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(54) AEROSOL GENERATING SYSTEM

(57) An aerosol generating system is provided. The aerosol generating system includes an aerosol generating apparatus and an aerosol forming article. The aerosol forming article includes a solid aerosol precursor, and wherein the aerosol precursor includes a plurality of strips

of an aerosol forming substrate. At least one of the strips includes at least one embossed region to increase friction between strips. The aerosol generating apparatus includes a heating system including a heater for penetration into the precursor.

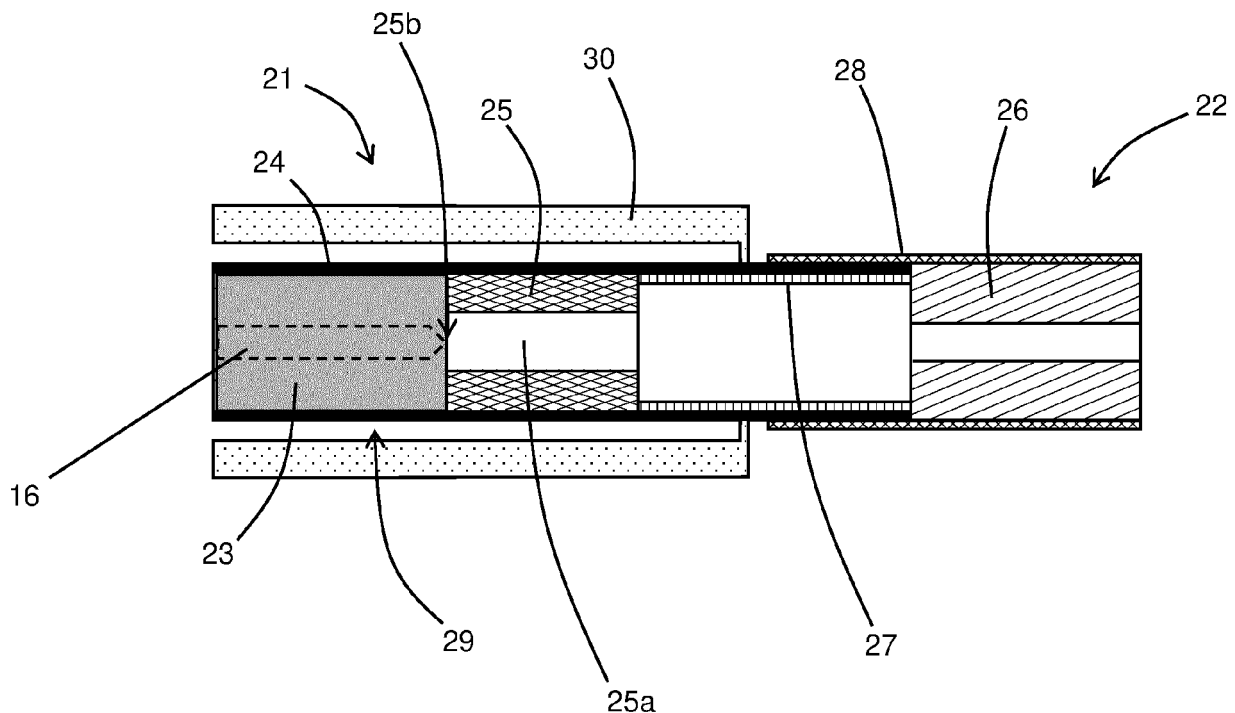


FIG 4

EP 4 108 108 A1

Description

FIELD

[0001] The present disclosure relates to the field of aerosol generating systems. In particular, the disclosure relates to aerosol generating systems including an embossed solid aerosol precursor.

BACKGROUND

[0002] Smoking substitute systems include electronic aerosol generation systems that permit a user to simulate the act of smoking by producing an aerosol (also referred to as a "vapour") that is drawn into the lungs through the mouth (inhaled) and then exhaled. The inhaled aerosol typically bears nicotine and/or flavourings without, or with fewer of, the odour and health risks associated with traditional smoking.

[0003] One approach for a smoking substitute 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 device and a consumable. The consumable may include the tobacco material. The device and consumable are configured to be physically coupled together. In use, heat is imparted to the tobacco material by a heating element of the device, 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] In some existing systems, the heating element penetrates into the tobacco portion of the consumable. This penetration can exert forces on the tobacco portion, which can cause the tobacco portion to be undesirably moved or shifted by the action of the heater. This may for example alter undesirably the airflow characteristics of the system.

[0006] There is a need for improved design of aerosol generating systems to enhance the user experience and improve the function of the aerosol generating system. In spite of the effort already invested in the development of aerosol generating systems further improvements are desirable.

SUMMARY

[0007] The present disclosure provides an aerosol generating system that comprises an aerosol generating apparatus and an aerosol forming article; wherein the

aerosol forming article includes a solid aerosol precursor, and wherein the solid aerosol precursor includes a plurality of strips of an aerosol forming substrate and wherein the aerosol generating apparatus includes a heating system including a heater for penetration into the solid aerosol precursor. In some embodiments, at least one of the strips includes at least one embossed region.

[0008] The provision of the embossed region increases the friction between strips. This increase in friction reduces the risk of the penetrative heater undesirably moving the strips within the precursor. This movement may take place during heater insertion and / or removal.

[0009] In some embodiments, at least two of the strips includes a respective embossed region. Such arrangements allow for yet further increased friction as two embossed regions can mutually engage to increase inter-strip friction.

[0010] In some embodiments, the plurality of strips are substantially aligned within the precursor. In some embodiments, the precursor is generally elongate, and has a longitudinal axis along the longest dimension of the elongate consumable. In some embodiments, the strips are generally aligned along that longitudinal axis. This may permit the manufacture of precursor sections to be a largely continuous process.

[0011] In some embodiments, the precursor is elongated along a longitudinal axis, and an embossed region on a first embossed strip is longitudinally off set along the longitudinal axis from the second embossed region on a second embossed strip. Mutually offsetting the embossed regions on two strips may again increase friction, as it may increase the chances of the embossed regions interdigitating with one another in the precursor.

[0012] In some embodiments, the embossed region on the first embossed strip is located longitudinally between a pair of embossed regions on the second embossed strip. Again, this may increase the chances of interdigitation in the precursor, and thus increase friction.

[0013] In some embodiments, each of substantially all of the strips include at least one respective embossed region. This again may further increase friction since all of the strips may have increased friction with their respective surrounding strips in the precursor.

[0014] In some embodiments each of substantially all of the strips includes a respective plurality of embossed regions. This again may increase friction by increasing the chances of mutual interdigitation between strips in the precursor.

[0015] In some embodiments, each strip has a longitudinal strip length and a transverse strip width, the strip length being greater than the strip width, and wherein the or each embossed region is located between two longitudinal opposed edges of the respective strip. This means that the embossed regions do not extend across an edge of the strip, which may be liable to weaken the strip. In such embodiments, with the embossed regions between the opposed edges of the respective strip, the tensile strength of the strips may be increased, and thus

the manufacturability is improved, and the stability of the final product may be improved.

[0016] In some embodiments the or each embossed region is generally circular. Such embodiments may be particularly simple to manufacture since no particular orientation is required to be maintained.

[0017] In some embodiments the or each embossed region is generally elongate. This may increase friction between strips as the elongate embossed regions may experience a higher friction against neighbouring strips in the precursor.

[0018] In some embodiments, the aerosol forming article includes an aperture immediately downstream of the precursor. Such an aperture may form part of the airflow path through the consumable / aerosol forming article, which may promote mixing of the vapours for a good user experience.

[0019] In some embodiments, the aperture is an upstream lumen of a bore. The bore may form a narrowing of the airflow path through the consumable / aerosol forming article. It is preferable that such a bore does not get block by precursor strips being pushed into it by the penetrative heater.

[0020] In some embodiments, wherein the bore is located through a porous filter material. In other words, in some embodiments, the aerosol forming article includes bore filter downstream of the precursor, optionally immediately downstream of the precursor.

[0021] In some embodiments, each strip has a substantially equal transverse width. This may permit a simpler manufacturing process.

[0022] In some embodiments, the heater has a rod shape or a blade shape. Such heaters may allow for easy penetration of the heater into the precursor. Either blade or rod heater may be inductively heated via an induction coil, or resistively heated, for example via one or more resistive heating tracks located on or in the blade or rod.

[0023] The present disclosure also provides an aerosol forming article in accordance with the above and proceeding disclosures. In other words, the present disclosure provides an aerosol forming article; wherein the aerosol forming article includes a solid aerosol precursor, and wherein the solid aerosol precursor includes a plurality of strips of an aerosol forming substrate. In some embodiments, at least one of the strips includes at least one embossed region. Further optional features of the aerosol forming article are outlined above and described via the embodiments below.

[0024] The present disclosure also provides a method of forming an aerosol forming article including the steps of obtaining a sheet of aerosol forming substrate (for example, recon tobacco), embossing the sheet with at least one embossed region, separating the substrate into a plurality of strips, and gathering the strips together to form a solid aerosol precursor.

[0025] Optionally, the embossing and separation steps are performed simultaneously, for example via a cooperating pair of rollers that a) separates the sheet into

strips, and b) imparts embossed region(s) onto the sheet / strips.

[0026] Optionally, the after the strips are gathered together, the strips are wrapped in a wrapping layer. The wrapping layer may be formed from a paper material.

[0027] Optionally, the method includes forming an aerosol forming article including the solid aerosol precursor.

[0028] Optionally the method includes locating a bore filter immediately downstream of the solid aerosol precursor.

[0029] Features of the solid aerosol precursor and of the aerosol forming article described herein are also applicable to the method of using an aerosol forming system.

[0030] The present disclosure also provides a method of using an aerosol forming system, the aerosol generating system comprising an aerosol generating apparatus and an aerosol forming article; wherein the aerosol forming article includes a solid aerosol precursor, and wherein the solid aerosol precursor includes a plurality of strips of an aerosol forming substrate and wherein the aerosol generating apparatus includes a heating system including a heater for penetration into the solid aerosol precursor. In some embodiments, at least one of the strips includes at least one embossed region. The method includes engaging the aerosol forming article with the aerosol generating system such that the heater penetrates the solid aerosol precursor, operating the heater such that the heater heats the solid aerosol precursor, and disengaging the aerosol forming article from the aerosol generating system such that the heater is withdrawn from the solid aerosol precursor. Features of the aerosol precursor, aerosol forming article, and aerosol generating system described herein are also applicable to this method of using an aerosol forming system.

[0031] The preceding summary is provided for purposes of summarizing some embodiments to provide a basic understanding of aspects of the subject matter described herein. Accordingly, the above-described features are merely examples and should not be construed to narrow the scope or spirit of the subject matter described herein in anyway. Moreover, the above and/or proceeding embodiments may be combined in any suitable combination to provide further embodiments. Other features, aspects, and advantages of the subject matter described herein will become apparent from the following Detailed Description, Figures, and Claims.

BRIEF DESCRIPTION OF THE FIGURES

[0032] Aspects, features and advantages of embodiments of the present disclosure will become apparent from the following description of embodiments in reference to the appended drawings in which like numerals denote like elements.

Figure 1A is a block system diagram showing componentry of an aerosol generating apparatus;

Figure 1B is a block system diagram showing componentry of the apparatus of figure 1A;

Figure 2 is a diagram showing an embodiment of the apparatus of figure 1B;

Figure 3 is a diagram showing a consumable in accordance with an embodiment of the present invention;

Figure 4 is a diagram showing the consumable of Figure 3 engaged with an HT device, in accordance with the present invention;

Figure 5A is a diagram of a recon sheet in accordance with an embodiment of the present invention;

Figure 5B is a diagram of a recon sheet in accordance with an embodiment of the present invention;

Figure 5C is a cross section view of a recon strip in accordance with an embodiment of the present invention;

Figure 6A is a diagram of a recon sheet in accordance with an embodiment of the present invention;

Figure 6B is a diagram of a recon strip in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION OF EMBODIMENTS

[0033] Before describing several embodiments of aerosol generating system and apparatus, it is to be understood that the system and apparatus is not limited to the details of construction or process steps set forth in the following description. 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 and apparatus could be embodied differently and/or be practiced or carried out in various ways.

[0034] 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.

[0035] Any patents, published patent applications, and non-patent publications mentioned in the specification may be taken as indicative of the level of skill of those skilled in the art to which the inventive concept(s) pertains and are herein expressly incorporated by reference in their entirety to the same extent as if each individual patent or publication was specifically and individually indicated to be incorporated by reference.

[0036] All of the systems, apparatus, and/or methods disclosed herein can be made and executed without undue experimentation in light of the present disclosure. While they have been described in terms of particular embodiments, 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.

[0037] 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.

[0038] 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).

[0039] 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.

[0040] Unless otherwise explicitly stated as incompatible, or the physics or otherwise of the embodiments, example, or claims prevent such a combination, the features of the foregoing embodiments and examples, and of the following 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 the example(s), embodiment(s), or dependency of the 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.

[0041] 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:

As used herein, the term **"aerosol generating apparatus"** or **"aerosol delivery apparatus"** or **"apparatus"** or **"electronic(e)-cigarette"** may include apparatus to deliver an aerosol to a user for inhalation. The apparatus may also be referred to as a "smoking substitute apparatus", which may refer to apparatus intended to be used instead of a conventional combustible smoking article. As used herein a "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). The apparatus may include an aerosol generating unit that may generate a vapour that may subsequently condense into the aerosol before delivery to an outlet, which may be arranged as a mouthpiece. The apparatus may be configured to deliver an aerosol for inhalation, which 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; flow properties including turbulence and velocity. The apparatus may be portable. As used herein, the term **"Portable"** may refer to the apparatus being for use when held by a user. The apparatus may be adapted to generate a variable amount of aerosol, e.g. by activating an aerosol generating unit of the apparatus for a variable amount of time, (as opposed to a metered dose of aerosol), which 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 a vaping button and/or inhalation sensor. Each occurrence of the aerosol generating apparatus being caused to generate aerosol for a period of time (which may be variable, see above) may be referred to as an "activation" of the aerosol generating apparatus. The aerosol generating apparatus may be arranged to vary an amount of aerosol delivered to a user 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).

[0042] As used herein, the term **"aerosol generating system"** or **"aerosol delivery system"** or **"system"** may include the apparatus and optionally other circuitry/componentry associated with the function of the apparatus, e.g. an external device and/or a external component (here "external" is intended to mean external to the aerosol generating apparatus). As used herein, the terms "external device" and "external component" may include one or more of a: a mobile device (which may be connected to the aerosol generating apparatus, e.g. via

a wireless or wired connection); a networked-based computer (e.g. a remote server); a cloud-based computer; any other server system.

[0043] As used herein, the term **"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. Aerosol herein may generally refer to/include a vapour. Aerosol may include one or more components of the precursor.

[0044] As used herein, the term **"aerosol-forming precursor"** or **"precursor"** or **"aerosol-forming substance"** or **"aerosol-forming substrate"** may refer to one or more of a: liquid; solid; gel; loose leaf material; other substance. The precursor may be processable by an aerosol generating unit of the apparatus to form an aerosol. The precursor may include one or more of: an active component; a carrier; a flavouring. The active component may include 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. The active component may be carried by the carrier, which may be a liquid, including propylene glycol and/or glycerine. The term "flavouring" may refer to 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. The precursor may include a substrate, e.g. reconstituted tobacco to carry one or more of the active component; a carrier; a flavouring.

[0045] As used herein, the term **"storage portion"** may refer to a portion of the apparatus adapted to store the precursor, it may be implemented as fluid holding reservoir or carrier for solid material depending on the implementation of the precursor as defined above.

[0046] As used herein, the term **"flow path"** may refer to a path or enclosed passageway through the apparatus, through which the user may inhale for delivery of the aerosol. 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. the outlet is downstream of the inlet.

[0047] As used herein, the term **"delivery system"** may refer to a system operative to deliver an aerosol to a user. The delivery system may include a mouthpiece/a mouthpiece assembly and the flow path.

[0048] As used herein, the term **"flow"** may refer to a flow in the flow path. The flow may include aerosol generated from the precursor. The flow may include air, which may be induced into the flow path via a puff.

[0049] As used herein, the term **"inhale"** or **"puff"** or **"draw"** may refer to a user expansion of the lungs and/or oral cavity to create a pressure reduction that induces flow through the flow path.

[0050] As used herein, the term **"aerosol generating unit"** may refer to a device to form the aerosol from the 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 the apparatus.

[0051] As used herein, the term **"heating system"** may refer to an arrangement of one or more heating elements, which are operable to aerosolise the precursor once heated. The heating elements may be electrically resistive to produce heat from electrical current there-through. The heating elements may be arranged as susceptors to produce heat when penetrated by an alternating magnetic field. The heating system may heat the precursor to below 300 or 350 degrees C, including without combustion.

[0052] As used herein, the term **"consumable"** may refer to a unit that includes or consists of the precursor. The consumable may include the aerosol generating unit, e.g. it is arranged as a cartomizer. The consumable may include the mouthpiece. The consumable may include the information carrying medium. With liquid or gel implementations of the precursor, e.g. an E-liquid, the consumable may be referred to as a "capsule" or a "pod" or "E-liquid consumable". The capsule may include the storage portion, e.g. a reservoir, for storage of the precursor. With solid material implementations of the precursor, e.g. tobacco or reconstituted tobacco formulation, 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 and the consumable may be arranged to carry the precursor. The consumable may be implemented as a dosage or pre-portioned amount of material, including a loose-leaf product.

[0053] As used herein the term **"heat not burn"** 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).

[0054] Referring to Figure 1A, an embodiment aerosol generating apparatus 2 includes a power supply 4, for supply of electrical energy. The apparatus 2 includes an aerosol generating unit 6 that is driven by the power supply 4. The power supply 4 may include an electric power supply in the form of a battery and/or an electrical connection to an external power source. The apparatus includes precursor 8, which in use is aerosolised by the aerosol generating unit 6. The apparatus 2 includes a delivery system 10 for delivery of aerosolised precursor to a user (not shown in Figure 1A).

[0055] Electrical circuitry (not illustrated in Figure 1A) may be implemented to control the interoperability of the power supply 4 and aerosol generating unit 6.

[0056] In variant embodiments, which are not illustrated, the power supply may be omitted, e.g. an aerosol generating unit implemented as an atomiser with flow expansion may not require a power supply.

5 [0057] Referring to Figure 1B, the aerosol generating apparatus 2 is an implementation of the embodiment of Figure 1A and/or other embodiments disclosed herein typically for generation of an aerosol from a solid precursor. A heating system 16 of the aerosol generating unit 6 interacts with the precursor 8 to generate vaporised and/or aerosol precursor. The precursor 8 is typically arranged as a solid and is arranged to receive thermal energy via conductive heat transfer from the aerosol generating unit 6, e.g. the heating system 16 is arranged as a rod (not illustrated in figure 1B), which is inserted into the precursor. The delivery system 10 includes a flow path 12 that transmits flow 14 through (or in operative proximity to) the precursor 8 to carry the vapour and/or aerosol to an outlet 20 of the flow path 12.

20 [0058] Referring to figure 2, which is a specific implementation of the embodiment of figures 1A and 1B, a consumable 22 is implemented as a stick. The stick 22 is separably connectable to a body 21 that comprises the power supply 4 and aerosol generating unit 6. The stick 22 includes proximal the body 21 the precursor 8 (not shown in figure 2) as a reconstituted tobacco formulation and distal the body 21 a mouthpiece 20 arranged as a filter.

30 [0059] As shown in Figures 3 and 4, an HNB consumable 22 in accordance with the present invention is shown. The consumable 22 is an example of an aerosol forming article according to the present invention. The consumable 22 comprises an aerosol-forming precursor 23 towards the upstream end of the consumable 22. In Figure 3 the consumable 22 is shown alone, in Figure 4 the consumable 22 is shown engaged with a representative section of the apparatus body 21.

35 [0060] The aerosol-forming precursor 23 comprises reconstituted ("recon") tobacco which includes nicotine as a volatile compound.

40 [0061] The aerosol-forming precursor 23 comprises 65 wt% tobacco which is provided in the form of gathered strips produced from a sheet of slurry or paper recon tobacco. The tobacco is dosed with 20wt% of a humectant such as propylene glycol (PG) or vegetable glycerine (VG) and has a moisture content of between 7-9 wt%. In other embodiments, the humectant content may be up to 25%. The aerosol-forming substrate further comprises cellulose pulp filler and guar gum binder. In some embodiments, a cellulose powder may be used as an alternative to cellulose pulp. In some embodiments no binder (i.e. 0% binder) may be included. Decreasing the binder and / or pulp content may correspondingly increase the tobacco content.

55 [0062] Although not apparent from Figures 3 and 4, the precursor 23 is formed of a plurality of elongate strips of plant material. For example, the precursor 23 may include 125 strips, where each strip is 1 millimetre wide.

In some embodiments, different strip width and / or number of strips are possible. In some embodiments, the total transverse width of the sheet is an integer multiple of the strip width. In some embodiments, the strip width may for example be between 1.0 and 3.0 millimetres, for example between 1.0 and 2.0 millimetres. In some embodiments, the strip width may be substantially equal to 1.4 millimetres. In some embodiments, the strip width may be substantially equal to 1.0 millimetres. In some embodiments, the strip width may be substantially equal to 2.0 millimetres. In some embodiments, the strip width may be substantially equal to 1.2 millimetres. In some embodiments, the strip width may be substantially equal to 1.35 millimetres. In some embodiments, the total transverse width of the sheet may be selected such that the total transverse width of the sheet is an integer multiple of the strip width. In some embodiments, the total number of strips across the sheet may be between 70 and 125, for example between 75 and 90.

[0063] Each strip of plant material is a longitudinally elongate ribbon of tobacco having generally rectangular, planar form. The strips within the precursor **23** are gathered together to be substantially, though not necessarily exactly, aligned along the long axis of the consumable **22** and of the precursor **23**. In some embodiments, each strip has a length that is substantially equal to the length of the precursor **23**.

[0064] As described in connection with later figures, each strip of plant material has a series of embossed regions. An embossed region is an area of the strip that stands out in relief from the surrounding area of the strip. In other words, in an embossed region, an embossed area of the strip is pushed out from the plane of the immediately surrounding strip surface.

[0065] For the avoidance of doubt, it is considered that in the context of the present invention embossing and debossing are interchangeable and similar concepts.

[0066] The precursor **23** is formed in a substantially cylindrical shape such that the consumable resembles a conventional cigarette. The precursor **23** has diameter of around 7mm and an axial length of around 12 mm. In other embodiments, different size and shape of the precursor **23** is possible, for example different length and / or diameter.

[0067] The precursor **23**, and in particular the gathered strips of tobacco, is / are circumscribed by a paper wrapping layer **24**. The paper wrapping layer **24** may include an inflammable layer or coating, for example a metallic foil layer (not shown in Figures). The foil layer may be on the inside of the paper wrapping layer **24**, facing the precursor **23**. Such an inflammable layer may have a lower coefficient of friction than an uncoated paper layer, so embossing the strips in combination with such an embossing layer may beneficially increase friction between precursor and the coated / lined internal surface of the paper wrapping layer **24**, as well as increasing interstrip friction in the precursor **23**.

[0068] The consumable **22** also comprises an up-

stream filter element **25** and a downstream (terminal) filter element **26**. The two filter elements **25**, **26** and spaced by a cardboard spacer tube **27**. Both filter elements **25**, **26** are formed of cellulose acetate tow and wrapped with a respective paper plug layer (not shown).

[0069] Both upstream and downstream filter elements **25**, **26** have a substantially cylindrical shape. The diameter of the upstream filter **25** matches the diameter of the aerosol-forming substrate **23**. The diameter of the terminal filter element **26** is slightly larger and matches the combined diameter of the aerosol-forming substrate **23** and the wrapping layer **24**.

[0070] In some embodiments, the downstream filter element **26** may be a solid monoacetate filter. That is a filter without any through bores. In some other embodiments, the downstream filter element **26** may include a plurality of parallel bores formed therethrough - a so-called multibore filter. For example, the downstream filter element **26** may include three parallel longitudinal bores passing therethrough. The diameter of each of the multiple bores may be substantially equal to 1.0 millimetre.

[0071] The upstream filter element **25** is slightly shorter in axial length than the terminal filter element **26** at an axial length of 10mm compared to 12mm for the terminal filter element **26**.

[0072] The upstream filter element **25** has a bore **25a** formed through it. The bore **25a** has an upstream lumen or opening **25b**, which is directly adjacent the downstream end of the precursor **23**. The embossed regions of the strips in the precursor **23** increase friction between the strips. Accordingly, when the heater **16** penetrates the precursor **23**, the risk that some strips of the precursor **23** may be pushed in a downstream direction, by the heater **16**, through the lumen **25a**, may be mitigated. This may improve the user experience since strips pushed into the lumen **25a** can alter detrimentally the airflow through the consumable **22**.

[0073] The cardboard spacer tube **27** is longer than each of the two filter portions having an axial length of around 14mm.

[0074] Each filter element **25**, **26** is a hollow bore filter element with a hollow, longitudinally extending bore. The diameter of the bore in the upstream filter **25** is slightly larger than the diameter of the bore in the terminal filter **26** having a diameter of 3mm compared to 2 mm for the terminal filter element **26**.

[0075] The cardboard spacer tube **27** and the upstream filter portion **25** are circumscribed by the wrapping layer **24**.

[0076] The terminal filter element **26** is joined to the upstream elements forming the consumable by a circumscribing paper tipping layer **28**. The tipping layer **28** encircles the terminal filter portion **26** and has an axial length of around 20mm such that it overlays a portion of the cardboard tube spacer **27**.

[0077] Referring to Figure 4, the consumable **22** of Figure 3 is shown inserted into an heated tobacco ("HT") device **21**. The combination of consumable **22** and HT

device **21** is an example of aerosol generating system according to the present invention. The HT device **21** includes a rod-shaped heating element **16** (shown in dashed lines). The heating element **16** projects into a cavity **29** within the main body **30** of the device.

[0078] In use (and as shown in Figure 4), the consumable **22** is inserted into the cavity **29** of the main body **30** of the device **21** such that the heating rod element **16** penetrates the precursor **23**. In general, the rod heater **16** locates between the strips of tobacco of the precursor **23**. In some embodiments (and as shown in Figure 4), the rod heater **16** has a pointed distal end. The pointed end of the rod heater **16** may ease the penetration of the rod heater **16** into the precursor **23**. In some other embodiments, the heater **16** may be a flat, blade-shaped, heater. Again, such a blade shaped heater may include a pointed distal end to aid penetration into the precursor. Heating of the strips in the precursor **23** is effected by powering the heating element **16** (e.g. with a rechargeable battery (not shown)).

[0079] In some other embodiments, the heating element **16** may be inductively coupled to an inductive coil, which causes the heater to heat inductively. In such embodiments, the inductive coil may surround at least a portion of the cavity **29** in which the heater **16** is located.

[0080] As the tobacco strips of the precursor **23** are heated, moisture and volatile compounds (e.g. nicotine) within the tobacco and the humectant are released as a vapour and entrained within an airflow generated by inhalation by the user at the terminal filter portion **26**.

[0081] As the vapour cools within the upstream filter element **25** and the cardboard spacer tube **27**, it condenses to form an aerosol containing the volatile compounds for inhalation by the user.

[0082] Further details of the precursor **23** will now be described.

[0083] Referring to Figure 5A, a top down view of a portion of a sheet **40** of recon tobacco is shown. The sheet **40** is generally elongate. The sheet **40** has a sheet length in a longitudinal dimension **41** and a sheet width in a transverse dimension **42**. The sheet length is many times larger than that the sheet width. The sheet **40** is provided on a roll where the roll has the rotational axis along the transverse dimension **42**. The dotted lines at the upper and lower edges of the sheet in Figure 5A are intended to indicate that sheet **40** continues beyond those dotted lines in the longitudinal dimension **41**.

[0084] The precursor **23** may be formed according to the following process / method.

[0085] In a first manufacturing process step, the sheet is embossed with a 2-dimensional embossing pattern of embossed regions **43**. Only a subset of the embossed regions **43** are labelled in Figure 5A for clarity. In the embodiment of Figure 5A, each embossed region **43** is generally circular. It will be appreciated that the pattern of embossing is 2-dimensional across the plane of the sheet. The embossed regions themselves rise out from / into the plane of the sheet in a third orthogonal dimension.

The embossing may be formed by an embossing roller with the inverse of the 2-dimensional embossing pattern to the formed on the sheet. That is the embossing pattern is formed in relief on the embossing roller. The sheet **40** passes between the embossing roller and a second cooperating roller to impart the embossing pattern to the sheet **40**.

[0086] In a second manufacturing process step, the sheet **40** is separated (e.g. cut) into a plurality of strips **44**. Only a subset of the strips **44** are labelled in Figure 5A for clarity. The cuts are made along the cut lines **45** extending along the longitudinal dimension **41** of the sheet **40**. Only a subset of the cut lines **45** are labelled in Figure 5A for clarity. Each strip **44** has a strip width **46** in the transverse dimension **42**. In the embodiment of Figure 5A, all strips **44** have the same strip width **46**. In other embodiments, the sheet **40** may be separated into a plurality of strips **44** in which there is a plurality of different strip widths **46**. In some embodiments the embossing and the separation are performed simultaneously. The sheet may be separated into strips via a pair of cooperating rollers. The rollers may include a plurality of cooperating and interlocking channels that separate the sheet into strips via cutting or shearing the sheets. In some embodiments, a single pair of cooperating rollers imparts the embossing pattern and separates the sheet into strips.

[0087] The sheet **40** of Figure 5A is intended to illustrate of the principles of the present invention. In other embodiments, the number of strips **44** across the transverse dimension **42** may be different from that shown in the Figure 5A. In some embodiments, the strip width **46** of each strip **44** as a fraction of the total transverse width of the sheet **40**, may be different. For example, the sheet **40** may have 125 strips **44**, each of a 1 millimetre strip width **46**, provided across a sheet **40** having a transverse total width of 125 millimetres. In some embodiments, different strip width and / or number of strips are possible. In some embodiments, the total transverse width of the sheet is an integer multiple of the strip width. In some embodiments, the strip width **46** may for example be between 1.0 and 3.0 millimetres, for example between 1.0 and 2.0 millimetres. In some embodiments, the strip width **46** may be substantially equal to 1.4 millimetres. In some embodiments, the strip width may be substantially equal to 1.0 millimetres. In some embodiments, the strip width may be substantially equal to 2.0 millimetres. In some embodiments, the strip width may be substantially equal to 1.2 millimetres. In some embodiments, the strip width may be substantially equal to 1.35 millimetres. In some embodiments, the total transverse width of the sheet may be selected such that the total transverse width of the sheet is an integer multiple of the strip width **46**. In some embodiments, the total number of strips across the sheet may be between 70 and 125, for example between 75 and 90.

[0088] When the sheet **40** is considered as whole, the embossed regions **43** form a 2-dimensional pattern

across the sheet **40**. The pattern may have a transverse periodicity across the transverse dimension **42** and a longitudinal periodicity along the longitudinal dimension **42**. The transverse periodicity may be the distance along the transverse dimension between two immediately adjacent embossed regions **43**. The longitudinal periodicity may be the distance along the longitudinal dimension between two immediately adjacent embossed regions **43**. In some embodiments, the longitudinal periodicity is different from the transverse periodicity. In some embodiments, the longitudinal periodicity is larger than the transverse periodicity. In some embodiments, the transverse periodicity is generally equal to the strip width **46**.

[0089] In some embodiments, the longitudinal periodicity is between 1.0 and 5.0 millimetres. In some embodiments, the longitudinal periodicity is between 1.5 and 5.0 millimetres. In some embodiments, the longitudinal periodicity is between 2.0 and 4.0 millimetres. In some embodiments, the longitudinal periodicity is between 2.0 and 3.0 millimetres. In some embodiments, the longitudinal periodicity is substantially equal to 2.15 millimetres. In some embodiments the longitudinal periodicity is greater than or equal to a longitudinal extent of an embossed region **43**.

[0090] Referring to Figure 5B, a top down view of a portion of a sheet **50** of recon tobacco is shown. The sheet **50** is similar in most respects to the sheet **40** of Figure 5A. The same reference numerals are used where appropriate. The sheet **50** of Figure 5B differs from the sheet **40** of Figure 5A because the 2-dimensional pattern of embossed regions **43** is different. In particular, the embossed pattern includes a plurality of longitudinal repeating units **47**. In the embodiment of Figure 5B, each repeating unit **47** comprises two longitudinal sequences of embossed regions **43**. Each longitudinal sequence within the unit **47** is longitudinally offset from the other longitudinal sequences of the repeating unit **47**. This longitudinal offset may also be considered a phase offset between adjacent longitudinal sequences. The strip cuts **45** may be made between longitudinal sequences within the repeating unit **47**. This means that, when the strips **44** are gathered together into the precursor **23**, the embossed regions **43** between strips may at least partially interdigitate with one another. In other words, an embossed region **43** on a first strip **44** is located between a pair of adjacent embossed regions **43** on a second, adjacent strip **44** when gathered into the precursor **23**. Again, this may increase the longitudinal friction between strips **44** in the precursor **23**.

[0091] Embossing the strips **44** effectively increases the volume of a particular strip **44** relative to an unembossed strip. This means that less recon material is needed to fill a precursor **23** of a particular size. For example, the present invention may result in a reduction of recon content in the precursor **23** of around 10 to 15%, relative to precursor **23** formed of unembossed recon.

[0092] Figure 5C shows a longitudinal cross section through a portion of one strip **44** from the sheet **40** of

Figure 5A or sheet **50** of Figure 5B. Two embossed regions **43** are illustrated as regions of the strip **44** that protrude from the surrounding surface of the strip **44**. The longitudinal dimension **41** of the sheet strip **44** is shown, which corresponds to the longitudinal dimension **41** shown in Figures 5A and 5B. The embossed regions **43** protrude in a positive vertical dimension **48**. The vertical dimension **48** is perpendicular to the plane of the strip **44**. It will be appreciated that the embossed regions **43** could equally protrude in the negative vertical dimension, which may be considered "debossing". Embossing and debossing are considered equivalent in the context of the present invention.

[0093] In the embodiment of Figures 5A, 5B, and 5C the embossed regions **43** each have a generally circular shape in the plane of the sheet **40** or sheet **50**. The diameter of each embossed region **43** may be between 0.5 and 2.0 millimetres, for example between 0.5 and 1.5 millimetres, for example substantially 0.5 millimetres. The diameter of each embossed region **22** may alternatively be expressed as a fraction of the strip width **46**. For example, in some embodiments, the embossed region **43** has a diameter that is less than 90% of the strip width, for example, less than 80% of the strip width, for example less than 70% of the strip width, for example less than 60% of the strip width, for example less than 50% of the strip width. In some embodiments, the strip width is substantially equal to 1.4 millimetres, and the embossed regions **43** have a diameter of 1.0 millimetres. In some embodiments, the strip width is substantially equal to 1.4 millimetres, and the embossed regions **43** have a diameter of approximately 0.5 millimetres.

[0094] Referring to Figure 6A a top down view of a portion of a sheet **60** of recon tobacco is shown. The sheet **60** is similar in most respects to the sheet **40** of Figure 5A and sheet **50** of Figure 5B. The same reference numerals are used for corresponding features. The sheet **60** of Figure 6A differs from the sheet **40** of Figure 5B and sheet **50** of Figure 5C because the shape of the embossed regions **43** is different. In particular, in the embodiment of Figure 6A, each embossed region **43** has a non-circular shape in the plane of the sheet **60** / strip **44**. More specifically, the shape of each embossed region **43** is elongate, for example an ovoid shape. The example transverse and longitudinal periodicities for the embodiment of Figures 5A, 5B and 5C are equally applicable to the embodiments of Figures 6A and 6B.

[0095] In the embodiment of Figure 6A, each repeating unit **47** comprises two longitudinal sequences of embossed regions **43**. Similarly to the embodiment of Figure 5B, each longitudinal sequence within the repeating unit **47** is longitudinally offset from the other longitudinal sequences of the repeating unit **47**. This longitudinal offset may also be considered a phase offset between adjacent longitudinal sequences. The strip cuts **45** may be made between longitudinal sequences within the repeating unit **47**. In the embodiment of Figure 6A, the embossed regions **43** of a first strip within the repeating unit **47** have

a first orientation; the embossed regions 43 of a second, adjacent, strip 44 have a second orientation, different from the first orientation. In some embodiments, along the transverse dimension 42, the orientations of sequential strips 44 alternate between the first and second orientations.

[0096] This means that, when the strips are gathered together into the precursor 23, the embossed regions 43 of adjacent strips 44 may interdigitate with one another. In other words, an embossed region 43 on a first strip 44 is located between a pair of adjacent embossed regions 43 on a second adjacent strip 44 when gathered into the precursor 23. Again, this may increase the longitudinal friction between strips 44 in the precursor 23.

[0097] Referring to Figure 6B, a portion of a strip 44 from the sheet 60 of Figure 6A is shown. Three embossed regions 43 are illustrated as regions of the strip 44 that protrude from the surrounding surface of the strip 44. The embossed regions 43 protrude in a positive vertical dimension 48 (out of the page, in the context of Figure 6B). The vertical dimension 48 is perpendicular to the plane of the strip 44. It will be appreciated that the embossed regions 43 could equally protrude in the negative vertical dimension, which may be considered "debossing". Embossing and debossing are considered equivalent in the context of the present invention.

[0098] The three embossed regions 43 of Figure 6B are substantially identical in size and shape. Each embossed region 43 has a major axis length 52, a minor axis width 53 and an orientation angle 54. The major axis length 52 is greater than the minor axis width 53, as such the embossed regions 43 are elongate. In the embodiment of Figures 6A and 6B, the embossed regions have an oval shape. Other elongate shapes are also possible. In the case that the major axis length 52 is equal to the minor axis width 53, the embossed regions are circular, and as such correspond to the embossed regions shown in Figs. 5A, B and C.

[0099] In some embodiments, the minor axis width 53 may be less than or equal to 90% of the major axis length 52; in other embodiments the minor axis width 53 may be less than or equal to 80% of the major axis length 52; the minor axis width 53 may be less than or equal to 70% of the major axis length 52; the minor axis width 53 may be less than or equal to 60% of the major axis length 52; the minor axis width 53 may be less than or equal to 50% of the major axis length 52.

[0100] Each embossed region 43 is inclined relative to the longitudinal dimension 41 of the strip 44. That is, the major axis 52 of the embossed region 43 forms an orientation angle 54 with the longitudinal axis / dimension of the strip 44. The orientation angle 44 may be any angle. In the embodiment of Figures 6A and 6B, the orientation angle 54 is substantially equal to 45 degrees. In other embodiments, the orientation may be between 0 and 180 degrees. An orientation angle of 0 degrees or 180 degrees means that the major axis 52 of the elongate embossed region 43 is substantially aligned with the longi-

tudinal axis 41 of the strip 44. An orientation angle 54 of 90 degrees means that the major axis 52 of the elongate embossed region 43 is perpendicular to the longitudinal axis 41 of the strip 44.

[0101] Referring back to Figure 6A, the embossed regions 43 of a first strip within the repeating unit 47 have a first orientation angle 54; the embossed regions 43 of a second, adjacent, strip 44 have a second orientation angle 54, different from the first orientation angle. Along the transverse dimension 42, the orientation angles 54 of the embossed regions 43 of sequential strips 44 alternate between the first and second embossed region orientation angles 54. In some embodiments, as shown in Figure 6A, the embossed regions 43 on adjacent strips 44 have embossed region 43 orientation angles 54 that are substantially 90 degrees different from one another.

[0102] In some embodiments, the sheet or strips may have a thickness in the vertical dimension 48 of between 100 and 600 micrometres. For example, between 100 and 500 micrometres, for example between 150 and 400 micrometres, for example between 200 and 300 micrometres. In some embodiments, the thickness is may be approximate 250 micrometres.

[0103] Each embossed region 43 has an embossing depth 49 in the vertical dimension 48. In any embodiment, the embossing depth 49 may be between 50 and 500 micrometres. For example, between 100 and 400 micrometres, for example between 200 and 300 micrometres. In some embodiments, the embossing depth 49 may be approximately 250 micrometres.

[0104] In an embodiment, the embossing 49 depth is between 50 and 200% of the thickness of the sheet or strips.

[0105] In any embodiment, the sheet or strips may be formed from recon (aerosol forming substrate) having a sheet weight greater than or equal to 100 g/m², e.g. greater than or equal to 110 g/m² such as greater than or equal to 120 g/m². The sheet 40 or sheet 50 or sheet 60, or the strip 44, may have a sheet weight less than or equal to 300 g/m² e.g. less than or equal to 250 g/m² or less than or equal to 200 g/m². The sheet 40 or sheet 50 or sheet 60, or the strip 44, may have a sheet weight of between 120 and 190 g/m².

Claims

1. An aerosol generating system including an aerosol generating apparatus and an aerosol forming article; wherein the aerosol forming article includes a solid aerosol precursor, and wherein the solid aerosol precursor includes a plurality of strips of an aerosol forming substrate, wherein at least one of the strips includes at least one embossed region; wherein the aerosol generating apparatus includes a heating system including a heater for penetration into the solid aerosol precursor.

2. A system according to claim 1 wherein each of at least two of the strips includes a respective embossed region.
3. A system according to claim 2, wherein the plurality of strips are substantially aligned within the precursor. 5
4. A system according to claim 2 or claim 3 wherein the precursor is elongated along a longitudinal axis, and an embossed region on a first embossed strip is longitudinally off set along the longitudinal axis from the second embossed region on a second embossed strip. 10
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5. A system according to claim 4, wherein the embossed region on the first embossed strip is located longitudinally between a pair of embossed regions on the second embossed strip. 20
6. A system according to any preceding claim wherein each of substantially all of the strips includes at least one respective embossed region.
7. A system according to claim 6 wherein each of substantially all of the strips includes a respective plurality of embossed regions. 25
8. A system according to claim 6 or claim 7 wherein each strip has a longitudinal strip length and a transverse strip width, the strip length being greater than the strip width, and wherein the or each embossed region is located between two longitudinal opposed edges of the respective strip. 30
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9. A system according to any preceding claim wherein the or each embossed region is generally circular.
10. A system according to any one of claims 1 to 8, wherein the or each embossed region is generally elongate. 40
11. A system according to any preceding claim wherein the aerosol forming article includes an aperture immediately downstream of the precursor. 45
12. A system according to claim 11 wherein the aperture is an upstream lumen of a bore.
13. A system according to claim 12 wherein the bore is located through a porous filter material. 50
14. A system according to any preceding claim, wherein each strip has a substantially equal transverse width. 55
15. A system according to any preceding claim wherein the heater has a rod shape or a blade shape.

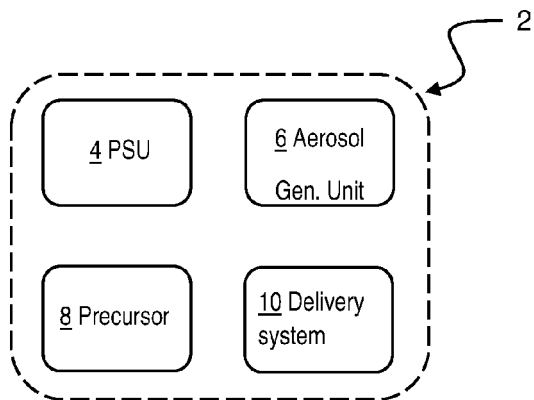


FIG 1A

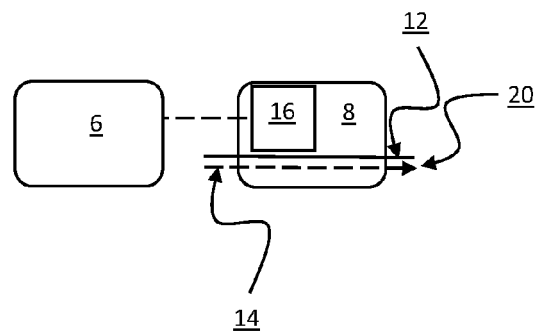


FIG 1B

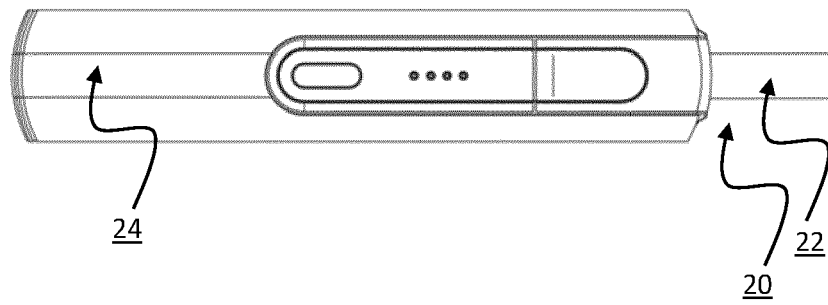


FIG 2

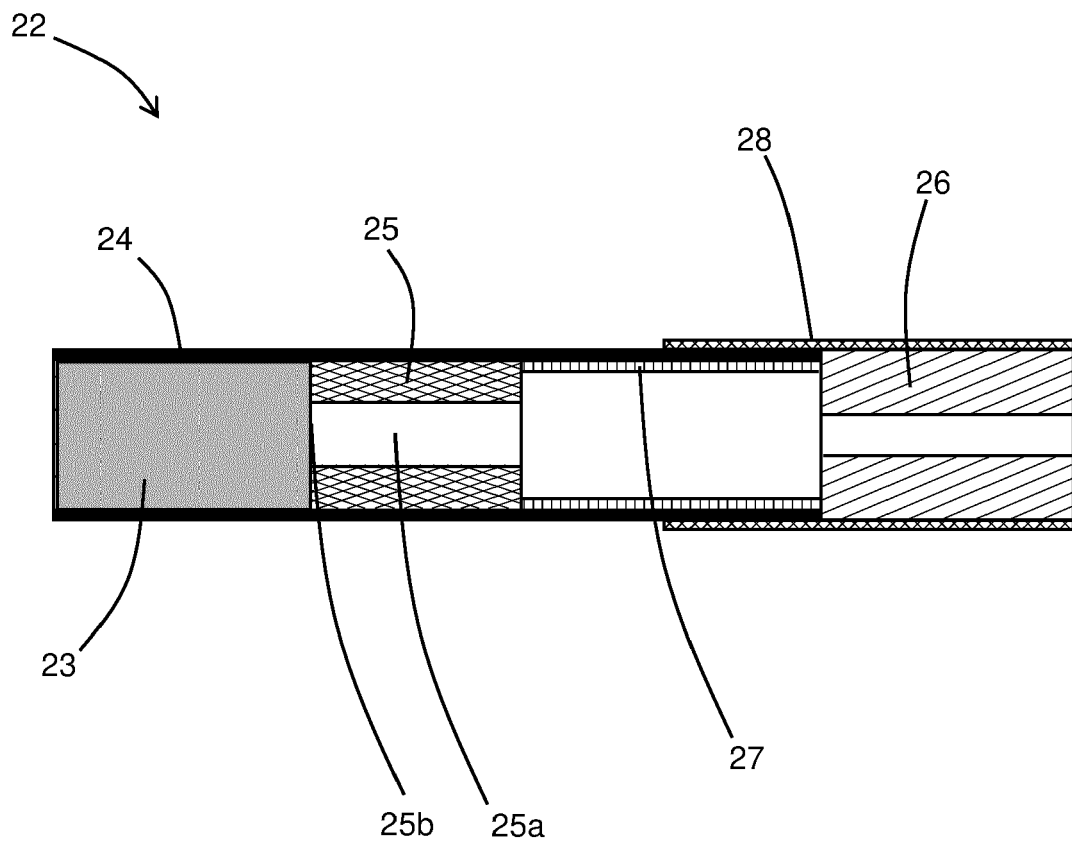


FIG 3

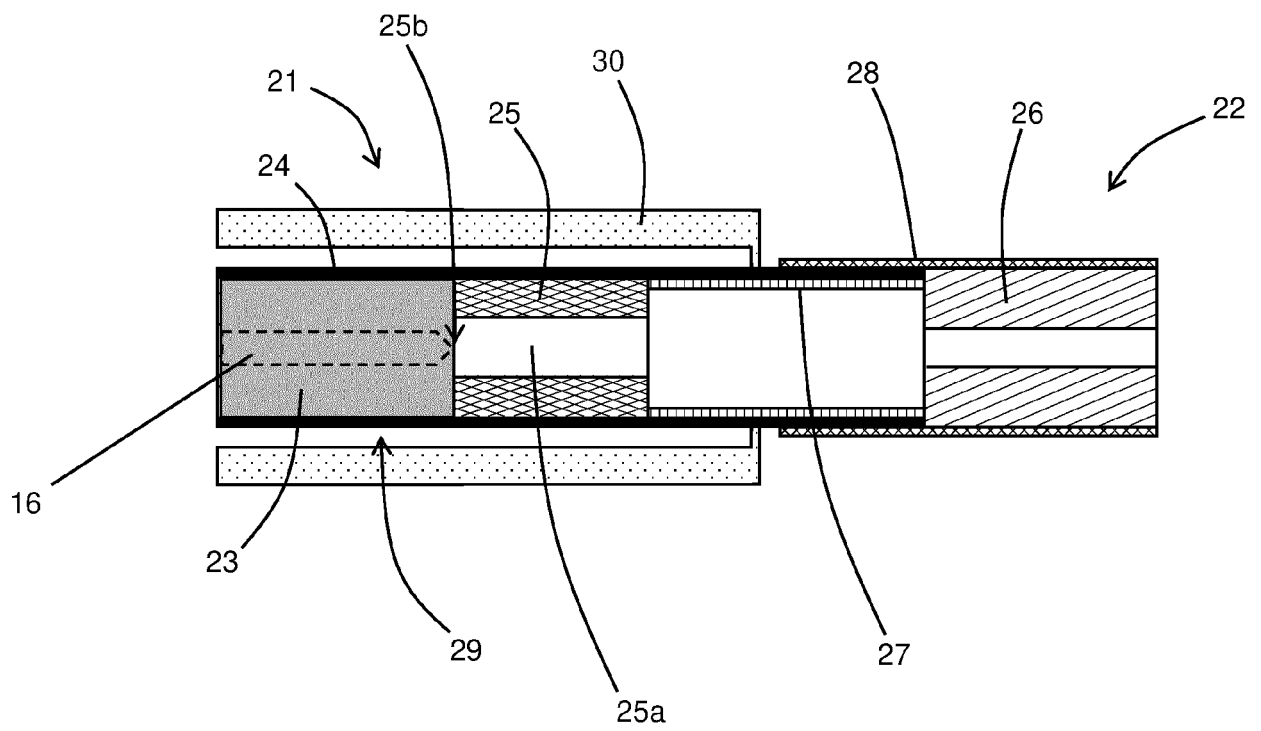


FIG 4

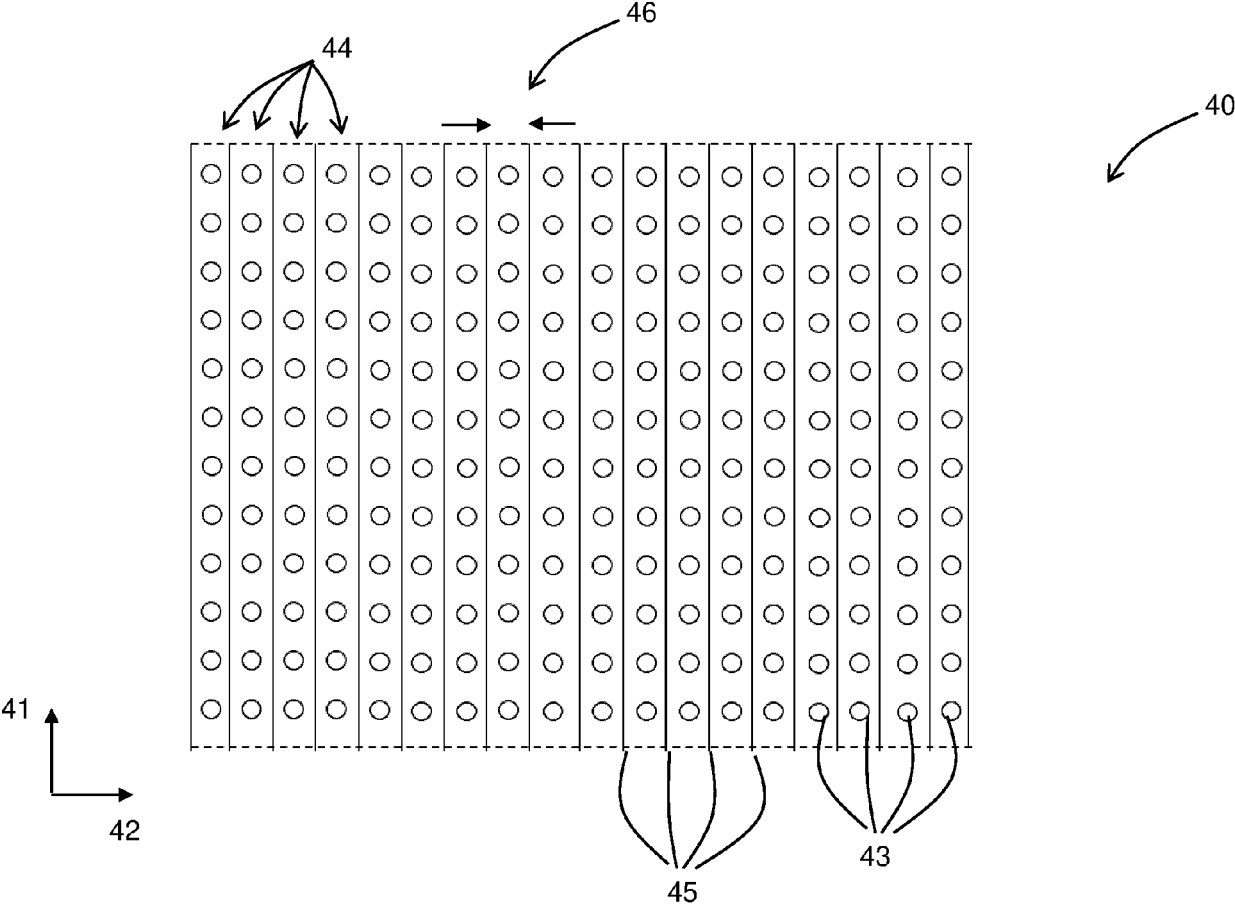


FIG 5A

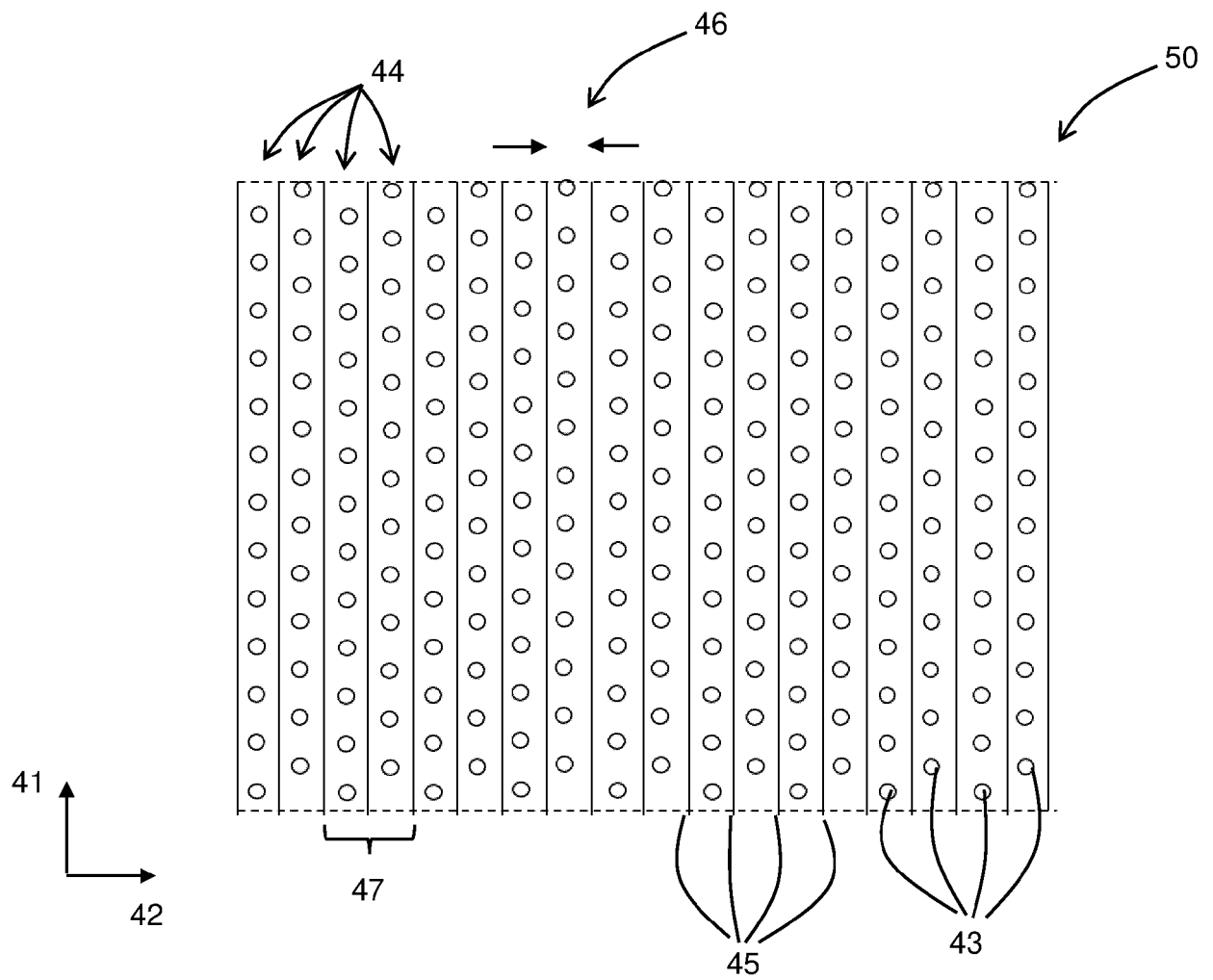
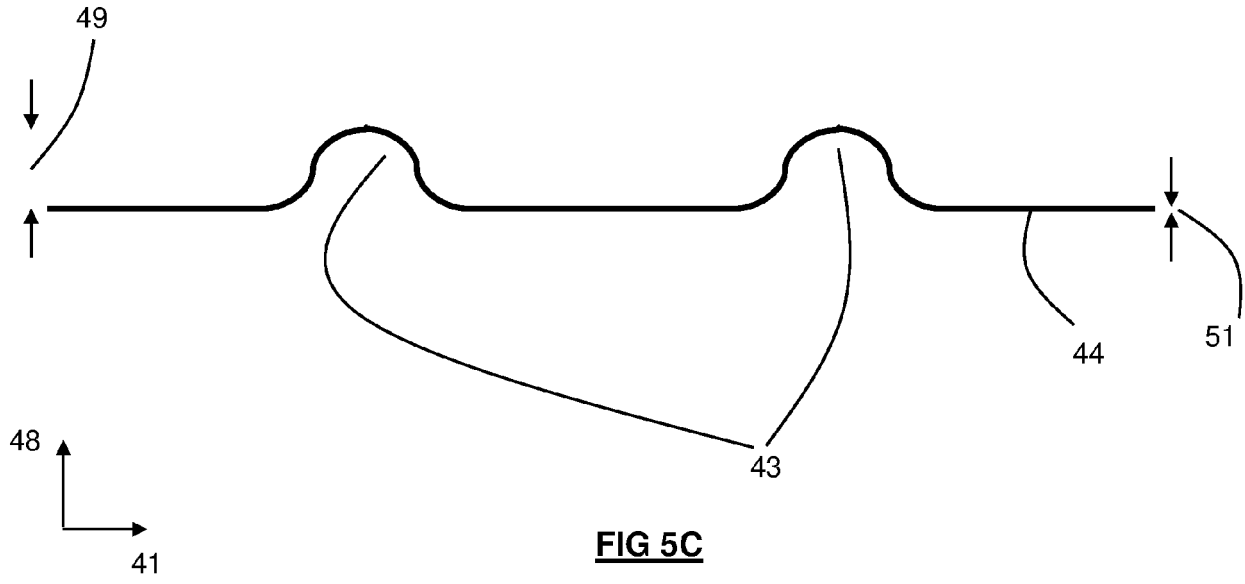


FIG 5B



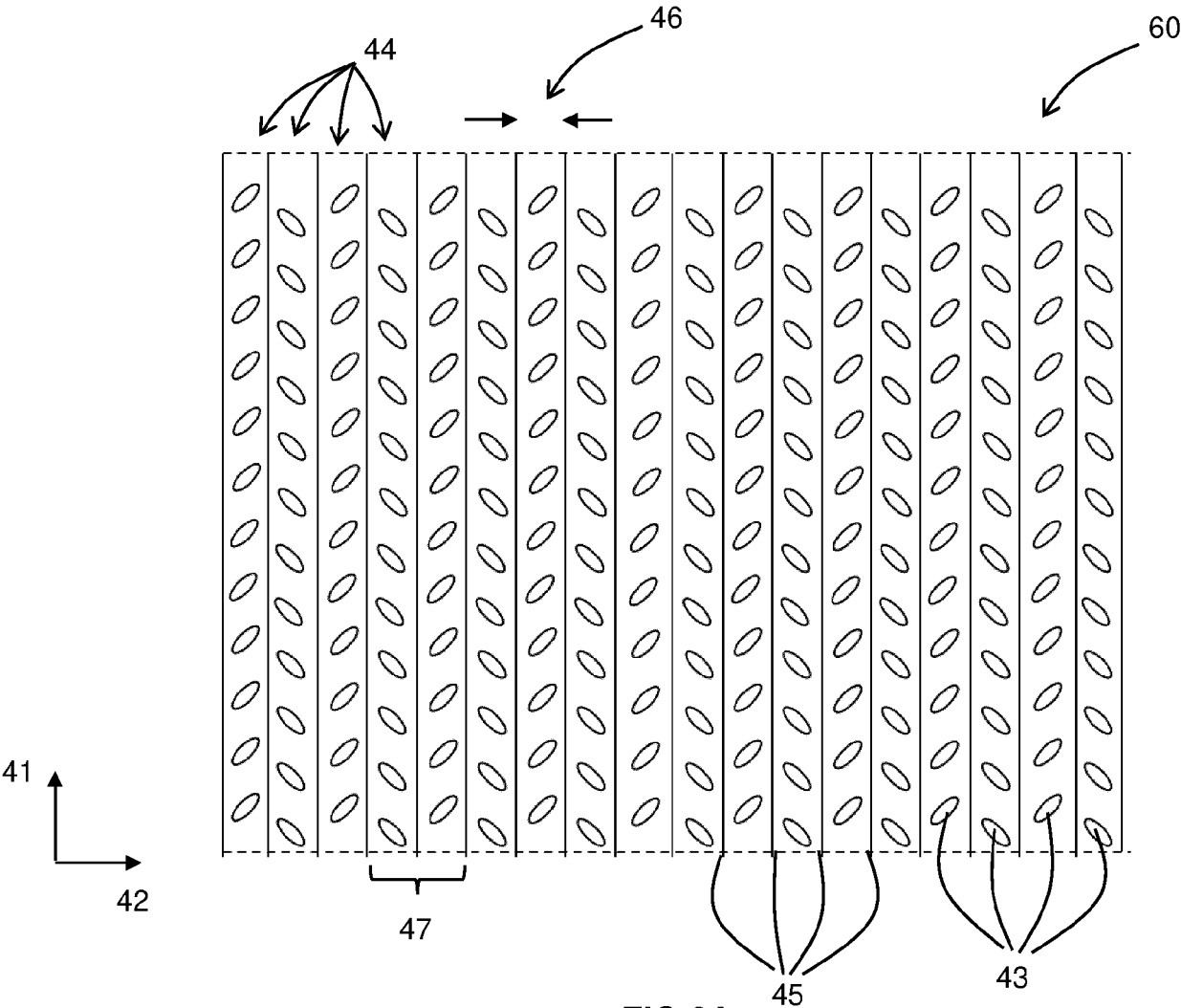


FIG 6A

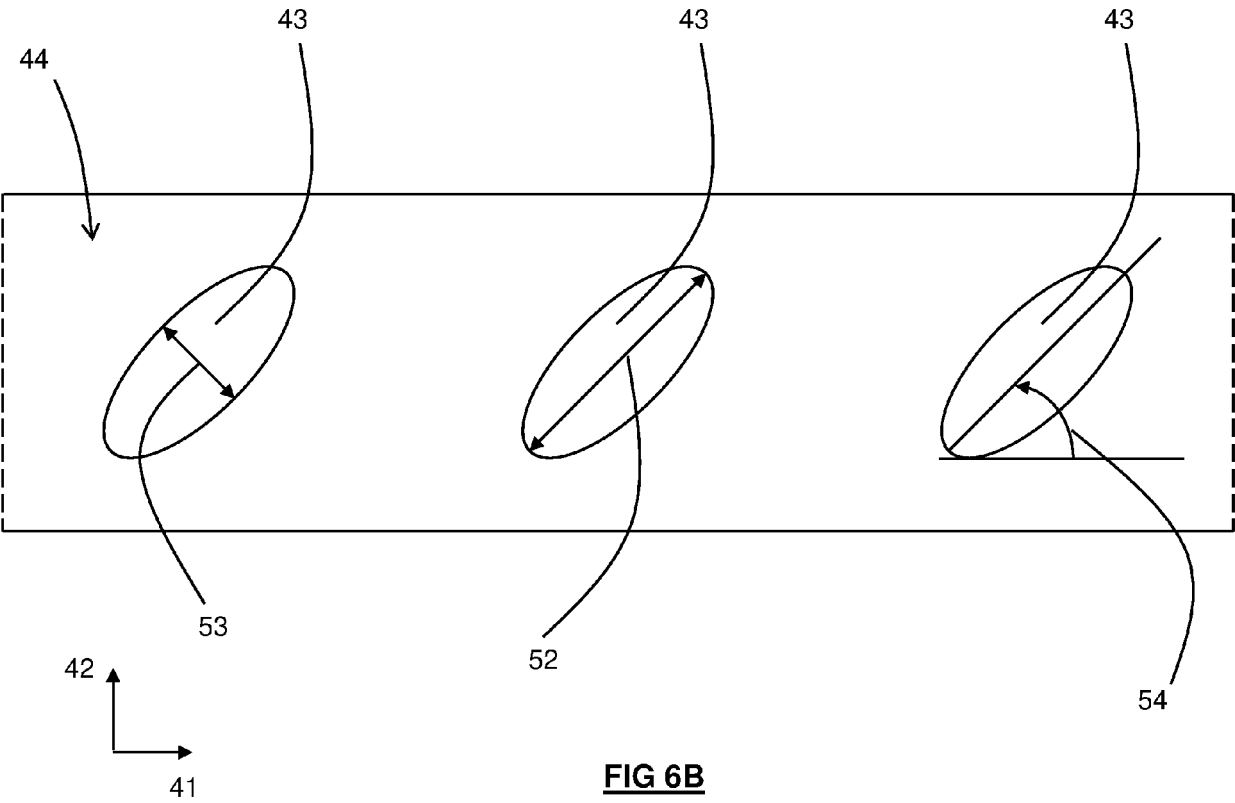


FIG 6B



EUROPEAN SEARCH REPORT

Application Number
EP 21 18 0911

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	US 2020/359675 A1 (REEVELL TONY [GB]) 19 November 2020 (2020-11-19) * abstract * * paragraphs [0015], [0058] - [0059], [0083], [0086] - [0088] * * figures 1-4 *	1-3,6-15 5	INV. A24F40/20 A24F40/40
X A	US 2020/120981 A1 (YAMADA MANABU [JP]) 23 April 2020 (2020-04-23) * abstract * * paragraphs [0053], [0062], [0079], [0095] - [0098] * * figures 1-10 *	1-4,6-9 5	
X A	EP 2 854 576 B1 (PHILIP MORRIS PRODUCTS SA [CH]) 23 December 2020 (2020-12-23) * abstract * * paragraphs [0131], [0138] - [0139] * * figures 1-11 *	1 5	
X A	CN 111 343 874 A (PHILIP MORRIS PRODUCTS SA) 26 June 2020 (2020-06-26) * the whole document *	1 5	TECHNICAL FIELDS SEARCHED (IPC) A24F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 15 November 2021	Examiner Cabrele, Silvio
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			

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

EP 21 18 0911

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 2020359675	A1	19-11-2020	BR 112020000471 A2	21-07-2020
			CN 110944527 A	31-03-2020
			EP 3664629 A1	17-06-2020
			JP 2020529856 A	15-10-2020
			KR 20200035001 A	01-04-2020
			US 2020359675 A1	19-11-2020
			WO 2019030277 A1	14-02-2019

US 2020120981	A1	23-04-2020	CN 110799048 A	14-02-2020
			EP 3643190 A1	29-04-2020
			JP W02018235959 A1	23-04-2020
			KR 20200007938 A	22-01-2020
			US 2020120981 A1	23-04-2020
			WO 2018235241 A1	27-12-2018
			WO 2018235959 A1	27-12-2018

EP 2854576	B1	23-12-2020	AR 091210 A1	21-01-2015
			AU 2013269589 A1	22-01-2015
			AU 2018200641 A1	15-02-2018
			BR 112014029738 A2	27-06-2017
			CA 2875167 A1	05-12-2013
			CN 104411191 A	11-03-2015
			CN 108514152 A	11-09-2018
			EP 2854576 A1	08-04-2015
			ES 2842936 T3	15-07-2021
			HK 1203776 A1	06-11-2015
			JP 6403666 B2	10-10-2018
			JP 2015517817 A	25-06-2015
			KR 20150024324 A	06-03-2015
			NZ 703083 A	26-08-2016
			PH 12014502504 A1	22-12-2014
			PL 2854576 T3	26-07-2021
			RU 2014153579 A	20-07-2016
			SG 11201407906T A	30-12-2014
			TW 201404317 A	01-02-2014
			UA 118086 C2	26-11-2018
			US 2015150302 A1	04-06-2015
			WO 2013178766 A1	05-12-2013
			ZA 201408251 B	31-08-2016

CN 111343874	A	26-06-2020	BR 112020009334 A2	27-10-2020
			CN 111343874 A	26-06-2020
			EP 3720303 A1	14-10-2020
			JP 2021505126 A	18-02-2021
			KR 20200096219 A	11-08-2020
			WO 2019110747 A1	13-06-2019

EPO FORM P0459

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55

15-11-2021

EPO FORM P0459

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