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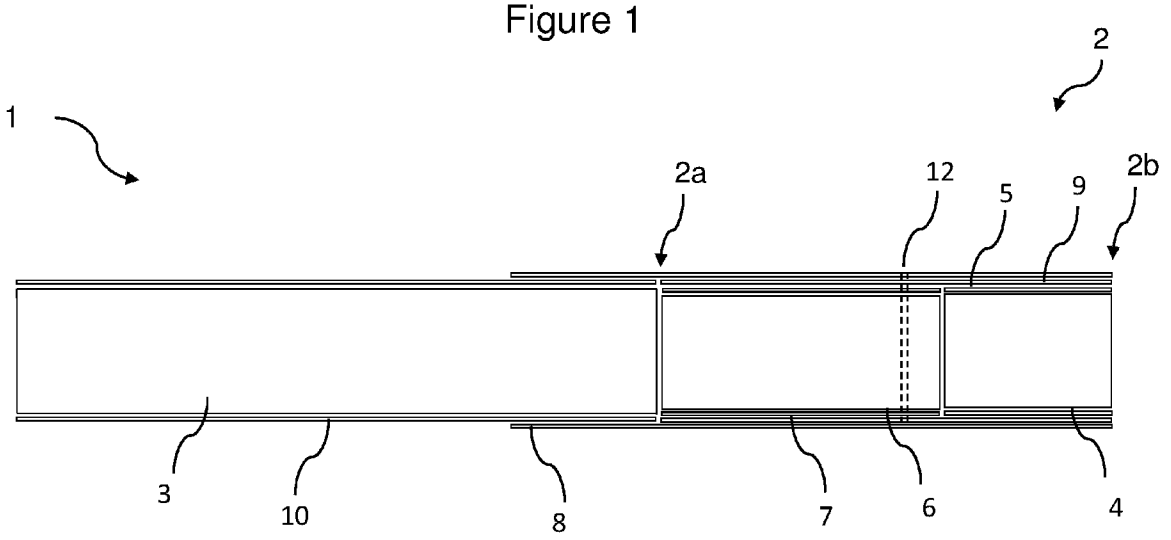
(54) Titre : EMBOUT POUR ARTICLE DESTINE A ETRE UTILISE DANS UN SYSTEME DE FOURNITURE D'AEROSOL ET ARTICLE DESTINE A ETRE UTILISE DANS UN SYSTEME DE FOURNITURE D'AEROSOL

(54) Title: A MOUTHPIECE FOR AN ARTICLE FOR USE IN AN AEROSOL PROVISION SYSTEM AND AN ARTICLE FOR USE IN AN AEROSOL PROVISION SYSTEM

Figure 1



(57) Abrégé/Abstract:
A mouthpiece (2) for an article for use in an aerosol provision system and an article (1) for use in an aerosol provision system. A mouthpiece for an article for use in an combustible aerosol provision system includes a body of material (4) at a mouth end of the mouthpiece. The body has a longitudinal axis and a cross sectional area measured perpendicular to the longitudinal axis and comprises fibrous material. The total denier of fibrous material per cross sectional mm^2 of the body is less than about 720 grams/9000m. The pressure drop across the length of the body is from 1,05 to 1,70 mm water per mm length of the body.

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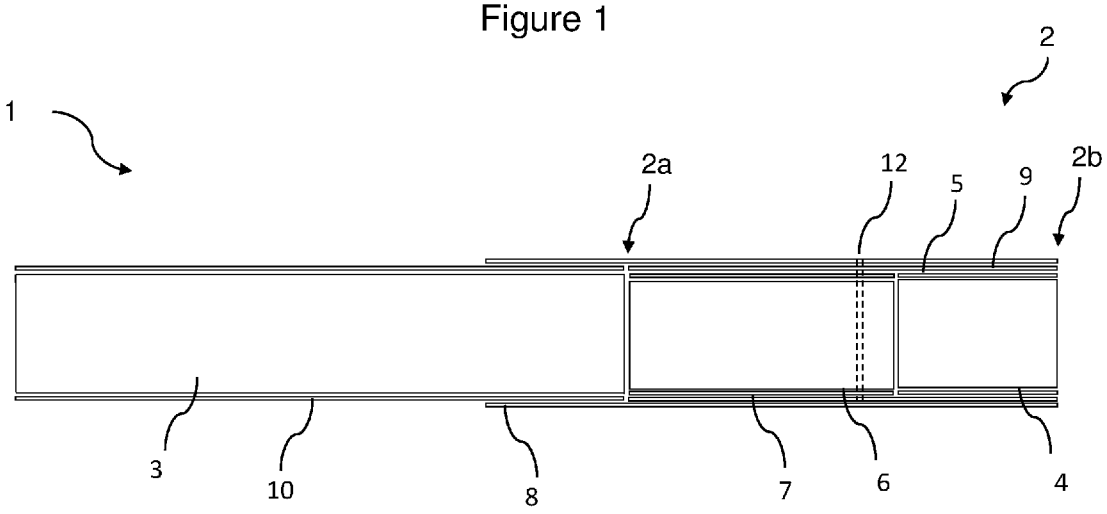
Figure 1



(57) Abstract: A mouthpiece (2) for an article for use in an aerosol provision system and an article (1) for use in an aerosol provision system. A mouthpiece for an article for use in an combustible aerosol provision system includes a body of material (4) at a mouth end of the mouthpiece. The body has a longitudinal axis and a cross sectional area measured perpendicular to the longitudinal axis and comprises fibrous material. The total denier of fibrous material per cross sectional mm^2 of the body is less than about 720 grams/9000m. The pressure drop across the length of the body is from 1,05 to 1,70 mm water per mm length of the body.

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A MOUTHPIECE FOR AN ARTICLE FOR USE IN AN AEROSOL PROVISION SYSTEM AND AN ARTICLE FOR USE IN AN AEROSOL PROVISION SYSTEM

Technical Field

The present invention relates to a mouthpiece for an article for use in an aerosol provision system, and an article for use in an aerosol provision system.

Background

Known aerosol provision systems, such as cigarettes, generally comprise a mouthpiece, including a section provided to alter some property of aerosol drawn therethrough, for example by performing a filtration function to remove constituents of the aerosol. The mouthpiece may be made from a single section, or from multiple sections.

Summary

In accordance with embodiments of the invention, in a first aspect there is provided a mouthpiece for an article for use in an aerosol provision system, the mouthpiece comprising a body of material at a mouth end of the mouthpiece, wherein the body has a longitudinal axis and a cross sectional area measured perpendicular to the longitudinal axis and comprises fibrous material, wherein the total denier of fibrous material per cross sectional mm^2 of the body is less than about 720 grams/9000m, and the pressure drop across the length of the body is from about 1.05 to about 1.70 mm water per mm length of the body.

In accordance with embodiments of the invention, in a second aspect there is provided an article for use in an aerosol provision system, the article comprising a mouthpiece according to the first aspect set out above and a rod of aerosol generating material.

In accordance with embodiments of the invention, in a third aspect there is provided a mouthpiece for an article for use in an combustible aerosol provision system, the mouthpiece comprising a body of material at the mouth end of the mouthpiece and a tubular element positioned upstream of the body of material and formed from filamentary tow extending over a longitudinal portion of the mouthpiece from a position less than about 12mm from the mouth end of the mouthpiece to a position greater than about 12mm from the mouth end of the mouthpiece.

Brief Description of the Drawings

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

Figure 1 is a side-on cross sectional view of an article for use in an aerosol provision system comprising a mouthpiece, the mouthpiece comprising a body of material at a mouth end of the mouthpiece, and a further mouthpiece section upstream of the body of material;

Figure 2 is a side-on cross sectional view of an article for use in an aerosol provision system comprising a mouthpiece, in this example the mouthpiece comprising first and second further mouthpiece sections upstream of the body of material;

Figure 3 is a side-on cross sectional view of an article for use in an aerosol provision system comprising a mouthpiece, in this example the mouthpiece including an adsorbent containing section; and

Figure 4 is a side-on cross sectional view of an article for use in an aerosol provision system comprising a mouthpiece, in this example the mouthpiece comprising a tubular element.

Detailed Description

As used herein, the term "delivery system" is intended to encompass systems that deliver a substance to a user, and includes:

combustible aerosol provision systems, such as cigarettes, cigarillos, cigars, and tobacco for pipes or for roll-your-own or for make-your-own cigarettes (whether based on tobacco, tobacco derivatives, expanded tobacco, reconstituted tobacco, tobacco substitutes or other smokable material);

non-combustible aerosol provision systems that release compounds from an aerosolisable material without combusting the aerosolisable material, such as electronic cigarettes, tobacco heating products, and hybrid systems to generate aerosol using a combination of aerosolisable materials;

articles comprising aerosolisable material and configured to be used as part of one of these non-combustible aerosol provision systems; and

aerosol-free delivery systems, such as lozenges, gums, patches, articles comprising inhalable powders, and smokeless tobacco products such as snus and snuff, which deliver a material to a user without forming an aerosol, wherein the material may or may not comprise nicotine.

According to the present disclosure, a "combustible" aerosol provision system is one where a constituent aerosolisable material of the aerosol provision system (or component thereof) is combusted or burned in order to facilitate delivery to a user.

According to the present disclosure, a "non-combustible" aerosol provision system is one where a constituent aerosolisable material of the aerosol provision system (or component thereof) is not combusted or burned in order to facilitate delivery to a user. In embodiments described herein, the delivery system can be a combustible or a non-combustible aerosol provision system, such as a powered non-combustible aerosol provision system.

The non-combustible aerosol provision system described herein can be 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 aerosolisable material is not a requirement.

The non-combustible aerosol provision system described herein can be a tobacco heating system, also known as a heat-not-burn system.

The non-combustible aerosol provision system described herein can be a hybrid system to generate aerosol using a combination of aerosolisable materials, one or a plurality of which may be heated. Each of the aerosolisable materials may be, for example, in the form of a solid, liquid or gel and may or may not contain nicotine. In one embodiment, the hybrid system comprises a liquid or gel aerosolisable material and a solid aerosolisable material. The solid aerosolisable material may comprise, for example, tobacco or a non-tobacco product.

Typically, the non-combustible aerosol provision system may comprise a non-combustible aerosol provision device and an article for use with the non-combustible aerosol provision system. However, it is envisaged that articles which themselves comprise a means for powering an aerosol generating component may themselves form the non-combustible aerosol provision system.

The non-combustible aerosol provision device may comprise a power source and a controller. The power source may be an electric power source or an exothermic power source. The exothermic power source comprises a carbon substrate which may be

energised so as to distribute power in the form of heat to an aerosolisable material or heat transfer material in proximity to the exothermic power source. The power source, such as an exothermic power source, is provided in the article so as to form the non-combustible aerosol provision system.

In one embodiment, the article for use with the non-combustible aerosol provision device may comprise an aerosolisable material, an aerosol generating component, an aerosol generating area, a mouthpiece, and/or an area for receiving aerosolisable material.

In one embodiment, the aerosol generating component is a heater capable of interacting with the aerosolisable material so as to release one or more volatiles from the aerosolisable material to form an aerosol. In one embodiment, the aerosol generating component is capable of generating an aerosol from the aerosolisable material without heating. For example, the aerosol generating component may be capable of generating an aerosol from the aerosolisable material without applying heat thereto, for example via one or more of vibrational, mechanical, pressurisation or electrostatic means.

In one embodiment, the aerosolisable material may comprise an active material, an aerosol forming material and optionally one or more functional materials. The active material may comprise nicotine (optionally contained in tobacco or a tobacco derivative) or one or more other non-olfactory physiologically active materials. A non-olfactory physiologically active material is a material which is included in the aerosolisable material in order to achieve a physiological response other than olfactory perception.

The aerosol forming material may comprise 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.

The one or more functional materials may comprise one or more of flavours, carriers, pH regulators, stabilizers, and/or antioxidants.

In one embodiment, the article for use with the non-combustible aerosol provision device may comprise aerosolisable material or an area for receiving aerosolisable material. In one embodiment, the article for use with the non-combustible aerosol provision device may comprise a mouthpiece. The area for receiving aerosolisable material may be a storage area for storing aerosolisable material. For example, the storage area may be a reservoir. In one embodiment, the area for receiving aerosolisable material may be separate from, or combined with, an aerosol generating area.

Aerosolisable material, which also may be referred to herein as aerosol generating material, is material that is capable of generating aerosol, for example when heated, irradiated or energized in any other way. Aerosolisable material may, for example, be in the form of a solid, liquid or gel which may or may not contain nicotine and/or flavourants. In some embodiments, the aerosolisable material may comprise an "amorphous solid", which may alternatively be referred to as a "monolithic solid" (i.e. non-fibrous). In some embodiments, the amorphous solid may be a dried gel. The amorphous solid is a solid material that may retain some fluid, such as liquid, within it. In some embodiments, the aerosolisable material may for example comprise from about 50wt%, 60wt% or 70wt% of amorphous solid, to about 90wt%, 95wt% or 100wt% of amorphous solid.

The aerosolisable material may be present on a substrate. The substrate may, for example, be or comprise paper, card, paperboard, cardboard, reconstituted aerosolisable material, a plastics material, a ceramic material, a composite material, glass, a metal, or a metal alloy.

An aerosol modifying agent is a substance that is able to modify aerosol in use. The agent may modify aerosol in such a way as to create a physiological or sensory effect on the human body. Example aerosol modifying agents are flavourants and sensates. A sensate creates an organoleptic sensation that can be perceived through the senses, such as a cool or sour sensation.

Articles, for instance those in the shape of rods, are often named according to the product length: "regular" (typically in the range 68 – 75 mm, e.g. from about 68 mm to about 72 mm), "short" or "mini" (68 mm or less), "king-size" (typically in the range 75 – 91 mm, e.g. from about 79 mm to about 88 mm), "long" or "super-king" (typically in the

range 91 – 105 mm, e.g. from about 94 mm to about 101 mm) and "ultra-long" (typically in the range from about 110 mm to about 121 mm).

They are also named according to the product circumference: "regular" (about 23 – 25 mm), "wide" (greater than 25 mm), "slim" (about 22 – 23 mm), "demi-slim" (about 19 – 22 mm), "super-slim" (about 16 – 19 mm), and "micro-slim" (less than about 16 mm).

Accordingly, an article in a king-size, super-slim format will, for example, have a length of about 83 mm and a circumference of about 17 mm.

Each format may be produced with mouthpieces of different lengths. The mouthpiece length will be from about 10mm to 50 mm, for instance from 15mm to 35mm. A tipping paper connects the mouthpiece to the aerosol generating material and will usually have a greater length than the mouthpiece, for example from 3 to 15 mm longer or 3 to 12mm longer, such that the tipping paper covers the mouthpiece and overlaps the aerosol generating material, for instance in the form of a rod of substrate material, to connect the mouthpiece to the rod.

Articles and their aerosol generating materials and mouthpieces described herein can be made in, but are not limited to, any of the above formats.

The terms 'upstream' and 'downstream' used herein are relative terms defined in relation to the direction of mainstream aerosol drawn though an article or device in use.

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 1.5 and 12 denier per filament, for example between 7 and 10 denier per filament and total denier values of 5,000 to 50,000, for example between 10,000 and 40,000.

As used herein, the term “tobacco material” refers to any material comprising tobacco or derivatives or substitutes thereof. 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.

As used herein, the terms "flavour" and "flavourant" refer to materials which, where local regulations permit, may be used to create a desired taste or aroma in a product for adult consumers. One or more flavours can be used as the aerosol modifying agent described herein.

They may include extracts (e.g., licorice, hydrangea, Japanese white bark magnolia leaf, chamomile, fenugreek, clove, menthol, Japanese mint, aniseed, cinnamon, herb, wintergreen, cherry, berry, peach, apple, Drambuie, bourbon, scotch, whiskey, spearmint, peppermint, lavender, cardamom, celery, cascarilla, nutmeg, sandalwood, bergamot, geranium, honey essence, rose oil, vanilla, lemon oil, orange oil, cassia, caraway, cognac, jasmine, ylang-ylang, sage, fennel, piment, ginger, anise, coriander, coffee, or a mint oil from any species of the genus Mentha), 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, oil, liquid, or powder.

In the figures described herein, like reference numerals are used to illustrate equivalent features, articles or components.

Figure 1 is a side-on cross sectional view of an article 1 for use with an aerosol provision system. In the present case, the article 1 comprises a cigarette.

The article 1 comprises a mouthpiece 2, and a cylindrical rod of aerosol generating material 3, in the present case tobacco material, connected to the mouthpiece 2. The aerosol generating material 3 provides an aerosol when combusted, for instance where

the rod of aerosol generating material 3 is combustible. In other embodiments the article may be used within a non-combustible aerosol provision device to form a non-combustible aerosol provision system, or the article 1 can include its own heat source, forming an aerosol provision system without requiring a separate aerosol provision device.

The mouthpiece 2 includes a body of material 4 positioned at the mouth end 2b of the mouthpiece. In the present example the mouthpiece 2 also includes a first further mouthpiece section 6 upstream of the body of material 4, in this example adjacent to and in an abutting relationship with the body of material 4. The body of material 4 and first further mouthpiece section 6 each define a substantially cylindrical outer shape and share a common longitudinal axis. The body 4 has a cross sectional area measured perpendicular to the longitudinal axis. The material forming the body 4 can be substantially uniformly provided across the whole volume of the body 4, for instance in terms of its density.

In the present example the article 1 has an outer circumference of about 24.5 mm (i.e. the article is in the regular format). In other examples the article can be provided in any of the formats described herein, for instance having an outer circumference of between 15 mm and 25 mm. In the present example the mouthpiece 2 has a length of 22 mm. In alternative embodiments the mouthpiece may have any length in the range 15 to 35 mm. In the present example the body of material 4 has a length of 7 mm, and first further mouthpiece section 6 has a length of 15 mm. In alternative embodiments the body 4 may have any length from about 5 to about 10 mm, for instance about 7mm or about 8mm in length, and the first further mouthpiece section 6 may have any length from about 7 to about 20 mm, for instance about 7mm, about 8mm, about 10mm, about 12mm, about 15mm or about 20mm in length.

The outer circumference of the mouthpiece 2 is substantially the same as the outer circumference of the rod of aerosol generating material 3, such that there is a smooth transition between these components. In the present example, the outer circumference of the mouthpiece 2 is about 24.3 mm.

In use, a section of a mouthpiece may retain components of the aerosol passing through the mouthpiece which can cause visible staining to the material of that section. Particularly at the mouth end of a mouthpiece, such staining may be visible to a user.

The body of material 4 described herein exhibits less visible staining than previous mouthpieces. This can be achieved by using a total denier of fibrous material per cross sectional mm^2 of the body which is less than about 720 grams/9000m, with such tows having less fibrous material per cross sectional mm^2 than previous mouthpieces. Also, the pressure drop across the length of the body is preferably from 1.05 to 1.70 mm water per mm length of the body, which allows aerosol to pass through the body without significant obstruction, while having enough fibrous material to provide acceptable hardness to the body.

The total denier of the fibrous material per cross-sectional mm^2 of the body is preferably less than 720 grams/9000m and at least 400 grams/9000m. This can provide a good balance between relatively low levels of fibrous material per cross sectional mm^2, allowing for low staining, and acceptable filter hardness.

In mouthpieces described herein, the fibrous material can have a density of from about 0.09mg to about 0.13mg per mm^3 of said body. The fibrous material can have a weight of from 4mg to 6mg per mm of length of said body.

In the present example, the body of material 4 is formed from filamentary tow. In the present example, the tow used in the body of material 4 has a denier per filament (d.p.f.) of 8 and a total denier of 30,000 g/9000m. In the present example, the tow comprises plasticised cellulose acetate tow. The plasticiser used in the tow comprises about 11.8% 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 4 and/or the plasticiser. For instance, the body 4 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 level of plasticiser, for instance triacetin, can be between 6% and 14%, for instance between 8% and 13% or 9% and 12%. The tow, whether formed from cellulose acetate or other materials, preferably has a d.p.f. of at least 6, more preferably at least 7 and still more preferably at least 7.5 g/9000m. These values of denier per filament provide a tow which has relatively coarse, thick fibres with a lower surface area than tows having lower d.p.f. values and which result in a lower pressure drop across the mouthpiece 2 than tows having lower d.p.f. values. Preferably, to achieve a sufficiently

uniform body of material 4, the tow has a denier per filament of less than 12 d.p.f, preferably less than 11 d.p.f. and still more preferably less than 10 d.p.f.

The total denier of the tow forming the body of material 4 is preferably less than 35,000, more preferably less than 32,000 and still more preferably less than 31,000 g/9000m. 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 hardness of the body of material 4, the tow preferably has a total denier of at least 8,000 and more preferably at least 10,000 g/9000m. Preferably, the denier per filament is between 6 and 12 while the total denier is between 25,000 and 32,000 g/9000m. More preferably, the denier per filament is between 7.5 and 9 while the total denier is between 29,000 and 31,000 g/9000m. Preferably the cross-sectional shape of the filaments of tow are 'Y' shaped, although in other embodiments other shapes such as 'X' shaped or generally circular cross sectioned filaments can be used, with the same d.p.f. and total denier values as provided herein.

It has been advantageously found that selecting a fibrous tow with denier per filament and total denier in the ranges described above such that the body has a total denier of fibrous material per cross sectional mm^2 of the body of less than 720 grams/9000m and at least 400 grams/9000m provides a good balance between pressure drop and hardness, resulting in a filter section which has low visible staining and an acceptable feel to the consumer.

It has been advantageously found that plasticiser levels of between about 9% and 13%, for instance about 11.8% by weight of the tow may be used in combination with filamentary tow having a denier per filament in the ranges set out above. This is a higher level of plasticiser than it is conventionally used, and provides increased hardness as compared to lower levels of plasticiser. The plasticiser can be triacetin.

The body of material 4 is wrapped in a first plug wrap 5. In the present example the first plug wrap 5 has a basis weight in the range 45 to 65 grams per square metre, preferably about 50 to about 60 grams per square metre. Providing a first plug wrap having a basis weight in these ranges further contributes to the hardness of the mouth end filter section. Alternatively, the first plug wrap 5 can have a basis weight in the

range 15 to 65 grams per square metre, for instance about 20 to about 40 grams per square metre.

The hardness of a body or further mouthpiece section may be measured according to the following protocol. Where the hardness of a section is referred to herein, the hardness is that as determined by the following measurement process. Any suitable device may be used for performing the measurement, such as the Borgwaldt Hardness Tester H10.

Hardness is defined as the ratio between the height h0 of a body and the height h_1 of the body under a defined load, stated as a percentage of h_0. Hardness may be expressed as:

Hardness = $(h_1/h_0)\times 100$

For an individual body, or a body contained in a multi-section rod, the hardness measurement is performed at the longitudinal centre point of the body.

A load bar is used to apply the defined load to the body. The length of the load bar should be significantly higher than that of the specimen to be measured. Prior to the hardness measurement, the body to be measured is conditioned according to ISO 3402 for a minimum of 48 hours, and is maintained in environmental conditions according to ISO 3402 during the measurement.

To perform the hardness measurement, a body is placed into the Hardness Tester H10, a pre-load of 2 g is applied to the body, and after 1 s the initial height h_0 of the body under the 2 g pre-load is recorded. The pre-load is then removed and a load bar bearing a load of 150 g is lowered onto the sample at a rate of 0.6 mm/s, after 5 s the height h_1 of the body under the 150 g load is measured.

The hardness is determined as the average hardness of at least 20 body or other mouthpiece sections measured according to this protocol.

In the present example the body of material 4 and the first further mouthpiece section 6 are combined using a second plug wrap 9 which is wrapped around both sections. A tipping paper 8 is wrapped around the full length of the mouthpiece 2 and over part of the rod of aerosol generating material 3 and has an adhesive on its inner surface to connect the mouthpiece 2 and rod 3. In the present example, the tipping paper 8

extends 5 mm over the rod of aerosol generating material 3 but it can alternatively extend between 3 mm and 15 mm over the rod 3, or between 4 mm and 6 mm, to provide a secure attachment between the mouthpiece 2 and rod 3.

Preferably, the second plug wrap 9 has a basis weight of less than 50 gsm, more preferably between about 20 gsm and 40 gsm. Preferably, the second plug wrap 9 has a thickness of between 30 μm and 60 μm, more preferably between 35 μm and 45 μm. Preferably, the second plug wrap 9 is a non-porous plug wrap, for instance having a permeability of less than 100 Coresta units, for instance less than 50 Coresta units. However, in other embodiments, the second plug wrap 9 can be a porous plug wrap, for instance having a permeability of greater than 200 Coresta Units.

In the present example, the rod of aerosol generating material 3 is wrapped in a wrapper 10. The wrapper 10 can, for instance, be a paper or paper-backed foil wrapper. In the present example, the wrapper 10 is substantially impermeable to air, although permeable wrappers can also be used. In alternative embodiments, the wrapper 10 has a permeability of less than 100 Coresta Units, for instance less than 60 Coresta Units. The permeability of the wrapper 10 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 first further mouthpiece section 6 may be formed from any of the materials set out above for the body of material 4. The material forming the first further mouthpiece section 6 can be substantially uniformly provided across the whole volume of the section 6, for instance in terms of its density. The first further mouthpiece section 6 may be formed from the same material as the body 4, or from a different material. In the present example, first further mouthpiece section 6 is also formed from filamentary tow. In the present example, the tow used in the first further mouthpiece section 6 has a denier per filament (d.p.f.) of 2 g/9000m and a total denier of 35,000 g/9000m. The tow from which the first further mouthpiece section is formed comprises about 8% plasticiser by weight of the tow. In the present case the plasticiser is triacetin. In alternative embodiments the plasticiser may comprise any of the options described for the body of material 4.

The tow forming the first further mouthpiece section 6, whether formed from cellulose acetate or other materials, preferably has a d.p.f. in the range from 1.5 to 7.5 g/9000m.

These values of denier per filament provide a tow which has relatively fine fibres, and results in a higher pressure drop per mm of the first further mouthpiece section 6 compared to the pressure drop per mm of the body of material 4. In the present example, first further mouthpiece section 6 has higher filtration efficiency than body of material 4.

First further mouthpiece section 6 is wrapped in third plug wrap 7. Preferably the third plug wrap is formed from the same material as the second plug wrap 9, as set out above. In alternative embodiments, the third plug wrap 7 may have a basis weight and a thickness selected from the ranges set out for the second plug wrap 9.

The total denier of the tow forming the first further mouthpiece section 6 is in the range 24,000 to 45,000 g/9000m. For appropriate firmness of the first further mouthpiece section 6, the tow preferably has a total denier of at least 25,000 and more preferably at least 30,000 g/9000m. Preferably, the denier per filament is between 1.5 and 3 g/9000m, while the total denier is between 30,000 and 43,000 g/9000m. 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.

Features of the body of material 4 are summarised in Table 1.0.

Tow	Plug wrap (gsm)	Length (mm)	Pressure drop mmWG	Hardness (%)	Plasticiser level (%)	Tow weight
8Y30000	50	7-8	11.5	90-94	11.8	36.6

Table 1.0

The article 1 has a ventilation level of about 60% of the aerosol drawn through the article. In alternative embodiments, the article can have a ventilation level of between 0% and 90% of aerosol drawn through the article, for instance between 55% and 75%. The ventilation is provided directly into the mouthpiece 2 of the article 1. In the present example, the article is provided with first and second parallel rows of perforations 12 through the tipping material 8, third plug wrap 7, and second plug wrap 9 providing ventilation into the first further mouthpiece section 6. In the present case, the perforations 12 are formed as laser perforations, at positions about 18 mm and about 19 mm respectively from the downstream, mouth-end 2b of the mouthpiece 2. In

alternative embodiments, the ventilation can be provided into the mouthpiece at other locations, for instance into the body of material 4, or an additional mouthpiece section, where one is provided.

Figure 2 is a side-on cross sectional view of a further article 1' including a mouthpiece 2'. Article 1' and mouthpiece 2' are the same as the article 1 and mouthpiece 2 illustrated in Figure 1, except that mouthpiece 2' includes a first further mouthpiece section 6 and a second further mouthpiece section. In the present example the second further mouthpiece section comprises a tubular element 13 formed from filamentary tow, and is positioned upstream of and immediately adjacent to first further mouthpiece section 6. In alternative embodiments the second further mouthpiece section may comprise any of the options set out above for the first further mouthpiece section 6. First further mouthpiece section 6 may also be formed from paper, for instance in a similar way to paper filters known for use in cigarettes. In this embodiment, the second further mouthpiece section 6 has a length of 8 mm. In the present example the length of the mouthpiece is 27 mm.

The "wall thickness" of the tubular element 13 corresponds to the thickness of the wall of the tube 13 in a radial direction. This may be measured, for example, using a calliper. The wall thickness is advantageously greater than 0.9mm, and more preferably 1.0mm or greater. Preferably, the wall thickness is substantially constant around the entire wall of the tubular element 13. However, where the wall thickness is not substantially constant, the wall thickness is preferably greater than 0.9 mm at any point around the tubular element 13, more preferably 1.0 mm or greater. The wall thickness is advantageously less than 3.0mm, and more preferably 2.0mm or less. The wall thickness can be about 1.0mm, about 1.2mm, about 1.4mm or about 1.5mm. In some examples, the wall thickness is between about 0.9mm and about 1.4mm, or between about 1.0mm and about 1.3mm.

Preferably, the length of the tubular element 13 is less than about 20 mm. More preferably, the length of the tubular element 13 is less than about 15 mm. Still more preferably, the length of the tubular element 13 is less than about 10 mm. In addition, or as an alternative, the length of the tubular element 13 is at least about 5 mm. Preferably, the length of the tubular element 13 is at least about 6 mm. In some preferred embodiments, the length of the tubular element 13 is from about 5 mm to about 20 mm, more preferably from about 6 mm to about 10 mm, even more preferably

from about 6 mm to about 8 mm, most preferably about 6 mm, 7 mm or about 8 mm. In the present example, the length of the tubular element 13 is 7 mm.

Preferably, the density of the tubular element 13 is at least about 0.25 grams per cubic centimetre (g/cc), more preferably at least about 0.3 g/cc. Preferably, the density of the tubular element 13 is less than about 0.75 grams per cubic centimetre (g/cc), more preferably less than 0.6 g/cc. In some embodiments, the density of the tubular element 13 is between 0.25 and 0.75 g/cc, more preferably between 0.3 and 0.6 g/cc, and more preferably between 0.4 g/cc and 0.6 g/cc or about 0.5 g/cc.

The filamentary tow forming the tubular element 13 preferably has a total denier of less than 80,000, more preferably less than 75,000. Preferably, the total denier is at least 20,000, more preferably at least 25,000. In preferred embodiments, the filamentary tow forming the tubular element 13 has a total denier between 25,000 and 58,000, more preferably between 28,000 and 40,000. 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 tubular element 13 preferably has a denier per filament of greater than 3. This denier per filament has been found to allow the formation of a tubular element 4 which is not too dense. Preferably, the denier per filament is at least 4, more preferably at least 5. In preferred embodiments, the filamentary tow forming the tubular element 13 has a denier per filament between 4 and 10, more preferably between 4 and 9. In one example, the filamentary tow forming the tubular element 13 has a 5Y30,000, a 7.3Y36000, a 8Y56000 or an 8Y40,000 tow formed from cellulose acetate and comprising about 18% plasticiser, for instance triacetin.

The tubular element 13 preferably has an internal diameter of greater than 3.0mm. More preferably, the tubular element 13 has an internal diameter of greater than 3.1mm, and still more preferably greater than 3.5mm or 3.6mm. In one embodiment, the internal diameter of the tubular element 13 is about 5.0mm. The internal diameter of the tubular element 13 can be between about 3.5mm and about 5.2mm, while the wall thickness is between about 1.0mm and about 1.3mm.

The tubular element 13 preferably comprises from 15% to 22% by weight of plasticiser. For cellulose acetate tow, the plasticiser is preferably triacetin, although other plasticisers such as polyethelyne glycol (PEG) can be used. More preferably, the tubular element 4 comprises from 16% to 20% by weight of plasticiser, for instance about 17%, about 18% or about 19% plasticiser.

In the present example tubular element 13 is formed from filamentary tow, however the tubular element can me formed in other ways, such as a from paper tube formed from a plurality of layers of paper which are parallel wound, with butted seams, to form the tubular element 13, or from spirally wound layers of paper, cardboard tubes, tubes formed using a papier-mâché type process, moulded or extruded plastic tubes or similar.

The hollow tubular element 13 can also be formed using a stiff plug wrap and/or tipping paper as the second plug wrap 9 and/or tipping paper 8 described herein, meaning that a separate tubular element is not required. The stiff plug wrap and/or tipping paper is manufactured to have a rigidity that is sufficient to withstand the axial compressive forces and bending moments that might arise during manufacture and whilst the article 1, 1' is in use. For instance, the stiff plug wrap and/or tipping paper can have a basis weight between 70 gsm and 120 gsm, more preferably between 80 gsm and 110 gsm. Additionally or alternatively, the stiff plug wrap and/or tipping paper can have a thickness between 80 μm and 200 μm, more preferably between 100 μm and 160 μm, or from 120 μm to 150 μm. It can be desirable for both the second plug wrap 9 and tipping paper 8 to have values in these ranges, to achieve an acceptable overall level of rigidity for the hollow tubular element 13.

The rod of aerosol generating material 3 preferably has a length of about 10 mm to 100 mm. In some embodiments, the length of the rod of aerosol generating material 3 is preferably in the range about 50 mm to 100 mm, more preferably in the range about 55 mm to 95 mm.

Figure 3 is a side-on cross sectional view of a further article 1" including a mouthpiece 2". Article 1" and mouthpiece 2" are the same as the article 1' and mouthpiece 2' illustrated in Figure 2, except that mouthpiece 2" includes an adsorbent containing section 14 in place of hollow tubular element 13.

The adsorbent containing section 14 comprises granules of an adsorbent material 15, for instance carbon granules, dispersed within the material of the adsorbent containing section 14. A suitable amount of activated carbon granules may be, for instance, 40mg, although other amounts, such as between 10mg and 80mg or between 10mg and 50mg can be used. Adsorbent containing section 14 is formed from filamentary tow, in the present example plasticised cellulose acetate tow, as described for first further mouthpiece section 6. In the present example the tow used to form the adsorbent containing section has a denier per filament of 7.3 g/9000m, and a total denier of 33,000 g/9000m. In alternative examples the tow may have, for instance, a denier per filament of 3.9 g/9000m and a total denier of 30,000 g/9000m, or any combination of denier per filament and total denier in the range set out for first further mouthpiece section 6. In alternative embodiments, the adsorbent containing section 14 can be provided in other forms, for instance a cavity at least partially filled with the adsorbent and arranged between two sections or plugs of tow.

The adsorbent containing section 14 is wrapped in a fourth plug wrap 16.

In alternative embodiments, first further mouthpiece section 6 may comprise an aerosol modifying agent provided within the section. The aerosol modifying agent may be provided in the form of a capsule, or in other examples can be provided in other forms, such as material injected into the section or provided on a thread, for instance the thread carrying a flavourant or other aerosol modifying agent, which may also be disposed within the section.

Where the aerosol modifying agent is provided in the form of a capsule, the capsule can comprise a breakable capsule, for instance a capsule which has a solid, frangible shell surrounding a liquid payload. The capsule can be entirely embedded within the material of the section, i.e. completely surrounded by the material forming the section. In other examples, a plurality of breakable capsules may be disposed within the section, for instance 2, 3 or more breakable capsules. The length of the section can be increased to accommodate the number of capsules required. In examples where a plurality of capsules are 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 first further mouthpiece sections 6 may be provided, with each section containing one or more capsules.

The capsule can have a core-shell structure. In other words, the capsule can comprise 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. In embodiments where a capsule is provided, the first plug wrap 5 can comprise a barrier coating to make the material of the plug wrap substantially impermeable to the liquid payload of the capsule 11. Alternatively or in addition, the second plug wrap 9 and/or tipping paper 8 can comprise a barrier coating to make the material of that plug wrap and/or tipping paper substantially impermeable to the liquid payload of the capsule.

In one example, the capsule is spherical and has a diameter of about 3 mm. In other examples, other shapes and sizes of capsule can be used. The total weight of the capsule may be in the range about 10 mg to about 50 mg.

The capsule may be located at a longitudinally central position within the first further mouthpiece section. That is, the capsule is positioned so that its centre is equidistant from each end of the first further mouthpiece section. In other examples, the capsule can be located at a position other than a longitudinally central position section, i.e. closer to the downstream end of the section 6 than the upstream end, or closer to the upstream end of the section 6 than the downstream end. Preferably, the mouthpiece is configured so that the capsule and the ventilation holes 12 are longitudinally offset from each other in the mouthpiece.

In some cases, the barrier material (also referred to herein as the encapsulating material) is frangible. The capsule is crushed or otherwise fractured or broken by the user to release the encapsulated aerosol modifier. Typically, the capsule is broken immediately prior to smoking but the user can select when to release the aerosol modifier. The term "breakable capsule" refers to a capsule, wherein the shell can be broken by means of a pressure to release the core; more specifically the shell can be ruptured under the pressure imposed by the user's fingers when the user wants to release the core of the capsule.

In some cases, the barrier material is heat resistant. That is to say, in some cases, the barrier will not rupture, melt or otherwise fail at the temperature reached at the capsule site during operation of the aerosol provision device. Illustratively, a capsule located in a mouthpiece may be exposed to temperatures in the range of 30°C to 100°C for

example, and the barrier material may continue to retain the liquid core up to at least about 50°C to 120°C.

In other cases, the capsule releases the core composition on heating, for example by melting of the barrier material or by capsule swelling leading to rupture of the barrier material.

The total weight of a capsule may be in the range of about 1 mg to about 100 mg, suitably about 5 mg to about 60 mg, about 8 mg to about 50 mg, about 10 mg to about 20 mg, or about 12 mg to about 18 mg.

The total weight of the core formulation may be in the range of about 2 mg to about 90 mg, suitably about 3 mg to about 70 mg, about 5 mg to about 25 mg, about 8 mg to about 30 mg, or about 10 mg to about 25 mg.

The capsule according to the invention comprises a core as described above, and a shell. The capsules may present a crush strength from about 4.5 N to about 40 N, more preferably from about 5 N to about 30 N or to about 28 N (for instance about 9.8 N to about 24.5 N). The capsule burst strength can be measured when the capsule is removed from the body of material 6 and using a force gauge to measure the force at which the capsule bursts when pressed between two flat metal plates. A suitable measurement device is the Sauter FK 50 force gauge with a flat headed attachment, which can be used to crush the capsule against a flat, hard surface having a surface similar to the attachment.

The capsules may be substantially spherical and have a diameter of at least about 0.4 mm, 0.6 mm, 0.8 mm, 1.0 mm, 2.0 mm, 2.5 mm, 2.8 mm or 3.0 mm. The diameter of the capsules may be less than about 10.0 mm, 8.0 mm, 7.0 mm, 6.0 mm, 5.5 mm, 5.0 mm, 4.5 mm, 4.0 mm, 3.8 mm or 3.6 mm. Illustratively, the capsule diameter may be in the range of about 0.4 mm to about 10.0 mm, about 0.8 mm to about 6.0 mm, about 2.5 mm to about 5.5 mm or about 2.8 mm to about 3.7 mm. In some cases, the capsule may have a diameter of about 3.0 mm or 3.5mm. These sizes are particularly suitable for incorporation of the capsule into an article as described herein.

Figure 4 is a side-on cross sectional view of a further article 1''' for use with an aerosol provision system. Article 1''' includes a mouthpiece 2'''. In the present example, the article 1''' comprises a cigarette.

Article 1''' and mouthpiece 2''' are the same as the article 1' and mouthpiece 2' described in Figure 2, except that the article 1''' of Figure 4 is for use in a combustible aerosol provision system and the second further mouthpiece section comprising tubular element 13 is provided immediately upstream of and adjacent to body 4, and first further filter section 6 is provided immediately upstream of and adjacent to tubular element 13.

The mouthpiece 2''' of Figure 4 comprises a body 4 of material at the mouth end of the mouthpiece 2''' and a tubular element 13 positioned upstream of the body 4 of material and formed from filamentary tow extending over a longitudinal portion of the mouthpiece 2''' from a position less than about 12mm from the mouth end of the mouthpiece 2''' to a position greater than about 12mm from the mouth end of the mouthpiece 2'''.

Providing the second further mouthpiece section immediately upstream of the body 4 results in the position of the second further mouthpiece section underlying the position where the consumer typically holds a smoking article. It has been advantageously found that providing the second further mouthpiece section in this position and as a tubular element 13 can result in an improved feel of this section for the consumer as they hold the smoking article, while providing a more conventional mouth-end appearance.

The hardness of the tubular element 13 may be greater than 85%, when measured in accordance with the protocol described herein. Preferably the hardness of the tubular element may be between 85% and 95%, or more preferably between about 90% and 95%.

The tubular element 13 may extend from a position about 7 mm, 8 mm, 9 mm or 10 mm from the mouth end of the mouthpiece. Preferably the tubular element extends from a position less than about 8.5 mm from the end of the mouthpiece, or more preferably from a position less than about 8 mm from the end of the mouthpiece. The tubular element 13 may extend to a position less than about 9 mm from the end of the mouthpiece to a position greater than about 15 mm from the end of the mouthpiece.

Preferably the tubular element 13 extends to a position greater than about 13 mm from the end of the mouthpiece, or more preferably to a position greater than about 14 mm from the end of the mouthpiece.

Perforations 12 are provided through the tipping material 8, third plug wrap 7, and second plug wrap 9, providing ventilation into the first further mouthpiece section 6.

In alternative embodiments, any of the mouthpiece sections 4, 6, 13, 14 described herein may be provided in a mouthpiece along with any other mouthpiece section as described herein. The first further mouthpiece section 6, and second further mouthpiece section, may be provided in any longitudinal position downstream of the rod 3. The body of material 4 is preferably provided at the furthest downstream position, so as to form the mouth end section of the mouthpiece.

Features of exemplary articles comprising further sections in addition to body 4 are set out in Table 2.0. The mouthpieces have a circumference of 24.30mm. All of the exemplary articles comprising further sections as specified in Table 2.0 also include body 4, which may be between 7 mm and 8 mm in length. The first further mouthpiece section in any of the exemplary articles set out in Table 2.0 may alternatively be formed from 7.3Y36000 denier tow. The CA tube sections set out in Table 2.0 can comprise the tubular element 13 as described herein.

Example	First further mouthpiece section						Second further mouthpiece section					
	Type	Tow (d.p.f. / t.d.)	Tow weight (g)	Plug wrap (gsm)	Length (mm)	Pressure drop	Type	Tow (d.p.f. / t.d.)	Tow weight (g)	Plug wrap (gsm)	Length (mm)	Pressure drop
1	CA tube	5.0Y/30000	52.8	27	12	32.1	Charcoal	7.3Y/33000	34.2	27	8	21.4
2	CA	2.0Y/35000	111.8	27	20	101.5						
3	Charcoal	3.9Y/30000	60.74	27	15	53.5						
4	CA	2.1Y/42000	94.5	27	15	90.25						
5	CA	3.0Y30000	73.5	27	15	48.5						
6	CA	2.1Y/42000	63	27	10	60.17						
7	CA	1.8Y/43000	64.6	27	10	76.8						
8	CA tube	5.0Y/30000	55.4		7	5	CA	2Y/35000	44.5	27	8	43.5
9	CA tube	5.0Y/30000	55.4		7	6.1	CA	1.5Y/46000	57.5	27	8	84.1
10	CA tube	5.0Y/30000	55.4		7	3.93	Charcoal	2.0Y/35000	41.0	27	8	49.6
11	CA tube	5.0Y/30000	55.4		7	7.9	CA	1.8Y/43000	76.1	27	12	92.1
12	CA tube	5.0Y/30000	55.4		7	4.6	Charcoal	2.1Y/30000	53.28	27	12	47.4

Table 2.0

In order to address various issues and advance the art, the entirety of this disclosure shows by way of illustration various embodiments in which the claimed invention(s) may be practiced and provide for superior delivery of a smoke modifying additives. The advantages and features of the disclosure are of a representative sample of embodiments only, and are not exhaustive and/or exclusive. They are presented only to assist in understanding and teach the claimed features. It is to be understood that advantages, embodiments, examples, functions, features, structures, and/or other aspects of the disclosure are not to be considered limitations on the disclosure 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 and/or spirit of the disclosure. Various embodiments may suitably comprise, consist of, or consist essentially of, various combinations of the disclosed elements, components, features, parts, steps, means, etc. In addition, the disclosure includes other inventions not presently claimed, but which may be claimed in future.

Claims

1. A mouthpiece for an article for use in an aerosol provision system, the mouthpiece comprising a body of material at a mouth end of the mouthpiece, wherein the body has a longitudinal axis and a cross sectional area measured perpendicular to the longitudinal axis and comprises fibrous material, wherein the total denier of fibrous material per cross sectional mm^2 of the body is less than about 720 grams/9000m, and the pressure drop across the length of the body is from about 1.05 to about 1.70 mm water per mm length of the body.

2. A mouthpiece according to claim 1, wherein the fibrous material has a weight of from about 0.09mg to about 0.13mg per mm^3 of said body.

3. A mouthpiece according to claim 1 or 2, wherein the fibrous material has a weight of from about 4mg to about 6mg per mm of length of said body.

4. A mouthpiece according to any one of claims 1 to 3, wherein the total denier of fibrous material per cross sectional mm^2 of the body is less than about 700 g/9000m, or less than about 675 g/9000m, or less than about 650 g/9000m.

5. A mouthpiece according to any one of claims 1 to 4, wherein the fibrous material comprises a denier per filament of about 6 to about 12 denier per filament, or about 7 to about 10 denier per filament, or about 7.5 to about 9 denier per filament.

6. A mouthpiece according to any one of claims 1 to 5, wherein the total denier of the fibrous filtration material is from about 25000 to about 35000 g/9000m, or about 28000 to about 32000 g/9000m, or about 29000 to about 31000 g/9000m.

7. A mouthpiece according to any one of claims 1 to 6, wherein the body of material comprises a plasticiser, and wherein the level of plasticiser is from about 5 % to about 14 % by weight of the body of material, or from about 8% to about 13% by weight of the body of material, or from about 10% to about 12% by weight of the body of material.

8. A mouthpiece according to any one of claims 1 to 7, wherein the body of material is circumscribed by a plug wrap, and wherein the plug wrap comprises a basis

weight of about 20 to about 65 grams per square metre, or about 45 to about 65 grams per square metre, or about 50 to about 60 grams per square metre.

9. A mouthpiece according to any one of claims 1 to 8, wherein the mouthpiece has a circumference in the range 16mm to 23mm or in the range 23 mm to 25 mm.

10. A mouthpiece according to any one of claims 1 to 9, wherein the mouthpiece comprises at least one further section upstream of the body of material.

11. A mouthpiece according to claim 10, wherein the at least one further section comprises a section formed from cellulose acetate tow.

12. A mouthpiece according to claim 10 or11, wherein the at least one further section comprises a hollow tubular section.

13. A mouthpiece according to any one of claims 10 to 12, wherein the at least one further section comprises particulate adsorbent material.

14. A mouthpiece according to any one of claims 1 to 13, wherein the hardness of the mouthpiece at a position 3mm from the mouth end of the mouthpiece is in the range 90% to 99 %.

15. A mouthpiece according to any one of claims 1 to 14, wherein the mouthpiece is circumscribed by a filter wrapper comprising a basis weight in the range 20 to 35 grams per square metre.

16. A mouthpiece for an article for use in a combustible aerosol provision system, the mouthpiece comprising a body of material at the mouth end of the mouthpiece; and a tubular element positioned upstream of the body of material and formed from filamentary tow extending over a longitudinal portion of the mouthpiece from a position less than about 12mm from the mouth end of the mouthpiece to a position greater than about 12mm from the mouth end of the mouthpiece.

17. A mouthpiece according to claim 16, wherein the mouthpiece has a hardness of at least about 85% at a position 12mm from the mouth end of the mouthpiece.

18, A mouthpiece according to claim 16 or 17, wherein the tubular element extends over a longitudinal portion of the mouthpiece from a position less than about 10mm from the mouth end of the mouthpiece to a position greater than about 13mm from the mouth end of the mouthpiece.

19. A mouthpiece according to claim 16, 17 or 18, wherein the tubular element extends over a longitudinal portion of the mouthpiece from a position less than about 9mm from the mouth end of the mouthpiece to a position greater than about 13mm from the mouth end of the mouthpiece.

20. A mouthpiece according to any one of claims 1 to 15 and any one of claims 16 to 19.

21. A mouthpiece according to any one of claims 1 to 20, for an article for use in a combustible aerosol provision system.

22. A mouthpiece according to claim 21, wherein said combustible aerosol provision system comprises a cigarette or a cigarillo.

23. An article for use in an aerosol provision system, the article comprising a mouthpiece according to any one of claims 1 to 22 and a rod of aerosol generating material.

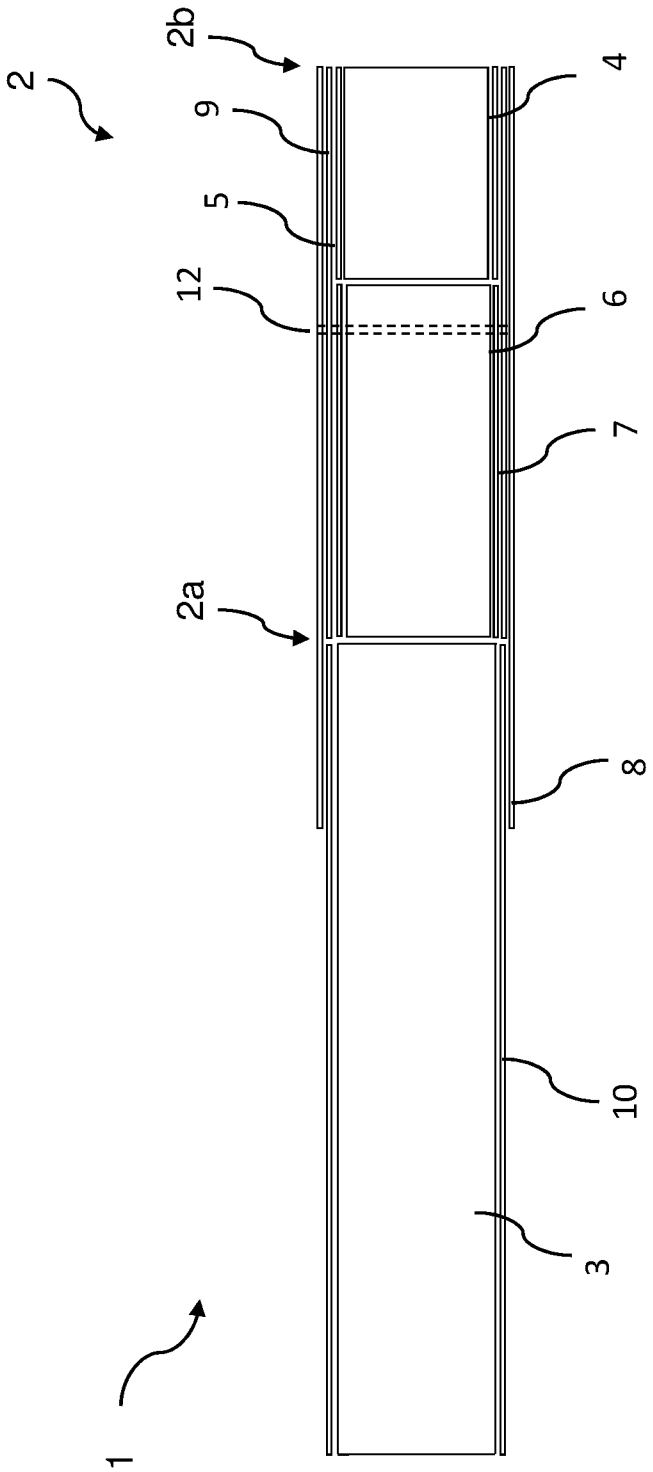

Figure 1

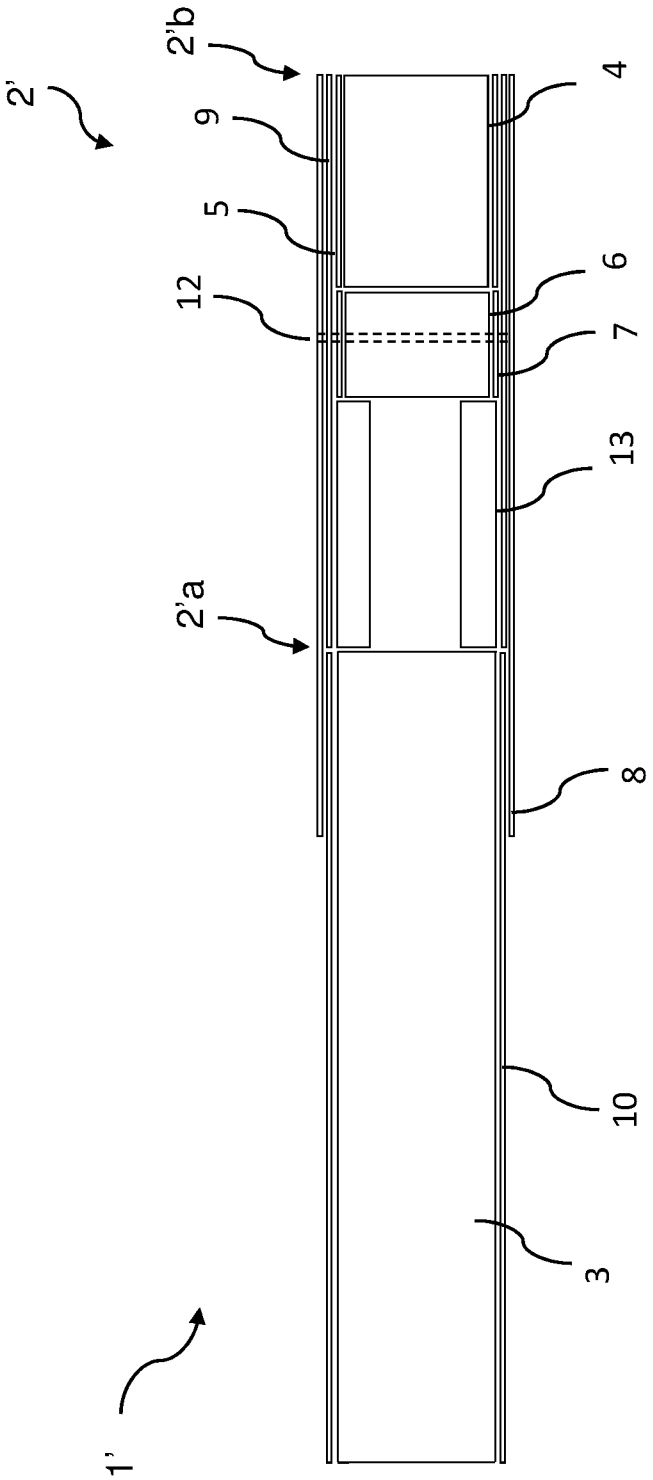

Figure 2

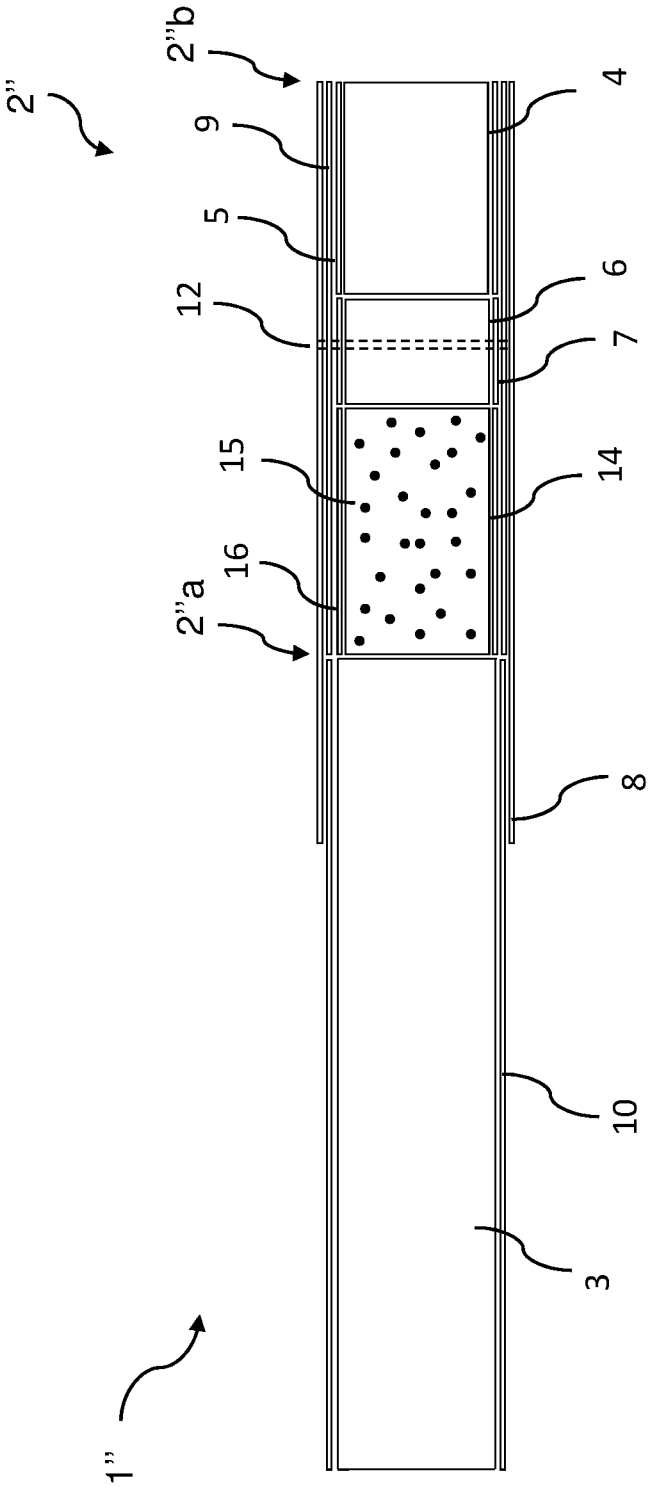

Figure 3

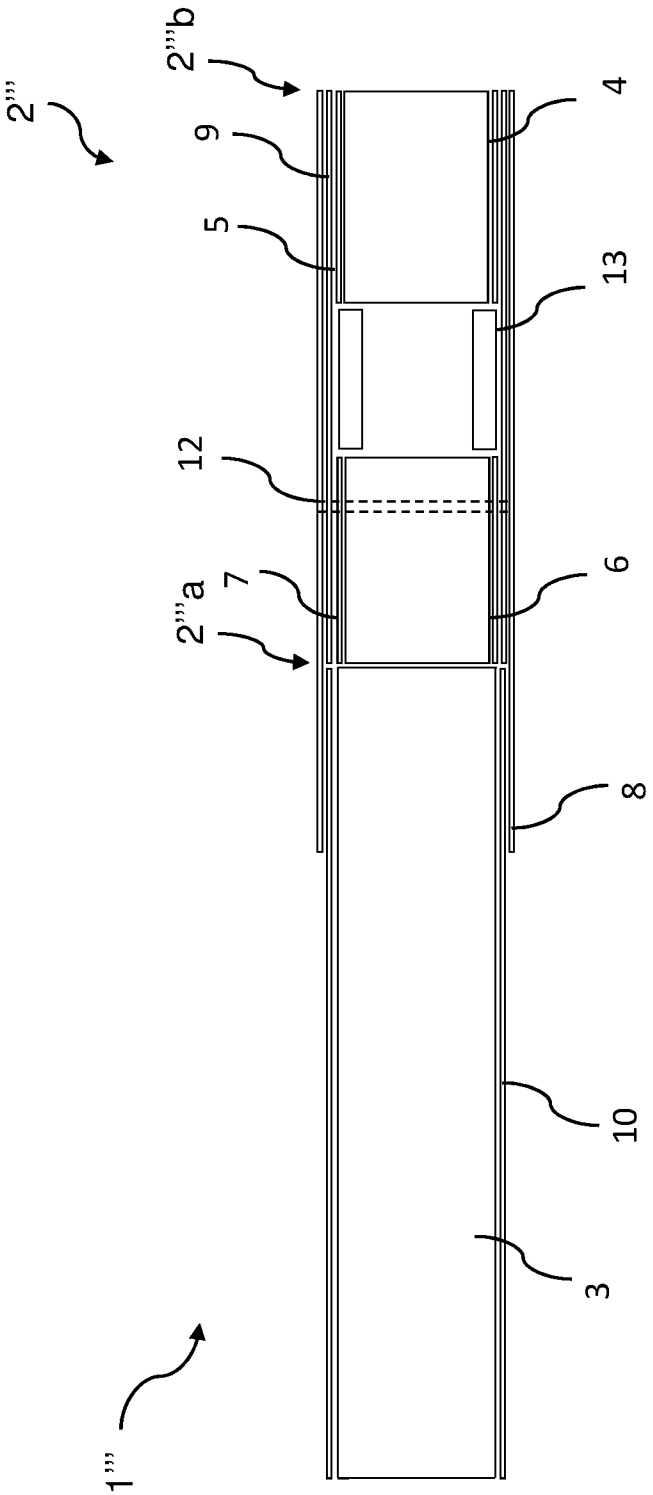

Figure 4

Figure 1