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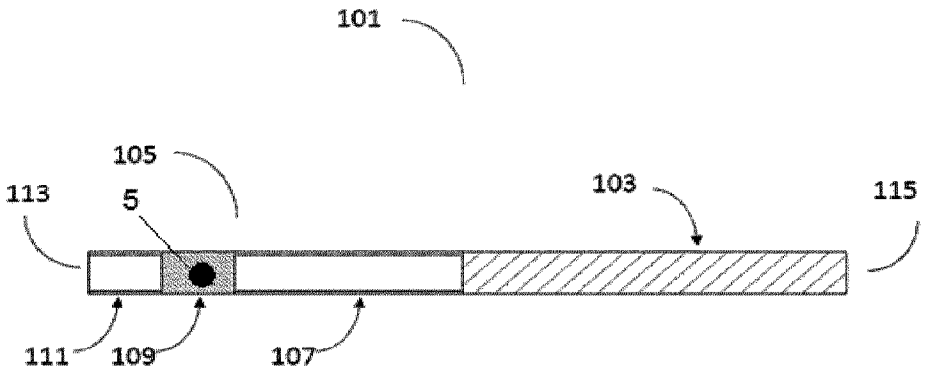

(57) Abrégé/Abstract:
Provided herein is a heat-not-burn article comprising an aerosol generating medium and a filter. The filter contains one or more crushable capsules. In use, the aerosol generating medium is heated without being combusted, and the capsule is exposed to a temperature of about 30 to 100ºC. During the exposure the structural integrity of the capsule is not compromised such that the capsule can be crushed by the user before, during or after heating.

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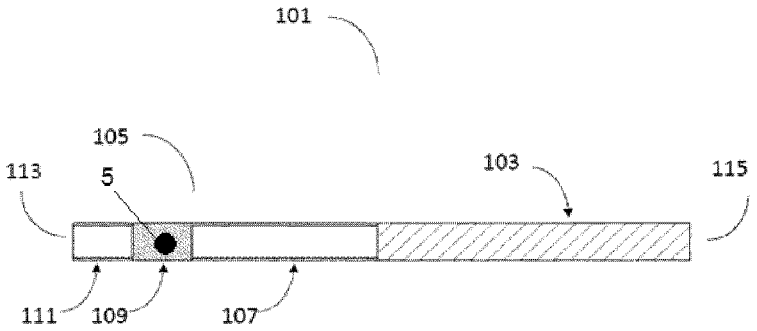

FIGURE 3

(57) **Abstract:** Provided herein is a heat-not-burn article comprising an aerosol generating medium and a filter. The filter contains one or more crushable capsules. In use, the aerosol generating medium is heated without being combusted, and the capsule is exposed to a temperature of about 30 to 100°C. During the exposure the structural integrity of the capsule is not compromised such that the capsule can be crushed by the user before, during or after heating.

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AEROSOL GENERATION

Technical Field

The present invention relates to a heat-not-burn article and a heat-not-burn assembly.

Background

Articles such as cigarettes, cigars and the like burn tobacco during use to create tobacco smoke. Alternatives to these combustible articles generate an inhalable aerosol by heating a substrate material.

These products may generally be referred to as aerosol generating devices. An example of such aerosol generating devices are the so-called heat-not-burn products, also known as tobacco heating products or tobacco heating devices, which release compounds by heating, but not burning, a solid substrate material to form an inhalable aerosol. The material may be for example tobacco or other non-tobacco products or a combination, such as a blended mix, which may or may not contain nicotine.

Summary

A first aspect of the invention provides a heat-not-burn article comprising an aerosol generating medium and a filter, the filter containing one or more crushable capsules,

wherein, in use, the aerosol generating medium is heated without being combusted, and the capsule is exposed to a temperature of about 30-100°C during which exposure its structural integrity is not compromised, such that the capsule can be crushed by the user before, during or after heating.

In some cases, in use, the aerosol generating medium generates a humid aerosol and the capsule is exposed to at least 12 mg of water.

In some cases, the capsule has a core-shell structure, the core comprising a liquid and the shell encapsulating the core, and wherein the shell comprises 5-90% by weight based on the total capsule shell weight of a gelling agent, wherein the gelling agent comprises carrageenan.

In some cases, the aerosol generating medium comprises an aerosol generating agent. In some cases, the aerosol generating medium comprises at least 10% by weight of an aerosol generating agent based on the total weight of the aerosol generating medium.

In some cases, the aerosol generating medium comprises a tobacco material.

In some cases, the aerosol generating medium comprises an aerosol generating agent and a tobacco material, which may be provided in the same portion of the aerosol generating medium or in separate sections of the aerosol generating medium.

In some cases, the capsule fills about 5-30% v/v of the filter.

In some cases, the filter comprises 70-95% v/v of a filter material. In some cases, the filter material has an average melting point of at least about 150°C. In some cases, the filter material has an average thermal conductivity of at least 0.130W/mK.

In some cases, the filter additionally comprises a wrapper that circumscribes the other filter components.

In some cases, the shell comprises 5-60% by weight based on the total capsule shell weight of carrageenan as a gelling agent. Suitably, the shell comprises 10-35% by weight based on the total capsule shell weight of carrageenan as a gelling agent.

In some cases, the gelling agent in the capsule shell comprises a carrageenan. In some cases, that carrageenan has a melting point of at least about 30°C or at least about 40°C.

In some cases, the capsule shell additionally comprises a plasticiser. In some cases, the total amount in the shell of plasticiser and gelling agent combined may be about 40-70% by weight based on the total capsule shell weight.

In some cases, the capsule shell additionally comprises a carbohydrate, such as a starch.

In some cases, the capsule has an initial crush strength (before heating) of from about 0.8 kilopond (kp) to about 3.5 kp, suitably from about 1.0 kp to about 2.5 kp, or from about 1.0 kp to about 2.0 kp.

In some cases, the capsule core comprises a flavourant.

A second aspect of the invention provides a heat-not-burn assembly, comprising a heat-not-burn article according to the first aspect and a heater.

In some cases, the capsule is at least about 25 mm or at least about 30 mm from the heater. In some cases, the capsule is 25-30 mm from the heater. In some other cases, the capsule is 30-35 mm from the heater.

In some cases, the heater comprises a combustible fuel source which is arranged such that, on ignition, the fuel source heats but does not burn the aerosol generating medium of the heat-not-burn article.

In some cases, the heater is a device into which the heat-not-burn article is at least partially inserted such that in use, the aerosol generating medium is heated but not burned.

In some cases, the assembly is configured such that the one or more capsules are exposed to a temperature of about 30-100°C. In some cases, the assembly is configured such that the one or more capsules are exposed to a temperature of about 40-90°C.

In some cases, the assembly may be configured to expose the aerosol forming medium to at least 200°C for at least 50% of a heating period.

According to a further aspect, the invention provides comprises a filter for a heat-not-burn article, the filter containing a crushable capsule,

wherein, in use, the aerosol generating medium is heated without being combusted, and the capsule is exposed to a temperature of about 30-100°C during which exposure its structural integrity is not compromised, such that the capsule can be crushed by the user before, during or after heating.

To the extent that they are compatible, features disclosed in relation to one aspect of the invention are explicitly disclosed in combination with all other aspects.

Further features and advantages of the invention will become apparent from the following description of examples of the invention, given by way of example only, which is made with reference to the accompanying drawings.

Brief Description of the Drawings

Figure 1 shows a schematic side view of an example of a heat-not-burn article.

Figure 2 shows a schematic side view an example of a heat-not-burn assembly.

Figure 3 shows a section view of an example of a heat-not-burn article.

Figure 4 shows a perspective view of the article of Figure 3.

Figure 5 shows a sectional elevation of an example of a heat-not-burn article.

Figure 6 shows a perspective view of the article of Figure 5.

Figure 7 shows a perspective view of an example of a heat-not-burn assembly.

Figure 8 shows a section view of an example heat-not-burn assembly.

Figure 9 shows a perspective view of an example an example heat-not-burn assembly.

Detailed Description

A first aspect of the invention provides a heat-not-burn article comprising an aerosol generating medium and a filter, the filter containing one or more crushable capsules,

wherein, in use, the aerosol generating medium is heated without being combusted, and the capsule is exposed to a temperature of about 30-100°C during which exposure its structural integrity is not compromised, such that the capsule can be crushed by the user before, during or after heating.

The aerosol generated by a heat-not-burn product is typically warm and moist due to the nature of the heating profile and the composition of the aerosol generating medium. For example, the aerosol generating medium in a heat-not-burn product according to the invention may contain a greater proportion of aerosol generating agent than a smokable material used in a combustible product. Further, or in the alternative, the aerosol generating medium in a heat-not-burn product according to the invention may be heated to a high temperature and/or for a longer period than the burning temperature/period of a combustible product. The inventors have established that the capsules detailed in claim 1 are particularly suitable for use in a heat-not-burn product and the conditions therein. The capsules stipulated in claim 1 have been found to be less likely to fail or rupture on exposure to the conditions in a heat-not-burn product, when compared to other capsules.

In some cases, in use, the aerosol generating medium generates a humid aerosol and the capsule is exposed to at least 12 mg of water.

The inventors have established that the temperature profile of the centre of the filter peaks at the time of each puff during use. This is due to hot aerosol being drawn through the filter on puffing. In some cases, the capsule may be exposed to a temperature in excess of about 30°C, 40°C or 50°C during use. In some cases, the maximum temperature that the capsule is exposed to in use is less than about 100°C, 90°C, 80°C or 70°C. In some cases, the capsule may be exposed to temperatures in the range of 30°C-100°C, suitably from 40°C-80°C or 50°C-70°C.

As used herein, the term "heat-not-burn article" refers to an article containing an aerosol generating medium; in use, components of the aerosol generating medium are volatilised by heating, without burning/combustion, to from an inhalable vapour or aerosol.

The aerosol generating medium of a heat-not-burn article comprises a solid component (in contrast to the aerosol generating medium of e-cigarettes in which the aerosol generating medium is liquid). By "solid", it is meant that the aerosol generating

medium exhibits no flow when in the steady-state. Solid may encompass gels and the like. For the avoidance of doubt, the aerosol generating medium of a heat-not-burn article may comprise, in addition to a solid component, a liquid component.

The capsule described herein may have a core-shell structure. In such cases, the core comprises a liquid. In some cases, the core may comprise one or more aerosol generating agents and/or one or more flavourants. In some cases, the core may comprise an acid, a base, and/or water. In some cases, the core may comprise a solvent. In some particular cases, the core may comprise menthol.

The capsule shell material (which may alternatively be referred to herein as the barrier material or the encapsulating material) encapsulates the core. The shell material may, in some cases, function to minimise migration of the core during storage of the product. In some cases, the shell material may provide controlled release of the core during use. The capsule can be ruptured (i.e. crushed) to release the contents before, during or after heating of the heat-not-burn article.

The capsule shell material is crushable; that is, it is frangible or breakable. The capsule is crushed or otherwise fractured or broken by the user to release the contents. Typically, the capsule is broken immediately prior to heating being initiated but the user can select when to release the contents (i.e. it can be crushed after heating is initiated). The term "crushable capsule" refers to a capsule in which the encapsulating material (which may be a shell) can be broken by means of a pressure to release the encapsulated material (which may be a capsule core); more specifically the encapsulating material (e.g. shell) can be ruptured under the pressure imposed by the user's fingers (or any other pressure creating means) when the user wants to release the contents of the capsule. In some cases, the capsule may have an initial (pre-heating) crush strength from about 0.8 kp to about 3.5 kp, suitably from about 1.0 kp to about 2.5 kp or from about 1.0 to about 2.0 kp. The inventors have established that capsules may be weakened on heating. The inventors have established that capsules having an initial crush strength of at least 0.8 kp are less likely to break/rupture on heating. The inventors have established that capsules having a crush strength of more than 3.5 kp are

difficult to crush prior to heating. The inventors have determined that an initial crush strength in the range of 1.0 kp to 2.0 kp provides the best capsule performance.

In some cases, the capsules described herein 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, 3.5 mm or 3.2 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 3.2 mm. In some cases, the capsule may have a diameter of about 3.0 mm to about 3.5 mm. These sizes are particularly suitable for incorporation of the capsule into a filter for a heat-not-burn article.

In some cases, the total weight of a capsule described herein may be in the range of about 1 mg to about 100 mg, suitably about 5 mg to about 60 mg, about 10 mg to about 50 mg, about 15 mg to about 40 mg, or about 15 mg to about 30 mg.

In some cases, 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 20 mg, or about 10 mg to about 15 mg.

The shell comprises 5-90% by weight based on the total capsule shell weight of a gelling agent, wherein the gelling agent comprises, consists essentially of or consists of a carrageenan. In some cases, the shell comprises 5-60%, 5-50% or 10-35% by weight based on the total capsule shell weight of the said gelling agent. In some cases, the gelling agent in the capsule shell comprises a carrageenan. In some cases, that carrageenan has a melting point of at least about 30°C or at least about 40°C.

In addition to carrageenan, the shell may comprise additional gelling agents. Suitable gelling agents which may be included in the capsule shell material may include, without limitation, polysaccharide or cellulosic gelling agents, gelatins, gums, gels, waxes or a mixture thereof. Suitable polysaccharides include alginates, dextrans, maltodextrins,

cyclodextrins and pectins. Suitable alginates include, for instance, a salt of alginic acid, an esterified alginate or glyceryl alginate. Salts of alginic acid include ammonium alginate, triethanolamine alginate, and group I or II metal ion alginate salts, such as sodium, potassium, calcium and magnesium alginate. Esterified alginates include propylene glycol alginate and glyceryl alginate. In some examples, the barrier material comprises sodium alginate and/ or calcium alginate. Suitable cellulosic materials include methyl cellulose, ethyl cellulose, hydroxyethyl cellulose, hydroxypropyl cellulose, carboxymethyl cellulose, cellulose acetate and cellulose ethers. The gelling agent may comprise one or more modified starches. The gelling agent may comprise one or more carrageenans. Suitable gums include agar, gellan gum, gum Arabic, pullulan gum, mannan gum, gum ghatti, gum tragacanth, Karaya, locust bean, acacia gum, guar, quince seed and xanthan gums. Suitable gels include agar, agarose, carrageenans, furoidan and furcellaran. Suitable waxes include carnauba wax. In some cases, the gelling agent may comprise carrageenans and/or gellan gum; these gelling agents are particularly suitable for inclusion as the gelling agent as the pressure required to break the resulting capsules is particularly suitable. In some cases, the capsule shell does not comprise gelatin.

The capsule shell may additionally comprise one or more of a bulking agent, a buffer, a colouring agent, and a plasticiser.

In some cases, the capsule shell material may comprise one or more bulking agents, such as starches, modified starches (such as oxidised starches) and sugar alcohols such as maltitol.

In some cases, the capsule shell material may comprise a colouring agent which renders easier the location of the capsule within the tobacco industry product during manufacture. The colouring agent is preferably chosen among colorants and pigments.

In some cases, the capsule shell material may further comprise at least one buffer, such as a citrate or phosphate compound.

In some cases, the capsule shell material may further comprise at least one plasticiser, which may be glycerol, sorbitol, maltitol, triacetin, polyethylene glycol, propylene glycol or another polyalcohol with plasticising properties, and optionally one acid of the monoacid, diacid or triacid type, especially citric acid, fumaric acid, malic acid, and the like. In some cases, the amount of plasticiser ranges from 1% to 30% by weight, preferably from 2% to 15% by weight, and even more preferably from 3 to 10% by weight of the total weight of the shell. In some cases, the total amount in the shell of plasticiser and gelling agent combined is about 40-70%, suitably 50-60% by weight based on the total capsule shell weight. In some cases, the plasticiser comprises, consists essentially of or consists of glycerol.

In some cases, the capsule shell may also comprise one or more filler materials. Suitable filler materials include comprising starch derivatives such as dextrin, maltodextrin, cyclodextrin (alpha, beta or gamma), or cellulose derivatives such as hydroxypropyl-methylcellulose (HPMC), hydroxypropylcellulose (HPC), methylcellulose (MC), carboxy-methylcellulose (CMC), polyvinyl alcohol, polyols or mixture thereof. The capsule shell may comprise, in some cases, up to about 60% by weight of filler, based on the total capsule shell weight. In some cases, the capsule shell may comprise up to about 50%, 40%, 30% or 20% by weight of filler, based on the total capsule shell weight. In some particular cases, the capsule shell may comprise no filler.

The capsule shell may additionally comprise a hydrophobic outer layer which reduces the susceptibility of the capsule to moisture-induced degradation. The hydrophobic outer layer is suitably selected from the group comprising waxes, especially carnauba wax, candelilla wax or beeswax, carbowax, shellac (in alcoholic or aqueous solution), ethyl cellulose, hydroxypropyl methyl cellulose, hydroxyl-propylcellulose, latex composition, polyvinyl alcohol, or a combination thereof. More preferably, the at least one moisture barrier agent is ethyl cellulose or a mixture of ethyl cellulose and shellac.

Methods of making the capsules include co-extrusion, optionally followed by centrifugation and curing and/or drying. These and other suitable techniques are known in the art.

The filter may comprise a filter material. For example, the filter may comprise a cellulosic material such as cellulose acetate, a ceramic material, polylactic acid, a polymer matrix and/or activated carbon. Suitable examples of ceramic materials include silicon carbide (SiC), silicon nitride (Si_3N_4), titanium carbide, and zirconium dioxide (zirconia).

In some cases, the filter material has an average melting point of at least about 150°C. In use in an aerosol generating device, the filter is generally exposed to temperatures below 150°C; thus, in such embodiments, the filter does not melt and supports the capsule well. This helps a user seeking to crush a capsule after heating is initiated. In some case, the filter material has an average melting point of at least about 160°C, 170°C, 180°C, 190°C or 200°C.

In some cases, the filter material has an average thermal conductivity of at least 0.130W/mK. The inventors have found that this aids the user seeking to crush a capsule after heating is initiated. In some cases, the filter material has an average thermal conductivity of at least 0.140W/mK, 0.150W/mK or 0.160W/mK.

In some cases, the filter may additionally comprise a wrapper that circumscribes the other filter components. The wrapper may comprise tobacco tipping paper.

In some cases, the capsule fills about 5-30% v/v of the filter. In some cases, the filter comprises 70-95% v/v of filter material, suitably cellulose acetate. The inventors have established that these proportions result in appropriate heat absorption by the capsule.

In some cases, the filter is substantially cylindrical and the capsule is arranged substantially centrally with respect to the diameter of the cylinder. In some cases, the capsule is arranged substantially centrally with respect to the cylinder length. In some cases, the cylindrical filter may be approximately 8-14 mm in length, suitably 9-13 mm or 10-12 mm. It may have a cross-sectional diameter of approximately 5-9 mm, suitably 7.5-8 mm. It may be formed from cellulose acetate fibres.

In some cases, the pressure difference across the filter when the user inhales is in the range of 30 to 90 mmH_2O, when the capsule is in an unbroken state. Suitably, the pressure difference across the filter may be in the range of from about 30 mmH_2O, 33 mmH_2O, 35 mmH_2O, 38 mmH_2O or 40 mmH_2O to about 90 mmH_2O, 75 mmH_2O, 65 mmH_2O, 60 mmH_2O, 55 mmH_2O or 50 mmH_2O, when the capsule is in an unbroken state. Illustratively, the pressure difference across the filter when the capsule is in an unbroken state may be in the range of about 35-60 mmH_2O, preferably 38-55 mmH_2O or 40-50 mmH_2O.

In some cases, the filter contains only one capsule. In other cases, the filter contains more than one capsule. Where the filter comprises a plurality of capsules, the individual capsules may be the same as each other or may differ. For example, a plurality of capsules may be provided so that the user can select when/whether to break the capsule, thereby controlling the aerosol delivery profile.

In some cases, the aerosol generating medium comprises an aerosol generating agent. In some cases, the aerosol generating medium comprises a tobacco material. In some cases, the aerosol generating medium comprises a flavourant. In some cases, the aerosol generating medium substantially consists of or consist of an aerosol generating agent and/or a tobacco material and/or a flavourant. In some cases, the aerosol generating medium may be provided as a single, unitary component. In other cases, the aerosol generating medium may comprise distinct sections containing different compositions. For example, the aerosol generating medium may comprise an aerosol generating agent and a tobacco material and these may be provided in distinct, separate sections of the aerosol generating medium.

In some embodiments, the capsule contains a flavourant and the aerosol generating medium comprises a flavourant, wherein the flavourant in both cases is substantially the same. This may provide for delivery of a more consistent flavour profile. In some cases, the capsule contains menthol and the aerosol generating medium comprises menthol.

As used herein, the term "tobacco material" refers to any material comprising tobacco or derivatives 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, reconstituted tobacco and/or tobacco extract.

The tobacco used to produce tobacco material may be any suitable tobacco, such as single grades or blends, cut rag or whole leaf, including Virginia and/or Burley and/or Oriental. It may also be tobacco particle 'fines' or dust, expanded tobacco, stems, expanded stems, and other processed stem materials, such as cut rolled stems. The tobacco material may be a ground tobacco or a reconstituted tobacco material. The reconstituted tobacco material may comprise tobacco fibres, and may be formed by casting, a Fourdrinier-based paper making-type approach with back addition of tobacco extract, or by extrusion.

As used herein, the term "aerosol generating agent" refers to an agent that promotes the generation of an aerosol. An aerosol generating agent may promote the generation of an aerosol by promoting an initial vaporisation and/or the condensation of a gas to an inhalable solid and/or liquid aerosol.

Suitable aerosol generating agents include, but are not limited to: a polyol such as sorbitol, glycerol, and glycols like propylene glycol or triethylene glycol; a non-polyol such as monohydric alcohols, high boiling point hydrocarbons, acids such as lactic acid, glycerol derivatives, esters such as diacetin, triacetin, triethylene glycol diacetate, triethyl citrate or myristates including ethyl myristate and isopropyl myristate and aliphatic carboxylic acid esters such as methyl stearate, dimethyl dodecanedioate and dimethyl tetradecanedioate. In some cases, the aerosol generating agent may comprise glycerol and/or propylene glycol.

In some cases, the aerosol generating medium comprises at least 10% by weight of an aerosol generating agent based on the total weight of the aerosol generating medium. Suitably, the aerosol generating medium comprises at least 12%, 15%, 18% or 20% by weight of an aerosol generating agent based on the total weight of the aerosol generating medium. The remainder may, in some cases, be tobacco material.

In some cases, the heat-not-burn article may be substantially cylindrical.

In some cases, the heat-not-burn article may additionally comprise a cooling element. This may be arranged between the filter and the aerosol generating medium, for example. The cooling element, if present, spaces the filter from the hottest parts (in use) of the heat-not-burn article. The cooling element, if present, may comprise a vacant tube, suitably formed from paper. Vaporised components of the aerosol generating medium may condense to form an aerosol in use in the cooling element, if present.

The heat-not-burn article may additionally comprise ventilation apertures. These may be provided in the sidewall of the article. In some cases, the ventilation apertures may be provided in the filter and/or cooling element. These apertures allow cool air to be drawn into the article during use, which mixes with the heated volatilised components thereby cooling the aerosol.

The ventilation enhances the generation of visible heated volatilised components from the article when it is heated in use. The heated volatilised components are made visible by the process of cooling the heated volatilised components such that supersaturation of the heated volatilised components occurs. The heated volatilised components then undergo droplet formation, otherwise known as nucleation, and eventually the size of the aerosol particles of the heated volatilised components increases by further condensation of the heated volatilised components and by coagulation of newly formed droplets from the heated volatilised components.

In some cases, the ratio of the cool air to the sum of the heated volatilised components and the cool air, known as the ventilation ratio, is at least 15%. A ventilation ratio of 15% enables the heated volatilised components to be made visible by the method described above. The visibility of the heated volatilised components enables the user to identify that the volatilised components have been generated and adds to the sensory experience of the smoking experience.

In another example, the ventilation ratio is between 50% and 85% to provide additional cooling to the heated volatilised components.

As used herein, the term "heat-not-burn assembly" refers to the combination of a heat-not-burn article and a heater. The heater heats the aerosol generating medium of the heat-not-burn article, without burning, to volatilise components of the substrate and generate an inhalable vapour or aerosol.

In some cases, the heater may be provided integrally with the article. For example, the heater may be a combustible fuel source that is attached to the article, such that in use, combustion of the fuel source heats the aerosol generating medium without burning of that medium. In another example, the heater may comprise a chemical heat source, such as a phase-change material, which undergoes an exothermic reaction to produce heat in use.

In other cases, the heater may be a separate entity, configured for use with the article. For example, the heater may be a device into which the heat-not-burn article is at least partially inserted. In another example, the heater may be a device which is at least partially inserted into the heat-not-burn article. The heater may be electrically controlled. In some cases, the heater comprises a thin film, electrically resistive heater, an induction heater or the like.

In some cases, the assembly may be configured such that at least a portion of the aerosol generating medium in the heat-not-burn article is exposed to a temperature of at least 180°C or 200°C for at least 50% of the heating period. In some examples, the aerosol

generating medium may be exposed to a heat profile as described in co-pending application PCT/EP2017/068804.

In some particular cases, a heat-not-burn assembly is provided which is configured to heat two portions of the aerosol generating medium separately. By controlling the temperature of the first and second portions over time such that the temperature profiles of the portions are different, it is possible to control the puff profile of the aerosol during use. The heat provided to the two portions of the aerosol generating medium may be provided at different times or rates; staggering the heating in this way may allow for both fast aerosol production and longevity of use.

In one particular example, the assembly may be configured such that on initiation of the consumption experience, a first heating element corresponding to a first portion of the aerosol generating medium is immediately heated to a temperature of 240°C. This first heating element is maintained at 240°C for 145 seconds and then drops to 135°C (where it remains for the rest of the consumption experience). 75 seconds after initiation of the consumption experience, a second heating element corresponding to a second portion of the aerosol generating medium is heated to a temperature of 160°C. 135 seconds after initiation of the consumption experience, the temperature of the second heating element is raised to 240°C (where it remains for the rest of the consumption experience). The consumption experience lasts 280 seconds, at which point both heaters are cool to room temperature.

In some cases, the assembly is configured such that the filter of the heat-not-burn article is not directly heated. For example, in cases where the heater is a device into which the article is partially inserted, the assembly may be configured such that the filter of the heat-not-burn article is not inserted into the device.

In some particular cases, the assembly is configured such that the filter and, if present, the cooling element of the heat-not-burn article are not directly heated. For example, in cases where the heater is a device into which the article is partially inserted, the

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assembly may be configured such that the filter and, if present, the cooling element of the heat-not-burn article are not inserted into the device. In other cases, at least part of the cooling element may be inserted into the device.

In such cases, even though the filter is not subject to direct heating, heat will be drawn through the heat-not-burn article during the consumption experience (when the user puffs). The inventors have established that the temperature profile of the centre of the filter peaks at the time of each puff. This is due to hot aerosol being drawn through the filter on puffing. In some cases, the filter (and capsule) may be exposed to a temperature in excess of about 30°C, 40°C or 50°C during use. In some cases, the maximum temperature that the filter (and capsule) is exposed to in use is less than about 100°C, 90°C, 80°C or 70°C. In some cases, the filter (and capsule) may be exposed to temperatures in the range of 30°C-100°C, suitably from 40°C-80°C or 50°C-70°C.

The inventors have established that the capsules stipulated in claim 1 are particularly suitable for use in a heat-not-burn article. Even though the capsules may, in some cases, be exposed to a temperature that exceeds the shell melting point or glass transition temperature, the capsules stipulated in claim 1 have been found to be less likely to fail or rupture on exposure to the conditions in a heat-not-burn assembly, when compared to other capsules. Such capsules can be readily crushed by the user before, during or after heating has been initiated to release their contents. A click sensation on crushing is maintained, providing tactile feedback to the user that crushing has been effected. This click sensation is useful, since the user then knows that enough pressure has been applied and the capsule contents have been released. Excess pressure, which may damage the heat-not-burn article, is therefore less likely to be applied.

Without wishing to be bound by theory, the suitability of the capsules described herein for use in a heat-not-burn article is thought to be due to the shell material composition and water uptake. Other factors which may be relevant include the heat capacity of the shell material, the melting point or the glass transition temperature of the shell material, and/or the distance of the capsule from the heater.

In some cases, the capsule may be disposed within the heat-not-burn article so that it is at least about 25 mm or at least about 30 mm from the heater in the heat-not-burn assembly. In some cases, the capsule may be disposed within the heat-not-burn article so that it is about 25-30 mm or about 30-35 mm from the heater. (These distances refer to the distance from the centre of the capsule to the nearest point of the heater.) This positioning may mean that the capsule is exposed to an appropriate heat level whilst ensuring that the heat-not-burn article has appropriate dimensions.

Capsules formed from a shell material comprising a carrageenan having a melting point of at least 30°C or at least 40°C have been found to survive exposure to heat-not-burn conditions very well.

An example heat-not-burn article is illustrated in figure 1. The illustrated heat-not-burn article 10 is substantially cylindrical in shape. It may include a rod of aerosol generating medium 1, suitably a rod of tobacco material, towards a first end 2 and a filter 3 towards the second end 4. Second end 4 is a mouth end. A capsule 5 is disposed within the filter 3. The filter 3 comprises a filter material that may be cellulose acetate. A paper sheath 6 retains the components in the cylindrical configuration and provides a passage 7 between the tobacco rod 1 and filter plug 3. Passage 7 functions as a cooling element and may be omitted in alternative embodiments. A further short passage is shown between the filter plug 3 and the second end 4. This may also be omitted in alternative embodiments.

In use, the heat-not-burn article 10 is partially inserted into a heater of heat-not-burn assembly (not shown) so that it can be heated to from an inhalable aerosol. In an embodiment, the heater forms an oven-type arrangement around the aerosol generating medium. In some embodiments, the first end 2 of the heat-not-burn article 10 is inserted, so that the aerosol generating medium 1 is contained within the heater. The heat-not-burn article 10 and heat-not-burn assembly are configured such that filter 3 and at least some of the passage 7 are not in the heater.

In alternative embodiments, the substantially cylindrical heat-not-burn article may include the aerosol generating medium 1 immediately adjacent to the filter 3. A passage may be provided on the opposite side of the filter to the medium, or there may be no passageway.

After use, the heat-not-burn article is removed from the heater and typically disposed of. Subsequent uses of the heater use further heat-not-burn articles.

An alternative heat-not-burn assembly is depicted in figure 2. In this assembly a combustible heat source 8 is arranged adjacent to the aerosol generating medium 1 at the first end 2 of the heat-not-burn article 10. The combustible heat source 8 may be separated from the aerosol generating medium 1 by a non-combustible material (not shown), such as an aluminium foil layer. Aluminium foil or other conductive, non-combustible materials are useful as they (a) conduct heat to the aerosol generating medium and (b) prevent combustion of the fuel source resulting in combustion of the aerosol generating medium. In use, the fuel source 8 is ignited by the user; heat is conducted by the aluminium foil (or the like) to the aerosol generating medium 1, to volatilise components of the medium 1 without combustion.

Referring to Figures 3 and 4, there are shown a partially cut-away section view and a perspective view of an example of a heat-not-burn article 101, similar to that shown in figure 1. The article 101 is adapted for use with a device having a power source and a heater. The article 101 of this embodiment is particularly suitable for use with the device 51 shown in Figures 7 to 9, described below. In use, the article 101 may be removably inserted into the device shown in Figure 7 at an insertion point 20 of the device 51.

The article 101 of one example is in the form of a substantially cylindrical rod that includes a body of aerosol generating medium 103 and a filter assembly 105 in the form of a rod. The filter assembly 105 includes three segments, a cooling segment 107, a filter segment 109 and a mouth end segment 111. The article 101 has a first end 113, also known as a mouth end or a proximal end and a second end 115, also known as a

distal end. The body of aerosol generating medium 103 is located towards the distal end 115 of the article 101. In one example, the cooling segment 107 is located adjacent the body of aerosol generating medium 103 between the body of aerosol generating medium 103 and the filter segment 109, such that the cooling segment 107 is in an abutting relationship with the aerosol generating medium 103 and the filter segment 103. In other examples, there may be a separation between the body of aerosol generating medium 103 and the cooling segment 107 and between the body of aerosol generating medium 103 and the filter segment 109. The filter segment 109 is located in between the cooling segment 107 and the mouth end segment 111. The mouth end segment 111 is located towards the proximal end 113 of the article 101, adjacent the filter segment 109. In one example, the filter segment 109 is in an abutting relationship with the mouth end segment 111. In one embodiment, the total length of the filter assembly 105 is between 37mm and 45mm, more preferably, the total length of the filter assembly 105 is 41mm.

In one embodiment, the body of aerosol generating medium 103 comprises tobacco. However, in other respective embodiments, the body of aerosol generating medium 103 may consist of tobacco, may consist substantially entirely of tobacco, may comprise tobacco and other components such as an aerosol generating agent and/or flavourant. In some cases, the aerosol generating medium may be free of tobacco.

In one example, the rod of aerosol generating medium 103 is between 34mm and 50mm in length, suitably between 38mm and 46mm in length, suitably 42mm in length.

In one example, the total length of the article 101 is between 71mm and 95mm, suitably between 79mm and 87mm, suitably 83mm.

An axial end of the body of aerosol generating medium 103 is visible at the distal end 115 of the article 101. However, in other embodiments, the distal end 115 of the article 101 may comprise an end member (not shown) covering the axial end of the body of aerosol generating medium 103.

The body of aerosol generating medium 103 is joined to the filter assembly 105 by annular tipping paper (not shown), which is located substantially around the circumference of the filter assembly 105 to surround the filter assembly 105 and extends partially along the length of the body of aerosol generating medium 103. In one example, the tipping paper is made of 58GSM standard tipping base paper. In one example the tipping paper has a length of between 42mm and 50mm, suitably of 46mm.

In one example, the cooling segment 107 is an annular tube and is located around and defines an air gap within the cooling segment. The air gap provides a chamber for heated volatilised components generated from the body of aerosol generating medium 103 to flow. The cooling segment 107 is hollow to provide a chamber for aerosol accumulation yet rigid enough to withstand axial compressive forces and bending moments that might arise during manufacture and whilst the article 101 is in use during insertion into the device 51. In one example, the thickness of the wall of the cooling segment 107 is approximately 0.29mm.

The cooling segment 107 provides a physical displacement between the aerosol generating medium 103 and the filter segment 109. The physical displacement provided by the cooling segment 107 will provide a thermal gradient across the length of the cooling segment 107. In one example the cooling segment 107 is configured to provide a temperature differential of at least 40 degrees Celsius between a heated volatilised component entering a first end of the cooling segment 107 and a heated volatilised component exiting a second end of the cooling segment 107. In one example the cooling segment 107 is configured to provide a temperature differential of at least 60 degrees Celsius between a heated volatilised component entering a first end of the cooling segment 107 and a heated volatilised component exiting a second end of the cooling segment 107. This temperature differential across the length of the cooling element 107 protects the temperature sensitive filter segment 109 from the high temperatures of the aerosol generating medium 103 when it is heated by the device 51. If the physical displacement was not provided between the filter segment 109 and the body of aerosol generating medium 103 and the heating elements of the device 51, then

the temperature sensitive filter segment 109 may become damaged in use, so it would not perform its required functions as effectively.

In one example the length of the cooling segment 107 is at least 15mm. In one example, the length of the cooling segment 107 is between 20mm and 30mm, more particularly 23mm to 27mm, more particularly 25mm to 27mm, suitably 25mm.

The cooling segment 107 is made of paper, which means that it is comprised of a material that does not generate compounds of concern, for example, toxic compounds when in use adjacent to the heater of the device 51. In one example, the cooling segment 107 is manufactured from a spirally wound paper tube which provides a hollow internal chamber yet maintains mechanical rigidity. Spirally wound paper tubes are able to meet the tight dimensional accuracy requirements of high-speed manufacturing processes with respect to tube length, outer diameter, roundness and straightness.

In another example, the cooling segment 107 is a recess created from stiff plug wrap or tipping paper. The stiff plug wrap 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 101 is in use during insertion into the device 51.

The filter segment 109 may be formed of any filter material sufficient to remove one or more volatilised compounds from heated volatilised components from the aerosol generating medium. In one example the filter segment 109 is made of a mono-acetate material, such as cellulose acetate. The filter segment 109 provides cooling and irritation-reduction from the heated volatilised components without depleting the quantity of the heated volatilised components to an unsatisfactory level for a user.

A crushable capsule 5 is provided in filter segment 109. It may be disposed substantially centrally in the filter segment 109, both across the filter segment 109 diameter and along the filter segment 109 length. In other cases, it may be offset in one or more dimension.

The density of the cellulose acetate tow material of the filter segment 109 controls the pressure drop across the filter segment 109, which in turn controls the draw resistance of the article 101. Therefore the selection of the material of the filter segment 109 is important in controlling the resistance to draw of the article 101. In addition, the filter segment performs a filtration function in the article 101.

In one example, the filter segment 109 is made of a 8Y15 grade of filter tow material, which provides a filtration effect on the heated volatilised material, whilst also reducing the size of condensed aerosol droplets which result from the heated volatilised material.

The presence of the filter segment 109 provides an insulating effect by providing further cooling to the heated volatilised components that exit the cooling segment 107. This further cooling effect reduces the contact temperature of the user's lips on the surface of the filter segment 109.

In one example, the filter segment 109 is between 6mm to 10mm in length, suitably 8mm.

The mouth end segment 111 is an annular tube and is located around and defines an air gap within the mouth end segment 111. The air gap provides a chamber for heated volatilised components that flow from the filter segment 109. The mouth end segment 111 is hollow to provide a chamber for aerosol accumulation yet rigid enough to withstand axial compressive forces and bending moments that might arise during manufacture and whilst the article is in use during insertion into the device 51. In one example, the thickness of the wall of the mouth end segment 111 is approximately 0.29mm. In one example, the length of the mouth end segment 111 is between 6mm to 10mm, suitably 8mm.

The mouth end segment 111 may be manufactured from a spirally wound paper tube which provides a hollow internal chamber yet maintains critical mechanical rigidity. Spirally wound paper tubes are able to meet the tight dimensional accuracy

requirements of high-speed manufacturing processes with respect to tube length, outer diameter, roundness and straightness.

The mouth end segment 111 provides the function of preventing any liquid condensate that accumulates at the exit of the filter segment 109 from coming into direct contact with a user.

It should be appreciated that, in one example, the mouth end segment 111 and the cooling segment 107 may be formed of a single tube and the filter segment 109 is located within that tube separating the mouth end segment 111 and the cooling segment 107.

Referring to Figures 5 and 6, there are shown a partially cut-away section and perspective views of an example of an article 301. The reference signs shown in Figures 5 and 6 are equivalent to the reference signs shown in Figures 3 and 4, but with an increment of 200.

In the example of the article 301 shown in Figures 5 and 6, a ventilation region 317 is provided in the article 301 to enable air to flow into the interior of the article 301 from the exterior of the article 301. In one example the ventilation region 317 takes the form of one or more ventilation holes 317 formed through the outer layer of the article 301. The ventilation holes may be located in the cooling segment 307 to aid with the cooling of the article 301. In one example, the ventilation region 317 comprises one or more rows of holes, and preferably, each row of holes is arranged circumferentially around the article 301 in a cross-section that is substantially perpendicular to a longitudinal axis of the article 301.

In one example, there are between one to four rows of ventilation holes to provide ventilation for the article 301. Each row of ventilation holes may have between 12 to 36 ventilation holes 317. The ventilation holes 317 may, for example, be between 100 to 500μm in diameter. In one example, an axial separation between rows of ventilation holes 317 is between 0.25mm and 0.75mm, suitably 0.5mm.

In one example, the ventilation holes 317 are of uniform size. In another example, the ventilation holes 317 vary in size. The ventilation holes can be made using any suitable technique, for example, one or more of the following techniques: laser technology, mechanical perforation of the cooling segment 307 or pre-perforation of the cooling segment 307 before it is formed into the article 301. The ventilation holes 317 are positioned so as to provide effective cooling to the article 301.

In one example, the rows of ventilation holes 317 are located at least 11mm from the proximal end 313 of the article, suitably between 17mm and 20mm from the proximal end 313 of the article 301. The location of the ventilation holes 317 is positioned such that user does not block the ventilation holes 317 when the article 301 is in use.

Providing the rows of ventilation holes between 17mm and 20mm from the proximal end 313 of the article 301 enables the ventilation holes 317 to be located outside of the device 51, when the article 301 is fully inserted in the device 51, as can be seen in Figures 8 and 9. By locating the ventilation holes outside of the device, non-heated air is able to enter the article 301 through the ventilation holes from outside the device 51 to aid with the cooling of the article 301.

The length of the cooling segment 307 is such that the cooling segment 307 will be partially inserted into the device 51, when the article 301 is fully inserted into the device 51. The length of the cooling segment 307 provides a first function of providing a physical gap between the heater arrangement of the device 51 and the heat sensitive filter arrangement 309, and a second function of enabling the ventilation holes 317 to be located in the cooling segment, whilst also being located outside of the device 51, when the article 301 is fully inserted into the device 51. As can be seen from Figures 8 and 9, the majority of the cooling element 307 is located within the device 51. However, there is a portion of the cooling element 307 that extends out of the device 51. It is in this portion of the cooling element 307 that extends out of the device 51 in which the ventilation holes 317 are located.

Referring now to Figures 7 to 9 in more detail, there is shown an example of a device 51 arranged to heat aerosol generating medium to volatilise at least one component of said aerosol generating medium, typically to form an aerosol which can be inhaled. The device 51 is a heating device which releases compounds by heating, but not burning, the aerosol generating medium.

A first end 53 is sometimes referred to herein as the mouth or proximal end 53 of the device 51 and a second end 55 is sometimes referred to herein as the distal end 55 of the device 51. The device 51 has an on/off button 57 to allow the device 51 as a whole to be switched on and off as desired by a user.

The device 51 comprises a housing 59 for locating and protecting various internal components of the device 51. In the example shown, the housing 59 comprises a uni-body sleeve 11 that encompasses the perimeter of the device 51, capped with a top panel 17 which defines generally the 'top' of the device 51 and a bottom panel 19 which defines generally the 'bottom' of the device 51. In another example the housing comprises a front panel, a rear panel and a pair of opposite side panels in addition to the top panel 17 and the bottom panel 19.

The top panel 17 and/or the bottom panel 19 may be removably fixed to the uni-body sleeve 11, to permit easy access to the interior of the device 51, or may be "permanently" fixed to the uni-body sleeve 11, for example to deter a user from accessing the interior of the device 51. In an example, the panels 17 and 19 are made of a plastics material, including for example glass-filled nylon formed by injection moulding, and the uni-body sleeve 11 is made of aluminium, though other materials and other manufacturing processes may be used.

The top panel 17 of the device 51 has an opening 20 at the mouth end 53 of the device 51 through which, in use, the article 101, 301 including the aerosol generating medium may be inserted into the device 51 and removed from the device 51 by a user.

The housing 59 has located or fixed therein a heater arrangement 23, control circuitry 25 and a power source 27. In this example, the heater arrangement 23, the control circuitry 25 and the power source 27 are laterally adjacent (that is, adjacent when viewed from an end), with the control circuitry 25 being located generally between the heater arrangement 23 and the power source 27, though other locations are possible.

The control circuitry 25 may include a controller, such as a microprocessor arrangement, configured and arranged to control the heating of the aerosol generating medium in the article 101, 301 as discussed further below.

The power source 27 may be for example a battery, which may be a rechargeable battery or a non-rechargeable battery. Examples of suitable batteries include for example a lithium-ion battery, a nickel battery (such as a nickel–cadmium battery), an alkaline battery and/ or the like. The battery 27 is electrically coupled to the heater arrangement 23 to supply electrical power when required and under control of the control circuitry 25 to heat the aerosol generating medium in the article (as discussed, to volatilise the aerosol generating medium without causing the aerosol generating medium to burn).

An advantage of locating the power source 27 laterally adjacent to the heater arrangement 23 is that a physically large power source 25 may be used without causing the device 51 as a whole to be unduly lengthy. As will be understood, in general a physically large power source 25 has a higher capacity (that is, the total electrical energy that can be supplied, often measured in Amp-hours or the like) and thus the battery life for the device 51 can be longer.

In one example, the heater arrangement 23 is generally in the form of a hollow cylindrical tube, having a hollow interior heating chamber 29 into which the article 101, 301 comprising the aerosol generating medium is inserted for heating in use. Different arrangements for the heater arrangement 23 are possible. For example, the heater arrangement 23 may comprise a single heating element or may be formed of plural heating elements aligned along the longitudinal axis of the heater arrangement 23. The or each heating element may be annular or tubular, or at least part-annular or part-

tubular around its circumference. In an example, the or each heating element may be a thin film heater. In another example, the or each heating element may be made of a ceramics material. Examples of suitable ceramics materials include alumina and aluminium nitride and silicon nitride ceramics, which may be laminated and sintered. Other heating arrangements are possible, including for example inductive heating, infrared heater elements, which heat by emitting infrared radiation, or resistive heating elements formed by for example a resistive electrical winding.

In one particular example, the heater arrangement 23 is supported by a stainless steel support tube and comprises a polyimide heating element. The heater arrangement 23 is dimensioned so that substantially the whole of the body of aerosol generating medium 103, 303 of the article 101, 301 is inserted into the heater arrangement 23 when the article 101, 301 is inserted into the device 51.

The or each heating element may be arranged so that selected zones of the aerosol generating medium can be independently heated, for example in turn (over time, as discussed above) or together (simultaneously) as desired.

The heater arrangement 23 in this example is surrounded along at least part of its length by a thermal insulator 31. The insulator 31 helps to reduce heat passing from the heater arrangement 23 to the exterior of the device 51. This helps to keep down the power requirements for the heater arrangement 23 as it reduces heat losses generally. The insulator 31 also helps to keep the exterior of the device 51 cool during operation of the heater arrangement 23. In one example, the insulator 31 may be a double-walled sleeve which provides a low pressure region between the two walls of the sleeve. That is, the insulator 31 may be for example a "vacuum" tube, i.e. a tube that has been at least partially evacuated so as to minimise heat transfer by conduction and/or convection. Other arrangements for the insulator 31 are possible, including using heat insulating materials, including for example a suitable foam-type material, in addition to or instead of a double-walled sleeve.

The housing 59 may further comprises various internal support structures 37 for supporting all internal components, as well as the heating arrangement 23.

The device 51 further comprises a collar 33 which extends around and projects from the opening 20 into the interior of the housing 59 and a generally tubular chamber 35 which is located between the collar 33 and one end of the vacuum sleeve 31. The chamber 35 further comprises a cooling structure 35f, which in this example, comprises a plurality of cooling fins 35f spaced apart along the outer surface of the chamber 35, and each arranged circumferentially around outer surface of the chamber 35. There is an air gap 36 between the hollow chamber 35 and the article 101, 301 when it is inserted in the device 51 over at least part of the length of the hollow chamber 35. The air gap 36 is around all of the circumference of the article 101, 301 over at least part of the cooling segment 307.

The collar 33 comprises a plurality of ridges 60 arranged circumferentially around the periphery of the opening 20 and which project into the opening 20. The ridges 60 take up space within the opening 20 such that the open span of the opening 20 at the locations of the ridges 60 is less than the open span of the opening 20 at the locations without the ridges 60. The ridges 60 are configured to engage with an article 101, 301 inserted into the device to assist in securing it within the device 51. Open spaces (not shown in the Figures) defined by adjacent pairs of ridges 60 and the article 101, 301 form ventilation paths around the exterior of the article 101, 301. These ventilation paths allow hot vapours that have escaped from the article 101, 301 to exit the device 51 and allow cooling air to flow into the device 51 around the article 101, 301 in the air gap 36.

In operation, the article 101, 301 is removably inserted into an insertion point 20 of the device 51, as shown in Figures 7 to 9. Referring particularly to Figure 8, in one example, the body of aerosol generating medium 103, 303, which is located towards the distal end 115, 315 of the article 101, 301, is entirely received within the heater arrangement 23 of the device 51. The proximal end 113, 313 of the article 101, 301 extends from the device 51 and acts as a mouthpiece assembly for a user.

In operation, the heater arrangement 23 will heat the article 101, 301 to volatilise at least one component of the aerosol generating medium from the body of aerosol generating medium 103, 303.

The primary flow path for the heated volatilised components from the body of aerosol generating medium 103, 303 is axially through the article 101, 301, through the chamber inside the cooling segment 107, 307, through the filter segment 109, 309, through the mouth end segment 111, 313 to the user. In one example, the temperature of the heated volatilised components that are generated from the body of aerosol generating medium is between 60°C and 250°C, which may be above the acceptable inhalation temperature for a user. As the heated volatilised component travels through the cooling segment 107, 307, it will cool and some volatilised components will condense on the inner surface of the cooling segment 107, 307.

In the examples of the article 301 shown in Figures 5 and 6, cool air will be able to enter the cooling segment 307 via the ventilation holes 317 formed in the cooling segment 307. This cool air will mix with the heated volatilised components to provide additional cooling to the heated volatilised components.

The ventilation enhances the generation of visible heated volatilised components from the article 317 when it is heated in use by the device 51. The heated volatilised components are made visible by the process of cooling the heated volatilised components such that supersaturation of the heated volatilised components occurs. The heated volatilised components then undergo droplet formation, otherwise known as nucleation, and eventually the size of the aerosol particles of the heated volatilised components increases by further condensation of the heated volatilised components and by coagulation of newly formed droplets from the heated volatilised components.

In one embodiment, the ratio of the cool air to the sum of the heated volatilised components and the cool air, known as the ventilation ratio, is at least 15%. A ventilation ratio of 15% enables the heated volatilised components to be made visible by the method described above. The visibility of the heated volatilised components

enables the user to identify that the volatilised components have been generated and adds to the sensory experience of the smoking experience.

In another example, the ventilation ratio is between 50% and 85% to provide additional cooling to the heated volatilised components.

As used herein, the terms "flavour", "flavouring" 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. 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.

For the avoidance of doubt, where in this specification the term "comprises" is used in defining the invention or features of the invention, embodiments are also disclosed in which the invention or feature can be defined using the terms "consists essentially of" or "consists of" in place of "comprises".

The above embodiments are to be understood as illustrative examples of the invention. Further embodiments of the invention are envisaged. It is to be understood that any feature described in relation to any one embodiment may be used alone, or in combination with other features described, and may also be used in combination with

one or more features of any other of the embodiments, or any combination of any other of the embodiments. Furthermore, equivalents and modifications not described above may also be employed without departing from the scope of the invention, which is defined in the accompanying claims.

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 the future.

CLAIMS

1. A heat-not-burn article comprising an aerosol generating medium and a filter, the filter containing one or more crushable capsules,

wherein the aerosol generating medium comprises at least 10% by weight of an aerosol generating agent based on the total weight of the aerosol generating medium and wherein, in use, the aerosol generating medium is heated without being combusted, and the capsule is exposed to a temperature of from about 30 to about 100°C during which exposure its structural integrity is not compromised, such that the capsule can be crushed by the user before, during or after heating; and

wherein the capsule has a core-shell structure, the core comprising a liquid and the shell encapsulating the core, the shell comprising 5-60% by weight based on the total capsule shell weight of carrageenan as a gelling agent, and having a melting point of at least 30°C.

2. The article according to claim 1, wherein, in use, the aerosol generating medium generates a humid aerosol and the capsule is exposed to at least 12 mg of water.

3. The article according to claim 1 or claim 2, wherein the aerosol generating medium comprises a tobacco material.

4. The article according to claim 3, wherein the aerosol generating medium comprises the aerosol generating agent and the tobacco material, which may be provided in the same portion of the aerosol generating medium or in separate sections of the aerosol generating medium.

5. The article according to any one of claims 1 to 4, wherein the one or more capsules fill from about 5 to about 30% v/v of the filter.

6. The article according to any one of claims 1 to 5, wherein the filter comprises 70-95% v/v of a filter material.

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7. The article according to claim 6, wherein the filter material has an average melting point of at least 150°C.

8. The article according to claim 6 or claim 7, wherein the filter material has an average thermal conductivity of at least 0.130 W/mK.

9. The article according to any one of claims 1 to 8, wherein the filter additionally comprises a wrapper that circumscribes other filter components.

10. The article according to any one of claims 1 to 9, wherein the capsule(s) shell comprises 10-35% by weight based on the total capsule shell of carrageenan as a gelling agent.

11. The article according to any one of claims 1 to 10, wherein the capsule(s) shell additionally comprises a plasticiser and/or a carbohydrate.

12. The article according to claim 11, wherein the carbohydrate is a starch.

13. The article according to any one of claims 1 to 12, wherein the one or more capsules have a crush strength, before heating is initiated, of from about 0.8 kp to about 3.5 kp.

14. The article according to claim 13, wherein the one or more capsules have a crush strength, before heating is initiated, of from about 1.0 kp to about 2.5 kp.

15. The article according to any one of claims 1 to 14, wherein the capsule(s) core comprises a flavourant.

16. A heat-not-burn assembly comprising the heat-not-burn article according to any one of claims 1 to 15 and a heater.

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17. The assembly according to claim 16, wherein the one or more capsules are disposed at least 25 mm from the heater.

18. The assembly according to claim 16 or claim 17, wherein the heater comprises a combustible fuel source which is arranged such that, on ignition, the fuel source heats but does not burn the aerosol generating medium of the heat-not-burn article.

19. The assembly according to claim 16 or claim 17, wherein the heater is a device into which the heat-not-burn article is at least partially inserted, such that in use, the aerosol generating medium is heated but not burned.

20. The assembly according to any one of claims 16 to 19, configured such that the one or more capsules are exposed to a temperature of from about 30 to about 100°C.

21. The assembly according to claim 20, configured such that the one or more capsules are exposed to a temperature of from about 40 to about 90°C.

22. The assembly according to any one of claims 16 to 21, configured to expose the aerosol forming medium to at least 200°C for at least 50% of a heating period.

23. A heat-not-burn article comprising an aerosol generating medium and a filter, the filter containing one or more crushable capsules,

wherein the aerosol generating medium comprises at least 10% by weight of an aerosol generating agent based on the total weight of the aerosol generating medium and wherein, in use, the aerosol generating medium is heated without being combusted, and the capsule is exposed to a temperature of 30-100°C and is exposed to at least 12 mg of water, during which exposure its structural integrity is not compromised, such that the capsule can be crushed by the user before, during or after heating,

the capsule having a core-shell structure, the core comprising a liquid and the shell encapsulating the core.

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24. The article according to claim 23, wherein the shell comprises 5-90% by weight based on the total capsule shell weight of a gelling agent, wherein the gelling agent comprises carrageenan.

25. The article according to claim 23 or 24, wherein the aerosol generating medium comprises a tobacco material.

26. The article according to any one of claims 23 to 24, wherein the aerosol generating medium comprises the aerosol generating agent and a tobacco material, which may be provided in the same portion of the aerosol generating medium or in separate sections of the aerosol generating medium.

27. The article according to claim 25, wherein the aerosol generating medium comprises the aerosol generating agent and the tobacco material, which may be provided in the same portion of the aerosol generating medium or in separate sections of the aerosol generating medium.

28. The article according to any one of claims 23 to 27, wherein the one or more capsules fill 5-30% v/v of the filter.

29. The article according to any one of claims 23 to 28, wherein the filter comprises 70-95% v/v of a filter material.

30. The article according to any one of claims 23 to 29, wherein the filter comprising filter material having an average melting point of at least 150°C.

31. The article according to any one of claims 23 to 30, wherein the filter comprises filter material having an average thermal conductivity of at least 0.130 W/mK.

32. The article according to any one of claims 23 to 31, wherein the filter additionally comprises a wrapper that circumscribes the other filter components.

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33. The article according to any one of claims 23 to 32, wherein the capsule shell comprises 5-60% by weight based on the total capsule shell weight of carrageenan as a gelling agent.

34. The article according to any one of claims 23 to 33, wherein the capsule shell comprises 10-35% by weight based on the total capsule shell of carrageenan as a gelling agent.

35. The article according to any one of claims 23 to 34, wherein the capsule shell additionally comprises a plasticiser or a carbohydrate, or comprises a plasticiser and a carbohydrate.

36. The article according to claim 35, wherein the carbohydrate is a starch.

37. The article according to any one of claims 23 to 36, wherein the one or more capsules have a crush strength, before heating is initiated, of from 0.8 kp to 3.5 kp.

38. The article according to claim 37, wherein the one or more capsules have a crush strength, before heating is initiated, of from 1.0 kp to 2.5 kp.

39. The article according to any one of claims 23 to 38, wherein the capsule core comprises a flavourant.

40. A heat-not-burn assembly comprising the heat-not-burn article according to any one of claims 23 to 39 and a heater.

41. The assembly according to claim 40, wherein the one or more capsules are disposed at least 25 mm from the heater.

42. The assembly according to claim 40 or claim 41, wherein the heater comprises a combustible fuel source which is arranged such that, on ignition, the fuel source heats but does not burn the aerosol generating medium of the heat-not-burn article.

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43. The assembly according to any one of claims 40 to 42, wherein the heater is a device into which the heat-not-burn article is at least partially inserted, such that in use, the aerosol generating medium is heated but not burned.

44. The assembly according to any one of claims 40 to 43, configured such that the one or more capsules are exposed to a temperature of 30-100°C.

45. The assembly according to claim 44, configured such that the one or more capsules are exposed to a temperature of 40-90°C.

46. The assembly according to any one of claims 40 to 45, configured to expose the aerosol generating medium to at least 200°C for at least 50% of a heating period.

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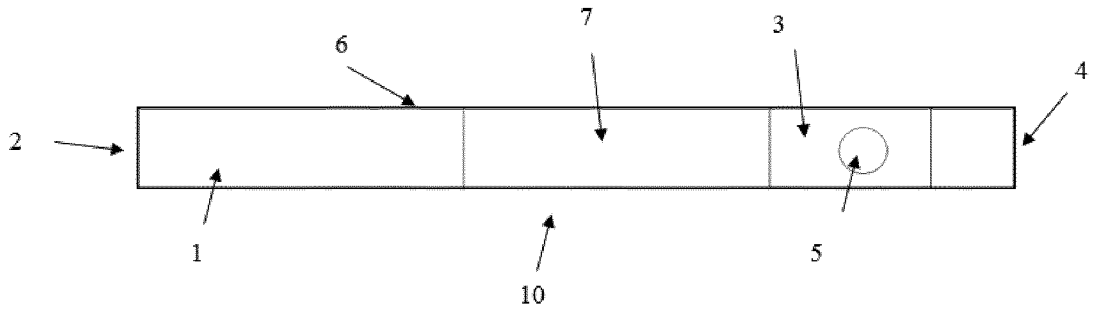


FIGURE 1

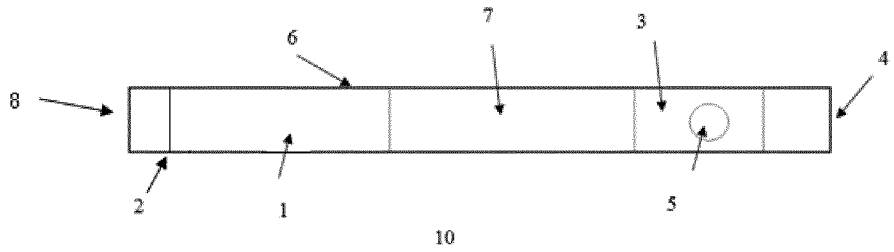


FIGURE 2

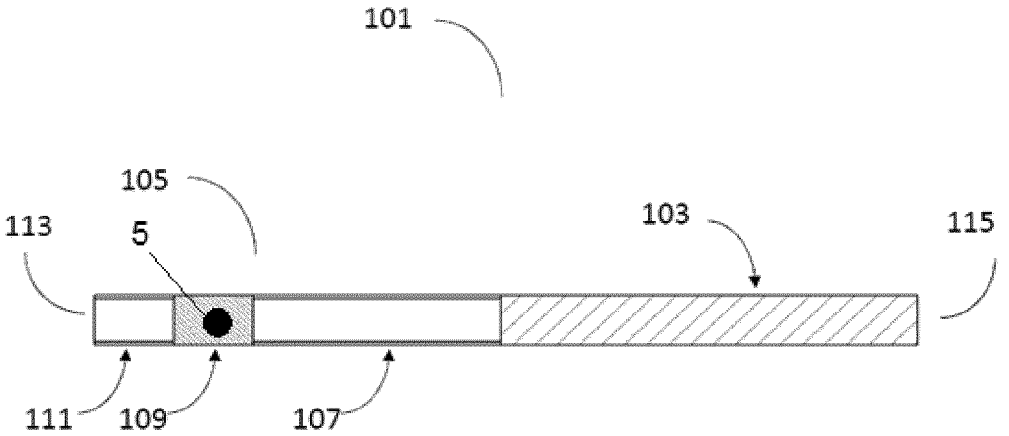


FIGURE 3

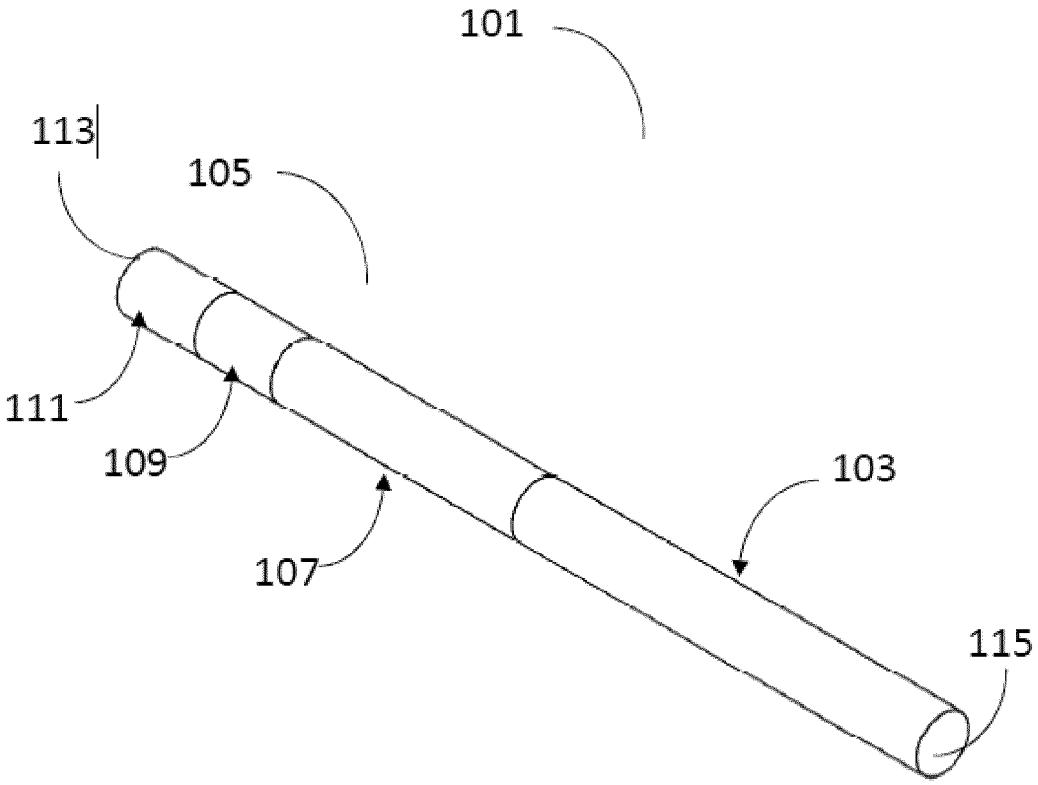


FIGURE 4

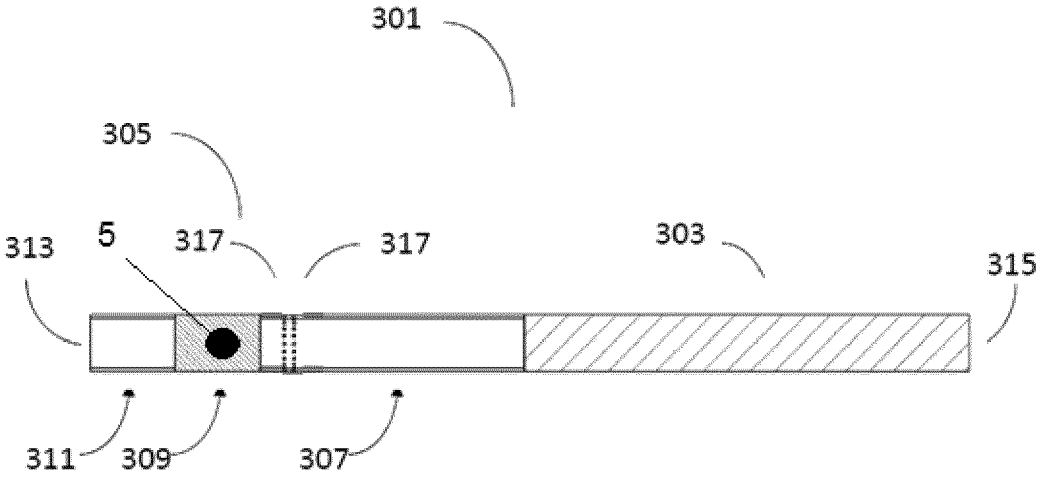


FIGURE 5

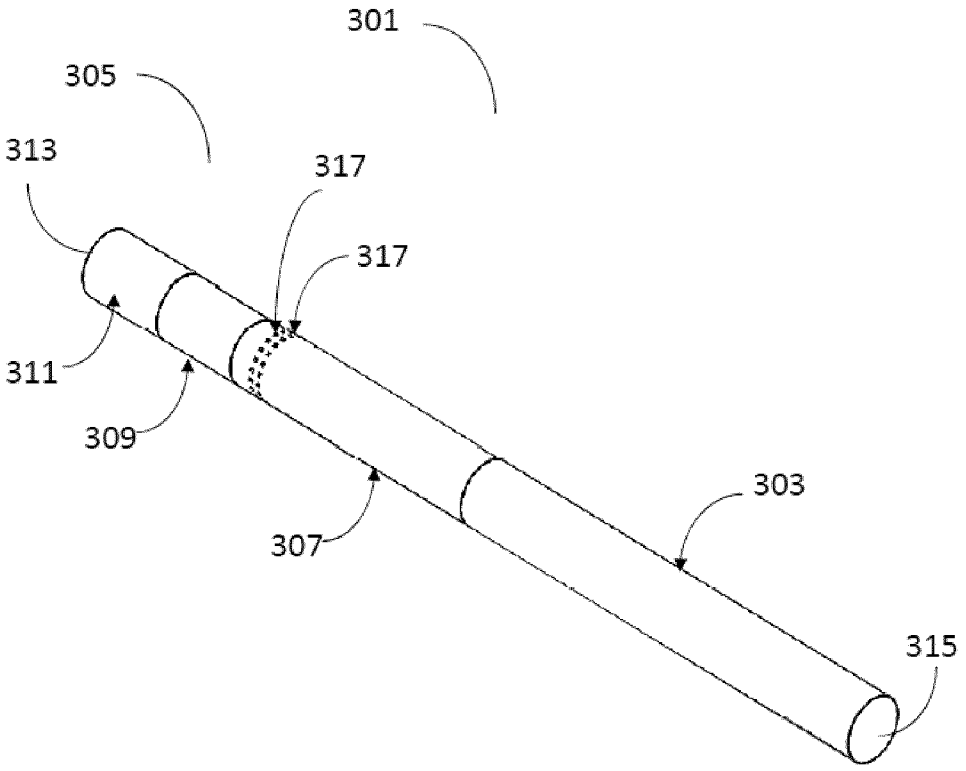


FIGURE 6

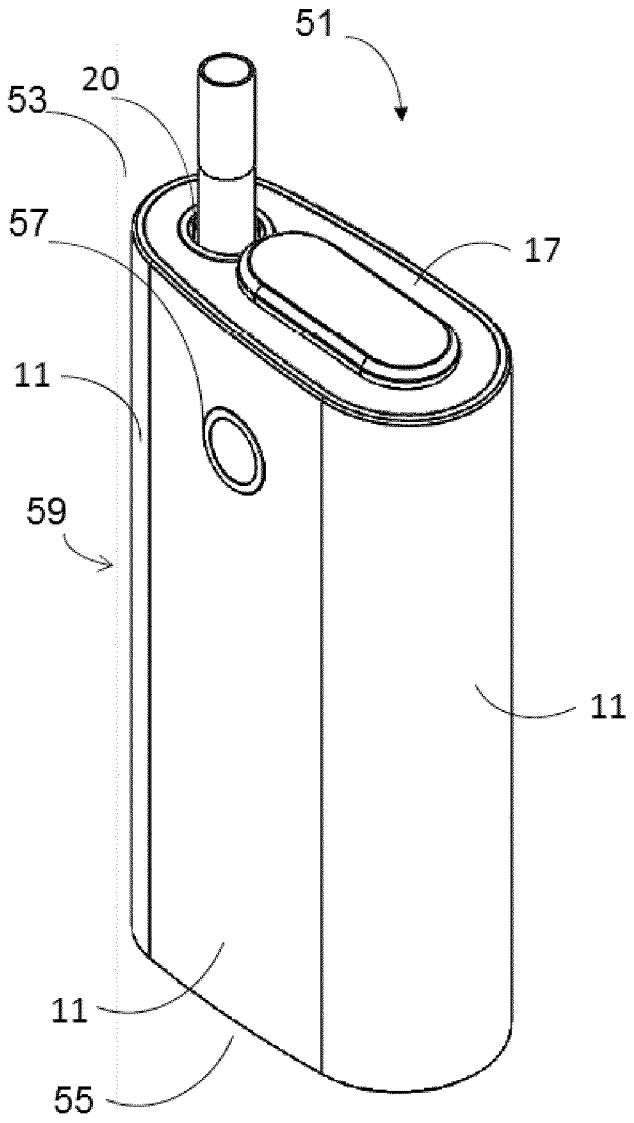


FIGURE 7

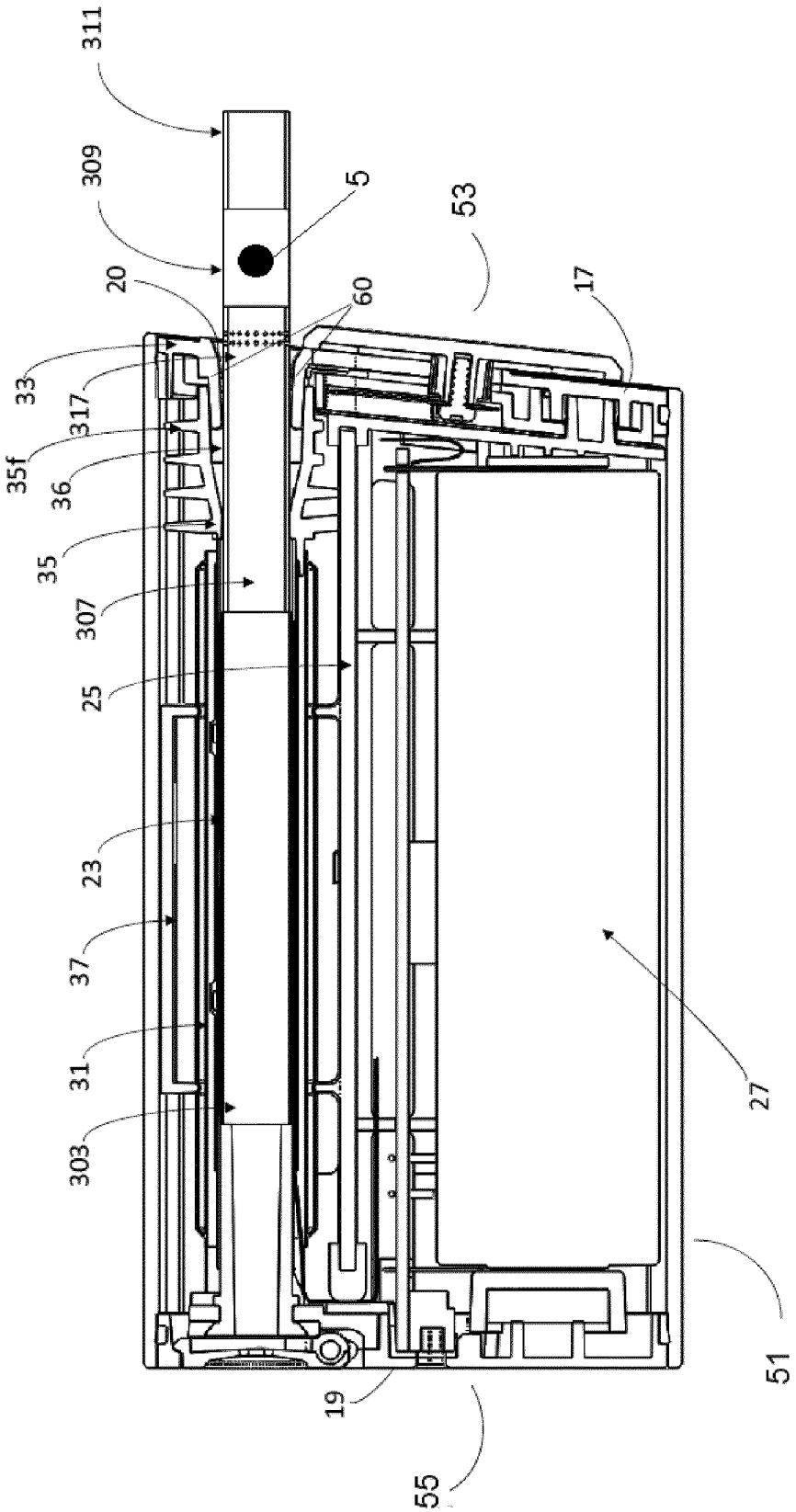


FIGURE 8

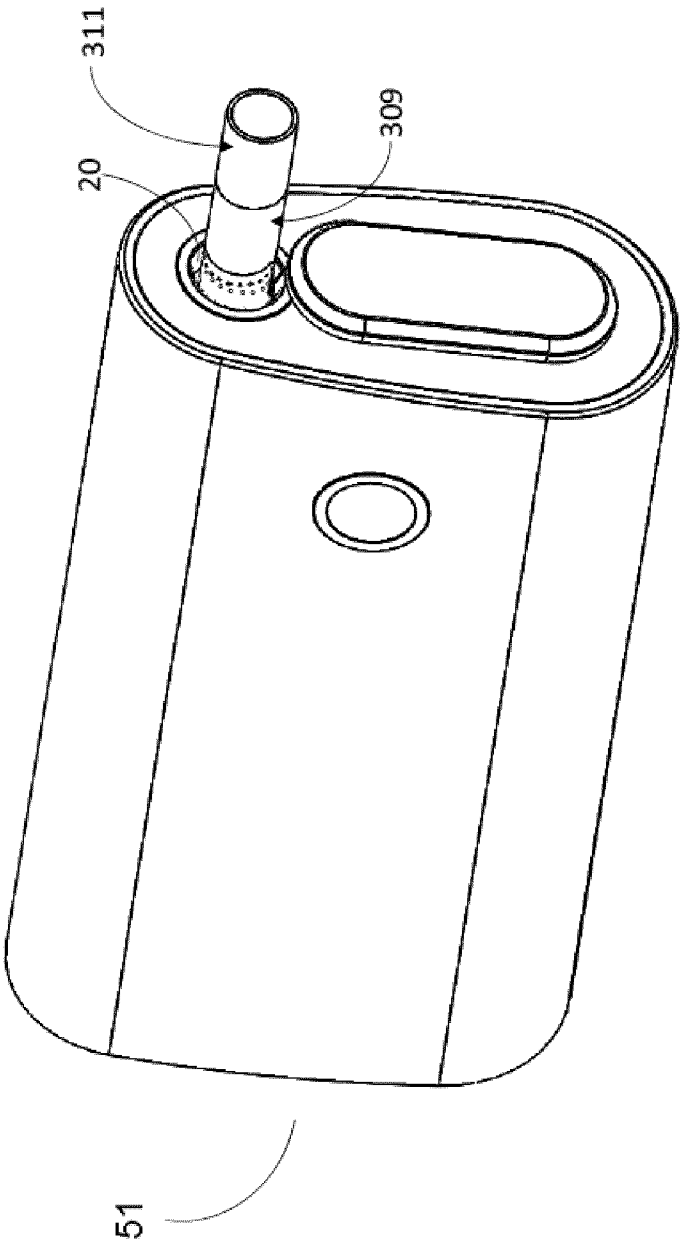
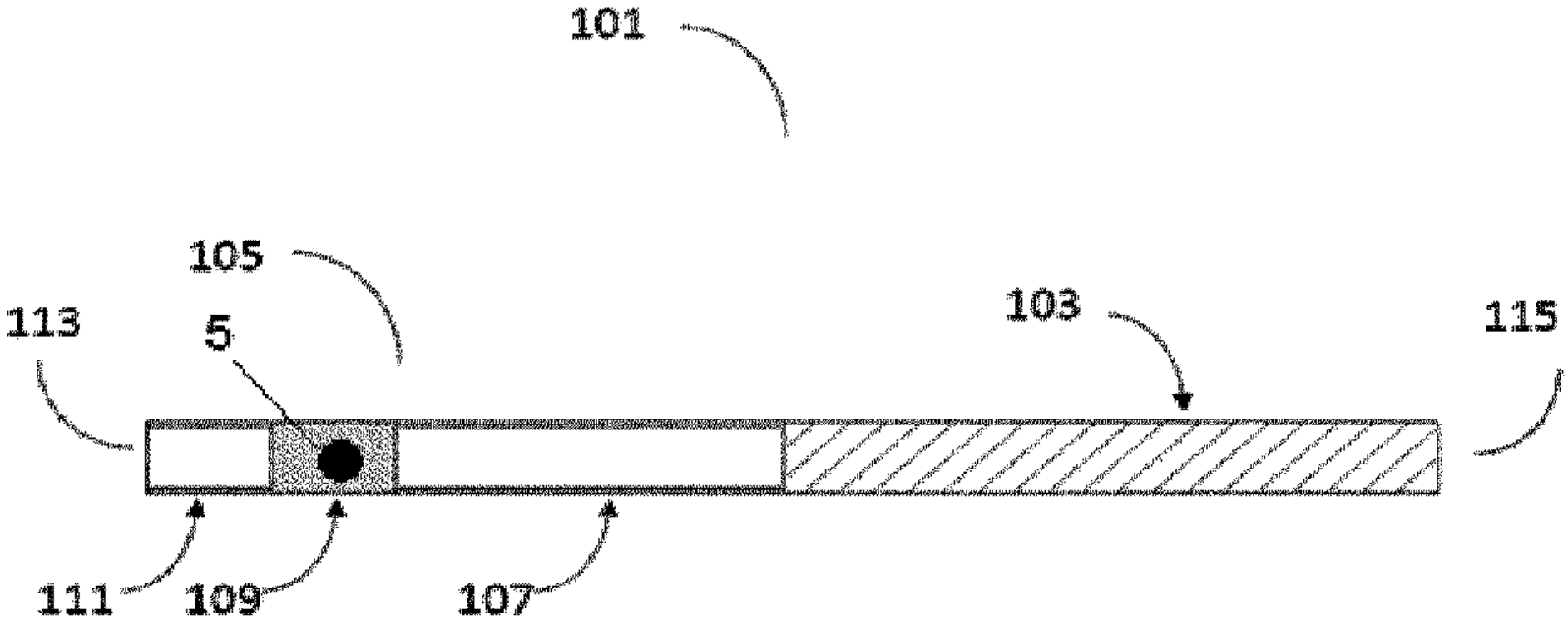


FIGURE 9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