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(54) **TOOL FOR A SMOKING SUBSTITUTE SYSTEM**

(57) A smoking substitute system (200) comprising an HNB device (201), an aerosol forming article (202) and a tool (250) is disclosed. The device comprises a main body (209) and a cap (210), where the cap is removably attached to the main body. The tool is adapted to disengage the cap and the main body. Further, the tool is adapted for indicating an orientation of the tool relative to the HNB device. The tool comprises a rigid member (253) and a movable member (254). The rigid member may comprise a plurality of flexible engaging arms (256). The tool further comprises an element (261) disposed in the rigid member. The element may extend from the rigid member, into a sliding path defined on the movable member. The element may indicate an orientation of the tool relative to the device. Additionally, the element facilitates in locking the movable member in a first position and a second position, relative to the rigid member.

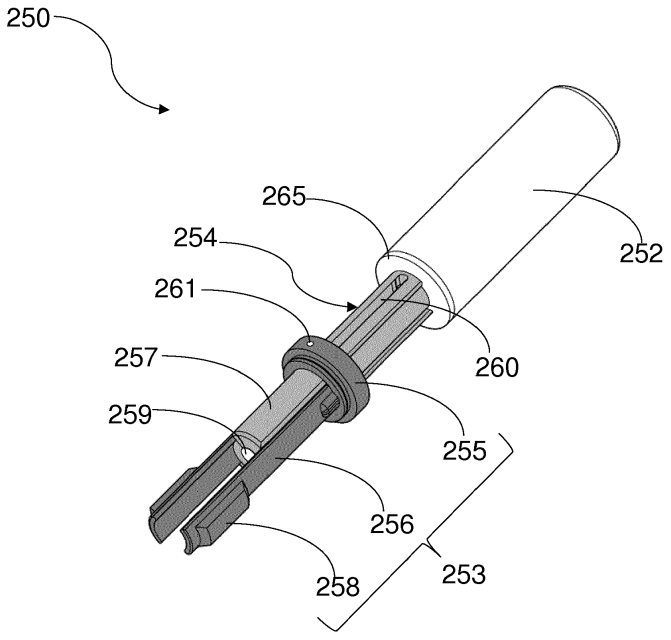

FIGURE 3B

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Description

TECHNICAL FIELD

[0001] The present invention relates to a smoking substitute system and particularly, although not exclusively, to a smoking substitute system comprising an HNB device, an aerosol-forming article and a tool.

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] Conventional combustible smoking articles, such as cigarettes, typically comprise a cylindrical rod of tobacco comprising shreds of tobacco which is surrounded by a wrapper, and usually also a cylindrical filter axially aligned in an abutting relationship with the wrapped tobacco rod. The filter typically comprises a filtration material which is circumscribed by a plug wrap. The wrapped tobacco rod and the filter are joined together by a wrapped band of tipping paper that circumscribes the entire length of the filter and an adjacent portion of the wrapped tobacco rod. A conventional cigarette of this type is used by lighting the end opposite to the filter, and burning the tobacco rod. The smoker receives mainstream smoke into their mouth by drawing on the mouth end or filter end of the cigarette.

[0004] 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 (or "substitute smoking systems") in order to avoid the smoking of tobacco.

[0005] 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.

[0006] Smoking substitute systems include electronic systems that permit a user to simulate the act of smoking by producing an aerosol (also referred to as a "vapour") that 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.

[0007] 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 with combustible tobacco products. Some smoking substitute systems use smoking substitute articles (also referred to as a "consumables") that are designed to resemble a traditional cigarette and are cylindrical in form with a mouthpiece at one end.

[0008] 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.

[0009] There are a number of different categories of smoking substitute systems, each utilising a different smoking substitute approach.

[0010] One approach for a smoking substitute system 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. The vapour may contain nicotine and/or flavourings. In the HT approach the intention is that the tobacco is heated but not burned, i.e. the tobacco does not undergo combustion.

[0011] A typical HT smoking substitute system may include a device and a consumable. The consumable may include the tobacco material. The device and consumable 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.

[0012] As the vapour passes through the consumable (entrained in the airflow) from the location of vaporisation to an outlet of the consumable (e.g. a mouthpiece), the vapour cools and condenses to form an aerosol for inhalation by the user. The aerosol will normally contain the volatile compounds.

[0013] In HT smoking substitute systems, heating as opposed to burning 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.

[0014] There may be a need for improved design of smoking substitute systems, in particular HT smoking substitute systems, to enhance the user experience and improve the function of the HT smoking substitute system.

[0015] The present disclosure has been devised in the light of the above considerations.

SUMMARY OF THE INVENTION

[0016] At its most general, the present invention relates to a tool for a smoking substitute system.

[0017] According to a first aspect of the present inven-

tion, there is provided the tool for an HNB device. The HNB device comprises a main body and a cap, where the cap is removably attached to the main body. The tool is adapted to disengage the cap and the main body. Furthermore, the tool is adapted for indicating an orientation of the tool relative to the HNB device.

[0018] By providing the tool for the HNB device, comprising a means for visually indicating an orientation of the tool, relative to the HNB device, may facilitate in precise positioning and engagement of the tool with the HNB device, and thereby facilitating easy disengaging of the cap and the main body of the HNB device.

[0019] The term "tool" is intended to refer to an implement, which may be adapted to disengage the cap and the main body of the HNB device.

[0020] Optional features will now be set out. These are applicable singly or in any combination with any aspect.

[0021] Optionally, the tool may comprise a rigid member and a movable member.

[0022] Conveniently, the tool further comprises an element disposed in the rigid member. The element may extend from the rigid member, into a sliding path defined on the movable member.

[0023] Optionally, the element may facilitate in locking the movable member in a first position and a second position, relative to the rigid member.

[0024] Advantageously, the element is adapted for visually indicating the orientation of the tool relative to the HNB device.

[0025] Conveniently, the visual indication of the orientation of the tool assists a user in locating the tool in a correct position relative to the HNB device.

[0026] Conveniently, the rigid member may comprise a plurality of flexible engaging arms, wherein the plurality of flexible engaging arms are operable between a first condition and a second condition. The operation of the flexible engaging arms to a second condition may facilitate in disengaging the cap and the body.

[0027] Advantageously, the movable member may be configured to slide coaxially within the rigid member, between a first position and a second position. This sliding movement of the movable member may facilitate in disengaging the cap and the main body.

[0028] Advantageously, the first position of the movable member, corresponds to a fully disengaged position of the tool and the second position corresponds to fully engaged position of the tool. The fully engaged position of the tool facilitates in disengaging the cap and the main body.

[0029] Conveniently, the movable member may be defined with a slot for receiving the element. The slot may facilitate in locking the movable member at the first position and the second position.

[0030] The HNB device (hereinafter referred as device) may comprise an elongate body or may also referred as "main body" or "body". An end of the body (elongated body or the main body), may be configured for engagement with an aerosol-forming article (e.g. a heated tobacco (HT) consumable). The device may comprise a cavity that is configured for selectively receipt of at least a portion of the consumable (i.e. for engagement with the consumable) and at least a portion of the tool (i.e. for engagement with the tool). The aerosol-forming article may be of the type that comprises an aerosol former (e.g. carried by an aerosol-forming substrate).

[0031] The device may comprise a heater for heating the aerosol-forming article. The heater may comprise a heating element, which may be in the form of a rod that extends from the body of the device. The heating element may extend from the end of the body that is configured for engagement with the aerosol-forming article.

[0032] The heater (and thus the heating element) may be rigidly mounted to the body. The heating element may be elongate so as to define a longitudinal axis and may, for example, have a transverse profile (i.e. transverse to a longitudinal axis of the heating element) that is substantially circular (i.e. the heating element may be generally cylindrical). Alternatively, the heating element may have a transverse profile that is rectangular (i.e. the heater may be a "blade heater"). The heating element may alternatively be in the shape of a tube (i.e. the heater may be a "tube heater"). The heating element may take other forms (e.g. the heating element may have an elliptical transverse profile). The shape and/or size (e.g. diameter) of the transverse profile of the heating element may be generally consistent for the entire length (or substantially the entire length) of the heating element.

[0033] The heating element may be between 15 mm and 25 mm long, e.g. between 18 mm and 20 mm long, e.g. around 19 mm long. The heating element may have a diameter of between 1.5 mm and 2.5 mm, e.g. a diameter between 2 mm and 2.3 mm, e.g. a diameter of around 2.15 mm.

[0034] The heating element may be formed of ceramic. The heating element may comprise a core (e.g. a ceramic core) comprising Al_2O_3. The core of the heating element may have a diameter of 1.8 mm to 2.1 mm, e.g. between 1.9 mm and 2 mm. The heating element may comprise an outer layer (e.g. an outer ceramic layer) comprising Al_2O_3. The thickness of the outer layer may be between 160 μm and 220 μm, e.g. between 170 μm and 190 μm, e.g. around 180 μm. The heating element may comprise a heating track, which may extend longitudinally along the heating element. The heating track may be sandwiched between the outer layer and the core of the heating element. The heating track may comprise tungsten and/or rhenium. The heating track may have a thickness of around 20 μm.

[0035] The heating element may be located in the cavity (of the device), and may extend (e.g. along a longitudinal axis) from an internal base of the cavity towards an opening of the cavity. The length of the heating element (i.e. along the longitudinal axis of the heater) may be less than the depth of the cavity. Hence, the heating element may extend for only a portion of the length of the cavity. That is, the heating element may not extend through (or

beyond) the opening of the cavity.

[0036] The heating element may be configured for insertion into an aerosol-forming article (e.g. a HT consumable) when an aerosol-forming article is received in the cavity. In that respect, a distal end (i.e. distal from a base of the heating element where it is mounted to the device) of the heating element may comprise a tapered portion, which may facilitate insertion of the heating element into the aerosol-forming article. The heating element may fully penetrate an aerosol-forming article when the aerosol-forming article is received in the cavity. That is, the entire length, or substantially the entire length, of the heating element may be received in the aerosol-forming article.

[0037] The heating element may have a length that is less than, or substantially the same as, an axial length of an aerosol-forming substrate forming part of an aerosol-forming article (e.g. a HT consumable). Thus, when such an aerosol-forming article is engaged with the device, the heating element may only penetrate the aerosol-forming substrate, rather than other components of the aerosol-forming article. The heating element may penetrate the aerosol-forming substrate for substantially the entire axial length of the aerosol forming-substrate of the aerosol-forming article. Thus, heat may be transferred from (e.g. an outer circumferential surface of) the heating element to the surrounding aerosol-forming substrate, when penetrated by the heating element. That is, heat may be transferred radially outwardly (in the case of a cylindrical heating element) or e.g. radially inwardly (in the case of a tube heater).

[0038] Where the heater is a tube heater, the heating element of the tube heater may surround at least a portion of the cavity. When the portion of the aerosol-forming article is received in the cavity, the heating element may surround a portion of the aerosol-forming article (i.e. so as to heat that portion of the aerosol-forming article). In particular, the heating element may surround an aerosol forming substrate of the aerosol-forming article. That is, when an aerosol-forming article is engaged with the device, the aerosol forming substrate of the aerosol-forming article may be located adjacent an inner surface of the (tubular) heating element. When the heating element is activated, heat may be transferred radially inwardly from the inner surface of the heating element to heat the aerosol forming substrate.

[0039] The cavity may comprise a (e.g. circumferential) wall (or walls) and the (tubular) heating element may extend around at least a portion of the wall(s). In this way, the wall may be located between the inner surface of the heating element and an outer surface of the aerosol-forming article. The wall (or walls) of the cavity may be formed from a thermally conductive material (e.g. a metal) to allow heat conduction from the heating element to the aerosol-forming article. Thus, heat may be conducted from the heating element, through the cavity wall (or walls), to the aerosol-forming substrate of an aerosol-forming article received in the cavity.

[0040] In some embodiments the device may comprise the cap disposed at the end of the body that is configured for engagement with an aerosol-forming article. Where the device comprises the heater having the heating element, the cap may at least partially enclose the heating element. The cap may be moveable between an open position in which access is provided to the heating element, and a closed position in which the cap at least partially encloses the heating element. The cap may be slideably engaged with the body of the device, and may be slideable between the open and closed positions.

[0041] The cap may define at least a portion of the cavity of the device. That is, the cavity may be fully defined by the cap, or each of the cap and body may define a portion of the cavity. The cap may comprise an opening to the cavity. The opening may be configured for receipt of at least a portion of an aerosol-forming article. That is, an aerosol-forming article may be inserted through the opening and into the cavity (so as to be engaged with the device).

[0042] The cap may be configured such that when an aerosol-forming article is engaged with the device (e.g. received in the cavity), only a portion of the aerosol-forming article is received in the cavity. That is, a portion of the aerosol-forming article (not received in the cavity) may protrude from (i.e. extend beyond) the opening. This (protruding) portion of the aerosol-forming article may be a terminal (e.g. mouth) end of the aerosol-forming article, which may be received in a user's mouth for the purpose of inhaling aerosol formed by the device.

[0043] In some embodiments, the smoking substitute system may be provided with the tool for disengaging the cap and the body of the device. The tool may be insertable into the cavity defined by the cap or the cap and the body of the device. The tool may be capable of operating in a first position and a second position, for disengaging the cap and the body of the device.

[0044] The tool may be configured such that, when the tool is engaged with the device (e.g. received in the cavity), only a portion of the tool is received in the cavity. Further, a portion of the tool (not received by the cavity), may protrude from (i.e. extend beyond) the opening. The protruding portion of the tool may be defined with a handle, which may be used for the purpose of gripping and operating the tool by the user, to disengage the cap and the body.

[0045] The device may comprise a power source or may be connectable to a power source (e.g. a power source separate to the device). The power source may be electrically connectable to the heater. In that respect, altering (e.g. toggling) the electrical connection of the power source to the heater may affect a state of the heater. For example, toggling the electrical connection of the power source to the heater may toggle the heater between an on state and an off state. The power source may be a power store. For example, the power source may be a battery or rechargeable battery (e.g. a lithium ion battery).

[0046] The device may comprise an input connection

(e.g. a USB port, Micro USB port, USB-C port, etc.). The input connection may be configured for connection to an external source of electrical power, such as a mains electrical supply outlet. The input connection may, in some cases, be used as a substitute for an internal power source (e.g. battery or rechargeable battery). That is, the input connection may be electrically connectable to the heater (for providing power to the heater). Hence, in some forms, the input connection may form at least part of the power source of the device.

[0047] Where the power source comprises a rechargeable power source (such as a rechargeable battery), the input connection may be used to charge and recharge the power source.

[0048] In a second aspect, there is provided a system (e.g. a smoking substitute system) comprising a device, an aerosol forming article and a tool. The device of the system, may comprise a body and a cap, where the cap may be removably attached to the body. The device may selectively receive the aerosol forming article and the tool.

[0049] The aerosol-forming article may comprise an aerosol-forming substrate at an upstream end of the aerosol-forming article. The article may be in the form of a smoking substitute article, e.g. heated tobacco (HT) consumable (also known as a heat-not-burn (HNB) consumable).

[0050] As used herein, the terms "upstream" and "downstream" are intended to refer to the flow direction of the vapour/aerosol i.e. with the downstream end of the article/consumable being the mouth end or outlet where the aerosol exits the consumable for inhalation by the user. The upstream end of the article/consumable is the opposing end to the downstream end.

[0051] The aerosol-forming article may be capable of engaging with the device (i.e. received by the cavity of the cap). The aerosol-forming substrate in the aerosol-forming article is capable of being heated to release at least one volatile compound that can form an aerosol. The aerosol-forming substrate may be located at the upstream end of the article/consumable.

[0052] The system mainly includes a device which may include the main body and the cap, where the cap may be removably attached to the body. Further, the system may include a tool, as provided in the first aspect, which may be adapted for disengaging the cap and the main body. The tool may include a rigid member, which may comprise a plurality of flexible engaging arms, which may be operable between a first condition and a second condition. Further, the tool may also include a movable member, which may be coaxial with the rigid member. The movable member may be operable between a first position and a second position that may translate the plurality of flexible engaging arms between the first condition and the second condition.

[0053] Optionally, each of the at least one flexure bearing may include a hook, adaptable to engage in a slit defined in the cap, to retain the cap in the main body. Further, the at least one flexure bearing may be moved from a locked position where the at least one flexure bearing may be engaged with the cap to an unlocked position where the hook of the at least one flexure bearing may be moved out of a slit defined in the cavity of the cap to disengage the cap and the main body. The hook of the at least one flexure bearing may be displaced outwardly from the slit by the movable member to disengage the cap and the main body. This way, the cap may be disengaged from the body by engaging the tool. The hook of the at least one flexure bearing may generally be referred to as a locking element that engages and disengages with the cap, when using the tool for the HNB device describes herein.

[0054] The tool of the system, may be capable of engaging with the device (i.e. received by the cavity of the cap), upon dislodging the aerosol-forming article, to disengage the cap and the body of the device. The tool may comprise a rigid member a movable member. The rigid member may comprise a collar and a plurality of flexible arms, extending from the collar. The movable member may be configured to slide co-axially within the rigid member in a first position and a second position, to facilitate disengaging of the cap and the body.

[0055] The tool may further comprise anindicator element disposed in rigid member. The indicator element may facilitate visual indication of orientation of the tool relative to the device. Further, the indicator element may also facilitate in locking the movable member in the first position and the second position, relative to the rigid member.

[0056] In order to generate an aerosol, the aerosol-forming substrate comprises at least one volatile compound that is intended to be vaporised/aerosolised and that may provide the user with a recreational and/or medicinal effect when inhaled. Suitable chemical and/or physiologically active volatile compounds include the group consisting of: nicotine, cocaine, caffeine, opiates and opoids, cathine and cathinone, kavalactones, mysticin, beta-carboline alkaloids, salvinorin A together with any combinations, functional equivalents to, and/or synthetic alternatives of the foregoing.

[0057] The aerosol-forming substrate may comprise plant material. The plant material may comprise least one plant material selected from the list including *Amaranthus dubius, Arctostaphylos uva-ursi* (Bearberry), *Argemone mexicana, Amica, Artemisia vulgaris,* Yellow Tees, *Galea zacatechichi, Canavalia maritima* (Baybean), *Cecropia mexicana* (Guamura), *Cestrum noctumum, Cynoglossum virginianum* (wild comfrey), *Cytisus scoparius, Damiana, Entada rheedii, Eschscholzia califomica* (California Poppy), *Fittonia albivenis, Hippobroma longiflora, Humulus japonica* (Japanese Hops), *Humulus lupulus* (Hops), *Lactuca virosa* (Lettuce Opium), *Laggera alata, Leonotis leonurus, Leonurus cardiaca* (Motherwort), *Leonurus sibiricus* (Honeyweed), *Lobelia cardinalis, Lobelia inflata* (Indian-tobacco), *Lobelia siphilitica, Nepeta cataria* (Catnip), *Nicotiana species* (Tobacco),

Nymphaea alba (White Lily), *Nymphaea caerulea* (Blue Lily), Opium poppy, *Passiflora incamata* (Passionflower), *Pedicularis densiflora* (Indian Warrior), *Pedicularis groenlandica* (Elephant's Head), *Salvia divinorum, Salvia dorrii* (Tobacco Sage), Salvia species (Sage), *Scutellaria galericulata, Scutellaria lateriflora, Scutellaria nana, Scutellaria* species (Skullcap), *Sida acuta* (Wireweed), *Sida rhombifolia, Silene capensis, Syzygium aromaticum* (Clove), *Tagetes lucida* (Mexican Tarragon), *Tarchonanthus camphoratus, Tumera diffusa* (Damiana), *Verbascum* (Mullein), *Zamia latifolia* (Maconha Brava) together with any combinations, functional equivalents to, and/or synthetic alternatives of the foregoing.

[0058] The plant material may be tobacco. Any type of tobacco may be used. This includes, but is not limited to, flue-cured tobacco, burley tobacco, Maryland Tobacco, dark-air cured tobacco, oriental tobacco, dark-fired tobacco, perique tobacco and rustica tobacco. This also includes blends of the above mentioned tobaccos.

[0059] The tobacco may comprise one or more of leaf tobacco, stem tobacco, tobacco powder, tobacco dust, tobacco derivatives, expanded tobacco, homogenised tobacco, shredded tobacco, extruded tobacco, cut rag tobacco and/or reconstituted tobacco (e.g. slurry recon or paper recon).

[0060] The aerosol-forming substrate may comprise a gathered sheet of homogenised (e.g. paper/slurry recon) tobacco or gathered shreds/strips formed from such a sheet.

[0061] The aerosol-forming substrate may comprise one or more additives selected from humectants, flavourants, fillers, aqueous/non-aqueous solvents and binders.

[0062] The flavourant may be provided in solid or liquid form. It 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 throughout the aerosol-forming substrate or may be provided in isolated locations and/or varying concentrations throughout the aerosol-forming substrate.

[0063] The aerosol-forming substrate may be formed in a substantially cylindrical shape such that the article/consumable resembles a conventional cigarette. It may have a diameter of between 5 and 10mm e.g. between 6 and 9mm or 6 and 8mm e.g. around 7 mm. It may have an axial length of between 10 and 15mm e.g. between 11 and 14mm such as around 12 or 13mm.

[0064] The article/consumable may comprise at least one filter element. There may be a terminal filter element at the downstream/mouth end of the article/consumable.

[0065] The or at least one of the filter element(s) (e.g. the terminal filter element) may be comprised of cellulose acetate or polypropylene tow. The at least one filter element (e.g. the terminal filter element) may be comprised of activated charcoal. The at least one filter element (e.g. the terminal element) may be comprised of paper. The or each filter element may be at least partly (e.g. entirely) circumscribed with a plug wrap e.g. a paper plug wrap.

[0066] The terminal filter element (at the downstream end of the article/consumable) may be joined to the upstream elements forming the article/consumable by a circumscribing tipping layer e.g. a tipping paper layer. The tipping paper may have an axial length longer than the axial length of the terminal filter element such that the tipping paper completely circumscribes the terminal filter element plus the wrapping layer surrounding any adjacent upstream element.

[0067] In some embodiments, the article/consumable may comprise an aerosol-cooling element which is adapted to cool the aerosol generated from the aerosol-forming substrate (by heat exchange) before being inhaled by the user.

[0068] The article/consumable may comprise a spacer element that defines a space or cavity between the aerosol-forming substrate and the downstream end of the consumable. The spacer element may comprise a cardboard tube. The spacer element may be circumscribed by the (paper) wrapping layer.

[0069] According to a third aspect of the present invention, there is provided an HNB device, which may be capable of being operated by a tool. The device comprises a body and a cap, where the cap is removably attached to the body.

[0070] Conveniently, the cap and the body of the device are disengaged by the tool.

[0071] The invention includes the combination of the aspects and preferred features described except where such a combination is clearly impermissible or expressly avoided.

[0072] The skilled person will appreciate that except where mutually exclusive, a feature or parameter described in relation to any one of the above aspects may be applied to any other aspect. Furthermore, except where mutually exclusive, any feature or parameter described herein may be applied to any aspect and/or combined with any other feature or parameter described herein.

SUMMARY OF THE FIGURES

[0073] So that the invention may be understood, and so that further aspects and features thereof may be appreciated, embodiments illustrating the principles of the invention will now be discussed in further detail with reference to the accompanying figures, in which:

Figure 1A is a schematic of a smoking substitute system;

Figure 1B is a schematic of a variation of the smoking substitute system of Figure 1A;

Figure 2A is a front view of a first embodiment of a smoking substitute system with the consumable engaged with the device;

Figure 2B is a front view of the first embodiment of the smoking substitute system with the consumable disengaged from the device;

Figure 2C is a section view of the consumable of the first embodiment of the smoking substitute system;

Figure 2D is a detailed view of an end of the device of the first embodiment of the smoking substitute system;

Figure 2E is a section view of the first embodiment of the substitute smoking system;

Figure 2F is a sectional view of the cap and a portion of the body of the device, of the first embodiment of the smoking substitute system;

Figure 2G is a sectional view of the cap and a portion of the body of the device of Figure 2F, with the cap in a partially disengaged position;

Figure 3A is a perspective view of tool of the smoking substitute system with enclosures.

Figure 3B is a detailed view of the tool of the substitute smoking system without one of the enclosure.

Figure 4 is a front view of the cap and the body of the device, with a portion of the tool inserted into the cap.

Figure 5A is a front view of the cap and the body of the device, with the tool inserted into the cap.

Figure 5B is a sectional view of portion of Figure 5A.

Figure 6A is a front view of the cap with tool in operating condition to disengage the cap and the body of the device.

Figure 6B is a sectional view of a portion of Figure 6A,

Figure 7A is a perspective view of the cap 210 being disengaged from the body of the device, along with the tool 250, and

Figure 7B is an exploded perspective view of the device and the cap 210.

DETAILED DESCRIPTION OF THE INVENTION

[0074] Aspects and embodiments of the present invention will now be discussed with reference to the accompanying figures. Further aspects and embodiments will be apparent to those skilled in the art. All documents mentioned in this text are incorporated herein by reference.

[0075] Figure 1A is a schematic providing a general overview of a smoking substitute system 100. The system 100 includes a device 101, an aerosol-forming article insertable to the device 101, and a tool 150, for disengaging components of the device 101. The aerosol-forming article is in the form of a consumable 102, which comprises an aerosol former 103. The system 100 is configured to vaporise the aerosol former by heating the aerosol former 103 (so as to form a vapour/aerosol for inhalation by a user).

[0076] In the illustrated system, the heater 104 forms part of the consumable 102 and is configured to heat the aerosol former 103. Heat from the heater 104 vaporises the aerosol former 103 to produce a vapour. The vapour subsequently condenses to form an aerosol, which is ultimately inhaled by the user.

[0077] The system 100 further comprises a power source 105 that forms part of the device 101. In other embodiments the power source 105 may be external to (but connectable to) the device 101. The power source 105 is electrically connectable to the heater 104 such that it is able to supply power to the heater 104 (i.e. for the purpose of heating the aerosol former 103). Thus, control of the electrical connection of the power source 105 to the heater 104 provides control of the state of the heater 104. The power source 105 may be a power store, for example a battery or rechargeable battery (e.g. a lithium ion battery).

[0078] The system 100 further comprises an I/O module comprising a connector 106 (e.g. in the form of a USB port, Micro USB port, USB-C port, etc.). The connector 106 is configured for connection to an external source of electrical power, e.g. a mains electrical supply outlet. The connector 106 may be used in substitution for the power source 105. That is the connector 106 may be electrically connectable to the heater 104 so as to supply electricity to the heater 104. In such embodiments, the device may not include a power source, and the power source of the system may instead comprise the connector 106 and an external source of electrical power (to which the connector 106 provides electrical connection).

[0079] In some embodiments, the connector 106 may be used to charge and recharge the power source 105 where the power source 104 includes a rechargeable battery.

[0080] The system 100 also comprises a user interface (UI) 107. Although not shown, the UI 107 may include input means to receive commands from a user. The input means of the UI 107 allows the user to control at least one aspect of the operation of the system 100. The input means may, for example, be in the form of a button, touchscreen, switch, microphone, etc.

[0081] The UI 107 also comprises output means to convey information to the user. The output means may, for example, comprise lights (e.g. LEDs), a display screen, speaker, vibration generator, etc.

[0082] The system 100 further comprises a controller 108 that is configured to control at least one function of

the device 101. In the illustrated embodiment, the controller 108 is a component of the device 101, but in other embodiments may be separate from (but connectable to) the device 101. The controller 108 is configured to control the operation of the heater 104 and, for example, may be configured to control the voltage applied from the power source 105 to the heater 104. The controller 108 may be configured to toggle the supply of power to the heater 105 between an on state, in which the full output voltage of the power source 105 is applied to the heater 104, and an off state, in which the no voltage is applied to the heater 104.

[0083] Although not shown, the system 100 may also comprise a voltage regulator to regulate the output voltage from the power source 105 to form a regulated voltage. The regulated voltage may then be applied to the heater 104.

[0084] In addition to being connected to the heater 104, the controller 108 is operatively connected to the UI 107. Thus, the controller 108 may receive an input signal from the input means of the UI 107. Similarly, the controller 108 may transmit output signals to the UI 107. In response, the output means of the UI 107 may convey information, based on the output signals, to a user.

[0085] Figure 1B is a schematic showing a variation of the system 100 of Figure 1A. In the system 100' of Figure 1B, the heater 104 forms part of the consumable 102, rather than the device 101. In this variation, the heater 104 is electrically connectable to the power source 105, for example, when the consumable 102 is engaged with the device 101.

[0086] Figures 2A and 2B illustrate a heated-tobacco (HT) smoking substitute system 200. The system 200 is an example of the systems 100, 100' described in relation to Figures 1A or 1B. System 200 includes the HNB device 201, consumable 202 and the tool 250 (as seen in figure 4). The description of Figures 1A and 1B above is applicable to the system 200 of Figures 2A and 2B, and will thus not be repeated.

[0087] The device 201, the consumable 202 and the tool 250 are configured such that the consumable 202 and the tool 250 may be selectively engaged with the device 201. Figure 2A shows the device 201 and the consumable 202 in an engaged state, whilst Figure 2B shows the device 201 and the consumable 202 in a disengaged state.

[0088] The device 201 comprises the body 209 and the cap 210. In use the cap 210 is removably engaged at an end of the body 209. From the sequence of Figures 2F and 2G, it may be noted that the cap 210 is moveable relative to the body 209. In particular, the cap 210 is slideable and can slide along a longitudinal axis of the body 209.

[0089] Referring back to Figure. 2B, the device 201 comprises an output means (forming part of the UI of the device 201) in the form of a plurality of light-emitting diodes (LEDs) 211 arranged linearly along the longitudinal axis of the device 201 and on an outer surface of the body 209 of the device 201. A button 212 is also arranged on an outer surface of the body 209 of the device 201 and is axially spaced (i.e. along the longitudinal axis) from the plurality of LEDs 211.

[0090] Figure 2C show a detailed section view of the consumable of 202 of the system 200. The consumable 202 generally resembles a cigarette. In that respect, the consumable 202 has a generally cylindrical form with a diameter of 7 mm and an axial length of 70 mm. The consumable 202 comprises an aerosol forming substrate 213, a terminal filter element 214, an upstream filter element 215 and a spacer element 216. In other embodiments, the consumable 202 may further comprise a cooling element. A cooling element may exchange heat with vapour that is formed by the aerosol-forming substrate 213 in order to cool the vapour so as to facilitate condensation of the vapour.

[0091] The aerosol-forming substrate 213 is substantially cylindrical and is located at an upstream end 217 of the consumable 202, and comprises the aerosol former of the system 200. In that respect, the aerosol forming substrate 213 is configured to be heated by the device 201 to release a vapour. The released vapour is subsequently entrained in an airflow flowing through the aerosol-forming substrate 213. The airflow is produced by the action of the user drawing on a downstream 218 (i.e. terminal or mouth end) of the consumable 202.

[0092] In the present embodiment, the aerosol forming substrate 213 comprises tobacco material that may, for example, include any suitable parts of the tobacco plant (e.g. leaves, stems, roots, bark, seeds and flowers). The tobacco may comprise one or more of leaf tobacco, stem tobacco, tobacco powder, tobacco dust, tobacco derivatives, expanded tobacco, homogenised tobacco, shredded tobacco, extruded tobacco, cut rag tobacco and/or reconstituted tobacco (e.g. slurry recon or paper recon). For example, the aerosol-forming substrate 213 may comprise a gathered sheet of homogenised (e.g. paper/slurry recon) tobacco or gathered shreds/strips formed from such a sheet.

[0093] In order to generate an aerosol, the aerosol forming substrate 213 comprises at least one volatile compound that is intended to be vaporised/aerosolised and that may provide the user with a recreational and/or medicinal effect when inhaled. The aerosol-forming substrate 213 may further comprise one or more additives. For example, such additives may be in the form of humectants (e.g. propylene glycol and/or vegetable glycerine), flavourants, fillers, aqueous/non-aqueous solvents and/or binders.

[0094] The terminal filter element 214 is also substantially cylindrical, and is located downstream of the aerosol forming substrate 213 at the downstream end 218 of the consumable 202. The terminal filter element 214 is in the form of a hollow bore filter element having a bore 219 (e.g. for airflow) formed therethrough. The diameter of the bore 219 is 2 mm. The terminal filter element 214 is formed of a porous (e.g. monoacetate) filter material. As

set forth above, the downstream end 218 of the consumable 202 (i.e. where the terminal filter 214 is located) forms a mouthpiece portion of the consumable 202 upon which the user draws. Airflow is drawn from the upstream end 217, thorough the components of the consumable 202, and out of the downstream end 218. The airflow is driven by the user drawing on the downstream end 218 (i.e. the mouthpiece portion) of the consumable 202.

[0095] The upstream filter element 215 is located axially adjacent to the aerosol-forming substrate 213, between the aerosol-forming substrate 213 and the terminal filter element 214. Like the terminal filter 214, the upstream filter element 215 is in the form of a hollow bore filter element, such that it has a bore 220 extending axially therethrough. In this way, the upstream filter 215 may act as an airflow restrictor. The upstream filter element 215 is formed of a porous (e.g. monoacetate) filter material. The bore 220 of the upstream filter element 214 has a larger diameter (3 mm) than the terminal filter element 214.

[0096] The spacer 216 is in the form of a cardboard tube, which defines a cavity or chamber between the upstream filter element 215 and the terminal filter element 214. The spacer 216 acts to allow both cooling and mixing of the vapour/aerosol from the aerosol-forming substrate 213. The spacer has an external diameter of 7 mm and an axial length of 14mm.

[0097] Although not apparent from the figure, the aerosol-forming substrate 213, upstream filter 215 and spacer 216 are circumscribed by a paper wrapping layer. The terminal filter 214 is circumscribed by a tipping layer that also circumscribes a portion of the paper wrapping layer (so as to connect the terminal filter 214 to the remaining components of the consumable 202). The upstream filter 215 and terminal filter 214 are circumscribed by further wrapping layers in the form of plug wraps.

[0098] Returning now to the device 201, Figure 2D illustrates a detailed view of the end of the device 201 that is configured to engage with the consumable 202. The cap 210 of the device 201 includes an opening 221 to an internal cavity 222 (more apparent from Figure 2D) defined by the cap 210. The opening 221 and the cavity 222 are formed so as to selectively receive at least a portion of the consumable 202 and at least a portion of the tool 250. During engagement of the consumable 202 with the device 201, a portion of the consumable 202 is received through the opening 221 and into the cavity 222. After engagement (see Figure 2B), the downstream end 218 of the consumable 202 protrudes from the opening 221 and thus protrudes also from the device 201. The opening 221 includes laterally disposed notches 226. When a consumable 202 is received in the opening 221, these notches 226 remain open and could, for example, be used for retaining a cover to cover the end of the device 201.

[0099] Figure 2E shows a cross section through a central longitudinal plane through the device 201. The device 201 is shown with the consumable 202 engaged therewith.

[0100] The device 201 comprises a heater 204 comprising heating element 223. The heater 204 forms part of the body 209 of the device 201 and is rigidly mounted to the body 209. In the illustrated embodiment, the heater 204 is a rod heater with a heating element 223 having a circular transverse profile. In other embodiments the heater may be in the form of a blade heater (e.g. heating element with a rectangular transverse profile) or a tube heater (e.g. heating element with a tubular form).

[0101] The heating element 223 of the heater 204 projects from an internal base of the cavity 222 along a longitudinal axis towards the opening 221. As is apparent from the figure, the length (i.e. along the longitudinal axis) of the heating element 223 is less than a depth of the cavity 222. In this way, the heating element 223 does not protrude from or extend beyond the opening 221.

[0102] When the consumable 202 is received in the cavity 222 (as is shown in Figure 2E), the heating element 223 penetrates the aerosol-forming substrate 213 of the consumable 202. In particular, the heating element 223 extends for nearly the entire axial length of the aerosol-forming substrate 213 when inserted therein. Thus, when the heater 204 is activated, heat is transferred radially from an outer circumferential surface the heating element 223 to the aerosol-forming substrate 213.

[0103] The device 201 further comprises an electronics cavity 224. A power source, in the form of a rechargeable battery 205 (a lithium ion battery), is located in electronics cavity 224.

[0104] The device 201 includes a connector (i.e. forming part of an IO module of the device 201) in the form of a USB port 206. The connector may alternatively be, for example, a micro-USB port or a USB-C port for examples. The USB port 206 may be used to recharge the rechargeable battery 205.

[0105] The device 201 includes a controller (not shown) located in the electronics cavity 224. The controller comprises a microcontroller mounted on a printed circuit board (PCB). The USB port 206 is also connected to the controller 208 (i.e. connected to the PCB and microcontroller).

[0106] The controller 208 is configured to control at least one function of the device 201. For example, the controller 208 is configured to control the operation of the heater 204. Such control of the operation of the heater 204 may be accomplished by the controller toggling the electrical connection of the rechargeable battery 205 to the heater 204. For example, the controller 208 is configured to control the heater 204 in response to a user depressing the button 212. Depressing the button 212 may cause the controller to allow a voltage (from the rechargeable battery 205) to be applied to the heater 204 (so as to cause the heating element 223 to be heated).

[0107] The controller is also configured to control the LEDs 211 in response to (e.g. a detected) a condition of the device 201 or the consumable 202. For example, the controller may control the LEDs to indicate whether the

device 201 is in an on state or an off state (e.g. one or more of the LEDs may be illuminated by the controller when the device 201 is in an on state).

[0108] The device 201 comprises a further input means (i.e. in addition to the button 212) in the form of a puff sensor 225. The puff sensor 225 is configured to detect a user drawing (i.e. inhaling) at the downstream end 218 of the consumable 202. The puff sensor 225 may, for example, be in the form of a pressure sensor, flowmeter or a microphone. The puff sensor 225 is operatively connected to the controller 208 in the electronics cavity 224, such that a signal from the puff sensor 225, indicative of a puff state (i.e. drawing or not drawing), forms an input to the controller 208 (and can thus be responded to by the controller 208).

[0109] Turning now to Figures 2F and 2G, which show cross section through a central longitudinal plane of the device 201, without the consumable 202 engaged with the device 201 (unlike Figure 2E). Further, Figure 2F shows that the cap 210, engaged to the body 209, whilst Figure 2G shows the cap 210 partially disengaged from the body 209 (e.g. can be slidable along a longitudinal axis of the body 209, with a portion of the cap 210 still engaged with the body 209.

[0110] The body 209 of the device 201 includes a plurality of guideways 228, 229. A plurality of first guideways 228 may be defined on an inner circumference of the body 209, at interface of the body 209 and the cap 210. The plurality of first guideways 228 are configured to receive the cap 201 and allow downward movement of the cap 210, so as to accommodate the cap 210 or a portion of the cap 210 in the body 209. Further, a plurality of second guideways 229 are also defined in the body 209, about the heating element 223. The plurality of second guideways 229 are configured to receive the cap 210 such that the cavity 222 defined by the cap 210 is circumscribed by the plurality of second guideways 229, during engagement of the cap 210 with the body 209. The cavity 222 of the cap 210 can be configured to traverse on the plurality of second guideways 229 to circumscribe the heating element 223, upon engagement of the cap 210 with the body 209.

[0111] In an illustrating embodiment, the cavity 222 or a portion of the cavity 222 may be defined with a through opening or slit 230 (e.g. a portion of wall defining the cavity 222 is provided with a through opening).). The slit 230 of the cavity 222 can be configured to circumscribe or partially circumscribe the heating element 223, upon engagement of the cap 210 with the body 209. The cavity 222 may further include the rigid base region 231, defined downstream of the slit 230. The rigid base region 231 may be configured to seat around a portion of the heating element 223, which is extending from the body 209 of the device 201.

[0112] The body 209 may further comprise at least one flexure bearing 232, in particular, at least one flexible hinge. In an illustrative embodiment, the device 201 may include at least two flexure bearings 232 (as e.g. two flexure bearings facing each other are shown in Figure 2F and 2G). The at least one living hinge 232 may be located proximal to the heating element 223, and may be defined downstream of the plurality of second guideways 229 defined in the body 209. The at least one flexure bearing 232 may be configured to extend along the length of the heating element 223. The at least one flexure bearing 232 may be adapted to engage with an external surface of a walls of cavity 222, when the cap 210 is received by the body 209.

[0113] As apparent from Figure 2F, each of the at least one flexure bearing 232 is fixedly connected to the body 209 of the device 201, and include a locking element or hook 268 at a distal end. The hook 268 may extend laterally from the end of each of the at least one flexure bearing 232, and may be defined in a wedge shape. The hook 268 of the at least one flexure bearing 232 is configured to ride along the cavity of the cap (that is, on the walls defining the cavity of the cap 210), until the hook 268 engages with the slit 230 defined on the at least one side of the cavity of the cap 210. Portion of the cavity 222 defining the slit 230 may be adapted to accommodate (or receive) the hook 268 of the at least one flexure bearing 232, upon engagement of the cap and the body. The hook 268 of the at least one flexure bearing 232 is adapted to be displaceable (that is, e.g. an inward and outward movement with regard to e.g. the heater element 223) in the slit 230 of the cavity 222, with respect to the heating element 223 of the heater 204. In this way, the consumable 202 when inserted into the cavity 222 of the cap 210 may be held in engagement with the heater element 223. The locking elements may in particularly not protrude into the cavity, so to not provide any obstacle for a consumable.

[0114] During lifting of the cap 210 (e.g. upward movement of the cap 210 or application of pull force on the cap 210 along a longitudinal axis of the device 201) for disengaging the cap 210 from the body 209, the hook 268 of the at least one flexure bearing 232 is configured to restrain disengagement (i.e. stopping further movement of the cap 210 in a longitudinal direction) of the cap 210, as apparent from Figure 2G. The hook 268 is configured to engage with the rigid base region 231 of the cavity 222 defined in the cap 210. Thus, the cap 210 may be partially disengaged (that is, the cap 210 can still be engaged with the body, but shifted or lifted) from the body 209, in response to operation of the at least one flexure bearing 232 in the body 209, during lifting of the cap 210. That is, the cap 210 may be allowed to be lifted to a height (e.g. distance along the longitudinal axis of the device 201) defined by the length of the at least one flexure bearing 232 and position of the hook 268 on the at least one flexure bearing 232 in the body 209. However, the cap 210 is restrained from completely disengaging (e.g. being removed or dislodged) from the body 209 of the device 201. The height and thickness of the rigid base region 231 of the cavity 222 may be considered as a restricting factor for disengagement of the cap 210 and

the body 209. In respect to this, a portion of the heating element 223 or the heater 204 may be exposed, upon lifting (or shifting) the cap 210 with respect to the body 209. In order for complete access (e.g. exposure) to the heater 204 or the heating element 223 in the device 201, there may be a requirement of disengagement (that is, dislodgement or removal) of the cap 210 completely from the body 209.

[0115] Turning now to the tool 250, as illustrated in Figure 3A, for disengaging the cap 210 and the body 209 of the device 201. The tool 250, is same as the tool 150 defined in the first embodiment of the system 100, as in Figure 1A. The tool 250 comprises a first enclosure 251 and a second enclosure 252, enclosing the tool 250. More apparent from Figure 3B, the first enclosure 251 is operated to access the tool 250 for disengaging the cap 210 and the body 209 of the device 201, while the second enclosure 252 is held as a grip portion (e.g. for gripping with fingers of the user) for the user to operate the tool 250. The second enclosure 252 can also be configured to be accessible for encompassing components for functions such as, cleaning the device 201, storage compartment, a spray unit (e.g. dispensing mouth refresher) and the like. The tool 250, at the first enclosure 251, is configured to encompass a rigid member 253 and a movable member 254. Each of the rigid member 253 and the movable member 254 are configured to extend in a direction opposite to the second enclosure 252 (e.g. along the longitudinal axis of the tool 250 and in a direction to be accommodated within the first enclosure 251).

[0116] The rigid member 253 includes a plurality of flexible engaging arms 256. In an illustrative embodiment, the rigid member 253 is defined with a collar 255, where the plurality of flexible engaging arms 256 is adapted to extend from the collar 255. Further, the movable member 254 and the rigid member 253 are co-axial such that, the movable member 254 or a portion of the movable member 254 is radially housed (e.g. about the perimeter) by the collar 255. The collar 255 may be configured to separate the first enclosure 251 from the second enclosure 252. On the other hand, the movable member 254 is fixed (e.g. fastened, adhesive bonded, snap fitted, and the like) to a base element 265 of the second enclosure 252. The collar 255 and the movable member 254 can be relatively moved with respect to each other (e.g. the movable member 254 can move with respect to position of the collar 255, or vice versa).

[0117] In the illustrating embodiment, the movable member 254 comprises a plunger 257 (e.g. the plunger 257 having profile such as cylindrical, cuboidal, rod-like, etc.). An end portion of the plunger 257 is fixed to the second enclosure 252 and is configured to extend along the longitudinal axis from the second enclosure 252. The movable member 254 is co-axially slidable within the collar 255 of the rigid member 253, between a first position and a second position. The first position corresponds to a fully disengaged position of the tool 250 (e.g. the collar 255 being distal from the second enclosure 252) and the second position corresponds to a fully engaged position of the tool (e.g. the collar 255 being proximal to the second enclosure 252). The movable member 254 can be linearly retracted to the first position and slid forward to the second position relative to position of the collar 255 by selective operation of the second enclosure 252 by the user.

[0118] As apparent in figure 3B, the plunger 257 of the movable member 254 is configured with a sliding path 260 (e.g. a groove inscribed on an outer circumference of the plunger 257). The sliding path 260 may be defined with one or more slots 262 (as seen in figure 5A), preferably at distal ends of the sliding path 260.

[0119] The rigid member 253 is configured to accommodate a element 261 (e.g. the element may be a pin having a profile such as cylindrical, rod like, etc.). The element 261 may extend from the collar 255 of the rigid member 253 into a sliding path 260 coaxially defined on the plunger 257 of the movable member 254 along the longitudinal axis. The element 261 may facilitate in visually indicating an orientation of the tool 250, relative to the device 201. This visual indication, may facilitate in precise positioning/engaging of the tool 250 with the device 201. The element 261 may be guided within the sliding path 260 and may be configured to occupy the one or more slots 262 in the sliding path 260, to lock the movable member 254 selectively in the first position and the second position. The element 261 may be optionally provided with a resilient member (not shown), to enable the element 261 to effectively occupy the one or more slots 262 defined in the sliding path 260.

[0120] The plurality of flexible engaging arms 256 may be configured to relatively extend with respect to an axial axis of the collar 255, and in-turn to that of the tool 250. The plurality of flexible engaging arms 256 may extend either substantially straight (that is, parallelly or axially extended) from the collar 255, or can be angularly extended with respect to the axial axis of the collar 255. As apparent from Figure 3B, each of the plurality of flexible engaging arms 256 are angularly extended with respect to the axial axis of the tool 250 and are configured to incline towards the axial axis of the tool 250 (e.g. bend inwards or towards centre). The plurality of flexible engaging arms 256 is operable from a first condition (e.g. at angularly inclined towards the axial axis of the tool 250) to a second condition (e.g. at axially extended to be parallel to the axial axis of the tool 250).

[0121] The tool 250 is insertable into the cap 210 of the device 201, as apparent from Figure 4. The insertion of the tool 250 may be performed through the opening 221 (as apparent in Figure 2D) defined in the cap 210. The tool 250 can be insertable into the cap 210 upon removal (e.g. dislodging, ejecting, disposing and the like) of the consumable 202 or a portion of the consumable 202 that may be residing in the cavity 222 of the cap 210. In the illustration of Figure 4, the tool 250 is positioned such that, the plurality of flexible engaging arms 256 are configured to engage with the opening 221 in the cap

210 (e.g. in a position where the second enclosure 252 of the tool 250 is gripped by the user and coaxially positioned with the opening 221 defined in the cap 210). The plurality of flexible engaging arms 256 can slide into the cavity 222 through the opening 221 in the cap 210.

[0122] During engagement of the tool 250 with the device 201, the element 261 disposed in the rigid member 253, facilitates the user to visualize the orientation of the tool 250 relative to the device 201. The position of the element 261 in the tool 250, determines the orientation of the tool 250 for precisely securing the flexible arms 256 of the tool 250 within the cavity 222 of the cap 210, to disengage the cap 210 and the body 209. For the instance, the position of the element 261 aligning with a front face or a back face of the device 201, corresponds to correct orientation of the tool 250 relative to the device 201, which may facilitate in precisely securing the flexible engaging arms 256 (thus, the tool 250) with the cavity 222 of the cap 210. At this instance, the movable member 254 is drawn to the first position from the second position (i.e. if the movable member 254 is at the second position). During displacement of the movable member 254 to the first position (that is, away from the cap 210), the element 261 disengages from the slot 262 corresponding to the second position, and traverses within the slidable path of the movable member 254. Then, the element 261 may engage with the slot 262 corresponding to the first position and hence, locks the movable member 254 in the first position, so that, the plurality of flexible engaging arms 256 are introduced into the cavity 222 in the first condition.

[0123] The plurality of flexible engaging arms 256 are configured to slide inside the cavity 222, through the opening 221 in the cap 210, until a collar 255 abuts a top surface of the cap 210, as apparent from Figure 5A. The collar 255 may be defined to exceed an outer diameter of the opening 221 of the cap 210, whereby the collar 255 is configured to restrict further movement of the tool 250 into the cap 210. Moreover, the plurality of flexible engaging arms 256 are configured such that, upon abutment of the collar 255 with the top surface of the cap 210, each of the plurality of engaging arms 256 is configured to engage with the rigid base region 231 of the cavity 222.

[0124] Each of the plurality of flexible engaging arms 256 may include a protruding tab 258, where the protruding tab 258 is configured to extend outwardly from an external surface of a respective flexible engaging arm of the plurality of flexible engaging arms 256. The protruding tab 258 is positioned away from the collar 255 in each of the plurality of flexible engaging arms 256. That is, the protruding tab 258 of each of the plurality of flexible engaging arms 256 is configured to be inserted into the cavity 222 before the collar 255 is abutted to the top surface of the cap 210. The plurality of flexible engaging arms 256 is configured to extend in the first condition, while the movable member 254 is operated to the first position, as can be seen in Figure 5B.

[0125] Upon insertion of the tool having the plurality of flexible engaging arms 256 into the cap 210, the hook 268 of the at least one flexure bearing 232 of the body 209 is configured to engage the protruding tabs 258 of the plurality of flexible engaging arms 256, through the slit 230 defined in the cavity 222. By inserting the tool, the plurality of flexible engaging arms 256 are deformed, e.g. bent inwardly, to be positioned adjacent to the at least one flexure bearing 232. The hook 268 of the at least one flexure bearing 232 is received by the slit 230 in the cavity 222, in a lock position, where the hook 268 is configured to restrain disengagement of the cap 210. As the protruding tab 258 engages with the hook 268 of the at least one flexure bearing 232, the protruding tab 258 and in-turn at least one flexible engaging arm of the plurality of flexible engaging arms 256 are configured to be deformed (i.e., translated) to the first condition. At this condition, the cap 210 may not be disengaged (i.e., dislodged or removed) from the body 209, in response to insertion of the tool 250 into the cavity 222 (that is, the rigid base region 231 of the cavity 222 is restrained by the hook 268 of the at least one flexure bearing 232).

[0126] The tool 250 may be operated by operating the movable member 254 from the first position to the second position (that is, towards the cap 210), through selective displacement of the second enclosure 252, as apparent from Figures 6A and 6B. At the second position, the movable member 254 is configured to enclose the heating element 223 of the heater 204, along a recess 259 defined in the plunger 257 of the movable member 254. The operation of the movable member 254 to the second position is also configured to translate (e.g. deform or displace) at least one flexible engaging arm of the plurality of flexible engaging arms 256 to the second condition from the first condition. In this respect, the protruding tab 258 of at least one flexible engaging arm of the plurality of flexible engaging arms 256 is configured to displace (e.g. deform outwardly or move about a width of the device 201) the hook 268 of the at least one flexure bearing 232 to an unlock position. At this position, the hook 268 of the at least one flexure bearing 232 is displaced outwardly away from the slit 230 defined in the cavity 222 and the heating element 223 of the device 201, as illustrated in Figure 6A.

[0127] The hook 268 of the at least one flexure bearing 232, upon displacement to the unlock position, by the protruding tab 258, is configured to disengage (or move away) from the rigid base portion of the cavity 222, for lifting of the cap 210. In other words, hook 268 of the at least one flexure bearing 232 may be moved outwardly and thus are not situated in the slit 230 anymore, so that the locking of the least one flexure bearing 232 is released and the cap 210 is removable. As a result of this, the cap 210 may be disengaged (that is, dislodged or removed) from the body 209 by pulling force (e.g. upward force applied on the cap 210 and the tool 250, or downward force applied on the body 209), as apparent from Figure 7A.

[0128] Figure 7B illustrates disengagement of the cap

210 and the body 209, for exposure of the heating element 223 of the heater 204.

[0129] The disengagement of the cap 210 and the body 209 of the device 201 may be performed by the tool 250, and a method for such disengagement is performed and initiated by inserting the tool 250 into the cap 210. The tool 250 through the plurality of flexible engaging arms 256 of the rigid member 253 is inserted into the cap 210, at the opening 221 defined in the top surface of the cap 210. The movable member 254 of the tool 250 is operated to the first position (that is, away from the cap 210) before the plurality of flexible engaging arms 256 may be inserted into the cap 210. The plurality of flexible engaging arms 256 of the rigid member 253 are configured to be insertable into the cap 210 in the first condition, to engage the slit 230 of the cavity 222 defined by the cap 210. While, inserting the flexible engaging arms 256 into the cavity 222 of the device 201, the visual indication means i.e. element 261 provided in the rigid member 253 provides an indication corresponding to orientation of the tool 201 relative to the device 201. Such that the tool 250 can be inserted in a defined orientation. The plurality of flexible engaging arms 256, in the cavity 222 of the cap 210, are held in the first condition by the at least one flexure bearing 232 defined in the body 209 of the device 201. At this point, the cap 210 may be partially disengaged, as the cap 210 may be retrained by the at least one flexure bearing 232, restraining the rigid base region 231 of the cap 210.

[0130] The movable member 254 of the tool 250 is then operated (e.g. moved or displaced) from the first position to the second position (that is, into the cavity 222 defined by the cap 210) such that, the plurality of flexible engaging arms 256 are translated (e.g. deformed) to the second condition from the first condition. The plunger 257 of the movable member 254 is configured to operate the plurality of flexible engaging arms 256 such that, the protruding tabs 258 of the plurality of flexible engaging arms 256 is configured to assist the slit 230 of the cavity 222 defined by the cap 210 to retain (e.g. regain) original profile (that is, as though no external forces are acted upon). Retaining of the profile by the deformation region of the cavity 222 may also displace the at least one flexure bearing 232 of the body 209. At this point, the rigid base region 231 of the cavity 222 is disengaged by the at least one flexure bearing 232, thereby allowing disengagement of the cap 210 and the body 209.

[0131] The features disclosed in the foregoing description, or in the following claims, or in the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for obtaining the disclosed results, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

[0132] While the invention has been described in conjunction with the exemplary embodiments described above, many equivalent modifications and variations will be apparent to those skilled in the art when given this disclosure. Accordingly, the exemplary embodiments of the invention set forth above are considered to be illustrative and not limiting. Various changes to the described embodiments may be made without departing from the spirit and scope of the invention.

[0133] For the avoidance of any doubt, any theoretical explanations provided herein are provided for the purposes of improving the understanding of a reader. The inventors do not wish to be bound by any of these theoretical explanations.

[0134] Any section headings used herein are for organizational purposes only and are not to be construed as limiting the subject matter described.

[0135] 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.

[0136] 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, +/- 10%.

[0137] 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 tool (250) for an HNB device (201),
   wherein the HNB device (201) comprises a main body (209) and a cap (210);
   wherein the cap (210) is removably attached to the main body (209);
   wherein the tool (250) is adapted for disengaging the cap (210) and the main body (209); and
   wherein the tool (250) is adapted for indicating an orientation of the tool (250) relative to the HNB device

(201).

2. The tool (250) according to claim 1, comprises a rigid member (253) and a movable member (254).

3. The tool (250) according to at least one of the preceding claims, further comprises an element (261) disposed in the rigid member (253), wherein the element (261) extends from the rigid member (253) into a coaxial sliding path of the movable member (254).

4. The tool (250) according to at least one of the preceding claims, wherein the element (261) is adapted to lock the movable member (254) in a first position and a second position, relative to the rigid member (253).

5. The tool (250) according to at least one of the preceding claims, wherein the element (261) is adapted for visually indicating the orientation of the tool (250) relative to the HNB device (201).

6. The tool (250) according to claim 5, wherein the visual indication of the orientation of the tool (250) assists a user in locating the tool (250) in a correct position relative to the HNB device (201).

7. The tool (250) according to at least one of the preceding claims, wherein the rigid member (253) comprises a plurality of flexible engaging arms (256), wherein the plurality of flexible engaging arms (256) are operable between a first condition and a second condition.

8. The tool (250) according to one of claims 2 to 7, wherein the movable member (254) is configured to slide coaxially within the rigid member (253), between a first position and a second position.

9. The tool (250) according to one of claims 4 to 8, wherein the first position corresponds to fully disengaged position of the tool (250), and the second position corresponds to fully engaged position of the tool (250).

10. The tool (250) according to at least one of the preceding claims, wherein the movable member (254) is defined with a slot (262) for receiving the element (261).

11. A smoking substitute system (200), comprising:
an HNB device (201), comprising:

a main body (209) and a cap (210), wherein the cap (210) is removably attached to the main body (209);
a consumable (201), wherein at least a portion of the consumable (202) is insertable into the cap (210) of the device (201) and
a tool (250), adapted for disengaging the cap (210) and the main body (209) of the HNB device (201).

12. The smoking substitute system (200) according to claim 11, wherein the tool (250) comprises a rigid member (253) and a movable member (254), wherein the movable member (254) is configured to slide coaxially within the rigid member (253) in a first position and a second position.

13. The smoking substitute system (200) according to claim 11 or 12, wherein the tool (250) further comprises an element (261) disposed within the rigid member (253), for visually indicating an orientation of the tool (250) relative to the HNB device (201), and the element (266) is further configured to lock the movable member (254) in a first position and a second position.

14. The smoking substitute system (200) according to at least one of claims 11 to 13, and the tool (250) according to at least one of the preceding claims, wherein the plurality of flexible engaging arms (253) is insertable into a cavity (222) defined in the cap (210), to engage with at least one flexure bearing (232) defined in the main body (209) of the HNB device (201); and
wherein the movable member (254) on operation, from the first position to the second position, is configured to translate the plurality of flexible engaging arms (256) to the second condition, for displacing the at least one flexure bearing (232) of the HNB device (201) to disengage the cap (210) and the main body (209).

15. The smoking substitute system (200) according to at least one of claims 11 to 14, wherein the at least one flexure bearing (232) is moved from a lock position where it is engaged with the cap (210) to a unlock position where a hook (268) of the at least one flexure bearing (232) is moved out of a slit (230) defined in the cavity (222) of the cap (210) to disengage the cap (210) and the main body (209).

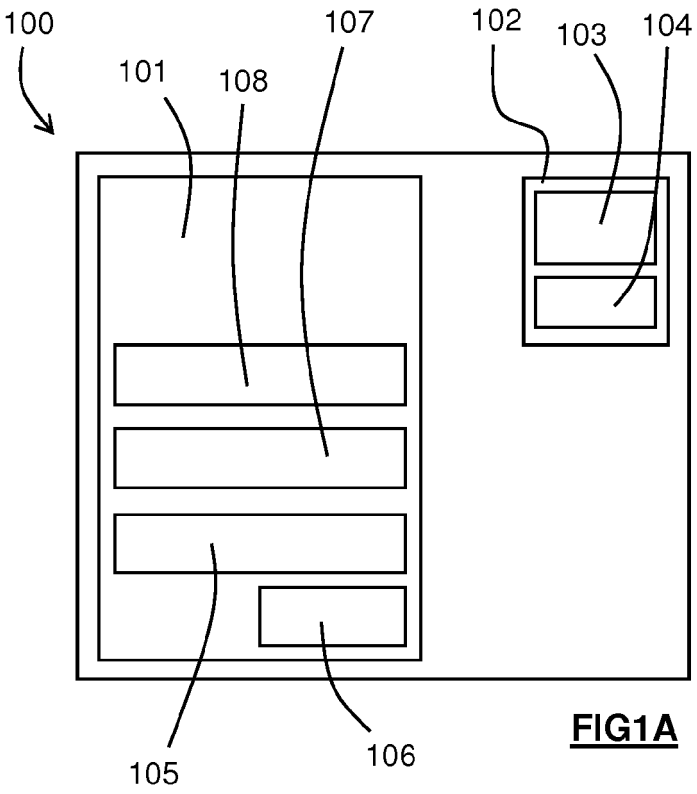
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FIG1A

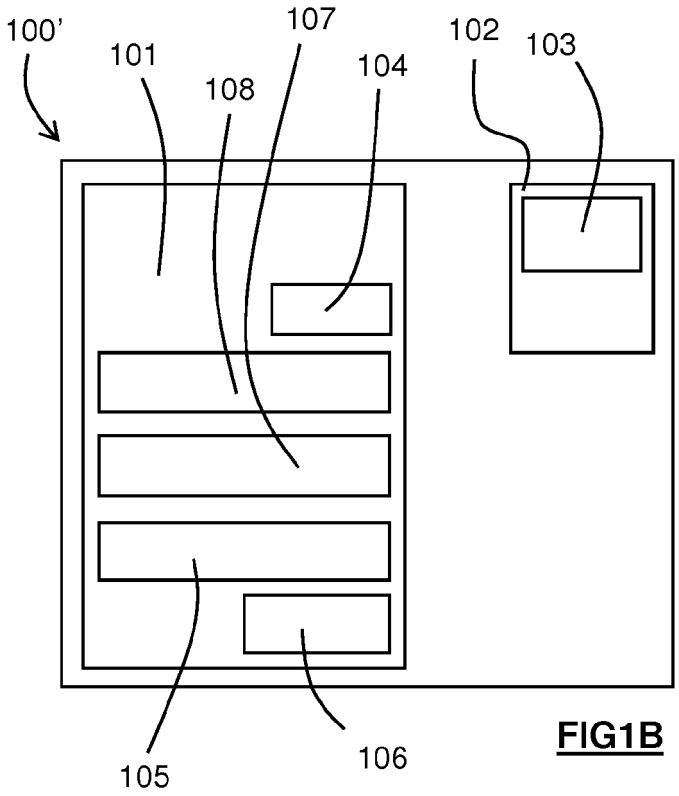
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FIG1B

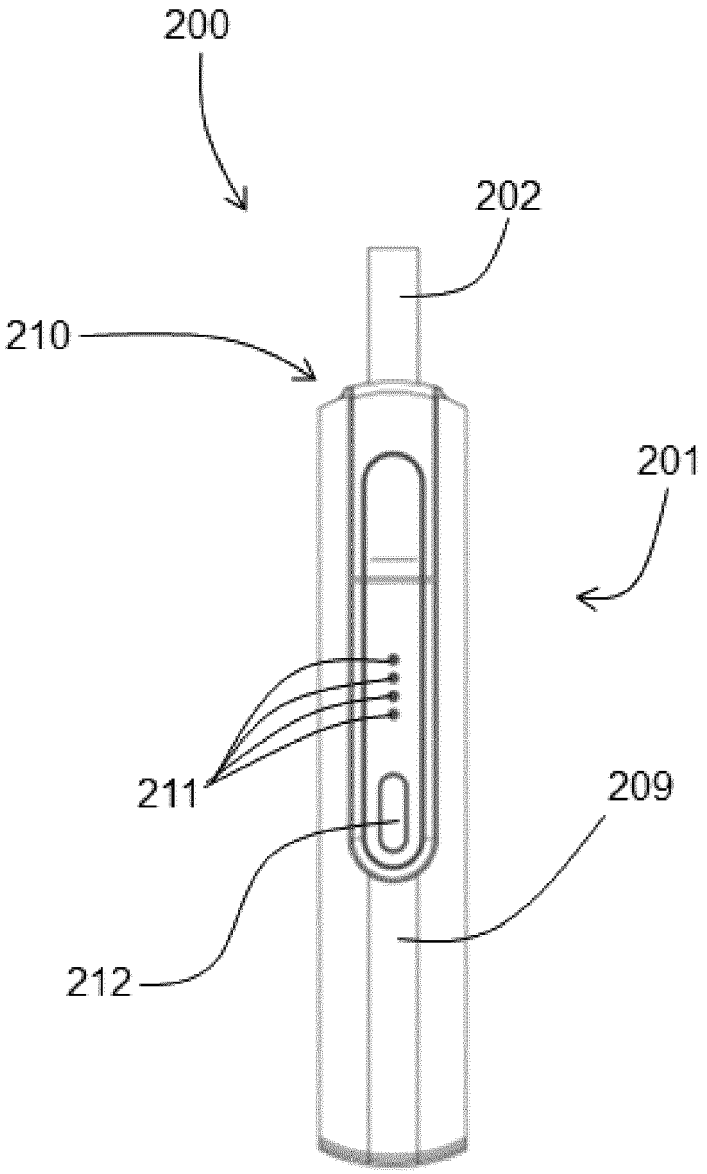

FIG 2A

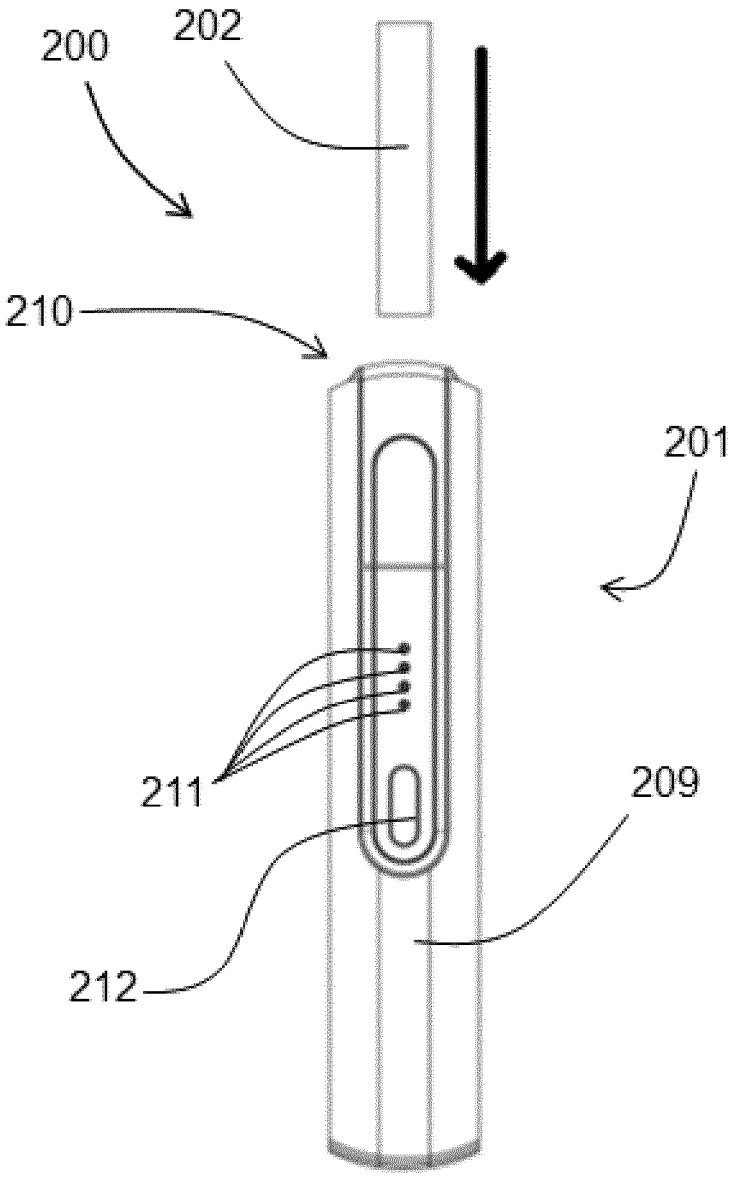

FIG 2B

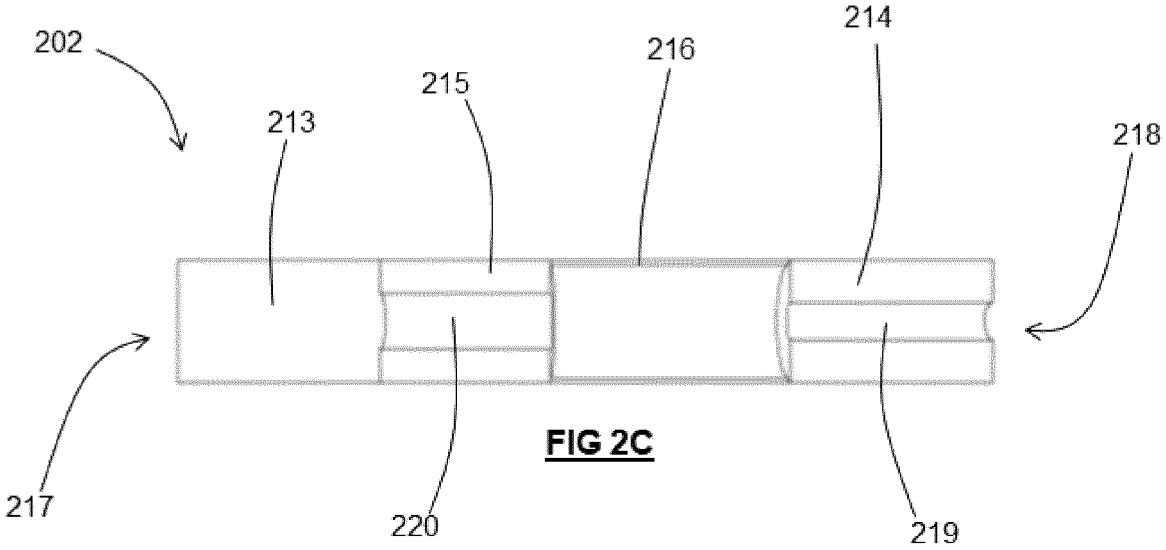

FIG 2C

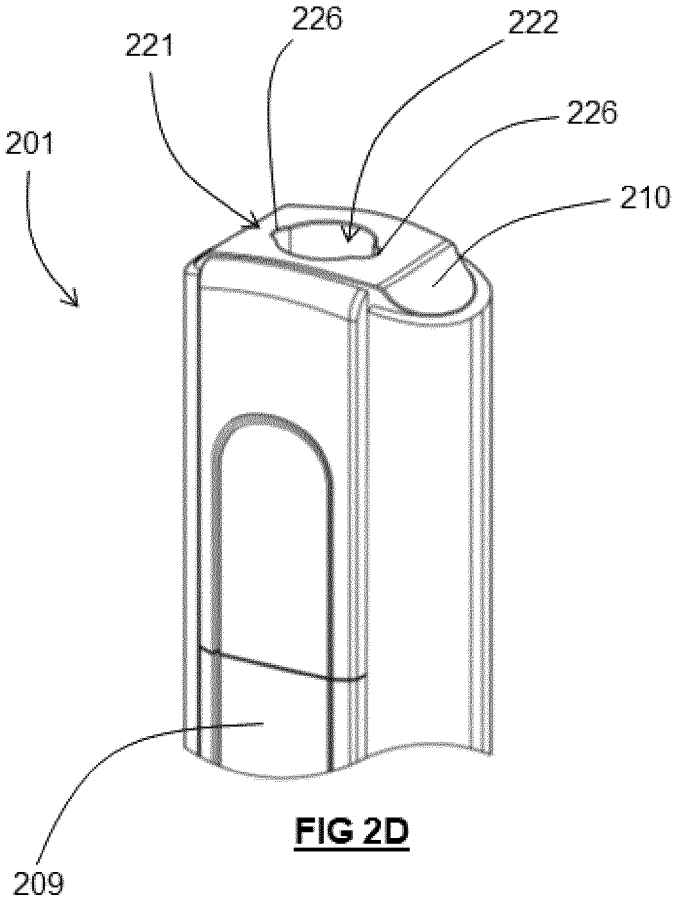

FIG 2D

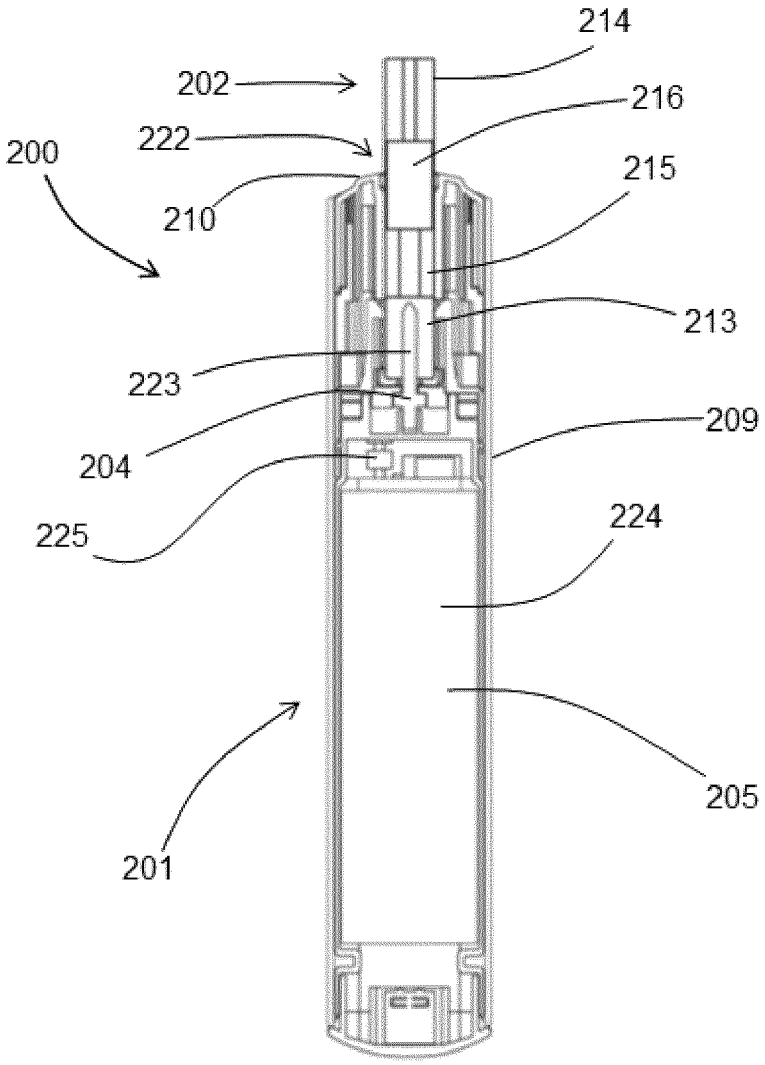

FIG 2E

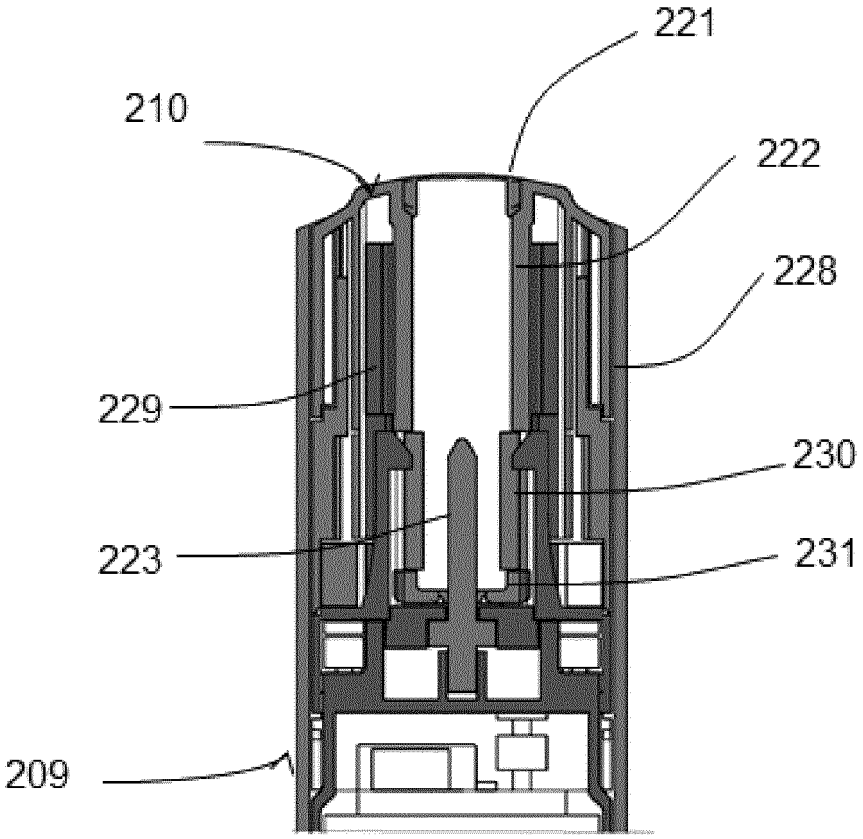

FIG 2F

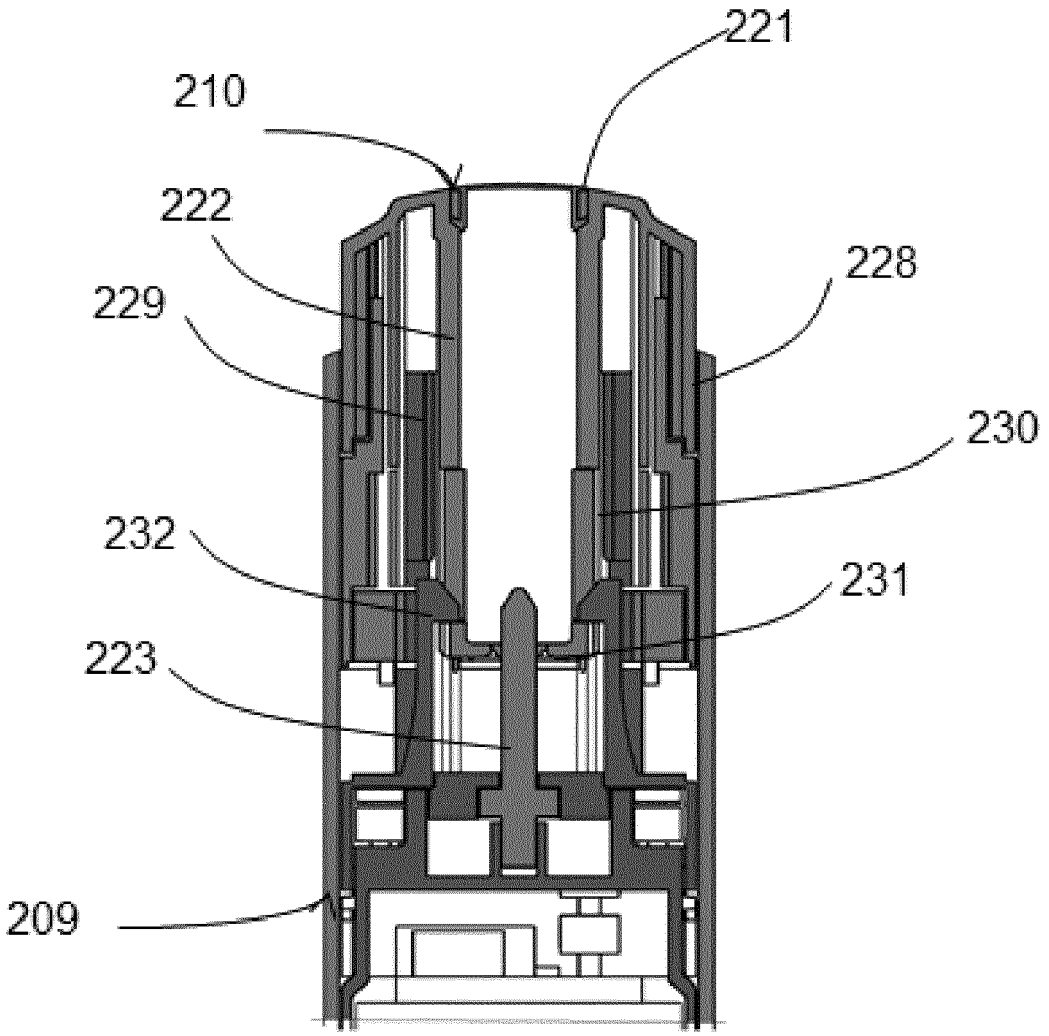

FIG 2G

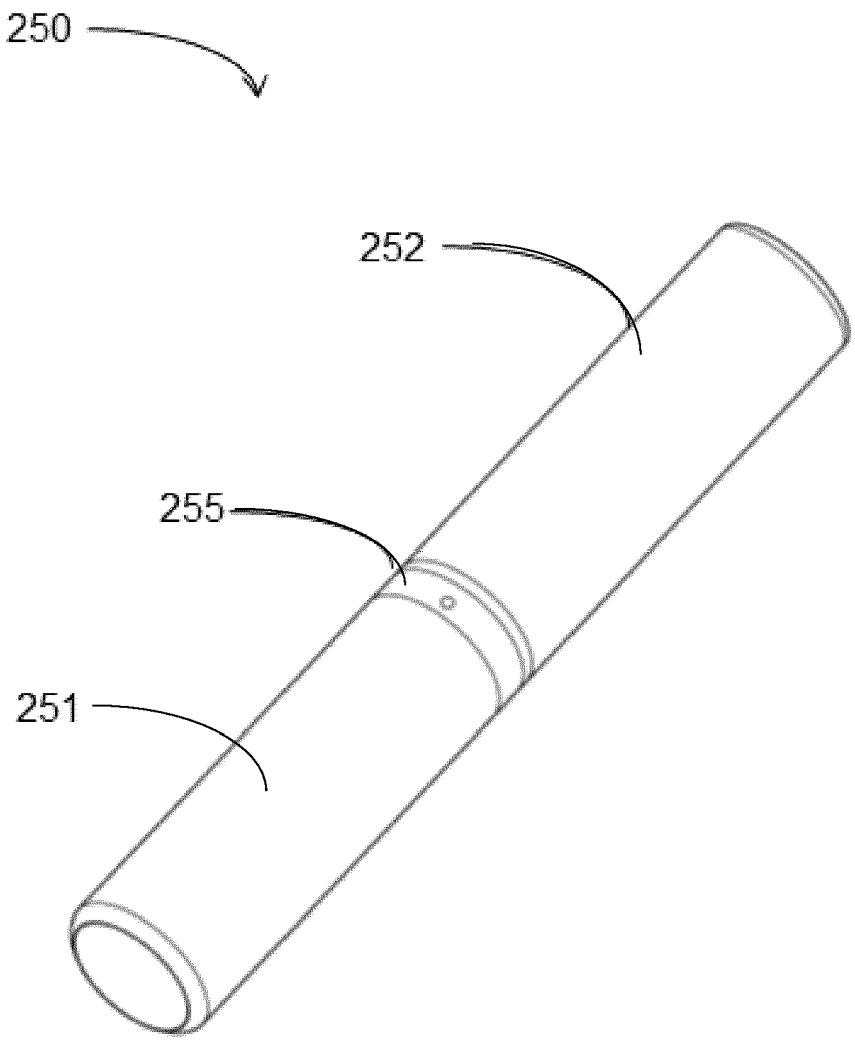

FIG 3A

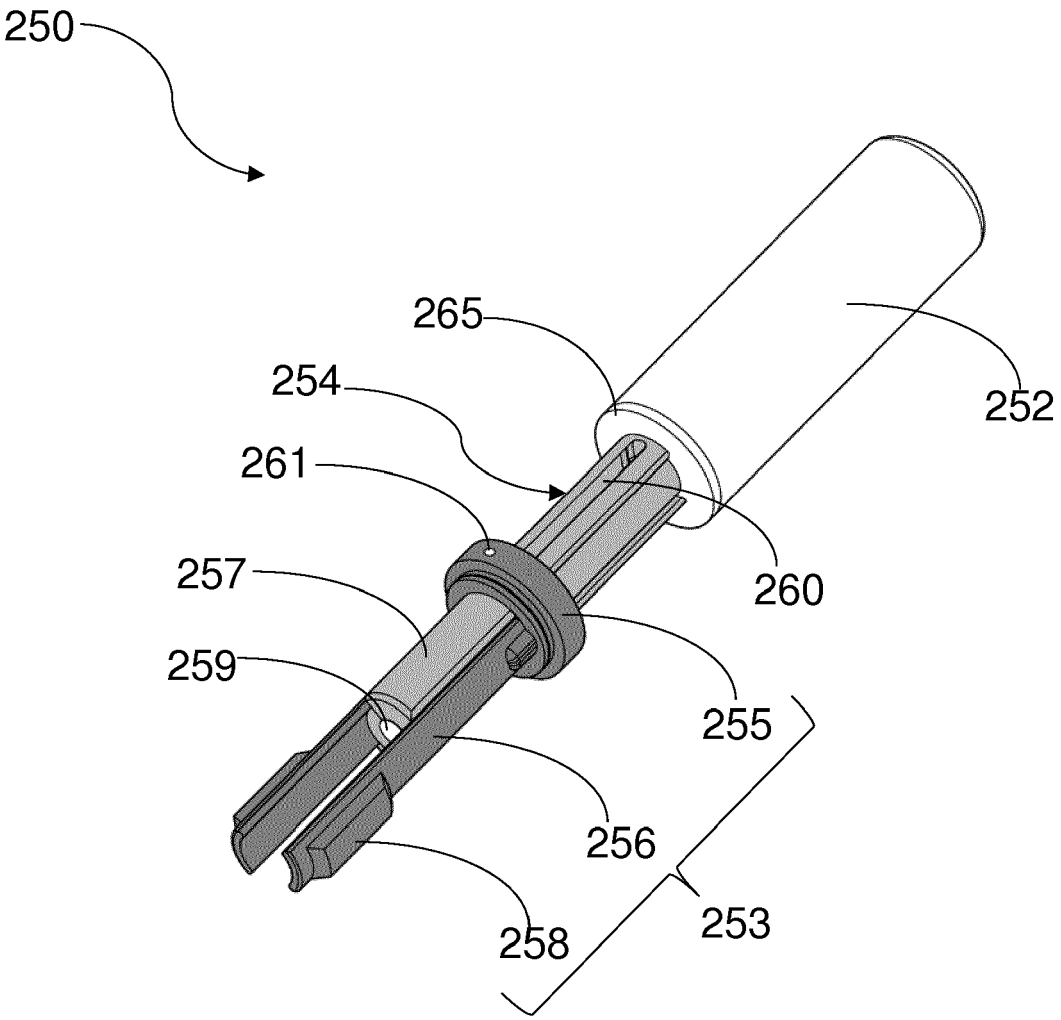

FIGURE 3B

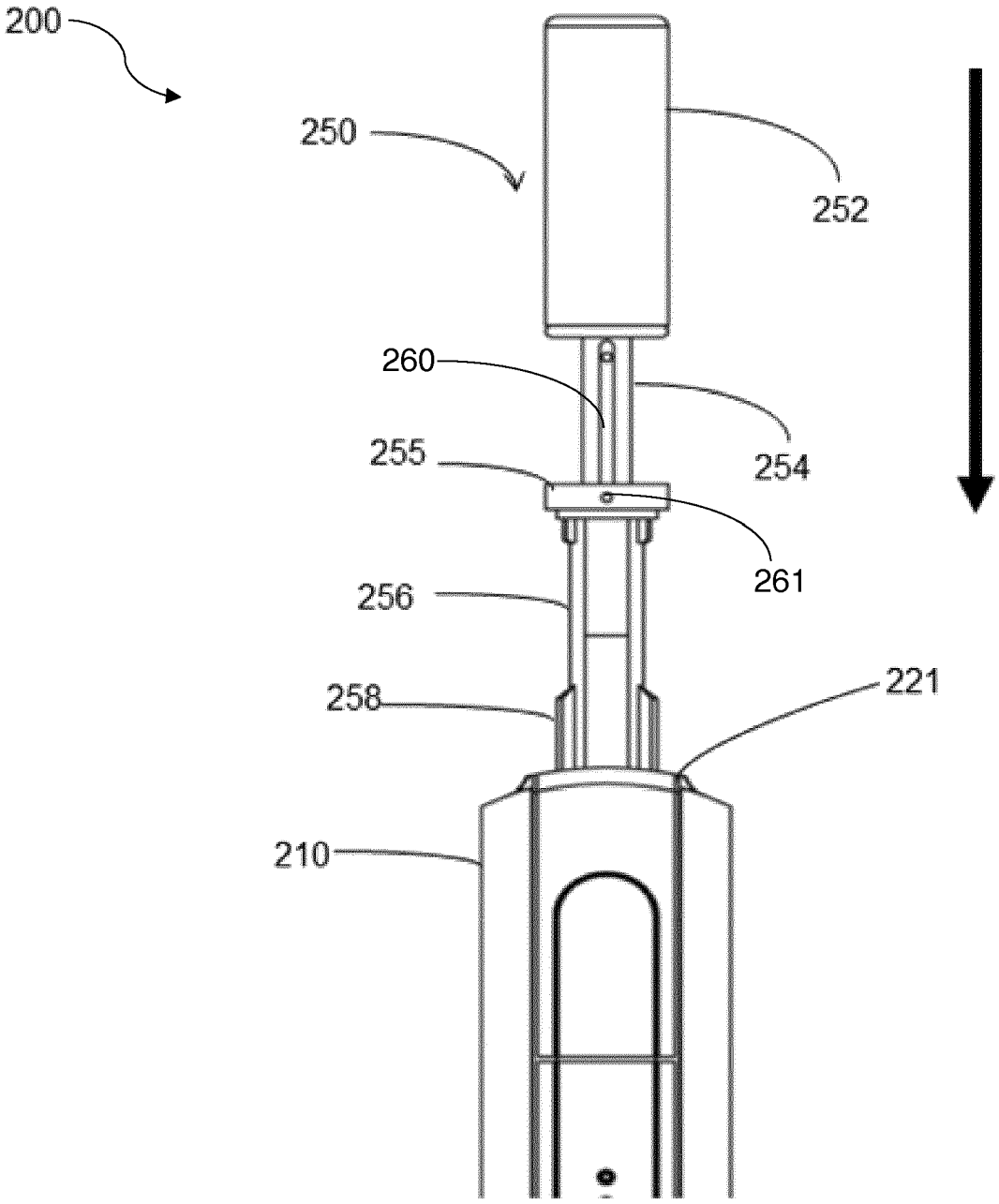

FIG 4

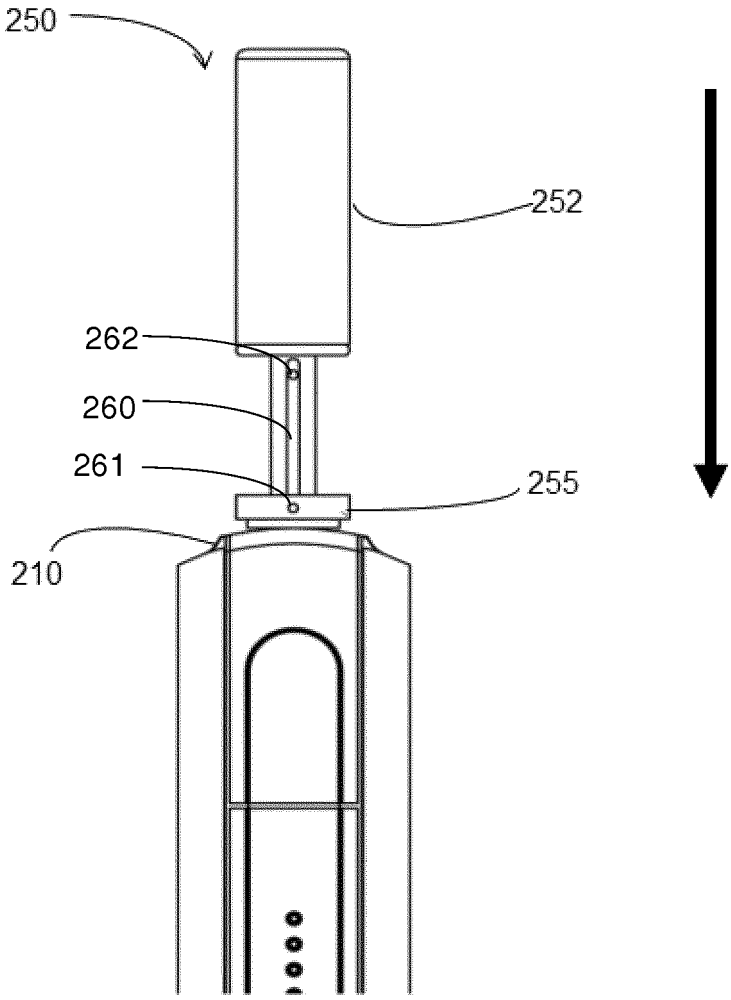

FIG 5A

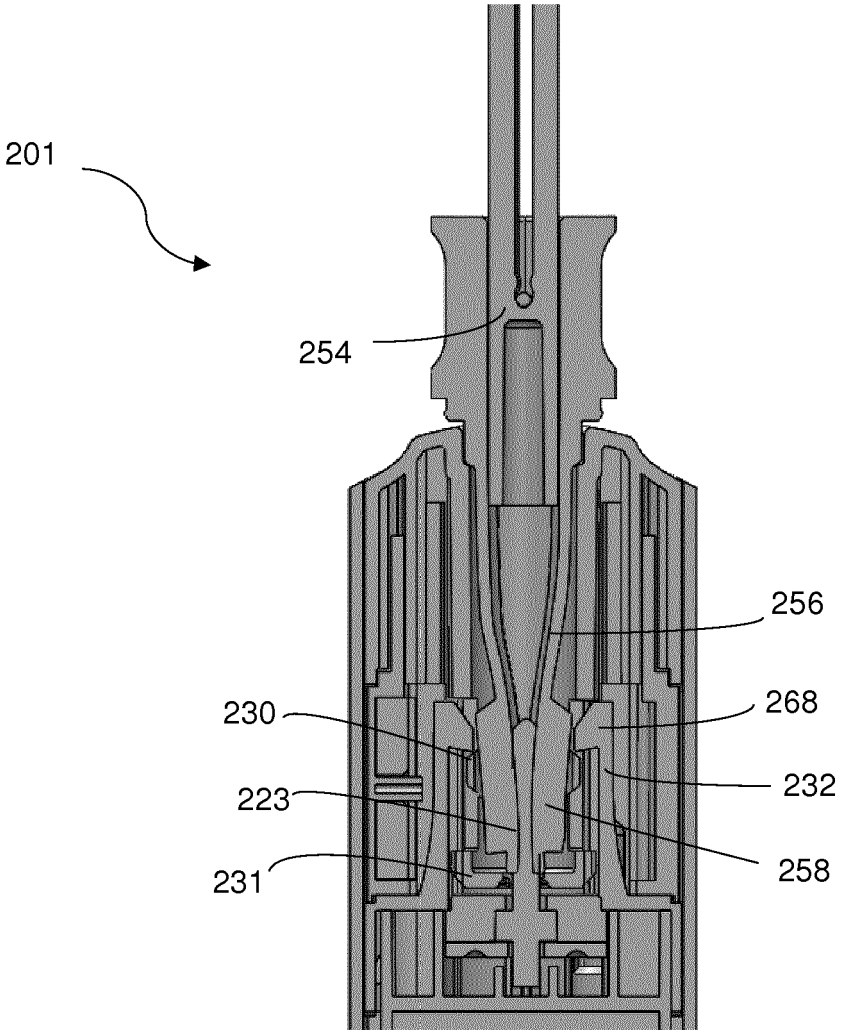

Figure 5B

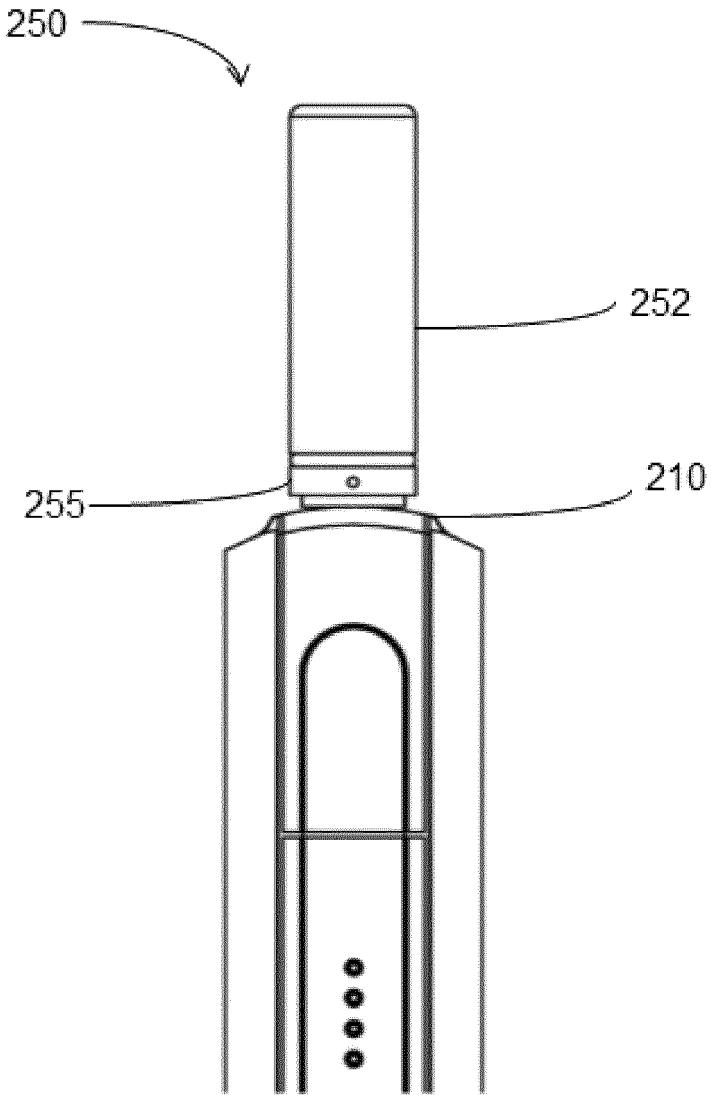

FIG 6A

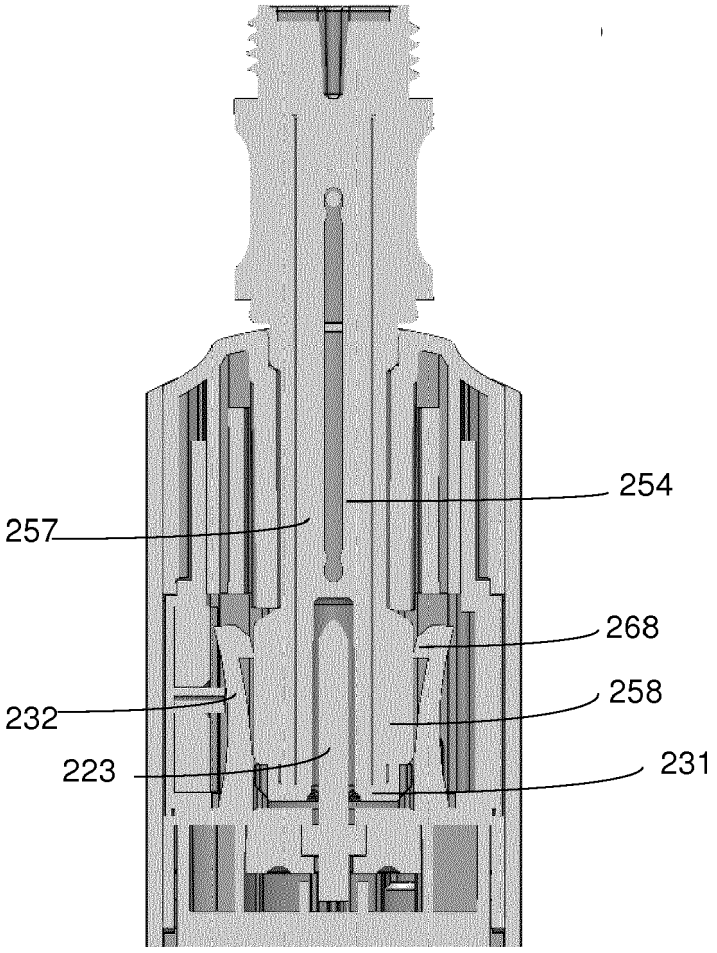

Figure 6B

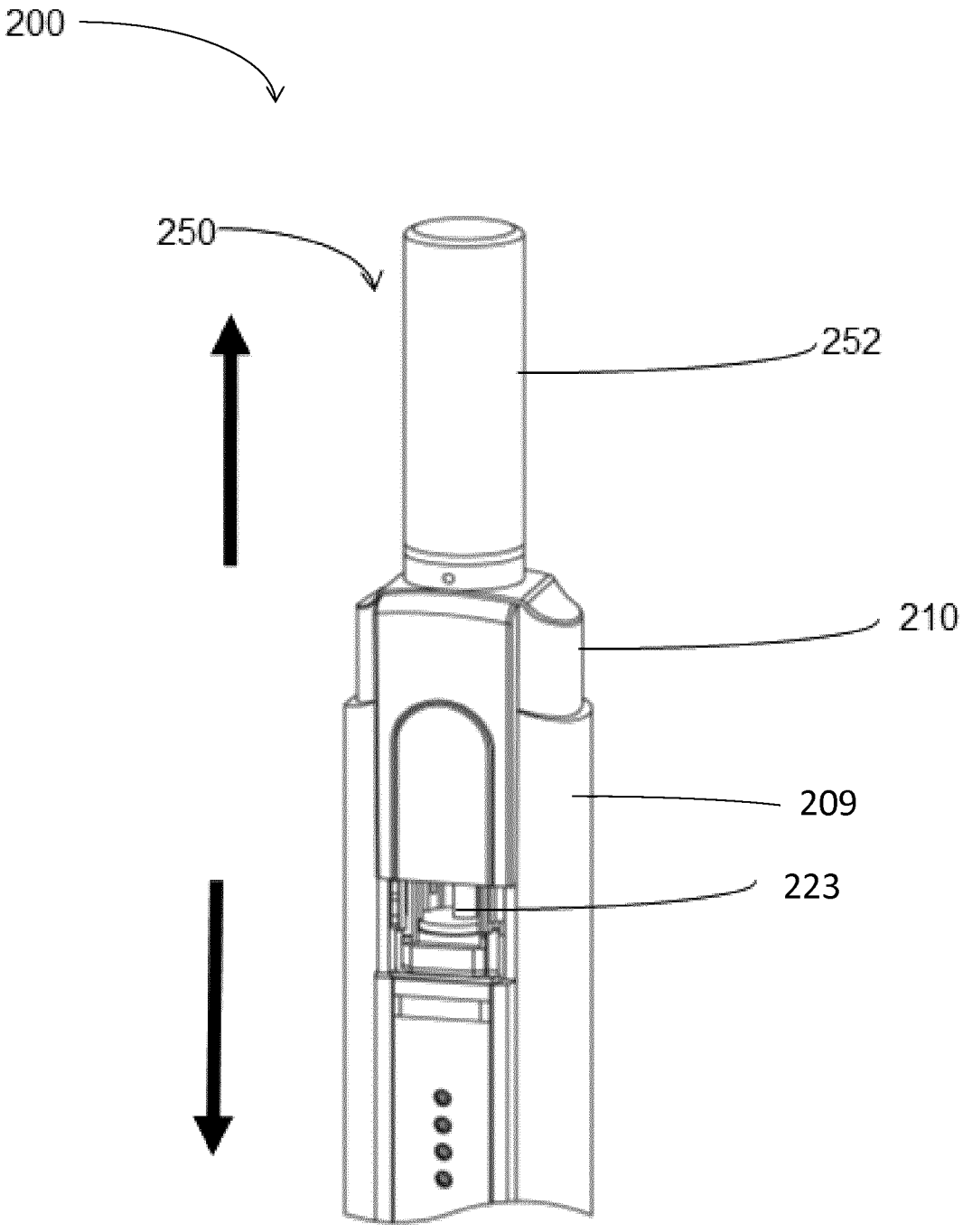

FIG 7A

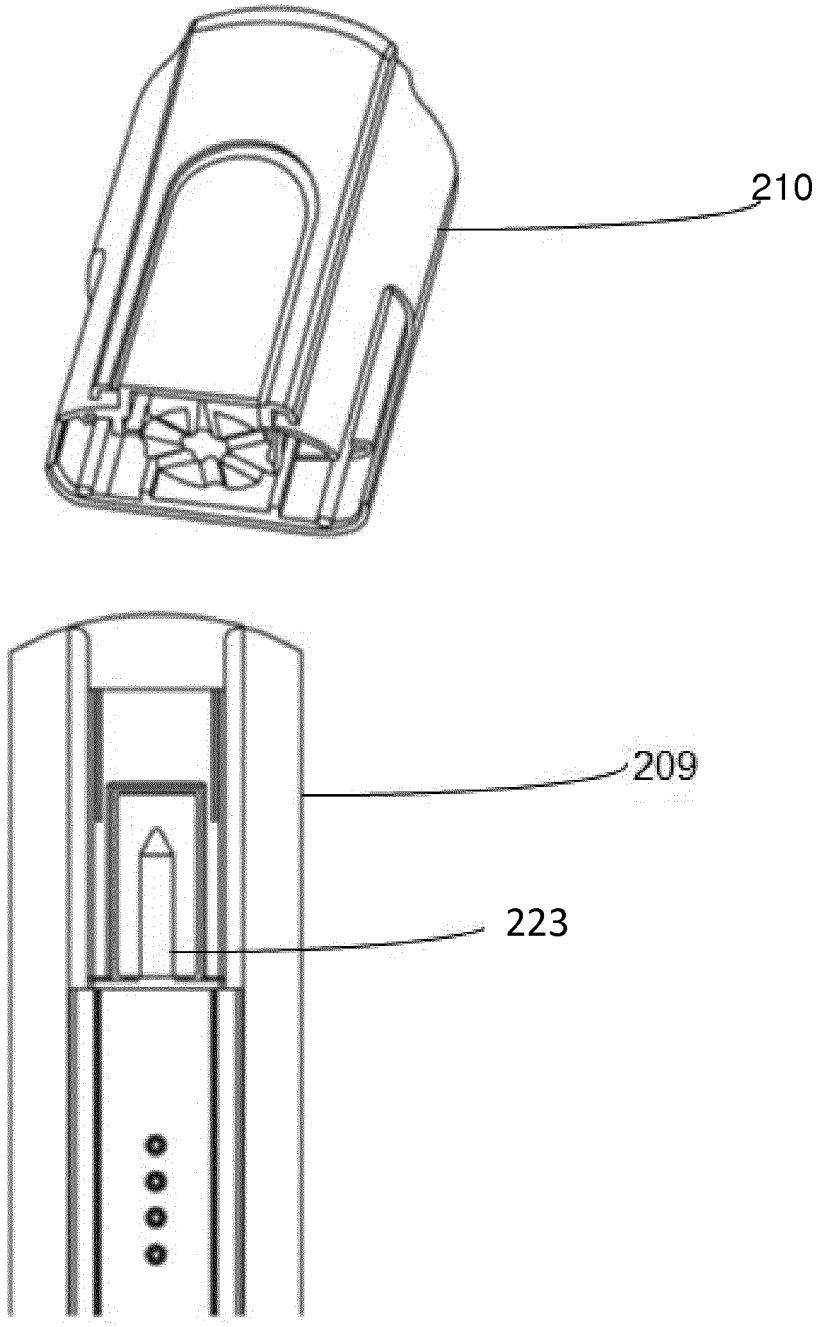

FIG 7B

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EUROPEAN SEARCH REPORT

Application Number
EP 19 02 0173

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	DE 43 08 627 A1 (EISOLD WOLFGANG [DE]) 22 September 1994 (1994-09-22)	1-10	INV. A24F47/00
A	* column 1, line 55 - column 2, line 3; figures *	11-15	

X	WO 2008/034455 A1 (SKF AB [SE]; OS ARIE JOHAN [NL]; REKERS HENDRIK CORNELIS [NL]) 27 March 2008 (2008-03-27)	1-10	
A	* page 8, line 8 - page 9, line 28; figures 1-6 *	11-15	

X	US 2015/257441 A1 (GERKIN LEWIS F [US]) 17 September 2015 (2015-09-17)	1,2,8, 11-13	
A	* paragraph [0030] - paragraph [0046]; figures 1-16 *	3-7,9, 10,14,15	

X	WO 2019/030360 A1 (PHILIP MORRIS PRODUCTS SA [CH]) 14 February 2019 (2019-02-14)	1,11	
A	* page 16, line 11 - line 33; figures 15-18 *	2-10, 12-15	
	-----		TECHNICAL FIELDS SEARCHED (IPC)
A	CN 208 096 008 U (WEITAO ELECTRONIC TECH SHENZHEN CO LTD) 16 November 2018 (2018-11-16)	1-15	A24F B25B
	* paragraph [0026] - paragraph [0034]; figures 1-2 *		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	30 August 2019	Espla, Alexandre

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 19 02 0173

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30-08-2019

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 4308627 A1	22-09-1994	NONE	
WO 2008034455 A1	27-03-2008	BR PI0622056 A2	28-05-2013
		CN 101511545 A	19-08-2009
		EP 2066478 A1	10-06-2009
		US 2010078951 A1	01-04-2010
		WO 2008034455 A1	27-03-2008
US 2015257441 A1	17-09-2015	NONE	
WO 2019030360 A1	14-02-2019	NONE	
CN 208096008 U	16-11-2018	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82