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(54) **FLAVOUR DELIVERY COMPOSITION AND SMOKING SUBSTITUTE APPARATUS**

(57) The present disclosure relates to a flavour delivery composition for use with a smoking substitute device, and a smoking substitute apparatus comprising the flavour delivery composition. In particular, the flavour de-

livery composition comprises a mixture of first flavourant particles and second flavourant particles, wherein the first flavourant particles have a higher flavourant release rate than the second flavourant particles.

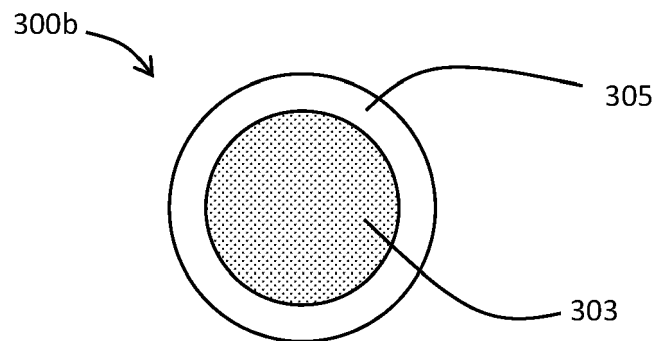


FIG 3B

Description

Technical field

[0001] The present invention relates generally to a flavour delivery composition for use with smoking substitute apparatuses, and smoking substitute apparatuses which are configured to deliver the flavourant delivery composition to a user without the need for flavoured e-liquid.

Background

[0002] The smoking of tobacco is generally considered to expose a smoker to potentially harmful substances. It is generally thought that a significant amount of the potentially harmful substances are generated through the heat caused by the burning and/or combustion of the tobacco and the constituents of the burnt tobacco in the tobacco smoke itself.

[0003] Combustion of organic material such as tobacco is known to produce tar and other potentially harmful by-products. There have been proposed various smoking substitute systems in order to avoid the smoking of tobacco.

[0004] Such smoking substitute systems can form part of nicotine replacement therapies aimed at people who wish to stop smoking and overcome a dependence on nicotine.

[0005] Smoking substitute systems, which may also be known as electronic nicotine delivery systems, may comprise electronic systems that permit a user to simulate the act of smoking by producing an aerosol, also referred to as a "vapour", which is drawn into the lungs through the mouth (inhaled) and then exhaled. The inhaled aerosol typically bears nicotine and/or flavourings without, or with fewer of, the odour and health risks associated with traditional smoking.

[0006] In general, smoking substitute systems are intended to provide a substitute for the rituals of smoking, whilst providing the user with a similar experience and satisfaction to those experienced with traditional smoking and tobacco products.

[0007] The popularity and use of smoking substitute systems has grown rapidly in the past few years. Although originally marketed as an aid to assist habitual smokers wishing to quit tobacco smoking, consumers are increasingly viewing smoking substitute systems as desirable lifestyle accessories. Some smoking substitute systems are designed to resemble a traditional cigarette and are cylindrical in form with a mouthpiece at one end. Other smoking substitute systems do not generally resemble a cigarette (for example, the smoking substitute device may have a generally box-like form).

[0008] There are a number of different categories of smoking substitute systems, each utilising a different smoking substitute approach. A smoking substitute approach corresponds to the manner in which the substitute system operates for a user.

[0009] One approach for a smoking substitute system is the so-called "vaping" approach, in which a vaporisable liquid, typically referred to (and referred to herein) as "e-liquid", is heated by a heater to produce an aerosol vapour which is inhaled by a user. An e-liquid typically includes a base liquid as well as nicotine and/or flavourings. The resulting vapour therefore typically contains nicotine and/or flavourings. The base liquid may include propylene glycol and/or vegetable glycerine.

A typical vaping smoking substitute system includes a mouthpiece, a power source (typically a battery), a tank or liquid reservoir for containing e-liquid, as well as a heater. In use, electrical energy is supplied from the power source to the heater, which heats the e-liquid to produce an aerosol (or "vapour") which is inhaled by a user through the mouthpiece.

[0010] Vaping smoking substitute systems can be configured in a variety of ways. For example, there are "closed system" vaping smoking substitute systems which typically have a heater and a sealed tank which is pre-filled with e-liquid and is not intended to be refilled by an end user. One subset of closed system vaping smoking substitute systems include a device which includes the power source, wherein the device is configured to be physically and electrically coupled to a component including the tank and the heater. In this way, when the tank of a component has been emptied, the device can be reused by connecting it to a new component. Another subset of closed system vaping smoking substitute systems are completely disposable, and intended for one-use only.

There are also "open system" vaping smoking substitute systems which typically have a tank that is configured to be refilled by a user, so the system can be used multiple times.

[0011] An example vaping smoking substitute system is the myblu™ e-cigarette. The myblu™ e cigarette is a closed system which includes a device and a consumable component. The device and consumable component are physically and electrically coupled together by pushing the consumable component into the device. The device includes a rechargeable battery. The consumable component includes a mouthpiece, a sealed tank which contains e-liquid, as well as a vaporiser, which for this system is a heating filament coiled around a portion of a wick which is partially immersed in the e-liquid. The system is activated when a microprocessor on board the device detects a user inhaling through the mouthpiece. When the system is activated, electrical energy is supplied from the power source to the vaporiser, which heats e-liquid from the tank to produce a vapour which is inhaled by a user through the mouthpiece.

[0012] Another example vaping smoking substitute system is the blu PRO™ e-cigarette. The blu PRO™ e cigarette is an open system which includes a device, a (refillable) tank, and a mouthpiece. The device and tank are physically and electrically coupled together by screwing one to the other. The mouthpiece and refillable tank

are physically coupled together by screwing one into the other, and detaching the mouthpiece from the refillable tank allows the tank to be refilled with e-liquid. The system is activated by a button on the device. When the system is activated, electrical energy is supplied from the power source to a vaporiser, which heats e-liquid from the tank to produce a vapour which is inhaled by a user through the mouthpiece.

[0013] An alternative to the "vaping" approach is the so-called Heated Tobacco ("HT") approach in which tobacco (rather than an e-liquid) is heated or warmed to release vapour. HT is also known as "heat not burn" ("HNB"). The tobacco may be leaf tobacco or reconstituted tobacco. In the HT approach the intention is that the tobacco is heated but not burned, i.e. the tobacco does not undergo combustion.

[0014] The heating, as opposed to burning, of the tobacco material is believed to cause fewer, or smaller quantities, of the more harmful compounds ordinarily produced during smoking. Consequently, the HT approach may reduce the odour and/or health risks that can arise through the burning, combustion and pyrolytic degradation of tobacco.

[0015] A typical HT smoking substitute system may include a device and a consumable component. The consumable component may include the tobacco material. The device and consumable component may be configured to be physically coupled together. In use, heat may be imparted to the tobacco material by a heating element of the device, wherein airflow through the tobacco material causes components in the tobacco material to be released as vapour. A vapour may also be formed from a carrier in the tobacco material (this carrier may for example include propylene glycol and/or vegetable glycerine) and additionally volatile compounds released from the tobacco. The released vapour may be entrained in the airflow drawn through the tobacco. As the vapour passes through the consumable component (entrained in the airflow) from the location of vaporization to an outlet of the component (e.g. a mouthpiece), the vapour cools and condenses to form an aerosol for inhalation by the user. The aerosol may contain nicotine and/or flavour compounds.

[0016] There may be a need for improved design of smoking substitute systems, in particular in regards to the delivery of flavour to a user. The present disclosure has been devised in the light of the above considerations.

Summary

[0017] When there is no flavourant present in the e-liquid, or an amount of flavourant is present which delivers a weak and underwhelming taste sensation to consumers, it is desirable to supplement this with flavourant which is located elsewhere on or in the smoking substitute apparatus. Broadly speaking, the present application relates to a flavour delivery composition for use with a smoking substitute apparatus, in particular so that the

user is able to experience flavour at the same time as inhaling the flavourless e-liquid.

[0018] According to a first aspect of the present invention, there is provided a flavour delivery composition for use with a smoking substitute apparatus, the flavour delivery composition comprising a mixture of first flavourant particles and second flavourant particles, wherein the first flavourant particles have a higher flavourant release rate than the second flavourant particles. In this way, the present invention provides a flavour delivery composition which may be used as a secondary flavourant delivery mechanism (that is, separate from an e-liquid, which may be flavourless) having an improved longevity of flavour without loss of flavour, and/or from which a flavour detected by a user changes over time. For example, in some embodiments the first flavourant particles and the second flavourant particles may comprise different flavourants so as to provide a flavour which changes over time. Alternatively, the first flavourant particles and the second flavourant particles may comprise the same flavourant, so as to provide a single flavour with improved longevity of flavour without the loss of flavour which typically occurs.

[0019] Optional features will now be set out. These are applicable singly or in any combination with any aspect.

[0020] Advantageously, the first flavourant particles and/or the second flavourant particles may comprise a barrier material which encapsulates a flavourant. A flavourant release rate may thereby be affected by the thickness of the barrier material, for example, or by the size of the flavourant particles. In particular, when the barrier material is made thinner, the flavourant release rate may be increased as the barrier material may disintegrate or break down quicker. Similarly, the flavourant release rate may be increased by reducing the particle size, which increases the surface area of the flavourant particles in a given volume of flavour delivery composition and therefore increase the rate at which the barrier material may disintegrate or break down to release a flavourant. Flavourant particles which are configured to encapsulate a flavourant in this way may be manufactured by any suitable microencapsulation process, for example centrifugal-suspension coating or fluidised bed coating. In some embodiments, the first flavourant particles and/or the second flavourant particles may have a diameter of between 500 μm and 5000 μm as measured by any one of Laser Diffraction, Sieve/Mesh Analysis, Microscopic Techniques including SEM (Scanning Electron Microscopy), Spraytec, or DLS (Dynamic Light Scattering). The particle diameter may be an average particle diameter, e.g. a mean particle diameter, as measured by any one of these techniques, for example. By providing flavourant particles having a particle size in this range it can be ensured that the flavourant particle is not inhaled into the lungs of a user, but flavourant is delivered to a user's oral and/or nasal cavity.

[0021] Optionally, the first flavourant particles and/or the second flavourant particles may comprise two or

more portions of flavourant separated by concentric barrier layers. In this way, each flavourant particle may itself comprise two or more flavourants which are released at different times, or may comprise a single flavourant which has increased longevity.

[0022] Preferably, the first flavourant particles may comprise a first flavourant material and the second flavourant material may comprise a second barrier material. A flavourant release rate may thereby be affected by the choice of the barrier material, such that a first flavourant particle may comprise a barrier material which disintegrates or breaks down at a faster rate than the second barrier material, for example. In some examples, concentric barrier layers may comprise differing barrier materials so as to modify the flavourant release rate of each layer.

[0023] Optionally, the barrier material (or first barrier material and second barrier material) may be selected from the group comprising: maltodextrin, corn syrup solid, modified starch, gum Arabic, modified cellulose, gelatine, cyclodextrin, lecithin, whey protein, and hydrogenated fat, starches (e.g. maize, wheat, potato, rice). For example, a barrier material may be chosen based on the rate of breakdown or dissolution of the barrier material in the presence of a vapour, as the rate of breakdown or dissolution correlates with the flavourant release rate. For example, the water solubility of the barrier material may be an important consideration when selecting a barrier material. A barrier material which has a higher water solubility will dissolve, disintegrate or break down at a faster rate than a material with a lower water solubility, thereby providing an increased flavourant release rate. In some embodiments, there may be a period in which the rate of breakdown of the first barrier material matches the rate of breakdown of the second barrier material, which results in mixing of two flavourants. Controlling the wall thickness of the barrier material may allow for controlled flavourant release rate.

[0024] Advantageously, the first flavourant particles and/or the second flavourant particles may comprise a carrier material which carries a flavourant. A flavourant release rate may thereby be affected by the size of the flavourant particles, for example. In particular, the flavourant release rate may be increased by reducing the particle size, which increases the surface area of the flavourant particles in a given volume of flavour delivery composition and therefore increase the rate at which the carrier material may dissolve to release a flavourant.

[0025] Preferably, the first flavourant particles may comprise a first carrier material and the second flavourant particles may comprise a second carrier material. A flavourant release rate may thereby be affected by the choice of carrier material, such that a first flavourant particle may comprise a first carrier material which dissolves at a faster rate than the second carrier material, for example.

[0026] Optionally, the carrier material (or first carrier material and second carrier material) may comprise hy-

droxypropyl methylcellulose (HPMC) and/or rice starch.

[0027] Of course, it is envisaged that the flavour delivery composition may comprise a mixture of flavourant particles which comprise a barrier material which encapsulates a flavourant and flavourant particles which comprise a carrier material which carries a flavourant. The first flavourant particles and second flavourant particles may each comprise a single type (that is, either barrier-based or carrier-based particles), or may each comprise a mixture (that is, a mixture of barrier-based and carrier-based particles).

[0028] Preferably, the first flavourant particles and the second flavourant particles may be configured to release flavourant upon contacting an aerosol generated from the smoking substitute apparatus. For example, this may be caused by a temperature change, a pH change, a humidity change and/or any other kind of change which may be associated with contact with a generated aerosol. For example, the first flavourant particles and the second flavourant particles may be configured to undergo a physical reaction to release flavourant upon contact with nicotine which is present in the aerosol vapour. In some embodiments, the first flavourant particles and the second flavourant particles may be configured to release flavourant upon contact a user's saliva, particularly where the flavour delivery composition is delivered orally to a user. For example, this may be caused by a temperature change, a pH change, a humidity change and/or any other kind of change which may be associated with contact with saliva. Advantageously, the first flavourant particles and the second flavourant particles may be configured to release flavourant as a result of the breakdown of the selected barrier materials. For example, the first flavourant particles may comprise a barrier material having a higher water solubility than a barrier material of the second flavourant particles, the first flavourant particles thereby disintegrating at a faster rate than the second flavourant particles and so having a higher flavourant release rate. Additionally and/or alternatively, the first flavourant particles may comprise a barrier material having a thinner barrier material than a barrier material of the second flavourant particles, the first flavourant particles thereby disintegrating at a faster rate than the second flavourant particles and so having a higher flavourant release rate. In some embodiments, the first flavourant particles and second flavourant particles may have different diameters. Altering these parameters allows for changes in the rate of dissolution or breakdown of barrier materials or carrier materials, and/or a change in surface area for flavourant release.

[0029] Optionally, the flavour delivery composition may be provided in a liquid, gel, solid, powder, or paste form. For example, the form of the flavour delivery composition may be selected depending on a delivery mechanism for the flavour delivery composition.

[0030] According to a second aspect of the present invention, there is provided a smoking substitute apparatus comprising: a reservoir for containing a vaporisable

e-liquid; an aerosol generator configured to vaporise the e-liquid to produce an aerosol vapour; a cavity for containing a flavour delivery composition substantially as described above with respect to the first aspect; a first flow passage for guiding said aerosol vapour from the aerosol generator to an outlet of the first flow passage; wherein the outlet of the first flow passage is located at a mouthpiece of the apparatus to deliver the aerosol vapour for inhalation by a user of the smoking substitute apparatus; and a second flow passage for guiding ambient air through the cavity and into a flow path of aerosol vapour, wherein the flow of ambient air through the second flow passage is effective to entrain flavour delivery composition from the cavity to be delivered to a user with the aerosol vapour. In this way, the second aspect provides a smoking substitute device which is suitable for delivering flavour to a user by a secondary flavour delivery mechanism, the flavour being provided by the flavour delivery composition according to the first aspect of the invention, which provides an improved longevity of flavour without loss of flavour, and/or from which a flavour detected by a user changes over time.

[0031] Preferably, an outlet of the second flow passage is also located at the mouthpiece of the apparatus. In this way, the flavour delivery composition may be delivered to the oral cavity of a user, or the outlet of the second flow passage may be located such that the flavour delivery composition may be delivered to a nasal cavity of a user when the smoking substitute apparatus is in use.

[0032] Optionally, an outlet of the second flow passage may be in a sidewall of the first flow passage. In this way, the flavour delivery composition may be delivered to a user with the aerosol vapour.

[0033] Throughout this application, the term "flavourant" is used to describe a compound or combination of compounds that provide flavour and/or aroma. For example, the flavourant may be configured to interact with a sensory receptor of a user (such as an olfactory or taste receptor). The flavourant may include one or more volatile substances. The flavourant may be provided in solid or liquid form. The flavourant may be natural or synthetic. For example, the flavourant may include menthol, liquorice, chocolate, fruit flavour (including e.g. citrus, cherry etc.), vanilla, spice (e.g. ginger, cinnamon) and tobacco flavour. The flavourant may be evenly dispersed or may be provided in isolated locations and/or varying concentrations. The flavourant may be configured to release aroma or flavour in response to one or more of heat, pressure, friction and moisture.

[0034] Where the smoking substitute apparatus is in the form of a consumable, the consumable may be configured for engagement with a main body (i.e. so as to form a closed smoking substitute system). For example, the consumable may comprise components of the system that are disposable, and the main body may comprise non-disposable or non-consumable components (e.g. power supply, controller, sensor, etc.) that facilitate the delivery of aerosol by the consumable. In such an em-

bodiment, the aerosol former (e.g. e-liquid) may be replenished by replacing a used consumable with an unused consumable.

[0035] The e-liquid may, for example, comprise a base liquid and e.g. nicotine. The base liquid may include propylene glycol and/or vegetable glycerine. The e-liquid may be flavourless. That is, the e-liquid may not contain any flavourants and may consist solely of a base liquid of propylene glycol and/or vegetable glycerine and nicotine. The reservoir may be in the form of a tank. At least a portion of the tank may be translucent. For example, the tank may comprise a window to allow a user to visually assess the quantity of e-liquid in the tank. A housing of the smoking substitute apparatus may comprise a corresponding aperture (or slot) or window that may be aligned with a translucent portion (e.g. window) of the tank. The reservoir may be referred to as a "clearomizer" if it includes a window, or a "cartomizer" if it does not.

[0036] The smoking substitute apparatus may comprise a passage for fluid flow therethrough. For example, the first flow passage may extend through (at least a portion of) the smoking substitute apparatus, between openings that may define an inlet and an outlet of the passage. The outlet may be at a mouthpiece of the smoking substitute apparatus. In this respect, a user may draw fluid (e.g. air) into and through the passage by inhaling at the outlet (i.e. using the mouthpiece). The passage may be at least partially defined by the tank. The tank may substantially (or fully) define the passage. In this respect, the tank may surround the passage.

[0037] The aerosol generator may comprise a wick. The aerosol generator may further comprise a heater. The wick may comprise a porous material. A portion of the wick may be exposed to fluid flow in the passage. The wick may also comprise one or more portions in contact with liquid stored in the reservoir. For example, opposing ends of the wick may protrude into the reservoir and a central portion (between the ends) may extend across the passage so as to be exposed to fluid flow in the passage. Thus, fluid may be drawn (e.g. by capillary action) along the wick, from the reservoir to the exposed portion of the wick.

[0038] The heater may comprise a heating element, which may be in the form of a filament wound about the wick (e.g. the filament may extend helically about the wick). The filament may be wound about the exposed portion of the wick. The heating element may be electrically connected (or connectable) to a power source. Thus, in operation, the power source may supply electricity to (i.e. apply a voltage across) the heating element so as to heat the heating element. This may cause liquid stored in the wick (i.e. drawn from the tank) to be heated so as to form a vapour and become entrained in fluid flowing through the passage. This vapour may subsequently cool to form an aerosol in the passage.

[0039] The smoking substitute apparatus (or main body engaged with the smoking substitute apparatus) may comprise a power source. The power source may

be electrically connected (or connectable) to a heater of the smoking substitute apparatus (e.g. when engaged with the main body). The power source may be a battery (e.g. a rechargeable battery). A connector in the form of e.g. a USB port may be provided for recharging this battery.

[0040] When the smoking substitute apparatus is in the form of a consumable, the smoking substitute apparatus may comprise an electrical interface for interfacing with a corresponding electrical interface of the main body. One or both of the electrical interfaces may include one or more electrical contacts. Thus, when the main body is engaged with the consumable, the electrical interface may be configured to transfer electrical power from the power source to a heater of the consumable. The electrical interface may also be used to identify the smoking substitute apparatus (in the form of a consumable) from a list of known types. For example, the consumable may have a certain concentration of nicotine and the electrical interface may be used to identify this. The electrical interface may additionally or alternatively be used to identify when a consumable is connected to the main body.

[0041] Again, where the smoking substitute apparatus is in the form of a consumable, the main body may comprise an interface, which may, for example, be in the form of an RFID reader, a barcode or QR code reader. This interface may be able to identify a characteristic (e.g. a type) of a consumable engaged with the main body. In this respect, the consumable may include any one or more of an RFID chip, a barcode or QR code, or memory within which is an identifier and which can be interrogated via the interface.

[0042] The smoking substitute apparatus or main body may comprise a controller, which may include a micro-processor. The controller may be configured to control the supply of power from the power source to the heater of the smoking substitute apparatus (e.g. via the electrical contacts). A memory may be provided and may be operatively connected to the controller. The memory may include non-volatile memory. The memory may include instructions which, when implemented, cause the controller to perform certain tasks or steps of a method.

[0043] The main body or smoking substitute apparatus may comprise a wireless interface, which may be configured to communicate wirelessly with another device, for example a mobile device, e.g. via Bluetooth®. To this end, the wireless interface could include a Bluetooth® antenna. Other wireless communication interfaces, e.g. WiFi®, are also possible. The wireless interface may also be configured to communicate wirelessly with a remote server.

[0044] A puff sensor may be provided that is configured to detect a puff (i.e. inhalation from a user). The puff sensor may be operatively connected to the controller so as to be able to provide a signal to the controller that is indicative of a puff state (i.e. puffing or not puffing). The puff sensor may, for example, be in the form of a pressure sensor or an acoustic sensor. That is, the controller may

control power supply to the heater of the consumable in response to a puff detection by the sensor. The control may be in the form of activation of the heater in response to a detected puff. That is, the smoking substitute apparatus may be configured to be activated when a puff is detected by the puff sensor. When the smoking substitute apparatus is in the form of a consumable, the puff sensor may form part of the consumable or the main body.

[0045] The invention includes the combination of the aspects and preferred features described except where such a combination is clearly impermissible or expressly avoided.

BRIEF DESCRIPTION OF THE DRAWINGS

[0046] So that further aspects and features thereof may be appreciated, embodiments will now be discussed in further detail with reference to the accompanying figures, in which:

Figure 1A is a front view of a smoking substitute system in an engaged position;

Figure 1B is a front view of the smoking substitute system of Figure 1A in a disengaged position;

Figure 2A is a schematic diagram of a first smoking substitute apparatus according to an embodiment of the present invention;

Figure 2B is a schematic diagram of a second smoking substitute apparatus according to an embodiment of the present invention;

Figure 3A is a diagram showing a first flavourant particle;

Figure 3B is a diagram showing a second flavourant particle; and

Figure 3C is a diagram showing a third flavourant particle.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0047] Aspects and embodiments will now be discussed with reference to the accompanying figures. Further aspects and embodiments will be apparent to those skilled in the art.

[0048] Figures 1A and 1B illustrate a smoking substitute system in the form of an e-cigarette system 101. The system 101 comprises an e-cigarette device defining a main body 102 of the system 101, and an smoking substitute apparatus in the form of an e cigarette consumable (or "pod") 103. In the illustrated embodiment the consumable 103 (smoking substitute apparatus) is removable from the main body (e-cigarette device), so as to be a replaceable component of the system 101. In other words, the e-cigarette system 101 is a closed system.

[0049] As is apparent from Figures 1A and 1B, the consumable 103 is configured to engage the main body 102. Figure 1A shows the main body 102 and the consumable 103 in an engaged state, whilst Figure 1B shows the main body 102 and the consumable 103 in a disengaged state.

When engaged, a portion of the consumable 103 is received in a cavity of the main body 102 and is retained in the engaged position by way of a snap-engagement mechanism. In other embodiments, the main body 102 and consumable 103 may be engaged by screwing one into (or onto) the other, through a bayonet fitting, or by way of an interference fit.

[0050] The system 101 is configured to vaporise an aerosol-former, which in the illustrated embodiment, is in the form of a nicotine-based e-liquid 104. The e-liquid 104 comprises nicotine and a base liquid including propylene glycol and/or vegetable glycerine. In the present embodiment, the e-liquid 104 is flavourless (and does not include any added flavourant). That is, if the e-liquid 104 were to be inhaled (i.e. in aerosol form) by a user, it would not have a particularly perceptible flavour or taste.

[0051] As is more apparent from Figures 2A and 2B, this e-liquid 104 is stored within a reservoir in the form of a tank 105 that forms part of the consumable 103. In the illustrated embodiment, the consumable 103 is a "single-use" consumable 103. That is, upon exhausting the e-liquid 104 in the tank 105, the intention is that the user disposes of the entire consumable 103. In other embodiments, the e-liquid (i.e. aerosol former) may be the only part of the system that is truly "single-use". That is, the tank may be refillable with e-liquid or the e-liquid may be stored in a non-consumable component of the system. For example, the e-liquid may be stored in a tank located in the main body or stored in another component that is itself not single-use (e.g. a refillable cartomizer).

[0052] The tank 105 surrounds, and thus defines a portion of, a passage 106 that extends between an inlet 107 and an outlet 108 at opposing ends of the consumable 103. In this respect, the passage comprises an upstream end at the end of the consumable 103 that engages with the main body 102, and a downstream end at an opposing end of the consumable 103 that comprises a mouthpiece 109 of the system 101. When the consumable 103 is engaged with the main body 102, a user can inhale (i.e. take a puff) via the mouthpiece 109 so as to draw air through the passage 106, and so as to form an airflow (indicated by arrows) in a direction from the inlet 107 to the outlet 108 of the passage 106. Although not illustrated, the passage 106 may be partially defined by a tube (e.g. a metal tube) extending through the consumable 103. The passage 106 is in fluid communication with a gap defined between the consumable 103 and the main body 102 (when engaged) such that air outside of the system 101 is drawn into the passage 106 (during an inhale).

[0053] The smoking substitute system 101 is configured to vaporise the e-liquid 104 for inhalation by a user. To provide this, the consumable 103 comprises a heater having of a porous wick 110 and a resistive heating element in the form of a heating filament 111 that is helically wound around a portion of the porous wick 110. The porous wick 110 extends across the passage 106 (i.e. transverse to a longitudinal axis of the passage 106) and op-

posing ends of the wick 110 extend into the tank 105 (so as to be submerged in the e liquid 104). In this way, e-liquid 104 contained in the tank 105 is conveyed from the opposing ends of the porous wick 110 to a central portion of the porous wick 110 so as to be exposed to the airflow in the passage 106 (i.e. caused by a user inhaling). In other embodiments the heating filament 111 and/or wick 110 may form part of the main body (but may engage the tank 105 during engagement of the main body 102 and the consumable 103).

[0054] The helical filament 111 is wound about this exposed central portion of the porous wick 110 and is electrically connected to an electrical interface in the form of electrical contacts 112 mounted at the end of the consumable that is proximate the main body 102 (when engaged). When the consumable 103 is engaged with the main body 102, the electrical contacts 112 contact corresponding electrical contacts (not shown) of the main body 102. The main body electrical contacts are electrically connected to a power source (not shown) of the main body 102, such that (in the engaged position) the filament 111 is electrically connected to the power source. In this way, power can be supplied by the main body 102 to the filament 111 in order to heat the filament 111. This heat is transferred from the filament 111 to the porous wick 110 which causes e-liquid 104 conveyed by the porous wick 110 to increase in temperature to a point at which it vaporises. The vaporised e-liquid becomes entrained in the airflow and, between the vaporisation point at the filament 111 and the outlet 108 of the passage 106, condenses to form an aerosol. This aerosol is then inhaled, via the mouthpiece 109, by a user of the system 101.

[0055] The power source of the main body 102 may be in the form of a battery (e.g. a rechargeable battery). The main body 102 may comprise a connector in the form of e.g. a USB port for recharging this battery. The main body 102 may also comprise a controller that controls the supply of power from the power source to the main body electrical contacts (and thus to the filament 111). That, is the controller may be configured to control a voltage applied across the main body electrical contacts, and thus the voltage applied across the filament 111. In this way, the filament 111 may only be heated under certain conditions (e.g. during a puff and/or only when the system is in an active state). In this respect, the main body 102 may include a puff sensor (not shown) that is configured to detect a puff (i.e. inhalation). The puff sensor may be operatively connected to the controller so as to be able to provide a signal, to the controller, which is indicative of a puff state (i.e. puffing or not puffing). The puff sensor may, for example, be in the form of a pressure sensor or an acoustic sensor.

[0056] Although not shown, the main body 102 and consumable 103 may comprise a further interface which may, for example, be in the form of an RFID reader, a barcode or QR code reader. This interface may be able to identify a characteristic (e.g. a type) of a consumable

103 engaged with the main body 102. In this respect, the consumable 103 may include any one or more of an RFID chip, a barcode or QR code, or memory within which is an identifier and which can be interrogated via the interface.

[0057] Figures 2A and 2B illustrates smoking substitute apparatuses which include a flavour cavity 200. The flavour cavity 200 has a reservoir formed therein which contains a flavour delivery composition 202. For example, the flavour delivery composition 202 may be provided in a powdered form. The smoking substitute apparatus is thus a hybrid pod which has both a tank 105 containing e-liquid 104 and a flavour cavity 200 containing a flavour delivery composition 202.

[0058] Similarly to in Figures 1A-1C, a first flow passage 106 extends between a first flow passage inlet 107 and a first flow passage outlet 108. The first flow passage outlet 108 is formed in the mouthpiece 109 of the consumable 103. The first flow passage 106 guides aerosol vapour of the e-liquid 104 from the tank 105 to the first flow passage outlet 108 in the mouthpiece 109, for inhalation by a user.

[0059] As shown in Figures 2A and 2B, a second flow passage 206 extends between a second flow passage inlet 208 and a second flow passage outlet 210a, 210b. The second flow passage 206 may be formed by one or more hollow tubes extending through the interior of the consumable 103. The second flow passage outlet 210a is formed in the mouthpiece 109, or the second flow passage outlet 210b may be formed in a sidewall of the first flow passage 106, and the flavour cavity 200 containing the flavour delivery composition 202 is formed in a portion of the second flow passage 206. Thus, the second flow passage 206 acts to guide ambient air from an outside of the consumable 103 through the second flow passage inlet 208 and the flavour cavity 200, to the second flow passage outlet 210a, 210b.

[0060] When a user of the smoking substitute system draws on the mouthpiece 109, ambient air is sucked through the second flow passage 206, and thus through the flavour cavity 200. The flavour delivery composition 202 is entrained in the flow of ambient air through the second flow cavity 206 and is therefore carried through the second flow passage outlet 210a, 210b by the flow of air and into the mouth of the user for inhalation.

[0061] In the arrangement shown in Figure 2A, the first flow passage 106 and second flow passage 206 are fluidly isolated from one another along their entire length to avoid e-liquid 104 mixing with the flavour delivery composition 202. Thus, the second flow passage 206 is isolated from the tank 105 and the heating element. In particular, the second flow passage outlet 210a is formed in the mouthpiece 109 such that the flavour delivery composition 202 may be delivered directly to a user's oral cavity without the flavour delivery composition 202 coming into contact with aerosol vapour generated from the e-liquid 104. This may have the advantage that the particles of the flavour delivery composition 202 do not start to dis-

integrate or break down until they reach the oral cavity of the user, thus increasing the longevity of the flavours. This arrangement may be particularly preferably when the flavour delivery composition 202 is configured to release flavourant when in contact with a user's saliva, for example due to a temperature or humidity change. This may be achieved by selection of an appropriate barrier and/or carrier material, as discussed in more detail below.

[0062] Alternatively, in the arrangement shown in Figure 2B, the outlet 210b of the second flow passage 206 may be formed in a sidewall of the first flow passage 106. In this way, flavour delivery composition 202 may be delivered directly to an aerosol vapour generated from the e-liquid 104 to be delivered to a user's oral cavity. This may have the advantage of ensuring that the flavour delivery composition 202 and the aerosol vapour are simultaneously delivered to the oral cavity of a user. This arrangement may be particularly preferable when the flavour delivery composition 202 is configured to release flavourant when in contact with the aerosol vapour, for example due to a temperature, humidity, pH, or any other change, or due to a reaction with nicotine present in the aerosol vapour. Preferably, the flavourant particles are soluble in the aerosol vapour (e.g. by contact with water vapour) to deliver flavourant to a user. This may be achieved by selection of an appropriate barrier and/or carrier material, as discussed in more detail below.

[0063] The second flow passage 206 may be adjustable (i.e. tuneable) to alter the amount of flavour delivery composition entrained in the air flow into the mouth of a user. The size and/or shape of the second flow passage air inlet 208 or second flow passage air outlet 210a, 210b may be adjustable to change the amount of composition entrained through the second flow passage per use (i.e. per puff) of the smoking substitute system. A user may be able to control the size or shape of the second flow passage inlet 208 or outlet 210a, 210b by the use of a button, or slider. The button or slider may act to partially close the second flow passage inlet 208 or outlet 210a, 210b.

[0064] Alternatively (or additionally), the first flow passage 106 may be adjustable to change the relative amount of composition 202 and aerosol vapour delivered to the mouth of a user through the mouthpiece 109.

[0065] Although not shown in the figures, there may be a flow passage obstructer extendable across the second flow passage 206. The flow passage obstructer may be formed as a flap, cap, lid or a sliding obstructer, and may be operable to partially, and/or completely block the second flow passage 206 so that ambient air cannot flow through the second flow passage 206. The second flow passage obstructer may be formed over the second flow passage inlet 208 as a cap or plug, or may be formed elsewhere in the second flow passage 206.

[0066] In other embodiments, the second flow passage 206 may be non-linear and/or tortuous, and follow a winding, meandering path. The second flow passage 206 may

spiral around the first flow passage 106.

[0067] In Figures 2A and 2B, the second flow passage air inlet 208 is formed in an outer side wall of the consumable 103. However, other configurations may be possible. For example, the first flow passage inlet 107 may be formed together with the second flow passage inlet 208 to form a combined flow inlet upstream of the tank 105 and the heating element. Air may travel through the combined flow inlet into a combined flow passage which branches into the first flow passage 106 and second flow passage 206 upstream of the heating element and tank 105. The flow of ambient air entering the consumable 103 may be split into two passages; the first guiding vaporised e-liquid 104 to the mouthpiece 109, and the second guiding powdered flavourant 202 to the mouthpiece 109.

[0068] Figures 3A-3C show schematic diagrams of flavourant particles 300a, 300b, 300c which may be used to provide a flavour delivery composition 202. Each of the flavourant particles 300a, 300b, 300c comprises a flavourant to provide flavour to a user, particularly as the e-liquid 104 may be substantially flavourless. The flavourant may be natural or synthetic. For example, the flavourant may include menthol, liquorice, chocolate, fruit flavour (including e.g. citrus, cherry etc.), vanilla, spice (e.g. ginger, cinnamon) and tobacco flavour. The flavourant may be configured to release aroma or flavour in response to one or more of heat, pressure, friction and moisture. It is envisaged that the flavour delivery composition 202 may comprise a mixture of any one or more of the flavourant particles 300a, 300b, 300c, and in particular the flavour delivery composition 202 comprises a mixture of first flavourant particle and a second flavourant particle, wherein the first flavourant particle has a higher flavour release rate than the second flavourant particle, such that a single flavour may have an enhanced longevity, or such that a flavour delivered to a user may evolve over time (that is, transform from a first flavour to a second flavour). Of course, any suitable number of flavourant particles may be chosen, such as three or more, in order to further enhance longevity of flavour and/or provide changing flavour over time.

[0069] A first flavourant particle 300a, shown in Fig. 3A, comprises a granule 301 formed from a combination of the flavourant with a carrier material. For example, the carrier material may comprise hydroxypropyl methylcellulose (HPMC) and/or rice starch. The flavourant particle 300a may thereby deliver flavour to a user as the granule dissolves or disintegrates to release flavourant from the carrier material. For example, this may happen on contact with an aerosol vapour and/or a user's saliva. Preferably, the flavourant particles are soluble in the aerosol vapour (e.g. by contact with water vapour) to deliver flavourant to a user. In some examples the granule may break down as a result of a change of temperature, or pH value, or other environmental condition, which may be particularly dependent on the carrier material or carrier materials which are chosen to form the granule 301. The

flavour release rate of the flavourant particle 300a may be selected based on the choice of carrier material, or on the ratios of different carrier materials which are used to form the granule 301. The flavour release rate may also be dependent on the size of the particle 300a. In particular, a smaller granule 301 may result in a higher flavourant release rate, whereas a larger granule may result in a lower flavourant release rate.

[0070] A second flavourant particle 300b, shown in Fig. 3B, comprises a flavourant 303 encapsulated by a barrier material 305. For example, the barrier material 305 may be selected from the group comprising: maltodextrin, corn syrup solid, modified starch, gum Arabic, modified cellulose, gelatine, cyclodextrin, lecithin, whey protein, and hydrogenated fat. The flavourant particle 300b is thereby configured to deliver flavour to a user as the barrier material 305 dissolves or disintegrates to release the flavourant 303 to the user. For example, this may happen on contact with an aerosol vapour and/or a user's saliva. In some examples the barrier material 305 may break down as a result of a change of temperature, or pH value, or other environmental condition, which may be particularly dependent on the barrier material which is chosen to form the flavourant particle 300b. The flavour release rate of the flavourant particle 300b may be selected based on the choice of barrier material 305. The flavour release rate may also be dependent on the size of the particle 300b. In particular, a smaller particle 300b may result in a higher flavourant release rate, whereas a larger granule may result in a lower flavourant release rate. Additionally, the flavour release rate may be dependent upon the thickness of the barrier material 305 which encapsulates the flavourant 303. For example, a thicker layer of barrier material 305 may result in a lower flavourant release rate compared with a thinner layer of barrier material 305. The flavourant 303 may be encapsulated by the barrier material 305 by any suitable manufacturing process, in particular microencapsulation processes. For example, the flavourant 303 may be encapsulated through centrifugal suspension coating, in which a concentrated suspension of the flavourant 303 in a barrier material 305 solution is applied to the surface of a spinning disk, whereby at the edge of the disk the suspension is sheared to pass off a stream of particles 300b which comprise the flavourant 303 coated by the barrier material 305. Alternatively, fluidised bed coating may be used, wherein particles of flavourant 303 are suspended by rapid air flow in a chamber and sprayed with a barrier material 305 solution to provide a coating. The resultant coating thickness of such methods may be in the range of approximately 50 to 150 μm , though this may vary depending on the coating material and the extent or time of the coating process.

[0071] A third flavourant particle 300c, shown in Fig. 3C, comprises a first flavourant portion 305 encapsulated by a first barrier material 307. A second flavourant portion 309 is provided concentrically with the first barrier material 307, and thus encapsulates the first flavourant portion

305 and the first barrier material 307. A second barrier material 311 is provided concentrically with the second flavourant portion 309. It is envisaged that any number of flavourant portions and barrier materials may be provided in a similarly, concentric, manner. For example, the barrier material 307 and the barrier material 311 may be selected from the group comprising: maltodextrin, corn syrup solid, modified starch, gum Arabic, modified cellulose, gelatine, cyclodextrin, lecithin, whey protein, and hydrogenated fat. The first flavourant portion 305 and the second flavourant portion 309 may comprise the same flavourant or different flavourants. For example, by comprising the same flavourant, the third flavourant particle 300c may provide a single flavour to a user with improved longevity or, by comprising different flavourants, the flavour provided by the third flavourant particle 300c may change over time (for example from a first to a second flavour). The first barrier material 307 and the second barrier material 311 may comprise the same material or may comprise different materials, and may have the same thickness or different thicknesses. In this way, the first barrier material 307 and the second barrier material 311 may be configured to have the same or a different flavour release rates. The flavour release rate may also change with the size of the third flavourant particle 300c. For example, a smaller flavourant particle may have a higher flavourant release rate than a smaller flavourant particle. The flavourant particle 300c may be manufactured by any suitable encapsulation process, such as those discussed above with respect to the second flavourant particle 300b. In particular, the encapsulation process may be repeated to provide the second flavourant 309 and the second barrier material 311. Of course, the process may be repeated any number of times to obtain the desired number of concentric flavourant portions and barrier material layers.

[0072] Preferably, the flavourant particles have a diameter of between 500 μm and 5000 μm as measured by any one of Laser Diffraction, Sieve/Mesh Analysis, Microscopic Techniques including SEM (Scanning Electron Microscopy), Spraytec, or DLS (Dynamic Light Scattering). The particle diameter may be an average particle diameter, e.g. a mean particle diameter, as measured by any one of these techniques, for example. By providing flavourant particles having a particle size in this range it can be ensured that the flavourant particle is not inhaled into the lungs of a user, but flavourant is delivered to a user's oral and/or nasal cavity.

[0073] While exemplary embodiments have been described above, many equivalent modifications and variations will be apparent to those skilled in the art when given this disclosure. Accordingly, the exemplary embodiments set forth above are considered to be illustrative and not limiting.

Throughout this specification, including the claims which follow, unless the context requires otherwise, the words "have", "comprise", and "include", and variations such as "having", "comprises", "comprising", and "including" will

be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps. It must be noted that, as used in the specification and the appended claims, the singular forms "a," "an," and "the" include plural referents unless the context clearly dictates otherwise. Ranges may be expressed herein as from "about" one particular value, and/or to "about" another particular value. When such a range is expressed, another embodiment includes from the one particular value and/or to the other particular value. Similarly, when values are expressed as approximations, by the use of the antecedent "about," it will be understood that the particular value forms another embodiment. The term "about" in relation to a numerical value is optional and means, for example, $\pm 10\%$.

The words "preferred" and "preferably" are used herein refer to embodiments of the invention that may provide certain benefits under some circumstances. It is to be appreciated, however, that other embodiments may also be preferred under the same or different circumstances. The recitation of one or more preferred embodiments therefore does not mean or imply that other embodiments are not useful, and is not intended to exclude other embodiments from the scope of the disclosure, or from the scope of the claims.

Claims

1. A flavour delivery composition for use with a smoking substitute apparatus, the flavour delivery composition comprising a mixture of first flavourant particles and second flavourant particles; wherein the first flavourant particles have a higher flavourant release rate than the second flavourant particles.
2. A flavour delivery composition according to any one of the preceding claims, wherein the first flavourant particles and the second flavourant particles comprise different flavourants.
3. A flavour delivery composition according to any one of the preceding claims, wherein the first flavourant particles and the second flavourant particles comprise the same flavourant.
4. A flavour delivery composition according to any one of claims 1 to 3, wherein the first flavourant particles and/or the second flavourant particles comprise a barrier material which encapsulates a flavourant.
5. A flavour delivery composition according to claim 4, wherein the first flavourant particles and/or the second flavourant particles comprise two or more portions of flavourant separated by concentric barrier material layers.

6. A flavour delivery composition according to claim 4 or claim 5, wherein the first flavourant particles comprise a first barrier material and the second flavourant particles comprise a second barrier material. 5
7. A flavour delivery composition according to any one of claims 4 to 6, wherein the barrier material is selected from the group comprising: maltodextrin, corn syrup solid, modified starch, gum Arabic, modified cellulose, gelatine, cyclodextrin, lecithin, whey protein, and hydrogenated fat. 10
8. A flavour delivery composition according to any one of the preceding claims, wherein the first flavourant particles and/or the second flavourant particles comprise a carrier material which carries a flavourant. 15
9. A flavour delivery composition according to claim 8, wherein the first flavourant particles comprise a first carrier material and the second flavourant particles comprise a second carrier material. 20
10. A flavour delivery composition according to claim 8 or claim 9, wherein the carrier material comprises hydroxypropyl methylcellulose (HPMC) and/or rice starch. 25
11. A flavour delivery composition according to any one of the preceding claims, wherein the first flavourant particles and the second flavourant particles are configured to release flavourant upon contacting an aerosol vapour generated from the smoking substitute apparatus. 30
12. A flavour delivery composition according to any one of the preceding claims, wherein the flavour delivery composition is provided in liquid, gel, solid, powder or paste form. 35
13. A smoking substitute apparatus comprising: 40
- a reservoir for containing a vaporisable e-liquid;
 - an aerosol generator configured to vaporise the e-liquid to produce an aerosol vapour;
 - a cavity for containing a flavour delivery composition according to any one of claims 1 to 12; 45
 - a first flow passage for guiding said aerosol vapour from the aerosol generator to an outlet of the first flow passage;
 - wherein the outlet of the first flow passage is located at a mouthpiece of the apparatus to deliver the aerosol vapour for inhalation by a user of the smoking substitute apparatus; and 50
 - a second flow passage for guiding ambient air through the cavity and into a flow path of aerosol vapour, wherein the flow of ambient air through the second flow passage is effective to entrain flavour delivery composition from the cavity to 55

be delivered to a user with the aerosol vapour.

14. A smoking substitute apparatus according to claim 13, wherein an outlet of the second flow passage is also located at the mouthpiece of the apparatus.

15. A smoking substitute apparatus according to claim 13, wherein an outlet of the second flow passage is in a sidewall of the first flow passage.

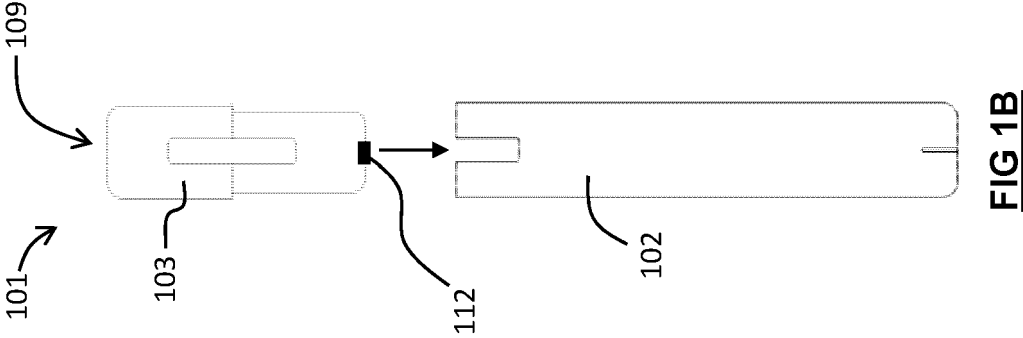


FIG 1B

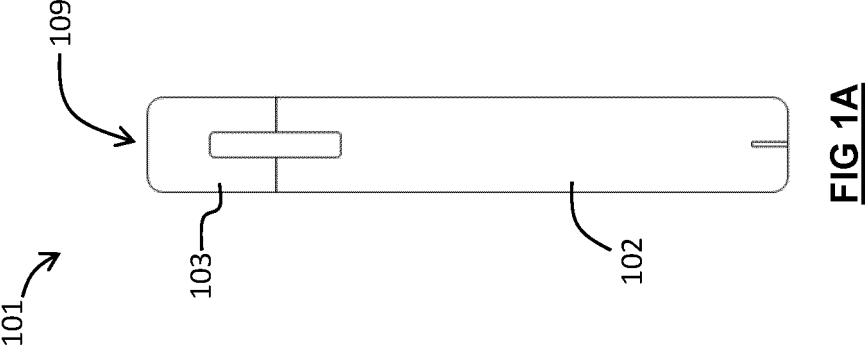
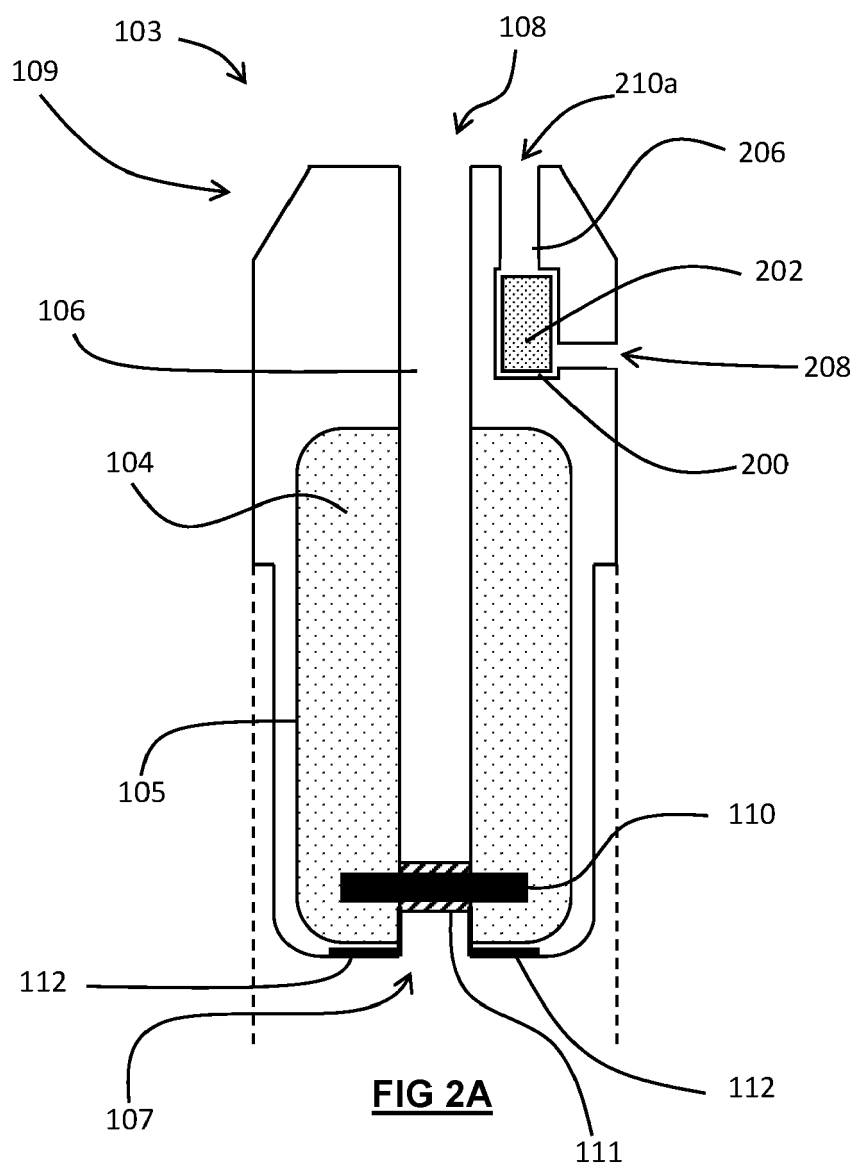
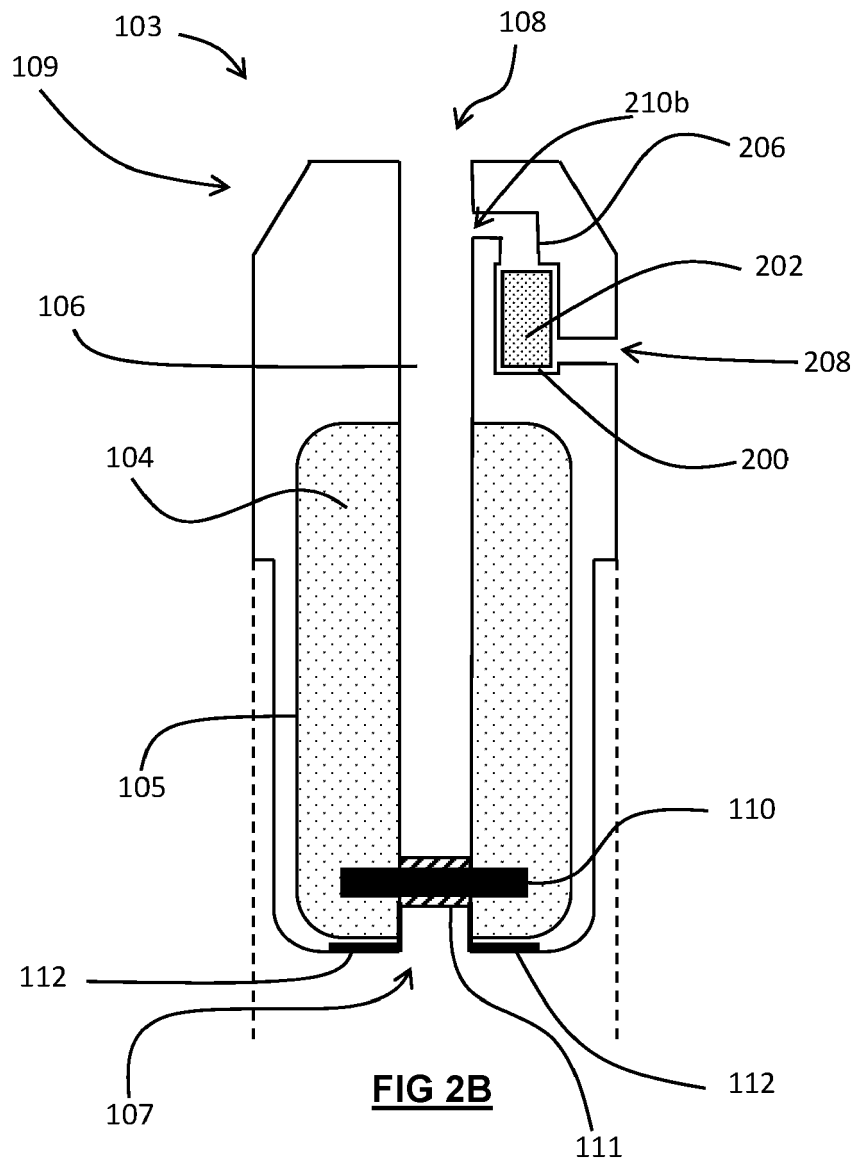


FIG 1A





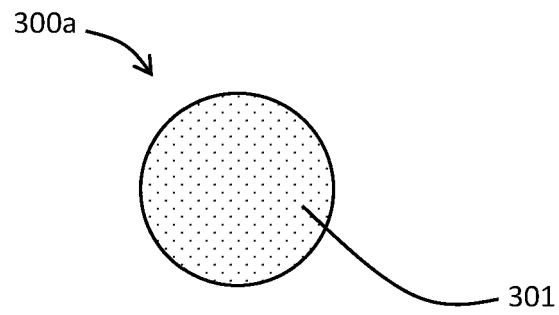


FIG 3A

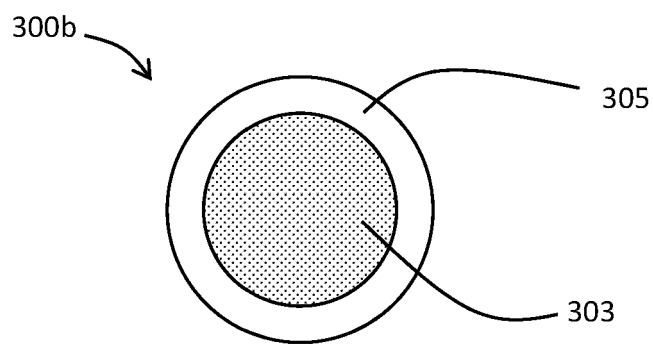


FIG 3B

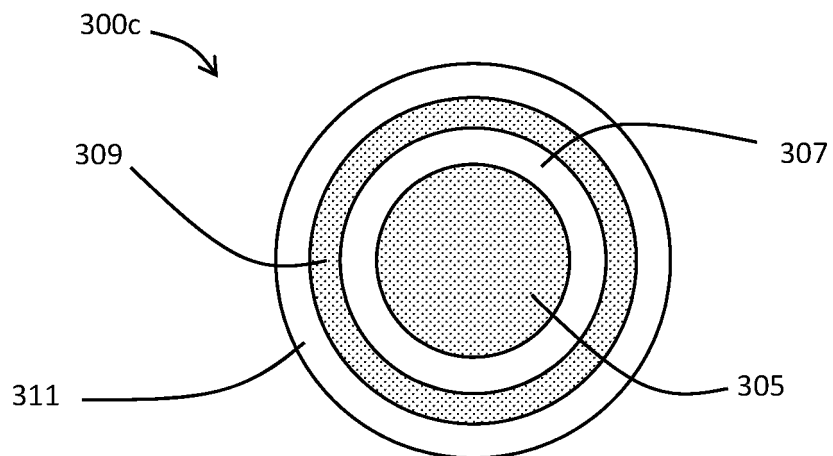


FIG 3C



EUROPEAN SEARCH REPORT

Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2019/183177 A1 (HUBBARD SAWYER [US] ET AL) 20 June 2019 (2019-06-20) * paragraph [0001] * * paragraph [0004] - paragraph [0006] * * paragraph [0028] - paragraph [0030] * * paragraph [0037] - paragraph [0040] * * paragraph [0042] * * paragraph [0052] - paragraph [0053] * * paragraph [0072] - paragraph [0073] * * figure 1 * * figure 2 * * figure 5 *	1,2,5-15	INV. A24B15/167 A24F40/20 A24F40/30 A24D3/04 A24D3/06
X	WO 2013/173469 A1 (LOEC INC [US]; TAYYARAH RANA [US] ET AL.) 21 November 2013 (2013-11-21) * figure 7 *	1-12	
A	* paragraph [0007] - paragraph [0013] * * paragraph [0059] - paragraph [0060] * * paragraph [0086] *	13-15	
X	US 2017/280769 A1 (LI SAN [US] ET AL) 5 October 2017 (2017-10-05) * paragraph [0004] - paragraph [0005] * * paragraph [0007] - paragraph [0010] * * paragraph [0019] - paragraph [0020] * * claims 4-10, 14-18, 24, 26 *	1-12	TECHNICAL FIELDS SEARCHED (IPC)
A		13-15	A24B A24F A24D
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 22 July 2020	Examiner Dimoula, Kerasina
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 20 15 7625

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 2019183177	A1	20-06-2019	AU 2018385644 A1	09-07-2020
			CA 3085805 A1	20-06-2019
			US 2019183177 A1	20-06-2019
			WO 2019116276 A1	20-06-2019

WO 2013173469	A1	21-11-2013	US 2013319429 A1	05-12-2013
			WO 2013173469 A1	21-11-2013

US 2017280769	A1	05-10-2017	CA 3014147 A1	12-10-2017
			CN 108778007 A	09-11-2018
			EP 3439492 A1	13-02-2019
			JP 2019513374 A	30-05-2019
			KR 20180124910 A	21-11-2018
			RU 2018134944 A	12-05-2020
			US 2017280769 A1	05-10-2017
			WO 2017174595 A1	12-10-2017
