2018/235241 A1	1-7, 9-13 8
Y A	JP 11-70630 A (OJI PAPER CO., LTD.) 16 March 1999, abstract, paragraph [0014] & EP 892109 A1, abstract, page 3, lines 13-15	1-7, 9-13 8
A	JP 2018-516536 A (BRITISH AMERICAN TOBACCO (INVESTMENTS) LTD.) 28 June 2018, entire text, all drawings & US 2018/0343917 A1 & WO 2016/156495 A2 & EP 3277113 A2 & CN 107404952 A	1-13

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☐ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 March 2019 (19.03.2019)	02 April 2019 (02.04.2019)

Name and mailing address of the ISA/	Authorized officer
Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Telephone No.

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2015517817 A **[0005]**
- JP 2018516536 A **[0005]**
- JP 4860634 B **[0005]**