(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 714 709 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
30.09.2020 Bulletin 2020/40

(51) Int Cl.:
A24F 47/00 *(2020.01)*

(21) Application number: **19166271.7**

(22) Date of filing: **29.03.2019**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(71) Applicant: **NERUDIA LIMITED**
Liverpool Merseyside L24 9HP (GB)

(72) Inventor: **The designation of the inventor has not yet been filed**

(74) Representative: **Mewburn Ellis LLP**
Aurora Building
Counterslip
Bristol BS1 6BX (GB)

(54) **AEROSOL DELIVERY DEVICE**

(57) The present disclosure provides an aerosol delivery device having a chamber airflow path through a vaporising chamber housing a vaporiser. The chamber airflow path extends through at least one aperture defined by an upstream edge of a transverse baffle mounted downstream from the vaporiser. The chamber airflow path through the at least one aperture has a transverse cross-sectional area that is substantially equal or less than a minimum transverse cross-sectional area of the chamber airflow path downstream from the at least one aperture.

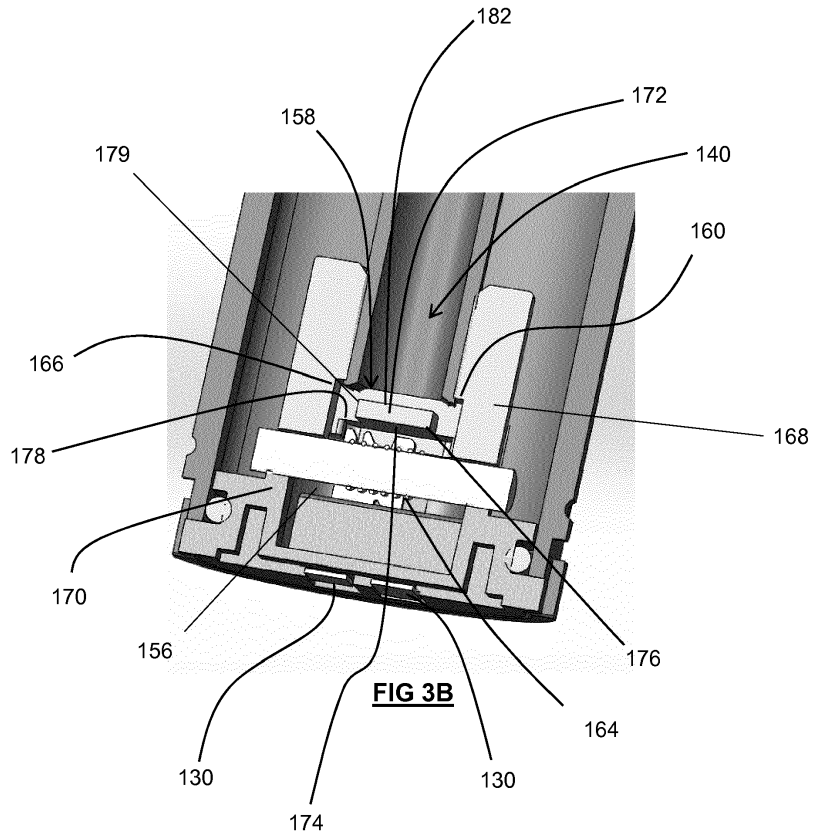

FIG 3B

EP 3 714 709 A1

Description

Field of the Invention

[0001] The present invention relates to an aerosol delivery device, and, more particularly but not exclusively, to an aerosol delivery device for 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 devices in order to avoid the smoking of tobacco.

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

[0005] Smoking substitute devices, 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 devices 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 devices 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 devices as desirable lifestyle accessories. Some smoking substitute devices are designed to resemble a traditional cigarette and are cylindrical in form with a mouthpiece at one end. Other smoking substitute devices 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 devices, 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 device 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 device 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 devices can be configured in a variety of ways. For example, there are "closed system" vaping smoking substitute devices 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 devices include a main body which includes the power source, wherein the main body is configured to be physically and electrically coupled to a consumable including the tank and the heater. In this way, when the tank of a consumable has been emptied, the main body can be reused by connecting it to a new consumable. Another subset of closed system vaping smoking substitute devices are completely disposable, and intended for one-use only.

[0012] There are also "open system" vaping smoking substitute devices which typically have a tank that is configured to be refilled by a user, so the device can be used multiple times.

[0013] An example vaping smoking substitute device is the myblu™ e-cigarette. The myblu™ e cigarette is a closed system device which includes a main body and a consumable. The main body and consumable are physically and electrically coupled together by pushing the consumable into the main body. The main body includes a rechargeable battery. The consumable includes a mouthpiece, a sealed tank which contains e-liquid, as well as a vaporiser, which for this device is a heating filament coiled around a portion of a wick which is partially immersed in the e-liquid. The device is activated when a microprocessor on board the main body detects a user inhaling through the mouthpiece. When the device 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 device is the blu PRO™ e-cigarette. The blu PRO™ e cigarette is an open system device which includes a main body, a (refillable) tank, and a mouthpiece. The main body and tank are physically and electrically coupled together by screwing one to the other. The mouthpiece and refillable tank are physically coupled together by screw-

ing one into the other, and detaching the mouthpiece from the refillable tank allows the tank to be refilled with e-liquid. The device is activated by a button on the main body. When the device 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] In prior art smoking substitute devices, some of the unvaporised e-liquid passes through the wick and to the mouthpiece. This may result in unvaporised e-liquid passing into the user's mouth, which may be unpleasant for the user. Further leakage occurs due to leakage paths present between the components of the consumable.

[0016] The present invention has been devised in light of the above considerations. Additionally, it is desirable to provide consumables which are easier and cheaper to manufacture

Summary of the Invention

[0017] At its most general, the present invention relates to an aerosol delivery device in which an airflow path around an airflow-directing member (baffle) within a vaporising chamber has a reduced cross-sectional area to match a minimum upstream cross-sectional area of the airflow path in the vaporising chamber.

[0018] In a first aspect, there is provided an aerosol delivery device having a chamber airflow path through a vaporising chamber housing a vaporiser, the chamber airflow path extending through at least one aperture defined by an upstream edge of a transverse baffle mounted downstream from the vaporiser, wherein the chamber airflow path through the at least one aperture has a transverse cross-sectional area that is substantially equal or less than a minimum transverse cross-sectional area of the chamber airflow path downstream from the at least one aperture.

[0019] The inclusion of a baffle downstream from the vaporiser may help to reduce (or prevent) un-vaporised liquid from the vaporiser passing to the user. The un-vaporised liquid may collect on an upstream surface of the baffle facing the vaporiser, whilst vapour is able to pass through the aperture(s) defined by the upstream edge of the baffle. Reducing the size of the aperture so that it has an equal or smaller transverse cross-sectional area (perpendicular to the chamber airflow path) than the chamber airflow path downstream of the aperture(s), effectively reduces the surface area of a downstream end wall of the chamber that is exposed to the air flow in the chamber airflow path through the aperture. In this way, it is possible to reduce or eliminate the chance of un-vaporised liquid depositing on this chamber end wall and thus being carried into the airflow downstream of the aperture(s).

[0020] The terms "transversely" and "transverse" are used herein in relation to the cross-sectional area of the airflow path to describe a direction that is substantially perpendicular to the airflow path. The terms "transversely" and "transverse" are used herein in relation to components of the device to describe a direction that is substantially perpendicular to the axial (longitudinal) direction of the device.

[0021] The device has a device airflow path extending from at least one inlet of the device to an outlet of the device with the vaporising chamber interposed between the inlet(s) and the outlet. The term "upstream" is used to define a direction towards the inlet(s) of the device. The term "downstream" is used to define a direction towards the outlet of the device.

[0022] Optional features of the present disclosure will now be set out. These are applicable singly or in any combination with any aspect of the present disclosure.

[0023] In some embodiments, the chamber airflow path has a portion extending from the aperture to a downstream edge of the transverse baffle wherein the chamber airflow path at the downstream edge of the transverse baffle has a transverse cross-sectional area that is substantially equal or less than a minimum transverse cross-sectional area of the chamber airflow path downstream from the downstream edge of the transverse baffle.

[0024] In some embodiments, the portion of the chamber airflow path extending from the aperture to the downstream edge of the transverse baffle has a constant transverse cross-sectional area.

[0025] The chamber airflow path is partly defined by one or more walls of the vaporising chamber. For example, the at least one aperture may be defined by the upstream edge of the baffle and the opposing sidewall of the chamber.

[0026] Where there is a constant transverse cross-sectional area between the aperture and the downstream edge of the baffle, the transverse width of the aperture (i.e. the transverse spacing between the upstream edge of the baffle and the sidewall of the chamber) equals the transverse spacing between the downstream edge of the baffle and the sidewall of the vaporising chamber.

[0027] In some embodiments, the transverse width of the aperture(s) (i.e. the transverse spacing between the upstream edge of the baffle and the sidewall of the chamber) equals (or is less than) the longitudinal spacing between the downstream edge of the baffle and the end wall of the vaporising chamber.

[0028] In some embodiments, the device comprises a passage extending longitudinally from the vaporising chamber to the outlet of the device. In these embodiments, the chamber airflow path extends to a passage opening which may be provided in a downstream end wall of the vaporising chamber.

[0029] The aperture (and the upstream/downstream edges of the baffle) may be offset transversely (i.e. laterally) from the longitudinal axis of the passage (e.g. may be radially outwards of the passage opening).

[0030] In some embodiments, the transverse width of the downstream end wall of the vaporising chamber between the passage opening and the sidewall of the vaporising chamber (measured between the radially outer-

most limit of the passage opening and the proximal sidewall) is less than the length of the chamber airflow path between the upstream edge and the downstream edge of the baffle.

[0031] In some embodiments, the chamber airflow path, between the vaporiser and the passage, may comprise at least one deflection. For example, a first portion of the chamber airflow path may extend in a generally longitudinal direction from the vaporiser to the aperture and/or the downstream edge of the baffle. A second portion of the airflow path between the first portion and the passage, may extend generally radially (laterally) e.g. generally parallel to a planar upper surface of the baffle, such that there may be a deflection between the first and second portions.

[0032] The device airflow path may comprise a third portion in the passage extending in a generally longitudinal direction. Thus, the device airflow path may deflect between the lateral direction (of the second portion) to a longitudinal direction (of the third portion) at or proximate to the passage opening.

[0033] The baffle may have two laterally opposed upstream edges that at least partly define two laterally opposed apertures (e.g. between the upstream edges and opposed sidewalls of the chamber). In this way, the chamber airflow path may be bifurcated as it passes downstream of the vaporiser. In these embodiments, it is preferable that the transverse cross-sectional area of the chamber airflow path in both branches of the bifurcated flow is as described above.

[0034] Accordingly, both branches of the bifurcated chamber airflow path may have a transverse cross-sectional area that is substantially equal or less than a minimum transverse cross-sectional area of the chamber airflow path downstream from the apertures.

[0035] In some embodiments, both branches of the bifurcated chamber airflow path have an equal transverse cross-sectional area downstream from the apertures.

[0036] The baffle may be configured (i.e. shaped and positioned) such that there is no direct longitudinal line of sight between the vaporiser and the passage. A transverse width of the baffle may be substantially the same or greater than a corresponding transverse width (or diameter) of the passage. A transverse cross-sectional area of the baffle may be substantially the same or greater than a transverse cross-sectional area of the passage. A transverse width of the baffle may be greater than 30% of a corresponding transverse width of the chamber, or may e.g. be greater than 40%, or 50%.

[0037] The passage opening (i.e. the opening from the vaporising chamber into the passage) may have a transverse cross-sectional area of more than 5 mm^2. The passage opening may have a transverse cross-sectional area of no more than 10mm^2. The passage opening may have an internal diameter of more than 2.5 mm. The passage opening may have an internal diameter of no more than 4 mm. The transverse cross-sectional area of the or each aperture may be less than the cross-sectional area of the passage opening.

[0038] There may be an inlet substantially transversely aligned with the baffle (i.e. both may be aligned along a shared longitudinal axis). The inlet may be substantially transversely aligned with the passage opening (e.g. the inlet may be aligned on the longitudinal axis). The inlet, baffle and passage opening may be aligned along the longitudinal axis.

[0039] The vaporising chamber may comprise opposing parallel sidewalls that are substantially parallel to the longitudinal axis, and a downstream (e.g. end) wall extending transversely between the sidewalls. The passage opening may be formed in the downstream wall of the chamber.

[0040] The device may comprise a tank (reservoir) for containing the vaporisable liquid (e.g. an e-liquid) with the vaporiser being in fluid communication with the tank. The e-liquid may, for example, comprise a base liquid and e.g. nicotine. The base liquid may include propylene glycol and/or vegetable glycerine.

[0041] The tank may be defined by a tank housing. At least a portion of the tank housing may be translucent. For example, the tank housing may comprise a window to allow a user to visually assess the quantity of e-liquid in the tank. The tank may be referred to as a "clearomizer" if it includes a window, or a "cartomizer" if it does not.

[0042] The passage may extend longitudinally within the tank and a passage wall may define the inner wall of the tank. In this respect, the tank may surround the passage e.g. the tank may be annular. The passage wall may comprise longitudinal ribs extending therealong. These ribs may provide support to the passage wall. The ribs may extend for the full length of the passage wall. The ribs may project (e.g. radially outwardly) into the tank.

[0043] The device may comprise an insert defining the device inlet(s). The insert may be inserted into an open end of the tank so as to seal against the tank housing. The insert may comprise an inner, longitudinally-extending sleeve that defines the wall(s) of the vaporising chamber and seals against the passage (e.g. seals against outer surfaces of the passage wall). The insert may be configured to support the vaporiser within the vaporising chamber. The insert may be formed of silicone. The baffle may be formed of silicone. The insert and the baffle may be integrally formed.

[0044] The vaporiser may comprise a heater and a wick (e.g. comprising a porous material). The wick may be elongate and extend transversely across the chamber between wall(s) (e.g. sidewalls) of the chamber (which may be defined by the inner sleeve). In order to be in fluid communication with the tank, the wick extends into the tank, e.g. one or both of its opposing transverse ends may extend into the tank, e.g. through the wall(s) of the chamber/through the inner sleeve. In this way e-liquid may be drawn (e.g. by capillary action) along the wick, from the tank to the exposed (central) portion of the wick. The wick may be oriented so as to align (in a direction of the longitudinal axis) with the or each aperture at least

partly defined by the baffle (e.g. defined between the upstream edges and wall(s) of the chamber). In this respect, the chamber airflow path may pass around, through or proximal the wick and through the aperture(s). The upstream edge(s) (and downstream edge(s) of the baffle) may extend across the chamber in a direction that is substantially perpendicular to the direction of the extension of the wick.

[0045] The heater may comprise a heating element, which may be in the form of a filament wound about the wick (e.g. the filament may extend helically about the wick). The filament may be wound about the exposed portion of the wick. The heating element may be electrically connected (or connectable) to a power source. Thus, in operation, the power source may supply electricity to (i.e. apply a voltage across) the heating element so as to heat the heating element. This may cause liquid stored in the wick (i.e. drawn from the tank) to be heated so as to form a vapour and become entrained in the chamber airflow path. This vapour may subsequently cool to form an aerosol in the vaporising chamber.

[0046] The device may be in the form of a consumable. The consumable may be configured for engagement with a main body (i.e. so as to form a smoking substitute system). For example, the consumable may comprise components of the system that are disposable, and the main body may comprise non-disposable or non-consumable components (e.g. power supply, controller, sensor, etc.) that facilitate the delivery of aerosol by the consumable. In such an embodiment, the aerosol former (e.g. e-liquid) may be replenished by replacing a used consumable with an unused consumable.

[0047] The main body and the consumable may be configured to be physically coupled together. For example, the consumable may be at least partially received in a recess of the main body, such that there is snap engagement between the main body and the consumable. Alternatively, the main body and the consumable may be physically coupled together by screwing one onto the other, or through a bayonet fitting.

[0048] Thus, the consumable may comprise one or more engagement portions for engaging with a main body. In this way, one end of the device (i.e. the inlet end) may be coupled with the main body, whilst an opposing end (i.e. the outlet end) of the consumable may define a mouthpiece.

[0049] The main body or the consumable may comprise a power source or be connectable to a power source. The power source may be electrically connected (or connectable) to the heater. The power source may be a battery (e.g. a rechargeable battery). An external electrical connector in the form of e.g. a USB port may be provided for recharging this battery.

[0050] The consumable may comprise an electrical interface for interfacing with a corresponding electrical interface of the main body. One or both of the electrical interfaces may include one or more electrical contacts. Thus, when the main body is engaged with the consumable, the electrical interface may be configured to transfer electrical power from the power source to a heater of the consumable. The electrical interface may also be used to identify the consumable from a list of known types. The electrical interface may additionally or alternatively be used to identify when the consumable is connected to the main body.

[0051] The main body may alternatively or additionally be able to detect information about the consumable 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 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.

[0052] The consumable or main body may comprise a controller, which may include a microprocessor. The controller may be configured to control the supply of power from the power source to the heater (e.g. via the electrical contacts). A memory may be provided and may be operatively connected to the controller. The memory may include non-volatile memory. The memory may include instructions which, when implemented, cause the controller to perform certain tasks or steps of a method.

[0053] The consumable or main body 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.

[0054] As is provided above, 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 the heater in response to airflow detection by the sensor. The control may be in the form of activation of the heater in response to a detected airflow. The airflow sensor may form part of the consumable or the main body.

[0055] In an alternative embodiment the device may be a non-consumable device in which an aerosol former (e.g. e-liquid) of the system may be replenished by refilling the tank of the device (rather than replacing the consumable). In this embodiment, the consumable described above may instead be a non-consumable component that is integral with the main body. Thus the device may comprise the features of the main body described above. In this embodiment, the only consumable portion may be e-liquid contained in the tank of the device. 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).

[0056] The device may be a smoking substitute device (e.g. an e-cigarette device) and, when in the form of a consumable, may be a smoking substitute consumable (e.g. an e-cigarette consumable).

[0057] In a second aspect there is disclosed a smoking substitute system comprising a main body having a power source, and a consumable as described above with respect to the first aspect, the consumable being engageable with the main body such that vaporiser of the consumable is connected to the power source of the main body.

[0058] The consumable may be an e-cigarette consumable. The main body may be as described above with respect to the first aspect. The main body may, for example, be an e-cigarette device for supplying power to the consumable.

[0059] The invention includes the combination of the aspects and preferred features described except where such a combination is clearly impermissible or expressly avoided.

Summary of the Figures

[0060] 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 front schematic view of a smoking substitute system;

Figure 1B is a front schematic view of a main body of the system;

Figure 1C is a front schematic view of a consumable of the system;

Figure 2A is a schematic of the components of the main body;

Figure 2B is a schematic of the components of the consumable;

Figure 3A is a section view of the consumable;

Figure 3B is a detailed section view of a vaporising chamber of the consumable; and

Figure 4 is a section view of a manufacturing assembly for manufacturing the consumable.

Detailed Description of the Invention

[0061] 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.

[0062] Figure 1A shows a first embodiment of a smoking substitute system 100. In this example, the smoking substitute system 100 includes a main body 102 and an aerosol delivery device in the form of a consumable 104. The consumable 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 main body may be integral with the consumable such that the aerosol delivery device incorporates the main body. In such systems, a tank of the aerosol delivery device may be accessible for refilling the device.

[0063] In this example, the smoking substitute system 100 is a closed system vaping system, wherein the consumable 104 includes a sealed tank 106 and is intended for single-use only. The consumable 104 is removably engageable with the main body 102 (i.e. for removal and replacement). Figure 1A shows the smoking substitute device 100 with the main body 102 physically coupled to the consumable 104, Figure 1B shows the main body 102 of the smoking substitute system 100 without the consumable 104, and Figure 1C shows the consumable 104 of the smoking substitute system 100 without the main body 102.

[0064] The main body 102 and the consumable 104 are configured to be physically coupled together by pushing the consumable 104 into a cavity at an upper end 108 of the main body 102, such that there is an interference fit between the main body 102 and the consumable 104. In other examples, the main body 102 and the consumable may be coupled by screwing one onto the other, or through a bayonet fitting.

[0065] The consumable 104 includes a mouthpiece (not shown in Figure 1A, 1B or 1C) at an upper end 109 of the consumable 104, and one or more air inlets (not shown) in fluid communication with the mouthpiece such that air can be drawn into and through the consumable 104 when a user inhales through the mouthpiece. The tank 106 containing e-liquid is located at the lower end 110 of the consumable 104.

[0066] The tank 106 includes a window 112, which allows the amount of e-liquid in the tank 106 to be visually assessed. The main body 102 includes a slot 114 so that the window 112 of the consumable 104 can be seen whilst the rest of the tank 106 is obscured from view when the consumable 104 is inserted into the cavity at the upper end 108 of the main body 102.

[0067] The lower end 110 of the main body 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 consumable 104 may identify itself to the main body 102, via an electrical interface, RFID chip, or barcode.

[0068] Figures 2A and 2B are schematic drawings of the main body 102 and consumable 104. As is apparent from Figure 2A, the main body 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.

[0069] 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.

[0070] 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.

[0071] The electrical interface 126 of the main body 102 may include one or more electrical contacts. The electrical interface 126 may be located in a base of the aperture in the top end 108 of the main body 102. When the main body 102 is physically coupled to the consumable 104, the electrical interface 126 is configured to transfer electrical power from the power source 118 to the consumable 104 (i.e. upon activation of the smoking substitute system 100).

[0072] The electrical interface 126 may be configured to receive power from a charging station when the main body 102 is not physically coupled to the consumable 104 and is instead coupled to the charging station. The electrical interface 126 may also be used to identify the consumable 104 from a list of known consumables. For example, the consumable 104 may be a particular 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 main body 102 when the consumable 10nected to the main body 102. Additionally, or alternatively, there may be a separate communication interface provided in the main body 102 and a corresponding communication interface in the consumable 104 such that, when connected, the consumable 104 can identify itself to the main body 102.

[0073] The additional components 128 of the main body 102 may comprise the light 116 discussed above.

[0074] The additional components 128 of the main body 102 may also comprise a charging port (e.g. USB or micro-USB port) 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 main body 102. Alternatively, the electrical interface 126 discussed above may be configured to act as a charging port configured to receive power from the charging station such that a separate charging port is not required.

[0075] The additional components 128 of the main body 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 the charging station (if present).

[0076] The additional components 128 of the main body 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 136 of the consumable 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 consumable 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.

[0077] The additional components 128 of the main body 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.

[0078] As shown in Figure 2B, the consumable 104 includes the tank 106, an electrical interface 130, a vaporiser 132, one or more air inlets 134, a mouthpiece 136, and one or more additional components 138.

[0079] The electrical interface 130 of the consumable 104 may include one or more electrical contacts. The electrical interface 126 of the main body 102 and an electrical interface 130 of the consumable 104 are configured to contact each other and thereby electrically couple the main body 102 to the consumable 104 when the lower end 111 of the consumable 104 is inserted into the upper end of the main body 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 main body 102 to the vaporiser 132 in the consumable 104.

[0080] 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.

[0081] 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 136. When the consumable 104 is physically coupled to the main body 102, the air inlets 134 receive air, which flows to the air inlets 134 along a gap between the main body 102 and the bottom end 110 of the consumable 104.

[0082] In operation, a user activates the smoking substitute device 110, e.g. through interaction with a user input forming part of the main body 102 or by inhaling through the mouthpiece 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 136.

[0083] An example of one of the one or more additional components 138 of the consumable 104 is an interface for obtaining an identifier of the consumable 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 consumable. The consumable 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 main body 102.

[0084] 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).

[0085] Figure 3A is a section view of the consumable 104 described above. The consumable 104 comprises a tank 106 for storing e-liquid, a mouthpiece 136 and a passage 140 extending along a longitudinal axis of the consumable 104. In the illustrated embodiment the passage 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 passage 140, such that the passage 140 extends centrally through the tank 106.

[0086] A tank housing 142 of the tank 106 defines an outer casing of the consumable 104, whilst a passage wall 144 defines the passage 140. The tank housing 142 extends from the lower end 111 of the consumable 104 to the mouthpiece 136 at the upper end 109 of the consumable 104. At the junction between the mouthpiece 136 and the tank housing 142, the mouthpiece 136 is wider than the tank housing 142, so as to define a lip 146 that overhangs the tank housing 142. This lip 146 acts as a stop feature when the consumable 104 is inserted into the main body 102 (i.e. by contact with an upper edge of the main body 102).

[0087] The tank 106, the passage 140 and the mouthpiece 136 are integrally formed with each other so as to form a single unitary component. As will be described further below with respect to Figure 4, this component may be formed by way of an injection moulding process and, for example, may be formed of a thermoplastic material such as polypropylene.

[0088] Although not immediately apparent from the figures, the tank housing 142 tapers, such that the thickness of the tank housing 142 decreases in a first demoulding direction (as will be discussed further with respect to Figure 4). In Figure 3A the first demoulding direction is in a downward direction away from the mouthpiece 136. This means that, aside from a small number of indents (which provide physical connection between the consumable 104 and the main body 102), the thickness of the tank housing 142 decreases with increasing distance away from the mouthpiece 136. In particular, the tank housing 142 tapers in this way, because internal and external surfaces of the tank housing 142 are angled with respect to the first demoulding direction. This tapering assists in forming the tank housing 142 and passage wall 144 as a single (i.e. unitary) component.

[0089] Like the tank housing 142, the passage wall 144 is also tapered such that the thickness of the passage wall 144 decreases along the first demoulding direction. Again, the thickness of the passage wall 144 decreases due to internal and external surfaces of the passage wall 144 being angled with respect to the first demoulding direction. As a result of the tapering of the passage wall 144, the passage 140 has an internal diameter that decreases in a downstream direction (i.e. an upward direction in Fig. 3). For example, the passage 140 has an internal width less than 4.0 mm and greater than 3.0 mm at an upstream end of the passage 140 (e.g. approximately 3.6 mm). On the other hand, the passage 140 has an internal width of less than 3.8 mm and greater than 2.8 mm at the downstream end of the passage 140 (e.g. approximately 3.4 mm).

[0090] The mouthpiece 136 comprises a mouthpiece aperture 148 defining an outlet of the passage 140. The mouthpiece aperture 148 has a radially inwardly directed inner surface 150, which joins an outer surface 152 of the mouthpiece 136 (i.e. a surface which contacts a user's lips in use) at an outer edge 154 of the mouthpiece aperture 148. At this outer edge 154, the included angle between the inner surface 150 of the mouthpiece aperture 148 and the outer surface 152 of the mouthpiece 136 (i.e. the "mouthpiece angle") is greater than 90 degrees. In the illustrated embodiment, this is due to the outer edge 154 being rounded. This edge 154 may otherwise be chamfered or bevelled.

[0091] The vaporiser 132 is located in a vaporising chamber 156 of the consumable 104. This is best shown in Figure 3B, which provides a detailed view of the vaporising chamber 156. The vaporising chamber 156 is downstream of the inlet 134 of the consumable 104 and is fluidly connected to the mouthpiece aperture 148 (i.e. outlet) by the passage 140. In particular, the passage 140 extends between the mouthpiece aperture 148 and an opening 158 from the chamber 156. This opening 158 is formed in a downstream (i.e. upper) wall 160 of the chamber 156.

[0092] The vaporiser 132 comprises a porous wick 162 and a heater filament 164 coiled around the porous wick 162. As is apparent from Figures 3A and 3B, the wick 162 extends transversely across the chamber 156 between sidewalls 166 of the chamber 156 which form part of an inner sleeve 168 of an insert 170 that defines the lower end 111 of the consumable 104 that connects with the main body 102. The insert 170 is inserted into an open lower end of the tank 106 so as to seal against the

tank housing 142.

[0093] In this way, the inner sleeve 168 projects into the tank 106 and seals with the passage 140 (around the passage wall 144) so as to separate the chamber 156 from the e-liquid in the tank 106. Ends of the wick 162 project through apertures in the inner sleeve 168 and into the tank 106 so as to be in contact with the e-liquid in the tank 106. In this way, e-liquid is transported along the wick 162 (e.g. by capillary action) to a central portion of the wick 162. The transported e-liquid is heated by the heater filament 164 (when activated e.g. by detection of inhalation), which causes the e-liquid to be vaporised and to be entrained in air flowing in the vaporising chamber 156. This vaporised liquid may cool to form an aerosol in the passage 140, which may then be inhaled by a user.

[0094] In some cases, unvaporised liquid can be carried by air flowing through the chamber 156. This may be undesirable for a user. To reduce or avoid this, the consumable 104 comprises a baffle 172, which is shown in more detail in Figure 3B. The baffle 172 extends across the chamber 156 so as to be interposed between the vaporiser 132 and the passage opening 158. In this way, unvaporised liquid from the wick 162 may collect on an upstream (i.e. lower) planar surface 174 of the baffle 172 rather than entering the passage opening 158. The baffle 172 also causes airflow from the vaporiser 132 to the passage opening 158 to be redirected around the baffle 172. The baffle 172 comprises two opposing upstream edges 176 around which the airflow is redirected. These upstream edges 176 and the sidewalls 166 of the chamber 156 define two respective apertures 178 spaced either side of the baffle 172. The baffle further comprises two downstream edges 179.

[0095] The chamber air flow path i.e. the airflow through the vaporising chamber 156 from proximal the vaporiser 132 to the passage opening 158 extends is bifurcated and has two branches extending through the apertures 178 in a generally longitudinal direction between the upstream edges 176 and the downstream edges 179. The transverse cross-sectional area of the chamber air flow path as it passes between the upstream and downstream edges 176, 179 is constant within each branch and equal between the two branches. Furthermore, the transverse cross-sectional area of the chamber airflow path between the upstream and downstream edges 176, 179 in each branch is equal to the minimum (smallest) cross-sectional area of the chamber airflow path downstream of the downstream edges 179 i.e. between the downstream edges 179 and the passage opening 158. In fact, the chamber airflow path between the apertures 178 and the passage opening 158 is constant. The chamber airflow path will deflect radially towards the passage opening 158 at the downstream edges 179.

[0096] Although not clear from Figure 3B, the transverse width of the apertures 178 equals the longitudinal spacing between the downstream edges 179 of the baffle 172 and the end wall 160 of the vaporising chamber 156. Furthermore, the transverse width of the end wall 160 of the vaporising chamber 156 between the passage opening 158 and the sidewall 166 of the vaporising chamber 156 (measured between the radially outermost limit of the passage opening 158 and the proximal sidewall 166) is less than the length of the chamber airflow path between the upstream edges 176 and the downstream edges 179 of the baffle 172.

[0097] Upon inhalation by a user at the mouthpiece aperture 148, air flows along the bifurcated chamber airflow path around the wick 162, through the apertures 178 and into the passage 140 via the passage opening 158.

[0098] Figure 4 shows a drawing of a manufacturing assembly 282 which is used to manufacture the consumable 104. The manufacturing assembly 282 comprises a first mould 284 and a second mould 286.

[0099] The first mould 284 has a shape which complements that of a first end of the integrally formed tank housing 142 and mouthpiece 136. The first mould 284 therefore has a shape which matches the inner surfaces defining the tank 106.

[0100] The second mould 286 has a shape which complements that of a second end of the integrally formed tank housing 142 and mouthpiece 136. The second mould 286 has a shape which matches the outer surface of the mouthpiece 136 and the inner surface of the mouthpiece aperture 148.

[0101] When the first mould 284 and the second mould 286 are brought together, they define a closed cavity which has the shape of the tank housing 142, the mouthpiece 136 and the passage walls 144.

[0102] To manufacture these components, heated material is injected into the cavity between the first mould 284 and the second mould 286. At this point, the first mould 284 and the second mould 286 meet at a boundary between external surfaces of the mouthpiece 136 and the tank housing 142.

[0103] The material is subsequently cooled, and the first mould 284 and the second mould 286 are separated, with the first mould 284 travelling in the first demoulding direction 288 (i.e. away from the second mould 286) and the second mould 286 travelling in a second demoulding direction 290 (i.e. away from the first mould 284 and opposite to the first demoulding direction 288). For a particular component, a demoulding direction is a direction along which a mould which contacts that component is removed during an injection moulding process.

[0104] The insert 170 and any additional components are subsequently inserted into the tank 106.

[0105] 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.

[0106] 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.

[0107] 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.

[0108] Any section headings used herein are for organizational purposes only and are not to be construed as limiting the subject matter described.

[0109] 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.

[0110] 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%.

[0111] 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 device having a chamber airflow path through a vaporising chamber housing a vaporiser, the chamber airflow path extending through at least one aperture defined by an upstream edge of a transverse baffle mounted downstream from the vaporiser, wherein the chamber airflow path through the at least one aperture has a transverse cross-sectional area that is substantially equal or less than a minimum transverse cross-sectional area of the chamber airflow path downstream from the at least one aperture.

2. A device according to claim 1 wherein the chamber airflow path has a portion extending from the aperture to a downstream edge of the transverse baffle, wherein the chamber airflow path at the downstream edge of the transverse baffle has a transverse cross-sectional area that is substantially equal or less than a minimum transverse cross-sectional area of the chamber airflow path downstream from the downstream edge of the transverse baffle.

3. A device according to claim 2 wherein the portion of the chamber airflow path extending from the aperture to the downstream edge of the transverse baffle has a constant transverse cross-sectional area.

4. A device according to claim 2 or 3 wherein the chamber airflow path is partly defined by an end wall of the vaporising chamber and wherein a transverse width of the aperture equals or is less than the longitudinal spacing between the downstream edge of the baffle and the end wall of the vaporising chamber.

5. A device according to claim 4 further comprising a passage extending longitudinally from the vaporising chamber to the outlet of the device wherein the chamber airflow path extends to a passage opening and wherein the transverse width of the end wall of the vaporising chamber between the passage opening and a sidewall of the vaporising chamber is less than the length of the chamber airflow path between the upstream edge and the downstream edge of the baffle.

6. A device according to claim 5 further comprising a tank for housing the vaporisable liquid and an insert defining the vaporising chamber, the insert configured to seal the open end of the tank, and wherein the insert comprises an inner sleeve projecting into the tank so as to seal against the passage, the inner sleeve defining the sidewalls of the vaporising chamber.

7. A device according to claim 6 wherein the or each aperture is further defined by the sidewalls of the vaporising chamber.

8. A device according to any one of claims 5 to 7 wherein the aperture is offset laterally from the longitudinal axis of the passage.

9. A device according to any one of the preceding claims wherein the baffle has two laterally opposed upstream edges that at least partly define two laterally opposed apertures such that the chamber airflow

path is bifurcated into two branches.

10. A device according to claim 9 wherein the both branches of the bifurcated chamber airflow path have a transverse cross-sectional area that is substantially equal or less than a minimum transverse cross-sectional area of the chamber airflow path downstream from the apertures.

11. A device according to any one of the preceding claims wherein the transverse cross-sectional area of the or each aperture is less than the transverse cross-sectional area of the passage opening.

12. A smoking substitute system comprising:

a main body comprising a power source; and
a consumable according to any one of the preceding claims, the consumable engageable with the main body such that the vaporiser of the consumable is electrically connected to the power source of the main body.

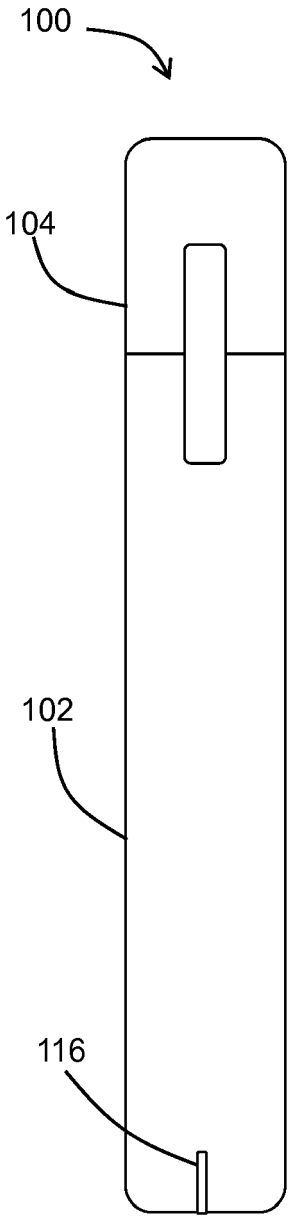

FIG 1A

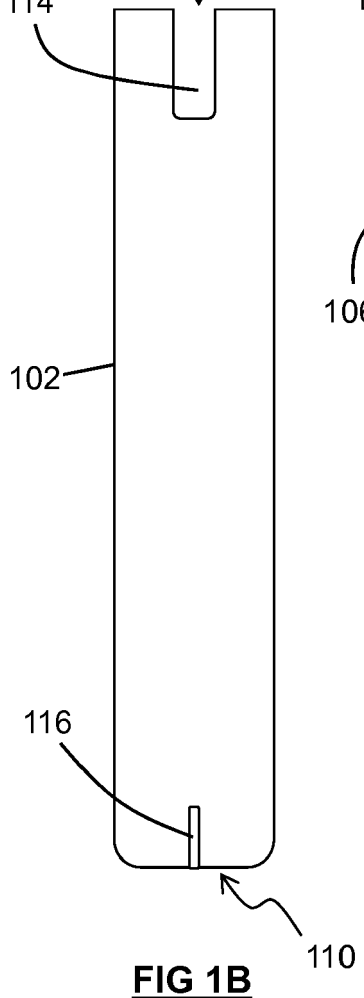

FIG 1B

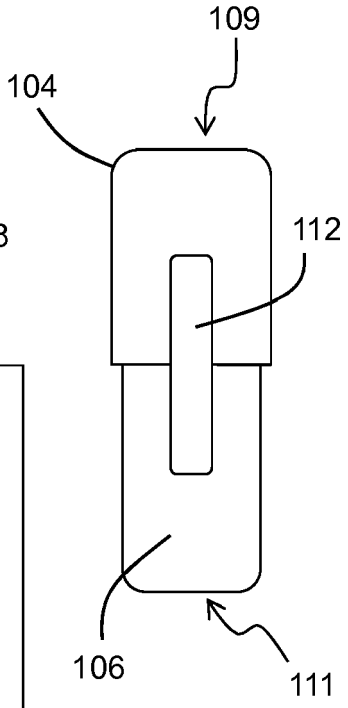

FIG 1C

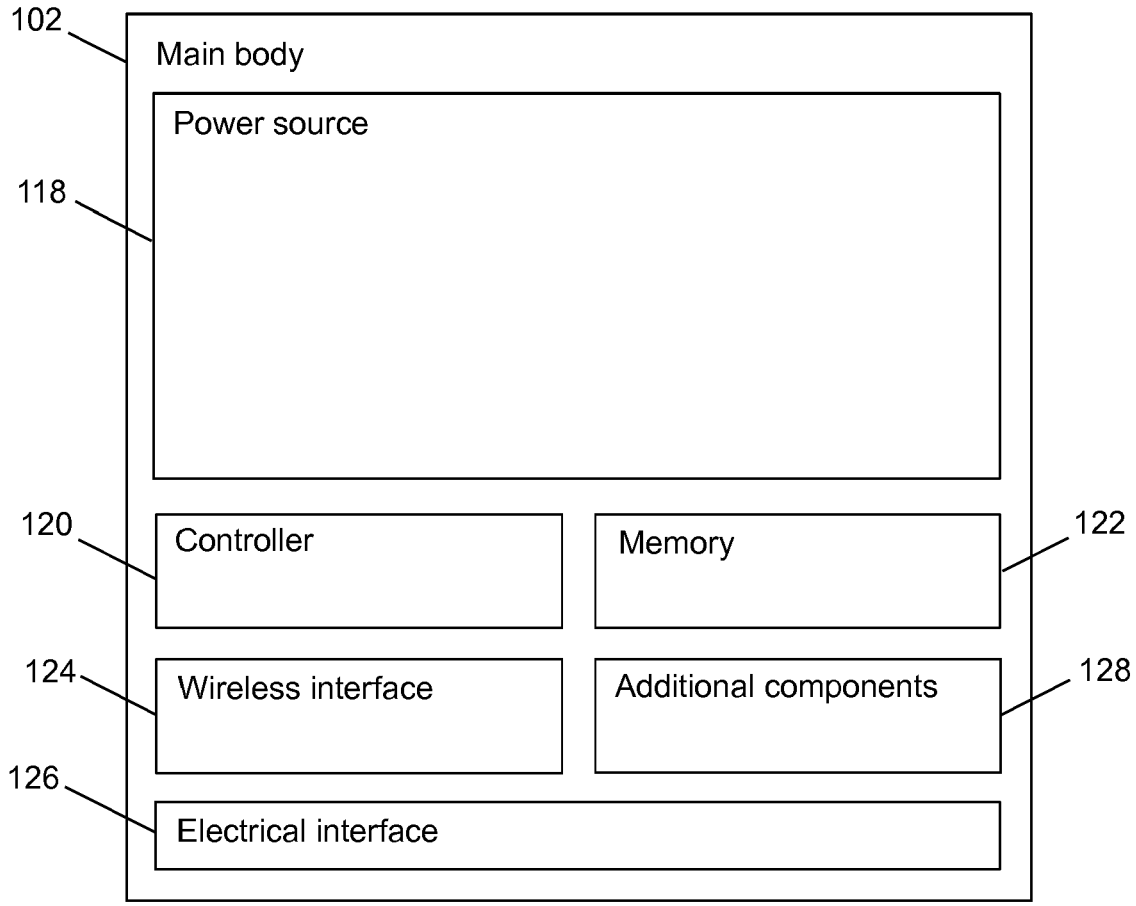
102
Main body
Power source
118
120
Controller
Memory
122
124
Wireless interface
Additional components
128
126
Electrical interface

FIG 2A

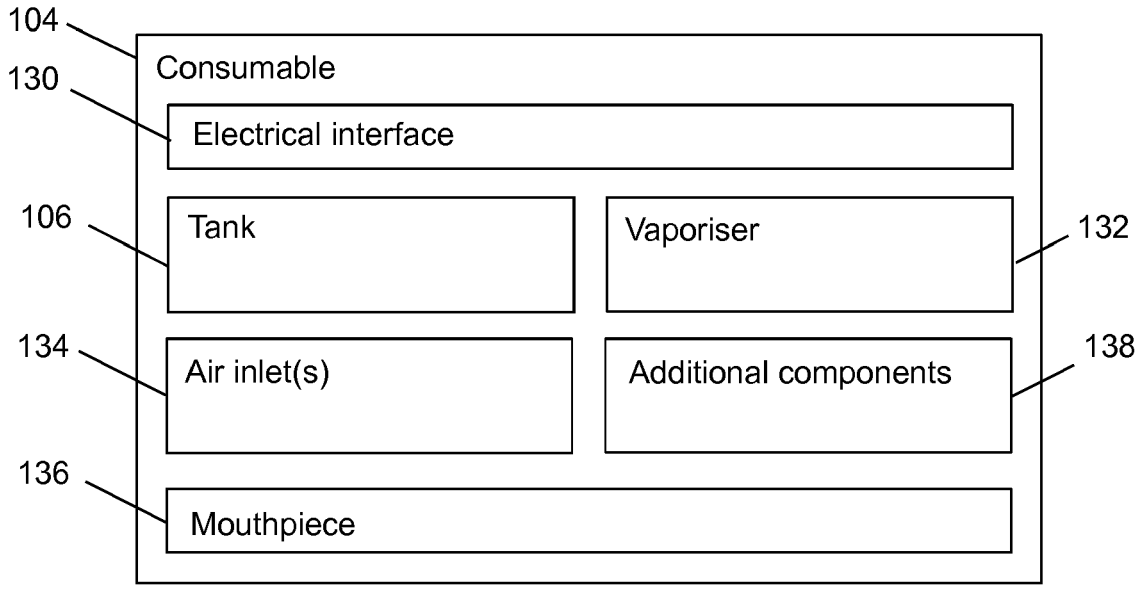
104
Consumable
130
Electrical interface
106
Tank
Vaporiser
132
134
Air inlet(s)
Additional components
138
136
Mouthpiece

FIG 2B

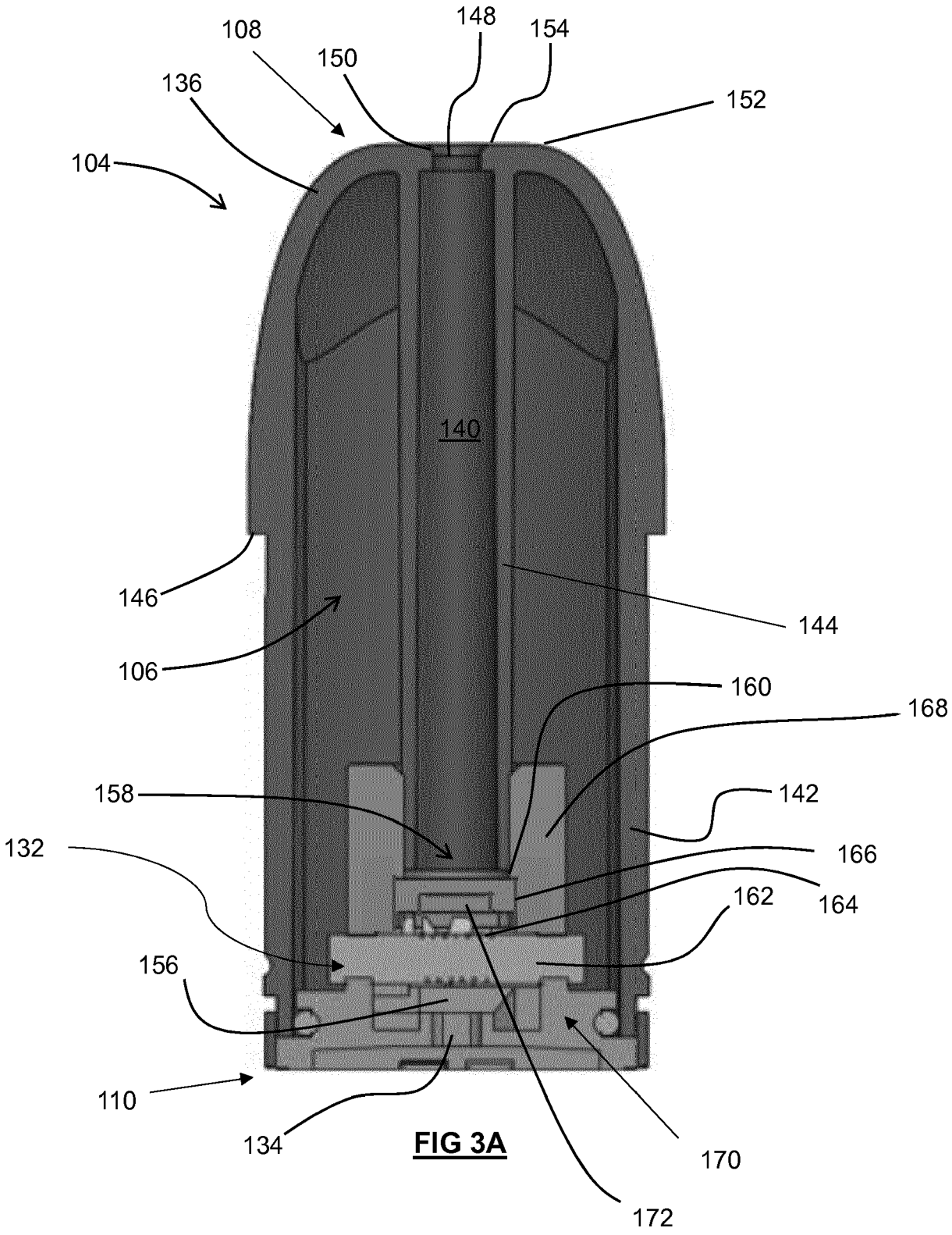
108
148
154
150
136
152
104
140
146
144
106
160
168
158
142
132
166
164
162
156
110
134
170
172

FIG 3A

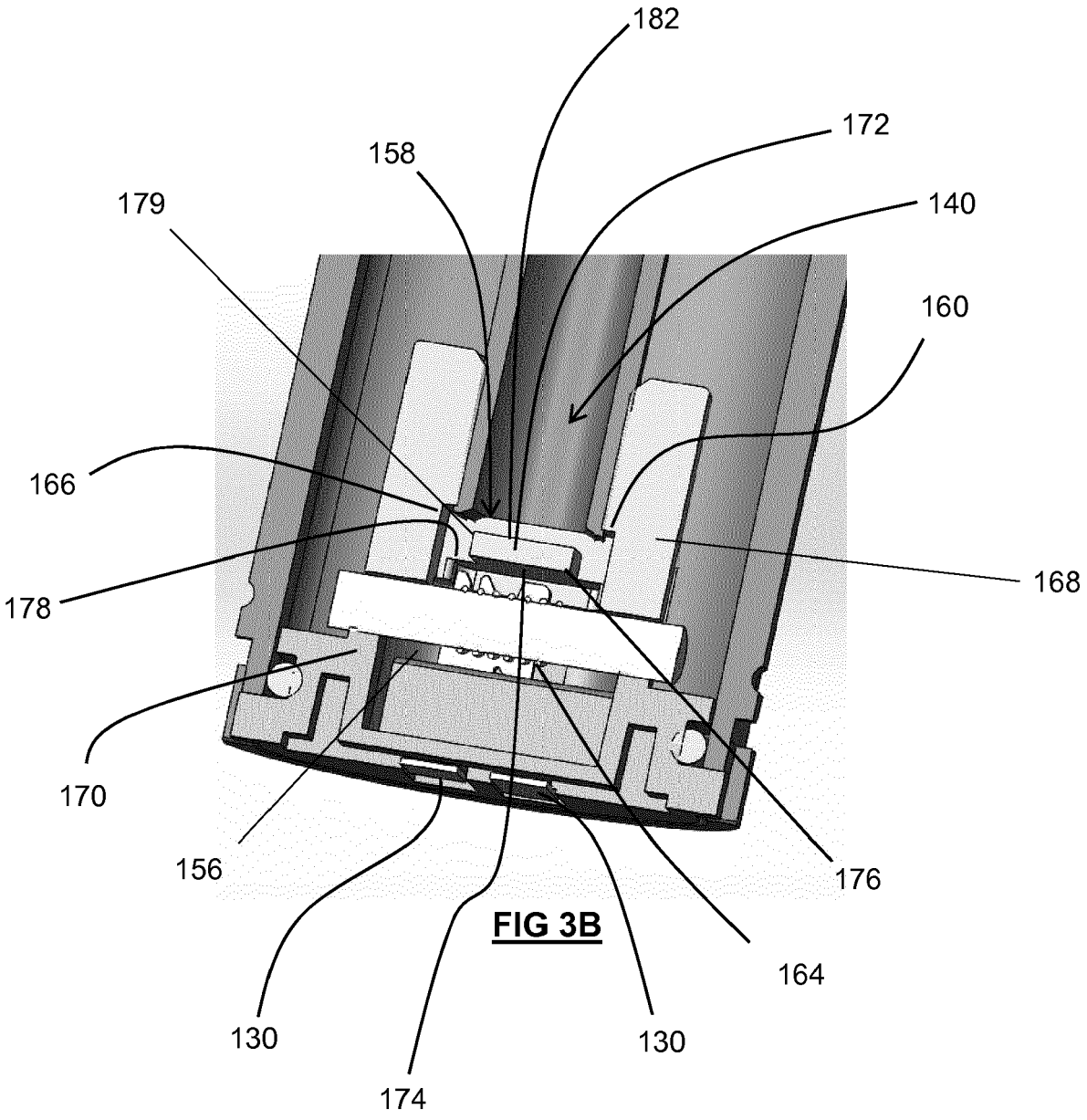

FIG 3B

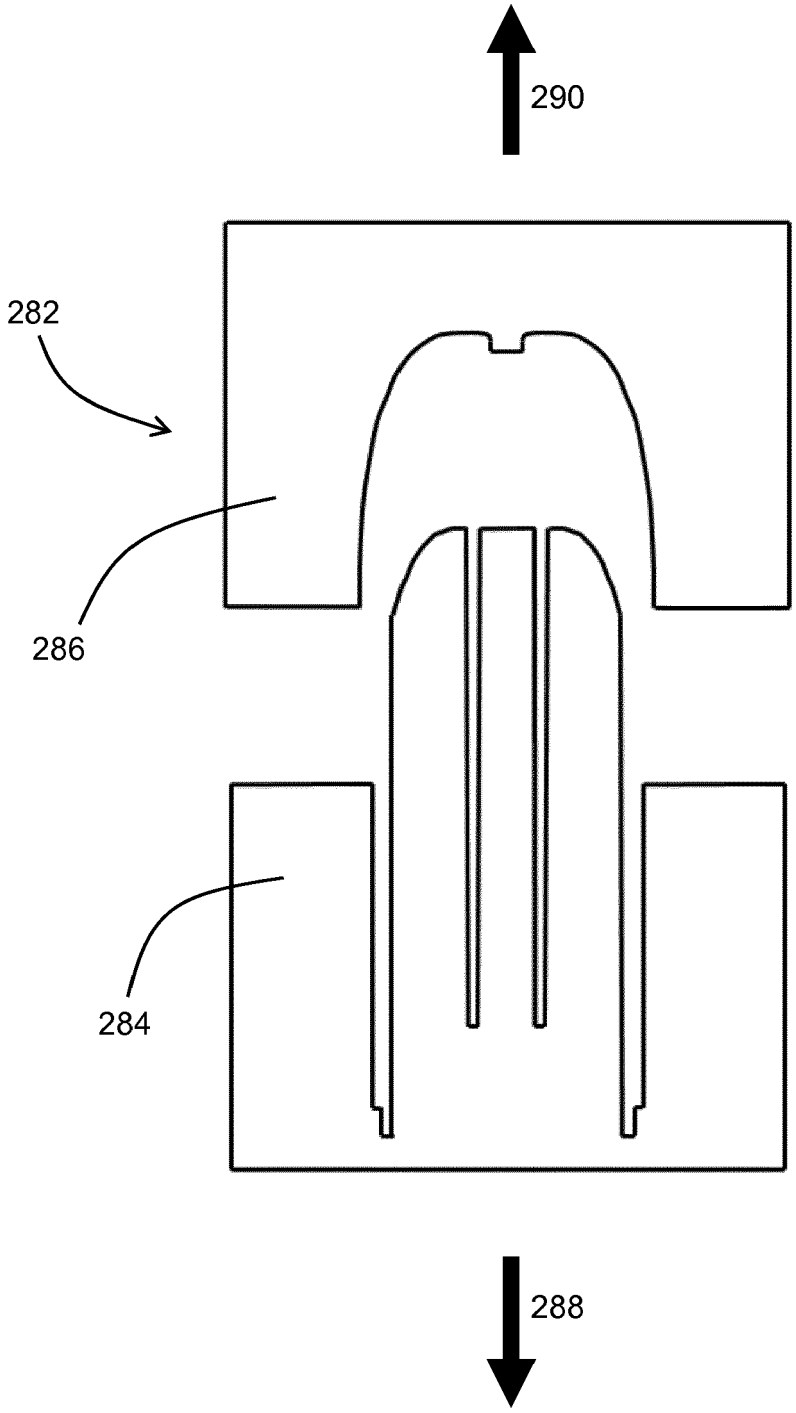

FIG 4

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 19 16 6271

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2016/120228 A1 (ROSTAMI ALI A [US] ET AL) 5 May 2016 (2016-05-05) * paragraphs [0035] - [0050]; figures 2,5 * -----	1-12	INV. A24F47/00
X	EP 2 319 334 A1 (PHILIP MORRIS PROD [CH]) 11 May 2011 (2011-05-11) * paragraphs [0076] - [0084]; figures 4,5a * -----	1-12	
X	WO 2018/001102 A1 (CHANGZHOU JWEI INTELLIGENT TECH CO LTD [CN] ET AL.) 4 January 2018 (2018-01-04) * page 6, paragraph 2 - page 14, paragraph 3; figure 5 * -----	1-12	
A	US 2018/310616 A1 (CLEMENS DAVID A [US] ET AL) 1 November 2018 (2018-11-01) * paragraphs [0061] - [0118]; figures * -----	1-12	
A	US 2017/295847 A1 (LIU QIUMING [CN]) 19 October 2017 (2017-10-19) * paragraphs [0042] - [0084]; figure 2 * -----	1-12	TECHNICAL FIELDS SEARCHED (IPC) A24F A61M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	12 September 2019	De Terlizzi, Marino

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 19 16 6271

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

12-09-2019

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2016120228 A1	05-05-2016	CN 107072293 A	18-08-2017
		EP 3214960 A1	13-09-2017
		US 2016120228 A1	05-05-2016
		WO 2016073709 A1	12-05-2016
EP 2319334 A1	11-05-2011	AU 2010311893 A1	07-06-2012
		BR 112012010034 A2	24-05-2016
		CA 2778786 A1	05-05-2011
		CN 102655773 A	05-09-2012
		CN 105815814 A	03-08-2016
		CO 6551748 A2	31-10-2012
		DK 2493341 T3	08-09-2013
		DK 2606756 T3	12-03-2018
		EA 201270596 A1	30-11-2012
		EA 201500760 A1	31-03-2016
		EP 2319334 A1	11-05-2011
		EP 2493341 A1	05-09-2012
		EP 2606756 A1	26-06-2013
		EP 3360429 A1	15-08-2018
		ES 2431273 T3	25-11-2013
		ES 2662930 T3	10-04-2018
		HK 1173346 A1	20-12-2013
		HU E038390 T2	29-10-2018
		IL 219338 A	30-04-2017
		JP 5901527 B2	13-04-2016
		JP 2013507976 A	07-03-2013
		KR 20120115488 A	18-10-2012
		KR 20170134770 A	06-12-2017
		KR 20190040381 A	17-04-2019
		LT 2606756 T	26-03-2018
		NZ 599821 A	30-04-2014
		PL 2606756 T3	29-06-2018
		PT 2493341 E	18-09-2013
		PT 2606756 T	24-05-2018
		RS 52925 B	28-02-2014
		SI 2606756 T1	30-03-2018
		UA 106393 C2	26-08-2014
		US 2011094523 A1	28-04-2011
		US 2016198772 A1	14-07-2016
		US 2016331039 A1	17-11-2016
		WO 2011050943 A1	05-05-2011
		ZA 201202994 B	30-01-2013
WO 2018001102 A1	04-01-2018	EP 3476230 A1	01-05-2019
		US 2019124997 A1	02-05-2019
		WO 2018001102 A1	04-01-2018

EPO FORM P0459

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

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 19 16 6271

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

12-09-2019

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2018310616 A1	01-11-2018	US 2018310616 A1	01-11-2018
		US 2019223513 A1	25-07-2019
		WO 2018198093 A2	01-11-2018
US 2017295847 A1	19-10-2017	CN 106714594 A	24-05-2017
		US 2017295847 A1	19-10-2017
		WO 2016049876 A1	07-04-2016

EPO FORM P0459

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