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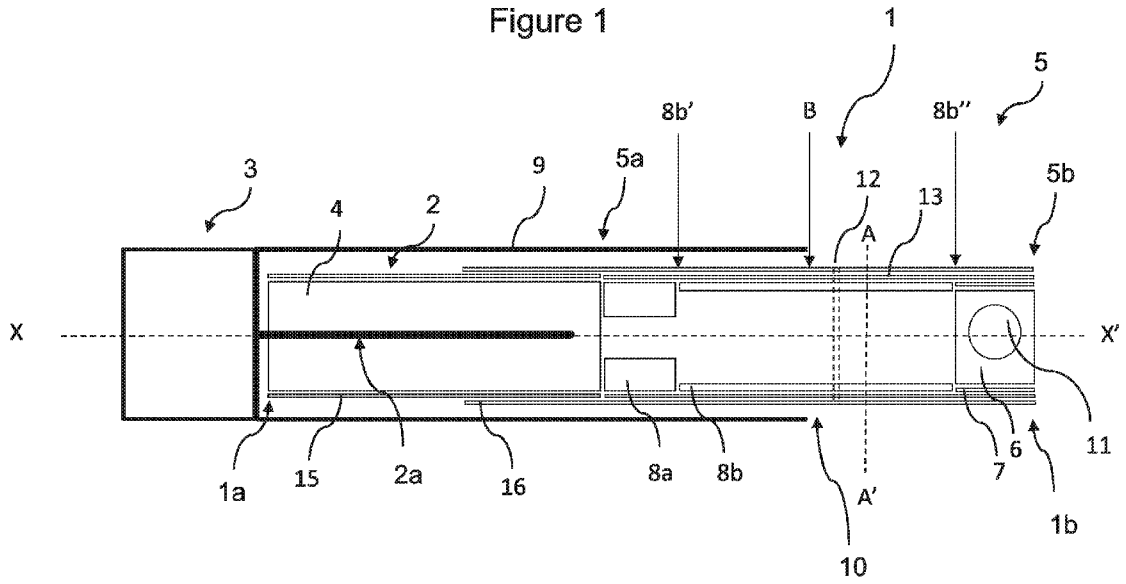
(54) Title: ARTICLE FOR USE IN A NON-COMBUSTIBLE AEROSOL PROVISION SYSTEM

Figure 1



(57) Abstract: An article for use in or as a non-combustible aerosol provision system includes an aerosol -generating material section comprising aerosol-generating material and at least 5% aerosol-former material by weight of the aerosol-generating material. The article also includes a first tubular element immediately downstream of the aerosol-generating material section, the first tubular element defining a first hollow cavity and comprising a first tubular wall, and a second tubular element immediately downstream of the first tubular element, the second tubular element comprising a second tubular wall having a wall thickness of less than about 320 μm and the second tubular element having an axial length of greater than about 15mm.

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Article for use in a non-combustible aerosol provision system

Technical field

The present invention relates to an article for use in a non-combustible aerosol provision system and a non-combustible aerosol provision system.

Background

Certain tobacco industry products produce an aerosol during use, which is inhaled by a user. For example, tobacco heating devices heat an aerosol generating substrate such as tobacco to form an aerosol by heating, but not burning, the substrate. Such tobacco industry products commonly include mouthpieces through which the aerosol passes to reach the user's mouth.

Summary

In accordance with embodiments described herein, in a first aspect there is provided an article for use in or as a non-combustible aerosol provision system, the article comprising: an aerosol-generating material section comprising aerosol-generating material and at least 5% aerosol-former material by weight of the aerosol-generating material;

a first tubular element immediately downstream of the aerosol-generating material section, the first tubular element defining a first hollow cavity and comprising a first tubular wall; and

a second tubular element immediately downstream of the first tubular element, the second tubular element defining a second hollow cavity and comprising a second tubular wall having a wall thickness of less than about 320 μm and the second tubular element having an axial length of greater than about 15mm.

The ratio of the thickness of the first tubular wall to the internal radius of the first hollow cavity can be between about 0.6 and about 1.1.

The ratio of the volume of the second hollow cavity to the volume of the first hollow cavity can be between about 6.5 and about 8.

The article can further comprise a mouth end component at the downstream end of the article.

The second tubular wall can comprise at least first and second overlapping paper layers each extending around substantially the whole circumference of the second tubular element. The at least first and second overlapping paper layers can each comprise a thickness of between 30 and 150 μm and/or the at least first and second overlapping paper layers can each comprise a basis weight of between 25 and 130 gsm. Alternatively or in addition, the at least first and second overlapping paper layers can be connected to each other by a layer of adhesive and/or the first and second overlapping paper layers can each be non-porous.

The first tubular element can have an axial length between about 5mm and about 14mm.

The aerosol-generating material section can be in the form of a rod having an axial length which is less than or equal to the axial length of the second tubular element.

The aerosol-generating material section can be in the form of a rod having an axial length which is between 50% and 80% of the axial length of the second tubular element.

The average weight per mm of axial length of the article can be less than about 14.5 mg/mm or less than about 14 mg/mm. The non-tobacco weight of the article can be between 45% and 55% of the overall article weight, for instance between 48% and 53%.

The second tubular wall can have a thickness of between about 160μm and about 250 μm, and/or the second tubular wall can have a thickness which is less than about 15% or less than about 10% of the internal radius of the second hollow cavity.

The second tubular element can define a second hollow cavity having a volume of at least about 520 mm^3.

The second tubular element can have an axial length of greater than about 16mm or greater than about 16.5mm and/or the second tubular element can have an axial length which is at least 1.5 or at least 2 times greater than the axial length of the first tubular element.

The aerosol-generating material can comprise a plurality of strands or strips of aerosol-generating material.

The strands or strips of aerosol-generating material can be arranged such that their longitudinal dimension is substantially parallel with the longitudinal axis of the article.

The aerosol-generating material can comprise reconstituted sheet tobacco material. Alternatively or in addition, aerosol-generating material can comprise an amorphous solid, such as the amorphous solid materials described herein. The amorphous solid can comprise a dried gel. The amorphous solid can be in sheet form, such as strands or strips of amorphous solid.

The combined volumes of the first and second hollow cavities can be at least about 580 mm^3, or at least about 620 mm^3 or at least about 650 mm^3.

The second tubular element can define a second hollow cavity and ventilation can be provided into the second hollow cavity through the wall of the second tubular element. The level of ventilation can be between about 10% and about 60%. In some examples, the level of ventilation is between 15% and 35%. In some examples, the level of ventilation is between 40% and 60%.

In accordance with embodiments described herein, in a second aspect there is provided a non-combustible aerosol provision system comprising a non-combustible aerosol provision device and an article according to the first aspect above.

The non-combustible aerosol provision device can comprise a heating element configured for insertion into the aerosol-generating material of the article.

The non-combustible aerosol provision device can comprise a housing and an aperture in the housing into which the article is inserted in use, and wherein the system is configured such that the second tubular element extends partially within and partially outside the housing when the article is fully inserted into the non-combustible aerosol provision device.

The system can be configured such that the second tubular element extends at least about 5mm within and at least about 8mm outside the housing when the article is fully inserted into the non-combustible aerosol provision device.

The article can comprise one or more ventilation apertures extending through said second tubular element at a location in the second tubular element which is outside the housing when the article is fully inserted into the non-combustible aerosol provision device.

Brief Description of the Drawings

Embodiments of the invention will now be described, by way of example only, with reference to accompanying drawings, in which:

Figure 1 is a side-on cross sectional view of an article for use with a non-combustible aerosol provision device;

Figure 2 is a cross sectional view of the article of Figure 1 taken along line A-A' shown in Figure 1; and

Figure 3 is a simplified schematic illustration of the components within the housing of the non-combustible aerosol provision device shown in Figure 2.

Detailed description

In the figures described herein, like reference numerals are used to illustrate equivalent features, articles or components. The terms 'upstream' and 'downstream' used herein are relative terms defined in relation to the direction of mainstream aerosol drawn through an article or device in use.

Figure 1 is a side-on cross sectional view of an article 1 for use in an aerosol delivery system, inserted into a receiving portion 2, in the present case a recess, of a non-combustible aerosol provision device 3. Figure 2 is a cross sectional view of the article 1 of Figure 1 taken along line A-A' shown in Figure 1.

The article 1 comprises an aerosol-generating section 4 and a downstream section 5 downstream of the aerosol-generating section 4. The downstream section 5 can be or include a mouthpiece designed to be inserted into a user's mouth in use, or alternatively may be arranged to work with a separate mouthpiece such as one provided as a separate attachment to the downstream section 5 or as part of the device 3. The downstream section 5 has an upstream end 5a and a downstream end 5b. In the

present example, the aerosol-generating section 4 comprises a source of aerosol-generating material in the form of a cylindrical rod of aerosol-generating material. In other examples, the aerosol-generating section 4 may comprise a cavity for receiving a source of aerosol-generating material. The aerosol-generating material can include at least 5% aerosol-former material by weight of the aerosol-generating material, calculated on a dry weight basis, the aerosol-former material being, for instance, one of the aerosol-former materials described herein.

In the present example, the receiving portion 2 is a recess in the device 3 including a pin-shaped heater 2a which penetrates the aerosol generating section 4. The pin-shaped heater 2a is resistively heated in the present example, although may alternatively be formed of a heating material as described herein which can be inductively heated, such as a susceptor. In other examples, the aerosol generating section 4 of the article 1 can include a heating material, for instance one which can be inductively heated, such as a susceptor.

The mouthpiece or downstream portion 5 includes a first tubular element 8a immediately downstream of the aerosol-generating material section 4, the first tubular element 8a defining a first hollow cavity. In the present example, the first tubular element 8a is in an abutting relationship with the aerosol-generating material. The first tubular element 8a has a first tubular wall. The mouthpiece or downstream portion 5 also includes a second tubular element 8b immediately downstream of the first tubular element 8a. In the present example, the second tubular element 8b is in an abutting relationship with the first tubular element 8a. The second tubular element 8b has a second tubular wall having a wall thickness of less than about 320 μm. The second tubular element 8b has an axial length of greater than about 15 mm, for instance between about 15 mm and about 25 mm. In the present example, a body of material 6 is provided at the downstream end 5b of the downstream section 5. The first and second tubular elements 8a, 8b, and the body of material 6, in the present example, each define a cylindrical outer shape and are arranged end-to-end on a common axis. The first and second tubular elements 8a, 8b, aerosol-generating material section 4 and body of material 6 have approximately the same outer diameter.

The first and second tubular elements 8a, 8b together define a chamber into which aerosol formed in the aerosol-generating section is drawn and expands and cools. The provision of discrete first and second tubular elements 8a, 8b enables these

components to be designed to achieve different functional effects. For instance, the first tubular element 8a can be arranged to provide functions such as helping to reduce movement of the aerosol-generating material in use, as the article 1 is inserted into the recess 2 and the pin heater 2a penetrates the aerosol-generating material section 4. For this purpose, the first tubular element 8a can have a wall thickness of, for instance, between 1mm and 3.5mm, or between 1.5mm and 2.5mm. Alternatively or additionally, the first tubular element 8a can be arranged to help with providing rigidity to the article 1. Alternatively or additionally, the first tubular element 8a can be arranged to encourage aerosol to flow predominantly through an axial region of the second tubular element 8b, for instance to assist with aerosol formation. The second tubular element 8b can be designed to define a relatively large chamber as compared to the first tubular element 8a, providing greater space into which the aerosol formed in the aerosol-generating section 4 can be drawn to expand and cool. In addition, for a given weight of the second tubular element 8b, providing a relatively thin wall thickness of less than 320 μm enables material to be concentrated in the outer region of the second tubular element 8b, which can provide a higher bending stiffness as compared to components with thicker walls and the same weight.

In one example, an article as described with reference to Figure 1 has the specific features set out in table 1.0 below.

Parameter	**Value**
Product circumference (mm)	22.1
Aerosol-generating material section length (mm)	12
First tubular element length (mm)	7
First tubular element wall thickness (mm)	1.6
First tubular element cavity diameter (mm)	3.9
Second tubular element length (mm)	17
Second tubular element wall thickness (mm)	0.2
Second tubular element cavity diameter (mm)	6.6
Body of material length (mm)	12
Article insertion depth in device (mm from upstream end)	25
Location of ventilation apertures (mm from downstream end)	21

Table 1.0

Although in the present case, the body of material 6 is provided at the mouth or downstream end 1b of the article 1, in other examples a further component can be provided downstream of the body of material 6. For instance, a further body of material can be provided.

The aerosol-generating material may comprise a plurality of strands or strips of aerosol-generating material. For example, the aerosol-generating material may comprise a plurality of strands or strips of an aerosolisable material and/or a plurality of strands or strips of an amorphous solid, as described hereinbelow. In some embodiments, the aerosol-generating material consists of a plurality of strands or strips of an aerosolisable material. In other embodiments, the aerosol-generating material consists of a single strand, strip or sheet of an aerosolisable material. The strands or strips of aerosol-generating material can be arranged such that their longitudinal dimension is substantially parallel with the longitudinal axis of the article. The aerosol-generating material can be in the form of reconstituted sheet tobacco material, such as bandcast reconstituted tobacco.

In the present example, the first tubular element has an axial length of about 7mm, but in other examples the first tubular element can have an axial length between about 5mm and about 14mm. In the present example, the first tubular element 8a has a wall thickness of about 1.6mm and an inner radius of the hollow cavity defined by the first tubular element 8a is about 1.95 mm. This results in a ratio between the thickness of the first tubular wall to the internal radius of the first hollow cavity of about 0.82. In other examples, the ratio of the thickness of the first tubular wall to the internal radius of the first hollow cavity can be between about 0.6 and about 1.1, or between about 0.7 and about 0.9.

In the present example, the volume of the second hollow cavity defined by the second tubular element 8b is about 588 mm^3. The volume of the first hollow cavity defined by the first tubular element 8a is about 84 mm^3. The ratio of the volume of the second hollow cavity to the volume of the first hollow cavity is therefore about 7 times. The ratio of the volume of the second hollow cavity to the volume of the first hollow cavity can alternatively be between about 6.5 and about 8. This provides an arrangement in which aerosol can expand from a relatively small cavity within the first tubular element 8a into the much larger cavity of the second tubular element 8b. The second tubular

element 8b can define a second hollow cavity having a volume of at least about 520 mm^3. The combined volumes of the first and second hollow cavities can, for instance, be at least about 580 mm^3, or at least about 620 mm^3 or at least about 650 mm^3.

The second tubular wall can comprise at least first and second overlapping paper layers each extending around substantially the whole circumference of the second tubular element 8b. The at least first and second overlapping paper layers can each have a thickness of between 30 and 150 μm. Alternatively or in addition, the at least first and second overlapping paper layers can each have a basis weight of between 25 and 130 gsm. The at least first and second overlapping paper layers can be connected to each other by a layer of adhesive. The first and second overlapping paper layers can each be non-porous.

The aerosol-generating material section 4 can be in the form of a rod having an axial length which is less than or equal to the axial length of the second tubular element 8b. For instance, the aerosol-generating material section 4 can be in the form of a rod having an axial length which is between 50% and 80% of the axial length of the second tubular element 8b. These arrangements result in an article with a relatively large cavity size defined by the second tubular element 8b as compared to the volume occupied by the aerosol-generating material. Such a cavity can allow for improved expansion of the volume of aerosol passing though the article 1 and better aerosol formation. Preferably, ventilation apertures are provided into the wall of the second tubular element 8b such that cool air enters the cavity defined by the second tubular element 8b in use, further enhancing aerosol formation via condensation of aerosol components within the cavity. The second tubular element 8b can have an axial length of greater than about 16mm or greater than about 16.5mm. For instance, in some examples, the second tubular element 8b can have an axial length which is at least 1.5 or at least 2 times greater than the axial length of the first tubular element 8a.

Use of a second tubular element 8b immediately downstream of the first tubular element 8a, which has a wall thickness of less than about 320 μm and an axial length of greater than about 15mm, can result in an article which has an overall weight which is lower than previous designs. In the present example, the aerosol-generating material section 4 has a weight of about 304 mg and the non-aerosol-generating material components of the article 1 have a combined weight of about 320 mg. The total weight is therefore 624 grams for an article 1 with an overall length of 48mm, resulting in an

average weight of 13 mg/mm. In some examples, the average weight per mm of axial length of the article can be less than about 14.5 mg/mm or less than about 14 mg/mm. The non-aerosol-generating material weight of the article can be between 45% and 55% of the overall article weight, for instance between 48% and 53%.

The tubular wall of the second tubular element 8b, in the present example, is formed from first and second overlapping paper sheets, resulting in an overall thickness of about 200μm. In alternative examples, the second tubular wall can have a thickness of between about 160μm and about 250 μm. The second hollow cavity defined by the second tubular element has a diameter of about 6.6mm and a radius 'r' shown in Figure 2 of about 3.3mm. The second tubular wall can, for instance, have a thickness which is less than about 15% or less than about 10% of the internal radius 'r' of the second hollow cavity.

As shown in Figure 1, the non-combustible aerosol provision device 3 and the article 1 together form a non-combustible aerosol provision system. The non-combustible aerosol provision device 3 includes a heating element 2a configured for insertion into the aerosol-generating material of the article 1. In the present example, the heating element is a pin-shaped heater 2a which penetrates the aerosol-generating material.

The non-combustible aerosol provision device 3 includes a housing 9 and an aperture 10 in the housing 9 into which the article 1 is inserted in use. The system is configured such that the second tubular element 8b extends partially within and partially outside the housing 9 when the article 1 is fully inserted into the non-combustible aerosol provision device 3, as shown in Figure 1. The system can be configured such that the second tubular element 8b extends at least about 5mm within and at least about 8mm outside the housing 9 when the article 1 is fully inserted into the non-combustible aerosol provision device 3. In the present example, the article 1 has an aerosol-generating material section 4 having a length of about 12mm, a first tubular element 8a having a length of about 7mm and a second tubular element 8b having a length of about 17mm. The article 1 is inserted into the device 3 to an insertion depth of about 25mm, as shown by arrow 'B' in Figure 1. In the present case, about 6mm of the second tubular element 8b, between the upstream end 8b' of the second tubular element and the location 'B' on the article 1 aligned with the entrance to the recess 2 in the device 3, extends within the device 3. About 11mm of the second tubular element 8b, between the location 'B' on the article 1 aligned with the entrance to the recess 2 in the device 3

and the downstream end 8b" of the second tubular element 8b, extends outside the device 3 when the article 1 is fully inserted into the device 3.

The article 1 includes one or more ventilation apertures 12 extending through the second tubular element 8b at a location in the second tubular element 8b which is outside the housing 9 when the article 1 is fully inserted into the non-combustible aerosol provision device 3. The one or more ventilation apertures 12 can be provided as one or more rows of apertures, such as laser or mechanically formed perforations, circumscribing the article 1. In some examples, the level of ventilation is between about 10% and about 60%, for instance between about 20% and about 55% of the mainstream aerosol.

In the present example, the cylindrical rod of aerosol-generating material comprises a plurality of strands and/or strips of aerosol-generating material, and is circumscribed by a wrapper 15. The wrapper 15 may be a moisture impermeable wrapper.

The plurality of strands or strips of aerosol-generating material may be aligned within the aerosol-generating section 4 such that their longitudinal dimension is in parallel alignment with the longitudinal axis, X-X' of the article 1. Alternatively, the strands or strips may generally be arranged such that their longitudinal dimension aligned is transverse to the longitudinal axis of the article 1.

A majority of the strands or strips may be arranged such that their longitudinal dimensions are in parallel alignment with the longitudinal axis of the article 1. In some embodiments, about 95% to about 100% of the plurality of strands or strips are arranged such that their longitudinal dimension is in parallel alignment with the longitudinal axis of the article 1. In some embodiments, substantially all of the strands or strips are arranged in the aerosol-generating section such that their longitudinal dimension is in parallel alignment with the longitudinal axis of the aerosol-generating section of the article 1.

Where the majority of the strands or strips are arranged in the aerosol-generating section 4 such that their longitudinal axis is parallel with the longitudinal axis of the aerosol-generating section 4 of the article 1, the force required to insert an aerosol generator, such as the heating element 2a in this case, into the aerosol-generating material can be relatively low. This can result in an article 1 which is easier to use.

In the present example, the rod of aerosol-generating material has a circumference of about 22.1 mm. In alternative embodiments, the rod of aerosol-generating material may have any suitable circumference, for example between about 20 mm and about 26 mm.

The first tubular element 8a is formed from filamentary tow, in the present example plasticised cellulose acetate tow. Other constructions can be used, such as a tubular element 8a formed having inner and outer paper tubes sandwiching a crimped paper sheet material. The wall of the first tubular element can be relatively non-porous, such that at least 80% of the aerosol generated by the aerosol generating material passes longitudinally through the hollow channels through the tube rather than through the wall material itself. For instance, at least 92% or at least 95% of the aerosol generated by the aerosol generating material can pass longitudinally through the first hollow cavity.

The filamentary tow forming the first tubular element 8a preferably has a total denier of between 25,000 and 45,000, preferably between 35,000 and 45,000. Preferably the cross-sectional shape of the filaments of tow are 'Y' shaped, although in other embodiments other shapes such as 'X' shaped filaments can be used.

The filamentary tow forming the first tubular element 8a preferably has a denier per filament between 4 and 10, more preferably between 4 and 9. In one example, the filamentary tow forming the first tubular element 8a has an 8Y40,000 tow formed from cellulose acetate and comprising 18% plasticiser, for instance triacetin.

Preferably, the density of the material forming the first tubular element 8a is at least about 0.20 grams per cubic centimetre (g/cc), more preferably at least about 0.25 g/cc. Preferably, the density of the material forming the first tubular element 8a is less than about 0.80 grams per cubic centimetre (g/cc), more preferably less than 0.6 g/cc. In some embodiments, the density of the material forming the first tubular element 8a is between 0.20 and 0.8 g/cc, more preferably between 0.3 and 0.6 g/cc, or between 0.4 g/cc and 0.6 g/cc or about 0.5 g/cc. These densities have been found to provide a good balance between improved firmness afforded by denser material and minimising the overall weight of the article. For the purposes of the present invention, the "density" of the material forming the first tubular element 8a refers to the density of any

filamentary tow or other material forming the element with any plasticiser incorporated. The density may be determined by dividing the total weight of the material forming the first tubular element 8a by the total volume of the material forming the first tubular element 8a, wherein the total volume can be calculated using appropriate measurements of the material forming the first tubular element 8a taken, for example, using callipers. Where necessary, the appropriate dimensions may be measured using a microscope.

The first and second tubular elements 8a, 8b can be configured to provide a temperature differential of at least 40 degrees Celsius between a heated volatilised component entering a first, upstream end of the first and second tubular elements 8a, 8b and a heated volatilised component exiting a second, downstream end of the first and second tubular elements 8a, 8b. The first and second tubular elements 8a, 8b are preferably configured to provide a temperature differential of at least 60 degrees Celsius, preferably at least 80 degrees Celsius and more preferably at least 100 degrees Celsius between a heated volatilised component entering a first, upstream end of the first and second tubular elements 8a, 8b and a heated volatilised component exiting a second, downstream end of the first and second tubular elements 8a, 8b. This temperature differential across the length of the first and second tubular elements 8a, 8b protects the temperature sensitive body of material 6 from the high temperatures of the aerosol-generating material when it is heated.

The aerosol-generating section 4 may exhibit a pressure drop of from about 15 to about 40 mm H_2O. In some embodiments, the aerosol-generating section 4 exhibits a pressure drop across the aerosol-generating section 4 of from about 15 to about 30 mm H_2O.

The aerosol-generating material may have a packing density or bulk density of between about 400 mg/cm^3 and about 900 mg/cm^3 within the aerosol-generating section. A packing density higher than this may make it difficult to insert the aerosol-generator of the aerosol provision device into the aerosol-generating material and increase the pressure drop. A packing density lower than 400 mg/cm^3 may reduce the rigidity of the article. Furthermore, if the packing density is too low, the aerosol-generating material may not effectively grip the aerosol-generator of the aerosol provision device.

At least about 70% of a volume of the aerosol-generating section is filled with the aerosol-generating material. In some embodiments, from about 75% to about 85% of the volume of the cavity is filled with the aerosol-generating material.

In the present embodiment, the moisture impermeable wrapper 15 which circumscribes the rod of aerosol-generating material comprises aluminium foil. In other embodiments, the wrapper 15 comprises a paper wrapper, optionally comprising a barrier coating to make the material of the wrapper substantially moisture impermeable. Where the wrapper comprises paper or a paper backing, i.e. a cellulose based material, the wrapper can have a basis weight greater than about 30 gsm. For example, the wrapper can have a basis weight in the range from about 40 gsm to about 70 gsm.

In the present example, the moisture impermeable wrapper 15 is also substantially impermeable to air. The wrapper 15 preferably has a permeability of less than 100 Coresta Units, more preferably less than 60 Coresta Units. It has been found that low permeability wrappers, for instance having a permeability of less than 100 Coresta Units, more preferably less than 60 Coresta Units, result in an improvement in the aerosol formation in the aerosol-generating material. The permeability of the wrapper 15 can be measured in accordance with ISO 2965:2009 concerning the determination of air permeability for materials used as cigarette papers, filter plug wrap and filter joining paper.

The body of material 6 is wrapped in a first plug wrap 7. A second plug wrap 13 is provided to connect the body of material 6, first tubular element 8a and second tubular element 8b. Preferably, the first and second plug wraps 7, 13 each have a basis weight of less than 50 gsm, more preferably between about 20 gsm and 40 gsm. Preferably, the first and second plug wraps 7, 13 each have a thickness of between 30 μm and 60 μm, more preferably between 35 μm and 45 μm. Preferably, the first and second plug wraps 7, 13 are non-porous plug wraps, for instance having a permeability of less than 100 Coresta units, for instance less than 50 Coresta units. However, in other embodiments, the first and/or second plug wrap 7, 13 can be a porous plug wrap, for instance having a permeability of greater than 200 Coresta Units.

Preferably, the length of the body of material 6 is less than about 15 mm. More preferably, the length of the body of material 6 is less than about 14 mm. In addition, or

as an alternative, the length of the body of material 6 is at least about 5 mm. Preferably, the length of the body of material 6 is at least about 8 mm. In some preferred embodiments, the length of the body of material 6 is from about 5 mm to about 15 mm, more preferably from about 8 mm to about 14 mm, even more preferably from about 10 mm to about 14 mm, most preferably about 10 mm, 11 mm or 12 mm. In the present example, the length of the body of material 6 is 12 mm.

In the present example, the body of material 6 is formed from filamentary tow. In the present example, the tow used in the body of material 6 has a denier per filament (d.p.f.) of 5 and a total denier of 25,000. In the present example, the tow comprises plasticised cellulose acetate tow. The plasticiser used in the tow comprises about 9% by weight of the tow. In the present example, the plasticiser is triacetin. In other examples, different materials can be used to form the body of material 6. For instance, rather than tow, the body 6 can be formed from paper, for instance in a similar way to paper filters known for use in cigarettes. For instance, the paper, or other cellulose-based material, can be provided as one or more portions of sheet material which is folded and/or crimped to form body 6. The sheet material can have a basis weight of from 15gsm to 60gsm, for instance between 20 and 50 gsm. The sheet material can, for instance, have a basis weight in any of the ranges between 15 and 25 gsm, between 25 and 30 gsm, between 30 and 40 gsm, between 40 and 45 gsm and between 45 and 50 gsm. Additionally or alternatively, the sheet material can have a width of between 50mm and 200mm, for instance between 60mm and 150mm, or between 80mm and 150mm. For instance, the sheet material can have a basis weight of between 20 and 50 gsm and a width between 80mm and 150mm. This can, for instance, enable the cellulose-based bodies to have appropriate pressure drops for an article having dimensions as described herein.

Alternatively, the body 6 can be formed from tows other than cellulose acetate, for instance polylactic acid (PLA), other materials described herein for filamentary tow or similar materials. The tow is preferably formed from cellulose acetate. The tow, whether formed from cellulose acetate or other materials, preferably has a d.p.f. of at least 5. Preferably, to achieve a sufficiently uniform body of material 6, the tow has a denier per filament of no more than 12 d.p.f., preferably no more than 11 d.p.f. and still more preferably no more than 10 d.p.f.

The total denier of the tow forming the body of material 6 is preferably at most 30,000, more preferably at most 28,000 and still more preferably at most 25,000. These values of total denier provide a tow which takes up a reduced proportion of the cross sectional area of the mouthpiece 2 which results in a lower pressure drop across the mouthpiece 2 than tows having higher total denier values. For appropriate firmness of the body of material 6, the tow preferably has a total denier of at least 8,000 and more preferably at least 10,000. Preferably, the denier per filament is between 5 and 12 while the total denier is between 10,000 and 25,000. Preferably the cross-sectional shape of the filaments of tow are 'Y' shaped, although in other embodiments other shapes such as 'X' shaped filaments can be used, with the same d.p.f. and total denier values as provided herein.

Irrespective of the material used to form the body 6, the pressure drop across body 6, can, for instance, be between 0.3 and 5mmWG per mm of length of the body 6, for instance between 0.5mmWG and 2.5mmWG per mm of length of the body 6. The pressure drop can, for instance, be between 1.5 and 2.5mmWG/mm of length, on average. The total pressure drop across body 6 can, for instance, be between 12mmWG and 30mWG, or between 15mmWG and 25mmWG. Where the body 6 includes an additive release component, the pressure drop refers to the average or total pressure drop prior to any rupture of that component.

A tipping paper 16 is wrapped around the full length of the downstream portion 5 and over part of the rod of aerosol-generating material and has an adhesive on its inner surface to connect the downstream portion 5 and rod. In the present example, the rod of aerosol-generating material is wrapped in wrapper 15, which forms a first wrapping material, and the tipping paper 16 forms an outer wrapping material which extends at least partially over the rod of aerosol-generating material to connect the downstream portion 5 and rod. In some examples, the tipping paper can extend fully over the rod of aerosol-generating material.

In the present example, the tipping paper 16 extends 5 mm over the rod of aerosol-generating material but it can alternatively extend between 3 mm and 10 mm over the rod, or more preferably between 4 mm and 6 mm, to provide a secure attachment. The tipping paper can have a basis weight greater than 20 gsm, for instance greater than 25 gsm, or preferably greater than 30 gsm, for example 37 gsm. These ranges of basis weights have been found to result in tipping papers having acceptable tensile strength

while being flexible enough to wrap around the article 1 and adhere to itself along a longitudinal lap seam on the paper.

The article 1 has a ventilation level of about 25% of the aerosol drawn through the article 1. The article 1 preferably includes ventilation apertures provided into the second tubular element 8b. In alternative embodiments, the article 1 can have a ventilation level of between 10% and 60% of aerosol drawn through the article 1, for instance between 20% and 50%.

An aerosol modifying agent is provided within the body of material 6, in the present example in the form of an additive release component, in the present case a capsule 11. However, the capsule 11 can be omitted in other embodiments. In the case that the capsule 11 is provided, the first plug wrap 7 can be an oil-resistant first plug wrap 7. In other examples, the aerosol modifying agent can be provided in other forms, such as material injected into the body of material 6 or provided on a thread, for instance the thread carrying a flavourant or other aerosol modifying agent, which may also be disposed within the body of material 6.

The capsule 11 can comprise a breakable capsule, for instance a capsule which has a solid, frangible shell surrounding a liquid payload. In the present example, a single capsule 11 is used. The capsule 11 is entirely embedded within the body of material 6. In other words, the capsule 11 is completely surrounded by the material forming the body 6. In other examples, a plurality of breakable capsules may be disposed within the body of material 6, for instance 2, 3 or more breakable capsules. The length of the body of material 6 can be increased to accommodate the number of capsules required. In examples where a plurality of capsules is used, the individual capsules may be the same as each other, or may differ from one another in terms of size and/or capsule payload. In other examples, multiple bodies of material 6 may be provided, with each body containing one or more capsules.

The capsule 11 has a core-shell structure. In other words, the capsule 11 comprises a shell encapsulating a liquid agent, for instance a flavourant or other agent, which can be any one of the flavourants or aerosol modifying agents described herein. The shell of the capsule can be ruptured by a user to release the flavourant or other agent into the body of material 6.

In the present example, the capsule 11 is spherical and has a diameter of about 3 mm. In other examples, other shapes and sizes of capsule can be used. For example, the capsule may have a diameter less than 4 mm, or less than 3.5 mm, or less than 3.25 mm. In alternative embodiments, the capsule may have a diameter greater than about 3.25 mm, for example greater than 3.5 mm, or greater than 4 mm. The total weight of the capsule 11 may be in the range about 10 mg to about 50 mg.

In the present example, the capsule 11 is located at a non-longitudinally central position within the body of material 6. In the present example, the capsule 11 is located closer to the upstream end of the body of material 6 than to the downstream end. That is, the capsule 11 is positioned so that its centre is 5 mm from the upstream end of the body of material 6 and 7mm from the downstream end, which can assist with ensuring that the capsule cannot be seen from the downstream end of the article 1.

The aerosol-generating material comprises an aerosol-former material. The aerosol-former material comprises one or more constituents capable of forming an aerosol. The aerosol-former material comprises one or more of glycerine, glycerol, propylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol, 1,3-butylene glycol, erythritol, meso-Erythritol, ethyl vanillate, ethyl laurate, a diethyl suberate, triethyl citrate, triacetin, a diacetin mixture, benzyl benzoate, benzyl phenyl acetate, tributyrin, lauryl acetate, lauric acid, myristic acid, and propylene carbonate. Preferably, the aerosol-former material is glycerol or propylene glycol.

The aerosol-former material is provided in an amount of up to about 50% on a dry weight base by weight of the aerosol-generating material. In some embodiments, the aerosol former material is provided in an amount of from about 5% to about 40% on a dry weight base by weight of the aerosol-generating material, from about 10% to about 30% on a dry weight base by weight of the aerosol-generating material or from about 10% to about 20% on a dry weight base by weight of the aerosol-generating material.

The aerosol-generating material herein can comprise an aerosol modifying agent, such as any of the flavours described herein. In one embodiment, the aerosol-generating material comprises menthol. When the aerosol-generating material is incorporated into an article for use in an aerosol-provision system, the article may be referred to as a mentholated article. The aerosol-generating material can comprise from 0.5mg to 20mg of menthol, from 0.7 mg to 20 mg of menthol, between 1mg and 18mg or

between 8mg and 16mg of menthol. In the present example, the aerosol-generating material comprises 16mg of menthol. The aerosol-generating material can comprise between 1% and 8% by weight of menthol, preferably between 3% and 7% by weight of menthol and more preferably between 4% and 5.5% by weight of menthol. In one embodiment, the aerosol-generating material comprises 4.7% by weight of menthol. Such high levels of menthol loading can be achieved using a high percentage of reconstituted tobacco material, for instance greater than 50% of the tobacco material by weight.

In some embodiments, the aerosol-generating material includes an aerosol-forming "amorphous solid", which may alternatively be referred to as a "monolithic solid" (i.e. non-fibrous). In some embodiments, the amorphous solid may comprise a dried gel. The amorphous solid is a solid material that may retain some fluid, such as liquid, within it.

In some examples, the amorphous solid comprises:
- 1-60 wt% of a gelling agent;
- 0.1-50 wt% of an aerosol-former material; and
- 0.1-80 wt% of a flavour;
wherein these weights are calculated on a dry weight basis.

In some further embodiments, the amorphous solid comprises:
- 1-50 wt% of a gelling agent;
- 0.1-50 wt% of an aerosol-former material; and
- 30-60 wt% of a flavour;
wherein these weights are calculated on a dry weight basis.

The amorphous solid material may be provided in sheet or in shredded sheet form. The amorphous solid material may take the same form as the plurality of strands or strips of aerosol-generating material described previously.

Suitably, the amorphous solid may comprise from about 1wt%, 5wt%, 10wt%, 15wt%, 20wt% or 25wt% to about 60wt%, 50wt%, 45wt%, 40wt% or 35wt% of a gelling agent (all calculated on a dry weight basis). For example, the amorphous solid may comprise 1-50wt%, 5-45wt%, 10-40wt% or 20-35wt% of a gelling agent. In some embodiments, the gelling agent comprises a hydrocolloid. In some embodiments, the gelling agent

comprises one or more compounds selected from the group comprising alginates, pectins, starches (and derivatives), celluloses (and derivatives), gums, silica or silicones compounds, clays, polyvinyl alcohol and combinations thereof. For example, in some embodiments, the gelling agent comprises one or more of alginates, pectins, hydroxyethyl cellulose, hydroxypropyl cellulose, carboxymethylcellulose, pullulan, xanthan gum guar gum, carrageenan, agarose, acacia gum, fumed silica, PDMS, sodium silicate, kaolin and polyvinyl alcohol. In some cases, the gelling agent comprises alginate and/or pectin, and may be combined with a setting agent (such as a calcium source) during formation of the amorphous solid. In some cases, the amorphous solid may comprise a calcium-crosslinked alginate and/or a calcium-crosslinked pectin.

In some embodiments, the gelling agent comprises alginate, and the alginate is present in the amorphous solid in an amount of from 10-30wt% of the amorphous solid (calculated on a dry weight basis). In some embodiments, alginate is the only gelling agent present in the amorphous solid. In other embodiments, the gelling agent comprises alginate and at least one further gelling agent, such as pectin.

In some embodiments the amorphous solid may include gelling agent comprising carrageenan.

Suitably, the amorphous solid may comprise from about 0.1wt%, 0.5wt%, 1wt%, 3wt%, 5wt%, 7wt% or 10% to about 50wt%, 45wt%, 40wt%, 35wt%, 30wt% or 25wt% of an aerosol-former material (all calculated on a dry weight basis). The aerosol-former material may act as a plasticiser. For example, the amorphous solid may comprise 0.5-40wt%, 3-35wt% or 10-25wt% of an aerosol-former material. In some cases, the aerosol-former material comprises one or more compound selected from erythritol, propylene glycol, glycerol, triacetin, sorbitol and xylitol. In some cases, the aerosol-former material comprises, consists essentially of or consists of glycerol.

The amorphous solid comprises a flavour. Suitably, the amorphous solid may comprise up to about 80wt%, 70wt%, 60wt%, 55wt%, 50wt% or 45wt% of a flavour.

In some cases, the amorphous solid may comprise at least about 0.1wt%, 1wt%, 10wt%, 20wt%, 30wt%, 35wt% or 40wt% of a flavour (all calculated on a dry weight basis).

For example, the amorphous solid may comprise 1-80wt%, 10-80wt%, 20-70wt%, 30-60wt%, 35-55wt% or 30-45wt% of a flavour. In some cases, the flavour comprises, consists essentially of or consists of menthol.

In some cases, the amorphous solid may additionally comprise an emulsifying agent, which emulsified molten flavour during manufacture. For example, the amorphous solid may comprise from about 5wt% to about 15wt% of an emulsifying agent (calculated on a dry weight basis), suitably about 10wt%. The emulsifying agent may comprise acacia gum.

In some embodiments, the amorphous solid is a hydrogel and comprises less than about 20 wt% of water calculated on a wet weight basis. In some cases, the hydrogel may comprise less than about 15wt%, 12 wt% or 10 wt% of water calculated on a wet weight basis. In some cases, the hydrogel may comprise at least about 1wt%, 2wt% or at least about 5wt% of water (WWB).

In some embodiments, the amorphous solid additionally comprises an active substance. For example, in some cases, the amorphous solid additionally comprises a tobacco material and/or nicotine. In some cases, the amorphous solid may comprise 5-60wt% (calculated on a dry weight basis) of a tobacco material and/or nicotine. In some cases, the amorphous solid may comprise from about 1wt%, 5wt%, 10wt%, 15wt%, 20wt% or 25wt% to about 70wt%, 60wt%, 50wt%, 45wt%, 40wt%, 35wt%, or 30wt% (calculated on a dry weight basis) of an active substance. In some cases, the amorphous solid may comprise from about 1wt%, 5wt%, 10wt%, 15wt%, 20wt% or 25wt% to about 70wt%, 60wt%, 50wt%, 45wt%, 40wt%, 35wt%, or 30wt% (calculated on a dry weight basis) of a tobacco material. For example, the amorphous solid may comprise 10-50wt%, 15-40wt% or 20-35wt% of a tobacco material. In some cases, the amorphous solid may comprise from about 1wt%, 2wt%, 3wt% or 4wt% to about 20wt%, 18wt%, 15wt% or 12wt% (calculated on a dry weight basis) of nicotine. For example, the amorphous solid may comprise 1-20wt%, 2-18wt% or 3-12wt% of nicotine.

In some cases, the amorphous solid comprises an active substance such as tobacco extract. In some cases, the amorphous solid may comprise 5-60wt% (calculated on a dry weight basis) of tobacco extract. In some cases, the amorphous solid may comprise from about 5wt%, 10wt%, 15wt%, 20wt% or 25wt% to about 60wt%, 50wt%, 45wt%, 40wt%, 35wt%, or 30wt% (calculated on a dry weight basis) tobacco extract. For

example, the amorphous solid may comprise 10-50wt%, 15-40wt% or 20-35wt% of tobacco extract. The tobacco extract may contain nicotine at a concentration such that the amorphous solid comprises 1wt% 1.5wt%, 2wt% or 2.5wt% to about 6wt%, 5wt%, 4.5wt% or 4wt% (calculated on a dry weight basis) of nicotine.

In some cases, there may be no nicotine in the amorphous solid other than that which results from the tobacco extract.

In some embodiments the amorphous solid comprises no tobacco material but does comprise nicotine. In some such cases, the amorphous solid may comprise from about 1wt%, 2wt%, 3wt% or 4wt% to about 20wt%, 18wt%, 15wt% or 12wt% (calculated on a dry weight basis) of nicotine. For example, the amorphous solid may comprise 1-20wt%, 2-18wt% or 3-12wt% of nicotine.

In some cases, the total content of active substance and/or flavour may be at least about 0.1wt%, 1wt%, 5wt%, 10wt%, 20wt%, 25wt% or 30wt%. In some cases, the total content of active substance and/or flavour may be less than about 90wt%, 80wt%, 70wt%, 60wt%, 50wt% or 40wt% (all calculated on a dry weight basis).

In some cases, the total content of tobacco material, nicotine and flavour may be at least about 0.1wt%, 1wt%, 5wt%, 10wt%, 20wt%, 25wt% or 30wt%. In some cases, the total content of active substance and/or flavour may be less than about 90wt%, 80wt%, 70wt%, 60wt%, 50wt% or 40wt% (all calculated on a dry weight basis).

The amorphous solid may be made from a gel, and this gel may additionally comprise a solvent, included at 0.1-50wt%. However, the inventors have established that the inclusion of a solvent in which the flavour is soluble may reduce the gel stability and the flavour may crystallise out of the gel. As such, in some cases, the gel does not include a solvent in which the flavour is soluble.

In some embodiments, the amorphous solid comprises less than 60wt% of a filler, such as from 1wt% to 60wt%, or 5wt% to 50wt%, or 5wt% to 30wt%, or 10wt% to 20wt%.

In other embodiments, the amorphous solid comprises less than 20wt%, suitably less than 10wt% or less than 5wt% of a filler. In some cases, the amorphous solid comprises less than 1wt% of a filler, and in some cases, comprises no filler.

The filler, if present, may comprise one or more inorganic filler materials, such as calcium carbonate, perlite, vermiculite, diatomaceous earth, colloidal silica, magnesium oxide, magnesium sulphate, magnesium carbonate, and suitable inorganic sorbents, such as molecular sieves. The filler may comprise one or more organic filler materials such as wood pulp, cellulose and cellulose derivatives. In particular cases, the amorphous solid comprises no calcium carbonate such as chalk.

In particular embodiments which include filler, the filler is fibrous. For example, the filler may be a fibrous organic filler material such as wood pulp, hemp fibre, cellulose or cellulose derivatives. Without wishing to be bound by theory, it is believed that including fibrous filler in an amorphous solid may increase the tensile strength of the material.

In some embodiments, the amorphous solid does not comprise tobacco fibres.

In some examples, the amorphous solid in sheet form may have a tensile strength of from around 200 N/m to around 1500 N/m. In some examples, such as where the amorphous solid does not comprise a filler, the amorphous solid may have a tensile strength of from 200 N/m to 400 N/m, or 200 N/m to 300 N/m, or about 250 N/m. Such tensile strengths may be particularly suitable for embodiments wherein the amorphous solid material is formed as a sheet and then shredded and incorporated into an aerosol-generating article.

In some examples, such as where the amorphous solid comprises a filler, the amorphous solid may have a tensile strength of from 600 N/m to 1500 N/m, or from 700 N/m to 900 N/m, or around 800 N/m. Such tensile strengths may be particularly suitable for embodiments wherein the amorphous solid material is included in an aerosol-generating article as a rolled sheet, suitably in the form of a tube.

In some cases, the amorphous solid may consist essentially of, or consist of a gelling agent, water, an aerosol-former material, a flavour, and optionally an active substance.

In some cases, the amorphous solid may consist essentially of, or consist of a gelling agent, water, an aerosol-former material, a flavour, and optionally a tobacco material and/or a nicotine source.

The amorphous solid may comprise one or more active substances and/or flavours, one or more aerosol-former materials, and optionally one or more other functional material.

In embodiments described herein, the amorphous solid material may be incorporated into the article in sheet form. The amorphous solid material in sheet form may be shredded and then incorporated into the article, suitably mixed into with an aerosolisable material, such as the plurality of strands or strips of aerosol-generating material described herein.

In further embodiments the amorphous solid sheet may additionally be incorporated as a planar sheet, as a gathered or bunched sheet, as a crimped sheet, or as a rolled sheet (i.e. in the form of a tube). In some such cases, the amorphous solid of these embodiments may be included in an aerosol-generating article as a sheet, such as a sheet circumscribing a rod comprising aerosolisable material. For example, the amorphous solid sheet may be formed on a wrapping paper which circumscribes an aerosolisable material such as tobacco.

Figure 3 is a simplified schematic illustration of the components within the housing 9 of the non-combustible aerosol provision device 3 shown in Figure 2.

As shown in Figure 3, within the housing 9 there is an electrical energy supply 20, for example a rechargeable lithium ion battery. A controller 21 is connected to the heating element 2a, the electrical energy supply 20, and a user interface 22, for example a touch-sensitive display. The controller 21 controls the power supplied to the heating element 2a in order to regulate its temperature. Typically the aerosol-generating material is heated to a temperature of between 250 and 450 degrees centigrade.

The heating element 2a is configured for insertion into the aerosol generating material of the article 1. The heating element 2a is in the form of a pin heater in the present example, but in alternative examples can be shaped in the form of a blade terminating in a point. That is, such a blade heater can have a length dimension that is greater than its width dimension, which is greater than its thickness dimension.

When the heater is actuated, the aerosol-generating material of the article is warmed and volatile substances are generated or evolved. As a user draws on the mouthpiece 5, air is drawn into the article 1 and the volatile substances condense to form an inhalable aerosol. This aerosol passes through the mouthpiece 5 of the article 1 and into the user's mouth.

As used herein, the term "non-combustible aerosol provision system" is intended to encompass systems that deliver at least one substance to a user by releasing compounds from an aerosol-generating material without combusting the aerosol-generating material, such as electronic cigarettes, tobacco heating products, and hybrid systems to generate aerosol using a combination of aerosol-generating materials.

According to the present disclosure, a "non-combustible" aerosol provision system is one where a constituent aerosol-generating material of the aerosol provision system (or component thereof) is not combusted or burned in order to facilitate delivery of at least one substance to a user.

In some embodiments, the delivery system is a non-combustible aerosol provision system, such as a powered non-combustible aerosol provision system. In some embodiments, the non-combustible aerosol provision system is an electronic cigarette, also known as a vaping device or electronic nicotine delivery system (END), although it is noted that the presence of nicotine in the aerosol-generating material is not a requirement.

In some embodiments, the non-combustible aerosol provision system is an aerosol-generating material heating system, also known as a heat-not-burn system. An example of such a system is a tobacco heating system. In some embodiments, the non-combustible aerosol provision system is a hybrid system to generate aerosol using a combination of aerosol-generating materials, one or a plurality of which may be heated. Each of the aerosol-generating materials may be, for example, in the form of a solid, liquid or gel and may or may not contain nicotine. In some embodiments, the hybrid system comprises a liquid or gel aerosol-generating material and a solid aerosol-generating material. The solid aerosol-generating material may comprise, for example, tobacco or a non-tobacco product. For instance, the solid aerosol-generating material can comprise non-tobacco botanical material.

Typically, the non-combustible aerosol provision system may comprise a non-combustible aerosol provision device and a consumable for use with the non-combustible aerosol provision device, such as the article 1 described herein.

In some embodiments, the disclosure relates to consumables comprising aerosol-generating material and configured to be used with non-combustible aerosol provision devices. These consumables are referred to as articles throughout the disclosure.

In some embodiments, the non-combustible aerosol provision system, such as a non-combustible aerosol provision device thereof, may comprise a power source and a controller. The power source may, for example, be an electric power source or an exothermic power source. In some embodiments, the exothermic power source comprises a carbon substrate which may be energised so as to distribute power in the form of heat to an aerosol-generating material or to a heat transfer material in proximity to the exothermic power source.

In some embodiments, the non-combustible aerosol provision system comprises an area for receiving the consumable, an aerosol generator, an aerosol generation area, a housing, a mouthpiece, a filter and/or an aerosol-modifying agent.

In some embodiments, the consumable for use with the non-combustible aerosol provision device may comprise aerosol-generating material, an aerosol-generating material storage area, an aerosol-generating material transfer component, an aerosol generator, an aerosol generation area, a housing, a wrapper, a filter, a mouthpiece, and/or an aerosol-modifying agent.

In some embodiments, the consumable comprises a substance to be delivered. The substance to be delivered may be an aerosol-generating material or a material that is not intended to be aerosolised. As appropriate, either material may comprise one or more active constituents, one or more flavours, one or more aerosol-former materials, and/or one or more other functional materials.

In some embodiments, the substance to be delivered comprises an active substance.

The active substance as used herein may be a physiologically active material, which is a material intended to achieve or enhance a physiological response. The active substance

may for example be selected from nutraceuticals, nootropics, psychoactives. The active substance may be naturally occurring or synthetically obtained. The active substance may comprise for example nicotine, caffeine, taurine, theine, vitamins such as B6 or B12 or C, melatonin, cannabinoids, or constituents, derivatives, or combinations thereof. The active substance may comprise one or more constituents, derivatives or extracts of tobacco, cannabis or another botanical.

In some embodiments, the active substance comprises nicotine. In some embodiments, the active substance comprises caffeine, melatonin or vitamin B12.

As noted herein, the active substance may comprise or be derived from one or more botanicals or constituents, derivatives or extracts thereof. As used herein, the term "botanical" includes any material derived from plants including, but not limited to, extracts, leaves, bark, fibres, stems, roots, seeds, flowers, fruits, pollen, husk, shells or the like. Alternatively, the material may comprise an active compound naturally existing in a botanical, obtained synthetically. The material may be in the form of liquid, gas, solid, powder, dust, crushed particles, granules, pellets, shreds, strips, sheets, or the like. Example botanicals are tobacco, eucalyptus, star anise, hemp, cocoa, cannabis, fennel, lemongrass, peppermint, spearmint, rooibos, chamomile, flax, ginger, ginkgo biloba, hazel, hibiscus, laurel, licorice (liquorice), matcha, mate, orange skin, papaya, rose, sage, tea such as green tea or black tea, thyme, clove, cinnamon, coffee, aniseed (anise), basil, bay leaves, cardamom, coriander, cumin, nutmeg, oregano, paprika, rosemary, saffron, lavender, lemon peel, mint, juniper, elderflower, vanilla, wintergreen, beefsteak plant, curcuma, turmeric, sandalwood, cilantro, bergamot, orange blossom, myrtle, cassis, valerian, pimento, mace, damien, marjoram, olive, lemon balm, lemon basil, chive, carvi, verbena, tarragon, geranium, mulberry, ginseng, theanine, theacrine, maca, ashwagandha, damiana, guarana, chlorophyll, baobab or any combination thereof. The mint may be chosen from the following mint varieties: Mentha Arventis, Mentha c.v.,Mentha niliaca, Mentha piperita, Mentha piperita citrata c.v.,Mentha piperita c.v, Mentha spicata crispa, Mentha cardifolia, Memtha longifolia, Mentha suaveolens variegata, Mentha pulegium, Mentha spicata c.v. and Mentha suaveolens.

In some embodiments, the active substance comprises or is derived from one or more botanicals or constituents, derivatives or extracts thereof and the botanical is tobacco.

In some embodiments, the active substance comprises or derived from one or more botanicals or constituents, derivatives or extracts thereof and the botanical is selected from eucalyptus, star anise, cocoa and hemp.

In some embodiments, the active substance comprises or derived from one or more botanicals or constituents, derivatives or extracts thereof and the botanical is selected from rooibos and fennel.

In some embodiments, the substance to be delivered comprises a flavour.

As used herein, the terms "flavour" and "flavourant" refer to materials which, where local regulations permit, may be used to create a desired taste, aroma or other somatosensorial sensation in a product for adult consumers. They may include naturally occurring flavour materials, botanicals, extracts of botanicals, synthetically obtained materials, or combinations thereof (e.g., tobacco, cannabis, licorice (liquorice), hydrangea, eugenol, Japanese white bark magnolia leaf, chamomile, fenugreek, clove, maple, matcha, menthol, Japanese mint, aniseed (anise), cinnamon, turmeric, Indian spices, Asian spices, herb, wintergreen, cherry, berry, red berry, cranberry, peach, apple, orange, mango, clementine, lemon, lime, tropical fruit, papaya, rhubarb, grape, durian, dragon fruit, cucumber, blueberry, mulberry, citrus fruits, Drambuie, bourbon, scotch, whiskey, gin, tequila, rum, spearmint, peppermint, lavender, aloe vera, cardamom, celery, cascarilla, nutmeg, sandalwood, bergamot, geranium, khat, naswar, betel, shisha, pine, honey essence, rose oil, vanilla, lemon oil, orange oil, orange blossom, cherry blossom, cassia, caraway, cognac, jasmine, ylang-ylang, sage, fennel, wasabi, piment, ginger, coriander, coffee, hemp, a mint oil from any species of the genus Mentha, eucalyptus, star anise, cocoa, lemongrass, rooibos, flax, ginkgo biloba, hazel, hibiscus, laurel, mate, orange skin, rose, tea such as green tea or black tea, thyme, juniper, elderflower, basil, bay leaves, cumin, oregano, paprika, rosemary, saffron, lemon peel, mint, beefsteak plant, curcuma, cilantro, myrtle, cassis, valerian, pimento, mace, damien, marjoram, olive, lemon balm, lemon basil, chive, carvi, verbena, tarragon, limonene, thymol, camphene), flavour enhancers, bitterness receptor site blockers, sensorial receptor site activators or stimulators, sugars and/or sugar substitutes (e.g., sucralose, acesulfame potassium, aspartame, saccharine, cyclamates, lactose, sucrose, glucose, fructose, sorbitol, or mannitol), and other additives such as charcoal, chlorophyll, minerals, botanicals, or breath freshening agents. They may be imitation, synthetic or natural ingredients or blends thereof. They

may be in any suitable form, for example, liquid such as an oil, solid such as a powder, or gas.

In some embodiments, the flavour comprises menthol, spearmint and/or peppermint. In some embodiments, the flavour comprises flavour components of cucumber, blueberry, citrus fruits and/or redberry. In some embodiments, the flavour comprises eugenol. In some embodiments, the flavour comprises flavour components extracted from tobacco. In some embodiments, the flavour comprises flavour components extracted from cannabis.

In some embodiments, the flavour may comprise a sensate, which is intended to achieve a somatosensorial sensation which are usually chemically induced and perceived by the stimulation of the fifth cranial nerve (trigeminal nerve), in addition to or in place of aroma or taste nerves, and these may include agents providing heating, cooling, tingling, numbing effect. A suitable heat effect agent may be, but is not limited to, vanillyl ethyl ether and a suitable cooling agent may be, but not limited to eucolyptol, WS-3.

An aerosol-generating material is a material that is capable of generating aerosol, for example when heated, irradiated or energized in any other way. An aerosol-generating material may be in the form of a solid, liquid or gel which may or may not contain an active substance and/or flavourants. The aerosol-generating material may be incorporated into an article for use in the aerosol-generating system. The aerosol-generating material can comprise tobacco or non-tobacco botanical material as described herein.

As used herein, the term "tobacco material" refers to any material comprising tobacco or derivatives or substitutes thereof. The tobacco material may be in any suitable form. The term "tobacco material" may include one or more of tobacco, tobacco derivatives, expanded tobacco, reconstituted tobacco or tobacco substitutes. The tobacco material may comprise one or more of ground tobacco, tobacco fibre, cut tobacco, extruded tobacco, tobacco stem, tobacco lamina, reconstituted tobacco and/or tobacco extract.

A consumable is an article comprising or consisting of aerosol-generating material, part or all of which is intended to be consumed during use by a user. A consumable may comprise one or more other components, such as an aerosol-generating material

storage area, an aerosol-generating material transfer component, an aerosol generation area, a housing, a wrapper, a mouthpiece, a filter and/or an aerosol-modifying agent. A consumable may also comprise an aerosol generator, such as a heater, that emits heat to cause the aerosol-generating material to generate aerosol in use. The heater may, for example, comprise combustible material, a material heatable by electrical conduction, or a susceptor.

A susceptor is a material that is heatable by penetration with a varying magnetic field, such as an alternating magnetic field. The susceptor may be an electrically-conductive material, so that penetration thereof with a varying magnetic field causes induction heating of the heating material. The heating material may be magnetic material, so that penetration thereof with a varying magnetic field causes magnetic hysteresis heating of the heating material. The susceptor may be both electrically-conductive and magnetic, so that the susceptor is heatable by both heating mechanisms. The device that is configured to generate the varying magnetic field is referred to as a magnetic field generator, herein.

An aerosol-modifying agent is a substance, typically located downstream of the aerosol generation area, that is configured to modify the aerosol generated, for example by changing the taste, flavour, acidity or another characteristic of the aerosol. The aerosol-modifying agent may be provided in an aerosol-modifying agent release component, that is operable to selectively release the aerosol-modifying agent

The aerosol-modifying agent may, for example, be an additive or a sorbent. The aerosol-modifying agent may, for example, comprise one or more of a flavourant, a colourant, water, and a carbon adsorbent. The aerosol-modifying agent may, for example, be a solid, a liquid, or a gel. The aerosol-modifying agent may be in powder, thread or granule form. The aerosol-modifying agent may be free from filtration material.

An aerosol generator is an apparatus configured to cause aerosol to be generated from the aerosol-generating material. In some embodiments, the aerosol generator is a heater configured to subject the aerosol-generating material to heat energy, so as to release one or more volatiles from the aerosol-generating material to form an aerosol. In some embodiments, the aerosol generator is configured to cause an aerosol to be generated from the aerosol-generating material without heating. For example, the

aerosol generator may be configured to subject the aerosol-generating material to one or more of vibration, increased pressure, or electrostatic energy.

The filamentary tow material described herein can comprise cellulose acetate fibre tow. The filamentary tow can also be formed using other materials used to form fibres, such as polyvinyl alcohol (PVOH), polylactic acid (PLA), polycaprolactone (PCL), poly(1-4 butanediol succinate) (PBS), poly(butylene adipate-co-terephthalate)(PBAT), starch based materials, cotton, aliphatic polyester materials and polysaccharide polymers or a combination thereof. The filamentary tow may be plasticised with a suitable plasticiser for the tow, such as triacetin where the material is cellulose acetate tow, or the tow may be non-plasticised. The tow can have any suitable specification, such as fibres having a 'Y' shaped or other cross section such as 'X' shaped, filamentary denier values between 2.5 and 15 denier per filament, for example between 8.0 and 11.0 denier per filament and total denier values of 5,000 to 50,000, for example between 10,000 and 40,000.

The various embodiments described herein are presented only to assist in understanding and teaching the claimed features. These embodiments are provided as a representative sample of embodiments only, and are not exhaustive and/or exclusive. It is to be understood that advantages, embodiments, examples, functions, features, structures, and/or other aspects described herein are not to be considered limitations on the scope of the invention as defined by the claims or limitations on equivalents to the claims, and that other embodiments may be utilised and modifications may be made without departing from the scope of the claimed invention. Various embodiments of the invention may suitably comprise, consist of, or consist essentially of, appropriate combinations of the disclosed elements, components, features, parts, steps, means, etc, other than those specifically described herein. In addition, this disclosure may include other inventions not presently claimed, but which may be claimed in future."

Claims

1. An article for use in or as a non-combustible aerosol provision system, the article comprising:

an aerosol-generating material section comprising aerosol-generating material and at least 5% aerosol-former material by weight of the aerosol-generating material;

a first tubular element immediately downstream of the aerosol-generating material section, the first tubular element defining a first hollow cavity and comprising a first tubular wall; and

a second tubular element immediately downstream of the first tubular element, the second tubular element defining a second hollow cavity and comprising a second tubular wall having a wall thickness of less than about 320 μm and the second tubular element having an axial length of greater than about 15mm.

2. An article according to claim 1, wherein the ratio of the thickness of the first tubular wall to the internal radius of the first hollow cavity is between about 0.6 and about 1.1.

3. An article according to claim 1 or 2, wherein the ratio of the volume of the second hollow cavity to the volume of the first hollow cavity is between about 6.5 and about 8.

4. An article according to claim 1, 2 or 3, further comprising a mouth end component at the downstream end of the article.

5. An article according to any one of claims 1 to 4, wherein the second tubular wall comprises at least first and second overlapping paper layers each extending around substantially the whole circumference of the second tubular element.

6. An article according to claim 5, wherein the at least first and second overlapping paper layers each comprise a thickness of between 30 and 150 μm and/or wherein the at least first and second overlapping paper layers each comprise a basis weight of between 25 and 130 gsm.

7. An article according to claim 5 or 6, wherein the at least first and second overlapping paper layers are connected to each other by a layer of adhesive and/or wherein the first and second overlapping paper layers are each non-porous.

8. An article according to any one of claims 1 to 7, wherein the first tubular element has an axial length between about 5mm and about 14mm.

9. An article according to any one of claims 1 to 8, wherein the aerosol-generating material section is in the form of a rod having an axial length which is less than or equal to the axial length of the second tubular element.

10. An article according to any one of claims 1 to 9, wherein the aerosol-generating material section is in the form of a rod having an axial length which is between 50% and 80% of the axial length of the second tubular element.

11. An article according to any one of claims 1 to 10, wherein the average weight per mm of axial length of the article is less than about 14.5 mg/mm or less than about 14 mg/mm.

12. An article according to any one of claims 1 to 11, wherein the second tubular wall has a thickness of between about 160μm and about 250 μm, and/or wherein the second tubular wall has a thickness which is less than about 15% or less than about 10% of the internal radius of the second hollow cavity.

13. An article according to any one of claims 1 to 12, wherein the second tubular element defines a second hollow cavity having a volume of at least about 520 mm3.

14. An article according to any one of claims 1 to 13, wherein the second tubular element has an axial length of greater than about 16mm or greater than about 16.5mm and/or wherein the second tubular element has an axial length which is at least 1.5 or at least 2 times greater than the axial length of the first tubular element.

15. An article according to any one of claims 1 to 14, wherein the aerosol-generating material comprises a plurality of strands or strips of aerosol-generating material.

16. An article according to claim 15, wherein the strands or strips of aerosol-generating material are arranged such that their longitudinal dimension is substantially parallel with the longitudinal axis of the article.

17. An article according to any one of claims 1 to 16, wherein the aerosol-generating material is in the form of reconstituted sheet tobacco material.

18. An article according to any one of claims 1 to 17, wherein the combined volumes of the first and second hollow cavities is at least about 580 mm^3, or at least about 620 mm^3 or at least about 650 mm^3.

19. A non-combustible aerosol provision system comprising a non-combustible aerosol provision device and an article according to any one of the preceding claims.

20. A non-combustible aerosol provision system according to claim 19, wherein the non-combustible aerosol provision device comprises a heating element configured for insertion into the aerosol-generating material of the article.

21. A non-combustible aerosol provision system according to claim 19 or 20, wherein the non-combustible aerosol provision device comprises a housing and an aperture in the housing into which the article is inserted in use, and wherein the system is configured such that the second tubular element extends partially within and partially outside the housing when the article is fully inserted into the non-combustible aerosol provision device.

22. A non-combustible aerosol provision system according to claim 21, wherein the system is configured such that the second tubular element extends at least about 5mm within and at least about 8mm outside the housing when the article is fully inserted into the non-combustible aerosol provision device.

23. A non-combustible aerosol provision system according to claim 21 or 22, wherein the article comprises one or more ventilation apertures extending through said second tubular element at a location in the second tubular element which is outside the housing when the article is fully inserted into the non-combustible aerosol provision device.

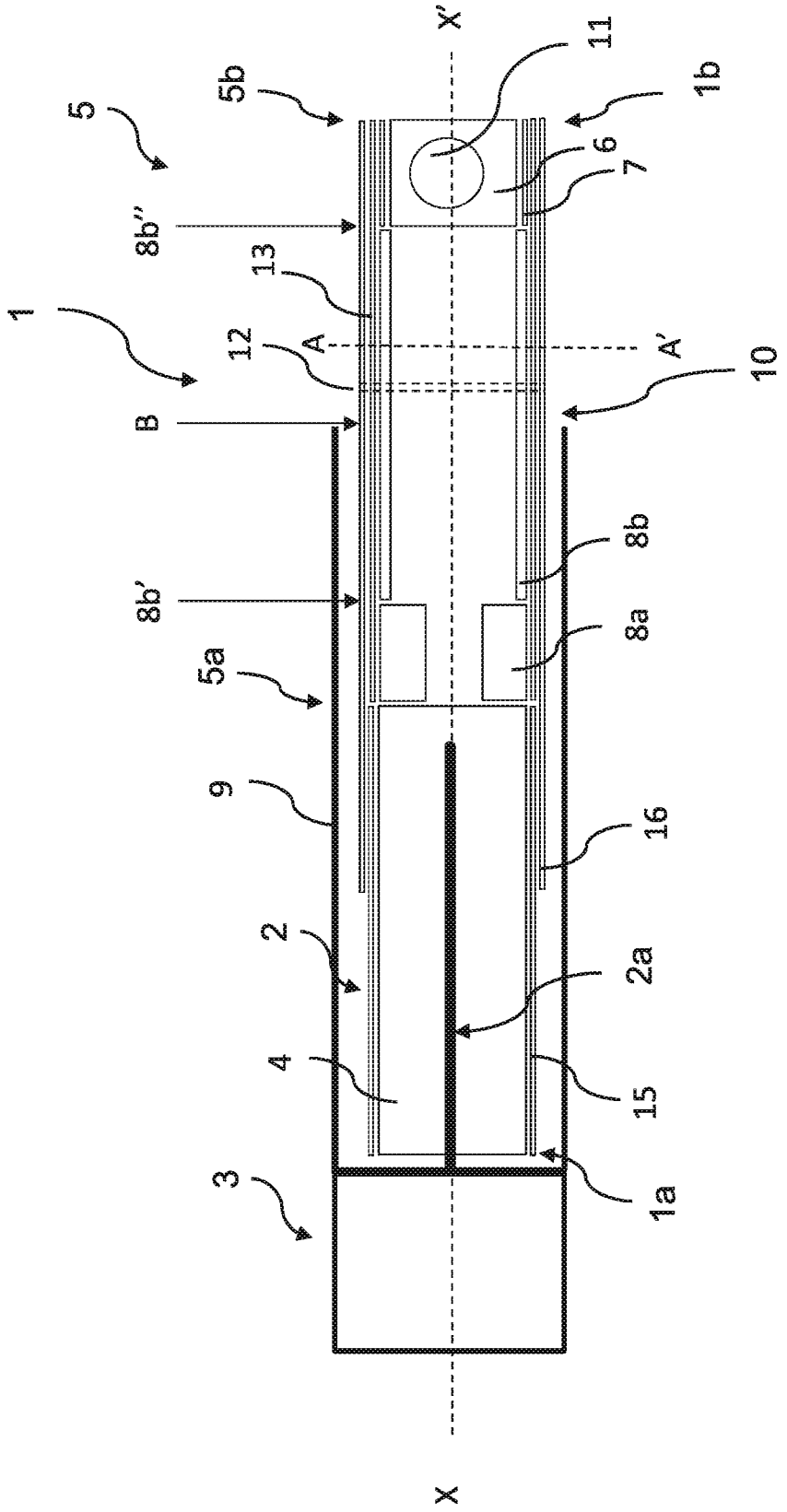

Figure 1

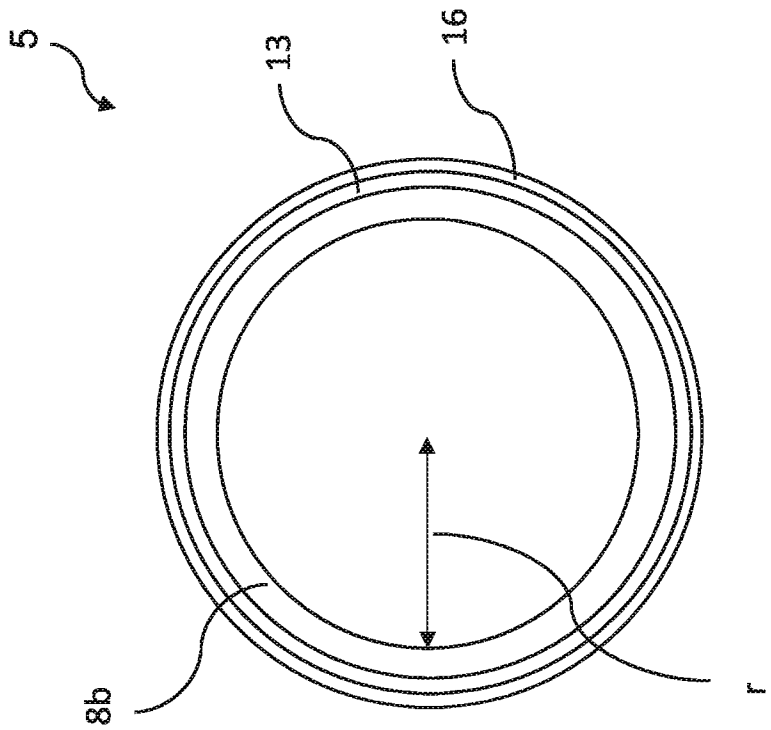

Figure 2

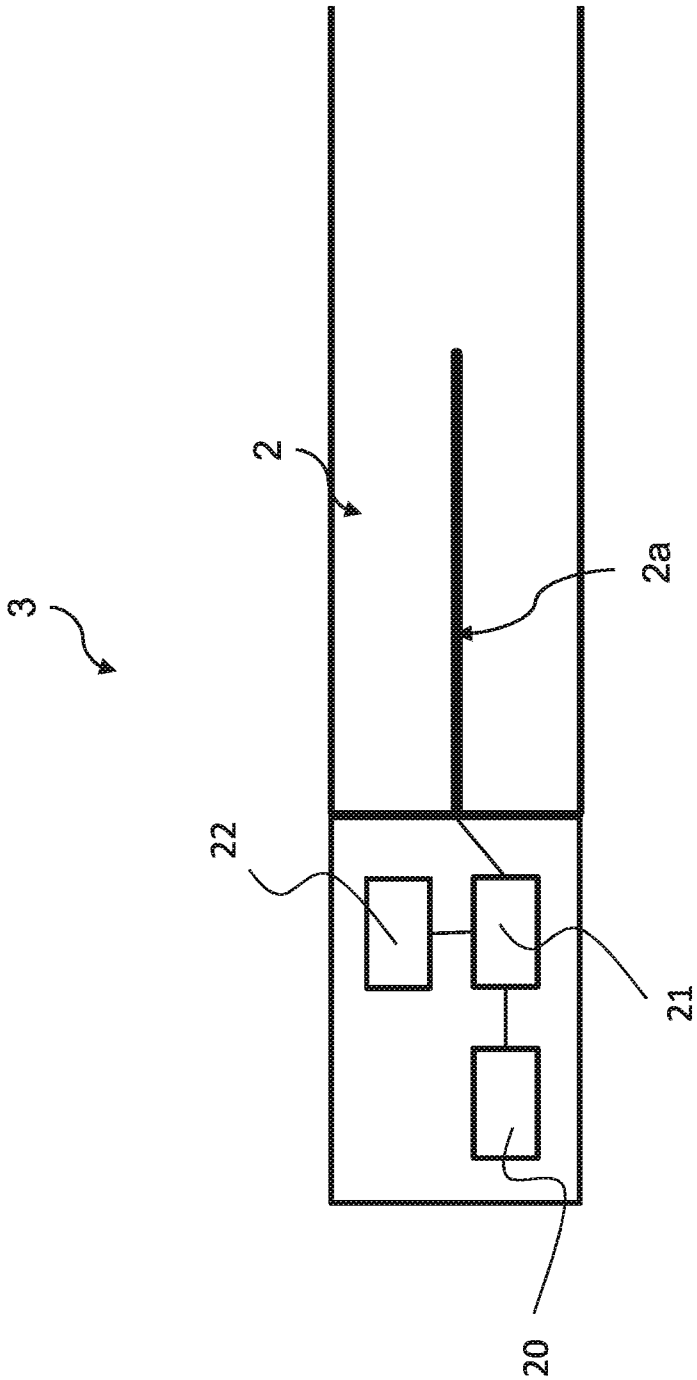

Figure 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2023/051121

A. CLASSIFICATION OF SUBJECT MATTER
INV. A24D1/20
ADD.

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)
A24D

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2021/130191 A1 (PHILIP MORRIS PRODUCTS SA [CH]) 1 July 2021 (2021-07-01)	1-4,8-23
Y	figure 1 page 21, lines 3-7 page 23, line 19 - line 20 page 24, lines 3-6 page 26, lines 10-12 page 29, line 24 - page 33, line 11 page 30, line 30 - page 31, line 4 page 31, lines 3,4	5-7
Y	EP 3 845 076 A1 (NERUDIA LTD [GB]) 7 July 2021 (2021-07-07) figure 1 paragraph [0079]	5-7

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[x] Further documents are listed in the continuation of Box C.

[x] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 July 2023	27/07/2023

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Schwertfeger, C

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Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2023/051121

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2019/115408 A1 (NERUDIA LTD [GB]) 20 June 2019 (2019-06-20) figure 1 page 8, line 32 - page 9, line 12	6

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/GB2023/051121

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		EP 4081056 A1	02-11-2022
		JP 2023508890 A	06-03-2023
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		JP 2021506278 A	22-02-2021
		WO 2019115408 A1	20-06-2019