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

(11) **EP 4 494 488 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
**22.01.2025 Bulletin 2025/04**

(21) Application number: **23186453.9**

(22) Date of filing: **19.07.2023**

(51) International Patent Classification (IPC):
***A24D 1/20*** *(2020.01)* ***A24D 3/04*** *(2006.01)*
***A24D 3/06*** *(2006.01)* ***A24F 40/46*** *(2020.01)*
***A24F 40/50*** *(2020.01)* *A24F 40/20* *(2020.01)*
*A24F 40/30* *(2020.01)*

(52) Cooperative Patent Classification (CPC):
**A24D 1/20; A24B 15/16; A24B 15/283; A24D 3/04; A24D 3/048; A24F 40/46; A24F 40/50;** A24F 40/20; A24F 40/30

(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 ME MK MT NL NO PL PT RO RS SE SI SK SM TR**
Designated Extension States:
**BA**
Designated Validation States:
**KH MA MD TN**

(71) Applicant: **Imperial Tobacco Limited**
**Bristol, BS3 2LL (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 GENERATING SYSTEM**

(57) A consumable (70) for an aerosol generating (e.g. heat-not-burn) apparatus (50). The consumable comprising a carrier element (101) containing a carrier (106) in the form of propylene glycol and/or glycerine. A substantially unimpeded airflow path (105) is provided at a periphery of the carrier element for flow of air from an upstream end of the carrier element to a downstream end of the carrier element. Also disclosed is an aerosol-generating system and a carrier element.

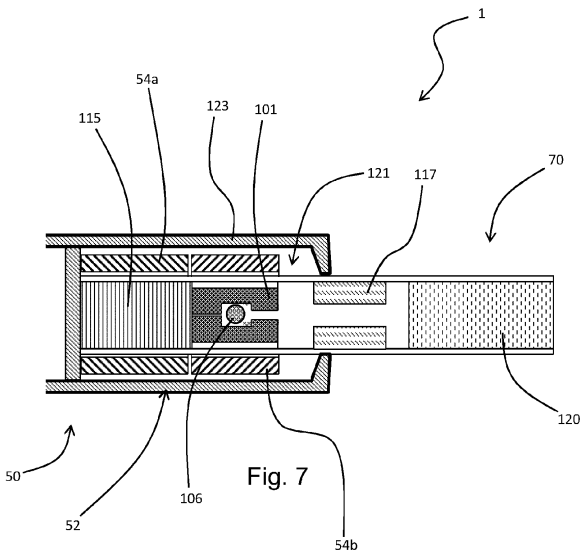


Fig. 7

EP 4 494 488 A1

## Description

### FIELD

**[0001]** The present disclosure relates to an aerosol generating system, a consumable and an aerosol generating apparatus for heating the consumable.

### BACKGROUND

**[0002]** A typical aerosol generating apparatus may comprise a power supply, an aerosol generating unit that is driven by the power supply, an aerosol precursor, which in use is aerosolised by the aerosol generating unit to generate an aerosol, and a delivery system for delivery of the aerosol to a user.

**[0003]** One approach for an aerosol generating system is the "heated tobacco" ("HT") approach in which tobacco is heated or warmed to release vapour. The tobacco may be leaf tobacco or reconstituted tobacco. The vapour may contain nicotine and/or flavourings. In the HT approach the intention is that the tobacco is heated but not burned, i.e. the tobacco does not undergo combustion.

**[0004]** A typical HT system may include a heating system and a consumable. The consumable may include the tobacco material. In use, the tobacco material is heated by the heating system, wherein airflow through the tobacco material causes moisture in the tobacco material to be released as vapour. A vapour may also be formed from a carrier in the tobacco material (this carrier may for example include propylene glycol and/or vegetable glycerine) and additionally volatile compounds released from the tobacco. The released vapour may be entrained in the airflow drawn through the tobacco.

**[0005]** There is a general desire to improve the overall quality of the vapour generated by such systems. There is also a desire to minimise (or entirely avoiding) any burning of the tobacco material. In spite of the effort already invested in the development of aerosol generating apparatuses/systems further improvements are desirable.

### SUMMARY

**[0006]** In a first aspect, there is disclosed a consumable for an aerosol generating (e.g. heat-not-burn) apparatus, the consumable comprising a carrier element containing a carrier in the form of propylene glycol and/or glycerine, wherein a substantially unimpeded airflow path is provided at a periphery of the carrier element for flow of air from an upstream end of the carrier element to a downstream end of the carrier element.

**[0007]** When used with an aerosol generating apparatus the carrier element of the consumable may be heated and a user may draw air through the consumable (by inhalation), such that an aerosol may be formed by vaporisation and/or entrainment of components of the carrier element in the airflow.

**[0008]** The provision of a substantially unimpeded airflow path at a periphery of the carrier element may provide an airflow path with reduced pressure loss (for example, when compared to an airflow path through a porous medium as is typical). Likewise, the flow of air around the carrier element to the downstream end may be such that, in use, vaporised carrier can be drawn from the downstream end of the carrier element by air that has passed along the airflow path. By drawing carrier from the downstream end of the carrier element (rather than e.g. directly passing air through the carrier element and thus directly across the carrier), the cooling rate of the carrier may be reduced. Without wishing to be bound by theory, it appears that imposing a slower cooling rate on a vapour can have the effect of generating aerosols of larger particle size. Controlling the particle size in this way (e.g. providing larger aerosol particles) may be desirable for targeting particular parts of a user's respiratory system (in general, the smaller the particle, the further it is able to travel into the respiratory system).

**[0009]** One or more channels may be provided at a periphery of the carrier element. The one or more channels may provide the unimpeded airflow path. The one or more channels may each extend from the upstream end of the carrier element to the downstream end of the carrier element. Each channel may be substantially linear.

**[0010]** In some embodiments, the one or more channels may be external to the carrier element. For example, the one or more channels may be provided by a space surrounding the carrier element. The one or more channels may be in the form of grooves formed in a peripheral surface of the carrier element.

**[0011]** In some embodiments, the one or more channels may be internal to the carrier element. For example, the one or more channels may be holes (i.e. fully bounded by a portion of the carrier element) internally of the carrier element but at a peripheral region (i.e. proximate to a peripheral surface of the carrier element).

**[0012]** The carrier element may be substantially cylindrical (and the peripheral surface may be a circumferential surface). The channels may be spaced evenly in a circumferential direction about a central axis of the carrier element (the central axis passing centrally between ends of the cylindrical carrier element).

**[0013]** In either case, the unimpeded airflow path passes around a central region of the carrier element where the carrier may be held. Thus, the unimpeded airflow may not directly impinge on the carrier, but instead may draw carrier from the downstream end of the carrier element.

**[0014]** The carrier element may be porous (e.g. formed of a porous material). The carrier element may, for example, by formed of a fibrous material. The carrier element may be configured to wick liquid.

**[0015]** The carrier element may comprise an internal cavity. The internal cavity may be in fluid communication with an opening at the downstream end of the carrier element. In this way, air that has passed along the un-

impeded airflow path (e.g. through the channels) and around the carrier element may draw carrier from the internal cavity of the carrier element through the opening at the downstream end.

**[0016]** The internal cavity may comprise a chamber and a narrowed region (relative to the chamber) disposed between the chamber and the opening. The carrier may be held within the internal cavity. The carrier may be held within the chamber.

**[0017]** The carrier contained by the carrier element may be a liquid (i.e. at room temperature). The carrier may be held within a shell (e.g. a rigid shell). The shell may comprise a biopolymer (e.g. a polymer derived from seaweed). Together, the carrier and the shell may define a capsule.

**[0018]** The capsule may be disposed within the internal cavity of the carrier element (e.g. the chamber). The narrowed region of the chamber may be configured to prevent dislodgement of the capsule from the chamber (e.g. may be sized so as to be smaller than the capsule). In this way, the capsule may be retained within the chamber.

**[0019]** The shell of the capsule may be configured to melt at a temperature that is lower than a temperature at which the carrier is vapourised. The shell may, for example, be configured to melt at a temperature that is less than 290°C, or e.g. less than 250°C. In use, heating of the carrier element may melt the capsule, which may then release the liquid carrier held therein. When the carrier element is formed of a porous and/or wicking material as discussed above, the carrier may then flow into the pores of the carrier element to be retained by the carrier element. In this way, the liquid may be held in the capsule pre-use and then released when required. This avoids the liquid carrier leaking from the consumable during e.g. transport and storage.

**[0020]** The carrier element may comprise first and second carrier element parts (e.g. that together form the carrier element). The internal cavity of the carrier element may be partly defined by the first carrier element part and partly defined by the second carrier element part. For example, the carrier element may have a split line (defining a plane along which the first and second carrier element parts come together) that passes through the internal cavity (e.g. the chamber). In this way, the carrier element parts may be configured so that they can be brought together around the capsule during assembly. This may provide a way to capture the capsule within the carrier element. The first and second carrier element parts may be substantially identical, which may simplify manufacture of the consumable.

**[0021]** The consumable may further comprise a solid aerosol precursor. The solid aerosol precursor may by substantially cylindrical. The solid aerosol precursor may comprise tobacco. The solid aerosol precursor may comprise leaf material (e.g. tobacco leaf material). The solid aerosol precursor may comprise a substrate, e.g. reconstituted tobacco to carry one or more of an active component (e.g. one or more of nicotine; caffeine; a cannabidiol oil; a non-pharmaceutical formulation, e.g. a formulation which is not for treatment of a disease or physiological malfunction of the human body).

**[0022]** The solid aerosol precursor and/or the carrier element may carry e.g. a flavouring (e.g. a component that provides a taste and/or a smell to the user. The flavouring may include one or more of: Ethylvanillin (vanilla); menthol, Isoamyl acetate (banana oil); or other.

**[0023]** When the solid aerosol precursor comprises tobacco, the carrier element may comprise less tobacco (e.g. by weight) than the solid aerosol precursor. The carrier element may, for example, be substantially free of tobacco.

**[0024]** The consumable may comprise opposite upstream and downstream ends. The solid aerosol precursor may be at the upstream end of the consumable (and may define the upstream end). The downstream end may define a mouthpiece of the consumable (i.e. received in a user's mouth in use). Thus, in normal use, when a user inhales on the downstream end (the mouthpiece) air may flow into the upstream end towards the downstream end.

**[0025]** The carrier element may be downstream of the solid aerosol precursor. In this way, in use, vapour generated from the solid aerosol precursor may be entrained in an airflow through the consumable, and subsequently vapour from the carrier may be entrained in the airflow. The carrier element may be immediately downstream of the solid aerosol precursor (i.e. nothing else may be between the solid aerosol precursor and the carrier element). The carrier element may be adjacent the solid aerosol precursor.

**[0026]** The carrier element and solid aerosol precursor may be axially arranged (e.g. arranged along a central longitudinal axis of the consumable).

**[0027]** A mixing space may be provided downstream (e.g. immediately downstream) of the carrier element. The mixing space may thus be downstream (e.g. immediately downstream) of the carrier element. The mixing space may be an open space in the consumable absent of e.g. a filter, carrier element, cooling element, etc. The mixing space may allow airflow to mix and draw carrier from the downstream end of the carrier element.

**[0028]** A filter element may be provided downstream of the carrier element. The filter element may be substantially cylindrical. The filter element may be a hollow bore filter element, which may comprise a central bore extending therethrough (in other embodiments, a plurality of bores may be provided). The hollow bore filter element may be porous. The filter element may be spaced in a downstream direction from the carrier element. The mixing space may be defined between the filter element and the carrier element.

**[0029]** The mixing space may be a first mixing space and the consumable may comprise a second (i.e. further) mixing space downstream of the filter element. Thus, the consumable may comprise two mixing spaces, which may be positioned either side of the filter element.

**[0030]** The filter element may be a first filter element and the consumable may comprise a second filter element. The second filter element may be substantially cylindrical. The second filter element may be downstream of the first filter element. The second filter element may be downstream (e.g. immediately downstream) of the second mixing space. The second filter element may be a solid filter element (i.e. may not include a bore). The second filter element may be porous. The second filter element may be a terminal filter element, in that it may be disposed at a terminal downstream end of the consumable.

**[0031]** The consumable may have a substantially cylindrical shape. The solid aerosol precursor and the carrier element may be connected by a wrapper extending circumferentially about both the solid aerosol precursor and the carrier element. Likewise, each of the above-mentioned filter elements may be connected to the solid aerosol precursor and/or carrier element by the wrapper and/or by one or more further wrappers. The above-mentioned mixing spaces may be spaced formed within the one or more wrappers.

**[0032]** In a second aspect, there is disclosed an aerosol generating system comprising:

a consumable comprising:

a carrier element containing a carrier in the form of propylene glycol and/or glycerine, wherein a substantially unimpeded airflow path is provided at a periphery of the carrier element for flow of air from an upstream end of the carrier element to a downstream end of the carrier element; and

a solid aerosol precursor;

a heating system for heating the consumable.

**[0033]** The consumable may be as otherwise described above with respect to the first aspect. Thus, the consumable may include one or more of the optional features of the first aspect.

**[0034]** The heating system may be arranged to heat the solid aerosol precursor (when present) and the carrier element of the consumable. The heating system may be configured to heat the solid aerosol precursor and the carrier element to different temperatures in use. For example, the heating system may be configured to heat the carrier element of the consumable, in use, to a higher temperature than the solid aerosol precursor.

**[0035]** As will now be described, the provision of two different temperature may be particularly useful for embodiments in which the solid aerosol precursor comprises tobacco. In at least some cases, the temperature at which polypropylene glycol and/or glycerine is most effectively vapourised can be higher than a temperature at which tobacco is susceptible to burning. Such burning can be undesirable in systems in which the intention is to heat but not combust the tobacco (i.e. heat-not-burn systems). Arranging the tobacco and carrier in two different parts of the consumable, and then heating those parts to different temperatures allows optimisation of the heating temperature of each of these components of the consumable. In particular, and in view of the above, heating the carrier element to a higher temperature than the solid aerosol precursor (when containing tobacco) can provide particularly effective vaporisation of the carrier while avoiding (or at least reducing the possibility of) burning of the tobacco.

**[0036]** When the consumable comprises a capsule including a shell (as discussed above with respect to the first aspect), the heating system may be configured to heat the carrier element to a temperature above the melting point of the shell. In this way, in use, the shell may melt to release the carrier when the carrier element is heated.

**[0037]** The heating system may comprise a first heater arranged to heat the solid aerosol precursor in use and a second heater arranged to heat the carrier element in use. The second heater may be configured to heat to a higher temperature than the first heater in use. Each heater may comprise one or more heating elements.

**[0038]** The first and second heaters of the heating system may be arranged axially along the consumable (e.g. along an elongate axis of the consumable).

**[0039]** The first heater and/or the second heater may be configured to at least partly surround the consumable in use. In this respect, the first heater and/or second heater may be referred to as an external heater. The first heater and/or second heater may be tubular.

**[0040]** The heaters may take other forms. For example, the first heater and/or the second heater may be configured to extend into (i.e. penetrate) the consumable in use (e.g. may be an internal heater). For example, the first heater and/or second heater may be a rod or a blade.

**[0041]** The heating system may be configured to heat the solid aerosol precursor to a temperature that is less than 290°C, or e.g. less than 250°C, or e.g. about 200°C. The first heater may be configured to heat, in use, to a temperature that is less than 290°C, or e.g. less than 250°C, or e.g. about 200°C.

**[0042]** The heating system may be configured to heat the carrier element to a temperature that is greater than 280°C, or e.g. about 290°C. The second heater may be configured to heat, in use, to a temperature that is greater than 280°C, or e.g. about 290°C.

**[0043]** The heating system may be configured to heat the solid aerosol precursor and carrier element concurrently (the carrier element being heated to a higher temperature than the solid aerosol precursor).

**[0044]** The aerosol generating system may comprise a controller operatively connected to the heater system for controlling the heating system. The above-described heating by the heating system (and the heaters of the heating system) may be controlled by the controller. The controller may be configured to control the heating of the

solid aerosol precursor and carrier element by the heating system. For example, in at least one operating mode of the heating system, the controller may control the first and second heaters to heat concurrently (the second heater being heated to a higher temperature than the first heater). As an example, the first heater may be controlled to heat to a first predetermined temperature and the second heater may be controlled to heat to a second predetermined temperature that is higher than the first predetermined temperature.

**[0045]** The controller may be configured to control the heating by controlling a power supply to the heating system. For example, the controller may comprise a power supply duty cycle. Where the heating system comprises first and second heaters, the controller may be configured to control the power supply to the first heater according to a first duty cycle and control the power supply to the second heater according to a second duty cycle that is different to the first duty cycle.

**[0046]** In other embodiments, where the heating system includes a single heater, the variation in temperature may be provided by regions of different material and or structure (e.g. regions of a single heating element or of a plurality of heating elements).

**[0047]** The heating system may form part of an aerosol generating apparatus. The aerosol generating apparatus may be configured for releasable engagement with the consumable. For example, the aerosol generating apparatus may comprise a consumable-receiving cavity for receipt of the consumable. The heating system may be disposed in and/or at least partly surround the consumable-receiving cavity.

**[0048]** In a third aspect, the disclosure provides a method of generating an aerosol using the aerosol generating system according to the second aspect, the method comprising heating the consumable using the heating system, and drawing air through the consumable such that air flows through the channels of the consumable and subsequently draws carrier from the downstream end of the carrier element.

**[0049]** The step of heating the consumable in the third aspect, may comprise heating the carrier element of the consumable to a different (e.g. higher) temperature than the solid aerosol precursor of the consumable.

**[0050]** In a fourth aspect the present disclosure provides electrical circuitry and/or a computer program configured to cause an aerosol generating apparatus/system to perform any method or method step disclosed herein. A computer readable medium comprising the computer program is also disclosed.

**[0051]** In a fifth aspect, the present disclosure provides a carrier element for a consumable for use with an aerosol generating apparatus, the carrier element comprising an internal cavity for retaining a capsule, and the carrier element being formed of separate first and second carrier element parts, each of the first and second carrier element parts partly defining the internal cavity such that the first and second carrier element parts can be brought together around a capsule to enclose the capsule in the internal cavity.

**[0052]** The carrier element of the fifth aspect may be as described above with respect to the first aspect (i.e. may include one or more of the optional features of the first aspect). For example, the internal cavity may be in fluid communication with an opening formed in the carrier element. The internal cavity may comprise a chamber and a narrowed region between the chamber and the opening.

**[0053]** The carrier element may be porous (e.g. may be formed of a fibrous material).

**[0054]** One or more channels may be formed at a periphery of the carrier element. The channels may be grooves formed in a peripheral surface. The carrier element may be substantially cylindrical (and the channels may be formed in the circumferential surface of the carrier element).

**[0055]** Each of the carrier element parts may be substantially the same. This may simplify manufacture of the carrier element (i.e. only one "type" of carrier element part must be formed in order to produce a carrier element).

**[0056]** In a sixth aspect, there is provided a method of forming a consumable for an aerosol generating apparatus, the method comprising combining a first carrier element part with a second carrier element part to form of carrier element having an internal cavity; the step of combining the first and second carrier element parts comprising capturing a capsule in the internal cavity, between the first and second carrier element parts.

**[0057]** The carrier element of the sixth aspect may be as described above with respect to the first aspect (i.e. may include one or more of the optional features of the first aspect). For example, the internal cavity may be in fluid communication with an opening formed in the carrier element. The internal cavity may comprise a chamber and a narrowed region between the chamber and the opening.

**[0058]** The method of the sixth aspect may further comprise combining the carrier element with one or more of a solid aerosol precursor and/or a filter element. The method may comprise circumferentially wrapping the carrier element and the solid aerosol precursor and/or filter element with a wrapper.

**[0059]** The preceding summary is provided for purposes of summarizing some examples to provide a basic understanding of aspects of the subject matter described herein. Accordingly, the above-described features should not be construed to narrow the scope or spirit of the subject matter described herein in any way. Moreover, the above and/or proceeding examples may be combined in any suitable combination to provide further examples, except where such a combination is clearly impermissible or expressly avoided. Other features, aspects, and advantages of the subject matter described herein will become apparent from the following text and the accompanying drawings.

## BRIEF DESCRIPTION OF THE FIGURES

**[0060]** Aspects, features and advantages of the present disclosure will become apparent from the following description of examples in reference to the appended drawings in which like numerals denote like elements.

**Fig. 1** is a block system diagram showing an example aerosol generating apparatus.

**Fig. 2** is a block system diagram showing an example implementation of the apparatus of Fig. 1, where the aerosol generating apparatus is configured to generate aerosol from a solid precursor.

**Fig. 3** is a schematic diagram showing an example implementation of the apparatus of Fig. 2.

**Fig. 4** is section view showing a consumable for use with a heat-not-burn apparatus.

**Fig. 5** is a front section view of a carrier element of the consumable of Fig. 4.

**Fig. 6** is a side section view of a carrier element of the consumable of Fig. 4.

**Fig. 7** is a section view of an aerosol generating system including the consumable of Fig. 4.

## DETAILED DESCRIPTION OF EMBODIMENTS

**[0061]** Before describing several examples implementing the present disclosure, it is to be understood that the present disclosure is not limited by specific construction details or process steps set forth in the following description and accompanying drawings. Rather, it will be apparent to those skilled in the art having the benefit of the present disclosure that the systems, apparatuses and/or methods described herein could be embodied differently and/or be practiced or carried out in various alternative ways.

**[0062]** Unless otherwise defined herein, scientific and technical terms used in connection with the presently disclosed inventive concept(s) shall have the meanings that are commonly understood by those of ordinary skill in the art, and known techniques and procedures may be performed according to conventional methods well known in the art and as described in various general and more specific references that may be cited and discussed in the present specification.

**[0063]** Any patents, published patent applications, and non-patent publications mentioned in the specification are hereby incorporated by reference in their entirety.

**[0064]** All examples implementing the present disclosure can be made and executed without undue experimentation in light of the present disclosure. While particular examples have been described, it will be apparent to those of skill in the art that variations may be applied to the systems, apparatus, and/or methods and in the steps or in the sequence of steps of the methods described herein without departing from the concept, spirit, and scope of the inventive concept(s). All such similar substitutions and modifications apparent to those skilled in the art are deemed to be within the spirit, scope, and concept of the inventive concept(s) as defined by the appended claims.

**[0065]** The use of the term "a" or "an" in the claims and/or the specification may mean "one," as well as "one or more," "at least one," and "one or more than one." As such, the terms "a," "an," and "the," as well as all singular terms, include plural referents unless the context clearly indicates otherwise. Likewise, plural terms shall include the singular unless otherwise required by context.

**[0066]** The use of the term "or" in the present disclosure (including the claims) is used to mean an inclusive "and/or" unless explicitly indicated to refer to alternatives only or unless the alternatives are mutually exclusive. For example, a condition "A or B" is satisfied by any of the following: A is true (or present) and B is false (or not present), A is false (or not present) and B is true (or present), and both A and B are true (or present).

**[0067]** As used in this specification and claim(s), the words "comprising, "having," "including," or "containing" (and any forms thereof, such as "comprise" and "comprises," "have" and "has," "includes" and "include," or "contains" and "contain," respectively) are inclusive or open-ended and do not exclude additional, unrecited elements or method steps.

**[0068]** Unless otherwise explicitly stated as incompatible, or the physics or otherwise of the embodiments, examples, or claims prevent such a combination, the features of examples disclosed herein, and of the claims, may be integrated together in any suitable arrangement, especially ones where there is a beneficial effect in doing so. This is not limited to only any specified benefit, and instead may arise from an "ex post facto" benefit. This is to say that the combination of features is not limited by the described forms, particularly the form (e.g. numbering) of example(s), embodiment(s), or dependency of claim(s). Moreover, this also applies to the phrase "in one embodiment," "according to an embodiment," and the like, which are merely a stylistic form of wording and are not to be construed as limiting the following features to a separate embodiment to all other instances of the same or similar wording. This is to say, a reference to 'an,' 'one,' or 'some' embodiment(s) may be a reference to any one or more, and/or all embodiments, or combination(s) thereof, disclosed. Also, similarly, the reference to "the" embodiment may not be limited to the immediately preceding embodiment. Further, all references to one or more embodiments or examples are to be construed as non-limiting to the claims.

**[0069]** The present disclosure may be better understood in view of the following explanations, wherein the terms used that are separated by "or" may be used

interchangeably:

**[0070]** As used herein, an **"aerosol generating apparatus"** (or **"electronic(e)-cigarette")** may be an apparatus configured to deliver an aerosol to a user for inhalation by the user. The apparatus may additionally/alternatively be referred to as a "smoking substitute apparatus", if it is intended to be used instead of a conventional combustible smoking article. As used herein a combustible "smoking article" may refer to a cigarette, cigar, pipe or other article, that produces smoke (an aerosol comprising solid particulates and gas) via heating above the thermal decomposition temperature (typically by combustion and/or pyrolysis). An aerosol generated by the apparatus (when used with a consumable) may comprise an aerosol with particle sizes of 0.2 - 7 microns, or less than 10 microns, or less than 7 microns. This particle size may be achieved by control of one or more of: heater temperature; cooling rate as the vapour condenses to an aerosol (as discussed above); flow properties including turbulence and velocity. The generation of aerosol by the aerosol generating apparatus may be controlled by an input device. The input device may be configured to be user-activated, and may for example include or take the form of an actuator (e.g. actuation button) and/or an airflow sensor.

**[0071]** Each occurrence of the aerosol generating apparatus being caused to generate aerosol for a period of time (which may be variable) may be referred to as an **"activation"** of the aerosol generating apparatus. The aerosol generating apparatus may be arranged to allow an amount of aerosol delivered to a user to be varied per activation (as opposed to delivering a fixed dose of aerosol), e.g. by activating an aerosol generating unit of the apparatus for a variable amount of time, e.g. based on the strength/duration of a draw of a user through a flow path of the apparatus (to replicate an effect of smoking a conventional combustible smoking article).

**[0072]** The aerosol generating apparatus may be portable. As used herein, the term **"portable"** may refer to the apparatus being for use when held by a user.

**[0073]** As used herein, an **"aerosol generating system"** may be a system that includes an aerosol generating apparatus and a consumable.

**[0074]** As used herein, an **"aerosol"** may include a suspension of precursor, including as one or more of: solid particles; liquid droplets; gas. Said suspension may be in a gas including air. An aerosol herein may generally refer to/include a vapour. An aerosol may include one or more components of the precursor.

**[0075]** As used herein, the term **"precursor"** can encompass, for example, the solid aerosol precursor and/or the carrier described in relation to the aspects above (both of these components contribute to the aerosol produced by the consumable in use).

**[0076]** As used herein, a **"flow path"** may refer to a path or enclosed passageway through an aerosol generating apparatus and/or consumable, e.g. for delivery of an aerosol to a user. The flow path may be arranged to receive aerosol from an aerosol generating unit. When referring to the flow path, upstream and downstream may be defined in respect of a direction of flow in the flow path, e.g. with an outlet being downstream of an inlet.

**[0077]** As used herein, a **"delivery system"** may be a system operative to deliver an aerosol to a user. The delivery system may include a mouthpiece and a flow path.

**[0078]** As used herein, a **"flow"** may refer to a flow in a flow path. A flow may include aerosol generated from the precursor. The flow may include air, which may be induced into the flow path via a puff by a user.

**[0079]** As used herein, a **"puff"** (or "**inhale**" or "**draw**") by a user may refer to expansion of lungs and/or oral cavity of a user to create a pressure reduction that induces flow through the flow path.

**[0080]** As used herein, an **"aerosol generating unit"** may refer to a device configured to generate an aerosol from a precursor. The aerosol generating unit may include a unit to generate a vapour directly from the precursor (e.g. a heating system or other system) or an aerosol directly from the precursor (e.g. an atomiser including an ultrasonic system, a flow expansion system operative to carry droplets of the precursor in the flow without using electrical energy or other system). A plurality of aerosol generating units to generate a plurality of aerosols (for example, from a plurality of different aerosol precursors) may be present in an aerosol generating apparatus.

**[0081]** As used herein, a "**heating system**" may refer to an arrangement of at least one heating element, which is operable to aerosolise a precursor once heated. The at least one heating element may be electrically resistive to produce heat from the flow of electrical current therethrough. The at least one heating element may be arranged as a susceptor to produce heat when penetrated by an alternating magnetic field. The heating system may be configured to heat a precursor to below 300 or 350 degrees C, including without combustion.

**[0082]** As used herein, a "**consumable**" may refer to a unit that includes a precursor. The consumable may include a mouthpiece. The consumable may include an information carrying medium. The consumable may be referred to as a "stick" or "package" or "heat-not-burn consumable". In a heat-not-burn consumable, the mouthpiece may be implemented as a filter.

**[0083]** As used herein "**heat-not-burn**" (or "**HNB**" or "**heated precursor**") may refer to the heating of a precursor, typically tobacco, without combustion, or without substantial combustion (i.e. localised combustion may be experienced of limited portions of the precursor, including of less than 5% of the total volume).

**[0084]** As used herein, "**electrical circuitry**" may refer to one or more electrical components, examples of which may include: an Application Specific Integrated Circuit (ASIC); electronic/electrical componentry (which may include combinations of transistors, resistors, capacitors, inductors etc); one or more processors; a non-transitory

memory (e.g. implemented by one or more memory devices), that may store one or more software or firmware programs; a combinational logic circuit; interconnection of the aforesaid. The electrical circuitry may be located entirely at the apparatus, or distributed between the apparatus and/or on one or more external devices in communication with the apparatus, e.g. as part of a system

**[0085]** As used herein, a "**processing resource**" (or "**processor**" or "**controller**") may refer to one or more units for processing data, examples of which may include an ASIC, microcontroller, FPGA, microprocessor, digital signal processor (DSP) capability, state machine or other suitable component. A processing resource may be configured to execute a computer program, e.g. which may take the form of machine readable instructions, which may be stored on a non-transitory memory and/or programmable logic. The processing resource may have various arrangements corresponding to those discussed for the circuitry, e.g. on-board and/or off board the apparatus as part of the system. As used herein, any machine executable instructions, or computer readable media, may be configured to cause a disclosed method to be carried out, e.g. by a aerosol generating apparatus or system as disclosed herein, and may therefore be used synonymously with the term method.

**[0086]** As used herein, an "**external device**" (or "**peripheral device**") may include one or more electronic components external to an aerosol generating apparatus. Those components may be arranged at the same location as the aerosol generating apparatus or remote from the apparatus. An external device may comprise electronic computer devices including: a smartphone; a PDA; a video game controller; a tablet; a laptop; or other like device.

**[0087]** As used herein, a "**computer readable medium/media**" (or "**memory**" or "**data storage**") may include any medium capable of storing a computer program, and may take the form of any conventional non-transitory memory, for example one or more of: random access memory (RAM); a CD; a hard drive; a solid state drive; a memory card; a DVD. The memory may have various arrangements corresponding to those discussed for the circuitry /processor. The present disclosure includes a computer readable medium configured to cause an apparatus or system disclosed herein to perform a method as disclosed herein.

**[0088]** Referring to Fig. 1, an example aerosol generating system 1 includes a consumable 70 and an aerosol generating apparatus 50. The system 1 includes a power supply 2, for supply of electrical energy. The system 1 also includes an aerosol generating unit 4 that is driven by the power supply 2. The power supply 2 may include an electric power supply in the form of a battery and/or an electrical connection to an external power source. The system 1 includes a precursor 6, which in use is aerosolised by the aerosol generating unit 4 to generate an aerosol. The apparatus 2 includes a delivery system 8 for delivery of the aerosol to a user.

**[0089]** Electrical circuitry (not shown in figure 1) may be implemented to control the interoperability of the power supply 4 and aerosol generating unit 6.

**[0090]** Fig. 2 shows an implementation of the apparatus 1 of Fig. 1, where the aerosol generating apparatus 1 is configured to generate aerosol by a-heat not-burn process.

**[0091]** In this example, the system 1 again includes an aerosol generating apparatus 50 and a consumable 70. The aerosol generating apparatus 50 includes the power supply 4 and a heating system 52. The heating system 52 includes at least one heating element 54. The aerosol generating apparatus 50 may additionally include any one or more of electrical circuitry 56, a memory 58, a wireless interface 60, one or more other components 62.

**[0092]** The electrical circuitry 56 may include a processing resource for controlling one or more operations of the body 50, e.g. based on instructions stored in the memory 58.

**[0093]** The wireless interface 60 may be configured to communicate wirelessly with an external (e.g. mobile) device, e.g. via Bluetooth.

**[0094]** The aerosol generating apparatus 50 is configured to releasably engage with the consumable 70 such that the at least one heating element 54 of the heating system 52 can heat the precursor 6 of the consumable. In use, a user may activate the aerosol generating apparatus 1 to cause the heating system 52 of the aerosol generating apparatus 50 to cause the at least one heating element 54 to heat the precursor 6 of the consumable (without combusting it) by conductive heat transfer, to generate an aerosol which is inhaled by the user.

**[0095]** Fig. 3 shows an example implementation of the aerosol generating system 1 of Fig. 2.

**[0096]** As depicted in Fig. 3, the consumable 70 is implemented as a stick, which is engaged with the aerosol generating apparatus 50 by inserting the stick into an aperture at a top end 53 of the aerosol generating apparatus 50, which causes the at least one heating element 54 of the heating system 52 to penetrate into or at least partly surround, the precursor 6.

**[0097]** The consumable 70 includes a precursor 6 (which, as is discussed further below can incorporate a solid aerosol precursor and a carrier) proximal to the aerosol generating apparatus 50, and a filter distal to the aerosol generating apparatus 50. The filter serves as the mouthpiece of the consumable 70 and thus the system 1 as a whole.

**[0098]** In this example, the at least one heating element 54 is tube-shaped (e.g. with a hollow transverse profile). Other heating element shapes are possible, e.g. the at least one heating element may be a rod-shaped element with a circular transverse profile, or may be blade-shaped (with a rectangular transverse profile).

**[0099]** In this example, the aerosol generating apparatus 50 includes a cap 51. In use the cap 51 is engaged at a top end 53 of the aerosol generating apparatus 50.

Although not apparent from Fig. 5, the cap 51 is moveable relative to the aerosol generating apparatus 50. In particular, the cap 51 is slidable and can slide along a longitudinal axis of the aerosol generating apparatus 50.

**[0100]** The aerosol generating apparatus 50 also includes an actuator 55 on an outer surface of the aerosol generating apparatus 50. In this example, the actuator 55 has the form of a button.

**[0101]** The aerosol generating apparatus 50 also includes a user interface device configured to convey information to a user. Here, the user interface device is implemented as a plurality of lights 57, which may e.g. be configured to illuminate when the apparatus 1 is activated and/or to indicate a charging state of the power supply 4. Other user interface devices are possible, e.g. to convey information haptically or audibly to a user.

**[0102]** The aerosol generating apparatus 50 may also include an airflow sensor which detects airflow in the aerosol generating apparatus 50 (e.g. caused by a user inhaling through the consumable 70). This may be used to count puffs, for example.

**[0103]** In this example, the consumable 70 includes a flow path which transmits aerosol generated by the at least one heating element 54 to the mouthpiece of the consumable 70.

**[0104]** In this example, the aerosol generating unit 4 is provided by the above-described heating system 52 and the delivery system 8 is provided by the above-described flow path and mouthpiece of the consumable 70.

**[0105]** Referring to Figures 4, 5 and 6, an aerosol generating consumable 70, which may be implemented in any of the preceding examples, is shown. The consumable 70, which is for use with a heat-not-burn apparatus, comprises a porous (e.g. fibrous) carrier element 101 containing a liquid carrier 106 in the form of propylene glycol and/or glycerine. As is apparent from Figure 5, in particular, the carrier element 101 has a substantially cylindrical shape with an upstream end 102, a downstream end 103 and a circumferential peripheral surface 104 connecting the upstream 102 and downstream 103 ends. The carrier element 101 further includes channels 105 in the form of linear grooves in the peripheral surface 104, which extend from the upstream end 102 of the carrier element 101 to the downstream end 103 (parallel to the central axis of the carrier element 101). In particular, the carrier element 101 includes a total of six channels 105 (two of which are labelled in Figure 5), which are spaced circumferentially from one another about the periphery of the carrier element 101. The channels 105 provide a substantially unimpeded airflow path at a periphery of the carrier element 101 for flow of air from the upstream end 102 of the carrier element 101 to the downstream end 103 of the carrier element 101.

**[0106]** Also apparent from Figure 5 is that the liquid carrier 106 is held within a spherical shell 107 (which may be formed of a biopolymer, such as a polymer derived from seaweed). Together, the liquid carrier 106 and the shell 107 form a capsule 108. The capsule 108 is held within a cuboid shaped chamber 109 of an internal cavity 110 of the carrier element 101. In addition to the chamber 109, the internal cavity 110 includes a narrowed region (i.e. a neck) 111, which leads to an opening 112 at the downstream end of the carrier element 101. The narrowed region 111 and the opening 112 each have a smaller diameter than the capsule 108, which means that the capsule 108 is unable to be dislodged from the carrier element 101 through the opening 112.

**[0107]** To aid in assembly of the capsule 108 within the carrier element 101, the carrier element 101 is formed of a first carrier element part 113 and a second carrier element part 114. These parts 113, 114 form two halves of the carrier element 101, such that a split line between the two parts 113, 114 extends centrally through the carrier element 101 (so as to pass through the internal cavity 110). Accordingly, each of the first 113 and second 114 carrier element parts defines part of the internal cavity 110. This means that the first 113 and second 115 carrier element parts can be assembled together in a manner whereby the capsule 108 is captured between them in the chamber 109.

**[0108]** As shown in Figure 4, the provision of the channels 105 at the periphery of the carrier element 101 means that in use, most (or all) air flows around the periphery of the carrier element 101, through the channels 105 (rather than through the carrier element 101). Likewise, the provision of the opening 112 at the downstream end 103 of the carrier element 101 means that as airflow exits the channels 105, carrier 106 released from the shell 107 (the mechanism for which is discussed further below) is drawn from the carrier element 101 through the opening 112. This is illustrated using the arrows in Figure 4. As has been discussed above, this mechanism for entraining carrier 106 in the airflow can aid in reducing the cooling rate of the carrier 106, which can result in an aerosol having a larger particle size (i.e. than would be the case if the air passed directly through the carrier element 101.

**[0109]** As mentioned above, in use, the carrier 106 is released from the shell 107. To facilitate this, the shell 107 of the capsule 108 is configured to melt when heated by an aerosol generating apparatus (the shell 107 may, for example, be configured to melt at a temperature that is lower than a temperature at which the carrier 106 is typically vapourised). When the shell 107 melts, the carrier 106 is released so as to flow into the pores of the carrier element 101. The porous nature of the carrier element 101 means that it wicks the liquid carrier 106 such that the carrier 106 is distributed throughout the carrier element 101. The carrier 106 can then be drawn from the carrier element 101 by the airflow exiting the channels 105, as discussed above. By providing a shell 107 that melts, the carrier 106 can be contained until it is required for use, which prevents leakage of the carrier 106 from the consumable 70 during e.g. transport and storage.

**[0110]** The carrier element 101 is directly downstream

of a solid aerosol precursor 115, which is at an upstream end of the consumable 70. Together, the carrier 106 of the carrier element 101 and the solid aerosol precursor 115 provide the precursor 6 of the consumable 70 (in that together they form the aerosol that is ultimately inhaled by a user). In use, air first flows through the solid aerosol precursor 115, and then along the channels 105 at the periphery of the carrier element 101. Like the carrier element 101, the solid aerosol precursor 115 is substantially cylindrical. The solid aerosol precursor 115, in this embodiment, comprises a reconstituted tobacco substrate.

**[0111]** Downstream of the carrier element 101 is a first mixing space 116 in which air that exits the channels 105 mixes and draws carrier 106 from the carrier element 101. Downstream of the first mixing space 116 is a hollow bore filter element 117 formed of cellulose acetate tow wrapped in a paper plug wrapper (not shown). The hollow bore filter element 117 includes an axially extending central bore 118, through which air can pass. The central bore 118 acts as a flow disturber to provide further cooling and mixing of the airflow through the consumable 70. A second mixing space 119 is provided downstream of the hollow bore filter element 117. In use, airflow passes through the bore 118 of the hollow bore filter 117, then exhausts into the larger diameter second mixing space 119, causing turbulent flow eddies as it exits. This provides even further mixing of the aerosol and additional cooling. At the downstream end of the consumable 70, immediately downstream of the second mixing space 119, a solid (i.e. no bore) terminal filter element 120 is provided. Like the hollow bore filter element 117, the terminal filter element 120 is formed of cellulose acetate tow with a paper plug wrapper (again, not shown).

**[0112]** The solid aerosol precursor 115, carrier element 105, hollow bore filter element 117 and terminal filter element 120 are all circumscribed by a paper wrapping layer 121. This holds the various elements together to form the consumable 70, and defines the two mixing spaces 116, 119. Although not shown, each mixing space 116, 119 may be defined within a cardboard tube that extends about an interior surface of the paper wrapping layer 121.

**[0113]** Referring now to Figure 7, the consumable 70 is shown engaged in a consumable-receiving cavity 121 of an aerosol generating apparatus 50. Together, the consumable 70 and aerosol generating apparatus 50 form an aerosol generating system 1.

**[0114]** The consumable-receiving cavity 121 of the apparatus 50 is defined by a housing 123 of the apparatus 50. Housed within the housing 123 is a heating system 52 that includes first 54a and second 54b heating elements. In the illustrated embodiment, the heating elements 54a, 54b are both tubular heating elements that circumferentially surround the consumable-receiving cavity 121 (and thus the consumable 70 when received therein). In other embodiments, the heating elements 54a, 54b could take other forms. For example, they could be in the form of blade or rod heating elements configured to penetrate the consumable 70.

**[0115]** The heating system 52 is configured to heat the solid aerosol precursor 115 and the carrier element 101 of the consumable 70 to different temperatures. This is facilitated by the provision of the two heating elements 54a, 54b. In particular, the second heating element 54b is controlled (by e.g. a controller that is not shown) to heat up to a higher temperature than the first heating element 54a. In this way, in use, when the apparatus 50 is activated, the carrier element 101 (and thus the carrier 106) is heated to a higher temperature than the solid aerosol precursor 115. In particular, the solid aerosol precursor 115 is heated to a temperature of about 200°C, while the carrier 106 is heated to a higher temperature of about 290°C. This prevents burning of the tobacco of the solid aerosol precursor 115, while ensuring efficient vaporisation of the carrier (such vaporisation being particularly effective at temperatures of at least 290°C).

## Claims

1. A consumable for an aerosol generating apparatus, the consumable comprising a carrier element containing a carrier in the form of propylene glycol and/or glycerine, wherein a substantially unimpeded airflow path is provided at a periphery of the carrier element for flow of air from an upstream end of the carrier element to a downstream end of the carrier element.

2. A consumable according to claim 1 wherein the unimpeded airflow path is provided by one or more channels at a periphery of the carrier element; and wherein the channels are in the form of grooves formed in a peripheral surface of the carrier element.

3. A consumable according to any one of the preceding claims wherein the carrier element is porous.

4. A consumable according to any one of the preceding claims wherein the carrier element comprises an internal cavity in fluid communication with an opening at the downstream end of the carrier element; wherein the internal cavity comprises a chamber and a narrowed region disposed between the chamber and the opening at the downstream end of the carrier element; and wherein the carrier element comprises first and second separate carrier element parts, each of the first and second carrier element parts partly defining the chamber of the carrier element.

5. A consumable according to claim 4 wherein the carrier element comprises first and second separate carrier element parts, each of the first and second carrier element parts partly defining the chamber of the carrier element.

6. A consumable according to any one of the preceding claims wherein the carrier is a liquid.

7. A consumable according to claim 6 wherein the carrier is held within a shell, the shell and carrier defining a capsule.

8. A consumable according to claim 7, when dependent on claim 4, wherein the carrier is held within the chamber of the carrier element.

9. A consumable according to any one of the preceding claims comprising a solid aerosol precursor upstream of the carrier element.

10. A consumable according to any one of the preceding claims comprising a mixing space immediately downstream of the carrier element.

11. A consumable according to any one of the preceding claims comprising a hollow bore filter element downstream of the carrier element; and comprising a second mixing space downstream of the hollow bore filter element.

12. An aerosol generating system comprising:
a consumable comprising:

a carrier element containing a carrier in the form of propylene glycol and/or glycerine, wherein a substantially unimpeded airflow path is provided at a periphery of the carrier element for flow of air from an upstream end of the carrier element to a downstream end of the carrier element; and
a solid aerosol precursor; and
a heating system for heating the consumable.

13. An aerosol generating system according to claim 12 wherein the heating system is configured to heat the solid aerosol precursor and the carrier element, in use, to different temperatures; and wherein the heating system is configured to heat the carrier element to a higher temperature than the solid aerosol precursor.

14. A method of generating an aerosol using the aerosol generating system according to any one of claims 12 or 13, the method comprising heating the consumable using the heating system, and drawing air through the consumable such that air flows through the channels of the consumable and subsequently draws carrier from the downstream end of the carrier element.

15. A carrier element for a consumable for use with an aerosol generating apparatus, the carrier element comprising an internal cavity for retaining a capsule, and the carrier element being formed of separate first and second carrier element parts, each of the first and second carrier element parts partly defining the internal cavity such that the first and second carrier element parts can be brought together around a capsule to enclose the capsule in the internal cavity.

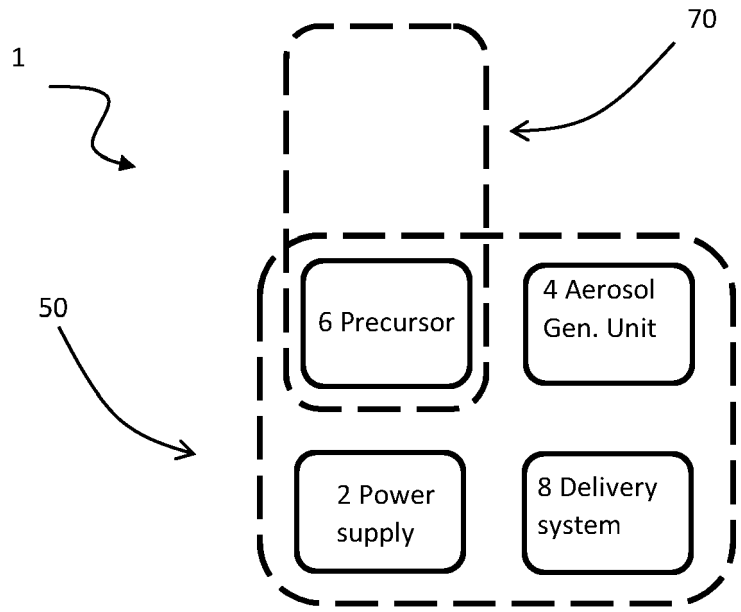
1
70
50
6 Precursor
4 Aerosol Gen. Unit
2 Power supply
8 Delivery system

Fig. 1

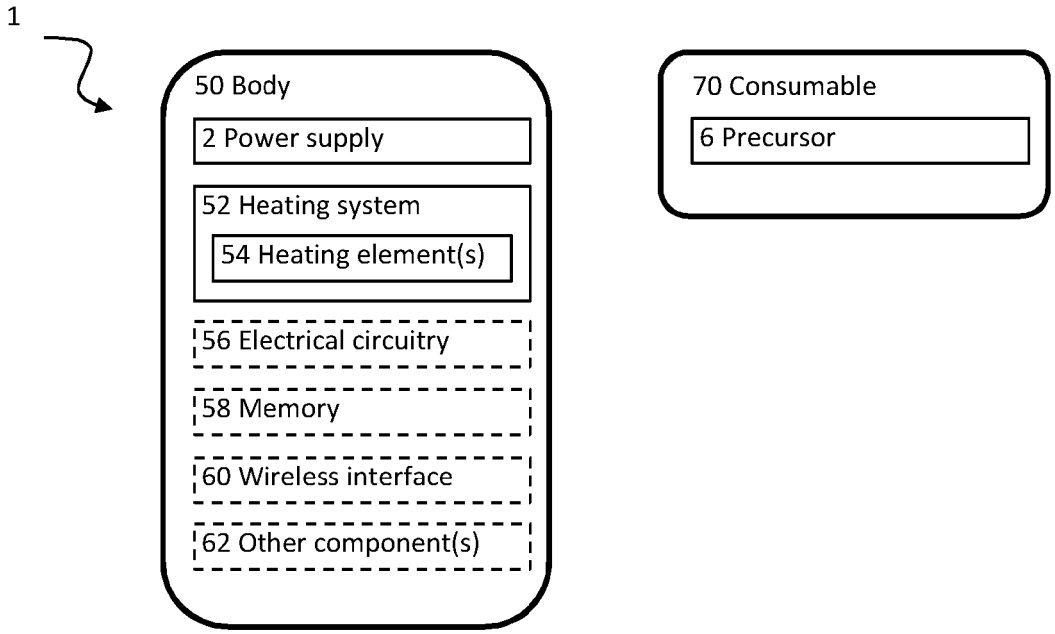
1
50 Body
2 Power supply
52 Heating system
54 Heating element(s)
56 Electrical circuitry
58 Memory
60 Wireless interface
62 Other component(s)
70 Consumable
6 Precursor

Fig. 2

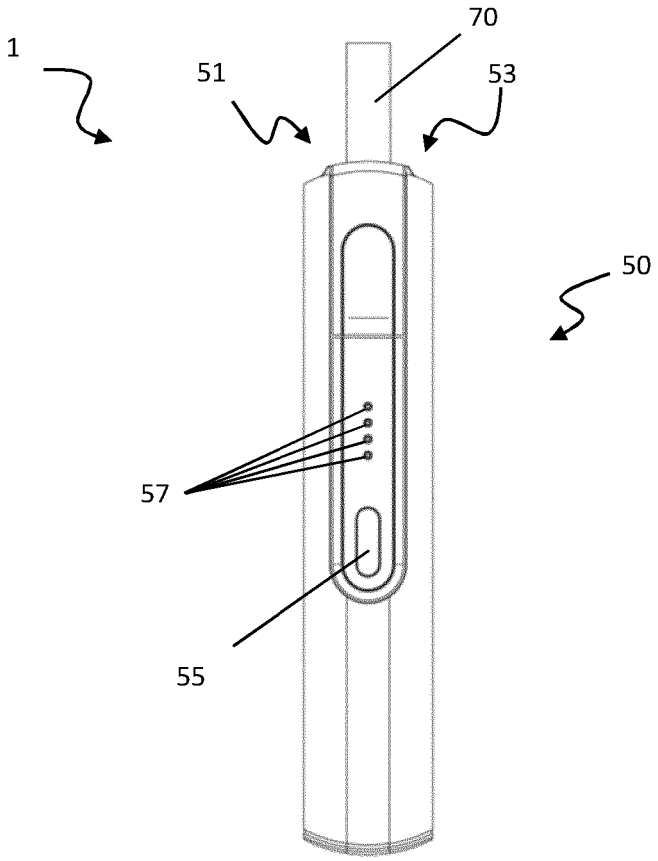
1
70
51
53
50
57
55

Fig. 3

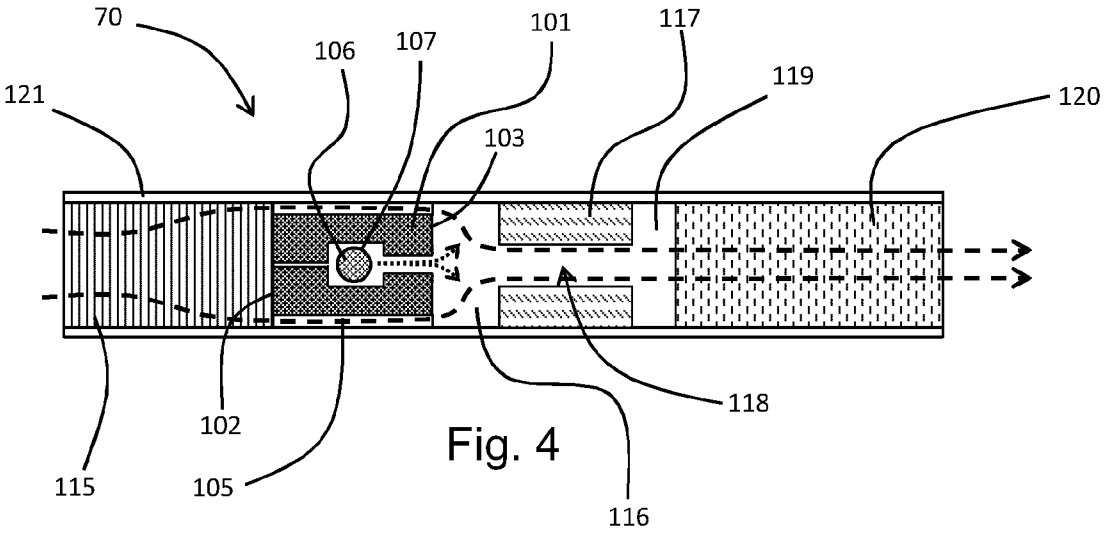


Fig. 4

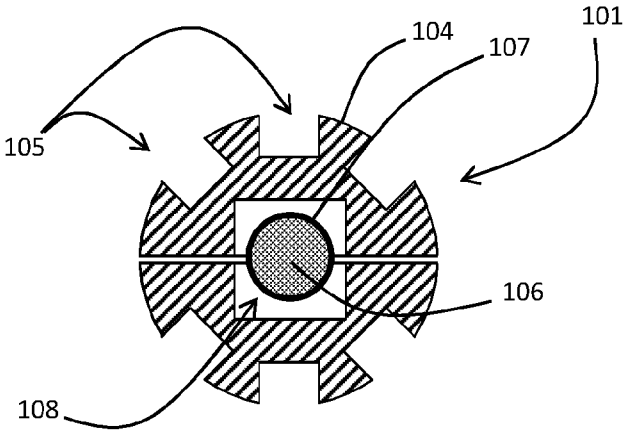


Fig. 5

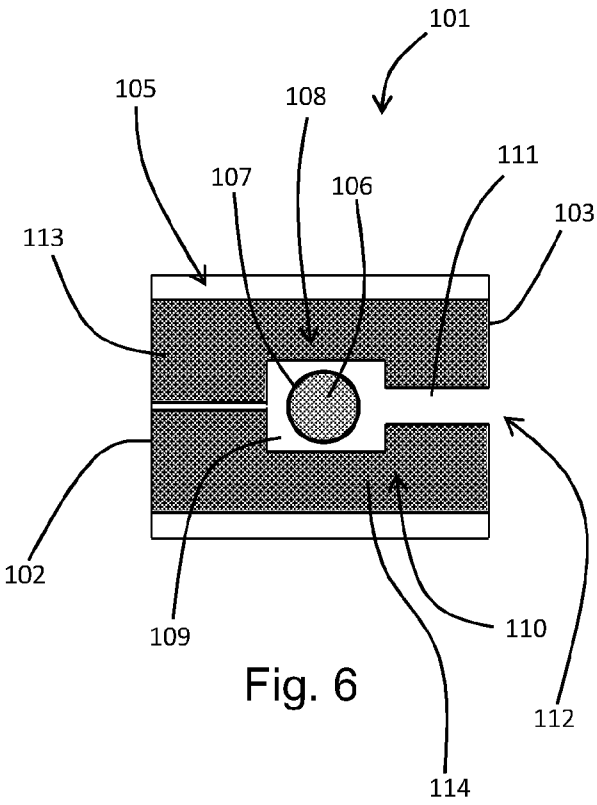


Fig. 6

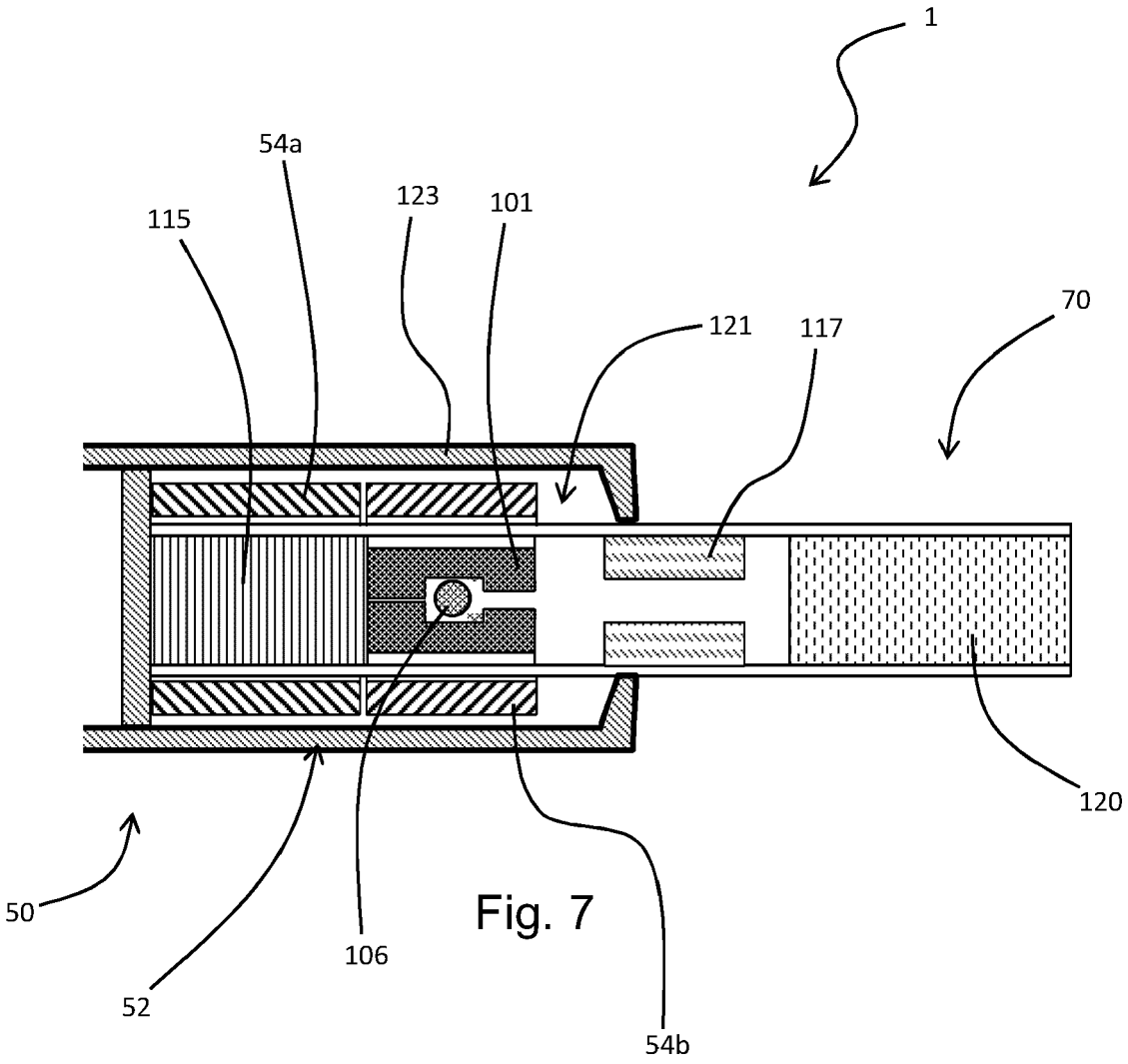


Fig. 7

Europäisches Patentamt
European Patent Office
Office européen des brevets

# EUROPEAN SEARCH REPORT

Application Number
EP 23 18 6453

## 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 11 000 061 B2 (PHILIP MORRIS PRODUCTS SA [CH]) 11 May 2021 (2021-05-11) | 1-12,14 | INV. A24D1/20 |
| A | * column 1, line 63 - column 14, line 21; figures 1-5 * | 13 | A24D3/04 A24D3/06 A24F40/46 |
| X | US 2022/211101 A1 (SPIELES SANDRA [DE] ET AL) 7 July 2022 (2022-07-07) | 1-3,6,9, 10,12,14 | A24F40/50 |
| A | * paragraph [0054] - paragraph [0072]; figures 1A-13 * | 4,5,7,8, 11,13 | ADD. A24F40/20 A24F40/30 |
| X | US 2014/202479 A1 (NICHOLLS JANE [GB] ET AL) 24 July 2014 (2014-07-24) | 1-12,14 | |
| A | * paragraph [0146] - paragraph [0199]; figures 1A-12C * | 13 | |

TECHNICAL FIELDS SEARCHED (IPC)

A24D
A24F

~~The present search report has been drawn up for all claims~~

1

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| The Hague | 14 December 2023 | Espla, Alexandre |

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)

Europäisches Patentamt
European Patent Office
Office européen des brevets

Application Number
EP 23 18 6453

## CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

## LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-14

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

Europäisches Patentamt
European Patent Office
Office européen des brevets

## LACK OF UNITY OF INVENTION
## SHEET B

Application Number
EP 23 18 6453

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

**1. claims: 1-14**

**A consumable comprising a carrier element containing a carrier in the form of propylene glycol and/or glycerine, wherein a substantially unimpeded airflow path is provided at a periphery of the carrier element.**

**---**

**2. claim: 15**

**A carrier element for a consumable, formed of separate first and second carrier element parts, each partly defining an internal cavity for retaining a capsule.**

**---**

# ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 23 18 6453

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.

14-12-2023

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| US 11000061 B2 | 11-05-2021 | AR 105286 A1 | 20-09-2017 |
| | | CN 107846970 A | 27-03-2018 |
| | | JP 6855396 B2 | 07-04-2021 |
| | | JP 2018519821 A | 26-07-2018 |
| | | KR 20180029203 A | 20-03-2018 |
| | | RU 2712209 C1 | 24-01-2020 |
| | | TW 201701781 A | 16-01-2017 |
| | | US 2019000134 A1 | 03-01-2019 |
| | | WO 2017009298 A1 | 19-01-2017 |
| US 2022211101 A1 | 07-07-2022 | CA 3141947 A1 | 03-12-2020 |
| | | CN 113966175 A | 21-01-2022 |
| | | EA 202193242 A1 | 18-03-2022 |
| | | EP 3975764 A1 | 06-04-2022 |
| | | JP 2022535189 A | 05-08-2022 |
| | | KR 20220013383 A | 04-02-2022 |
| | | TW 202102147 A | 16-01-2021 |
| | | US 2022211101 A1 | 07-07-2022 |
| | | WO 2020239599 A1 | 03-12-2020 |
| US 2014202479 A1 | 24-07-2014 | AR 086375 A1 | 11-12-2013 |
| | | BR 112013029365 A2 | 31-01-2017 |
| | | CL 2013003254 A1 | 25-07-2014 |
| | | EP 2706873 A1 | 19-03-2014 |
| | | JP 5901745 B2 | 13-04-2016 |
| | | JP 2014513538 A | 05-06-2014 |
| | | MX 346812 B | 31-03-2017 |
| | | RU 2013155217 A | 20-06-2015 |
| | | TW 201306761 A | 16-02-2013 |
| | | US 2014202479 A1 | 24-07-2014 |
| | | WO 2012156695 A1 | 22-11-2012 |

EPO FORM P0459

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