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(71) Applicant: PHILIP MORRIS PRODUCTS S.A.
[CH/CH]; Quai Jeanrenaud 3, 2000 Neuchâtel (CH).

(72) Inventors: BATISTA, Rui Nuno Rodrigues Alves; Quai Jeanrenaud 3, 2000 Neuchâtel (CH). BOLOGNA, Matteo; Quai Jeanrenaud 3, 2000 Neuchâtel (CH). CLUSE, Camille Sophie; Quai Jeanrenaud 3, 2000 Neuchâtel (CH).

(74) Agent: TAYLOR, Gillian; Reddie & Grose LLP, The White Chapel Building, 10 Whitechapel High Street, London Greater London E1 8QS (GB).

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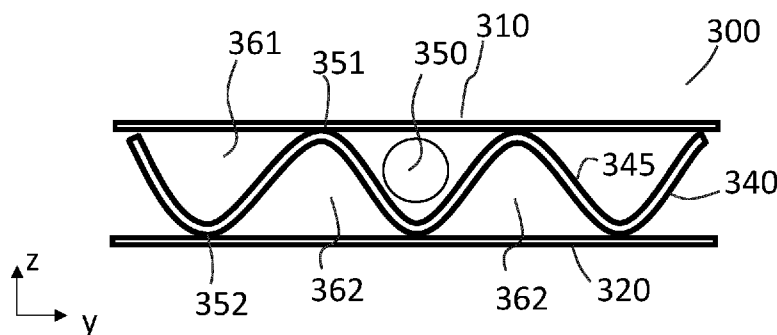


FIGURE 3

(57) Abstract: An aerosol-generating article (100)(200)(300)(400)(500)(600)(700)(800) for use with an aerosol-generating device to generate an inhalable aerosol comprises an aerosol-forming substrate (345)(440)(540) heatable to release an aerosol or volatile compounds capable of forming an aerosol; and an elongate flavour-bearing element (350)(480,490)(580,590)(680,690)(780,790)(880,890) comprising a carrier material and a flavourant supported on the carrier material. The aerosol-generating article (100)(200)(300)(400)(500)(600)(700)(800) has an article length, an article width and an article thickness, the article length and the article width being at least two times the article thickness.

AEROSOL-GENERATING ARTICLE COMPRISING ELONGATE FLAVOUR-BEARING ELEMENT

The present disclosure relates to an aerosol-generating article comprising an aerosol-forming substrate and an elongate flavour-bearing element. The present disclosure further relates to an aerosol-generating system comprising an aerosol-generating device and an aerosol-generating article comprising an aerosol-generating substrate and an elongate flavour-bearing element.

A typical aerosol-generating article may appear similar to a conventional cigarette. For example, such an aerosol-generating article may be substantially cylindrical and comprise an aerosol-forming substrate and other components such as a mouthpiece filter element and a cooling element, all arranged together in the form of a rod and wrapped in a cigarette paper. Dimensions of typical aerosol-generating articles are often similar to the dimensions of conventional cigarettes.

However, a significant portion of the aerosol-forming substrate in these cylindrical aerosol-generating articles may not be sufficiently heated to form an aerosol during use. This is undesirable since the insufficiently heated portion of the aerosol-forming substrate contributes to the cost of manufacture and transport of the aerosol-generating article, but does not contribute to the aerosol delivered to an end user. This may be the case regardless of the way in which the aerosol-forming substrate is heated, for example regardless of whether a resistive or inductive heater is used and regardless of whether the aerosol-forming substrate is heated from the inside or the outside. Moreover, the components of these cylindrical aerosol-generating articles normally need to have the same or very similar outer diameters so that they can be brought together, accurately positioned in co-axial alignment and wrapped in a cigarette paper. This can lead to increased cost and complexity of manufacture.

It is an aim of the present disclosure to provide an improved aerosol-generating article, in which a greater portion of an aerosol-forming substrate of the aerosol-generating article is sufficiently heated to form an aerosol during use. It is also an objective of the present disclosure to provide such an aerosol-generating article which provides greater control over delivery of flavour to the consumer. It is also an objective of the present disclosure to provide an aerosol-generating article that can be manufactured relatively efficiently and cheaply.

According to the present disclosure there is provided an aerosol-generating article. The aerosol-generating article may be for use with an aerosol-generating device to generate an inhalable aerosol. The article may comprise an aerosol-forming substrate. The substrate may be heatable to release an aerosol or volatile compounds capable of forming an aerosol. The article may further comprise an elongate flavour-bearing element. The elongate flavour-bearing element may comprise a carrier material and a flavourant supported on the carrier material. The article may have an article length, an article width, and an article thickness. The article length may be at least two times the article thickness. The article width may be at least two times the article thickness.

According to the present invention there is provided an aerosol-generating article for use with an aerosol-generating device to generate an inhalable aerosol, the aerosol-generating article comprising:

an aerosol-forming substrate heatable to release an aerosol or volatile compounds capable of forming an aerosol; and

an elongate flavour-bearing element comprising a carrier material and a flavourant supported on the carrier material,

5 wherein the article has an article length, an article width and an article thickness, the article length and the article width being at least two times the article thickness.

According to the present disclosure, the aerosol-generating article is a planar aerosol-generating article having a length extending in an x direction (corresponding to the article length), a width extending in a y direction (corresponding to the article width), and a thickness extending in a z
10 direction (corresponding to the article thickness).

For the purpose of the present disclosure, the “thickness” of the aerosol-generating article may also be referred to as the “height” of the aerosol-generating article.

Any reference to the length, width, height or thickness of the aerosol-generating article should be considered to relate to the average length, width, height or thickness, respectively, unless otherwise
15 indicated.

According to the invention, the thickness of the aerosol-generating article is less than or equal to 50 percent of both of the length and width of the aerosol-generating article.

Aerosol-generating articles according to the present disclosure may preferably be substantially flat articles or substantially planar articles. Advantageously, a larger base area may provide greater
20 surface area for heating by a planar heater of an aerosol-generating device. Advantageously, a smaller height may allow a smaller temperature gradient or difference across the height of the aerosol-generating article during heating. For example, where the base of the aerosol-generating article is in contact with, and heated by, a planar heater, there may be a smaller temperature difference between the base and an upper surface opposing the base if the spacing, or height, between the base and the
25 upper surface is smaller. Advantageously, this may allow heating of a greater proportion of the aerosol-forming substrate of the aerosol-generating article to a temperature at which an aerosol is released, whilst minimising the risk of burning the hottest portion of the substrate closest to the heater. Alternatively, or in addition, this may reduce a time required to heat the aerosol-forming substrate sufficiently to release an aerosol.

Aerosol-generating articles according to the present disclosure advantageously comprise at least one elongate flavour-bearing element. The elongate flavour-bearing element is adapted to release flavour into the aerosol generated upon heating of the aerosol-forming substrate during use. This advantageously provides a greater degree of control over the flavours released from the article. The provision of at least one elongate flavour-bearing element may be used to provide additional
35 flavours to those released from the aerosol-forming substrate. Alternatively, or in addition, the provision of an elongate flavour-bearing element may be used to provide flavour at specific times during the heating cycle, for example, the supplement the flavours released from the aerosol-forming substrate at the start or end of the heating cycle.

The elongate flavour-bearing element can advantageously be positioned within the aerosol-generating article to control the timing and rate of release of the flavourant. For example, an elongate
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flavour-bearing element may be positioned within the aerosol-generating article such that it is close to a heating element when the article is inserted into an aerosol-generating device. In such cases, the flavourant will typically be released relatively quickly. Alternatively, an elongate flavour-bearing element can be positioned within the aerosol-generating article such that it is further from the heating element when the article is inserted into an aerosol-generating device. In such cases, it will take longer for the elongate flavour-bearing element to be heated and so the flavourant will typically be released later in the heating cycle. In certain examples, a plurality of elongate flavour-bearing elements may be positioned different within the aerosol-generating article to provide the release of flavours at different times during the heating cycle.

Advantageously, the flavourant can be released passively from an elongate flavour-bearing element, that is, without the need for the consumer to activate or manipulate the element in any way. This is useful in many embodiment of the present invention, which relate to planar aerosol-generating articles which have the aerosol-forming substrate enclosed within a cavity.

The use of an elongate flavour-bearing element also enables a high degree of control over the amount of flavourant incorporated into each individual article, particularly when compared to a flavourant that is granular or particulate. The amount of flavourant can be readily controlled through the adaptation of the length of the elongate element, which can be accurately selected. This enables greater consistency between aerosol-generating articles. The elongate flavour-bearing element can also be more effectively retained in place within the aerosol-generating article than a loose granular or particulate flavourant.

The use of an elongate flavour-bearing element to provide flavour is particularly advantageous for planar or flat aerosol-generating articles, such as those of the present invention. In such articles, it is desirable to reduce the thickness of the aerosol-forming substrate as much as possible and an elongate element which can be adapted to have a relatively small diameter is therefore a particularly suitable means for incorporating a flavourant.

A further advantage of elongate flavour-bearing elements in the aerosol-generating articles of the present invention is that the elongate flavour-bearing element can be used to provide additional structural integrity to the aerosol-forming substrate and aerosol-generating article, which may be particularly helpful when the thickness is relatively low. The elongate flavour-bearing element can provide a line of reinforcement through the aerosol-generating article which improves the strength of the article. It may also be helpful to provide a structural component within the aerosol-generating article which can help to define and at least partially separate distinct areas within the aerosol-generating article, for example, within a cavity within the aerosol-generating article.

In certain examples as described below, aerosol-generating articles according to the present invention incorporate an air inlet and an air outlet in order to establish an air flow path through the aerosol-generating article. Advantageously, the elongate flavour-bearing element may be provided within an air inlet or an air outlet. This provides a convenient location for the elongate flavour-bearing element, which enables the flavourant to be effectively entrained into the air flow passing through the article during use. The presence of the elongate flavour-bearing element within an air inlet or air outlet

also potentially provides a barrier within the air inlet or air outlet which protects the aerosol-forming substrate within the aerosol-generating article to some extent.

The elongate flavour-bearing element can advantageously be produced from a continuous length of the carrier material such that it can readily be introduced into the article during a continuous, linear and high speed production process. The position of the elongate flavour-bearing element within the aerosol-generating article can be readily adapted in a continuous process and the use of an elongate flavour-bearing element therefore provides a high degree of flexibility in terms of its placement within the aerosol-generating article. Linear production processes have been found to be particularly effective for the production of planar or flat consumables as provided by the present invention.

Where the elongate flavour-bearing element is formed from a continuous length of the carrier material as described above, it is straightforward to cut the carrier material to the required length and this can be done accurately to ensure consistence between articles. As such, there can advantageously be minimal waste of the carrier material and flavourants.

Elongate flavour-bearing elements can advantageously be formed of natural, biodegradable materials so that the use of sustainable materials in the aerosol-generating articles according to the invention can be maximised.

As described in more detail below, the aerosol-generating article according to the invention may include a single elongate flavour-bearing element or a plurality of elongate flavour-bearing elements. All references below to 'the elongate flavour-bearing element' should be considered to refer to each elongate flavour-bearing element where a plurality of elongate flavour-bearing elements are provided.

The elongate flavour-bearing element may take any suitable form and suitable elongate flavour-bearing elements would be known to the skilled person. For example, the elongate flavour-bearing element may be in the form of a flavour-bearing thread, yarn, filament or tape. The elongate flavour-bearing element is preferably in the form of a flavour-bearing thread comprising a carrier thread material and a flavourant supported on the carrier thread material.

As used herein, the term "thread material" denotes an elongate filamentous material having a length substantially greater than an equivalent diameter thereof.

The term "equivalent diameter" is used herein to denote the diameter of the circle which has the same transverse cross-sectional area as the elongate flavour-bearing element or thread. In general, the transverse cross-section of the elongate flavour-bearing element or thread may have any shape, although a circular or quasi-circular shape, such as an oval shape or elliptical shape is preferred as described below. For elongate flavour-bearing elements or threads having a circular transverse cross-section, the equivalent diameter is the diameter of the cross-section of the element or thread.

The carrier material may be formed of any material that is suitable for forming an elongate element and retaining a flavourant. Preferably, the carrier material is an elongate filamentous material.

The carrier material may be formed of cellulose acetate, for example, a cellulose acetate yarn.

Preferably, the carrier material comprises cellulosic fibres. For example, the carrier material is preferably a thread or yarn formed of cellulosic fibres. Suitable cellulosic fibres include but are not

limited to cotton fibres, flax fibres, hemp fibres, bamboo fibres, sisal fibres, ramie fibres, coir fibres, kenaf fibres, abaca fibres and jute fibres. Preferably, the cellulosic fibres are cotton fibres, such that the carrier material is a cotton yarn.

Alternatively or in addition, the carrier material may include regenerated cellulose fibres.

5 Regenerated cellulose fibres are formed from cellulose that is extracted from wood pulp, which is then chemically dissolved and extruded as a filament. The regenerated cellulose may be formed from cellulose from any suitable wood pulp feedstock, for instance but not limited to wood pulp derived from bamboo, eucalyptus, beech, birch, spruce, pine, maple and aspen.

10 The elongate flavour-bearing element may comprise any suitable flavourant supported on the carrier material. Suitable flavourants include but are not limited to menthol, eugenol, anethole, linalool, limonene or essential oil such as peppermint oil or spearmint oil.

In certain preferred embodiments, the flavourant comprises menthol.

15 The flavourant may comprise at least 0.01 percent by weight of a menthol on a dry weight basis. Preferably, the flavourant comprises at least 1 percent by weight of a menthol on a dry weight basis, more preferably at least 5 percent by weight of a menthol on a dry weight basis, more preferably at least 10 percent by weight of a menthol on a dry weight basis.

In certain embodiments, the flavourant comprises at least 20 percent by weight of a menthol on a dry weight basis, preferably at least 25 percent by weight of a menthol on a dry weight basis, more preferably at least 30 percent by weight of a menthol on a dry weight basis.

20 The flavourant may comprise up to 90 percent by weight of a menthol on a dry weight basis, preferably up to 85 percent by weight of a menthol on a dry weight basis, more preferably up to 80 percent by weight of a menthol on a dry weight basis, more preferably up to 75 percent by weight of a menthol on a dry weight basis.

25 Where the aerosol-forming substrate comprises one or more flavourants which have been applied during production of the aerosol-forming substrate, at least one of the same flavourants may be used on the elongate flavour-bearing element. In such embodiments, the flavour released from the elongate flavour-bearing element can enhance the level of the same flavour released from the aerosol-forming substrate. The use of the same flavourants in the elongate flavour-bearing element and aerosol-forming substrate can also advantageously be used to prolong the sensory experience
30 for the consumer, since the elongate flavour-bearing element can be adapted to release flavour at the start or end of the heating cycle, thereby supplementing the flavour released from the aerosol-forming substrate.

The flavourant of the elongate flavour-bearing element may comprise a flavour formulation comprising one or more flavours in a suitable solvent, such as glycerin, propylene glycol or water.

35 The flavourant of the elongate flavour-bearing element may optionally comprise one or more flavourants that have been encapsulated or dispersed within a matrix structure. This may advantageously improve the retention of the flavourant within the aerosol-generating article prior to use.

The flavourant of the elongate flavour-bearing element may optionally comprise a colourant.

40 The inclusion of a colourant provides colouration to the elongate flavour-bearing element. This may

be desirable if the elongate flavour-bearing element is visible to the consumer from the exterior of the aerosol-generating article, for example, to indicate the nature of the flavourant.

In embodiments of the invention in which the aerosol-generating article comprises a plurality of elongate flavour-bearing elements, the plurality of elongate flavour-bearing elements may comprise the same flavourant as each other, or the plurality of elongate flavour-bearing elements may comprise one or more different flavourants. For example, each of the plurality of elongate flavour-bearing elements may comprise a different flavourant to the other elongate flavour-bearing elements. The provision of a plurality of elongate flavour-bearing elements comprising different flavourants enables further control over the release profile of the flavourants and also provides the possibility to achieve a greater variety of flavour combinations.

The elongate flavour-bearing element may optionally comprise an outer coating layer applied to the carrier material having the flavourant supported thereon. The use of an outer coating layer may advantageously improve the retention of the flavourant prior to use and may also enable a further degree of control over the temperature and timing of the release of the flavourant. Preferably, the outer coating layer is formed of a material that melts or dissolves during the heating of the aerosol-generating article in an aerosol-generating device.

Suitable coating materials for forming the outer coating layer include but are not limited to wax, stearin, sugar solution, polysaccharide including alginate.

In certain embodiments, the outer coating layer is formed of an adhesive composition. Suitable adhesive compositions would be known to the skilled person. The use of an outer coating layer having adhesive properties may advantageously help to secure the elongate flavour-bearing element in place within the aerosol-generating article.

The elongate flavour-bearing element preferably has an equivalent diameter of at least 0.5 millimetres, more preferably at least 1 millimetre, more preferably at least 1.5 millimetres.

The elongate flavour-bearing element preferably has an equivalent diameter of less than or equal to 3.5 millimetres, more preferably less than or equal to 3 millimetres, more preferably less than or equal to 2.5 millimetre.

For example, the elongate flavour-bearing element may have an equivalent diameter of between 0.5 millimetres and 3.5 millimetres, or between 0.5 millimetres and 3 millimetres, or between 0.5 millimetres and 2.5 millimetre.

For example, the elongate flavour-bearing element may have an equivalent diameter of between 1 millimetre and 3.5 millimetres, or between 1 millimetre and 3 millimetres, or between 1 millimetre and 2.5 millimetres.

For example, the elongate flavour-bearing element may have an equivalent diameter of between 1.5 millimetres and 3.5 millimetres, or between 1.5 millimetres and 3 millimetres, or between 1.5 millimetres and 2.5 millimetres.

The equivalent diameter of the elongate flavour-bearing element will typically be adapted depending on the article thickness.

The equivalent diameter of the elongate flavour-bearing element is preferably at least 10 percent of the article thickness of the aerosol-generating article, more preferably at least 20 percent

of the article thickness, more preferably at least 30 percent of the article thickness, more preferably at least 40 percent of the article thickness.

The equivalent diameter of the elongate flavour-bearing element is preferably less than or equal to 80 percent of the article thickness of the aerosol-generating article, more preferably less than or equal to 75 percent of the article thickness, more preferably less than or equal to 70 percent of the article thickness, more preferably less than or equal to 65 percent of the article thickness.

For example, the equivalent diameter of the elongate flavour-bearing element may between 10 percent and 80 percent of the article thickness, or between 10 percent and 75 percent of the article thickness, or between 10 percent and 70 percent of the article thickness, or between 10 percent and 65 percent of the article thickness.

For example, the equivalent diameter of the elongate flavour-bearing element may between 20 percent and 80 percent of the article thickness, or between 20 percent and 75 percent of the article thickness, or between 20 percent and 70 percent of the article thickness, or between 20 percent and 65 percent of the article thickness.

For example, the equivalent diameter of the elongate flavour-bearing element may between 30 percent and 80 percent of the article thickness, or between 30 percent and 75 percent of the article thickness, or between 30 percent and 70 percent of the article thickness, or between 30 percent and 65 percent of the article thickness.

For example, the equivalent diameter of the elongate flavour-bearing element may between 40 percent and 80 percent of the article thickness, or between 40 percent and 75 percent of the article thickness, or between 40 percent and 70 percent of the article thickness, or between 40 percent and 65 percent of the article thickness.

The equivalent diameter of the elongate flavour-bearing element is preferably at least 2 percent of the article width of the aerosol-generating article, more preferably at least 5 percent of the article width, more preferably at least 7.5 percent of the article width, more preferably at least 10 percent of the article width.

The equivalent diameter of the elongate flavour-bearing element is preferably less than or equal to 35 percent of the article width of the aerosol-generating article, more preferably less than or equal to 30 percent of the article width, more preferably less than or equal to 25 percent of the article width, more preferably less than or equal to 20 percent of the article width.

For example, the equivalent diameter of the elongate flavour-bearing element may between 2 percent and 35 percent of the article width, or between 2 percent and 30 percent of the article width, or between 2 percent and 25 percent of the article width, or between 2 percent and 20 percent of the article width.

For example, the equivalent diameter of the elongate flavour-bearing element may between 5 percent and 35 percent of the article width, or between 5 percent and 30 percent of the article width, or between 5 percent and 25 percent of the article width, or between 5 percent and 20 percent of the article width.

For example, the equivalent diameter of the elongate flavour-bearing element may between 7.5 percent and 35 percent of the article width, or between 7.5 percent and 30 percent of the article

width, or between 7.5 percent and 25 percent of the article width, or between 7.5 percent and 20 percent of the article width.

For example, the equivalent diameter of the elongate flavour-bearing element may between 10 percent and 35 percent of the article width, or between 10 percent and 30 percent of the article width, or between 10 percent and 30 percent of the article width, or between 10 percent and 25 percent of the article width.

The ratio of the article width to the equivalent diameter of the elongate flavour-bearing element is therefore typically significantly higher than the ratio of the article thickness to the equivalent diameter of the elongate flavour-bearing element. This reflects the planar or flat form of the aerosol-generating article. Preferably, the ratio of the article width to the equivalent diameter of the elongate flavour-bearing element is at least 2 times the ratio of the article thickness to the equivalent diameter of the elongate flavour-bearing element, more preferably at least 2.5 times the ratio of the article thickness to the equivalent diameter of the elongate flavour-bearing element, more preferably at least 3 times the ratio of the article thickness to the equivalent diameter of the elongate flavour-bearing element, more preferably at least 3.5 times the ratio of the article thickness to the equivalent diameter of the elongate flavour-bearing element.

The ratio of the article width to the equivalent diameter of the elongate flavour-bearing element may be less than or equal to 8 times the ratio of the article thickness to the equivalent diameter of the elongate flavour-bearing element, or less than or equal to 5 times the ratio of the article thickness to the equivalent diameter of the elongate flavour-bearing element.

The elongate flavour-bearing element preferably has a length of at least 10 millimetres, more preferably at least 15 millimetres, more preferably at least 20 millimetres, more preferably at least 25 millimetres.

The elongate flavour-bearing element preferably has a length of less than or equal to 100 millimetres, more preferably less than or equal to 80 millimetres, more preferably less than or equal to 60 millimetre.

For example, the elongate flavour-bearing element may have a length of between 10 millimetres and 100 millimetres, or between 10 millimetres and 80 millimetres, or between 10 millimetres and 60 millimetres.

For example, the elongate flavour-bearing element may have a length of between 15 millimetres and 100 millimetres, or between 15 millimetres and 80 millimetres, or between 15 millimetres and 60 millimetres.

For example, the elongate flavour-bearing element may have a length of between 20 millimetres and 100 millimetres, or between 20 millimetres and 80 millimetres, or between 20 millimetres and 60 millimetres.

For example, the elongate flavour-bearing element may have a length of between 25 millimetres and 100 millimetres, or between 25 millimetres and 80 millimetres, or between 25 millimetres and 60 millimetres.

The length of the elongate flavour-bearing element will typically be adapted depending on the article length.

The length of the elongate flavour-bearing element is preferably at least 50 percent of the article length of the aerosol-generating article, more preferably at least 60 percent of the article length, more preferably at least 75 percent of the article length, more preferably at least 90 percent of the article length.

5 The length of the elongate flavour-bearing element may be substantially equal to the article length of the aerosol-generating article.

 The length of the elongate flavour-bearing element is preferably at least 50 percent of the length of the aerosol-forming substrate, more preferably at least 60 percent of the length of the aerosol-forming substrate, more preferably at least 75 percent of the length of the aerosol-forming substrate,
10 more preferably at least 90 percent of the length of the aerosol-forming substrate.

 The length of the elongate flavour-bearing element may be substantially equal to the length of the aerosol-forming substrate.

 The length of the elongate flavour-bearing element may be greater than the length of the aerosol-forming substrate.

15 The elongate flavour-bearing element may have any suitable transverse cross-sectional shape. Preferably, the elongate flavour-bearing element has a transverse cross-sectional shape that is circular, oval or elliptical.

 The transverse cross-sectional shape may be constant or substantially constant along the length of the elongate flavour-bearing element. Alternatively, the transverse cross-sectional shape
20 may vary along the length of the elongate flavour-bearing element.

 The elongate flavour-bearing element of aerosol-generating article according to the present invention may be provided in a wide variety of positions and configurations, depending on the construction of the aerosol-generating article and the desired level of heating of the elongate flavour-bearing element. For example, the position of the elongate flavour-bearing element may be selected
25 such that the elongate flavour-bearing element is provided at a desired distance from a heater element when the aerosol-generating article is inserted into an aerosol-generating device. As described above, this selection of the position of the elongate flavour-bearing element enables a degree of control over the timing and rate of release of flavourant from the elongate flavour-bearing element during use.

 In embodiments in which a plurality of elongate flavour-bearing elements are provided, the
30 elongate flavour-bearing elements may be provided at different positions, for example, at different distances from the heating element, in order to provide even greater control over the release of flavourant.

 The elongate flavour-bearing element may extend through the aerosol-generating article in a substantially straight line. In such embodiments, the elongate flavour-bearing element may extend
35 substantially longitudinally through at least a part of the aerosol-generating article, in the x direction as defined above. In such embodiments, the elongate flavour-bearing element may extend substantially centrally through the aerosol-generating article. Alternatively, the elongate flavour-bearing element may extend longitudinally through the aerosol-generating article at an axial distance from the central axis of the article. For example, the elongate flavour-bearing element may extend
40 proximate an edge of the aerosol-generating article.

Alternatively, the elongate flavour-bearing element may extend substantially transversely through at least a part of the aerosol-generating article, in the y direction or the z direction as defined above. Alternatively, the elongate flavour-bearing element may extend linearly through the aerosol-generating article in a direction that is not aligned with the x, y, or z direction.

5 In other embodiments, the elongate flavour-bearing element may extend through the aerosol-generating article in a non-straight line. For example, the elongate flavour-bearing element may have a twisted, wavy or coiled configuration. Alternatively, the elongate flavour-bearing element may extend circumferentially at least part way around the aerosol-generating article.

10 The position of the elongate flavour-bearing element relative to the aerosol-forming substrate may be varied.

In certain embodiments, the elongate flavour-bearing element may extend at least part way through the aerosol-forming substrate. For example, the elongate flavour-bearing element may be embedded within a solid aerosol-forming substrate.

15 In other embodiments, the elongate flavour-bearing element may extend along at least a part of the external surface of the aerosol-forming substrate.

In other embodiments, the elongate flavour-bearing element may extend through the aerosol-generating article separately from the aerosol-forming substrate such that there is no contact between the elongate flavour-bearing element and the aerosol-forming substrate.

20 At least a portion of the elongate flavour-bearing element may be provided downstream of the aerosol-forming substrate. The elongate flavour-bearing element may be provided entirely downstream of the aerosol-forming substrate.

Alternatively or in addition, at least a portion of the elongate flavour-bearing element may be provided upstream of the aerosol-forming substrate. The elongate flavour-bearing element may be provided entirely upstream of the aerosol-forming substrate.

25 In embodiments in which the aerosol-generating article comprises a frame containing the aerosol-forming substrate, as described in more detail below, the elongate flavour-bearing element may be mounted on or within the frame. In such embodiments, the elongate flavour-bearing element may or may not be in contact with the aerosol-forming substrate.

30 According to the present disclosure, there may be provided an aerosol-generating article for use with an aerosol-generating device to generate an aerosol, the aerosol-generating article comprising an aerosol-forming substrate for producing an aerosol, the aerosol-generating article comprising a substantially planar upper surface defined by a length extending in an x direction and a width extending in a y direction, and a substantially planar lower surface defined by a length extending in an x direction and a width extending in a y direction. The substantially planar upper surface and the substantially planar lower surface may be vertically spaced from each other by a height or thickness defined in a z direction. This corresponds to the article height defined above.

35 An air flow channel may be defined between the substantially planar upper and lower surfaces. The height of the aerosol-generating article may be less than 5 millimetres, for example between 1.5 millimetres and 5 millimetres, for example between 1.5 millimetres and 4 millimetres, for example 40 between 1.5 millimetres and 3 millimetres, for example between 1.5 millimetres and 2 millimetres. One

or both of the substantially planar upper and lower surfaces may comprise an aerosol-forming substrate.

The aerosol-generating article may comprise upper and lower layers, the upper layer forming the substantially planar upper surface and the lower layer forming the substantially planar lower surface. At least one of the upper and lower layers may comprise or consist of aerosol-forming substrate.

In such aerosol-generating articles, the elongate flavour-bearing element may extend at least part way across the substantially planar upper or lower surface. Alternatively, the elongate flavour-bearing element may be provided proximate the substantially planar upper or lower surface but spaced apart from the corresponding planar surface.

The aerosol-generating article may comprise a corrugated layer. The aerosol-generating article may comprise a first planar layer, a second planar layer, and a corrugated layer arranged between the first planar layer and the second planar layer. At least one of the first planar layer, the second planar layer and the corrugated layer may comprise or consist of an aerosol-forming material. The aerosol-forming substrate may comprise or be the corrugated layer. The substrate may comprise or be the first planar layer. The substrate may comprise or be the second planar layer.

In such articles, the elongate flavour-bearing element may be provided within one or more of the first planar layer, the second planar layer and the corrugated layer. Alternatively or in addition, the elongate flavour-bearing element may be provided between adjacent layers in the aerosol-generating article. The elongate flavour-bearing element may be provided in a channel of the corrugated layer.

The use of a corrugated structure in the aerosol-generating article may advantageously allow the production of an aerosol-generating article that has extremely low RTD while still being sufficiently rigid to for a user to handle. Further, use of a corrugated structure may allow a low density, low RTD, aerosol-generating article to be produced using high speed production methods similar to those used for production of corrugated cardboard.

The aerosol-generating article may comprise a first planar external surface, a second planar external surface, a cavity and a frame. The frame may be positioned between the first planar external surface and the second planar external surface. The frame may at least partially define the cavity. The aerosol-generating article may comprise an air inlet and an air outlet, and an airflow passage extending between the air inlet and the air outlet through the cavity.

Preferably, the aerosol-forming substrate is positioned between the first planar external surface and the second planar external surface. Preferably, the aerosol-forming substrate is provided within the cavity.

The elongate flavour-bearing element may be provided within the cavity. In such examples, the elongate flavour-bearing element may be embedded into the aerosol-forming substrate, or mounted on a surface of the aerosol-forming substrate. Alternatively or in addition, the elongate flavour-bearing element may be provided within the cavity, independently from the aerosol-forming substrate.

The frame may comprise a peripheral wall at least partially circumscribing or encircling the cavity. The frame may comprise a peripheral wall wholly circumscribing or encircling the cavity.

Advantageously, the frame may allow the aerosol-generating article to be relatively thin whilst maintaining structural rigidity.

The elongate flavour-bearing element may be mounted on the frame or a part of the frame. The elongate flavour-bearing element may extend at least part way over an internal surface of the frame.

5 Alternatively or in addition, the elongate flavour-bearing element may extend at least part way over an external surface of the frame. For example, the elongate flavour-bearing element may be provided on a surface of the peripheral wall. The surface of the peripheral wall on which the elongate flavour-bearing element is provided may be downstream of the aerosol-forming substrate. Alternatively or in addition, the surface of the peripheral wall on which the elongate flavour-bearing element is provided
10 may be upstream of the aerosol-forming substrate. Alternatively or in addition, the surface of the peripheral wall on which the elongate flavour-bearing element is provided may be along the side of the aerosol-forming substrate, relative to the longitudinal direction of the aerosol-generating article.

Where the aerosol-forming substrate is provided within the cavity defined by the frame, elongate flavour-bearing element may be provided between the frame and the aerosol-forming substrate.

15 Where the aerosol-generating article comprises a plurality of elongate flavour-bearing elements, the plurality of elongate flavour-bearing elements may be provided on different sides of the frame.

The aerosol-generating article may comprise a first planar external layer and a second planar external layer, in which the first planar external layer forms the first planar external surface and the second planar external layer forms the second planar external surface. Optionally, at least one of the
20 first planar external layer, the second planar external layer, and the frame may comprise or consist of aerosol-forming substrate.

The elongate flavour-bearing element may be provided between the frame and the first planar external layer or the second planar external layer. For example, the elongate flavour-bearing elements may be provided between the frame and the first planar external layer. Alternatively, the elongate
25 flavour-bearing element may be provided between the frame and the second planar external layer. Where a plurality of elongate flavour-bearing elements are provided, there may be at least one elongate flavour-bearing element between the frame and the first planar external layer and at least one elongate flavour-bearing element between the frame and the second planar external layer. The plurality of elongate flavour-bearing elements may have the same or a different flavourant to each
30 other.

The cavity may be substantially empty.

A corrugated layer may be positioned within the cavity.

The frame may be a substantially planar frame.

The frame may have a height between 50 percent and 100 percent of the height of the aerosol-
35 generating article. The frame may have a height between 50 percent and 95 percent of the height of the aerosol-generating article. The frame may have a height between 60 percent and 95 percent of the height of the aerosol-generating article. The frame may have a height between 70 percent and 95 percent of the height of the aerosol-generating article. The frame may have a height between 80 percent and 95 percent of the height of the aerosol-generating article.

The frame may have a height between 1 millimetre and 5.5 millimetres. The frame may have a height between 1 millimetre and 5 millimetres. Preferably, the frame may have a height between 1.5 millimetres and 5 millimetres.

5 The frame may be made from or comprise a biodegradable material. The frame may be made entirely from a biodegradable material.

10 The frame may be made from or comprise a cellulosic material. The cellulosic material may comprise one or more sheets or layers of cellulosic material. The cellulosic material may comprise cellulose fibres. The cellulosic material may be paper, paperboard, or cardboard. The frame may be made from or comprise a plant material, such as tobacco. The frame may be made entirely from a cellulosic material.

15 The frame may be a unitary component formed of a single portion. Alternatively, the frame may be formed of two or more separate portions or walls which are connected to form the frame. For example, in preferred embodiments the frame comprises a first side wall and a second side wall. The first and second side walls preferably extend longitudinally along the article. The first and second side walls may be opposed to each other. The frame may further comprise a first end wall and a second end wall. The first and second end walls may be opposed to each other. The first end wall may connect the first and second side walls, for example, at the upstream end of the frame. The second end wall may connect the first and second side walls, for example, at the downstream end of the frame.

20 The inner faces of the two or more portions or walls forming the frame may provide the inner surfaces of the cavity. The elongate flavour-bearing element may be mounted on an inner face of one of the two or more portions or walls forming the frame. A plurality of elongate flavour-bearing elements may be mounted on the inner faces of one or more of the portions or walls forming the frame. For example, in a preferred embodiment, a first elongate flavour-bearing element extends along the inner face of the first side wall. Optionally, a second elongate flavour-bearing element extends along the inner face of the second side wall.

The frame or a portion of the frame may comprise two or more layers. That is, the frame or a portion of the frame may have a laminated structure.

30 Where at least a portion of the frame is formed of a laminated structure, the elongate flavour-bearing element may be provided between adjacent layers of the laminated structure. Such an arrangement advantageously secures the elongate flavour-bearing element in position within the aerosol-generating article.

35 The frame may comprise one or more elongate channels extending through it. The one or more elongate channels are therefore provided internally within the structure of the frame, for example within a wall of the frame. For example, the frame may comprise one or more elongate channels extending longitudinally through it. Alternatively or in addition, the frame may comprise one or more elongate channels extending transversely through it. The one or more elongate channels provide air flow pathways through the frame. The elongate flavour-bearing element may be provided within the one or more elongate channels defined within the frame. The position of the one or more elongate channels may be adapted in order to control the distance between the elongate flavour-bearing

40

element and the heating element when the aerosol-generating article is in place within an aerosol-generating device.

In preferred embodiments, the frame comprises a first side wall having a first elongate channel extending longitudinally through it and a second side wall having a second elongate channel extending through it. At least one of the first elongate channel and the second elongate channel contains an elongate flavour-bearing element. The frame may further comprise a first end wall and a second end wall. The first and second elongate channels may extend through the first end wall and the second end wall such that the elongate channels provide an airflow pathway all of the way through the frame between the downstream end and the upstream end.

The elongate flavour-bearing element or elements can conveniently be incorporated into the one or more elongate channels within the frame, which also act as air flow pathways through the frame. The positioning of an elongate flavour-bearing element within an air flow pathway enables the flavourant to be effectively released into the air passing through the frame and subsequently carried through the aerosol-generating article and mixed with the aerosol generated from the aerosol-forming substrate.

In some embodiments, it may be beneficial that the elongate flavour-bearing element can be retained within the frame, separately from the aerosol-forming substrate.

The aerosol-generating article according to any of the aspects disclosed herein may have an air flow path extending through the aerosol-generating article. The aerosol-generating article may have an air-flow path defined through the aerosol-generating article in an x/y plane from one side of the aerosol-generating article to the other side of the aerosol-generating article.

The aerosol-generating article preferably has a resistance to draw (RTD) of less than 20 millimetre H₂O, for example less than 10 millimetre H₂O, in the direction of the airflow path. Preferably, the aerosol-generating article has a RTD of less than 20 millimetre H₂O, for example less than 10 millimetre H₂O, in at least one direction in an x/y plane of the aerosol-generating article. An aerosol-generating article with a low resistance air-flow path may allow for superior air-flow management and allow aerosol to be extracted more efficiently from the aerosol-generating article and guided to a user.

Unless otherwise specified, the resistance to draw (RTD) is measured in accordance with ISO 6565-2015. The RTD refers to the pressure required to force air through the full length of a component, such as the aerosol-generating article. The terms "pressure drop" or "draw resistance" of a component or article may also refer to the "resistance to draw". Such terms generally refer to the measurements made in accordance with ISO 6565-2015 and are normally carried out at under test at a volumetric flow rate of about 17.5 millilitres per second at the output or downstream end of the measured component at a temperature of about 22 degrees Celsius, a pressure of about 101 kPa (about 760 Torr) and a relative humidity of about 60%.

The aerosol-generating article may have an article length of at least 10, 12, 14, 16 or 18 millimetres. The aerosol-generating article may have an article length of no more than 100, 100, 40, 30, 26, 24, or 22 millimetres. The aerosol-generating article may have a length (for example, an x dimension) of between 10 millimetres and 100 millimetres, or between 10 millimetres and 50 millimetres, for example between 10 millimetres and 40 millimetres, for example between 12

millimetres and 30 millimetres, for example between 14 millimetres and 26 millimetres, for example between 16 millimetres and 24 millimetres, for example between 18 millimetres and 22 millimetres, for example about 18 millimetres, or about 19 millimetres, or about 20 millimetres, or about 21 millimetres, or about 22 millimetres.

5 The aerosol-generating article may have an article width of at least 5, 8, 10, 11 or 12 millimetres. The article may have an article width of no more than 20, 18, 16, 15, or 14 millimetres. The aerosol-generating article may have a width (for example, a y dimension) of between 5 millimetres and 20 millimetres, for example between 8 millimetres and 18 millimetres, for example between 10 millimetres and 16 millimetres, for example between 11 millimetres and 15 millimetres, for example between 12
10 millimetres and 14 millimetres, for example about 13 millimetres.

 The aerosol-generating article may have a height (for example, a z dimension) of between 1 millimetres and 10 millimetres, for example between 1.2 millimetres and 8 millimetres, for example between 1.4 millimetres and 7 millimetres, for example between 1.6 millimetres and 6 millimetres, for example between 1.7 millimetres and 5 millimetres, for example about 1.7 millimetres, or about 4.5
15 millimetres, or about 2 millimetres, or about 3 millimetres, or about 4 millimetres.

 The aerosol-generating article of any of the aspects of the present disclosure when viewed in plan may have a shape defining a polygon, a quadrilateral (for example, a rectangle or a square), an oval, a circle, or a combination thereof. Where the aerosol-generating article comprises substantially planar upper and lower surfaces, one or both of the upper and lower surfaces when viewed in plan
20 may have a shape defining a polygon, a quadrilateral (for example, a rectangle or a square), an oval, a circle, or a combination thereof. A perimeter of the aerosol-generating article when viewed in plan may be formed of a plurality of straight sides, a plurality of curved sides, or a combination of straight and curved sides. Where the aerosol-generating article comprises substantially planar upper and lower surfaces, a perimeter of one or both of the upper and lower surfaces when viewed in plan may
25 have a shape defining a polygon, a quadrilateral (for example, a rectangle or a square), an oval, a circle, or a combination thereof.

 The aerosol-forming substrate may comprise nicotine. Nicotine may be present in the form of a tobacco material or may be in the form of a nicotine extract.

 The aerosol-forming substrate may comprise one or more organic materials such as tobacco,
30 mint, tea and cloves. The aerosol-forming substrate may comprise one or more of: herb leaf, tobacco leaf, fragments of tobacco ribs, reconstituted tobacco, homogenised tobacco such as cast leaf, extruded tobacco, expanded tobacco, aerosol-generating films and gel compositions.

 The aerosol-forming substrate may comprise or consist of homogenised tobacco material, for example a reconstituted tobacco material or a cast leaf tobacco material.

35 The aerosol-forming substrate may be in the form of shredded aerosol-generating material. The shredded aerosol-generating material may comprise one or more of: strips and strands of aerosol-generating material, such as strips and strands of tobacco or homogenised tobacco material. The shredded aerosol-generating material may be in the form of a shredded sheet of homogenised tobacco material.

The aerosol-forming substrate may be or comprise cut filler. The aerosol-forming substrate may be or comprise tobacco cut filler. The cut filler may comprise one or more of bright tobacco, dark tobacco, aromatic tobacco and filler tobacco. Examples of bright tobaccos are Flue-Cured Brazil, Indian Flue-Cured, Chinese Flue-Cured, US Flue-Cured such as Virginia tobacco, and Flue-Cured from Tanzania. Examples of aromatic tobaccos are Oriental Turkey, Greek Oriental, semi-oriental tobacco but also Fire Cured, US Burley, such as Perique, and Rustica. Examples of dark tobacco are Dark Cured Brazil Galpao, Burley Malawi or other African Burley, Sun Cured or Air Cured Indonesian Kasturi. As used herein, the term "cut filler" is used to describe a blend of shredded plant material, such as tobacco plant material, including, in particular, one or more of leaf lamina, processed stems and ribs, homogenised plant material.

The aerosol-forming substrate may be in the form of a sheet of aerosol-generating material. As used herein, the term "sheet" describes a laminar element having a width and length substantially greater than the thickness thereof. The sheet of aerosol-generating material may be a sheet of plant material. The sheet of aerosol-generating material may be a sheet of tobacco material. The sheet of aerosol-generating material may be a sheet of homogenised tobacco material, such as a cast leaf sheet.

The aerosol-forming substrate may comprise a bound collection of strips, strands or particles of tobacco material. The aerosol-forming substrate may be in the form of a compressed plug of tobacco material; for example, in which a plug having a substantially circular cross-section in an initial state of the plug is compressed into a flatter cross-sectional profile in a subsequent state of the plug. The tobacco material may be enclosed by a wrapper. The aerosol-forming substrate may be in the form of strips, strands or particles of tobacco material bound together in a binder matrix.

The aerosol-forming substrate may comprise one or more aerosol-formers. Suitable aerosol-formers are well known in the art and include, but are not limited to, one or more aerosol-formers selected from: polyhydric alcohols, such as propylene glycol, polyethylene glycol, triethylene glycol, 1, 3-butanediol and glycerine; esters of polyhydric alcohols, such as glycerol mono-, di- or triacetate; and aliphatic esters of mono-, di- or polycarboxylic acids, such as dimethyl dodecanedioate and dimethyl tetradecanedioate. It may be particularly preferable for the aerosol-former to be or comprise one or both of glycerine and propylene glycol. The aerosol former may consist of glycerine or propylene glycol or of a combination of glycerine and propylene glycol.

The aerosol-forming substrate may have an aerosol-former content greater than or equal to 1, 2, 5, 10, or 15 percent by weight on a dry weight basis. The aerosol-forming substrate may have an aerosol-former content greater than or equal to 15 percent by weight on a dry weight basis, for example greater than 20 by weight on a dry weight basis, or greater than 25 by weight on a dry weight basis, or greater than 30 by weight on a dry weight basis, or greater than 40 by weight on a dry weight basis, or greater than 50 by weight on a dry weight basis.

The aerosol-forming substrate may have an aerosol-former content less than or equal to 30 percent by weight on a dry weight basis, less than or equal to 25 percent by weight on a dry weight basis, or less than or equal to 20 percent by weight on a dry weight basis. That is, the aerosol-generating material may have an aerosol-former content less than or equal to 30 by weight on a dry

weight basis, less than or equal to 25 by weight on a dry weight basis, or less than or equal to 20 by weight on a dry weight basis.

5 The aerosol-forming substrate may have an aerosol-former content between 1 percent and 30 percent by weight on a dry weight basis, between 1 percent and 25 percent by weight on a dry weight basis, or between 1 percent and 20 percent by weight on a dry weight basis.

The aerosol-forming substrate may comprise at least 50 percent by weight of aerosol former, at least 60 percent by weight of aerosol former, or at least 70 percent by weight of aerosol former.

10 The aerosol-forming substrate may comprise less than or equal to 85 percent by weight of aerosol former, less than or equal to 80 percent by weight of aerosol former, or less than or equal to 75 percent by weight of aerosol former.

The aerosol-forming substrate may comprise between 50 percent and 85 percent by weight of aerosol former, between 50 percent and 80 percent by weight of aerosol former, or between 50 percent and 75 percent by weight of aerosol former.

15 The aerosol-forming substrate may comprise nicotine. The aerosol-forming substrate may comprise natural nicotine, or synthetic nicotine, or a combination of natural nicotine and synthetic nicotine.

The aerosol-forming substrate may comprise at least 0.5 percent by weight of nicotine, at least 1 percent by weight of nicotine, at least 1.5 percent by weight of nicotine, or at least 2 percent by weight of nicotine.

20 The aerosol-forming substrate may comprise one or more flavourants. The one or more flavourants may comprise one or more of: one or more essential oils such as eugenol, peppermint oil and spearmint oil; one or both of menthol and eugenol; one or both of anethole and linalool; and a herbaceous material. Suitable herbaceous material includes herb leaf or other herbaceous material from herbaceous plants including, but not limited to, mints, such as peppermint and spearmint, lemon
25 balm, basil, cinnamon, lemon basil, chive, coriander, lavender, sage, tea, thyme, and caraway. The one or more flavourants may comprise a tobacco material.

The aerosol-forming substrate may comprise one or more botanicals. For example, the aerosol-forming substrate may comprise about 1 to 90 %, for example about 15 to 55 %, preferably of about 20 to 35 %, of botanicals such as Clove, Echinacea sp., Fennel, Ginger, Hawthorn berry, Elderberry,
30 Monarda, Mullein leaves, Nettle, Plantain, Turmeric, Yarrow, Rooibos, Star Anise, Thyme, Anethum, Chamomile and compounds of those.

The aerosol-forming substrate may have a moisture content of about 5 to 25%, preferably of about 7 to 15%, at final product state. For example, the aerosol-forming substrate may be a homogenised tobacco material with a moisture of about 5 to 25%, preferably of about 7 to 15%, at
35 final product state.

The aerosol-forming substrate may comprise a binder. For example, the aerosol-forming substrate may comprise about 1 to 10%, preferably of about 1 to 5%, of a binder such as any of common gums or pectins used in food and beverage (F&B) industries. Preferred binders may be natural pectins, such as fruit, for example citrus, or tobacco pectins; guar gums, land locust bean
40 gums, such as hydroxyethyl and/or hydroxypropyl of those; starches, such as modified or derivatized

starches; alginate; methyl, ethyl, ethylhydroxymethyl and carboxymethyl, celluloses; dextran; and xanthan gum. A preferable binder is guar.

The aerosol-forming substrate may comprise, or consist of, a solid aerosol-forming material. The aerosol-forming substrate may comprise a liquid aerosol-forming material, for example a liquid aerosol-forming material retained within a porous matrix. The aerosol-forming substrate may comprise a gel aerosol-forming material.

According to the present disclosure, there is provided an aerosol-generating system. The system may comprise an aerosol-generating article as described herein. The system may comprise an aerosol-generating device for use with the aerosol-generating article to generate an inhalable aerosol.

According to the present invention, there is provided an aerosol-generating system comprising an aerosol-generating article according to the invention as defined above and an aerosol-generating device for use with the aerosol-generating article to generate an inhalable aerosol.

Optionally, the aerosol-generating device comprises a heater for heating the aerosol-forming substrate of the aerosol-generating article. The heater may comprise an electrically resistive heating element. The heater may comprise an infrared heating element. The heater may comprise an inductor, such as an inductor coil. The inductor may be configured to generate an alternating electromagnetic field to heat susceptor material. The susceptor material may be located in the alternating electromagnetic field. The device may comprise the susceptor material, or the article may comprise the susceptor material, or both the article and the device may each comprise some susceptor material.

The aerosol-generating device may comprise a cavity dimensioned to receive at least a portion of the aerosol-generating article or aerosol-forming substrate, a heater or heating means, a power source for supplying power to the heater or heating means, and a controller to control supply of power to the heater or heating means. The aerosol-generating device may be configured to heat the aerosol-forming substrate to form an aerosol, for example an inhalable aerosol. The aerosol-generating device may additionally be configured to heat the elongate flavour-bearing element to release the flavourant into the inhalable aerosol generated from the aerosol-forming substrate.

The aerosol-generating device may preferably be configured to receive the entirety of the aerosol-generating article such that the aerosol-generating article is wholly enclosed within the aerosol-generating device.

The cavity may comprise an opening into which a distal end of the aerosol-generating article can be inserted. The cavity may have any suitable cross-sectional shape. For example, the cavity may have a rectangular transverse cross-section, for example a rectangular cross-section having opposing top and bottom sides that are greater in length than left and right sides.

Preferably, at least one internal surface of the cavity is a heating surface configured to heat the aerosol-generating article. The heating surface may comprise a heater, for example a resistance heater, or an infra-red heater, or a susceptor configured to be heated by engagement with an inductor. The heating surface may comprise an inductor, for example the surface may comprise a coil arranged to generate a fluctuating electromagnetic field within a space of the cavity. The heating surface may be a surface that is permeable to a fluctuating electromagnetic field, such that an inductor arranged

outside the cavity can project a fluctuating electromagnetic field through the heating surface to engage with a susceptor arranged within the cavity.

As used herein, the term “aerosol-generating article” may refer to an article able to generate, or release, an aerosol.

5 As used herein, the term “aerosol-forming substrate” may refer to a substrate capable of releasing an aerosol or volatile compounds that can form an aerosol. Such volatile compounds may be released by heating the aerosol-forming substrate. An aerosol-forming substrate may comprise an aerosol-forming material. An aerosol-forming substrate may be adsorbed, coated, impregnated, or otherwise loaded onto a carrier or support. An aerosol-forming substrate may conveniently be part of
10 an aerosol-generating article or smoking article.

As used herein, the term “aerosol-generating device” may refer to a device for use with an aerosol-generating article to enable the generation, or release, of an aerosol.

As used herein, the term “aerosol generating system” refers to a combination of an aerosol-generating device and one or more aerosol-forming articles for use with the device. An aerosol-
15 generating system may include additional components, such as a charging unit for recharging an on-board electric power supply in an electrically operated or electric aerosol-generating device.

As used herein, the term “aerosol former” may refer to any suitable known compound or mixture of compounds that, in use, facilitates formation of an aerosol. The aerosol may be a dense and stable aerosol. The aerosol may be substantially resistant to thermal degradation at the operating
20 temperature of the aerosol-forming substrate or aerosol-generating article.

As used herein, the term “nicotine”, is used to describe nicotine, nicotine base or a nicotine salt.

As used herein, the terms “proximal”, “distal”, “upstream” and “downstream” are used to describe the relative positions of components, or portions of components, of the aerosol-generating article.

As used herein, the term “longitudinal” refers to the direction corresponding to the main
25 longitudinal axis of the aerosol-generating article, which extends between the upstream and downstream ends of the aerosol-generating article. During use, air may be drawn through the aerosol-generating article in the longitudinal direction.

As used herein, the term “sheet” denotes a laminar element having a width and length substantially greater than the thickness thereof. The width of a sheet may be greater than 10 mm, preferably greater than 20 mm or 30 mm. In certain embodiments, sheets of material for use in forming
30 aerosol-forming substrates as described herein may have a thickness of between 10 μm and about 1000 μm , for example between 10 μm and about 300 μm .

As used herein, the term “homogenised tobacco material” encompasses any tobacco material formed by the agglomeration of particles of tobacco material. Sheets or webs of homogenised tobacco
35 material are formed by agglomerating particulate tobacco obtained by grinding or otherwise powdering of one or both of tobacco leaf lamina and tobacco leaf stems. In addition, homogenised tobacco material may comprise a minor quantity of one or more of tobacco dust, tobacco fines, and other particulate tobacco by-products formed during the treating, handling and shipping of tobacco. The sheets of homogenised tobacco material may be produced by casting, extrusion, paper making
40 processes or other any other suitable processes known in the art.

The term “cast leaf” is used herein to refer to a product made by a casting process that is based on casting a slurry comprising plant particles (for example, clove particles or tobacco particles and clove particles in a mixture) and a binder (for example, guar gum) onto a supportive surface, such as a belt conveyor, drying the slurry and removing the dried sheet from the supportive surface. An example of the casting or cast leaf process is described in, for example, US-A-5,724,998 for making cast leaf tobacco. In a cast leaf process, particulate plant materials are produced by pulverizing, grinding, or comminuting parts of the plant. The particles produced from one or more plants are mixed with a liquid component, typically water, to form a slurry. Other components in the slurry may include fibres, a binder and an aerosol former. The particulate plant materials may be agglomerated in the presence of the binder. The slurry is cast onto a supportive surface and dried into a sheet of homogenized plant material. Preferably, homogenized plant material used in articles according to the present invention may be produced by casting. Such homogenized plant material may comprise agglomerated particulate plant material.

As used herein, resistance to draw is expressed with the units of pressure “mm H₂O” or “mm WG” or “mm of water gauge” and may be measured in accordance with ISO 6565:2002.

The invention is defined in the claims. However, below there is provided a non-exhaustive list of non-limiting examples. Any one or more of the features of these examples may be combined with any one or more features of another example, embodiment, or aspect described herein.

Example Ex1. An aerosol-generating article for use with an aerosol-generating device to generate an inhalable aerosol, the aerosol-generating article comprising:

an aerosol-forming substrate heatable to release an aerosol or volatile compounds capable of forming an aerosol; and

an elongate flavour-bearing element comprising a carrier element and a flavourant supported on the carrier element;

wherein the article has an article length, an article width, and an article thickness, the article length and the article width being at least two times the article thickness.

Example Ex2. An aerosol-generating article according to example Ex1, wherein the article length extends in an article length direction, the article width extends in an article width direction, and the article thickness extends in an article thickness direction, and wherein the article length direction, the article width direction, and the article thickness direction are mutually perpendicular.

Example Ex3. An aerosol-generating article according to any preceding example, wherein the article length and the article width are at least 3, 4 or 5 times the article thickness.

Example Ex4. An aerosol-generating article according to any preceding example, wherein the article is substantially cuboid in shape.

Example Ex5. An aerosol-generating article according to any preceding example, wherein the elongate flavour-bearing element is in the form of a flavour-bearing thread, yarn, filament or tape.

Example Ex6. An aerosol-generating article according to any preceding example, wherein the elongate flavour-bearing element is in the form of a flavour-bearing thread comprising a carrier thread material and a flavourant support on the carrier thread material.

Example Ex7. An aerosol-generating article according to any preceding example, wherein the carrier material comprises cellulosic fibres.

Example Ex8. An aerosol-generating article according to any preceding example, wherein the carrier material comprises cotton fibres.

5 Example Ex9. An aerosol-generating article according to any preceding example, wherein the flavourant is selected from menthol, eugenol, anethole, linalool, limonene, essential oil such as peppermint oil or spearmint oil, or a combination thereof.

Example Ex10. An aerosol-generating article according to any preceding example, wherein the flavourant comprises menthol.

10 Example Ex11. An aerosol-generating article according to example Ex10, wherein the flavourant comprises at least 0.01 percent by weight of menthol on a dry weight basis, for example at least 1 percent by weight, or at least 5 percent by weight, or at least 10 percent by weight, on a dry weight basis.

Example Ex12. An aerosol-generating article according to any preceding example, wherein the
15 aerosol-forming substrate comprises one or more flavourants which are the same as the flavourant on the elongate flavour-bearing element.

Example Ex13. An aerosol-generating article according to any preceding example, wherein the flavourant comprises a colourant.

Example Ex14. An aerosol-generating article according to any preceding example, comprising
20 a plurality of elongate flavour-bearing elements comprising a carrier element and a flavourant supported on the carrier element, wherein the plurality of elongate flavour-bearing elements comprise a different flavourant to each other.

Example Ex15. An aerosol-generating article according to any preceding example, wherein the elongate flavour-bearing element comprises an outer coating layer applied to the carrier material
25 having the flavourant supported thereon.

Example Ex16. An aerosol-generating article according to example Ex15, wherein the outer coating layer comprises one or more of: wax, stearin, sugar solution and polysaccharide including alginate.

Example Ex17. An aerosol-generating article according to example Ex15, wherein the outer
30 coating layer comprises an adhesive composition.

Example Ex18. An aerosol-generating article according to any preceding example, wherein the equivalent diameter of the elongate flavour-bearing element is at least 0.5 millimetres, for example at least 1 millimetres, or at least 1.5 millimetres.

Example Ex19. An aerosol-generating article according to any preceding example, wherein the
35 equivalent diameter of the elongate flavour-bearing element is less than or equal to 3.5 millimetres, for example less than or equal to 3 millimetres, or less than or equal to 2.5 millimetre.

Example Ex20. An aerosol-generating article according to any preceding example, wherein the equivalent diameter of the elongate flavour-bearing element is at least 10 percent of the article thickness, for example, at least 20 percent or at least 30 percent, or at least 40 percent of the article
40 thickness.

Example Ex21. An aerosol-generating article according to any preceding example, wherein the equivalent diameter of the elongate flavour-bearing element is less than or equal to 80 percent of the article thickness, for example, less than or equal to 75 percent or less than or equal to 70 percent or less than or equal to 65 percent of the article thickness.

5 Example Ex22. An aerosol-generating article according to any preceding example, wherein the equivalent diameter of the elongate flavour-bearing element is at least 2 percent of the article width, for example at least 5 percent or at least 7.5 percent or at least 10 percent of the article width.

10 Example Ex23. An aerosol-generating article according to any preceding example, wherein the equivalent diameter of the elongate flavour-bearing element is less than or equal to 35 percent of the article width, for example, less than or equal to 30 percent or less than or equal to 25 percent or less than or equal to 20 percent of the article width.

15 Example Ex24. An aerosol-generating article according to any preceding example, wherein the ratio of the article width to the equivalent diameter of the elongate flavour-bearing element is at least 2 times the ratio of the article thickness to the equivalent diameter of the elongate flavour-bearing element, for example at least 2.5 times or at least 3 times or at least 3.5 times the ratio of the article thickness to the equivalent diameter of the elongate flavour-bearing element.

Example Ex25. An aerosol-generating article according to any preceding example, wherein the elongate flavour-bearing element has a length of at least 10 millimetres, for example at least 15 millimetres, for example at least 20 millimetres, for example at least 25 millimetres.

20 Example Ex26. An aerosol-generating article according to any preceding example, wherein the elongate flavour-bearing element has a length of less than or equal to 100 millimetres, for example less than or equal to 80 millimetres or less than or equal to 60 millimetres.

25 Example Ex27. An aerosol-generating article according to any preceding example, wherein the length of the elongate flavour-bearing element is at least 50 percent of the article length, for example, at least 60 percent or at least 75 percent or at least 90 percent of the article length.

Example Ex28. An aerosol-generating article according to any preceding example, wherein the length of the elongate flavour-bearing element is substantially equal to the article length.

30 Example Ex29. An aerosol-generating article according to any preceding example, wherein the length of the elongate flavour-bearing element is at least 50 percent of the length of the aerosol-forming substrate, for example, at least 60 percent or at least 75 percent or at least 90 percent of the length of the aerosol-forming substrate.

Example Ex30. An aerosol-generating article according to any preceding example, wherein the length of the elongate flavour-bearing element is substantially equal to the length of the aerosol-forming substrate.

35 Example Ex31. An aerosol-generating article according to any of examples Ex1 to Ex29, wherein the length of the elongate flavour-bearing element is greater than the length of the aerosol-forming substrate.

40 Example Ex32. An aerosol-generating article according to any preceding example, wherein the elongate flavour-bearing element has a transverse cross-sectional shape that is circular, oval or elliptical.

Example Ex33. An aerosol-generating article according to any preceding example, wherein the elongate flavour-bearing element extends in a substantially straight line through the aerosol-generating article.

5 Example Ex34. An aerosol-generating article according to example Ex 33, wherein the elongate flavour-bearing element extends substantially longitudinally through the aerosol-generating article.

Example Ex35. An aerosol-generating article according to example Ex33, wherein the elongate flavour-bearing element extends substantially transversely through the aerosol-generating article.

10 Example Ex36. An aerosol-generating article according to any of examples Ex1 to Ex32, wherein the elongate flavour-bearing element extends in a non-straight line through the aerosol-generating article.

15 Example Ex37. An aerosol-generating article according to example Ex36, wherein the elongate flavour-bearing element extends circumferentially at least part way around the aerosol-generating article.

Example Ex38. An aerosol-generating article according to any preceding example, wherein the elongate flavour-bearing element extends at least part way through the aerosol-forming substrate.

20 Example Ex39. An aerosol-generating article according to any preceding example, wherein the elongate flavour-bearing element extends along at least a part of the external surface of the aerosol-forming substrate.

Example Ex40. An aerosol-generating article according to any preceding example, wherein at least a part of the elongate flavour-bearing element is provided downstream of the elongate flavour-bearing element.

25 Example Ex41. An aerosol-generating article according to any preceding example, wherein at least a part of the elongate flavour-bearing element is provided upstream of the elongate flavour-bearing element.

30 Example Ex42. An aerosol-generating article according to any preceding example, wherein the aerosol-generating article comprises a substantially planar upper surface defined by a length extending in an x direction and a width extending in a y direction, and a substantially planar lower surface defined by a length extending in an x direction and a width extending in a y direction, wherein the substantially planar upper surface and the substantially planar lower surface are vertically spaced from each other by a height defined in a z direction.

Example Ex43. An aerosol-generating article according to example Ex42, further comprising an air flow channel defined between the planar upper surface and the planar lower surface.

35 Example Ex44. An aerosol-generating article according to example Ex42 or Ex43, the aerosol-generating article comprising an upper layer forming the substantially planar upper surface and a lower layer forming the substantially planar lower surface.

40 Example Ex45. An aerosol-generating article according to example Ex44, wherein the elongate flavour-bearing element extends at least part way across the substantially planar upper or lower surface.

Example Ex46. An aerosol-generating article according to example Ex44, wherein the elongate flavour-bearing element is spaced apart from the substantially planar upper or lower surface.

Example Ex47. An aerosol-generating article according to any preceding example, wherein the aerosol-generating article comprises a first planar layer, a second planar layer and a corrugated layer arranged between the first planar layer and the second planar layer.

Example Ex48. An aerosol-generating article according to example Ex47, wherein the elongate flavour-bearing element is provided in a channel of the corrugated layer.

Example Ex49. An aerosol-generating article according to example Ex47, wherein the elongate flavour-bearing element is provided within the first planar layer or the second planar layer.

Example Ex50. An aerosol-generating article according to any of examples Ex1 to Ex43, wherein the aerosol-generating article comprises a first planar external surface, a second planar external surface, a cavity and a frame which defines the cavity.

Example Ex51. An aerosol-generating article according to example Ex50, wherein the aerosol-forming substrate is within the cavity.

Example Ex52. An aerosol-generating article according to example Ex50 or Ex51, wherein the elongate flavour-bearing element is provided within the cavity.

Example Ex53. An aerosol-generating article according to example Ex50 or Ex51, wherein the elongate flavour-bearing element is mounted on the frame or a part of the frame.

Example Ex54. An aerosol-generating article according to example Ex53, wherein the elongate flavour-bearing element extends at least part way over an internal surface of the frame.

Example Ex55. An aerosol-generating article according to example Ex53, wherein the elongate flavour-bearing element extends at least part way over an internal surface of the frame.

Example Ex56. An aerosol-generating article according to example Ex53, wherein the frame comprises a peripheral wall and wherein the elongate flavour-bearing element is provided on a surface of the peripheral wall.

Example Ex57. An aerosol-generating article according to example Ex53, wherein the aerosol-generating article further comprises a first planar external layer and a second planar external layer, wherein the first planar external layer forms the first planar external surface and the second planar external layer forms the second planar external surface.

Example Ex58. An aerosol-generating article according to example Ex57, wherein the elongate flavour-bearing element is provided between the frame and the second planar external layer.

Example Ex59. An aerosol-generating article according to example Ex57, wherein the aerosol-generating article comprises a plurality of elongate flavour-bearing elements, wherein at least one elongate flavour-bearing element is provided between the frame and the first planar external layer and at least one elongate flavour-bearing element is provided between the frame and the second planar external layer.

Example Ex60. An aerosol-generating article according to example Ex50, wherein at least a part of the frame has a laminated structure comprising two or more layers.

Example Ex61. An aerosol-generating article according to example Ex60, wherein the elongate flavour-bearing element is provided between the two or more layers of the laminated structure.

5 Example Ex62. An aerosol-generating article according to example Ex50, wherein the frame comprises one or more elongate channels extending through it and wherein the elongate flavour-bearing element is provided within the one or more channels.

Example Ex63. An aerosol-generating article according to example Ex62, wherein the one or more channels extend longitudinally through the aerosol-generating article.

10 Example Ex64. An aerosol-generating article according to example Ex62, wherein the one or more channels extend transversely through the aerosol-generating article.

Example Ex65. An aerosol-generating article according to any of examples Ex50 to Ex64, further comprising an air inlet, an air outlet and an airflow passage extending between the air inlet and the air outlet through the cavity.

15 Example Ex66. An aerosol-generating article according to example Ex65, having a resistance to draw (RTD) of less than 20 millimetre H₂O, for example less than 10 millimetre H₂O, in the direction of the airflow path.

20 Example Ex67. An aerosol-generating article according to any preceding example, the aerosol-generating article having an article width of between 5 millimetres and 20 millimetres, for example, between 10 millimetres and 16 millimetres, for example between 11 millimetres and 15 millimetres, for example between 12 millimetres and 14 millimetres, for example about 13 millimetres.

25 Example Ex68. An aerosol-generating article according to any preceding example, the aerosol-generating article having an article length of between 10 millimetres and 100 millimetres, or between 10 millimetres and 50 millimetres, for example between 10 millimetres and 40 millimetres, for example between 12 millimetres and 30 millimetres, for example between 14 millimetres and 26 millimetres, for example between 16 millimetres and 24 millimetres, for example between 18 millimetres and 22 millimetres, for example about 18 millimetres, or about 19 millimetres, or about 20 millimetres, or about 21 millimetres, or about 22 millimetres.

30 Example Ex69. An aerosol-generating article according to any preceding example, the aerosol-generating article having an article thickness of between 1 millimetres and 10 millimetres, for example between 1.2 millimetres and 8 millimetres, for example between 1.4 millimetres and 7 millimetres, for example between 1.6 millimetres and 6 millimetres, for example between 1.7 millimetres and 5 millimetres, for example about 1.7 millimetres, or about 4.5 millimetres, or about 2 millimetres, or about 3 millimetres, or about 4 millimetres.

35 Example Ex70. An aerosol-generating article according to any preceding example, wherein the aerosol-forming substrate comprises homogenised tobacco material.

Example Ex71. An aerosol-generating article according to any preceding example, wherein the aerosol-forming substrate comprises tobacco cut filler.

40 Example Ex72. An aerosol-generating article according to any preceding example, wherein the aerosol-forming substrate has an aerosol former content of greater than or equal to 15 percent

by weight on a dry weight basis, for example greater than 20 by weight on a dry weight basis, or greater than 25 by weight on a dry weight basis, or greater than 30 by weight on a dry weight basis, or greater than 40 by weight on a dry weight basis, or greater than 50 by weight on a dry weight basis.

5 Example Ex73. An aerosol-generating system according to any preceding example, comprising a plurality of elongate flavour-bearing elements.

 Example Ex74. An aerosol-generating system according to example Ex73, wherein the plurality of elongate flavour-bearing elements are provided in different locations within the aerosol-generating article.

10 Example Ex75. An aerosol-generating system comprising an aerosol-generating article according to any preceding example and an aerosol-generating device for use with the aerosol-generating article to generate an inhalable aerosol.

 Example Ex76. An aerosol-generating system according to example Ex75, wherein the aerosol-generating device comprises a heater for heating the aerosol-forming substrate and the
15 elongate flavour-bearing element of the aerosol-generating article.

 Examples will now be further described with reference to the figures in which:

 Figure 1 is a perspective side view of an aerosol-generating article according to a first embodiment of the present disclosure;

 Figure 2 is a perspective side view of an aerosol-generating article according to a second
20 embodiment of the present disclosure;

 Figure 3 is a schematic end view of an aerosol-generating article according to a third embodiment of the present disclosure;

 Figure 4 is a schematic side view of the aerosol-generating article of figure 3;

 Figure 5 is a schematic plan view of the aerosol-generating article of figure 3;

25 Figure 6 shows a schematic illustration of a corrugated element as used in the aerosol-generating article of figure 3;

 Figure 7 shows a perspective view of an aerosol-generating article according to a fourth embodiment of the present disclosure;

 Figure 8 shows an exploded perspective view of the aerosol-generating article of figure 7;

30 Figure 9 shows a further exploded perspective view of the aerosol-generating article of figure 7;

 Figure 10 shows a schematic transverse cross-sectional view of the aerosol-generating article of figure 7;

 Figure 11 shows a schematic longitudinal cross-sectional view of the aerosol-generating article of figure 7;

35 Figure 12 shows an exploded perspective view of an aerosol-generating article according to a fifth embodiment of the present disclosure;

 Figure 13 shows a schematic transverse cross-sectional view of the aerosol-generating article of figure 12;

40 Figure 14 shows a schematic lateral cross-sectional view of the aerosol-generating article of figure 12.

Figure 15 shows a perspective view of an aerosol-generating article according to a sixth embodiment of the present disclosure;

Figure 16 shows an exploded perspective view of the aerosol-generating article of figure 15;

5 Figure 17 shows a perspective view of an aerosol-generating article according to a seventh embodiment of the present disclosure;

Figure 18 shows an exploded perspective view of the aerosol-generating article of figure 17

Figure 19 show a perspective view of an aerosol-generating article according to an eighth embodiment of the present disclosure;

Figure 20 shows an exploded perspective view of the aerosol-generating article of Figure 19;

10 Figure 21 shows a schematic longitudinal cross-sectional view of the aerosol-generating article of figure 19;

Figure 22 shows a schematic view of an aerosol-generating device according to an embodiment of the present disclosure, the device configured to engage with an aerosol-generating article, for example the aerosol-generating article of any of figures 1 to 21;

15 Figure 23 shows a schematic end view of the aerosol-generating device of figure 22;

Figure 24 is a schematic view showing an aerosol-generating article (for example, the aerosol-generating article of any of figures 1 to 21) in engagement with the aerosol-generating device of figure 22; and

20 Figure 25 is a schematic view of an alternative embodiment to that of figures 22 to 24, showing an aerosol-generating article in engagement with an aerosol-generating device.

Figure 1 illustrates a perspective side view of an aerosol-generating article 100 according to a first embodiment of the present disclosure. The aerosol-generating article 100 has upper and lower surfaces 110, 120 which are flat or planar.

25 The aerosol-generating article 100 comprises an aerosol-forming substrate (not shown) and an elongate flavour-bearing element (not shown) embedded in the aerosol-forming substrate. The elongate flavour-bearing element extends longitudinally through the aerosol-forming substrate, in a substantially central position. The elongate flavour-bearing element comprises a cotton thread loaded with a menthol flavourant. The aerosol-forming substrate may be enclosed within an interior of the aerosol-generating article 100. The aerosol-forming substrate may at least partially define an exterior
30 of the aerosol-generating article 100; for example, one or both of the upper and lower surfaces 110, 120 may comprise or consist of aerosol-forming substrate.

A suitable aerosol-forming substrate may be homogenised tobacco.

35 The aerosol-generating article 100 has a length, extending in an x dimension, of 80 millimetres, a width, extending in a y dimension, of 15 millimetres, and a height (which may also be referred to as a thickness), extending in a z dimension, of 3.6 millimetres.

Figure 2 illustrates a perspective side view of an aerosol-generating article 200 according to a second embodiment of the present disclosure, being a variant of aerosol-generating article 100. Features in common with aerosol-generating article 100 are referred to with like reference signs but commencing with numeral 2 instead of numeral 1. An air flow path 230 is defined through the aerosol-
40 generating article 200 between the upper and lower surfaces 210, 220. The air flow path 230 extends

between opposed first and second ends 201, 202 of the aerosol-generating article 200. The first end 201 may define a distal end of the aerosol-generating article 200, and the second end 202 may define a proximal or mouth end of the aerosol-generating article. The air flow path 230 may be directed towards a mouth of a user to allow a user to inhale aerosol generated in consequence of heating of aerosol-forming substrate of the aerosol-generating article 200.

Figures 3, 4, and 5 illustrate respectively an end view, a side view, and a plan view of an aerosol-generating article 300 according to a third embodiment of the present disclosure. The aerosol-generating article 300 comprises a planar upper layer 310, a planar lower layer 320, and an intermediate or separation layer 340 arranged between the upper layer 310 and lower layer 320.

The planar upper layer 310 is formed from a sheet of paper having a thickness of 300 microns. The planar lower layer 320 is formed from a sheet of paper having a thickness of 300 microns. The intermediate layer 340 is a corrugated element formed from a corrugated sheet of aerosol-forming substrate 345. A suitable aerosol-forming substrate may be homogenised tobacco. Thus, the intermediate layer 340 may be formed from a corrugated sheet of homogenised tobacco material 345.

As shown in Figure 3, the article 300 further comprises an elongate flavour-bearing element 350. The elongate flavour-bearing element 350 may comprise a cotton thread loaded with a menthol flavourant.

Figure 6 illustrates the corrugated sheet of aerosol-forming substrate 345. The corrugations have an amplitude 346 of 3 millimetres and a wavelength 347 of 3 millimetres. The sheet of aerosol-forming substrate 345 forming the intermediate layer 340 has a thickness of 150 microns.

Points of intersection 351, 352 between the upper layer 310 and the intermediate layer 340 and between the lower layer 320 and the intermediate layer 340 comprise an adhesive that joins the respective layers.

The aerosol-generating article 300 has a length, extending in an x dimension, of 80 millimetres, a width, extending in a y dimension, of 15 millimetres, and a height (or thickness), extending in a z dimension, of 3.6 millimetres.

Corrugations of the intermediate layer 340 form a first set of longitudinally extending channels 361 that are bounded by the upper layer 310 and the intermediate layer 340, and a second set of longitudinally extending channels 362 bounded by the lower layer 320 and the intermediate layer 340. The first and second sets of longitudinally extending channels 361, 362 extend through the length of the aerosol-forming substrate between a proximal end 371 of the substrate 345 and a distal end 372 of the substrate 345. The longitudinally extending channels 361, 362 define an air-flow path through the substrate 345. The air-flow path, therefore, passes over both sides of the sheet of aerosol-forming substrate 345. The porosity of the aerosol-generating article along the air-flow path is in the region of 90 %. This provides a very low resistance to draw (RTD) of less than 5 mm H₂O. In fact, the RTD is close to zero.

The aerosol-forming substrate 345 may be a sheet of any suitable aerosol-forming substrate.

The elongate flavour-bearing element 350 extends along one of the first set of longitudinally extending channels 361 of the corrugated element forming the intermediate layer 340. The dashed line in Figure 5 indicates the position of the elongate flavour-bearing element 350.

During use of the aerosol-generating article 300, the aerosol-forming substrate 345 is heated up to cause the aerosol-forming substrate 345 to release volatile compounds, which are then entrained in air drawn into the channels 361, 362 via the distal end 372. The volatile compounds then cool and condense to form an aerosol which may be drawn out of the channels 361, 362 of the aerosol-generating article 300 via the proximal end 371. During use, the elongate flavour-bearing element 350 is also heated, causing the flavourant carried on the elongate flavour-bearing thread 350 to volatilise and thereby be released into the aerosol generated from the aerosol-forming substrate 345.

Figure 7 shows an aerosol-generating article 400 according to a fourth embodiment of the present disclosure. The aerosol-generating article 400 comprises a first planar external layer 424 forming a first planar external surface 421, a second planar external layer 425 forming a second planar external surface 422, and a frame 450 positioned between the first planar external layer 424 and the second planar external layer 425. The second planar external surface 422 is positioned parallel to the first planar external surface 421.

Figures 8 and 9 show exploded views of the aerosol-generating article 400 of figure 7. The frame 450 circumscribes and at least partially defines a cavity 430. Figure 8 shows the cavity 430 in an empty state. Figure 9 shows the cavity 430 filled with aerosol-forming substrate 440. Figures 10 and 11 show respective transverse and longitudinal cross-sectional views of the aerosol-generating article 400 when the cavity 430 is filled with aerosol-forming substrate 440.

As shown most clearly in Figure 9, the aerosol-generating article 400 further comprises a plurality of elongate flavour-bearing elements 480,490 extending longitudinally through the aerosol-generating article . Each of the elongate flavour-bearing elements 480,490 comprises a cotton thread loaded with a flavourant. The elongate flavour-bearing elements 480,490 are coated with an outer wax layer. A first pair of parallel, spaced apart elongate flavour-bearing elements 480 is provided between the aerosol-forming substrate 440 and the first planar external layer 424. The first pair of elongate flavour-bearing elements 480 are loaded with a menthol flavourant. A second pair of parallel, spaced apart elongate flavour-bearing elements 490 is provided between the aerosol-forming substrate 440 and the second planar external layer 422. The second pair of elongate flavour-bearing elements 490 are loaded with an additional flavourant, wherein the same additional flavourant is provided in the aerosol-forming substrate 440.

The first planar external layer 424 and the second planar external layer 425 are made from cigarette paper having a thickness of 35 micrometres and are in physical contact, with and bonded to, the frame 450. The first planar external layer 424 overlies a first end of the cavity 430 and forms a first cavity end wall 431. The second planar external layer 425 overlies a second end of the cavity 430 and forms a second cavity end wall 432, the second cavity end wall 432 being opposite to the first cavity end wall 431. That is, the frame 450, the first planar external layer 424 and the second planar external layer 425 collectively define the cavity 430.

The frame 450 has a hollow cuboid shape and is made from cardboard. The frame 450 defines an aperture extending through the height (also referred to as the thickness) of the frame 450 and the aperture at least partially forms the cavity 430 of the aerosol-generating article 400. The frame 450 comprises a peripheral wall 451 that circumscribes the cavity 430. The peripheral wall 451 includes a

front wall 413 and a back wall 414. In more detail, the peripheral wall 451 is defined by an inner transverse surface 452 of the frame 450 and an outer transverse surface 453 of the frame 450. The inner transverse surface 452 of the peripheral wall 451 at least partially defines a perimeter of the cavity 430. The outer transverse surface 453 of the peripheral wall 451 at least partially defines a
5 perimeter of the aerosol-generating article 400. The peripheral wall 451 has a radial thickness measured between the inner transverse surface 452 of the frame 450 and the outer transverse surface 453 of the frame 450 of about 5 millimetres.

An air inlet 411 and an air outlet 412 are defined by, and extend through, the peripheral wall 451 of the frame 450. More specifically, the air inlet 411 extends through the front wall 413 and the air
10 outlet 412 extends through the back wall 414. The air inlet 411 and the air outlet 412 have an equivalent diameter of 5 millimetres. An airflow passage extends between the air inlet 411 and the air outlet 412 through the cavity 430. As shown in figures 9 to 11, an aerosol-forming substrate 440 is positioned within the cavity 430. The aerosol-forming substrate 440 comprises an aerosol-generating material in the form of tobacco cut filler and has an aerosol-former content of 5 percent by weight on
15 a dry weight basis. As shown, the aerosol-forming substrate 440 fills the entire volume of the cavity 430.

The aerosol-generating article 400 has a cuboid shape and has a height (or thickness) extending in a z dimension, as measured between the first planar external surface 421 and the second planar external surface 422, of 8 millimetres, a width extending in a y dimension of 40 millimetres and a length
20 extending in an x dimension of 60 millimetres. The frame 450 has a height (or thickness) extending in a z dimension of 7.93 millimetres, a width extending in a y dimension of 40 millimetres and a length extending in an x dimension of 60 millimetres. The cavity 430 has a height (or thickness) extending in a z dimension of 7.93 millimetres, a width extending in a y dimension of 30 millimetres and a length extending in an x dimension of 50 millimetres.

Figure 12 shows an aerosol-generating article 500 according to a fifth embodiment of the present disclosure. Features in common with aerosol-generating article 400 are referred to with like reference signs but commencing with numeral 5 instead of numeral 4. Aerosol-generating article 500 differs from aerosol-generating article 400 in that the aerosol-forming substrate is in the form of a sheet of aerosol-generating material 540, in particular a corrugated sheet of homogenised tobacco material.
25 Figures 13 and 14 show respective transverse and lateral cross-section views of the aerosol-generating article 500 of figure 12.

The corrugated sheet of homogenised tobacco material 540 comprises a plurality of parallel corrugations having a plurality of substantially parallel peaks 543 and troughs 544. The plurality of parallel corrugations are defined by a corrugation profile which, as seen in figure 13, is sinusoidal. The
35 plurality of parallel corrugations have a corrugation wavelength of about 4.6 millimetres. The corrugation amplitude is approximately the same as the height (or thickness) of the cavity 430, as shown by the peaks 543 and troughs 544 coinciding with the first cavity end wall 531 and the second cavity end wall 532, respectively.

The plurality of parallel corrugations form a plurality of channels 545 between the sheet of
40 aerosol-generating material 540 and the first cavity end wall 531, and a plurality of channels 546

between the sheet of aerosol-generating material 540 and the second cavity end wall 532. The plurality of channels 545, 546 extend in a longitudinal direction of the aerosol-generating article 500 and form at least a portion of the airflow passage extending between the air inlet 511 and the air outlet 512.

As shown in Figure 13, the aerosol-generating article 500 further comprises a first pair of
5 elongate flavour-bearing elements 580 comprising a first flavourant and a second pair of elongate flavour-bearing elements 590 comprising a second flavourant that is different to the first flavourant. The first pair of elongate flavour-bearing elements 580 are provided within two of the plurality of channels 545 defined between the sheet of aerosol-generating material 540 and the first cavity end wall 531. The second pair of elongate flavour-bearing elements 590 are provided within two of the
10 plurality of channels 546 defined between the sheet of aerosol-generating material 540 and the second cavity end wall 532. Each of the elongate flavour-bearing elements 580, 590 extends longitudinally along the length of the article 500.

Figure 15 shows an aerosol-generating article 600 according to a sixth embodiment of the present disclosure. The aerosol-generating article 600 is similar to the aerosol-generating article 400
15 and features in common with aerosol-generating article 400 are referred to with like reference signs but commencing with numeral 6 instead of numeral 4. The aerosol-generating article 600 differs from the article 400 shown in Figure 7 in that it comprises a frame 650 formed of a first frame layer 652 and a second frame layer 654. Figure 16 shows an exploded view of the first planar external layer 624, the first frame layer 652, the second frame layer 654 and the second planar external layer 625. The
20 first frame layer 652 is the same length, width and height as the second frame layer 654 and overlies the second frame layer 654. The first frame layer 652 and the second frame layer 654 are bonded together with an adhesive (not shown). The air inlet 611 and the air outlet 612 are formed by both the first frame layer 652 and the second frame layer 654.

As shown in Figure 16, a first elongate flavour-bearing element 680 and a second elongate
25 flavour-bearing element 690 are provided between the first frame layer 652 and the second frame layer 654. The first elongate flavour-bearing element 680 and the second elongate flavour-bearing element 690 each extend longitudinally along the length of the frame 650, from the downstream end to the upstream end. The first elongate flavour-bearing element 680 and the second elongate flavour-bearing element 690 are both formed of a cotton yarn loaded with a flavourant. The first elongate
30 flavour-bearing element 680 is loaded with a first flavourant and the second elongate flavour-bearing element 690 is loaded with a second flavourant that is different to the first flavourant.

Figure 17 shows an aerosol-generating article 700 according to a seventh embodiment of the present disclosure. Figure 18 shows an exploded view of the aerosol-generating article 700 of Figure
35 17. The aerosol-generating article 700 is similar to the aerosol-generating article 400 and features in common with aerosol-generating article 400 are referred to with like reference signs but commencing with numeral 7 instead of numeral 4. The aerosol-generating article 700 differs from the article 400 shown in Figure 7 in that it comprises a frame 750 formed of multiple connected frame portions. The frame 750 comprises a first side wall 754, a second side wall 756, a first end wall 758 and a second end wall 760.

The first end wall 758 and the second end wall 760 extend transversely to the longitudinal axis of the of the aerosol-generating article 700. The first end wall 758 and the second end wall 760 extend from one lateral edge of the aerosol-generating article 700 to the other lateral edge of the aerosol-generating article 700. The air inlet 711 is defined as an aperture extending through the first end wall 758. The air outlet 712 is defined as an aperture extending through the second end wall 760.

The first side wall 754 and the second side wall 756 extend along the longitudinal axis of the aerosol-generating article 700 from the air inlet 711 to the air outlet 712. The first side wall 754 and the second side wall 756 extend between inner surfaces of the first end wall 758 and the second end wall 760 so as to form the frame 750.

As shown in Figure 18, a first elongate flavour-bearing element 780 extends longitudinally along the inner face of the first side wall 754 between the upstream and downstream ends of the first side wall 754. A second elongate flavour-bearing element 790, the position of which is indicated by the dotted line in Figure 18, extends longitudinally along the inner face of the second side wall 756 between the upstream and downstream ends of the second side wall 756. The first elongate flavour-bearing element 780 and the second elongate flavour-bearing element 790 are both formed of a cotton thread loaded with a flavourant. The first elongate flavour-bearing element 780 and the second elongate flavour-bearing element 790 are identical to each other and carry the same flavourant, which is preferably menthol.

Figure 19 shows an aerosol-generating article 800 according to an eighth embodiment of the present disclosure. Figure 20 shows an exploded view of the aerosol-generating article 800 of Figure 19. Figure 21 shows a longitudinal cross-section through the article of Figures 19 and 20. The aerosol-generating article 800 is similar to the aerosol-generating article 400 and features in common with aerosol-generating article 400 are referred to with like reference signs but commencing with numeral 8 instead of numeral 4. The aerosol-generating article 800 differs from the article 400 shown in Figure 7 in that it comprises a frame 850 formed of multiple connected frame portions. The frame 850 comprises a first side portion 854, a second side portion 856, a first end portion 858 and a second end portion 860.

The first end portion 858 and the second end portion 860 extend transversely to the longitudinal axis of the of the aerosol-generating article 800. The first end portion 858 and the second end portion 860 extend from one lateral edge of the aerosol-generating article 800 to the other lateral edge of the aerosol-generating article 800. The air inlet 811 is defined as an aperture extending through the first end portion 858. The air outlet 812 is defined as an aperture extending through the second end portion 860.

The first end portion 858 comprises an additional pair of elongate channels 870, 872 on either side of the air inlet 811 and spaced apart from the air inlet. The elongate channels 870, 872 extend through the first end portion 858 between the upstream and downstream ends.

The first side portion 854 and the second side portion 856 extend along the longitudinal axis of the aerosol-generating article 800 between inner surfaces of the first end portion 858 and the second end portion 860 so as to form the frame 850.

A first elongate channel 874 extends longitudinally through the first side portion 854 between the upstream and downstream ends. A second elongate channel 876 extends longitudinally through the second side portion 856 between the upstream and downstream ends. As shown in Figure 21, the first and second elongate channels 874, 876 are aligned with the pair of elongate channels 870, 872 in the first end portion, to form a continuous elongate channel on each side of the article 800. These elongate channels provide additional air flow paths through the article 800. The first and second elongate channels 874, 876 are also in fluid communication with the air outlet 812 in the second end portion 860.

As shown in Figures 21, the first elongate channel 874 contains a first elongate flavour-bearing element 880, which extends along the full length of the first elongate channel 874. The second elongate channel 876 contains a second elongate flavour-bearing element 890, which extends along the full length of the second elongate channel 876. Each of the first elongate flavour-bearing element 880 and the second elongate flavour-bearing element 890 comprises a cotton thread loaded with a flavourant.

During use of each of the aerosol-generating articles shown in the figures, the aerosol-forming substrate is heated up to cause the aerosol-forming substrate to release volatile compounds, which are then entrained in air drawn through the air inlet into the cavity. The volatile compounds then cool and condense to form an aerosol which may be drawn out of the aerosol-generating article through the air outlet.

. During use, the elongate flavour-bearing elements are also heated, causing the flavourants carried on the elongate flavour-bearing threads to volatilise and thereby be released into the aerosol generated from the aerosol-forming substrate. The elongate flavour-bearing elements may be adapted such that the different flavourants or the same flavourant from different threads are released at different times during the heating cycle.

Figures 22 and 23 illustrate an aerosol-generating device 6000 configured for use with an aerosol-generating article 900 comprising or consisting of aerosol-forming substrate 40. The device 6000 is an elongate aerosol-generating device extending between a proximal end 6001 and a distal end 6002. The device 6000 comprises a battery 6010, a controller 6020 and a heater 6030 located within a housing 6040. The controller 6020 controls supply of power from the battery 6010 to the heater 6030. A cavity 6050 is defined in the device 6000, the cavity having an opening 6051 defined in the proximal end 6001 of the device. The opening 6051 is rectangular in shape and is dimensioned to accommodate the transverse cross-section of the aerosol-generating article 900. The cavity 6050 comprises an upper planar surface 6052 and a lower planar surface 6053. The heater 6030 is located in the lower planar surface 6053 to heat a lower surface of the aerosol-generating article 600 inserted into the cavity 6050. An air-flow path is configured to allow air to flow into the cavity 6050 from outside the device 6000.

Figure 24 illustrates the device 6000 of figure 22 in engagement with the aerosol-generating article 900. There is little tolerance between outer surfaces of the aerosol-generating article 600 and the internal surfaces of the cavity 6050. Thus, there is a snug fit between the aerosol-generating article 900 and the device 6000. As the RTD of the aerosol-generating article 900 is negligible, the RTD of

the system formed by the combination of aerosol-generating article 900 and aerosol-generating device 6000 is controlled by the air-flow path defined within the device. When a user has inserted the aerosol-generating article 900 into the cavity 6050, the device 6000 can be operated. The heater 6030 heats a lower surface of the aerosol-generating article 800, and as a result the aerosol-forming substrate 940 of the aerosol-generating article 900 is heated. Volatile components of the aerosol-forming substrate 940 are evaporated and condense in longitudinal air-flow channels defined within the aerosol-generating article 900 to form an aerosol. The user inhales the aerosol by drawing on the proximal end 601 of the aerosol-generating article 900. Once the aerosol-generating substrate 940 of the aerosol-generating article 900 has been depleted of volatile components, the aerosol-generating article is removed from the cavity 6050 of the device 6000 and disposed of. The aerosol-generating article 900 may be any one of the aerosol-generating articles 100, 200, 300, 400, 500, 600, 700, 800 previously described or any other aerosol-generating article of the present disclosure.

Although Figure 24 shows part of the aerosol-generating article 900 extending outside of the aerosol-generating device 6000, in other embodiments the entirety of an aerosol-generating article may be wholly enclosed within an aerosol-generating device. By way of example, figure 25 illustrates an alternative embodiment to that of Figure 24, with like features referred to by the same reference numbers but with the addition of a prime symbol '. For the alternative embodiment of Figure 25, the entirety of aerosol-generating article 900' is enclosed within the interior of aerosol-generating device 6000'.

For the purpose of the present description and of the appended claims, except where otherwise indicated, all numbers expressing amounts, quantities, percentages, and so forth, are to be understood as being modified in all instances by the term "about". Also, all ranges include the maximum and minimum points disclosed and include any intermediate ranges therein, which may or may not be specifically enumerated herein. In this context, therefore, a number "A" is understood as " $A \pm 10\%$ of "A". Within this context, a number "A" may be considered to include numerical values that are within general standard error for the measurement of the property that the number "A" modifies. The number "A", in some instances as used in the appended claims, may deviate by the percentages enumerated above provided that the amount by which "A" deviates does not materially affect the basic and novel characteristic(s) of the claimed invention. Also, all ranges include the maximum and minimum points disclosed and include any intermediate ranges therein, which may or may not be specifically enumerated herein. The terms "in which" and "wherein" are used synonymously through this specification.

CLAIMS

1. An aerosol-generating article for use with an aerosol-generating device to generate an inhalable aerosol, the aerosol-generating article comprising:

5 an aerosol-forming substrate heatable to release an aerosol or volatile compounds capable of forming an aerosol; and

an elongate flavour-bearing element comprising a carrier material and a flavourant supported on the carrier material,

10 wherein the article has an article length, an article width and an article thickness, the article length and the article width being at least two times the article thickness.

2. An aerosol-generating article according to claim 1, wherein the elongate flavour-bearing element is a flavour-bearing thread comprising a carrier thread material and a flavourant supported on the carrier thread material.

3. An aerosol-generating article according to claim 1 or 2, wherein the elongate flavour-bearing element comprises an outer coating layer applied to the carrier material having the flavourant supported thereon.

4. An aerosol-generating article according to any preceding claim, comprising a plurality of elongate flavour-bearing elements in different positions within the aerosol-generating article.

5. An aerosol-generating article according to any preceding claim, wherein the equivalent diameter of the elongate flavour-bearing element is at least 40 percent of the article thickness.

6. An aerosol-generating article according to any preceding claim, wherein the equivalent diameter of the elongate flavour-bearing element is less than or equal to 20 percent of the article width.

7. An aerosol-generating article according to any preceding claim, wherein the ratio of the article width to the equivalent diameter of the elongate flavour-bearing element is at least 3 times the ratio of the article thickness to the equivalent diameter of the elongate flavour-bearing element.

8. An aerosol-generating article according to any preceding claim, wherein the length of the elongate flavour-bearing element is at least 50 percent of the length of the aerosol-generating article.

9. An aerosol-generating article according to any preceding claim, wherein the elongate flavour-bearing element is embedded in the aerosol-forming substrate or provided on an external surface of the aerosol-forming substrate.

10. An aerosol-generating article according to any preceding claim, comprising a first planar external surface, a second planar external surface, a frame and a cavity defined by the frame, wherein the aerosol-forming substrate and the elongate flavour-bearing element are provided within the cavity.

5 11. An aerosol-generating article according to any preceding claim, comprising a first planar external surface, a second planar external surface, a frame and a cavity defined by the frame, wherein the aerosol-forming substrate is provided within the cavity and wherein the elongate flavour-bearing element is mounted on the frame or a part of the frame.

10 12. An aerosol-generating article according to claim 10, further comprising a first planar external layer forming the first planar external surface and a second planar external layer forming the second planar external surface, wherein the elongate flavour-bearing element is provided between the frame and the first planar external layer or the second planar external layer.

15 13. An aerosol-generating article according to any preceding claim, comprising a first planar external surface, a second planar external surface, a frame and a cavity defined by the frame, wherein the aerosol-forming substrate is provided within the cavity, wherein the frame comprises one or more elongate channels extending therethrough and wherein the elongate flavour-bearing element is provided within the one or more elongate channels.

20 14. An aerosol-generating article according to any preceding claim, comprising a first planar external surface, a second planar external surface, a frame and a cavity defined by the frame, wherein the aerosol-forming substrate is provided within the cavity, wherein at least a part of the frame is formed of a laminate structure comprising two or more layers and wherein the elongate flavour-bearing
25 element is provided between the two or more layers of the laminate structure.

15. An aerosol-generating system comprising: an aerosol-generating article according to any preceding claim and an aerosol-generating device for use with the aerosol-generating article to generate an inhalable aerosol, wherein the aerosol-generating device comprises a heater for heating
30 the aerosol-forming substrate of the aerosol-generating article and the elongate flavour-bearing element.

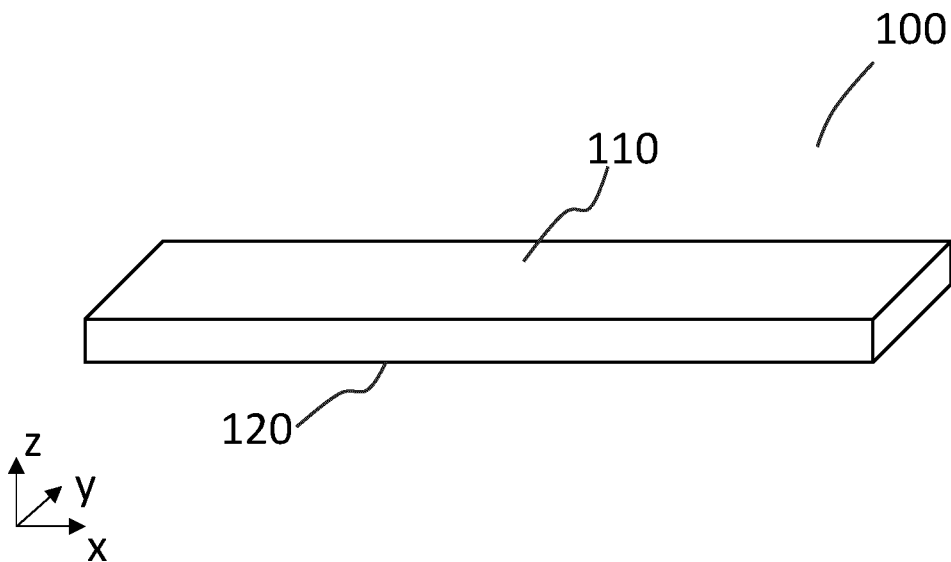


FIGURE 1

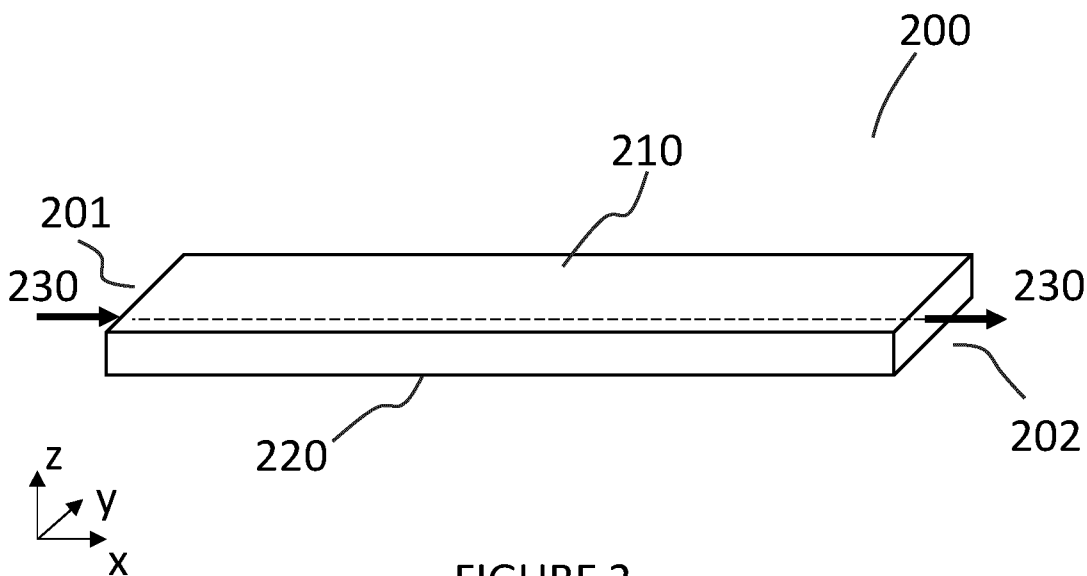
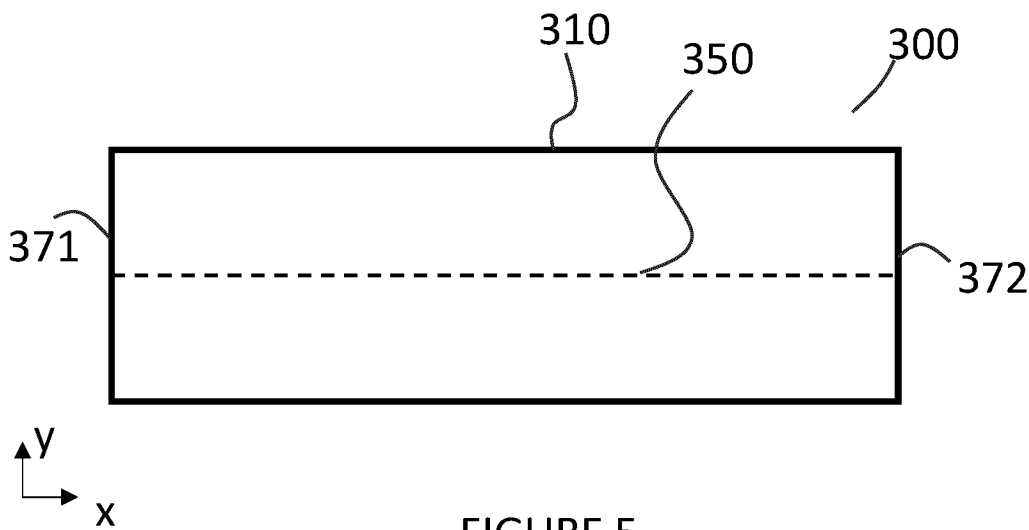
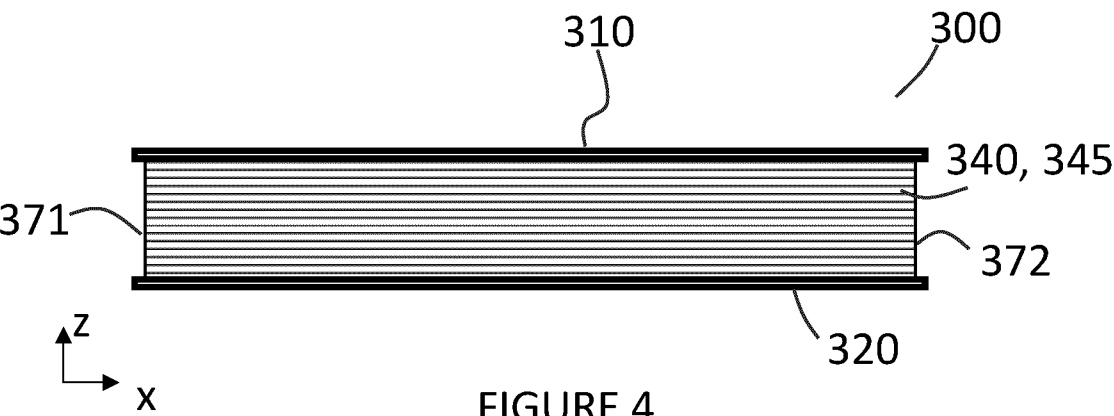
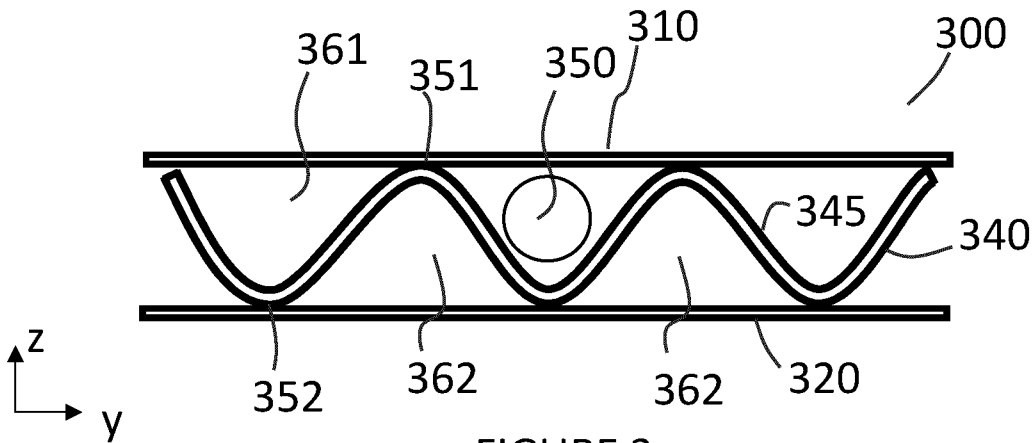


FIGURE 2



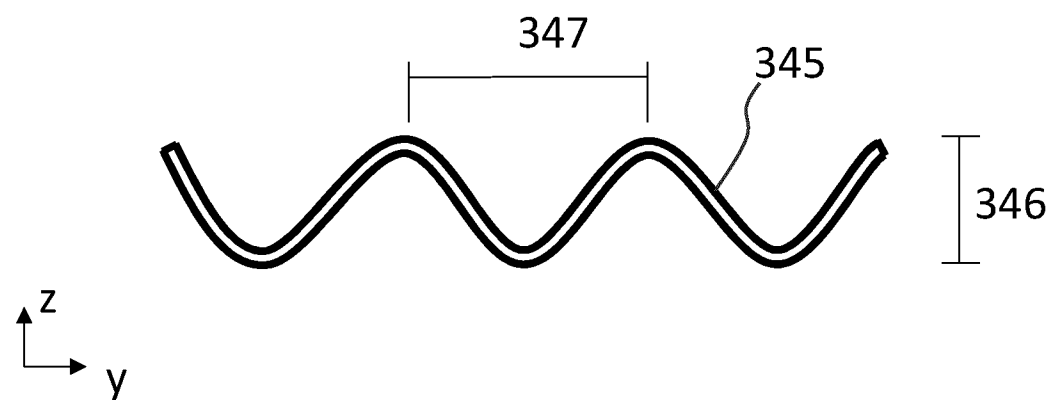
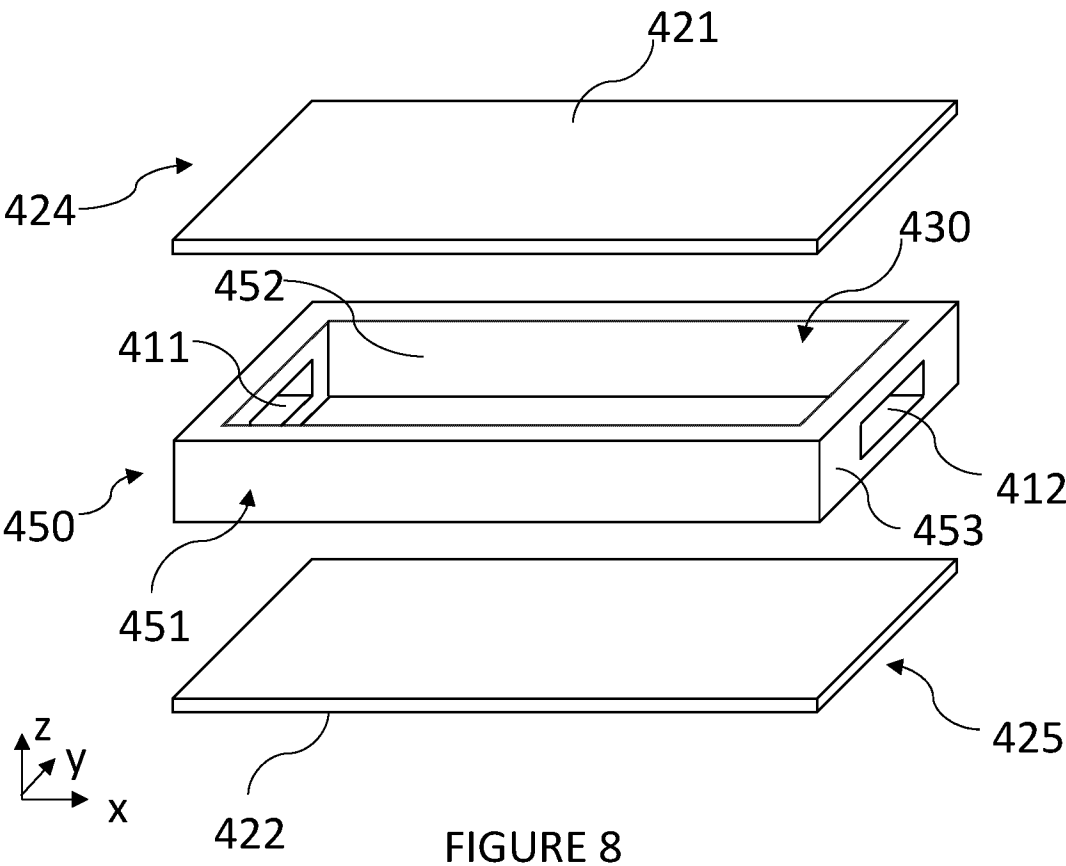
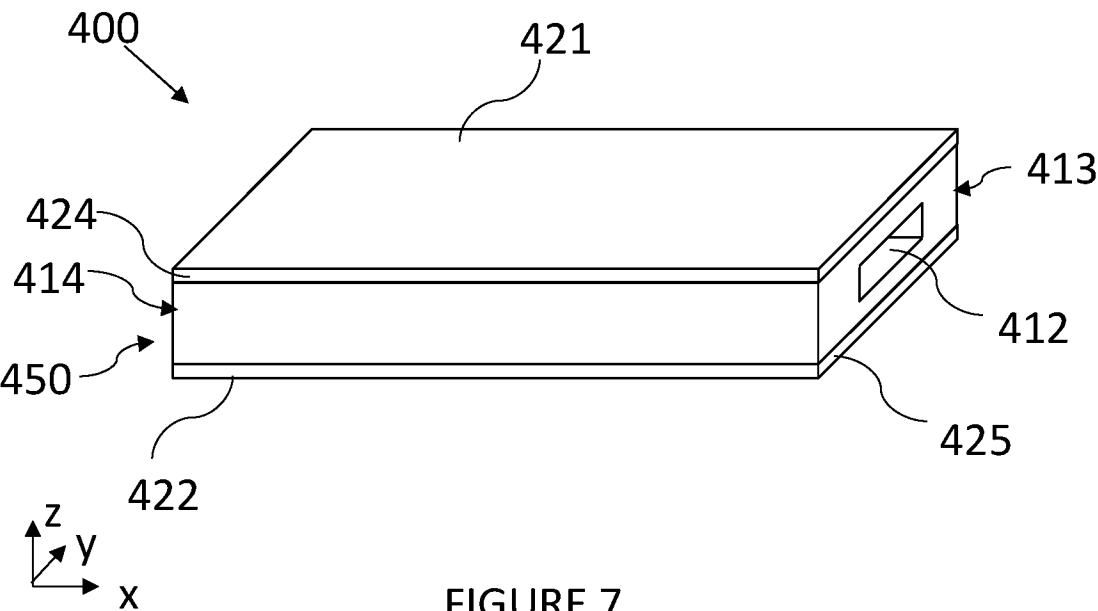


FIGURE 6



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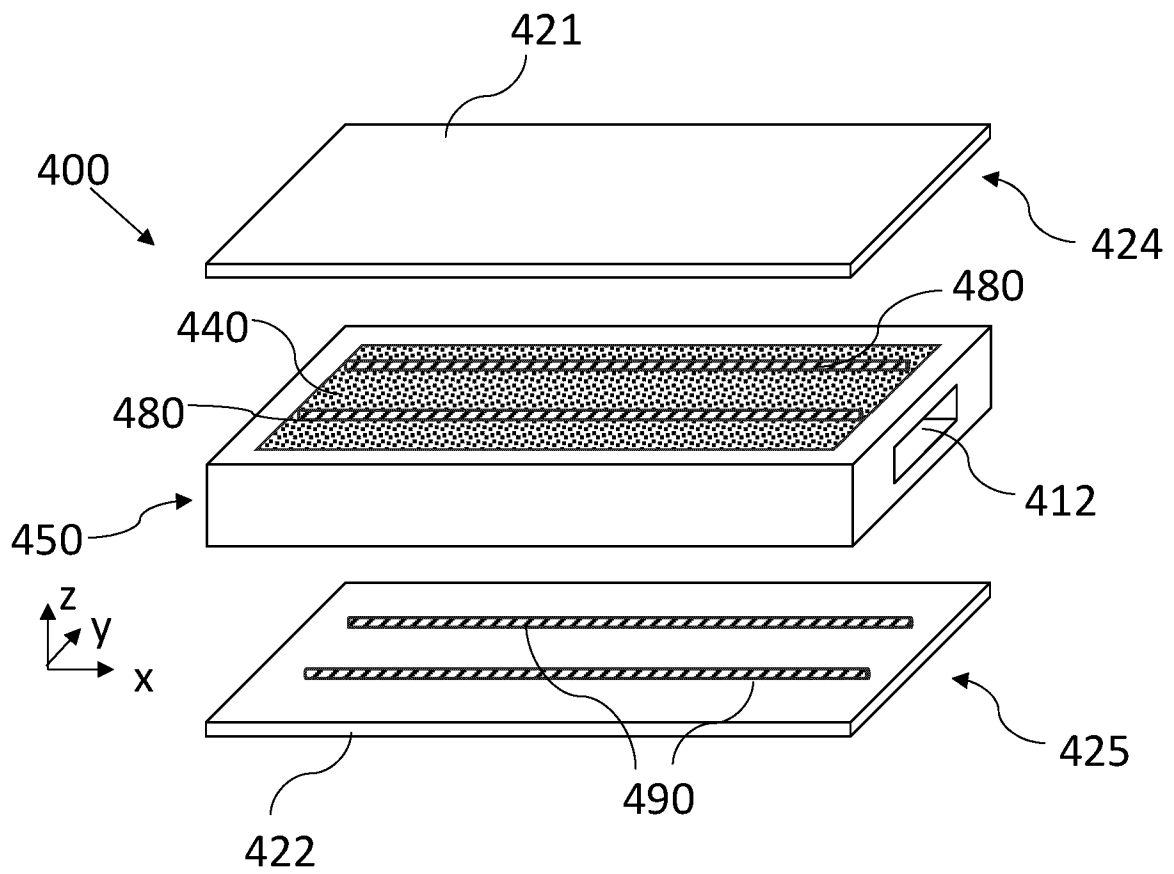


FIGURE 9

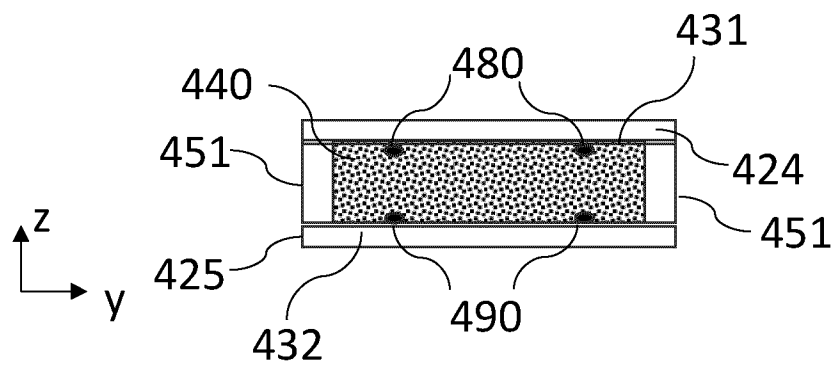


FIGURE 10

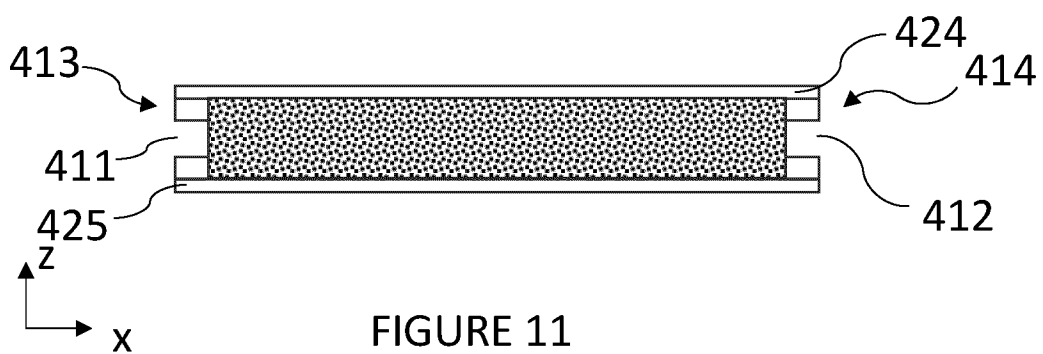


FIGURE 11

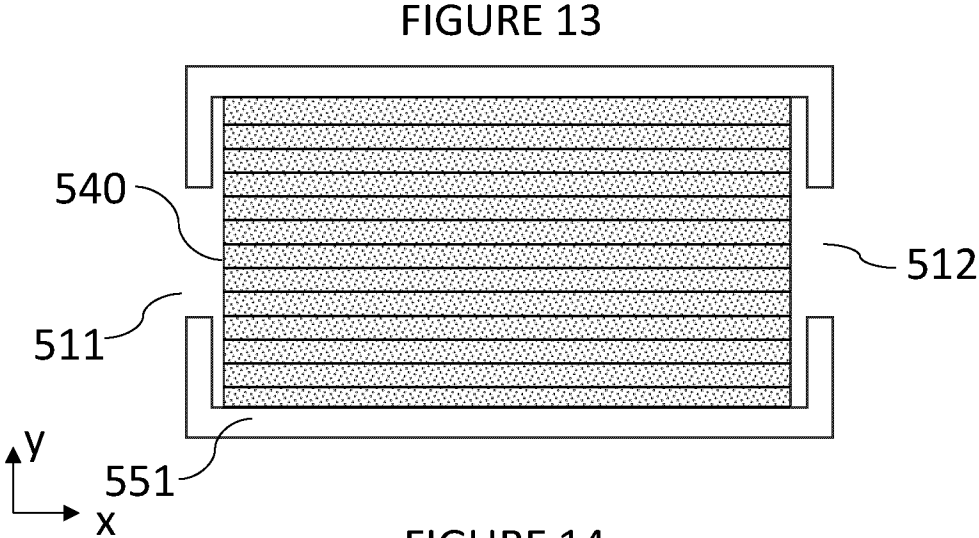
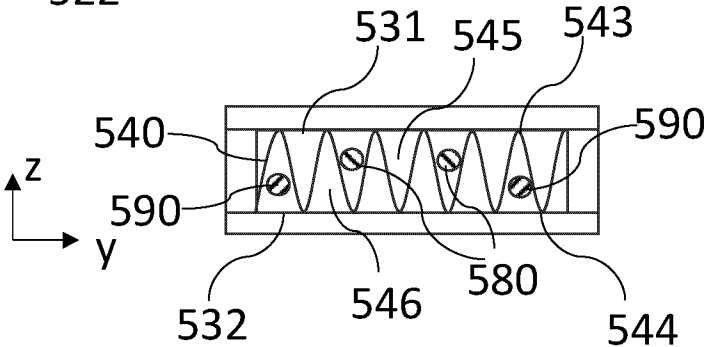
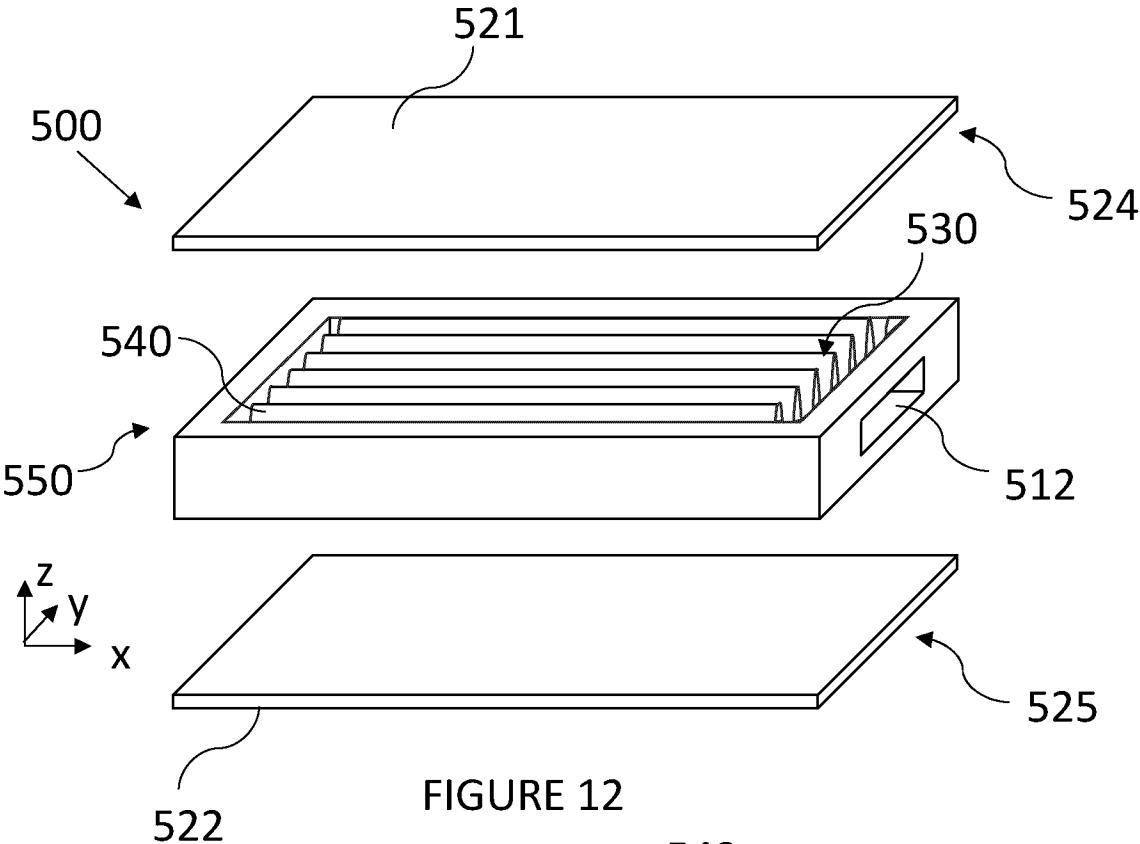
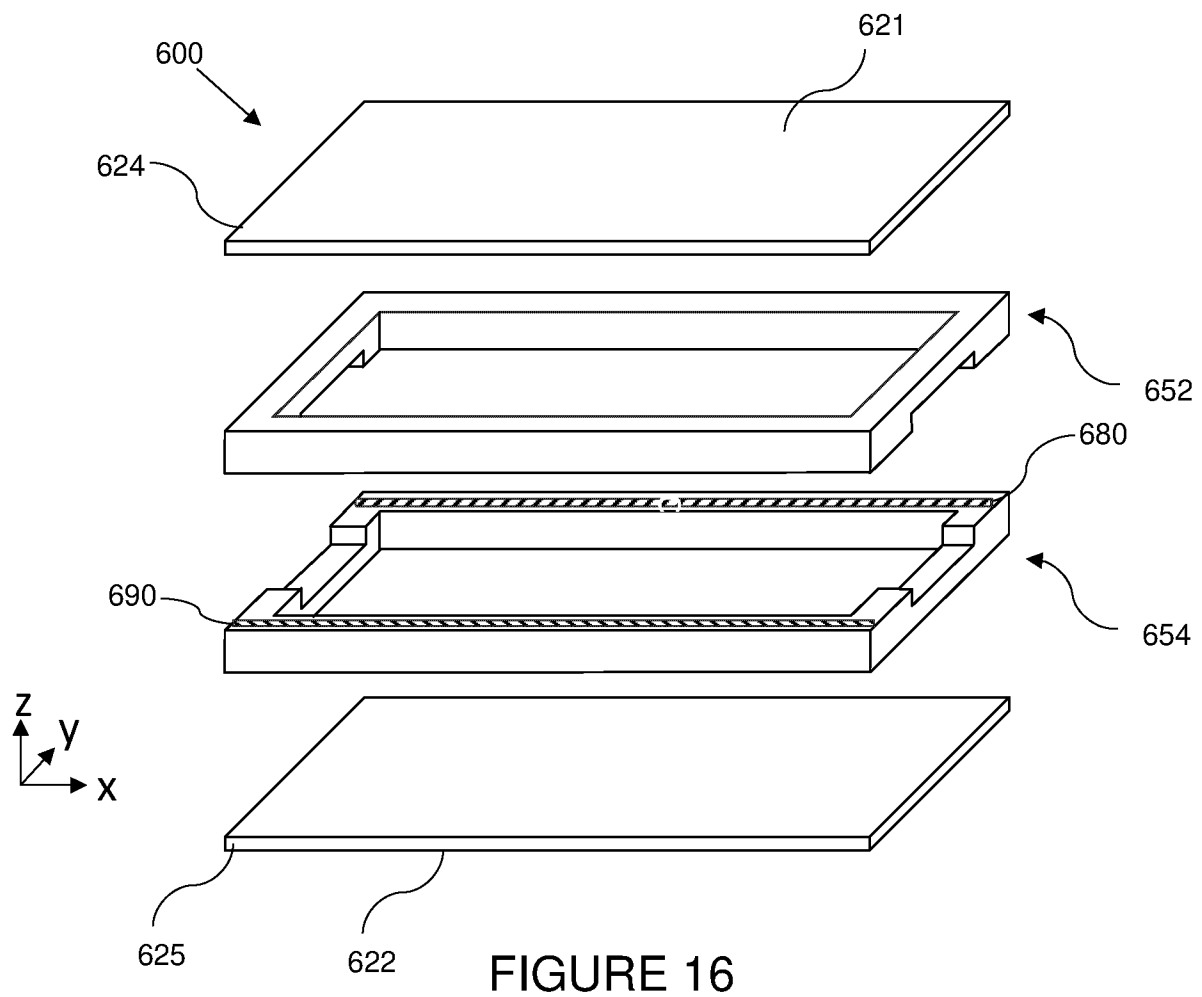
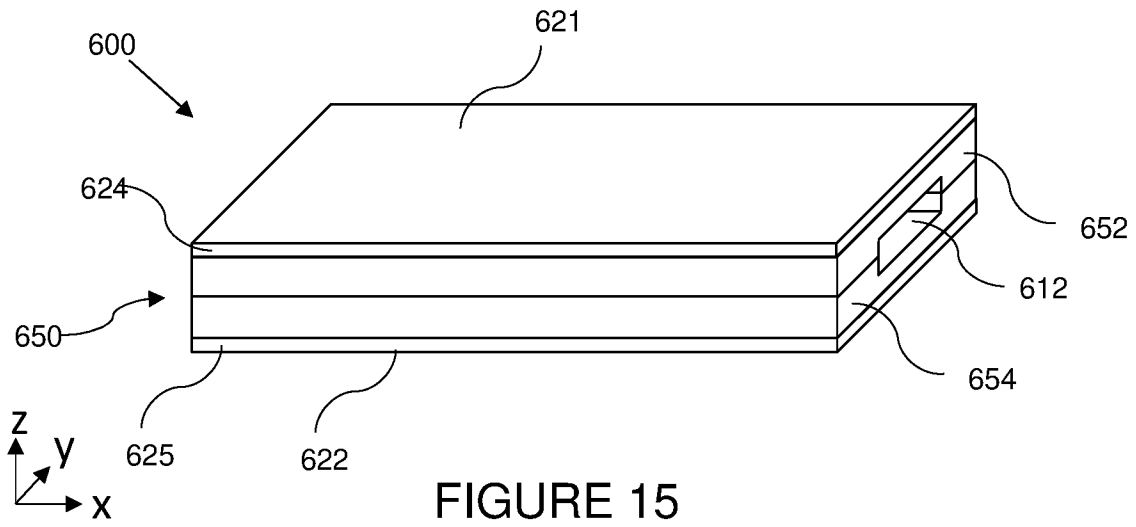
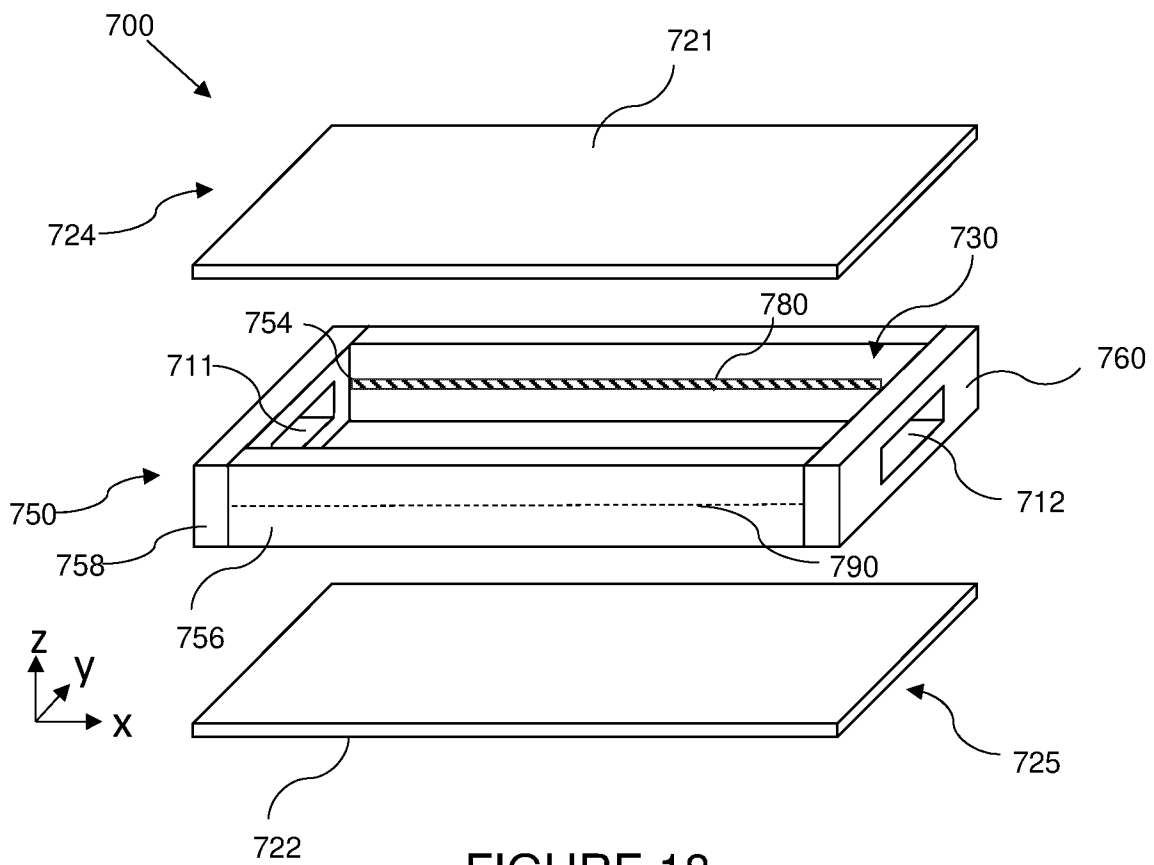
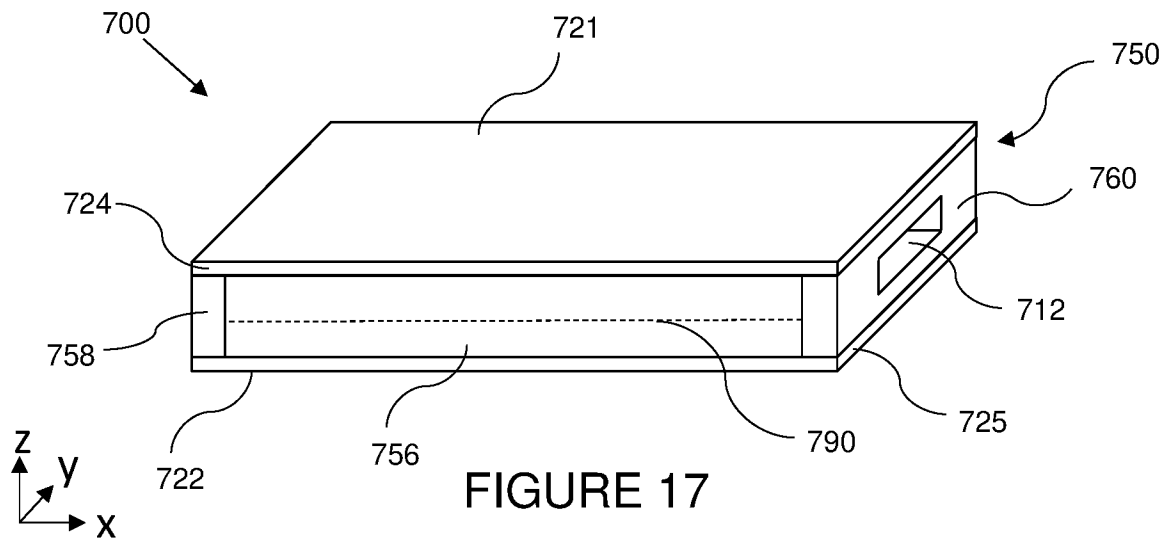


FIGURE 14



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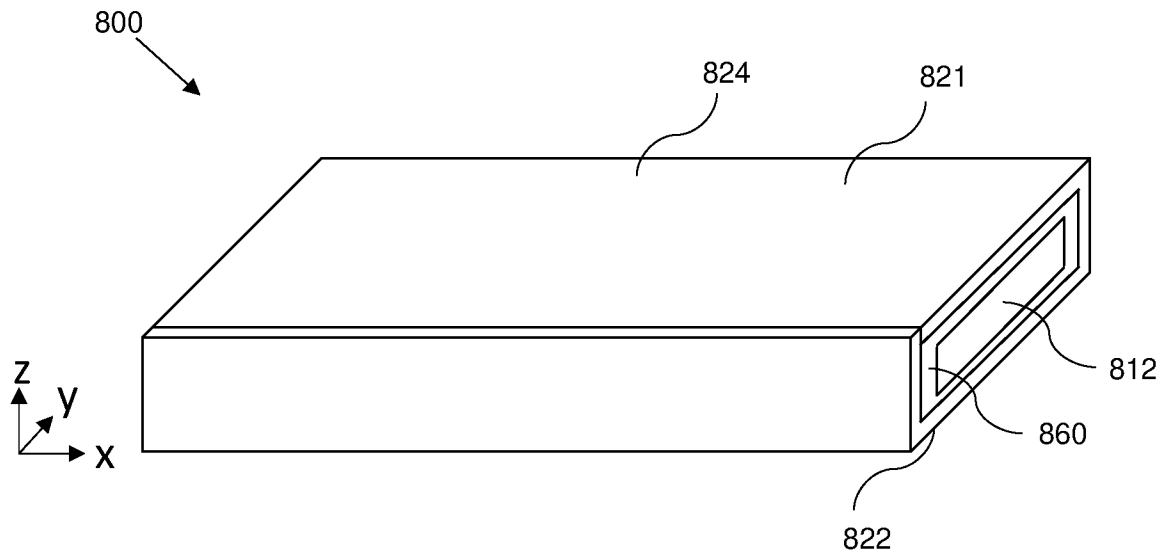


FIGURE 19

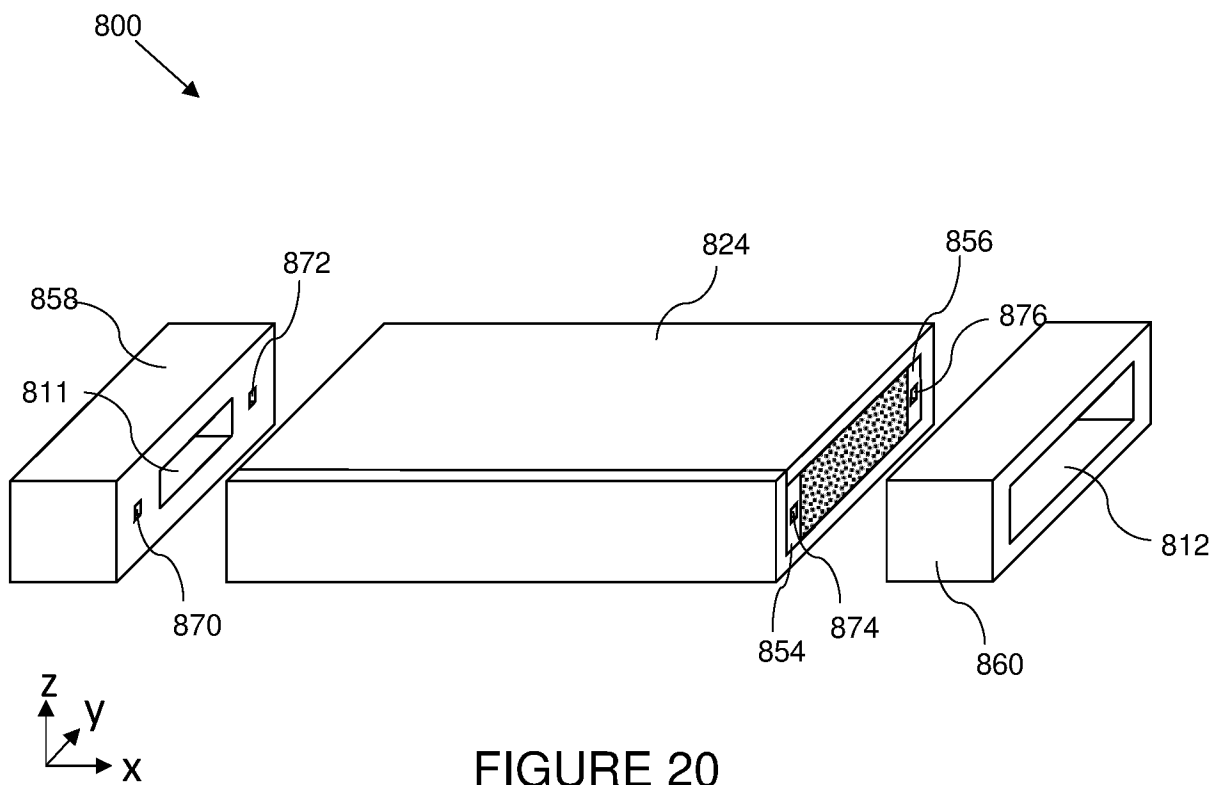


FIGURE 20

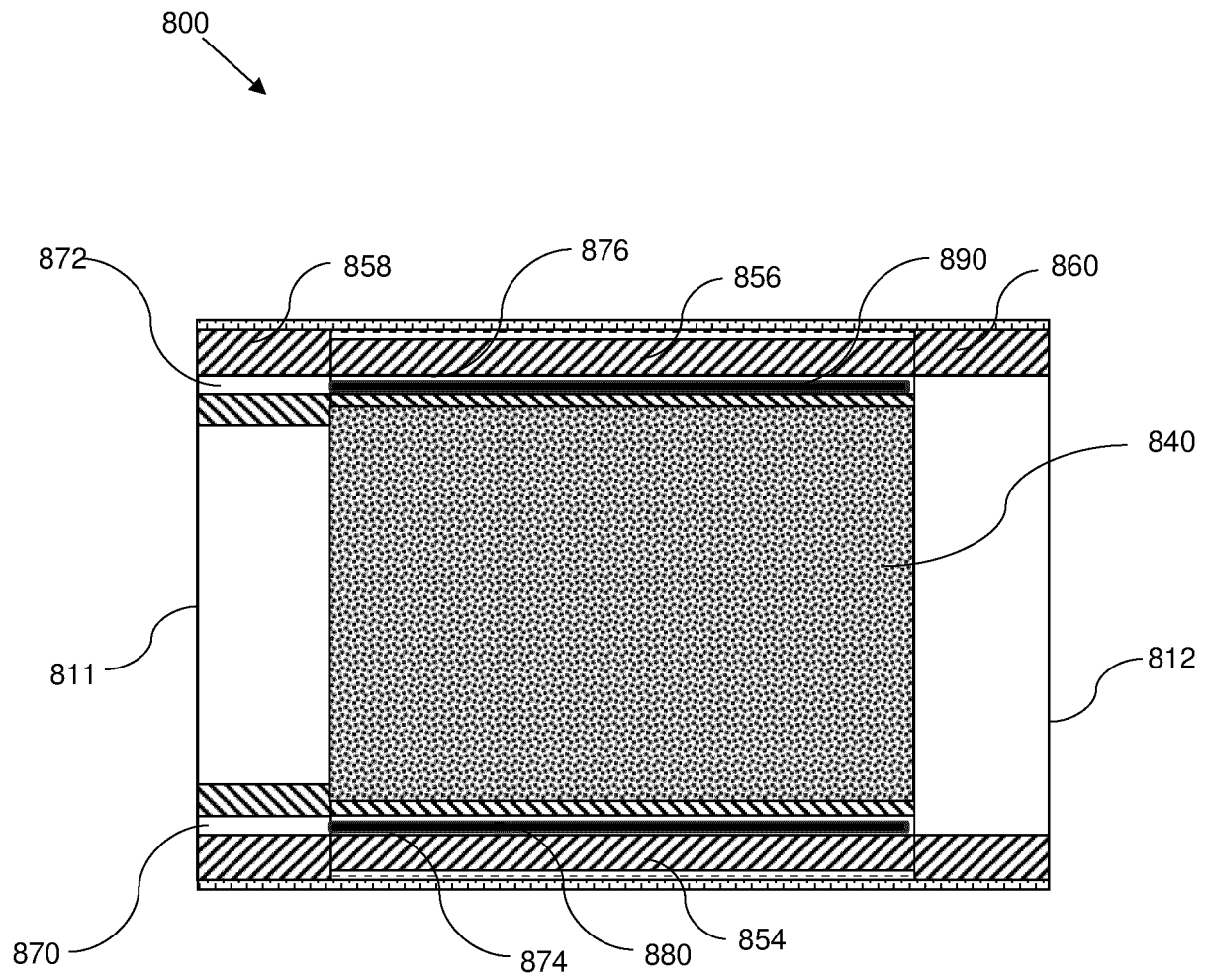


FIGURE 21

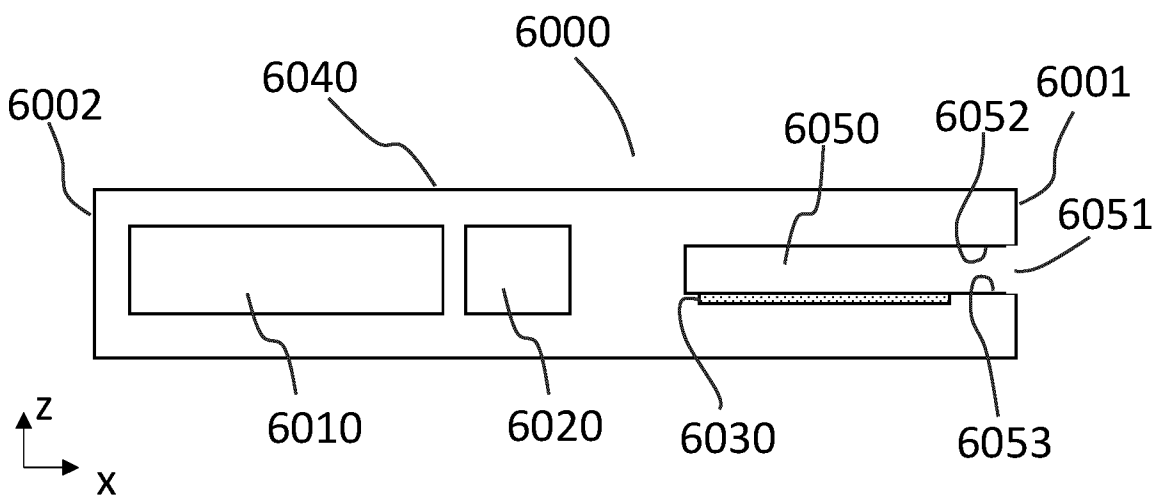


FIGURE 22

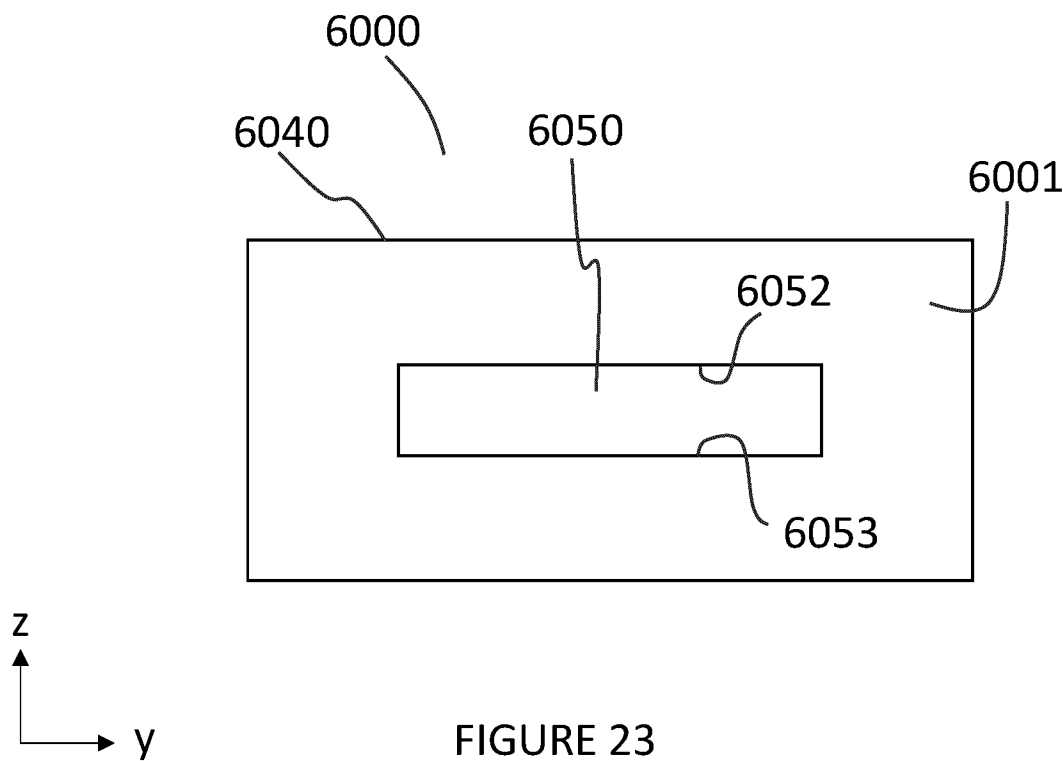
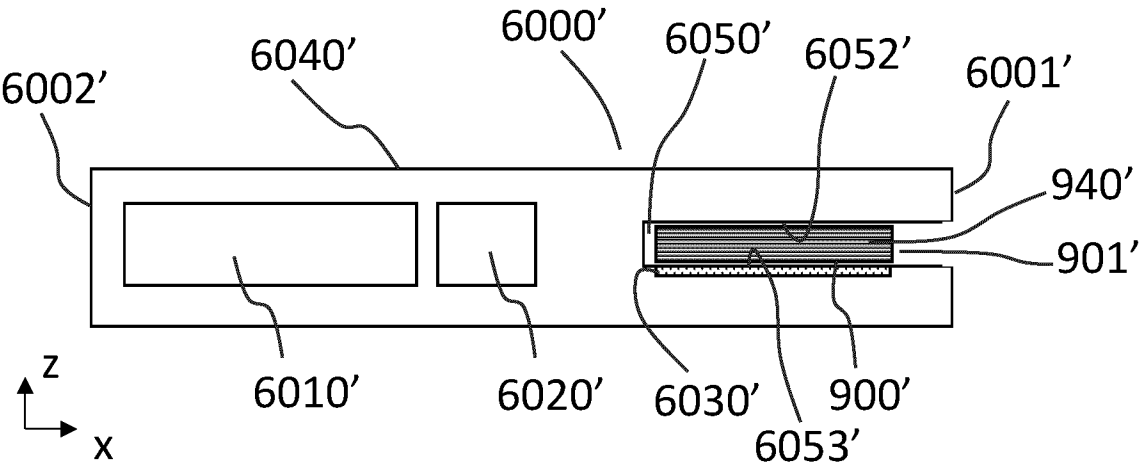
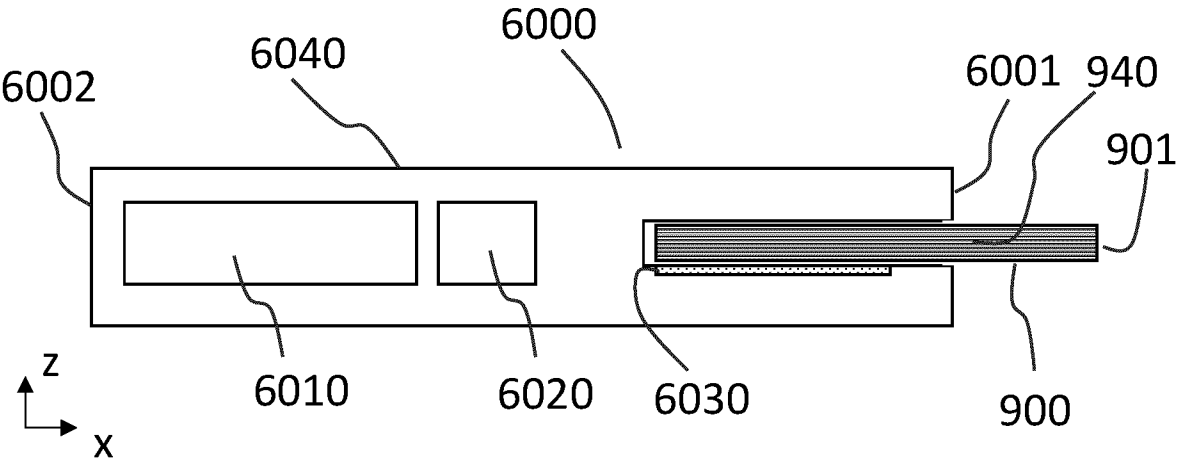


FIGURE 23



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2024/086620

A. CLASSIFICATION OF SUBJECT MATTER

INV. A24D1/20 A24F40/40
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A24D A24F A61M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 9 943 114 B2 (PHILIP MORRIS PRODUCTS SA [CH]) 17 April 2018 (2018-04-17)	1,4-15
Y	column 18, line 58 - line 64; figure 3B -----	2,3
X	US 2022/030944 A1 (GRISCIK GREGORY [US] ET AL) 3 February 2022 (2022-02-03)	1,4-9, 14,15
Y	paragraph [0045] - paragraph [0046];	2,3
A	figures 1-3 -----	10-13
Y	US 2022/046980 A1 (CAMPITELLI GENNARO [CH] ET AL) 17 February 2022 (2022-02-17)	2
	paragraph [0032]; figures 35-37 -----	
Y	EP 3 732 936 B1 (CQENS TECH INC [US]) 20 September 2023 (2023-09-20)	3
	paragraph [0241] paragraph [0484] -----	



Further documents are listed in the continuation of Box C.



See patent family annex.

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"Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

4 April 2025

Date of mailing of the international search report

22/04/2025

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2

NL - 2280 HV Rijswijk

Tel. (+31-70) 340-2040,

Fax: (+31-70) 340-3016

Authorized officer

Dartis, Daniel

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2024/086620

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 9943114	B2	17-04-2018	CA 2951105 A1 14-01-2016
			CN 106659247 A 10-05-2017
			EP 3166430 A1 17-05-2017
			JP 6734838 B2 05-08-2020
			JP 2017520263 A 27-07-2017
			KR 20170020782 A 24-02-2017
			KR 20230072514 A 24-05-2023
			US 2017164657 A1 15-06-2017
			WO 2016005533 A1 14-01-2016
US 2022030944	A1	03-02-2022	CN 113438905 A 24-09-2021
			EP 3914107 A1 01-12-2021
			JP 2022517282 A 07-03-2022
			US 2020229509 A1 23-07-2020
			US 2022030944 A1 03-02-2022
			US 2024164431 A1 23-05-2024
			WO 2020154078 A1 30-07-2020
US 2022046980	A1	17-02-2022	BR 112021010471 A2 24-08-2021
			CN 113490428 A 08-10-2021
			EP 3897235 A1 27-10-2021
			JP 2022514839 A 16-02-2022
			KR 20210101218 A 18-08-2021
			US 2022046980 A1 17-02-2022
			WO 2020127107 A1 25-06-2020
EP 3732936	B1	20-09-2023	BR 112020013602 A2 17-02-2021
			CN 112136360 A 25-12-2020
			EP 3732936 A1 04-11-2020
			EP 4266831 A2 25-10-2023
			ES 2966547 T3 22-04-2024
			HU E064211 T2 28-02-2024
			JP 7093919 B2 01-07-2022
			JP 7373867 B2 06-11-2023
			JP 2021514177 A 10-06-2021
			JP 2022137015 A 21-09-2022
			JP 2024012329 A 30-01-2024
			KR 20200105692 A 08-09-2020
			KR 20220132018 A 29-09-2022
			PH 12020551030 A1 02-08-2021
			PL 3732936 T3 08-04-2024
			PT 3732936 T 23-11-2023
			PT 4266831 T 19-03-2025
			RU 2020125825 A 03-03-2022
			SG 11202006324T A 29-07-2020
			US 11606969 B1 21-03-2023
			US 2019200677 A1 04-07-2019
			US 2020383377 A1 10-12-2020
			US 2023091696 A1 23-03-2023
			WO 2019136165 A1 11-07-2019