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(54) **MANUFACTURING METHOD FOR TOBACCO SHEET FOR NON-COMBUSTION HEATING-TYPE FLAVOR INHALER**

(57) Provided is a tobacco sheet for a non-combustion heating-type flavor inhaler, the sheet having high bulkiness. Further provided is a method for manufacturing the tobacco sheet for a non-combustion heating-type flavor inhaler, said method comprising a step in which a mixture including a tobacco material and an aerogel-generating agent is formed into a sheet, and a step in which the mixture formed into the sheet is dried, wherein a moisture reduction speed in the drying step is 0.8% WB/second or above.

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Description

TECHNICAL FIELD

[0001] The present invention relates to a method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler.

BACKGROUND ART

[0002] In combustion-type flavor inhalers (cigarettes), tobacco fillers including leaf tobacco and tobacco sheets are burned to obtain the flavor. For example, Patent Literature 1 discloses a tobacco sheet used in a combustion-type flavor inhaler. As an alternative to combustion-type flavor inhalers, a non-combustion heating-type flavor inhaler configured to deliver flavor by heating a flavor source, such as a tobacco sheet, instead of combustion thereof, has been reported. The heating temperature of the non-combustion heating-type flavor inhaler is lower than the combustion temperature of the combustion-type flavor inhaler, and is, for example, about 400°C or lower. As described above, the heating temperature of the non-combustion heating-type flavor inhaler is low, thus, an aerosol-generating agent can be added to the flavor source in the non-combustion heating-type flavor inhaler from the viewpoint of increasing the amount of smoke. The aerosol-generating agent is vaporized by heating to generate an aerosol. The aerosol is supplied to a user along with a flavor component, such as a tobacco component, so that the user can obtain sufficient flavor.

[0003] The non-combustion heating-type flavor inhaler can include, for example, a tobacco-containing segment filled with a tobacco sheet or the like, a cooling segment, and a filter segment. The length of the tobacco-containing segment of the non-combustion heating-type flavor inhaler in the axial direction is usually shorter than the length of the tobacco-containing segment of the combustion-type flavor inhaler in the axial direction in relation to the heater. Thus, in the non-combustion heating-type flavor inhaler, a large amount of tobacco sheet is filled in the section of the short tobacco-containing segment in order to ensure the amount of aerosol generated during heating. To fill a large amount of tobacco sheets in a short section, in the non-combustion heating-type flavor inhaler, a tobacco sheet having low filling capacity, that is, high density, is usually used. The filling capacity is a value indicating a volume when a shredded tobacco sheet having a predetermined mass is compressed at a predetermined pressure for a predetermined time.

CITATION LIST

PATENT LITERATURE

[0004] PTL 1: Japanese Examined Patent Application Publication No. 60-45914

SUMMARY OF INVENTION

TECHNICAL PROBLEM

[0005] However, the inventors have found that, when considering the heating method, the heating capacity of the heater, and the generation of aerosol, the total heat capacity of the tobacco-containing segment increases when a tobacco sheet having low filling capacity (high density) is used, and thus the tobacco sheet filled in the tobacco-containing segment does not sufficiently contribute to the generation of aerosol depending on the heating method and the capacity of the heater. To solve the above-described problem, it is conceivable to reduce the total heat capacity of the tobacco-containing segment.

[0006] To reduce the total heat capacity of the tobacco-containing segment, the inventors have conducted studies on (1) a reduction in the specific heat of the tobacco raw material contained in the tobacco sheet, and (2) the use of a tobacco sheet having high filling capacity (low density). However, with respect to (1), it is difficult to reduce the specific heat of the tobacco raw material itself; thus, it was considered effective to reduce the total heat capacity of the tobacco-containing segment by (2). Therefore, it is desired to develop a high-filling-capacity (low-density) tobacco sheet suitable for a non-combustion heating-type flavor inhaler.

[0007] The present invention aims to provide a high-filling-capacity tobacco sheet for a non-combustion heating-type flavor inhaler.

SOLUTION TO PROBLEM

[0008] The present invention includes the following embodiments.

[1] A method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler includes the steps of:

forming a mixture containing a tobacco raw material and an aerosol-generating agent into a sheet shape, and drying the mixture formed into the sheet shape,
in which a moisture reduction rate in the drying is 0.8% WB/s or more.

[2] In the method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler described in [1], the drying is performed by a flash drying process.

[3] In the method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler described in [2], in the flash drying process, hot air blown onto the mixture formed into the sheet shape has a temperature of 140°C to 350°C.

[4] In the method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler described in [2] or [3], in the flash drying process, hot air blown onto the mixture formed into the sheet shape has an air velocity of 12 to 50 m/s.

[5] In the method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler described in any of [1] to [4], the amount of moisture in the mixture formed into the sheet shape before the drying is 20% to 50% WB, and the amount of moisture in the mixture formed into the sheet shape after the drying is 8% to 15% WB.

[6] In the method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler described in any of [1] to [5], the tobacco raw material is at least one tobacco powder selected from the group consisting of leaf tobacco, midribs, and residual stems.

[7] In the method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler described in any of [1] to [6], the proportion of the tobacco raw material contained in 100% by mass of the mixture is 45% to 95% by mass on a dry basis.

[8] In the method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler described in any of [1] to [7], the aerosol-generating agent is at least one selected from the group consisting of glycerine, propylene glycol, and 1,3-butanediol.

[9] In the method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler described in any of [1] to [8], the proportion of the aerosol-generating agent contained in 100% by mass of the mixture is 4% to 50% by mass on a dry basis.

[10] In the method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler described in any of [1] to [9], the mixture further contains a forming agent.

[11] In the method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler described in [10], the forming agent is at least one selected from the group consisting of polysaccharides, proteins, and synthetic polymers.

[12] In the method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler described in [10] or [11], the proportion of the forming agent contained in 100% by mass of the mixture is 0.1% to 15% by mass on a dry basis.

[13] In the method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler described in any of [1] to [12], the mixture further contains a fibrous material as a reinforcing agent.

[14] In the method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler described in [13], the proportion of the fibrous material contained in 100% by mass of the mixture is 5% to 50% by mass on a dry basis.

ADVANTAGEOUS EFFECTS OF INVENTION

[0009] According to the present invention, it is possible to provide a tobacco sheet having high filling capacity for a non-combustion heating-type flavor inhaler.

BRIEF DESCRIPTION OF DRAWINGS

[0010]

[Fig. 1] Fig. 1 is a cross-sectional view illustrating an example of the non-combustion heating-type flavor inhaler according to the present embodiment.

[Fig. 2] Fig. 2 illustrates an example of a non-combustion heating-type flavor inhalation system according to the present embodiment, in which (a) is a cross-sectional view illustrating a state before a non-combustion heating-type flavor inhaler is inserted into a heating device, and (b) is a cross-sectional view illustrating a state in which the non-combustion heating-type flavor inhaler is inserted into the heating device and heated.

DESCRIPTION OF EMBODIMENTS

[Method for Manufacturing Tobacco Sheet for Non-Combustion Heating-Type Flavor Inhaler]

[0011] A method for manufacturing a tobacco sheet according to the present embodiment for a non-combustion heating-type flavor inhaler (hereinafter, also referred to as a "tobacco sheet") includes the steps of forming a mixture containing a tobacco raw material and an aerosol-generating agent into a sheet shape (hereinafter, also referred to as a "forming step"), and drying the mixture formed into the sheet shape (hereinafter, also referred to as a "drying step"). Here, a moisture reduction rate in the drying is 0.8% WB/s or more.

[0012] In the method according to the present embodiment, a moisture reduction rate in the mixture formed into the sheet shape (hereinafter, also referred to as a "sheet-like mixture") in the drying step is 0.8% WB/s or more, and the moisture in the sheet-like mixture evaporates rapidly. Thus, the sheet-like mixture is deformed into a three-dimensionally twisted shape (curly shape (crinkly, curled)) and is fixed while sufficiently holding the aerosol-generating agent. The resulting tobacco sheet is thus bulky and has high filling capacity. Therefore, the use of the tobacco sheet manufactured by the method according to the present embodiment makes it possible to reduce the total heat capacity of the tobacco-containing segment, allowing the tobacco sheet filled in the tobacco-containing segment to sufficiently contribute to aerosol generation. The tobacco sheet manufactured by the method according to the present embodiment preferably further contains a forming agent. When the blending ratio of the tobacco raw material, the aerosol-generating agent, the forming agent, the reinforcing agent, and so forth falls within a predetermined range, the filling capacity of the tobacco sheet is further improved.

[0013] The method according to the present embodiment includes at least the forming step and the drying step, and may further include another step.

(Forming Step)

<Tobacco Raw Material>

[0014] In this step, a mixture containing the tobacco raw material and the aerosol-generating agent is formed into a sheet shape. The tobacco raw material is not particularly limited as long as it contains a tobacco component. Examples thereof include a tobacco powder and a tobacco extract. Examples of the tobacco powder include leaf tobacco, midribs, and residual stems. These may be used alone or in combination of two or more. These can be used as the tobacco powder by shredding them into a predetermined size. Regarding the size of the tobacco powder, the 90% cumulative particle size (D90) in the volume-based particle size distribution measured by dry laser diffractometry is preferably 200 μm or more from the viewpoint of further improving the filling capacity.

[0015] Examples of the tobacco extract include a tobacco extract obtained by roughly crushing leaf tobacco, mixing the crushed leaf tobacco with a solvent, such as water, under stirring to extract a water-soluble component from the leaf tobacco, and drying and concentrating the obtained water extract under reduced pressure. The proportion of the tobacco raw material contained in 100% by mass of the mixture is preferably 45% to 95% by mass on a dry basis. When the proportion of the tobacco raw material is 45% or more by mass, the tobacco aroma can be sufficiently generated during heating. When the proportion of the tobacco raw material is 95% or less by mass, sufficient amounts of aerosol-generating agent and forming agent can be contained. The proportion of the tobacco raw material is more preferably 60% to 90% by mass, still more preferably 70% to 80% by mass, on a dry basis. In the present embodiment, the proportion on a dry basis refers to a proportion based on a dry amount, and indicates a proportion in a case where the amount of all components other than water in the mixture is 100% by mass.

<Aerosol-Generating Agent>

[0016] Examples of the aerosol-generating agent include glycerine, propylene glycol, and 1,3-butanediol. These may be used alone or in combination of two or more. The proportion of the aerosol-generating agent contained in 100% by mass of the mixture is preferably 4% to 50% by mass on a dry basis. When the proportion of the aerosol-generating agent is 4% or more by mass, a sufficient amount of aerosol can be generated during heating. When the proportion of the aerosol-generating agent is 50% or less by mass, a sufficient amount of aerosol can be generated during heating from the viewpoint of heat capacity. The proportion of the aerosol-generating agent is more preferably 6% to 40% by mass, still more preferably 8% to 30% by mass, particularly preferably 10% to 18% by mass on a dry basis.

<Forming Agent>

[0017] The mixture preferably further contains a forming agent from the viewpoint of ensuring the shape. Examples

of the forming agent include polysaccharides, proteins, and synthetic polymers. These may be used alone or in combination of two or more. Examples of the polysaccharides include cellulose derivatives and naturally occurring polysaccharides.

[0018] Examples of the cellulose derivatives include cellulose ethers, such as methyl cellulose, ethyl cellulose, hydroxyethyl cellulose, hydroxymethylethyl cellulose, hydroxypropyl cellulose, hydroxypropylmethyl cellulose, benzyl cellulose, trityl cellulose, cyanoethyl cellulose, carboxymethyl cellulose, carboxyethyl cellulose, and aminoethyl cellulose; organic acid esters, such as cellulose acetate, cellulose formate, cellulose propionate, cellulose butyrate, cellulose benzoate, cellulose phthalate, and tosyl cellulose; and esters of inorganic acids, such as cellulose nitrate, cellulose sulfate, cellulose phosphate, and cellulose xanthate.

[0019] Examples of the naturally occurring polysaccharides include plant-derived polysaccharides, such as guar gum, tara gum, loust bean gum, tamarind seed gum, pectin, arabic gum, tragacanth gum, karaya gum, ghatti gum, arabinogalactan, flax seed gum, cassia gum, psyllium seed gum, artemisia seed gum, and glucan; algae-derived polysaccharides, such as carrageenan, agar, alginic acid, propylene glycol alginate, furcellaran, and oyster thief extracts; microorganism-derived polysaccharides, such as xanthan gum, gellan gums, curdlan, pullulan, Agrobacterium succinoglycan, welan gum, macrophomopsis gum, and rhamsan gum; crustacean-derived polysaccharides, such as chitin, chitosan, and glucosamine; and starches, such as starches, sodium starch glycolate, pregelatinized starch, and dextrin.

[0020] Examples of the proteins include cereal proteins, such as wheat gluten and rye gluten. Examples of the synthetic polymers include polyphosphoric acid, sodium polyacrylate, and polyvinylpyrrolidone.

[0021] When the mixture contains a forming agent, the proportion of the forming agent contained in 100% by mass of the mixture is preferably 0.1% to 15% by mass on a dry basis. When the proportion of the forming agent is 0.1% or more by mass, the raw material mixture can be easily formed into a sheet shape. When the proportion of the forming agent is 15% or less by mass, other raw materials can be sufficiently used for ensuring the functions required for the tobacco-containing segment of the non-combustion heating-type flavor inhaler. The proportion of the forming agent is more preferably 0.2% to 13% by mass, still more preferably 1% to 10% by mass, on a dry basis.

[0022] In particular, the mixture preferably further contains a first forming agent and a second forming agent from the viewpoint that the performance of the tobacco sheet to retain the aerosol-generating agent and to maintain the curly shape can be sufficiently achieved. Here, the first forming agent and the second forming agent may be different from each other in the type of forming agent, or may be the same in the type of the forming agent but different in the form. Examples of the first and second forming agents include the above-described polysaccharides, proteins, and synthetic polymers.

[0023] When the mixture contains the first forming agent, the proportion of the first forming agent contained in 100% by mass of the mixture is preferably 0.1% to 15% by mass on a dry basis. When the proportion of the first forming agent is 0.1% or more by mass, the raw material mixture can be easily formed into a sheet shape. When the proportion of the first forming agent is 15% or less by mass, other raw materials can be sufficiently used for ensuring a function required for the tobacco-containing segment of the non-combustion heating-type flavor inhaler. The proportion of the first forming agent is more preferably 0.1% to 12% by mass, still more preferably 0.1% to 10% by mass, still even more preferably 0.1% to 7% by mass, on a dry basis.

[0024] When the mixture contains the second forming agent, the proportion of the second forming agent contained in 100% by mass of the mixture is preferably 0.1% to 15% by mass on a dry basis. When the proportion of the second forming agent is 0.1% or more by mass, the raw material mixture can be easily formed into a sheet shape. When the proportion of the second forming agent is 15% or less by mass, other raw materials can be sufficiently used for ensuring a function required for the tobacco-containing segment of the non-combustion heating-type flavor inhaler. The proportion of the second forming agent is more preferably 0.1% to 12% by mass, still more preferably 0.1% to 10% by mass, still even more preferably 0.1% to 7% by mass, on a dry basis.

[0025] When the first forming agent and the second forming agent are the same in type but different in form, for example, the first forming agent may be in the form of a powder, and the second forming agent may be in the form of a solution or slurry. For example, a forming agent as the first forming agent may be directly mixed in the form of a powder, and the forming agent as the second forming agent may be dispersed or swollen in a solvent, such as water, and then mixed. Such a method can also provide the same effect as when two forming agents of different types are used.

<Reinforcing Agent>

[0026] The mixture can further contain a reinforcing agent from the viewpoint of further improving physical properties. Examples of the reinforcing agent include fibrous materials, such as fibrous (fiber-like) pulp and fibrous synthetic cellulose, and liquid materials, such as an aqueous pectin suspension, having a surface coating function of forming a film when dried. These may be used alone or in combination of two or more. Among these, the mixture preferably further contains a fibrous material as a reinforcing agent from the viewpoint of further improving the filling capacity.

[0027] When the mixture contains a reinforcing agent, the proportion of the reinforcing agent contained in 100% by

mass of the mixture is preferably 4% to 40% by mass on a dry basis. Within this range, other raw materials can be sufficiently used for ensuring the functions required for the tobacco-containing segment of the non-combustion heating-type flavor inhaler. The proportion of the reinforcing agent is more preferably 4.5% to 35% by mass, still more preferably 5% to 30% by mass, on a dry basis. When the reinforcing agent is a fibrous material, the proportion of the fibrous material contained in 100% by mass of the mixture is preferably 5% to 50% by mass on a dry basis.

<Humectant>

[0028] The mixture can further contain a humectant from the viewpoint of quality retention. Examples of the humectant include sugar alcohols, such as sorbitol, erythritol, xylitol, maltitol, lactitol, mannitol, and reduced maltose syrup. These may be used alone or in combination of two or more.

[0029] When the humectant is contained in the mixture, the proportion of the humectant contained in 100% by mass of the mixture is preferably 1% to 15% by mass on a dry basis. Within this range, other raw materials can be sufficiently used for ensuring the functions required for the tobacco-containing segment of the non-combustion heating-type flavor inhaler. The proportion of the humectant is more preferably 2% to 12% by mass, still more preferably 3% to 10% by mass, on a dry basis.

<Other Components>

[0030] The mixture can contain, in addition to the tobacco raw material, the aerosol-generating agent, the forming agents (first and second forming agents), the reinforcing agent, and the humectant, a flavor agent, such as a flavoring agent or a taste enhancer, a coloring agent, a wetting agent, a preservative, a diluent, such as an inorganic substance, and so forth, as needed. The mixture can contain water.

<Formation Method>

[0031] A method for forming the mixture into a sheet shape is not particularly limited. For example, the mixture can be formed by a known method such as a rolling method. An example of the method for forming the mixture into a sheet shape by rolling can be a method including the following steps.

(1) A step of mixing water, a tobacco raw material, an aerosol-generating agent, a forming agent, and a reinforcing agent to prepare a mixture.
(2) A step of rolling the mixture with rolling rollers.
(3) A step of peeling off the rolled article on the rolling roller with a doctor knife.

[0032] The surface of each rolling roller may be heated or cooled, and the number of rotations of each rolling roller may be adjusted, in accordance with the purpose. In addition, a tobacco sheet having a desired basis weight can be obtained by adjusting the distance between the rolling rollers.

(Drying Step)

[0033] In this step, the mixture formed into a sheet shape in the forming step is dried. In the method according to the present embodiment, the moisture reduction rate in the sheet-like mixture in the drying step is 0.8% WB/s or more. When the moisture reduction rate is 0.8% WB/s or more, moisture in the sheet-like mixture is rapidly evaporated. Thus, the sheet-like mixture is deformed into a three-dimensionally twisted shape (curly shape (crinkly, curled)) while sufficiently holding the aerosol-generating agent, and is fixed. The resulting tobacco sheet can thus be bulky and have high filling capacity. The moisture reduction rate is preferably 1.0% WB/s or more, more preferably 1.3% WB/s or more. The upper limit of the range of the moisture reduction rate is not particularly limited, and can be, for example, 15.0% WB/s or less. In the present embodiment, the "moisture reduction rate" is a value calculated by dividing the moisture reduction amount in the sheet-like mixture from the start of heating to the end of the heating in the drying step by the time from the start of the heating to the end of the heating. The moisture reduction amount can be measured and calculated with a heating and drying type moisture meter (for example, model number MX-50 available from A & D Co., Ltd.). The term "% WB" refers to the moisture content on a wet basis.

[0034] In this step, the sheet-like mixture is preferably dried by a flash drying process because the moisture reduction rate in the sheet-like mixture can be easily adjusted to 0.8% WB/s or more. The flash drying process is a process of drying an object to be dried by blowing high-temperature airflow to the object. The moisture reduction rate in the case of drying by the flash drying process is calculated on the basis of the moisture reduction amount in the time from the start to the end of blowing of the high-temperature airflow.

[0035] When the drying is performed by the flash drying process, the temperature of the hot air blown to the sheet-like mixture is preferably 140°C to 350°C. When the temperature of the hot air is 140°C or higher, a sufficient moisture reduction rate can be obtained. When the temperature of the hot air is 350°C or lower, a deterioration in quality due to heat can be inhibited. The temperature of the hot air is more preferably 150°C to 320°C, still more preferably 160°C to 300°C.

[0036] When the drying is performed by the flash drying process, the velocity of the hot air blown onto the sheet-like mixture is preferably 12 to 50 m/s. When the velocity of the hot air is 12 m/s or more, a sufficient moisture reduction rate can be obtained. When the velocity of the hot air is 50 m/s or less, the sheet-like mixture can be inhibited from being broken. The velocity of the hot air is more preferably 13 to 40 m/s, still more preferably 15 to 35 m/s.

[0037] When the drying is performed by the flash drying process, the time for blowing hot air to the sheet-like mixture (drying time) is preferably 10 seconds or less. When the drying time is 10 seconds or less, a deterioration in quality due to heat can be inhibited. The drying time is more preferably 7 seconds or less, still more preferably 6 seconds or less. The lower limit of the drying time is not particularly limited, and may be, for example, 2 seconds or more.

[0038] Regarding the amount of moisture in the sheet-like mixture before and after the drying, the amount of moisture contained in the sheet-like mixture before the drying is preferably 20% to 50% WB, and the amount of moisture contained in the sheet-like mixture after the drying is preferably 8% to 15% WB. When the amounts of moisture in the sheet-like mixture before and after the drying are within the above ranges, a change in the amount of moisture before and after the drying is large. Reducing the moisture at the moisture reduction rate in the present embodiment can be sufficient to give the sheet-like mixture the curly shape. The amount of moisture contained in the sheet-like mixture before the drying is more preferably 20% to 45% WB. The amount of moisture contained in the sheet-like mixture after the drying is more preferably 8% to 15% WB. The amount of moisture contained in the sheet-like mixture before the drying is still more preferably 20% to 40% WB. The amount of moisture contained in the sheet-like mixture after the drying is still more preferably 9% to 14% WB. The amount of moisture contained in the sheet-like mixture is a value measured with a heating and drying type moisture meter (for example, model number MX-50 available from A & D Co., Ltd.).

(Other Steps)

[0039] In addition to the forming step and the drying step, the method according to the present embodiment may further include, for example, a step of cutting the sheet-like mixture, a step of spraying a coating agent or the like on a surface, and so forth between the forming step and the drying step. In the step of cutting the sheet-like mixture, for example, the sheet-like mixture is cut into a strip with a rotary roller cutter, and then cut also in the longitudinal direction, so that the sheet-like mixture can have a size of 3 to 40 mm long and 0.5 to 3.0 mm wide. The thickness of the tobacco sheet obtained by the method according to the present embodiment can be, for example, 100 to 1,000 μm.

(Filling Capacity of Tobacco Sheet)

[0040] The filling capacity of the tobacco sheet manufactured by the method according to the present embodiment is preferably 190 cc/100 g or more. When the filling capacity is 190 cc/100 g or more, the total heat capacity of the tobacco-containing segment of the non-combustion heating-type flavor inhaler can be sufficiently reduced, and the tobacco sheet filled in the tobacco-containing segment can further contribute to aerosol generation. The filling capacity is more preferably 210 cc/100 g or more, still more preferably 230 cc/100 g or more. The upper limit of the range of the filling capacity is not particularly limited, and may be, for example, 800 cc/100 g or less. The filling capacity is a value measured with DD-60A (trade name, available from Burghart) after the tobacco sheet is cut into a size of 0.8 mm × 20 mm and left in a conditioning room at 22°C and 60% RH for 48 hours. The measurement is performed by placing 15 g of the shredded tobacco sheet in a cylindrical container having an inside diameter of 60 mm, and determining the volume after the shredded tobacco sheet is compressed for 30 seconds under a load of 3 kg.

[Non-Combustion Heating-Type Flavor Inhaler]

[0041] The non-combustion heating-type flavor inhaler according to the present embodiment includes a tobacco-containing segment that contains a tobacco sheet manufactured by the method according to the present embodiment. The non-combustion heating-type flavor inhaler according to the present embodiment includes a tobacco-containing segment filled with the tobacco sheet having high filling capacity according to the present embodiment. Thus, the total heat capacity of the tobacco-containing segment can be sufficiently reduced, and the tobacco sheet filled in the tobacco-containing segment can further contribute to aerosol generation.

[0042] Fig. 1 illustrates an example of the non-combustion heating-type flavor inhaler according to the present embodiment. A non-combustion heating-type flavor inhaler 1 illustrated in Fig. 1 includes a tobacco-containing segment 2 filled with a tobacco sheet manufactured by the method according to the present embodiment, a tubular cooling segment

3 having perforations 8 on the circumference, a center-hole segment 4, and a filter segment 5. The non-combustion heating-type flavor inhaler according to the present embodiment may have another segment in addition to the tobacco-containing segment, the cooling segment, the center-hole segment, and the filter segment.

[0043] The length of the non-combustion heating-type flavor inhaler according to the present embodiment in the axial direction is preferably, but not particularly limited to, 40 mm or more and 90 mm or less, more preferably 50 mm or more and 75 mm or less, still more preferably 50 mm or more and 60 mm or less. The circumference of the non-combustion heating-type flavor inhaler is preferably 16 mm or more and 25 mm or less, more preferably 20 mm or more and 24 mm or less, still more preferably 21 mm or more and 23 mm or less. In an embodiment, for example, the tobacco-containing segment has a length of 20 mm, the cooling segment has a length of 20 mm, the center-hole segment has a length of 8 mm, and the filter segment has a length of 7 mm. The length of the filter segment can be selected in the range of 4 mm to 10 mm. In this case, the airflow resistance of the filter segment is selected so as to be 15 mmH_2O/segment or more and 60 mmH_2O/segment or less. The lengths of these individual segments can be appropriately changed in accordance with manufacturing suitability, required quality, and so forth. Even if the filter segment alone is disposed downstream of the cooling segment without using the center-hole segment, the flavor inhaler can function as a non-combustion heating-type flavor inhaler.

(Tobacco-Containing Segment)

[0044] In the tobacco-containing segment 2, a wrapping paper (hereinafter, also referred to as a "wrapper") is filled with the tobacco sheet manufactured by the method according to the present embodiment. A method for filling the tobacco sheet into the wrapping paper (hereinafter, also referred to as a "wrapper") is not particularly limited. For example, the tobacco sheet may be wrapped in a wrapper, or the tobacco sheet may be filled in a tubular wrapper. When the tobacco sheet has a shape, such as a rectangular shape, having a longitudinal direction, the tobacco sheet may be packed in such a manner that its longitudinal direction is an unspecified direction in the wrapper, or may be packed so as to be aligned in the axial direction of the tobacco-containing segment 2 or in a direction perpendicular to the axial direction.

(Cooling Segment)

[0045] In an embodiment, as illustrated in Fig. 1, the cooling segment 3 can include a tubular member 7. The tubular member 7 may be, for example, a cardboard tube formed by processing cardboard into a tubular shape.

[0046] The tubular member 7 and mouthpiece lining paper 12 described below are provided with perforations 8 penetrating therethrough. The presence of the perforations 8 allows outside air to be introduced into the cooling segment 3 during inhalation. Thus, the vaporized aerosol component produced by heating the tobacco-containing segment 2 comes into contact with the outside air to reduce its temperature, thus liquefying to form an aerosol. The diameter of (length across) each perforation 8 is not particularly limited, and may be, for example, 0.5 mm or more and 1.5 mm or less. The number of the perforations 8 may be, but not particularly limited to, one or two or more. For example, the multiple perforations 8 may be provided on the circumference of the cooling segment 3.

[0047] The amount of outside air introduced through the perforations 8 is preferably 85% or less by volume, more preferably 80% or less by volume, based on the volume of the entire gas inhaled by a user. When the proportion of the amount of outside air is 85% or less by volume, a decrease in flavor due to dilution with outside air can be sufficiently inhibited. In other words, this is also referred to as a ventilation ratio. The lower limit of the range of the ventilation ratio is preferably 55% or more by volume, more preferably 60% or more by volume, from the viewpoint of cooling performance.

[0048] The cooling segment may also be a segment including a crimped, pleated, gathered, or folded sheet of a suitable component material. The cross-sectional profile of such an element may exhibit randomly oriented channels. The cooling segment may also include a bundle of longitudinally extending tubes. Such a cooling segment can be formed, for example, by wrapping a pleated, gathered, or folded sheet material with wrapping paper.

[0049] The length of the cooling segment in the axial direction can be, for example, 7 mm or more and 28 mm or less, and can be, for example, 18 mm. The cooling segment can be substantially circular in its axial cross-sectional shape. The diameter can be, for example, 5 mm or more and 10 mm or less, and can be, for example, about 7 mm.

(Center-Hole Segment)

[0050] The center-hole segment includes a filling layer having one or multiple hollow portions and an inner plug wrapper (inner wrapping paper) covering the filling layer. For example, as illustrated in Fig. 1, the center-hole segment 4 includes a second filling layer 9 having a hollow portion and a second inner plug wrapper 10 covering the second filling layer 9. The center-hole segment 4 has a function of increasing the strength of a mouthpiece segment 6. The second filling layer 9 can be, for example, a rod, having an inside diameter of ø1.0 mm to ∅5.0 mm, formed by hardening densely packed

cellulose acetate fibers to which a triacetin-containing plasticizer has been added in an amount of 6% or more by mass and 20% or less by mass based on the mass of the cellulose acetate. The second filling layer 9 has a high fiber filling density, so that air or aerosol flows only in the hollow portion during inhalation, and hardly flows in the second filling layer 9. Since the second filling layer 9 inside the center-hole segment 4 is a fiber-filled layer, the feeling of touch from the outside during use is less likely to cause the user to feel uncomfortable. The center-hole segment 4 need not include the second inner plug wrapper 10, and the shape of the center-hole segment 4 may be maintained by thermoforming.

(Filter Segment)

[0051] The configuration of the filter segment 5 is not particularly limited, and the filter segment 5 may be formed of a single filling layer or multiple filling layers. The outside of the filling layer may be wrapped with one or more sheets of wrapping paper. The airflow resistance per segment of the filter segment 5 can be appropriately changed in accordance with, for example, the amount of filler and the material of the filler filled in the filter segment 5. For example, when the filler is formed of cellulose acetate fibers, the airflow resistance can be increased by increasing the amount of cellulose acetate fibers filled in the filter segment 5. When the filler is formed of cellulose acetate fibers, the filling density of the cellulose acetate fibers can be 0.13 to 0.18 g/cm^3. The airflow resistance is a value measured with an airflow resistance measuring device (trade name: SODIMAX, available from SODIM).

[0052] The circumference of the filter segment 5 is preferably, but not particularly limited to, 16 to 25 mm, more preferably 20 to 24 mm, still more preferably 21 to 23 mm. The length of the filter segment 5 in the axial direction can be selected from 4 to 10 mm, and is selected in such a manner that the airflow resistance is 15 to 60 mmH_2O/segment. The length of the filter segment 5 in the axial direction is preferably 5 to 9 mm, more preferably 6 to 8 mm. The cross-sectional shape of the filter segment 5 is not particularly limited, and may, for example, be circular, elliptical, or polygonal. To the filter segment 5, flavoring agent-containing breakable capsules or flavoring agent beads may be added, or a flavoring agent may be directly added.

[0053] As illustrated in Fig. 1, the center-hole segment 4 and the filter segment 5 can be connected using an outer plug wrapper (outer wrapping paper) 11. The outer plug wrapper 11 can be, for example, a tubular sheet of paper. The tobacco-containing segment 2, the cooling segment 3, and the center-hole segment 4 that has been connected to the filter segment 5 can be connected using the mouthpiece lining paper 12. These can be connected, for example, by applying an adhesive, such as a vinyl acetate adhesive, to the inner surface of the mouthpiece lining paper 12, placing the three segments, and wrapping them. These segments may be connected in multiple steps with multiple sheets of lining paper.

[Non-Combustion Heating-Type Flavor Inhalation System]

[0054] A non-combustion heating-type flavor inhalation system according to the present embodiment includes the non-combustion heating-type flavor inhaler according to the present embodiment and a heating device configured to heat the tobacco-containing segment of the non-combustion heating-type flavor inhaler. The non-combustion heating-type flavor inhalation system according to the present embodiment may have another configuration other than the non-combustion heating-type flavor inhaler according to the present embodiment and the heating device.

[0055] Fig. 2 illustrates an example of the non-combustion heating-type flavor inhalation system according to the present embodiment. The non-combustion heating-type flavor inhalation system illustrated in Fig. 2 includes the non-combustion heating-type flavor inhaler 1 according to the present embodiment, and a heating device 13 configured to, from the outside, heat the tobacco-containing segment of the non-combustion heating-type flavor inhaler 1.

[0056] Fig. 2(a) illustrates a state before the non-combustion heating-type flavor inhaler 1 is inserted into the heating device 13, and Fig. 2(b) illustrates a state in which the non-combustion heating-type flavor inhaler 1 is inserted into the heating device 13 and heated. The heating device 13 illustrated in Fig. 2 includes a body 14, a heater 15, a metal tube 16, a battery unit 17, and a control unit 18. The body 14 has a tubular recessed portion 19. The heater 15 and the metal tube 16 are arranged on the inner surface of the recessed portion 19 at a position corresponding to the tobacco-containing segment of the non-combustion heating-type flavor inhaler 1 to be inserted into the recessed portion 19. The heater 15 can be an electrical resistance heater. Electric power is supplied from the battery unit 17 by instructions from the control unit 18, which controls the temperature, to heat the heater 15. The heat generated from the heater 15 is conducted to the tobacco-containing segment of the non-combustion heating-type flavor inhaler 1 through the metal tube 16 having high thermal conductivity.

[0057] In Fig. 2(b), there is a gap between the outer circumference of the non-combustion heating-type flavor inhaler 1 and the inner circumference of the metal tube 16 because it is schematically illustrated. However, actually, it is desirable that there is no gap between the outer circumference of the non-combustion heating-type flavor inhaler 1 and the inner circumference of the metal tube 16 in order to achieve efficient heat conduction. The heating device 13 heats the tobacco-containing segment of the non-combustion heating-type flavor inhaler 1 from the outside, but may heat it from the inside.

[0058] The heating temperature with the heating device is not particularly limited, but is preferably 400°C or lower, more preferably 150°C or higher and 400°C or lower, still more preferably 200°C or higher and 350°C or lower. The heating temperature refers to the temperature of the heater of the heating device.

EXAMPLES

[0059] While specific examples of the present embodiment will be described below, the present invention is not limited thereto.

[Example 1]

[0060] Tobacco lamina (leaf tobacco) was dry-ground with a Hosokawa Micron ACM machine to obtain a tobacco powder. With regard to the tobacco powder, the 90% cumulative particle size (D90) in the volume-based particle size distribution measured by a dry laser diffractometry using a Mastersizer (trade name, available from Malvern Panalytical of Spectris Co., Ltd.) was 200 μm.

[0061] A tobacco sheet was manufactured using the tobacco powder as a tobacco raw material. Specifically, 78 parts by mass of the tobacco raw material, 12 parts by mass of glycerine as an aerosol-generating agent, 1 part by mass of water-swollen carboxymethyl cellulose as a first forming agent, 4 parts by mass of powdered carboxymethyl cellulose as a second forming agent, and 5 parts by mass of fibrous pulp as a reinforcing agent were mixed and kneaded by an extruder. The kneaded product was molded into a sheet shape with two pairs of metal rollers to form a rolled article. A rotary roller cutter for noodle making was pressed against the rolled article into strips each having a width of 0.8 mm. Then each of the strips was cut so as to have a length of 20 mm, thereby resulting in a sheet-like mixture.

[0062] Thereafter, the sheet-like mixture was rapidly dried by a flash drying process using a flash dryer under the conditions of a hot air temperature of 160°C, an air velocity of 25.4 m/s, and a drying time of 5 seconds. The moisture reduction rate in the drying was 1.6% WB/s. The amount of moisture contained in the sheet-like mixture before the drying was 21.3% WB. The amount of moisture contained in the sheet-like mixture after the drying was 13.2% WB. The resulting tobacco sheet had a curly shape.

[0063] The filling capacity of the resulting tobacco sheet was measured. Specifically, the tobacco sheet was allowed to stand in a conditioning room at 22°C and 60% RH for 48 hours, and then the filling capacity was measured with DD-60A (trade name, available from Burghart). The measurement was performed by placing 15 g of the tobacco sheet in a cylindrical container having an inside diameter of 60 mm, and determining the volume when the tobacco sheet was compressed for 30 seconds with a load of 3 kg. Table 1 presents the results. In Table 1, the filling capacity is indicated by the rate of increase in filling capacity (%) with respect to a reference value of the filling capacity of Comparative Example 1 described below.

[Comparative Example 1]

[0064] A sheet-like mixture was produced in the same manner as in Example 1. The sheet-like mixture was then dried at 80°C for 240 seconds in an oven (trade name: FG-220, available from Advantec Toyo Kaisha, Ltd.) in which hot air was circulated. The moisture reduction rate in the drying was 0.04% WB/s. The amount of moisture contained in the sheet-like mixture before the drying was 21.3% WB. The amount of moisture contained in the sheet-like mixture after the drying was 12.7% WB. The resulting tobacco sheet did not have a curly shape. The filling capacity of the tobacco sheet was measured in the same manner as in Example 1. Table 1 presents the results.

[Table 1]

	Rate of increase in filling capacity (%)
Example 1	16
Comparative Example 1	-

[0065] The tobacco sheet of Example 1 in which the tobacco sheet was manufactured by the method according to the present embodiment had improved filling capacity, compared with the tobacco sheet of Comparative Example 1 in which the moisture reduction rate in the drying was less than 0.8% WB/s.

REFERENCE SIGNS LIST

[0066]

1 non-combustion heating-type flavor inhaler
2 tobacco-containing segment
3 cooling segment
4 center-hole segment
5 filter segment
6 mouthpiece segment
7 tubular member
8 perforation
9 second filling layer
10 second inner plug wrapper
11 outer plug wrapper
12 mouthpiece lining paper
13 heating device
14 body
15 heater
16 metal tube
17 battery unit
18 control unit
19 recessed portion

Claims

1. A method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler, the method comprising the steps of:

   forming a mixture containing a tobacco raw material and an aerosol-generating agent into a sheet shape; and drying the mixture formed into the sheet shape,
   wherein a moisture reduction rate in the drying is 0.8% WB/s or more.

2. The method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler according to claim 1, wherein the drying is performed by a flash drying process.

3. The method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler according to claim 2, wherein in the flash drying process, hot air blown onto the mixture formed into the sheet shape has a temperature of 140°C to 350°C.

4. The method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler according to claim 2 or 3, wherein in the flash drying process, hot air blown onto the mixture formed into the sheet shape has an air velocity of 12 to 50 m/s.

5. The method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler according to any one of claims 1 to 4, wherein an amount of moisture in the mixture formed into the sheet shape before the drying is 20% to 50% WB, and the amount of moisture in the mixture formed into the sheet shape after the drying is 8% to 15% WB.

6. The method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler according to any one of claims 1 to 5, wherein the tobacco raw material is at least one tobacco powder selected from the group consisting of leaf tobacco, midribs, and residual stems.

7. The method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler according to any one of claims 1 to 6, wherein a proportion of the tobacco raw material contained in 100% by mass of the mixture is 45% to 95% by mass on a dry basis.

8. The method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler according to any one of claims 1 to 7, wherein the aerosol-generating agent is at least one selected from the group consisting of glycerine, propylene glycol, and 1,3-butanediol.

9. The method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler according to any one of claims 1 to 8, wherein a proportion of the aerosol-generating agent contained in 100% by mass of the mixture is 4% to 50% by mass on a dry basis.

10. The method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler according to any one of claims 1 to 9, wherein the mixture further contains a forming agent.

11. The method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler according to claim 10, wherein the forming agent is at least one selected from the group consisting of polysaccharides, proteins, and synthetic polymers.

12. The method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler according to claim 10 or 11, wherein a proportion of the forming agent contained in 100% by mass of the mixture is 0.1% to 15% by mass on a dry basis.

13. The method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler according to any one of claims 1 to 12, wherein the mixture further contains a fibrous material as a reinforcing agent.

14. The method for manufacturing a tobacco sheet for a non-combustion heating-type flavor inhaler according to claim 13, wherein a proportion of the fibrous material contained in 100% by mass of the mixture is 5% to 50% by mass on a dry basis.

Fig. 1

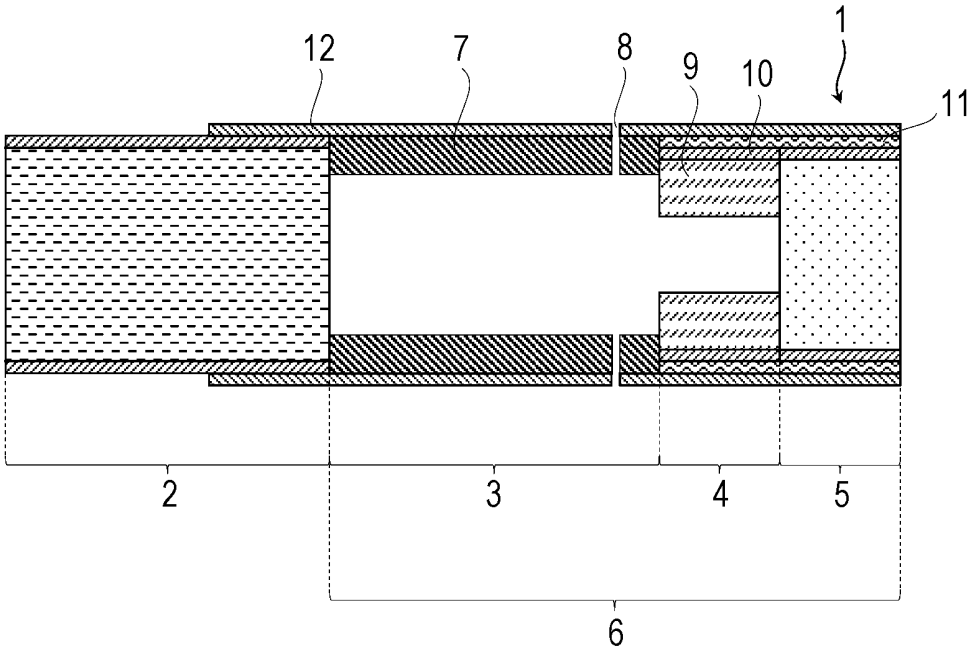
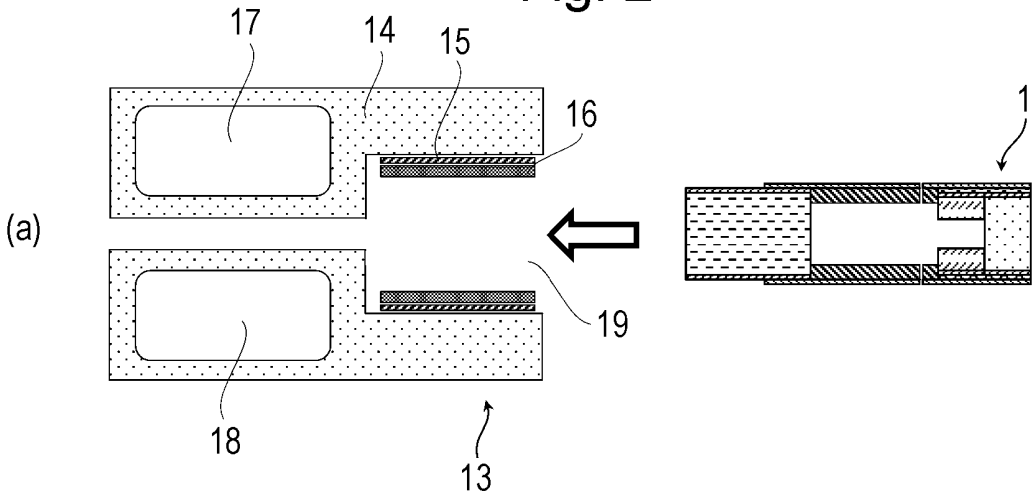
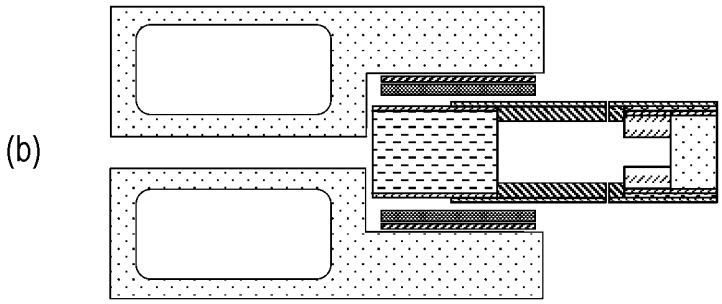


Fig. 2





INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2022/018922

A. CLASSIFICATION OF SUBJECT MATTER

A24B 15/16(2020.01)i; ***A24B 3/14***(2006.01)i; ***A24C 5/01***(2020.01)i
FI: A24B15/16; A24B3/14; A24C5/01

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)

A24B15/16; A24B3/14; A24C5/01

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 1971-2022
Registered utility model specifications of Japan 1996-2022
Published registered utility model applications of Japan 1994-2022

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.
A	WO 2018/235956 A1 (JAPAN TOBACCO INC.) 27 December 2018 (2018-12-27) entire text, all drawings	1-14
A	WO 2021/172255 A1 (JAPAN TOBACCO INC.) 02 September 2021 (2021-09-02) entire text, all drawings	1-14

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

* Special categories of cited documents:
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"E" earlier application or patent but published on or after the international filing date
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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
01 July 2022	**12 July 2022**
Name and mailing address of the ISA/JP **Japan Patent Office (ISA/JP)** **3-4-3 Kasumigaseki, Chiyoda-ku, Tokyo 100-8915** **Japan**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2022/018922

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
WO 2018/235956 A1	27 December 2018	WO 2018/235238 A1	
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WO 2021/172255 A1	02 September 2021	WO 2021/171459 A1	
		WO 2021/171738 A1	
		WO 2021/171739 A1	
		WO 2021/171740 A1	
		WO 2021/171741 A1	

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REFERENCES CITED IN THE DESCRIPTION

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