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(54) **AEROSOL DELIVERY COMPONENT**

(57) Disclosed is an aerosol-delivery component comprising: a tank for liquid aerosol precursor having a tank wall portion that defines a bleed port; and a valve having a moveable valve member configured to at least partially open the bleed port in a first (e.g. upright) orientation of the component and configured to block the bleed port in second (e.g. inverted) orientation of the component.

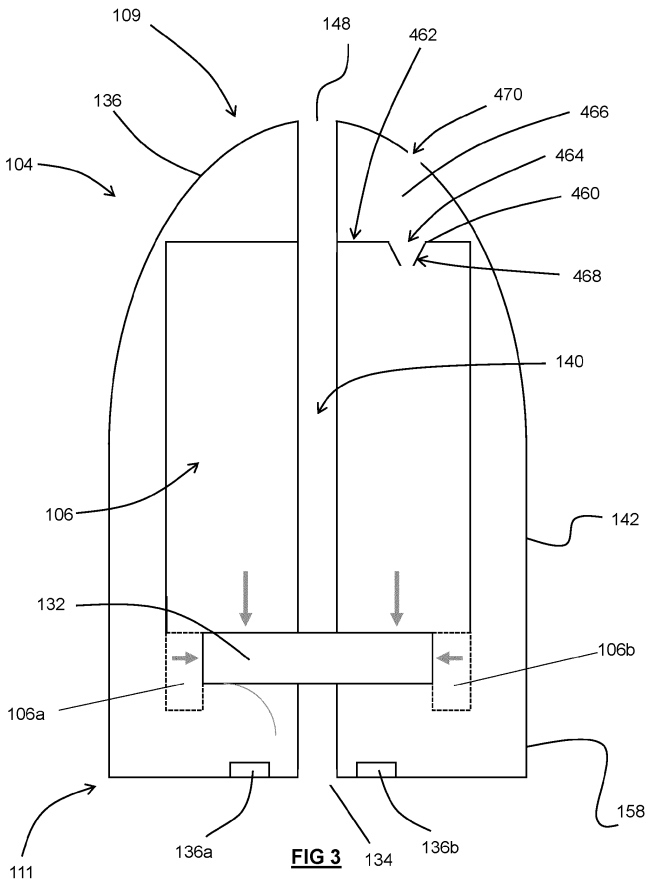

FIG 3

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Description

Technical field

[0001] The present disclosure relates to an aerosol-delivery component (e.g. a smoking substitute component), which may be a consumable for receipt in an aerosol-delivery device to form an aerosol-delivery system (e.g. a smoking substitute system).

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.

[0010] 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.

[0011] 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 consumable component including the tank and the heater. In this way, when the tank of the consumable component has been emptied, the device can be reused by connecting it to a new consumable component. Another subset of closed system vaping smoking substitute systems are completely disposable, and intended for one-use only.

[0012] 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.

[0013] 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.

[0014] 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.

[0015] As the vapour passes through the consumable (entrained in the airflow) from the location of vaporization 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 may contain nicotine and/or flavour compounds.

[0016] In aerosol delivery devices comprising a sealed tank containing a liquid aerosol precursor e.g. an e-liquid or a flavoured aerosol precursor, it may be desirable to provide a bleed port extending between an inside and an outside of the tank in order to allow a bleed of air into the tank to avoid a vacuum build up as the volume of liquid aerosol precursor within the tank reduces. Any reduction of pressure within the tank may inhibit effective delivery of the liquid aerosol precursor for aerosolisation.

[0017] The provision of a bleed outlet may render the tank prone to leakage as the bleed outlet provides a passage for the liquid aerosol precursor from the tank, especially when the tank is in an inverted position where the liquid precursor may be in contact with the bleed outlet.

[0018] The present invention has been devised in light of the above considerations.

Summary

[0019] According to a first aspect there is a provided an aerosol-delivery component, comprising:

a tank for liquid aerosol precursor having a tank wall portion that defines a bleed port; and

a valve having a moveable valve member configured to at least partially open the bleed port in a first orientation of the component and configured to block the bleed port in second orientation of the component.

[0020] By providing a bleed port in the tank wall portion, air is able to flow into the tank to prevent any reduction of pressure within the tank during use as liquid aerosol precursor is consumed in the first orientation of the component. By providing a valve configured to close the bleed port in the second orientation of the component, leakage of liquid aerosol precursor (e.g. e-liquid or liquid flavourant) from the tank is reduced since the bleed port is blocked.

[0021] Optional features will now be set out. These are applicable singly or in any combination with any aspect.

[0022] The first orientation of the component may be a use orientation in which liquid precursor is depleted through vaporisation. In the first orientation, liquid aerosol precursor within the tank is not in contact with the tank wall portion defining the bleed port.

[0023] The first orientation may additionally be a substantially upright orientation of the component.

[0024] The tank wall portion defining the bleed port may be in an upper wall of the tank and the term "substantially upright" may define that the upper wall of the tank (with the bleed port) is vertically uppermost relative to an opposing lower wall of the tank.

[0025] The component may comprise a mouthpiece portion defining an air outlet and the term "substantially upright" may define that the mouthpiece portion and air outlet are vertically uppermost relative to the tank.

[0026] The upper wall of the tank may be proximal the mouthpiece.

[0027] The component may be an axially elongate component having a central elongate axis and the terms "substantially upright" and "vertically uppermost" are intended to define that the central elongate axis extending from the tank to the mouthpiece portion (and/or from a lowerwall of the tank to the upper wall of the tank) is oriented so as to be less than 90 degree, for example equal to or less than 80 or 70 degrees, such as equal to or less than 60 or 50 degrees from the vertical. The central elongate axis (extending from the tank to the mouthpiece/lower tank wall to upper tank wall) may be at an inversion angle of about 45 degrees or less from the vertical e.g. the central elongate axis of the component (extending from the tank to the mouthpiece/lower tank wall to upper tank wall) may be substantially vertically oriented in the first/use orientation (an at inversion angle of substantially 0 degrees).

[0028] The second orientation of the component may be a non-use orientation in which liquid precursor is not depleted through vaporisation. In the second orientation of the component, liquid aerosol precursor within the tank is in contact with at least part (e.g. a lowermost portion) of the tank wall portion.

[0029] The second orientation may additionally or alternatively be a substantially inverted orientation of the component.

[0030] The term "substantially inverted" may define that the mouthpiece portion and air outlet are vertically lowermost relative to the tank and/or that the upper wall of the tank (comprising the bleed port) is vertically lowermost relative to the lower wall of the tank.

[0031] The terms "substantially inverted" and "vertically lowermost" are intended to define that the central elongate axis extending from the tank to the mouthpiece portion is oriented so as to be equal to or greater than 90 degrees, for example equal to or greater than 100 or 110 degrees, such as equal to or greater than 120 or 130 degrees from the vertical. The central elongate axis (extending from the tank to the mouthpiece/lower tank wall to upper tank wall) may be at an inversion angle of about 135 degrees or more from the vertical e.g. the central

elongate axis of the component (extending from the tank to the mouthpiece/lower tank wall to upper tank wall) may be substantially vertically inverted in the second/non-use orientation (at an inversion angle of substantially 180 degrees).

[0032] For the avoidance of doubt, the terms "substantially inverted" and "vertically lowermost" are also intended to define that the central elongate axis extending from the mouthpiece portion to the tank and from the upper tank wall to lower tank wall is oriented so as to be equal to or less than 90 degrees, for example equal to or less than 80 or 70 degrees, such as equal to or less than 60 or 50 degrees from the vertical. The central elongate axis (extending from the mouthpiece to the tank/upper tank wall to lower tank wall) may be at an inversion angle of about 45 degrees or less from the vertical e.g. the central elongate axis of the component (extending from the mouthpiece to the tank/upper tank wall to lower tank wall) may be substantially vertically oriented in the second/non-use orientation (at an inversion angle of substantially 0 degrees).

[0033] The tank wall portion defining the bleed port may be in an upper wall of the tank i.e. proximal the mouthpiece portion.

[0034] The bleed port may be an aperture or channel extending through the tank wall portion. It may open into a void within the component. The void may be defined within the mouthpiece portion.

[0035] The component (e.g. the mouthpiece portion) may comprise a bleed inlet to allow bleed of air into the void (and subsequently into the tank through the bleed port).

[0036] The bleed port will have a tank-side opening which will open into the tank and an opposing-side e.g. a void-side opening which may open into the mouthpiece portion e.g. into the void.

[0037] The valve has an open configuration in which the bleed port is at least partially e.g. fully open i.e. the tank-side opening of the bleed port is at least partially (e.g. fully) unobscured by the moveable valve member. The open configuration of the valve corresponds to the first/use orientation of the component.

[0038] The valve has a closed configuration in which the bleed port is at least partially e.g. fully blocked i.e. the tank-side opening is at least partially (e.g. fully) obscured by the moveable valve member to form a liquid seal. The closed configuration of the valve corresponds to the second/non-use orientation of the component.

[0039] The valve may comprise the movable valve member and a valve seat. The valve seat may comprise a sealing element e.g. a compressible sealing element.

[0040] The valve seat may be provided on and/or defined by the tank wall portion. In some embodiments, the valve seat may be provided as a separate component affixed to or integrally formed with the wall portion. In other embodiments, the valve seat may simply be provided by the wall portion at the periphery of the tank side opening of the bleed port.

[0041] The valve seat may at least partially e.g. fully encircle the tank-side opening of the bleed port.

[0042] The moveable valve member is formed of material that is non-buoyant in liquid aerosol precursor e.g. a metal material such as stainless steel.

[0043] In some embodiments the movable valve member may be a ball (e.g. a stainless-steel ball bearing) i.e. the valve may be a ball valve.

[0044] In other embodiments, the moveable member may be a pivotable flap.

[0045] The valve may further comprise a retaining member for retaining the moveable valve member.

[0046] For example, for the ball valve, the valve may further comprise a valve cage for retaining the moveable ball proximal the bleed port. The valve cage may have an open end affixed to the tank wall portion and a cage portion provided within the tank. The valve cage (portion) will be liquid permeable and may be formed of a meshed wire or fabric material.

[0047] The retaining member may bias the moveable valve member towards bleed port (i.e. towards the tank-side opening of the bleed port) as the component is moved from the first to the second orientation. For example, the valve cage portion may comprise tapered walls tapering from a narrower cage portion distal the bleed port to a wider cage portion proximal the bleed port.

[0048] Where the moveable member is a flap, the retaining member may comprise a hinge portion of the flap affixed (directly or indirectly) to the tank wall portion and an actuating portion of the flap may be pivotable about the hinge portion to block or unblock the tank-side opening of the bleed port.

[0049] The valve member may be actuated by gravity.

[0050] In the first orientation of the component and the open configuration of the valve, the weight of the moveable valve member (e.g. the weight of the ball or actuating portion of the flap) will cause it to fall away from the bleed port. The moveable ball valve member will be seated within the valve cage portion. The moveable flap valve member will remain secured to the wall portion at its pivoting portion.

[0051] The tank-side opening of the bleed port will be unobscured and thus air can enter the tank through the bleed port.

[0052] As the component is inverted from its first/upright/use orientation towards its second/inverted/non-use orientation, the weight of the liquid aerosol precursor that gradually exerts itself on the movable member increases as the inversion angle of the central elongate axis (from the tank to the mouthpiece portion) increases.

[0053] At inversion angle of about 90 degree or more the liquid aerosol precursor will contact a lower part of the tank wall portion and weight of the moveable valve member and liquid aerosol precursor is sufficient to cause the valve to close with the moveable valve member moving to block the tank-side opening of the bleed port.

[0054] Once the component is fully inverted (at an inversion angle of 180 degrees) the full weight of the move-

able valve member and liquid aerosol precursor liquid will press the moveable valve member securely against the valve seat to prevent leakage of the liquid aerosol precursor.

[0055] The component comprises an airflow path that extends from an air inlet to the air outlet in the mouthpiece portion. In this respect, a user may draw fluid (e.g. air) into and along the airflow path by inhaling at the outlet (i.e. using the mouthpiece portion).

[0056] The air flow path passes a vaporiser between the air inlet and the outlet. The vaporiser may be housed in a vaporising chamber.

[0057] The airflow path may comprise a first portion extending from the air inlet towards the vaporiser. A second portion of the airflow path passes through the vaporising chamber and/or over/around the vaporiser to a conduit that extends to the outlet. The conduit may extend along the axial centre of the component.

[0058] References to "downstream" in relation to the airflow path are intended to refer to the direction towards the outlet/mouthpiece portion. Thus the second portion of the airflow path is downstream of the first portion of the airflow path. Conversely, references to "upstream" are intended to refer to the direction towards the air inlet. Thus the first portion of the airflow path (and the air inlet) is upstream of the second portion of the airflow path (and the outlet/mouthpiece portion).

[0059] The tank is for housing the liquid aerosol precursor. The liquid aerosol precursor may comprise an e-liquid, for example, comprising a base liquid and e.g. nicotine. The base liquid may include propylene glycol and/or vegetable glycerine.

[0060] The conduit may extend through the tank with the conduit walls defining an inner region of the tank. In this respect, the tank may surround at least a portion of the conduit e.g. the tank may be annular.

[0061] The conduit may extend through the void within the mouthpiece portion to the air outlet. The bleed inlet into the void may be provided through the conduit wall (downstream of the tank).

[0062] The tank may be defined by one or more side walls (e.g. laterally opposed first and second side walls) extending longitudinally from the mouthpiece portion.

[0063] The tank may further comprise opposing front and rear walls spaced by the laterally opposed first and second side walls.

[0064] The tank walls may be integrally formed with the mouthpiece portion.

[0065] The distance between the first and second side walls may define a width of the tank. The distance between the front and rear walls may define a depth of the tank. The width of the tank may be greater than the depth of the tank.

[0066] The length of the tank/component housing may be greater than the width of the tank/component housing. The depth of the tank/component housing may be smaller than each of the width and the length.

[0067] The tank walls may be integrally formed and may additionally be integrally formed with the mouthpiece portion. In that way, the component may be easily manufactured using injection moulding.

[0068] The component housing may comprise a lower shell that at least partly forms the base portion of the component. The lower shell may overlap the tank walls.

[0069] As discussed above, the air flow path passes over/around the vaporiser between the air inlet and the outlet. The vaporiser may be disposed in the vaporising chamber. The vaporising chamber may form part of the airflow path.

[0070] The vaporiser may comprise a heating element. Alternatively, the vaporiser may comprise an ultrasonic or flow expansion unit, or an induction heating system.

[0071] The vaporiser may comprise a wick.

[0072] The wick may form the base of the tank so that the aerosol precursor may be in contact with the wick. The wick may comprise one or more channels on its upper surface (facing the tank), the channels being in fluid communication with the tank.

[0073] The wick may have a length and width defining its upper surface with a depth aligned with the longitudinal axis of the component. Thus, the upper surface and opposing lower surface of the wick may lie in respective planes that are perpendicular to the longitudinal axis of component and longitudinal to the first and third portions of the airflow path.

[0074] The wick may comprise a porous material e.g. a ceramic material. A portion of the wick e.g. at least a portion of the lower surface and/or at least a portion of at least one side wall extending between the upper and lower surface (in a depth direction of the wick) may be exposed to airflow in the second portion of the airflow path.

[0075] The heating element may be in the form of a heater track on the wick e.g. on the lower surface of the wick.

[0076] In other embodiments, the wick may be a cylindrical, porous wick e.g. formed of cotton or ceramic. It may be oriented so as to extend in the direction of the width dimension of the component (perpendicular to the longitudinal axis of the component). Thus, the wick may extend in a direction perpendicular to the direction of airflow in the airflow path. Opposing ends of the wick may protrude into the tank and a central portion (between the ends) may extend across the airflow path so as to be exposed to airflow. Thus, fluid may be drawn (e.g. by capillary action) along the wick, from the tank to the exposed portion of the wick. The heating element 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.

[0077] The heating element may be electrically connectable (or connected) to a power source. Thus, in operation (i.e. in the use orientation), 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 along the airflow path. This vapour may subsequently cool to form an aerosol in the airflow path (e.g. the third portion of the airflow path).

[0078] In a second aspect there is provided an aerosol-delivery system (e.g. a smoking substitute system) comprising a component according to the first aspect and an aerosol-delivery (e.g. smoking substitute) device.

[0079] The component may be an aerosol-delivery (e.g. a smoking substitute) consumable i.e. in some embodiments the component may be a consumable component for engagement with the aerosol-delivery (e.g. a smoking substitute) device to form the aerosol-delivery (e.g. s smoking substitute) system.

[0080] The device may be configured to receive the consumable component. For example the device and the consumable component may be configured to be physically coupled together. For example, the consumable component may be at least partially received in a recess of the device, such that there is snap engagement between the device and the consumable component. Alternatively, the device and the consumable component may be physically coupled together by screwing one onto the other, or through a bayonet fitting.

[0081] Thus, the consumable component may comprise one or more engagement portions for engaging with the device.

[0082] The device and consumable component may be coupled together by magnetic attraction. For example, the device may comprise at least one magnet whilst the component may comprise a magnet or ferrous metal plate/portion.

[0083] The consumable component may comprise an electrical interface for interfacing with a corresponding electrical interface of the device. One or both of the electrical interfaces may include one or more electrical contacts. Thus, when the device is engaged with the consumable component, the electrical interface may be configured to transfer electrical power from the power source to a heating element of the consumable component. The electrical interface may also be used to identify the consumable component from a list of known types. The electrical interface may additionally or alternatively be used to identify when the consumable component is connected to the device.

[0084] The device may alternatively or additionally be able to detect information about the consumable component via an RFID reader, a barcode or QR code reader. This interface may be able to identify a characteristic (e.g. a type) of the consumable. In this respect, the consumable component 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.

[0085] In other embodiments, the component may be integrally formed with the aerosol-delivery (e.g. a smoking substitute) device to form the aerosol-delivery (e.g. s smoking substitute) system.

[0086] In such embodiments, the aerosol former (e.g. e-liquid) may be replenished by re-filling a tank that is integral with the device (rather than replacing the consumable). Access to the tank (for re-filling of the e-liquid) may be provided via e.g. an opening to the tank that is sealable with a closure (e.g. a cap).

[0087] Further features of the device are described below. These are applicable to both the device for receiving a consumable component and to the device integral with the component.

[0088] The device may comprise a power source e.g. a rechargeable battery. The device may comprise a controller.

[0089] 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. The device 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.

[0090] An airflow (i.e. puff) sensor may be provided that is configured to detect a puff (i.e. inhalation from a user). The airflow 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 airflow sensor may, for example, be in the form of a pressure sensor or an acoustic sensor. The controller may control power supply to a heating element in response to airflow detection by the sensor. The control may be in the form of activation of the heating element in response to a detected airflow. The airflow sensor may form part of the device.

[0091] In a third aspect there is provided a method of using the aerosol-delivery (e.g. smoking substitute) consumable component according to the first aspect, the method comprising engaging the consumable component with an aerosol-delivery (e.g. smoking substitute) device (as described above) having a power source so as to electrically connect the power source to the consumable component (i.e. to the vaporiser of the consumable component).

[0092] 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

[0093] So that further aspects and features thereof may be appreciated, embodiments will now be discussed in further detail with reference to the accompanying fig-

ures, in which:

- Fig. 1A is a front schematic view of a smoking substitute system;
- Fig. 1B is a front schematic view of a device of the system;
- Fig. 1C is a front schematic view of a component of the system;
- Fig. 2A is a schematic of the elements of the device;
- Fig. 2B is a schematic of the elements of the component;
- Fig. 3 is a schematic view of the component according to the first aspect in a first orientation;
- Fig. 4 is a schematic view of the component according to the first aspect in a second orientation;
- Fig. 5A is a schematic view of a ball valve in an open configuration;
- Fig. 5B is a schematic view of the ball valve of Fig. 5A in a closed configuration;
- Fig. 5C is another schematic view of the ball valve of Fig. 5A in a closed configuration;
- Fig. 6A is a schematic view of a pivotable flap valve in an open configuration; and
- Fig. 6B is a schematic view of the pivotable flap of Fig. 6A valve in a closed configuration.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0094] Fig. 1A shows a first embodiment of a smoking substitute system 100. In this example, the smoking substitute system 100 includes a device 102 and a component 104. The component 104 may alternatively be referred to as a "pod", "cartridge" or "cartomizer". It should be appreciated that in other examples (i.e. open systems), the device may be integral with the component. In such systems, a tank of the aerosol delivery system may be accessible for refilling the device.

[0095] In this example, the smoking substitute system 100 is a closed system vaping system, wherein the component 104 includes a sealed tank 106 and is intended for single-use only. The component 104 is removably engageable with the device 102 (i.e. for removal and replacement). Fig. 1A shows the smoking substitute system 100 with the device 102 physically coupled to the component 104, Fig. 1B shows the device 102 of the smoking substitute system 100 without the component 104, and Fig. 1C shows the component 104 of the smoking substitute system 100 without the device 102.

[0096] The device 102 and the component 104 are configured to be physically coupled together by pushing the component 104 into a cavity at an upper end 108 of the device 102, such that there is an interference fit and/or a magnetic connection between the device 102 and the component 104. In other examples, the device 102 and the component may be coupled by screwing one onto the other, or through a bayonet fitting.

[0097] The component 104 includes a mouthpiece portion at an upper end 109 of the component 104, and one or more air inlets (not shown) in fluid communication with the mouthpiece portion such that air can be drawn into and through the component 104 when a user inhales through the mouthpiece portion. The tank 106 containing e-liquid is located at the lower end 111 of the component 104.

[0098] The tank 106 includes a window 112, which allows the amount of e-liquid in the tank 106 to be visually assessed. The device 102 includes a slot 114 so that the window 112 of the component 104 can be seen whilst the rest of the tank 106 is obscured from view when the component 104 is inserted into the cavity at the upper end 108 of the device 102.

[0099] The lower end 110 of the device 102 also includes a light 116 (e.g. an LED) located behind a small translucent cover. The light 116 may be configured to illuminate when the smoking substitute system 100 is activated. Whilst not shown, the component 104 may identify itself to the device 102, via an electrical interface, RFID chip, or barcode.

[0100] The lower end 110 of the device 102 also includes a charging connection 115, which is usable to charge a battery within the device 102. The charging connection 115 can also be used to transfer data to and from the device, for example to update firmware thereon.

[0101] Figs. 2A and 2B are schematic drawings of the device 102 and component 104. As is apparent from Fig. 2A, the device 102 includes a power source 118, a controller 120, a memory 122, a wireless interface 124, an electrical interface 126, and, optionally, one or more additional components 128.

[0102] The power source 118 is preferably a battery, more preferably a rechargeable battery. The controller 120 may include a microprocessor, for example. The memory 122 preferably includes non-volatile memory. The memory may include instructions which, when implemented, cause the controller 120 to perform certain tasks or steps of a method.

[0103] The wireless interface 124 is preferably configured to communicate wirelessly with another device, for example a mobile device, e.g. via Bluetooth®. To this end, the wireless interface 124 could include a Bluetooth® antenna. Other wireless communication interfaces, e.g. WiFi®, are also possible. The wireless interface 124 may also be configured to communicate wirelessly with a remote server.

[0104] The electrical interface 126 of the device 102 may include one or more electrical contacts. The electrical interface 126 may be located in a base of the aperture in the upper end 108 of the device 102. When the device 102 is physically coupled to the component 104, the electrical interface 126 is configured to transfer electrical power from the power source 118 to the component 104 (i.e. upon activation of the smoking substitute system 100).

[0105] The electrical interface 126 may also be used to identify the component 104 from a list of known components. For example, the component 104 may be a par-

ticular flavour and/or have a certain concentration of nicotine (which may be identified by the electrical interface 126). This can be indicated to the controller 120 of the device 102 when the component 104 is connected to the device 102. Additionally, or alternatively, there may be a separate communication interface provided in the device 102 and a corresponding communication interface in the component 104 such that, when connected, the component 104 can identify itself to the device 102.

[0106] The additional components 128 of the device 102 may comprise the light 116 discussed above.

[0107] The additional components 128 of the device 102 also comprises the charging connection 115 configured to receive power from the charging station (i.e. when the power source 118 is a rechargeable battery). This may be located at the lower end 110 of the device 102.

[0108] The additional components 128 of the device 102 may, if the power source 118 is a rechargeable battery, include a battery charging control circuit, for controlling the charging of the rechargeable battery. However, a battery charging control circuit could equally be located in a charging station (if present).

[0109] The additional components 128 of the device 102 may include a sensor, such as an airflow (i.e. puff) sensor for detecting airflow in the smoking substitute system 100, e.g. caused by a user inhaling through a mouthpiece portion 136 of the component 104. The smoking substitute system 100 may be configured to be activated when airflow is detected by the airflow sensor. This sensor could alternatively be included in the component 104. The airflow sensor can be used to determine, for example, how heavily a user draws on the mouthpiece or how many times a user draws on the mouthpiece in a particular time period.

[0110] The additional components 128 of the device 102 may include a user input, e.g. a button. The smoking substitute system 100 may be configured to be activated when a user interacts with the user input (e.g. presses the button). This provides an alternative to the airflow sensor as a mechanism for activating the smoking substitute system 100.

[0111] As shown in Fig. 2B, the component 104 includes the tank 106, an electrical interface 130, a vaporiser 132, one or more air inlets 134, a mouthpiece portion 136, and one or more additional components 138.

[0112] The electrical interface 130 of the component 104 may include one or more electrical contacts. The electrical interface 126 of the device 102 and an electrical interface 130 of the component 104 are configured to contact each other and thereby electrically couple the device 102 to the component 104 when the lower end 111 of the component 104 is inserted into the upper end 108 of the device 102 (as shown in Fig. 1A). In this way, electrical energy (e.g. in the form of an electrical current) is able to be supplied from the power source 118 in the device 102 to the vaporiser 132 in the component 104.

[0113] The vaporiser 132 is configured to heat and vaporise e-liquid contained in the tank 106 using electrical energy supplied from the power source 118. As will be described further below, the vaporiser 132 includes a heating filament and a wick. The wick draws e-liquid from the tank 106 and the heating filament heats the e-liquid to vaporise the e-liquid.

[0114] The one or more air inlets 134 are preferably configured to allow air to be drawn into the smoking substitute system 100, when a user inhales through the mouthpiece portion 136. When the component 104 is physically coupled to the device 102, the air inlets 134 receive air, which flows to the air inlets 134 along a gap between the device 102 and the lower end 111 of the component 104.

[0115] In operation, a user activates the smoking substitute system 100, e.g. through interaction with a user input forming part of the device 102 or by inhaling through the mouthpiece portion 136 as described above. Upon activation, the controller 120 may supply electrical energy from the power source 118 to the vaporiser 132 (via electrical interfaces 126, 130), which may cause the vaporiser 132 to heat e-liquid drawn from the tank 106 to produce a vapour which is inhaled by a user through the mouthpiece portion 136.

[0116] An example of one of the one or more additional components 138 of the component 104 is an interface for obtaining an identifier of the component 104. As discussed above, this interface may be, for example, an RFID reader, a barcode, a QR code reader, or an electronic interface which is able to identify the component. The component 104 may, therefore 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 electronic interface in the device 102.

[0117] It should be appreciated that the smoking substitute system 100 shown in figures 1A to 2B is just one exemplary implementation of a smoking substitute system. For example, the system could otherwise be in the form of an entirely disposable (single-use) system or an open system in which the tank is refillable (rather than replaceable).

[0118] Fig. 3 is a schematic view of an example of the component 104 described above. The component 104 comprises a tank 106 for storing e-liquid, a mouthpiece portion 136 and a conduit 140 extending along a longitudinal axis of the component 104. In the illustrated embodiment the conduit 140 is in the form of a tube having a substantially circular transverse cross-section (i.e. transverse to the longitudinal axis). The tank 106 surrounds the conduit 140, such that the conduit 140 extends centrally through the tank 106.

[0119] A component housing 142 defines an outer casing of the component 104. The component housing 142 extends from a lower shell 158 at the lower end 111 of the component 104 to the mouthpiece portion 136 at the upper end 109 of the component 104. The component housing may define a lip or shoulder which acts as a stop feature when the component 104 is inserted into the device 102 (i.e. by contact with an upper edge of the device

102).

[0120] The tank 106, the conduit 140 and the mouthpiece portion 136 are integrally formed with each other so as to form a single unitary component and may e.g. be formed by way of an injection moulding process. Such a component may be formed of a thermoplastic material.

[0121] The mouthpiece portion 136 comprises a mouthpiece aperture 148 defining an outlet of the conduit 140. A vaporiser 132 is downstream of the inlet 134 of the component 104 and is fluidly connected to the mouthpiece aperture 148 (i.e. outlet) by the conduit 140.

[0122] The vaporiser 132 comprises a porous ceramic wick and a heater track (not shown) printed onto the bottom surface (facing the inlet 34) of the ceramic wick or the vaporiser may comprise a cylindrical porous wick with a coiled heating filament.

[0123] The porous ceramic wick and heater track vaporiser 132 may form the base of the tank 106 so that the aerosol precursor is in contact with the wick and may move axially into the wick.

[0124] Alternatively, the cylindrical wick and coiled heating filament may extend into opposing lower portions 106a, 106b of the tank so that the aerosol precursor may move radially into the wick.

[0125] The aerosol precursor is heated by the heater track (when activated e.g. by detection of inhalation), which causes the aerosol precursor to be vaporised and to be entrained in air flowing past the wick. This vaporised liquid may cool to form an aerosol in the conduit 140, which may then be inhaled by a user.

[0126] The lower shell 158 of the component housing 142 has an opening that accommodates the electrical interface 119 of the consumable component 102 comprising two electrical contacts 136a, 136b that are electrically connected to the heater track. In this way, when the consumable component 104 is engaged with the device 102, power can be supplied from the power source 118 of the device to the heater track.

[0127] The component 104 is illustrated in fig. 3 in a first (upright/use) orientation with the mouthpiece portion 136 and air outlet 148 being vertically uppermost relative to the tank 106. A central axis of the component from the tank 106 to the mouthpiece portion 136 is substantially vertical. The component 104 is illustrated in fig. 4 in a second (inverted/use) orientation with the mouthpiece portion 136 and air outlet 148 being vertically lowermost relative to the tank 106. The central axis of the component from the mouthpiece portion 136 to the tank 106 is substantially vertical.

[0128] The tank 106 has a tank wall portion 460 located at an upper wall 462 of the tank 106. The tank wall portion 460 defines a bleed port 464 consisting of a channel that extends through the tank wall portion 460. This bleed port 464 provides a route from inside the tank 106 to a void 466 within the component 104, specifically, to a void 466 within the mouthpiece portion 136 of the component 404.

[0129] The component 104 also comprises a valve 468. The valve 468 includes a moveable valve member (see figures 5A-C and 6A-C) that is configured to at least partially open the bleed port 464 when the component 104 is in the first (substantially upright) orientation as illustrated in Fig. 3 and to block the bleed port 464 when the component 104 is in the second (substantially inverted) orientation as illustrated in Fig. 4.

[0130] The component 104 further includes a bleed inlet 470. As illustrated in Figs. 3 and 4, this bleed inlet 470 may be provided through the housing 142 of the mouthpiece portion 136, however, the bleed inlet 470 may alternatively or additionally be provided through the wall of the conduit 140 downstream of the tank 106.

[0131] Figs. 5A-5C are schematic views of an exemplary valve 568. The valve 568 consists of a ball valve including a movable valve member 570 in the form of a stainless-steel ball-bearing, and a valve cage 572 retaining the ball 570. The cage 572 includes an open end 574 attached to the tank wall portion 460 and a cage portion 576 that extends from the open end 574 and into the tank 106. The cage portion 576 is formed from a liquid permeable material (e.g. a meshed wire, fabric, etc.), such that liquid (and/or air) can flow through the cage portion 576.

[0132] The cage 572 has a depth that is greater than the diameter of the ball 570. Accordingly, the ball 570 is able to move along the axis of the cage 572 as the orientation of the component 104 (and thus valve) is changed.

[0133] Fig. 5A shows the ball valve 568 in the open configuration. The ball valve 568 is configured to be in open configuration when the component 404 is in the first (upright) orientation. In this open configuration, the weight of the ball 570 causes the ball 570 to rest at the lower end 582 of the cage 572 distal the bleed port 464. In the open configuration, the bleed port 464 is unobstructed. Accordingly, air is able to pass through the bleed port 464 and transfer from the void 466 into the tank 106 of the component 104 to avoid a reduction of pressure within the tank 106 as liquid aerosol precursor is depleted.

[0134] Fig. 5B shows the ball valve 568 in a closed configuration. The ball valve 568 is configured to be in the closed configuration when the component 404 is in the second (inverted) orientation. In this configuration, the (non-buoyant) ball 570 sinks within the tank 106 and subsequently engages with a compressible sealing element 578 that surrounds the bleed port 464, and thereby blocks and seals the bleed port 464. As a result, liquid within the tank 106 is prevented from leaking out because of the liquid seal formed between the ball 570 and the sealing element 578.

[0135] The valve cage portion 576 further comprises tapered walls 580 that taper from a narrower cage portion 582 distal the bleed port 464 to a wider cage portion 584 proximal the bleed port 464. These tapered walls 580 bias the ball 570 towards the sealing element 578 / bleed port 464 when the component 104 is moved from the first

(upright) to the second (inverted) orientation.

[0136] For example, Fig. 5C shows the ball valve 568 when the component 404 is oriented horizontally, i.e. such that the central elongate axis extending from the mouthpiece portion 136 to the tank 106 and from the upper tank wall 462 to lower tank wall 463 is approximately 90 degrees from the vertical. Here, the tapered walls 580 promote the non-buoyant ball 570 to roll along the cage 572 from the narrower cage portion 582 distal to the bleed port 464 to the wider cage 584 portion proximal to the bleed port 464. Accordingly, in this substantially inverted orientation, the ball 570 engages with the sealing element 578 and provides a liquid seal, thereby preventing liquid leakage from the tank 106.

[0137] Figs. 6A and 6B are schematic views of another, namely, a pivotable flap valve 668. The pivotable flap valve 668 comprises a flap 686 that is connected to the tank wall portion 460 by a hinge 688. The hinge 688 enables the flap 686 to pivot between an open and closed configuration. The open configuration (as shown in Fig. 6A) occurs when the component 404 is orientated in the first (upright) orientation. Here, the weight of the flap 686 causes the flap 686 to pivot open, which in turn results in the bleed port 464 being exposed, and air being able to enter and leave the tank 106. On the other hand, the closed configuration (as shown in Fig. 6B) occurs when the component 404 is oriented in the second (inverted orientation). Here, the weight of the (non-buoyant) flap 686 causes the flap 686 to sink in the tank liquid and cover/engage with the sealing element 578 surrounding the bleed port 470. Resultantly, the bleed port 470 is blocked and leakage of liquid from the tank is inhibited.

[0138] 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.

[0139] 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.

[0140] 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%.

[0141] 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. An aerosol-delivery component, comprising:

   a tank for liquid aerosol precursor having a tank wall portion that defines a bleed port; and
   a valve having a moveable valve member configured to at least partially open the bleed port in a first orientation of the component and configured to block the bleed port in second orientation of the component.

2. A component according to claim 1 wherein the first orientation of the component is an upright orientation in which liquid aerosol precursor within the tank is not in contact with the tank wall portion defining the bleed port.

3. A component according to claim 1 or 2 wherein the second orientation of the component is an inverted orientation in which liquid aerosol precursor within the tank is in contact with at least part of the tank wall portion defining the bleed port.

4. A component according to any one of claims 1 to 3 wherein the component comprises a vaporiser and wherein the first orientation comprises a use orientation in which the vaporiser is used to deplete the liquid aerosol precursor.

5. A component according to any one of the preceding claims in which the component is an axially elongate component and comprises a mouthpiece portion defining an air outlet, an elongate axis of the component extending from the tank to the mouthpiece portion and wherein, in the first orientation, an inversion angle of the elongate axis from vertical is less than 90 degrees and/or wherein, in the second orientation, the inversion angle of the elongate axis from vertical is 90 degrees or more.

6. A component according to any one of the preceding claims wherein the bleed port is an aperture or channel extending through the tank wall portion from a tank-side opening into a void within the component.

7. A component according to claim 6 wherein the component further comprises a bleed inlet to allow bleed of air into the void.

8. A component according to claim 6 or 7 wherein the valve has an open configuration in which the tank-side opening of the bleed port is at least partially unobscured by the moveable valve member. and a closed configuration in which the tank-side opening of bleed port is at least partially blocked by the moveable valve member to form a liquid seal.

9. A component according to any one of the preceding claims wherein the moveable valve member is a ball or flap.

10. A component according to claim 9 wherein the valve further comprising a retaining member for retaining the moveable valve member in proximity to the bleed port.

11. A component according to claim 10 wherein the moveable member is a ball and the retaining member is a cage having an open end secured to the tank wall portion.

12. A component according to claim 10 wherein the moveable member is a flap and the retaining member is a hinge portion of the flap.

13. A component according to any one of the preceding claims wherein the valve member is actuated by gravity.

14. A component according to any one of the preceding claims which is a consumable component for receipt in a smoking substitute device.

15. An aerosol-delivery system comprising a component according to any one of the preceding claims and a device comprising a power source.

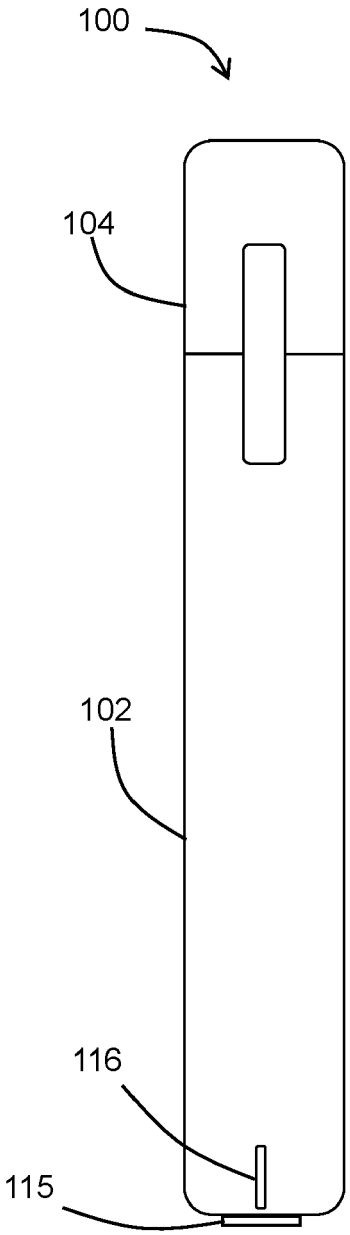

FIG 1A

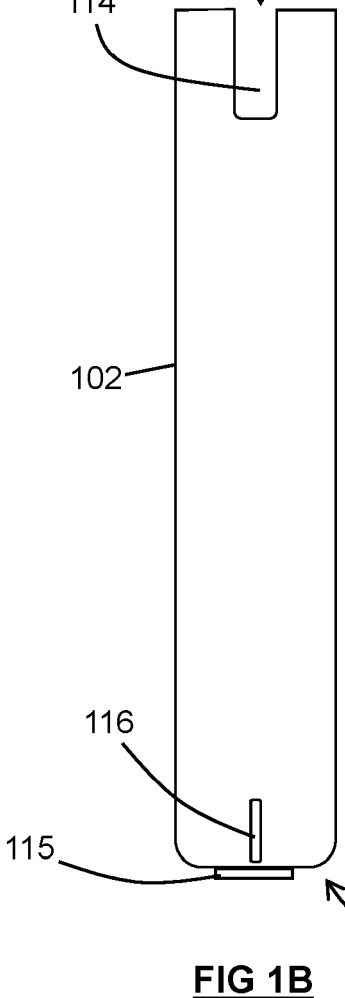

FIG 1B

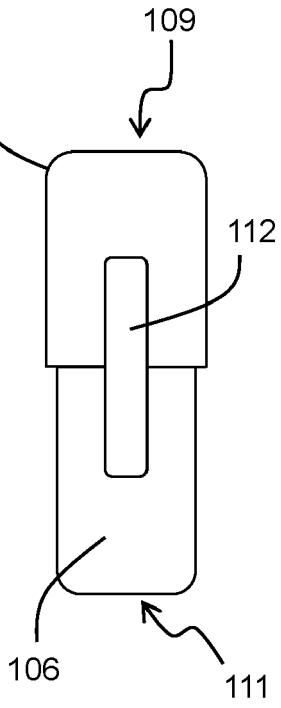

FIG 1C

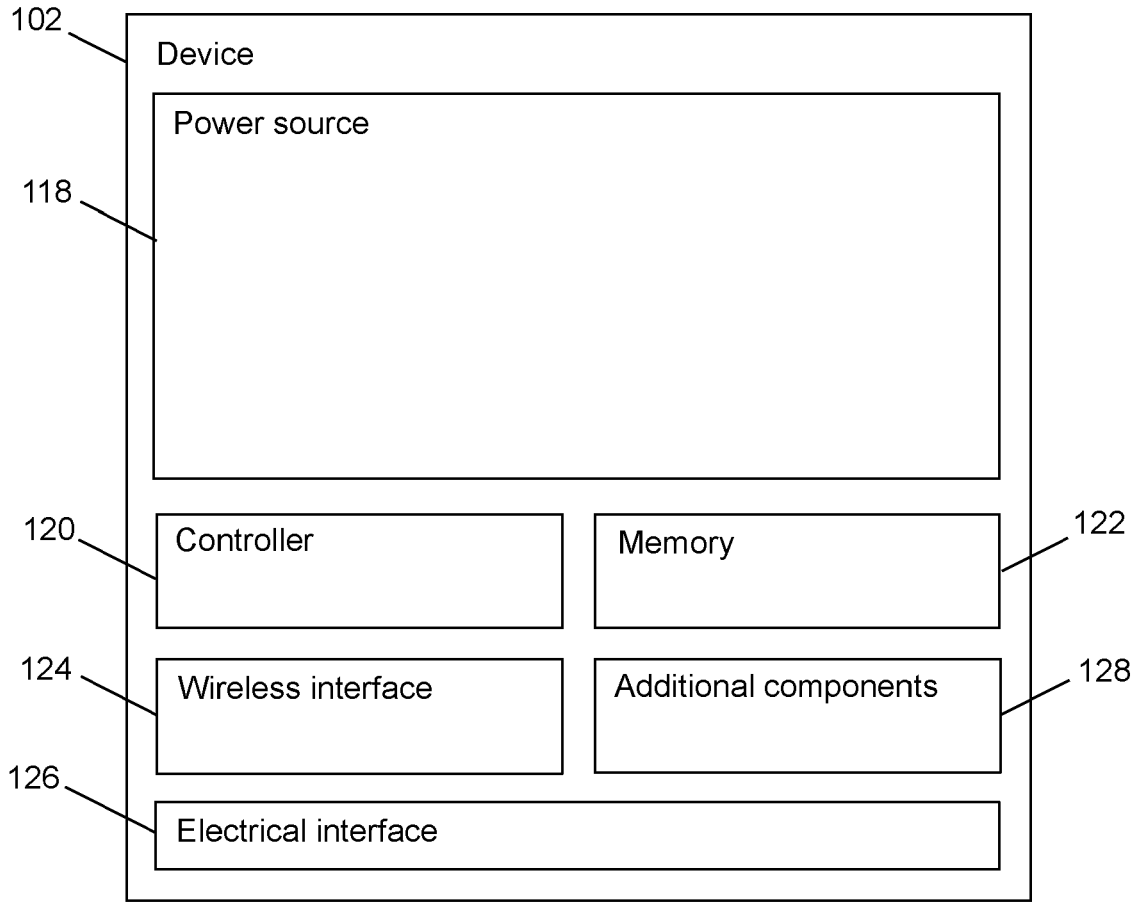
102
Device
Power source
118
120
Controller
Memory
122
124
Wireless interface
Additional components
128
126
Electrical interface

FIG 2A

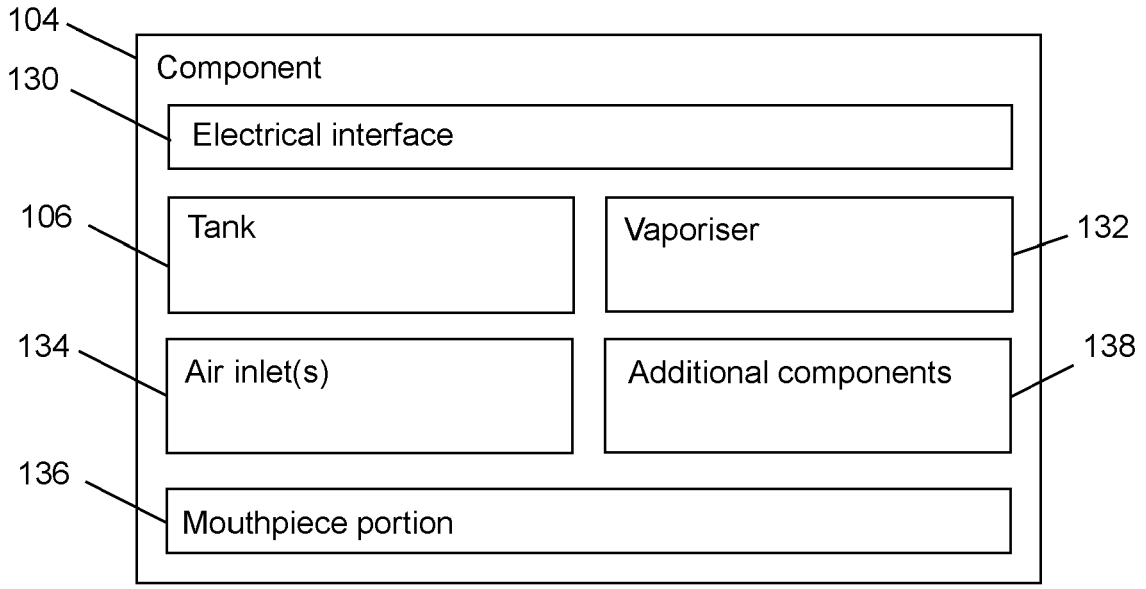
104
Component
130
Electrical interface
106
Tank
Vaporiser
132
134
Air inlet(s)
Additional components
138
136
Mouthpiece portion

FIG 2B

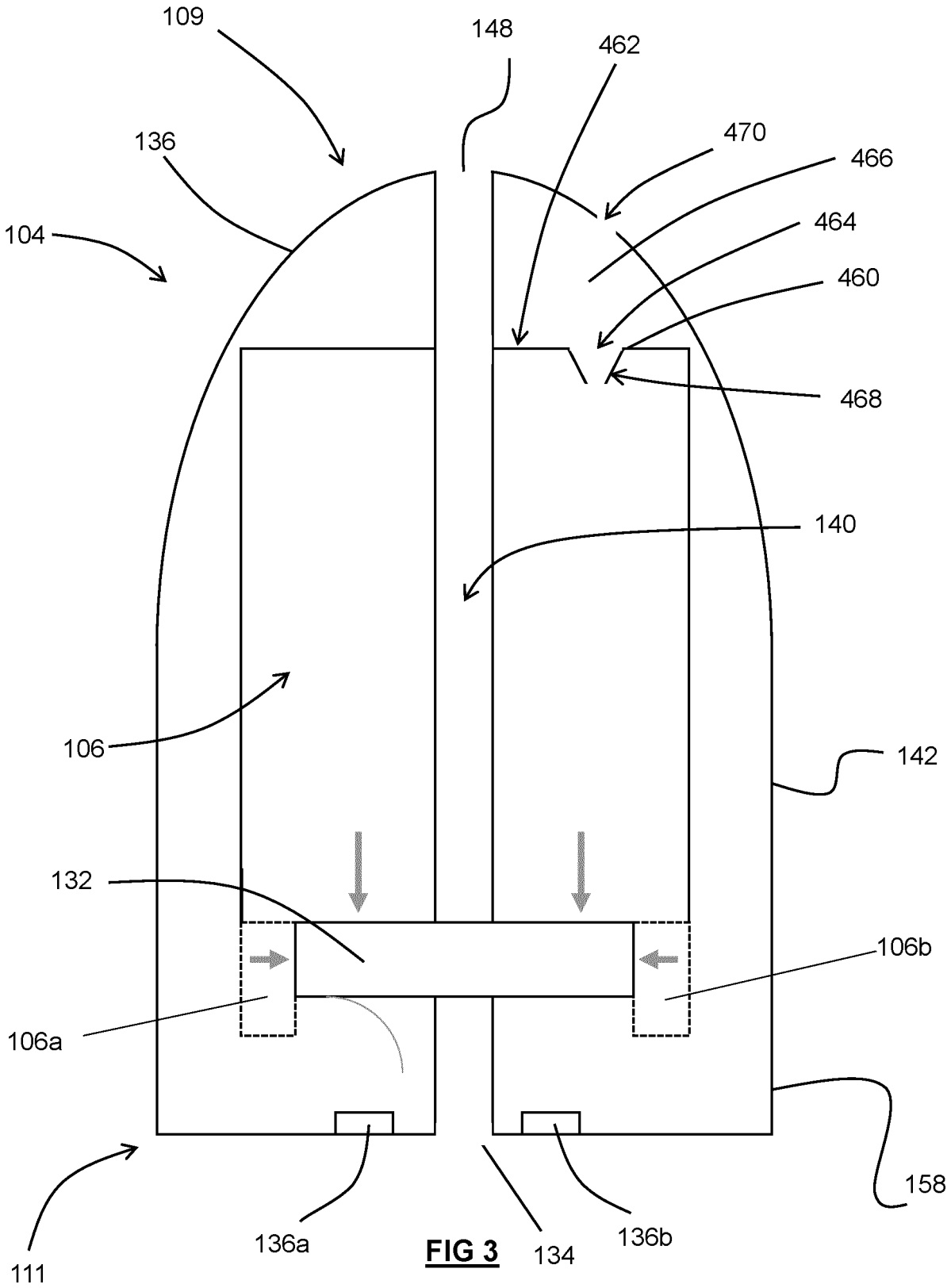
109
148
462
136
470
466
104
464
460
468
140
106
142
132
106b
106a
158
111
136a
134
136b

FIG 3

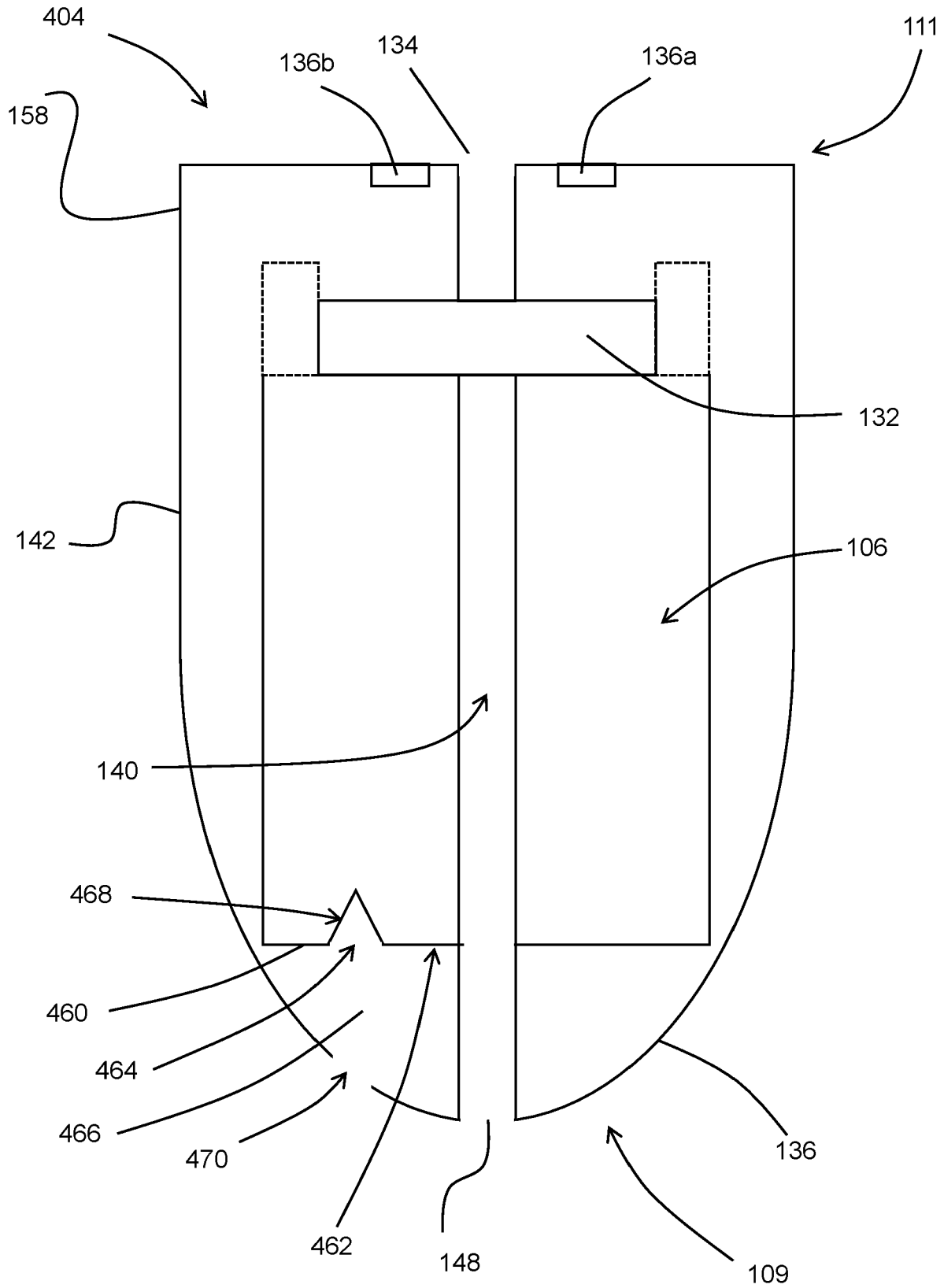
404
111
136b
134
136a
158
132
142
106
140
468
460
464
466
470
462
148
136
109

FIG 4

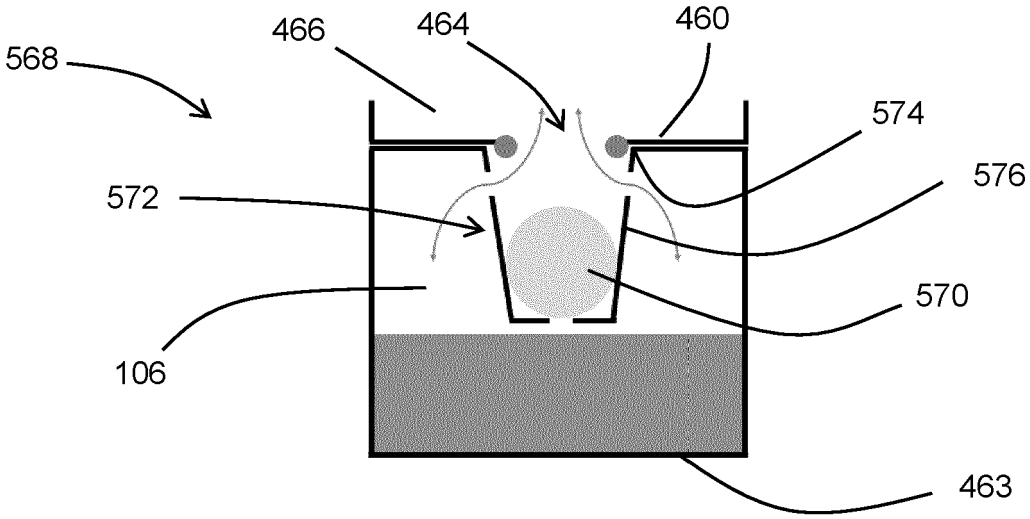

FIG 5A

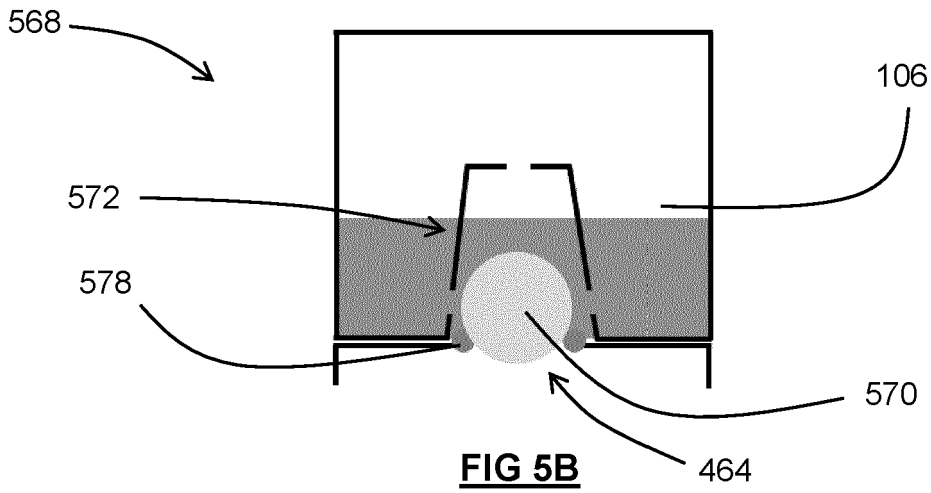

FIG 5B

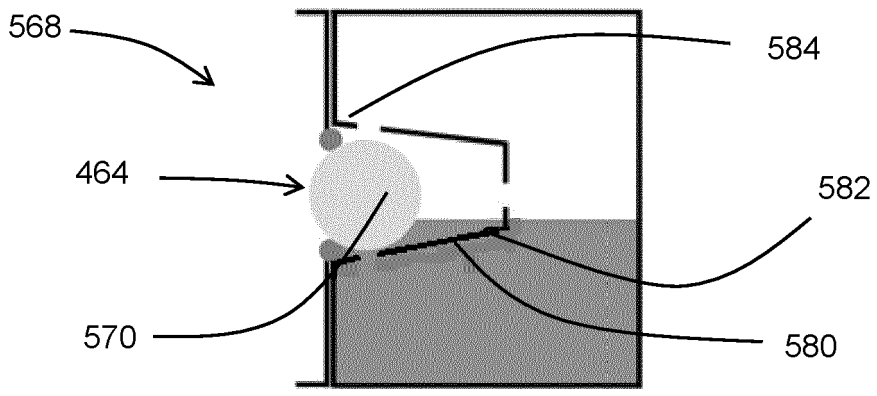

FIG 5C

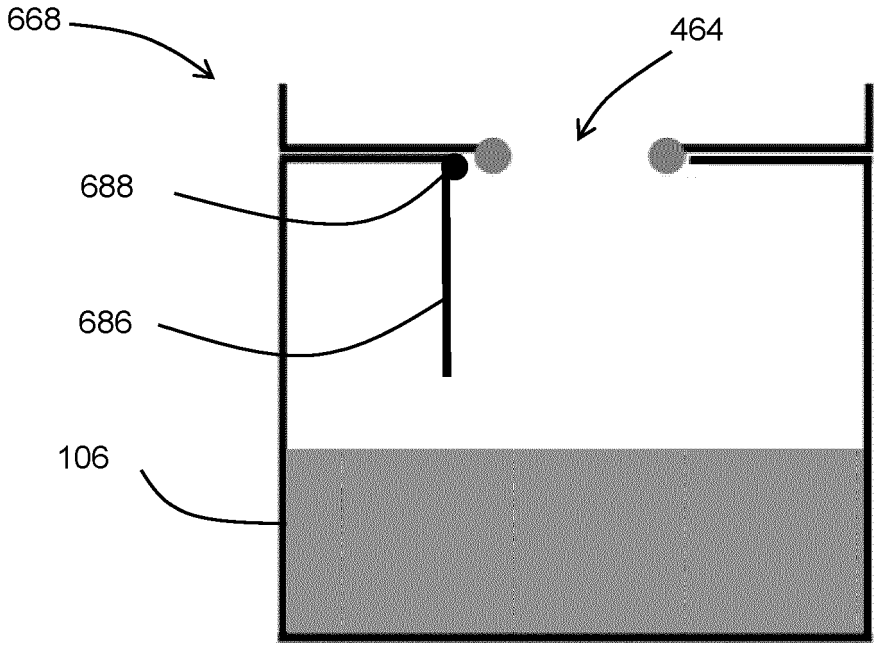

FIG 6A

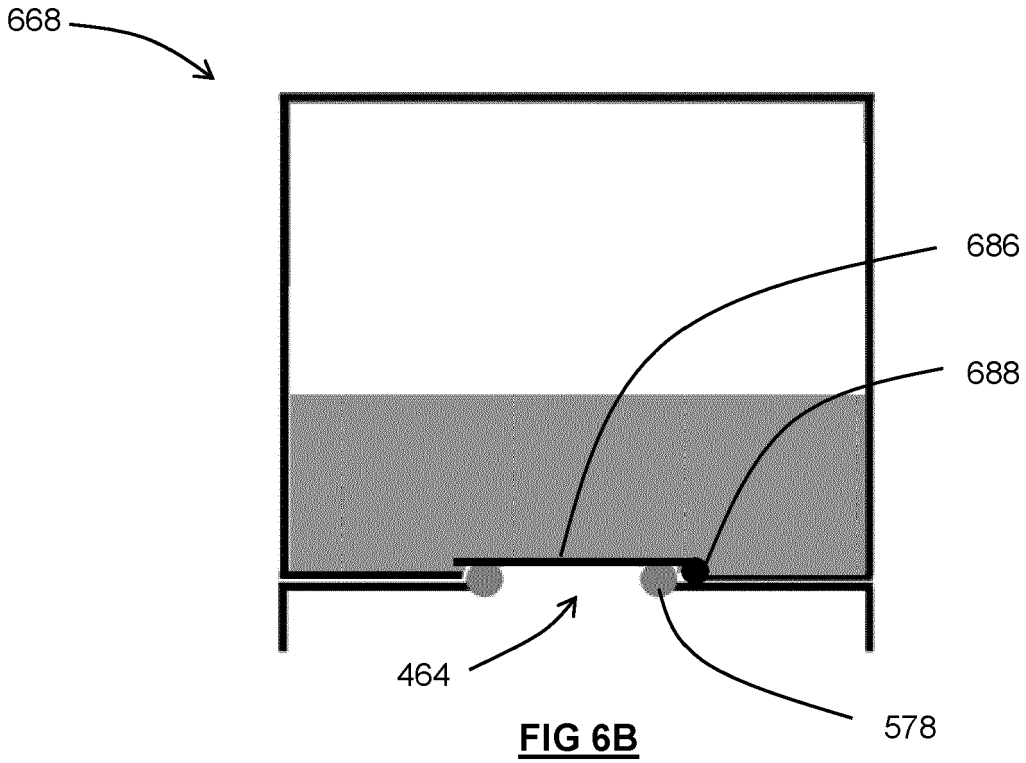

FIG 6B

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EUROPEAN SEARCH REPORT

Application Number
EP 21 21 5051

DOCUMENTS CONSIDERED TO BE RELEVANT

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			A24F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	19 May 2022	Paulson, Bo

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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D : document cited in the application
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 21 21 5051

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