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

(11) **EP 4 292 447 A1**

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

(43) Date of publication:
20.12.2023 Bulletin 2023/51

(21) Application number: **21925749.0**

(22) Date of filing: **30.09.2021**

(51) International Patent Classification (IPC):
A24B 15/16 *(2020.01)* ***A24B 15/28*** *(2006.01)*
A24F 40/42 *(2020.01)*

(52) Cooperative Patent Classification (CPC):
A24B 15/16; A24B 15/28; A24F 40/42

(86) International application number:
PCT/JP2021/036117

(87) International publication number:
WO 2022/172501 (18.08.2022 Gazette 2022/33)

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

(30) Priority: **12.02.2021 JP 2021020982**

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(54) FLAVOR FILLER AND FLAVOR INHALER

(57) The present invention provides a flavor filler for a flavor inhaler, the flavor filler including: porous cellulose particles having a porosity of at least 40%; and flavor layers carried on the outer surfaces of the porous cellulose particles and containing particles containing flavor components.

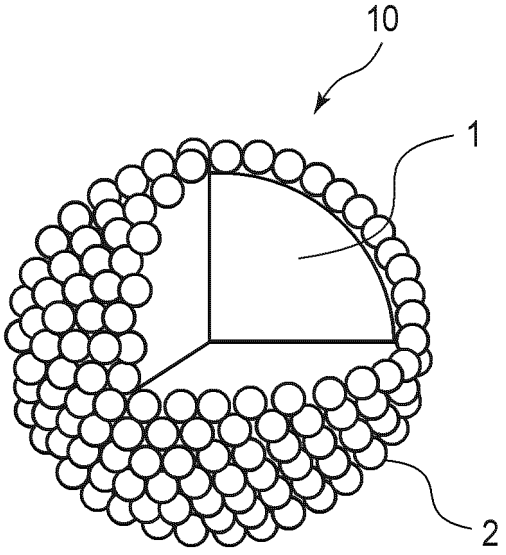

FIG. 3

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Description

FIELD

[0001] The present invention relates to a flavor filler and a flavor inhaler.

BACKGROUND

[0002] A heating-type flavor inhaler which provides a user with a tobacco flavor by heating, not burning, a tobacco filler such as cut tobacco is known as a tobacco product (see, for example, Patent Literature 1). The heating-type flavor inhaler includes a tobacco filler and an aerosol source. Vapor is generated from the aerosol source and the moisture of the tobacco filler through heating, and tobacco flavor components are transferred from the tobacco filler into the vapor, whereby aerosol (mainstream smoke) is generated. Since the heating-type flavor inhaler does not bum the tobacco filler, it has a drawback in that tobacco flavor components are not easily released from the tobacco filler.

[0003] Not only cut tobacco but tobacco granules and sheet tobacco are also known as tobacco fillers. The "cut tobacco" is obtained by cutting aged tobacco leaves (i.e., leaf tobacco which is ready to be incorporated as a tobacco flavor source into a tobacco product) into a predetermined size. The "tobacco granules" are obtained by molding a composition containing a ground product of aged tobacco leaves into a granular shape. The tobacco granules can be formed by a known method such as an extrusion granulation method. The "sheet tobacco" is obtained by molding a composition containing a ground product of aged tobacco leaves into a sheet shape. The sheet tobacco can be formed by a known method such as a papermaking method, a casting method, or a rolling method.

[0004] Tobacco fillers have been improved so that tobacco flavor components can be efficiently released from the tobacco fillers in the heating-type flavor inhaler. For example, Patent Literature 2 discloses reducing the density of each tobacco filler to thereby efficiently release tobacco flavor components from the tobacco fillers.

CITATION LIST

PATENT LITERATURE

[0005]

Patent Literature 1: WO2010/110226
Patent Literature 2: WO2017/141406

SUMMARY

TECHNICAL PROBLEM

[0006] An object of the present invention is to provide a technique that can improve the release of flavor components from a flavor filler used in a flavor inhaler.

SOLUTION TO PROBLEM

[0007] When the inventors of the present invention had a ground product of aged tobacco leaves (hereinafter, also referred to as "tobacco particles") carried on the outer surface of a porous cellulose particle having a high porosity, they discovered that the release of tobacco flavor components from the tobacco particles was improved. This discovery led to completion of the present invention.

[0008] According to one aspect, there is provided a flavor filler for a flavor inhaler comprising:

porous cellulose particles each having a porosity of 40% or more; and
a flavor layer carried on an outer surface of each of the porous cellulose particles and including flavor component-containing particles.

[0009] According to another aspect, there is provided a flavor inhaler comprising the abvove-mentioned flavor filler.

ADVANTAGEOUS EFFECTS OF INVENTION

[0010] According to the present invention, it is possible to provide a technique that can improve the release of flavor

components from a flavor filler used in a flavor inhaler.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

FIG. 1 is a schematic cross-sectional view showing an example of porous cellulose particles.
FIG. 2 is an electron microscope image showing an example of porous cellulose particles.
FIG. 3 is a partially cutaway view showing an example of a flavor filler.
FIG. 4 is a perspective view showing an example of a heating-type flavor inhaler.
FIG. 5 is an exploded view showing the heating-type flavor inhaler shown in FIG. 4.
FIG. 6 is a schematic view showing an inner structure of the heating-type flavor inhaler shown in FIG. 4.

DETAILED DESCRIPTION

[0012] Hereinafter, the present invention will be described in detail; however, the description below is intended to provide a detailed description of the present invention, and is not intended to limit the present invention.

<1. Flavor Filler>

[0013] A flavor filler includes:

porous cellulose particles each having a porosity of 40% or more; and
a flavor layer carried on an outer surface of each of the porous cellulose particles and including flavor component-containing particles.

[0014] The flavor filler can be incorporated into a flavor inhaler to provide a flavor to a user.
[0015] In a preferred embodiment, the flavor filler is a tobacco filler which includes a flavor layer which includes tobacco particles. That is, in a preferred embodiment, a tobacco filler includes:

porous cellulose particles each having a porosity of 40% or more; and
a flavor layer carried on an outer surface of each of the porous cellulose particles and including tobacco particles.

(Porous Cellulose Particles)

[0016] First, porous cellulose particles as carrier particles will be described. The porous cellulose particles each have a porosity of 40% or more. "Porosity" refers to a value calculated by the following formula:

$$\text{Porosity (\%)} = (\text{pore volume of particle} / \text{apparent volume of particle}) \times 100$$

[0017] "Pore volume of particle" refers to the larger volume out of a pore volume obtained by the Archimedes method and a pore volume calculated based on an average pore diameter obtained by a pore diameter distribution measured by the mercury intrusion method. The obtainment of the pore volume by the Archimedes method can be carried out in accordance with JIS R1634:1998. The obtainment of the pore volume by the mercury intrusion method can be carried out in accordance with JIS R1655:2003.
[0018] "Apparent volume of particle" refers to a theoretical volume of a particle when the particle is considered to be spherical, that is, a volume of a sphere having a diameter equal to an average particle diameter measured using a laser diffraction particle size distribution analyzer. The measurement of the average particle diameter using a laser diffraction particle size distribution analyzer can be carried out in accordance with JIS Z8825:2013 (a particle size analysis-laser diffraction scattering method).
[0019] The porosity of the porous cellulose particles is preferably 50% or more, more preferably 60% or more, still more preferably 70% or more, and yet still more preferably 80% or more. The upper limit of the porosity of the porous cellulose particles is, for example, 95%. The term "porosity" as used herein refers to an intra-particle porosity.
[0020] Since the porous cellulose particles have a high porosity, they have a low bulk density. Specifically, the porous cellulose particles have a bulk density of, for example, 0.1 to 0.6 g/mL, preferably 0.1 to 0.4 g/mL, and more preferably 0.1 to 0.3 g/mL.
[0021] The porous cellulose particles contain cellulose as a main component and have a porous structure. If the porous

cellulose particles have been produced using a plant such as wood pulp as a raw material, the porous cellulose particles may contain components other than cellulose that are derived from the raw material. Alternatively, the porous cellulose particles may intentionally contain components other than cellulose by incorporating a fine powder such as a binder, a flavorant, a fine tobacco powder, and a foaming agent in the process of making the particles.

[0022] The porous cellulose particles are known and used, for example, as a carrier for immobilizing enzymes, a carrier for ion exchangers, a carrier for carrying chemical agents, or a cosmetic additive. Porous cellulose particles are disclosed in, for example, Jpn. Pat. Appln. KOKAI Publication No. H6-157772, Jpn. Pat. Appln. KOKAI Publication No. 2001-323095, etc.

[0023] The shape of the porous cellulose particles is not particularly limited, but is preferably spherical. The spherical shape includes not only a true spherical shape but also a deformed spherical shape such as an elliptical spherical shape.

[0024] The porous cellulose particles have an average particle diameter of, for example, 300 to 2000 μm, and preferably 300 to 850 μm. The "average particle diameter" of the porous cellulose particles is determined by a laser diffraction scattering method, and refers to a value measured using a laser diffraction particle size distribution analyzer (e.g., LA-950 from Horiba, Ltd.).

[0025] Each of the porous cellulose particles has openings on its outer surface, and a maximum diameter (hereinafter, also referred to as "a pore diameter") of the surface openings is, for example, 1/2 to 1/1000 of the particle diameter of the porous cellulose particles, and preferably 1/5 to 1/50 of the particle diameter of the porous cellulose particles. The porous cellulose particles have an average pore diameter of, for example, 0.3 to 1000 μm, preferably 0.3 to 200 μm, and more preferably 6 to 40 μm. The average pore diameter can be obtained by randomly selecting 10 particles from an electron micrograph of the porous cellulose particles, selecting one representative surface opening from each particle, calculating the ratio of the maximum diameter (i.e., pore diameter) of the surface opening to the particle diameter based on the microscope image, multiplying this ratio by the particle diameter to calculate the pore diameter of each particle, and calculating the average value of the 10 particles.

[0026] In a preferred embodiment, each of the porous cellulose particles has a plurality of pores extending radially from the center of each of the porous cellulose particles toward the outer surface thereof. An example of the porous cellulose particles is shown in FIGS. 1 and 2. FIG. 1 is a schematic cross-sectional view, and FIG. 2 is an electron micrograph. FIG. 1 shows a porous cellulose particle 1, which has a plurality of pores 1a. In this description, the surface of the porous cellulose particle excluding the surfaces of the pores la is referred to as "an outer surface 1b of the porous cellulose particle". In FIGS. 1 and 2, the plurality of pores la extend radially from the center of the porous cellulose particle toward the outer surface 1b of the porous cellulose particle.

[0027] The porous cellulose particle may be prepared according to a known technique, or a commercially available product may be used as the porous cellulose particle. Examples of the commercially available porous cellulose particle include porous cellulose particles sold by Rengo Co., Ltd. under the trade name of Viscopearl.

(Flavor Layer)

[0028] A flavor layer is carried on the outer surface of the porous cellulose particle described above, and forms a flavor filler together with the porous cellulose particle. An example of the flavor filler is schematically shown in FIG. 3. FIG. 3 shows a flavor filler 10, which has a flavor layer 2 formed on the outer surface of the porous cellulose particle 1. In FIG. 3, the flavor layer 2 exists as a layer of fine particles on the outer surface of the porous cellulose particle 1. Although the flavor layer 2 exists as a layer of fine particles on the outer surface of the porous cellulose particle in FIG. 3, the flavor layer 2 is not limited to this configuration, provided that it is carried on the outer surface of the porous cellulose particle.

[0029] The flavor layer 2 shown in FIG. 3 can be formed by, for example, spray drying a liquid flavorant composition containing flavor component-containing particles and a binder onto the porous cellulose particle 1. The flavor layer 2 may be present in such a manner as to completely cover the outer surface of the porous cellulose particle 1 or partially cover the outer surface of the porous cellulose particle 1.

[0030] In FIG. 3, the flavor layer 2 exists only on the outer surface of the porous cellulose particle; however, a part of the flavor layer may enter the pores of the porous cellulose particle. It is preferable that a large amount of the flavor layer exist on the outer surface of the porous cellulose particle without entering the pores of the porous cellulose particle. If the flavor layer enters and exists in the pores of the porous cellulose particle, the flavor layer preferably exists in the vicinity of the outer surface of the porous cellulose particle. That is, in a preferred embodiment, the flavor layer exists in a larger amount from the center of the porous cellulose particle toward the outer surface of the porous cellulose particle. Thus, the flavor components can be efficiently released from the flavor component-containing particles included in the flavor layer.

[0031] In order to allow the flavor layer to be present on the outer surface or in the vicinity of the outer surface of the porous cellulose particle, the flavor component-containing particles included in the flavor layer preferably have an average particle diameter larger than an average pore diameter of the porous cellulose particles. The flavor component-containing

particles have an average particle diameter of, for example, 0.3 to 1000 μm, preferably 50 to 200 μm, and more preferably 60 to 80 μm. The average particle diameter of the flavor component-containing particles is determined by a laser diffraction scattering method, and refers to a value measured using a laser diffraction particle size distribution analyzer (e.g., LA-950 from Horiba, Ltd.).

[0032] The flavor component-containing particles are any types of particles containing a flavor components). The flavor component-containing particles are, for example, tobacco particles. Alternatively, the flavor component-containing particles are, for example, flavorant particles. The flavor component-containing particles may be one type of particle or multiple types of particles that provide different flavors. The flavor component-containing particles may be a combination of tobacco particles and flavorant particles, or may be multiple types of tobacco particles or multiple types of flavorant particles.

[0033] The "tobacco particles" are a ground product of aged tobacco leaves (i.e., leaf tobacco which is ready to be incorporated as a tobacco flavor source into a tobacco product"). The "aged tobacco leaves" refer to tobacco leaves obtained by subjecting leaves of a cultivated and harvested tobacco plant to various processes including drying in a farm house, subsequently one to several years of long-term aging in a leaf processing facility, and, subsequently to that, blending and cutting in a manufacturing facility. The grinding may be performed using a known grinding mill, and may be either dry grinding or wet grinding. As described above, the tobacco particles can have an average particle diameter of, for example, 0.3 to 1000 μm, preferably 50 to 200 μm, and more preferably 60 to 80 μm.

[0034] The "flavorant particles" are any type of powder containing a flavorant component(s). The flavorant particles do not encompass tobacco particles. The flavorant particles may be a natural flavorant or a synthetic flavorant. Any types of flavorant particles commonly used in tobacco products (especially in flavor inhalers) can be used as the flavorant particles. The flavorant particles may be, for example, cocoa, or a powder obtained by spray drying and powderizing a flavorant dispersion liquid. Alternatively, the flavorant particles may be a powder obtained by adsorbing a flavorant on porous granular calcium carbonate (e.g., PORECAL-N from Shiraishi Calcium Kaisha, Ltd.), or porous granular activated carbon (e.g., KURARAY COAL from Kuraray Co., Ltd.). As described above, the flavorant particles can have an average particle diameter of, for example, 0.3 to 1000 μm, preferably 50 to 200 μm, and more preferably 60 to 80 μm.

(Barrier Layer)

[0035] The flavor filler may further include a barrier layer on the flavor layer described above. The barrier layer can be formed by, for example, spray drying a liquid flavorant composition containing the components of the barrier layer onto the flavor layer formed on the porous cellulose particles. The barrier layer may be present in such a manner as to completely cover the flavor layer or partially cover the flavor layer.

[0036] The barrier layer can control the timing at which the flavor components are released from the flavor component-containing particles included in the flavor layer. Thus, the barrier layer can prevent a decrease in the release amount of the flavor components included in the flavor layer even when the puffs on the flavor inhaler are repeated.

[0037] In a first embodiment, the barrier layer includes a binder but is free from a flavor-contributing substance. Examples of the binder include hydroxypropyl cellulose (HPC). In this embodiment, the barrier layer does not include any flavor-contributing substance. The flavor-contributing substance refers to any type of substance that contributes to the flavor, and includes any types of flavor components in addition to particulate substances such as the above-described "tobacco particles" and the above-described "flavorant particles". In this embodiment, the barrier layer can delay the release of the flavor components from the flavor component-containing particles included in the flavor layer without contributing to the flavor. Thus, the barrier layer can prevent a decrease in the release amount of the flavor components included in the flavor layer even when the puffs on the flavor inhaler are repeated.

[0038] In a second embodiment, the barrier layer includes a flavor-contributing substance that provides a flavor different from the flavor of the flavor component-containing particles included in the flavor layer. In this embodiment, the barrier layer includes a flavor-contributing substance, and may also include an additive such as a binder as necessary. The flavor-contributing substance refers to any type of substance that contributes to the flavor, and includes any types of flavor components in addition to particulate substances such as the above-described "tobacco particles" and the above-described "flavorant particles". Examples of the binder include hydroxypropyl cellulose (HPC). In this embodiment, the barrier layer can provide a flavor different from the flavor of the flavor component-containing particles included in the flavor layer in a relatively early stage of the puff period, and the flavor layer can release the flavor components from the flavor component-containing particles in a relatively late stage of the puff period. Thus, the barrier layer can prevent a decrease in the release amount of the flavor components included in the flavor layer even when the puffs on the flavor inhaler are repeated.

[0039] In the second embodiment, the flavor component-containing particles included in the flavor layer are, for example, first tobacco particles, and the flavor-contributing substance included in the barrier layer is, for example, either second tobacco particles different from the first tobacco particles or flavorant particles. For the "tobacco particles" and the "flavorant particles" mentioned herein, reference can be made to the above description. The second tobacco particles

are tobacco particles that provide a tobacco flavor different from that of the first tobacco particles. For example, tobacco particles obtained from a combination (blend) of leaf tobacco varieties different from the first tobacco particles can be used as the second tobacco particles.

[0040] Alternatively, in the second embodiment, the flavor component-containing particles included in the flavor layer are, for example, first flavorant particles, and the flavor-contributing substance included in the barrier layer is, for example, either tobacco particles or second flavorant particles different from the first flavorant particles. For the "tobacco particles" and the "flavorant particles" mentioned herein, reference can be made to the above description. The second flavorant particles are flavorant particles that provide a flavor different from that of the first flavorant particles. For example, menthol-like flavorant particles (i.e., menthol particles or particles of a menthol analog having a mint odor) can be used as the first flavorant particles, and non-menthol-like flavorant particles (i.e., flavorant particles other than the menthol-like flavorant particles) can be used as the second flavorant particles.

[0041] If the barrier layer is provided, the combination of the flavor-contributing substance included in the barrier layer and the flavor component-containing particles included in the flavor layer can create diversity in the flavor that the user tastes.

(Method for Producing Flavor Filler)

[0042] The flavor filler can be produced by, for example, the following method.

[0043] First, a liquid flavorant composition is prepared by mixing together flavor component-containing particles, water, and, if necessary, an additive such as a binder. Porous cellulose particles are put into a fluidized-bed granulator, and hot air is sent into the granulator from the lower side to form a fluidized bed of the porous cellulose particles. The liquid flavorant composition is sprayed onto the fluidized bed, so that the droplets of the liquid flavorant composition are attached to the surfaces of the porous cellulose particles. The droplets of the liquid flavorant composition attached to the surfaces of the porous cellulose particles are quickly dried by the hot air, whereby a flavor layer is formed on the porous cellulose particles.

[0044] Alternatively, porous cellulose particles, flavor component-containing particles, and, if necessary, an additive such as a binder are put into a powder mixer and mixed together by rotation and shaking. As a result, the flavor component-containing particles are attached to the surfaces of the porous cellulose particles, and a flavor layer is thereby formed on the porous cellulose particles.

[0045] If the flavor filler further includes a barrier layer, the barrier layer can be formed by a method similar to the method of forming the flavor layer, while using, as core particles, the porous cellulose particles having the flavor layer formed on their surfaces.

[0046] Since the flavor filler can be produced by coating the core particles, as described above, it can be produced by a simple method.

(Advantageous Effects)

[0047] The flavor filler of the present invention can improve the release of the flavor components, as demonstrated in the working examples shown later. This effect is considered to be due to the fact that the flavor component-containing particles are carried on the outer surface of the respective porous cellulose particles and that the porous cellulose particles have a high porosity. Specifically, it is considered that the flavor components are easily released from the flavor component-containing particles to the extra-particle space since the flavor component-containing particles on the outer surface of the respective porous cellulose particles are in contact with the ambient air. It is also considered that the voids inside the porous cellulose particles can cause a flow of air from the extra-particle space toward the voids inside the particles, and that this flow of air increases the opportunities to release the flavor components from the flavor component-containing particles, promoting the release of the flavor components. In particular, it is considered that if each of the porous cellulose particles has a plurality of pores (i.e., voids) extending radially from its center toward its outer surface, these pores serve as air flow paths and can efficiently cause a flow of air from the extra-particle space toward the voids inside the particles.

[0048] On the other hand, if flavor granules are produced by compacting flavor component-containing particles into a granular shape, like tobacco granules known as a tobacco filler, the flavor granules will differ from the flavor filler of the present invention in the following two points.

(1) Since the flavor granules are entirely composed of flavor component-containing particles, many of the flavor component-containing particles exist inside the granules.

(2) Since the flavor granules are produced by compacting flavor component-containing particles into a granular shape, the flavor granules do not have as many voids inside the granules as the porous cellulose particles do.

[0049] It is considered that the flavor components cannot be released from the flavor component-containing particles present inside the flavor granules since many of the flavor component-containing particles inside the flavor granules are not in contact with the ambient air. It is also considered that since the flavor granules do not have as many voids inside the granules as the porous cellulose particles do, the flavor granules cannot cause a flow of air from the extra-granule space toward the inside of the granules as much as the porous cellulose particles do, making it difficult to release the flavor components even from the flavor component-containing particles present on the surfaces of the flavor granules.

[0050] Further, the flavor filler of the present invention has the following advantages. All of the flavor component-containing particles carried on the outer surface of the respective porous cellulose particles can contribute to the release of the flavor components. In addition, the voids inside the porous cellulose particles cause a flow of air from the extra-particle space toward the voids inside the particles, as described above, creating an environment in which the flavor components are easily released from the flavor component-containing particles. As a result, the amount of the flavor component-containing particles needed to provide a desired flavor can be reduced, leading to a reduction in production costs. In addition, since the porous cellulose particles have a high porosity, the weight of the flavor filler can be reduced.

<2. Flavor Inhaler>

[0051] The flavor filler described above can be incorporated into a flavor inhaler, preferably a heating-type flavor inhaler. That is, according to another aspect, there is provided a flavor inhaler which includes the above-described flavor filler. A flavor inhaler is a device which includes a flavor source and provides a user with a flavor through inhalation. According to a preferred embodiment, there is provided a heating-type flavor inhaler which includes the above-described flavor filler. The heating-type flavor inhaler is a flavor inhaler which provides a user with a flavor by heating, not burning, the flavor source.

[0052] The flavor inhaler of the present invention can have the same configuration as those of flavor inhalers known at the time when the present application was filed, except that the flavor source included in the known flavor inhalers is entirely or partially replaced with the flavor filler of the present invention.

[0053] The flavor filler of the present invention may be used in combination with an ordinary tobacco filler (i.e., cut tobacco, tobacco granules, sheet tobacco, etc.), or used alone without being used in combination with an ordinary tobacco filler (i.e., cut tobacco, tobacco granules, sheet tobacco, etc.). The flavor filler of the present invention can be incorporated into the flavor inhaler in any amount. The flavor filler of the present invention can be incorporated in an amount of, for example, 20 to 100% by mass when the total amount of the flavor source included in a single flavor inhaler is 100% by mass.

[0054] The heating-type flavor inhaler may be heated by a heating device separate from the inhaler or may be heated by a heating device integrated with the inhaler. Hereinafter, an example of the heating-type flavor inhaler will be described with reference to FIGS. 4 to 6.

[0055] FIG. 4 is a perspective view showing an example of an outer appearance of the heating-type flavor inhaler. FIG. 5 is an exploded view showing an example of the heating-type flavor inhaler. A heating-type flavor inhaler 30 (hereinafter simply referred to as a flavor inhaler 30) is an electronic cigarette, a nebulizer, or the like, and generates an aerosol in accordance with the inhalation of the user and provides it to the user. A single continuous inhalation performed by the user is referred to as a "puff". The flavor inhaler 30 adds components such as flavor components to the generated aerosol and releases them into the oral cavity of the user.

[0056] As shown in FIGS. 4 and 5, the flavor inhaler 30 includes a main body 30A, an aerosol source holding part 30B, and an additive component holding part 30C. The main body 30A supplies electric power and controls the overall operation of the device. The aerosol source holding part 30B holds an aerosol source for generating an aerosol through atomization. The additive component holding part 30C holds a tobacco filler 38. By holding the mouthpiece, which is an end portion on the side of the additive component holding part 30C, the user can inhale the aerosol to which the flavor or the like has been added.

[0057] The tobacco filler 38 includes the flavor filler of the present invention. As an example, the tobacco filler 38 may include the flavor filler of the present invention with tobacco particles included, and may also include an ordinary tobacco filler (i.e. cut tobacco, tobacco granules, sheet tobacco, etc.), if necessary. As another example, the tobacco filler 38 may include the flavor filler of the present invention without tobacco particles but with flavorant particles, and may also include an ordinary tobacco filler (i.e. cut tobacco, tobacco granules, sheet tobacco, etc.).

[0058] The flavor inhaler 30 is formed by assembling of the main body 30A, the aerosol source holding part 30B, and the additive component holding part 30C by the user, etc. Each of the main body 30A, the aerosol source holding part 30B, and the additive component holding part 30C has a cylindrical shape, a truncated cone shape, or the like having a predetermined diameter, and the main body 30A, the aerosol source holding part 30B, and the additive component holding part 30C can be coupled in this order. The main body 30A and the aerosol source holding part 30B are coupled to each other by, for example, screwing together a male screw portion and a female screw portion respectively provided at their end portions. The aerosol source holding part 30B and the additive component holding part 30C are, for example,

coupled by fitting the additive component holding part 30C having a tapered side surface in a tubular portion provided at one end of the aerosol source holding part 30B. The aerosol source holding part 30B and the additive component holding part 30C may be disposable replacement parts.

[0059] FIG. 6 is a schematic view showing an example of an inner structure of the flavor inhaler 30. The main body 30A includes a power supply 31, a control unit 32, and an inhalation sensor 33. The control unit 32 is electrically connected to the power supply 31 and the inhalation sensor 33. The power supply 31 is a secondary battery, etc., and supplies electric power to electric circuitry included in the flavor inhaler 30. The control unit 32 is a processor such as a microcontroller (Micro-Control Unit: MCU), and controls the operation of the electric circuitry included in the flavor inhaler 30. The inhalation sensor 33 is, for example, an atmospheric pressure sensor, a flow rate sensor, etc. When the user inhales from the mouthpiece of the flavor inhaler 30, the inhalation sensor 33 outputs a value corresponding to the negative pressure generated inside the flavor inhaler 30, a flow rate of a gas, etc. That is, the control unit 32 is capable of detecting inhalation based on the output value of the inhalation sensor 33.

[0060] The aerosol source holding part 30B of the flavor inhaler 30 includes a storage unit 34, a supply unit 35, a load 36, and a remaining amount sensor 37. The storage unit 34 is a container that stores a liquid aerosol source that is atomized by heating. The aerosol source is a polyol-based material such as glycerin or propylene glycol. The aerosol source may be a mixed liquid further containing a nicotine liquid, water, a flavorant, and the like. It is assumed that such an aerosol source is stored in the storage unit 34 in advance. The aerosol source may be a solid that does not require the storage unit 34.

[0061] The supply unit 35 includes a wick formed by twisting a fiber material such as glass fiber. The supply unit 35 is connected to the storage unit 34. The supply unit 35 is connected to the load 36, or at least part of the supply unit 35 is arranged in the vicinity of the load 36. The aerosol source permeates the wick through a capillary phenomenon, and moves to a portion where the aerosol source can be atomized by being heated by the load 36. In other words, the supply unit 35 soaks up the aerosol source from the storage unit 34, and carries it to the load 36 or the vicinity thereof. Porous ceramic may be used as the wick instead of the glass fiber.

[0062] The load 36 is, for example, a coil-shaped heater, and generates heat by letting a current flow therethrough. Also, the load 36 has, for example, positive temperature coefficient (PTC) characteristics, and its resistance value is substantially directly proportional to the generated heat temperature. The load 36 does not necessarily have to have the positive temperature coefficient characteristics, and it suffices that there is a correlation between the resistance value and the generated heat temperature. As an example, the load 36 may have negative temperature coefficient (NTC) characteristics. The load 36 may be wound around the outside of the wick, or conversely, may be configured in such a manner that the periphery of the load 36 is covered by the wick. The power supply to the load 36 is controlled by the control unit 32. When the aerosol source is supplied from the storage unit 34 to the load 36 by the supply unit 35, the aerosol source evaporates due to the heat of the load 36, causing an aerosol to be generated. When an inhaling action by the user is detected based on the output value of the inhalation sensor 33, the control unit 32 supplies power to the load 36 to generate an aerosol. When the remaining amount of the aerosol source stored in the storage unit 34 is sufficient, a sufficient amount of the aerosol source is supplied to the load 36, and the heat generated in the load 36 is transported to the aerosol source. In other words, the heat generated in the load 36 is used for raising the temperature of the aerosol source and vaporizing the aerosol source. Therefore, in this case, the temperature of the load 36 almost never exceeds a predetermined temperature designed in advance. On the other hand, when the aerosol source stored in the storage unit 34 is depleted, the amount of the aerosol source supplied to the load 36 per hour lowers. As a result, the heat generated in the load 36 is not transported to the aerosol source. In other words, the heat generated in the load 36 is not used for raising the temperature of the aerosol source and vaporizing the aerosol source. Therefore, in this case, the load 36 overheats, which in turn increases the resistance value of the load 36.

[0063] The remaining amount sensor 37 outputs sensing data for estimating the remaining amount of the aerosol source stored in the storage unit 34, based on the temperature of the load 36. For example, the remaining amount sensor 37 includes a resistor (shunt resistor) for current measurement connected in series with the load 36, and a measuring device connected in parallel with the resistor and configured to measure the voltage value of the resistor. The resistance value of the resistor is a predetermined constant value which does not substantially change with temperature. Therefore, the value of the current that flows through the resistor is obtained based on the known resistance value and the measured voltage value.

[0064] The additive component holding part 30C of the flavor inhaler 30 holds the tobacco filler 38 inside. As described above, the tobacco filler 38 includes the flavor filler of the present invention. As described above, the tobacco filler 38 may include an ordinary tobacco filler in addition to the flavor filler of the present invention. The ordinary tobacco filler can be constituted of, for example, cut tobacco and/or cut pieces obtained by cutting sheet tobacco at a predetermined width (cut pieces of sheet tobacco).

[0065] The additive component holding part 30C is provided with a ventilation hole on the mouthpiece side and a portion coupled to the aerosol source holding part 30B. Accordingly, when the user inhales from the mouthpiece, a negative pressure is generated inside the additive component holding part 30C, and the aerosol generated in the aerosol

source holding part 30B is inhaled, and components such as nicotine and flavor components are added to the aerosol inside the additive component holding part 30C and released into the oral cavity of the user.

<3. Preferred Embodiments>

[0066] Hereinafter, preferred embodiments of the present invention will be described.

[1] A flavor filler for a flavor inhaler, the flavor filler including:

porous cellulose particles each having a porosity of 40% or more; and
a flavor layer carried on an outer surface of each of the porous cellulose particles and including flavor component-containing particles.

[2] The flavor filler according to [1], wherein the porous cellulose particles each have a porosity of 50% or more, preferably 60% or more, more preferably 70% or more, and still more preferably 80% or more.
[3] The flavor filler according to [1] or [2], wherein the porous cellulose particles each have a porosity of 50 to 95%, preferably 60 to 95%, more preferably 70 to 95%, and still more preferably 80 to 95%.
[4] The flavor filler according to any one of [1] to [3], wherein each of the porous cellulose particles has a plurality of pores extending radially from a center of each of the porous cellulose particles toward the outer surface thereof.
[5] A flavor filler for a flavor inhaler, the flavor filler including:

porous cellulose particles, each of the porous cellulose particles having a plurality of pores extending radially from a center of each of the porous cellulose particles toward an outer surface thereof; and
a flavor layer carried on the outer surface of each of the porous cellulose particles and including flavor component-containing particles.

[6] The flavor filler according to [5], wherein the porous cellulose particles each have a porosity of 50% or more, preferably 60% or more, more preferably 70% or more, and still more preferably 80% or more.
[7] The flavor filler according to [5] or [6], wherein the porous cellulose particles each have a porosity of 50 to 95%, preferably 60 to 95%, more preferably 70 to 95%, and still more preferably 80 to 95%.
[8] The flavor filler according to any one of [1] to [7], wherein the flavor component-containing particles are tobacco particles.
[9] The flavor filler according to any one of [1] to [7], wherein the flavor component-containing particles are flavorant particles.
[10] The flavor filler according to any one of [1] to [9], wherein the porous cellulose particles have a bulk density of 0.1 to 0.6 g/mL, preferably 0.1 to 0.4 g/mL, and more preferably 0.1 to 0.3 g/mL.
[11] The flavor filler according to any one of [1] to [10], wherein the porous cellulose particles are spherical.
[12] The flavor filler according to any one of [1] to [11], wherein the flavor component-containing particles have an average particle diameter larger than an average pore diameter of the porous cellulose particles.
[13] The flavor filler according to any one of [1] to [12], wherein the flavor layer exists in a larger amount from a center of each of the porous cellulose particles toward the outer surface of thereof.
[14] The flavor filler according to any one of [1] to [13], wherein the porous cellulose particles have an average particle diameter of 300 to 2000 μm, and preferably 300 to 850 μm.
[15] The flavor filler according to any one of [1] to [14], wherein the porous cellulose particles have an average pore diameter of 0.3 to 1000 μm, preferably 0.3 to 200 μm, and more preferably 6 to 40 μm.
[16] The flavor filler according to any one of [1] to [15], wherein the flavor component-containing particles have an average particle diameter of 0.3 to 1000 μm, preferably 50 to 200 μm, and more preferably 60 to 80 μm.
[17] The flavor filler according to any one of [1] to [16], further including a barrier layer on the flavor layer.
[18] The flavor filler according to [17], wherein the barrier layer includes a binder but is free from a flavor-contributing substance.
[19] The flavor filler according to [17], wherein the barrier layer includes a flavor-contributing substance that provides a flavor different from a flavor of the flavor component-containing particles included in the flavor layer.
[20] The flavor filler according to [19], wherein the flavor component-containing particles are first tobacco particles, and the flavor-contributing substance is either second tobacco particles different from the first tobacco particles or flavorant particles.
[21] The flavor filler according to [19], wherein the flavor component-containing particles are first flavorant particles, and the flavor-contributing substance is either tobacco particles or second flavorant particles different from the first flavorant particles.

[22] A flavor inhaler including the flavor filler according to any one of [1] to [21].
[23] A heating-type flavor inhaler including the flavor filler according to any one of [1] to [21].

[Examples]

[1] Preparation of Flavor Filler

Flavor Filler A:

[0067] Porous cellulose particles (average particle diameter: 700 μm, porosity: 87%, bulk density: 0.2 g/mL) sold by Rengo Co., Ltd. under the trade name of Viscopearl were used as porous cellulose particles. The Viscopearl had a plurality of pores extending radially from the center of the particle toward the outer surface of the particle (see FIGS. 1 and 2) and had an average pore diameter of 0.5 μm. Tobacco particles (average particle diameter: 100 μm) were used as flavor component-containing particles. The tobacco particles were prepared from leaf scraps produced as a by-product in the process of manufacturing tobacco products, that is, leaf scraps produced in the work process in a leaf processing facility or a manufacturing facility. The tobacco particles prepared included a binder.

[0068] First, a liquid flavorant composition was prepared by mixing 45 g of the tobacco particles with 300 g of water. The porous cellulose particles were put into a particle-coating device (SPC-01, manufactured by Powrex) in an amount of 346 g, and hot air was sent into the device from the lower side to form a fluidized bed of the porous cellulose particles. The liquid flavorant composition was sprayed onto the fluidized bed, whereby the droplets of the liquid flavorant composition were attached to the surfaces of the fluidized porous cellulose particles. The droplets of the liquid flavorant composition attached to the surfaces of the porous cellulose particles were quickly dried by the hot air, whereby a flavor layer including the tobacco particles was formed on the porous cellulose particles. The composite particles thus obtained are referred to as "a flavor filler A".

Flavor Filler B:

[0069] Porous cellulose particles (average particle diameter: 300 μm, porosity: 87%, bulk density: 0.2 g/mL) sold by Rengo Co., Ltd. under the trade name of Viscopearl were used as porous cellulose particles. The Viscopearl had a plurality of pores extending radially from the center of the particle toward the outer surface of the particle (see FIGS. 1 and 2) and had an average pore diameter of 0.5 μm. Tobacco particles (average particle diameter: 100 μm) were used as flavor component-containing particles. The tobacco particles were prepared from leaf scraps produced as a by-product in the process of manufacturing tobacco products, that is, leaf scraps produced in the work process in a leaf processing facility or a manufacturing facility. The tobacco particles prepared included a binder.

[0070] The porous cellulose particles in an amount of 3389 g, the tobacco particles in an amount of 441 g, and a flavorant (a liquid flavorant containing ethanol as a main component (content: 20 to 30%)) in an amount of 345 g were put into a rocking mixer (RMHLC-600 (SJT)L, manufactured by AICHI ELECTRIC CO., LTD.), which is a dry powder mixer, and mixed together by rotation and shaking. As a result, the tobacco particles were attached to the surfaces of the porous cellulose particles, and a flavor layer including the tobacco particles was formed on the porous cellulose particles. The composite particles thus obtained are referred to as "a flavor filler B".

Flavor Filler C:

[0071] A flavor layer including tobacco particles was formed on porous cellulose particles in the same manner as in the case of the flavor filler B, except that porous cellulose particles (average particle diameter: 700 μm, porosity: 87%, bulk density: 0.2 g/mL) sold by Rengo Co., Ltd. under the trade name of Viscopearl were used as the porous cellulose particles. The Viscopearl had a plurality of pores extending radially from the center of the particle toward the outer surface of the particle (see FIGS. 1 and 2) and had an average pore diameter of 0.5 μm. The composite particles thus obtained are referred to as "a flavor filler C".

Flavor Filler D:

[0072] A flavor layer including tobacco particles was formed on porous cellulose particles in the same manner as in the case of the flavor filler B, except that porous cellulose particles (average particle diameter: 2000 μm, porosity: 93%, bulk density: 0.1 g/mL) sold by Rengo Co., Ltd. under the trade name of Viscopearl were used as the porous cellulose particles. The Viscopearl had a plurality of pores extending radially from the center of the particle toward the outer surface of the particle (see FIGS. 1 and 2) and had an average pore diameter of 105 μm. The composite particles thus obtained are referred to as "a flavor filler D".

Flavor Filler E:

[0073] A flavor layer including tobacco particles was formed on glass particles in the same manner as in the case of the flavor filler A, except that glass particles (average particle diameter: 710 to 1000 μm, porosity: 0%, bulk density: 1.5 g/mL) sold by AS ONE CORPORATION under the trade name of Glass Beads ASGB-20 were used instead of the porous cellulose particles. The composite particles thus obtained are referred to as "a flavor filler E".

Flavor Filler F:

[0074] Tobacco particles (average particle diameter: 200 μm) in an amount of 240 kg, a binder (HPC) in an amount of 16.85 kg, and an aqueous solution of potassium carbonate in an amount of 72.8 kg were mixed together using a mixer. The obtained mixture was molded using an extrusion-granulator (EM-15, manufactured by HOSOKAWA MICRON CORPORATION) to obtain granulated products having a diameter of 0.9 mm. The granulated products were dried and then classified into sizes of 300 to 840 μm to obtain flavor granules.

[0075] The flavor granules thus obtained are referred to as "a flavor filler F". The flavor filler F had a porosity of 30% and a bulk density of 0.55 g/mL.

[2] Evaluation Method

[0076] The additive component holding part 30C (i.e., capsule) of the heating-type flavor inhaler 30 shown in FIGS. 4 to 6 was filled with each of the flavor fillers A to F, whereby flavor inhalers A to F were produced. The filling amounts (mass) of the flavor fillers A to F were adjusted so that the filling rates (volumes) of the flavor fillers A to F in the capsule would be approximately the same. The filling amounts of the flavor fillers A to F are shown in Table 1.

[0077] The heating-type flavor inhaler was inhaled up to 50 puffs by an automatic inhaler, and the nicotine content in the smoke was measured for each puff. The nicotine content measured for each puff was counted up to give "a nicotine delivery amount (mg)". Prior to inhalation, the nicotine content (mg) in the flavor filler included in a single capsule was measured by GC-MS.

[0078] The nicotine release efficiency (%) was calculated by the following formula:

$$\text{Nicotine release efficiency (\%)} = (\text{nicotine delivery amount} / \text{nicotine content in flavor filler}) \times 100$$

[0079] In the working examples, nicotine, which is one of the flavor components, was used as an index to examine the amounts of the flavor components released from the flavor fillers.

[3] Evaluation Results

[0080] The results of the nicotine release efficiency are shown in the table below.

Table 1

Flavor inhaler	Filling amount of flavor filler (mg)	Nicotine content in flavor filler (mg)	Nicotine delivery amount (mg)	Nicotine release efficiency (%)
A	110	0.08	0.06	72
B	110	0.28	0.19	67
C	110	0.28	0.145	51
D	55	0.14	0.108	77
E	770	0.32	0.06	19
F	310	6.23	0.53	8.5

[0081] The results shown in Table 1 demonstrate that the flavor inhalers A to D have a higher nicotine release efficiency than the flavor inhaler E and the flavor inhaler F.

[0082] The reason why the flavor fillers A to D achieved a high nicotine release efficiency will be discussed below.

[0083] It is considered that the flavor inhalers A to D allowed the flavor components included in the tobacco particles to be easily released to the extra-particle space since many of the tobacco particles were carried on the outer surface

of the respective porous cellulose particles due to the relationship between the particle diameter of the tobacco particles and the pore diameter of the porous cellulose particles. It is also considered that since the porous cellulose particles of the flavor inhalers A to D had a plurality of pores (i.e., voids) inside the particles, and these voids were able to cause a flow of air from the extra-particle space toward the voids inside the particles, this flow of air increased the opportunities to release the flavor components from the tobacco particles. In particular, it is considered that since each of the porous cellulose particles had a plurality of pores (i.e., voids) extending radially from its center toward its outer surface, these pores served as air flow paths and efficiently caused a flow of air from the extra-particle space toward the voids inside the particles.

[0084] On the other hand, it is considered that since the glass particles of the flavor inhaler E did not have a plurality of pores (i.e., voids) inside the particles, the glass particles could not cause a flow of air from the extra-particle space toward the inside of the particles, making it difficult to release the flavor components even from the tobacco particles present on the surfaces of the glass particles.

[0085] It is considered that since the flavor inhaler F included, as a flavor filler, flavor granules obtained by extrusion molding of a mixture containing tobacco particles, the flavor inhaler F could not release the flavor components from the tobacco particles present inside the granules. It is also considered that since the flavor granules of the flavor inhaler F did not have as many voids inside the granules as the porous cellulose particles did, the flavor granules could not cause a flow of air from the extra-granule space toward the inside of the granules as much as the porous cellulose particles did, making it difficult to release the flavor components even from the tobacco particles present on the surfaces of the flavor granules.

REFERENCE SIGNS LIST

[0086]

1. Porous cellulose particles
1a. Pore
1b. Outer surface
2. Flavor layer
10. Flavor filler
30. Heating-type flavor inhaler
30A. Main body
30B. Aerosol source holding part
30C. Additive component holding part
31. Power supply
32. Control unit
33. Inhalation sensor
34. Storage unit
35. Supply unit
36. Load
37. Remaining amount sensor
38. Tobacco filler

Claims

1. A flavor filler for a flavor inhaler comprising:

porous cellulose particles each having a porosity of 40% or more; and
a flavor layer carried on an outer surface of each of the porous cellulose particles and including flavor component-containing particles.

2. The flavor filler according to claim 1, wherein the flavor component-containing particles are tobacco particles.

3. The flavor filler according to claim 1, wherein the flavor component-containing particles are flavorant particles.

4. The flavor filler according to any one of claims 1 to 3, wherein the porous cellulose particles each have a porosity of 50% or more.

5. The flavor filler according to any one of claims 1 to 4, wherein each of the porous cellulose particles has a plurality of pores extending radially from a center of each of the porous cellulose particles toward the outer surface thereof.

6. The flavor filler according to any one of claims 1 to 5, wherein the flavor component-containing particles have an average particle diameter larger than an average pore diameter of the porous cellulose particles.

7. The flavor filler according to any one of claims 1 to 6, wherein the flavor layer exists in a larger amount from a center of each of the porous cellulose particles toward the outer surface thereof.

8. The flavor filler according to any one of claims 1 to 7, wherein the porous cellulose particles have an average particle diameter of 300 to 2000 μm.

9. The flavor filler according to any one of claims 1 to 8, wherein the porous cellulose particles have an average pore diameter of 0.3 to 1000 μm.

10. The flavor filler according to any one of claims 1 to 9, wherein the flavor component-containing particles have an average particle diameter of 0.3 to 1000 μm.

11. The flavor filler according to any one of claims 1 to 10, further comprising a barrier layer on the flavor layer.

12. The flavor filler according to claim 11, wherein the barrier layer includes a binder but is free from a flavor-contributing substance.

13. The flavor filler according to claim 11, wherein the barrier layer includes a flavor-contributing substance that provides a flavor different from a flavor of the flavor component-containing particles included in the flavor layer.

14. The flavor filler according to claim 13, wherein the flavor component-containing particles are first tobacco particles, and the flavor-contributing substance is either second tobacco particles different from the first tobacco particles or flavorant particles.

15. The flavor filler according to claim 13, wherein the flavor component-containing particles are first flavorant particles, and the flavor-contributing substance is either tobacco particles or second flavorant particles different from the first flavorant particles.

16. A flavor inhaler comprising the flavor filler according to any one of claims 1 to 15.

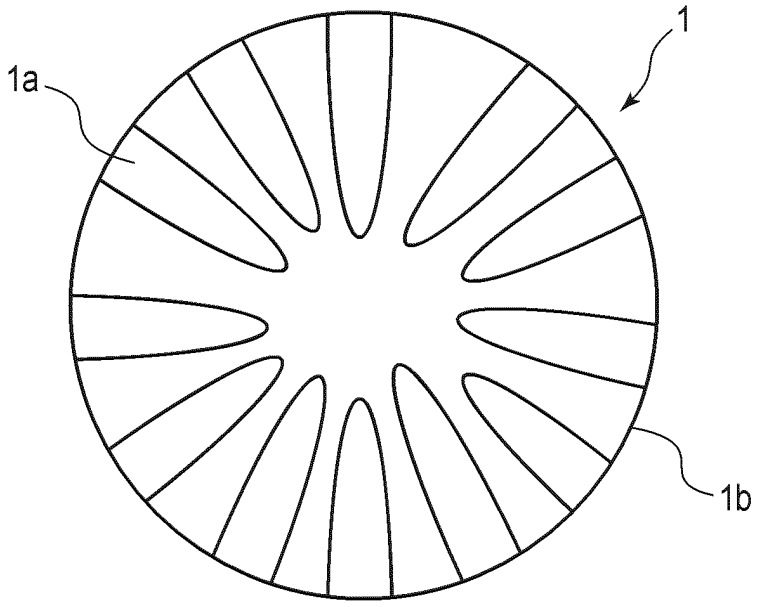

FIG. 1

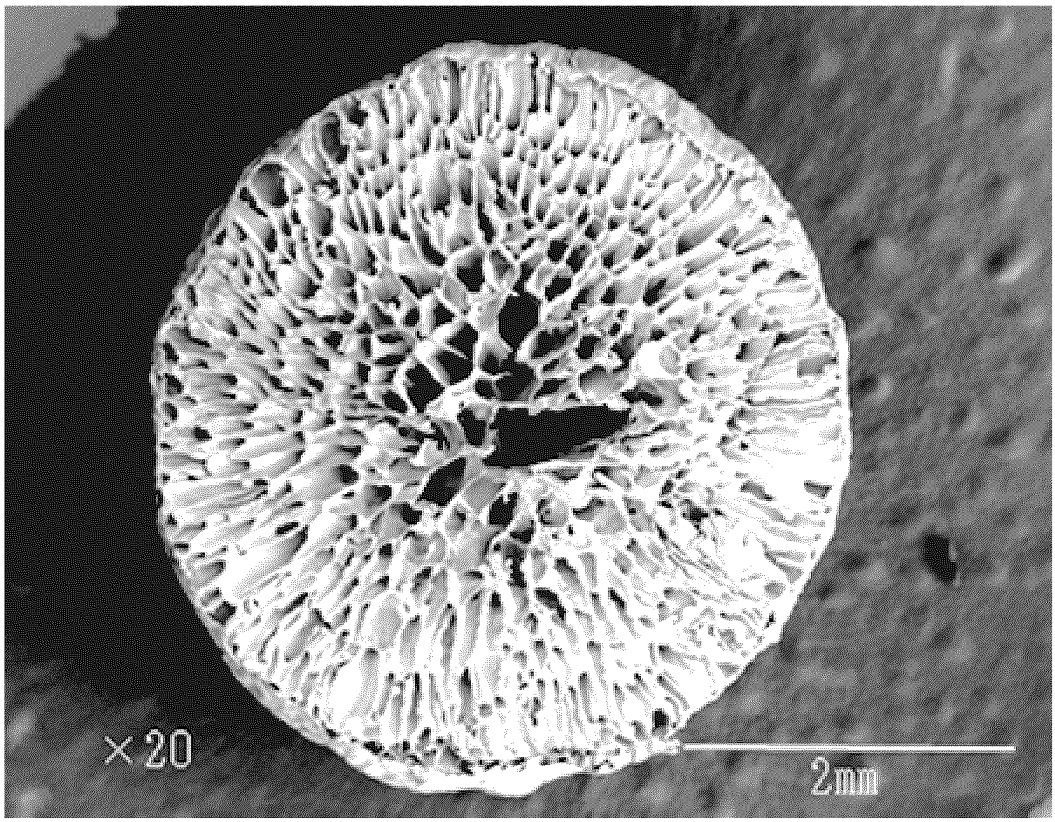

FIG. 2

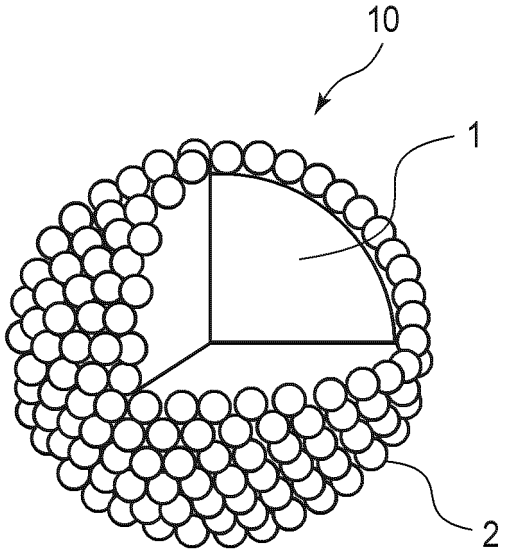

FIG. 3

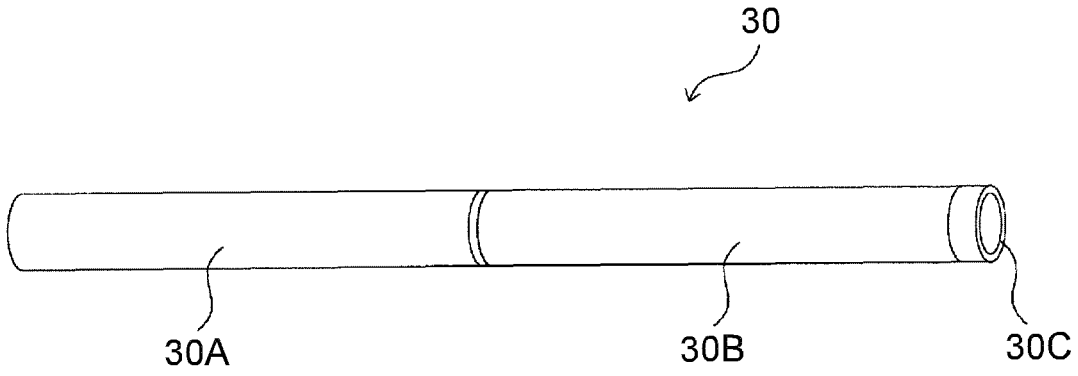

FIG. 4

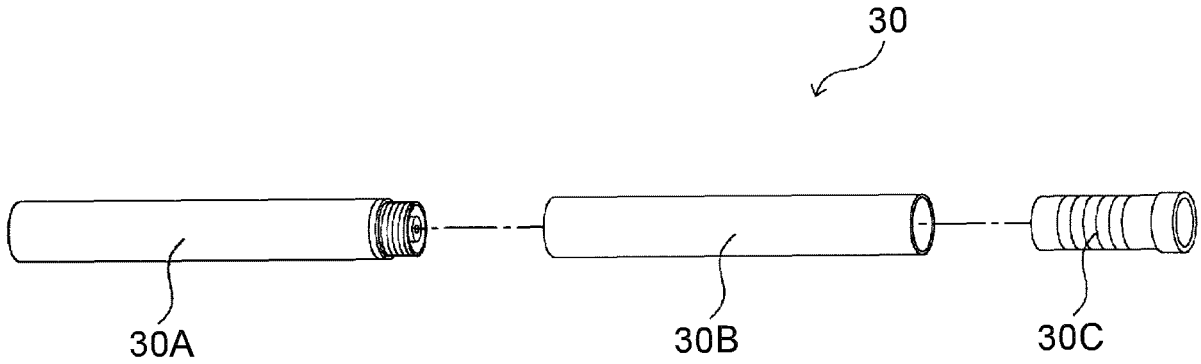

FIG. 5

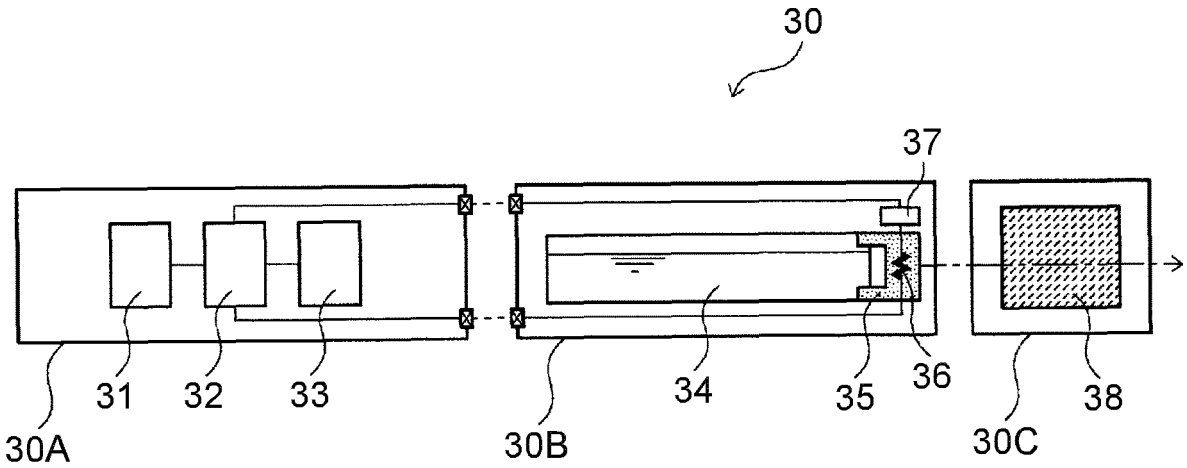

FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2021/036117

A. CLASSIFICATION OF SUBJECT MATTER

A24B 15/16(2020.01)i; ***A24B 15/28***(2006.01)i; ***A24F 40/42***(2020.01)i
FI: A24B15/16; A24B15/28; A24F40/42

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; A24B15/28; A24F40/42

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

Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2021
Registered utility model specifications of Japan 1996-2021
Published registered utility model applications of Japan 1994-2021

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.
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A		6, 13-15
Y	JP 2013-189604 A (DAINIPPON PRINTING CO., LTD.) 26 September 2013 (2013-09-26) paragraphs [0015], [0028]	1-5, 7-12, 16
Y	JP 2001-323095 A (RENGO CO., LTD.) 20 November 2001 (2001-11-20) paragraphs [0019]-[0043], fig. 1, 2	5, 7-12
A	JP 2008-156791 A (RENGO CO., LTD.) 10 July 2008 (2008-07-10) entire text, all drawings	1-16
A	JP 2019-528716 A (BRITISH AMERICAN TOBACCO (INVESTMENTS) LTD.) 17 October 2019 (2019-10-17) entire text, all drawings	1-16

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

* Special categories of cited documents:
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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
16 November 2021	**30 November 2021**
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.

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2021/036117

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- JP H6157772 B **[0022]**
- JP 2001323095 A **[0022]**