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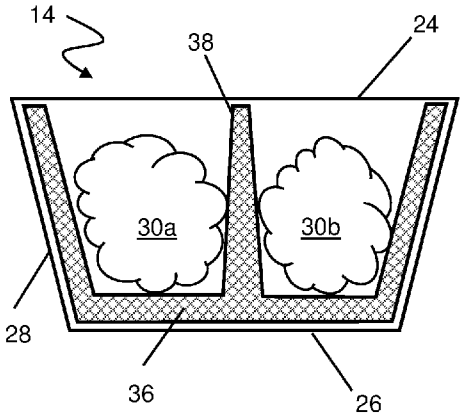

Figure 4A

(57) **Abstract:** The present invention relates to a capsule for a hookah device comprising: a smoking product comprising at least one ingredient configured to vaporise during heating of the smoking product in use and a housing comprising a plurality of walls shaped to define an internal chamber containing the smoking product and defining at least one air pathway to allow the vaporised ingredient to exit the capsule in use. A support structure is provided within the housing defining a surface area within the internal chamber away from the plurality of walls over which at least a portion of the smoking product is disposed, wherein the smoking product and support structure only partially fill the internal chamber.

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Capsule

The present disclosure relates to a capsule containing a consumable material for a water pipe, such as a hookah device, particularly to a capsule that is suitable for an electrically-heated hookah device.

BACKGROUND OF THE INVENTION

A prior art hookah device is disclosed in WO2015172224A1. The hookah device comprises a capsule (see figures 6 and 7) configured to receive a smoking product. The capsule may be placed in a heating chamber to heat and vaporise the smoking product (e.g. shisha tobacco) therein. Inhalation of the user draws the vaporised product through a water tank and out through a hose.

The capsule may be pre-packaged. For example, the capsule is filled by a manufacturer and then sold in a pre-filled form to the consumer. The inventor has found numerous problems with such pre-packaged arrangements.

The smoking product is provided in a single mass. The product therefore comprises a low specific surface area (i.e. the amount of surface area per volume of product). During heating thereof, only a small portion of the product is available to vaporise. This may lead to weak tasting or low volume smoke cloud formation.

Furthermore, the singular mass may behave in an unpredictable manner during heating, dependent on the position/orientation of the single mass relative to the heat source and air flow through the capsule. Some regions may be considerably hotter/cooler, resulting in a variable experience by the end user. It would be desirable to create a more consistent user experience.

Providing conventional tobacco/molasses with a greater specific surface area, typically means that less mass of smoking product is contained within a given internal volume of the capsule. This can lead to the capsule contents being consumed more quickly, i.e. resulting the need to replace the capsule more frequently.

Additionally, during manufacture, transportation, handling and/or storage of the pre-filled capsules, the product therein may “settle”. This may cause the product to agglomerate

and/or separate into components (e.g. due to the “Brazil-nut effect”) having undesirable/inconsistent properties. This may lead to sub-optimal performance of the smoking product during heating, thus leading to a sub-optimal experience for the user.

It is an aim of the present disclosure to overcome or ameliorate one or more of the above problems. It may be considered an additional or alternative aim to provide a capsule that offers a predictable and/or consistent experience for the user.

STATEMENT OF INVENTION

According to an aspect of the disclosure, there is provided a capsule for a water pipe comprising: a smoking product comprising at least one ingredient configured to vaporise during heating of the product; a housing configured to contain the product and comprising at least one air pathway to allow the vaporised ingredient to exit the capsule in use; and where the capsule comprises a support structure configured to a least partially separate or spread the smoking product within the housing.

The housing may comprise one or more flow inlet and/or outlet opening in the capsule. The support structure may define the air pathway leading to the inlet and/or outlet opening.

According to a second aspect of the disclosure, there is provided a capsule for a water pipe comprising: a smoking product comprising at least one ingredient configured to vaporise during heating of the smoking product; a housing comprising a wall structure shaped to define an internal chamber containing the smoking product and configured to provide at least one air pathway to allow the vaporised ingredient to exit the capsule in use; and one or more inert inclusion within the internal chamber.

The smoking product may be provided as a coating on the one or more inert inclusion. The inclusion may be embedded into the smoking product. The inclusion may comprise a bead.

According to a third aspect of the disclosure there is provided a capsule for a water pipe comprising: a smoking product comprising at least one ingredient configured to vaporise during heating of the smoking product, and divided into a plurality of discrete portions; a housing comprising a wall structure shaped to define an internal chamber containing the

discrete portions of the smoking product and configured to provide at least one air pathway to allow the vaporised ingredient to exit the capsule in use; where the plurality of discrete portions comprise different surface areas.

The discrete portions may comprise different shapes/sizes and/or thicknesses of the smoking product.

According to a fourth aspect of the disclosure there is provided a capsule for a water pipe comprising: a smoking product comprising at least one ingredient configured to vaporise during heating of the smoking product; a housing comprising a wall structure shaped to define an internal chamber containing the smoking product; where the smoking product comprises of a viscous liquid, semi-solid or paste material arranged to conform at least in part to a surface of the internal chamber; and where the wall structure is configured to define at least one open air pathway to allow the vaporised ingredient to exit the capsule in use.

According to a fifth aspect of the disclosure, there is provided a water pipe comprising the capsule of any of the first, second, third or fourth aspects. The water pipe may comprise an electric heater for heating the capsule therein.

According to a further aspect of the disclosure, there is provided a method of manufacture of a capsule for a water pipe, the method comprising: providing smoking product comprising at least one ingredient configured to vaporise during heating; forming a housing of the capsule having an internal chamber; providing a support structure for the internal chamber having a surface area arranged to receive the smoking product; applying the smoking product to the surface area of the support structure; and, closing the housing over the support structure with the smoking product applied thereto.

The closing may comprise sealing the housing with the smoking product and support structure therein.

Typically, the smoking product and support structure only partially fill the internal chamber so that the internal chamber is air permeable in use. The smoking product may be applied to the surface area of the support structure so as to maintain an air pathway in the capsule for allowing vapor to exit the capsule when heated in use.

Optional features of any aspect of the invention are define below and also in the appended dependent claims. Any of said optional features may be applied to any aspect of the invention, wherever practicable and said optional features may not be repeated for each aspect individually only for conciseness.

The smoking product is typically a consumable. The support structure may not be consumed or vaporised during heating of the capsule in use.

The capsule may be a single-use, consumable and/or disposable capsule. The capsule may be inserted into the water pipe for heating in use and may be removable from the hookah after use.

The support structure may have greater strength and/or stiffness than the smoking product. The support structure may be substantially inert, e.g. at a temperature achieved during heating of the product in use.

The support structure may be at least partially coated with the smoking product. A majority or substantially all of the support structure may be coated with the smoking product.

The smoking product may be malleable and/or deformable. The smoking product may comprise a viscous liquid, semi-solid and/or paste material. The smoking product may be amorphous and/or incapable of supporting its own weight without deformation. The support structure may define the shape of the smoking product within the capsule.

Additionally or alternatively, the smoking product may be applied to the support structure, e.g. as a coating, in a liquid, viscous liquid, or semi-solid form. The smoking product may be sticky/tacky. The smoking product may or may not harden after being applied to the support structure.

The support structure and smoking product may only partially fill the housing, e.g. the internal chamber thereof (i.e. comprises a filling/packaging fraction less than 1). A portion of the internal chamber may comprise voids, e.g. gas/air filled voids. The support structure and/or smoking product may occupy less than or equal to 50% of the internal volume of the capsule; preferably, less than or equal to 90%; preferably, less than or equal to 80%; preferably, less than or equal to 70%; preferably less than or equal to 60%; preferably less than or equal to 50%. The support structure and/or smoking product may occupy greater

than or equal to 20% of the internal volume of the capsule; preferably, greater than or equal to 30%; preferably, greater than or equal to 40%; preferably greater than or equal to 50%. The support structure and/or smoking product may occupy between 20% and 90% of the internal volume of the capsule; preferably, between 30% and 80%; preferably, between 40% and 70%; preferably, between 50% and 60%.

The smoking product (e.g. the ingredients thereof) may comprise a binder, a mist maker and/or a flavouring. The smoking product may or may not comprise a thickener. The flavouring product may comprise a sweetener and/or the smoking product may comprise a plurality of flavourings, e.g. at least one of which comprising a sweetener. The binder may or may not be an absorbent binder.

The absorbent-binder may comprise one or more of: fumed silica; amorphous silica; or talc. The smoking product comprises an inert, granular/powdery filler.

The smoking product may be configured to release the flavouring and/or mist maker when heated (e.g. the flavouring and/or mist maker may vaporise or otherwise become volatile/airborne).

The smoking product may comprise a colorant and/or stimulant. The stimulant may comprise any or any combination of caffeine, taurine, theobromine, nicotine and/or a cannabinoid. The cannabinoid may comprise tetrahydrocannabinol (THC) or cannabidiol (CBD). The smoking product may comprise cannabis and/or extracts and/or derivatives thereof.

The smoking product may comprise a nicotine containing product. The smoking product may comprise tobacco. The product may comprise a tobacco substitute (e.g. an organic substrate).

The product may comprise a shisha or Mu'assel product. The product may comprise a tobacco product comprising a sugar syrup (e.g. molasses). The product may comprise glycerol or other mist-maker. The product may contain flavouring and/or other additives. Tobacco may be provided with other conventional materials arranged to vaporise during heating.

The smoking product may comprise a filler. The smoking product may comprise granules, e.g. granules of inert material.

The smoking product may comprise a mixture or agglomeration of any combination of the above ingredients/constituent materials.

The capsule may comprise first and second walls, the internal chamber being between the first and second walls, wherein the first and second walls comprise at least one respective aperture therein, such that in use, air passes through the respective apertures and over the smoking product in the internal chamber.

The support structure may comprise greater mechanical strength than the smoking product.

The support structure may be shaped to maintain a desired dispersion of the smoking product within the internal chamber.

The support structure may substantially span a height and/or width dimension of the internal chamber. The support may have a height dimension that is greater than or equal to half, two-thirds or three-quarters the height of the internal chamber. The support structure may be shorter than the internal chamber to provide an open upper volume within the capsule, e.g. immediately beneath a lid of the capsule or ceiling of the internal chamber,

The support structure may form part of the wall structure of the capsule housing. The support structure may be integral therewith or permanently affixed thereto.

The support structure may be loosely disposed within the internal chamber and/or movement of the support structure may be constrained by contact with the plurality of walls. The support structure may be constrained by filling of a remainder of the capsule with the smoking product.

The support structure may comprise a partition/divider. The partition/divider may divide internal volume of the chamber and/or the smoking product into a plurality of discrete/spaced portions. The partition/divider may define an open airway through the capsule, e.g. blocking obstruction of the airpath by the smoking product. The airway may

be centrally arranged and/or may lead to a flow outlet of the capsule. The support structure may define an annular internal chamber for containing the smoking product.

The divider may be configured to divide the internal chamber of the capsule into two or more compartments or cells configured to contain a respective portion of the smoking product. The partition may provide a bowl/tray.

The compartments/cells may comprise a uniform shape/size. The compartments/cells may comprise a different shape/size. The compartments/cells may tesselate.

The support structure may be arranged to separate a plurality of layers of the smoking product. The layers may be provided horizontally and/or stacked in the height of the capsule. The layers may extend vertically. The layers may be parallel. The layers may be separated by a further layer (i.e. not comprising product). The further layer be air permeable. The support structure may be undulating/corrugated.

The partition may extend radially (e.g. to provide a plurality of sections). The partition may extend only partially across the capsule (e.g. partially across the height/width of the capsule). The partition may extend between the side walls of the capsule. The partition may extend between the top/bottom walls of the capsule.

The support structure may be at least partially encase/surround the smoking product. The support structure may comprise a sheet material. The sheet may be flexible. The sheet material may be porous/air permeable. A plurality of encased smoking products may be provided within the capsule. The encased smoking product may be loosely held within the capsule.

The support structure may provide a sachet/pouch/package. The support structure may provide a casing/wrapper. The product may rolled/coiled within the support structure.

The support structure may be at least partially embedded within or coated by the smoking product.

The support structure may comprise a hydroscopic material (e.g. powder/granules).

The support structure may comprise a plurality of elongate arms configured to extend into the smoking product and impinge movement thereof. The arms may be parallel. The arms may comprise protrusions to disturb the product during removal thereof. The protrusions may comprise a bard and/or flange. The arms may be air permeable (e.g. porous or mesh). The arms may be hollow. The arms may provide an air pathway. The arms may be connected to a handle to allow withdrawal thereof. The arm may form part of a closure for the capsule.

The support structure is removable or displaceable from the capsule to leave an air channel within the smoking product after displacement therefrom.

The support structure is air-permeable (e.g. porous). The support structure may comprises one or more of: a mesh; a foam; a perforated sheet material; or a web.

The support structure may comprise a plurality of elements (e.g. inclusions) contained within the capsule. The elements may comprise beads. The elements may be porous. The elements may be loosely held in the smoking product (i.e. may flow therein) and/or capsule. The elements may be inert. The elements may be coated, e.g. with the smoking product or another flavorant.

The inclusions may be metallic and/or electrically conductive. The inclusions may provide an inductive heating element.

The smoking product may at least partially encapsulate the support structure such that support structure provides a core and smoking product comprises a coating on the core.

The core may comprise an inert, inorganic material. The core may comprises one or more of: stone; glass; ceramic; or sand. The core may comprise a bead.

The coating may comprise an organic thickener. The coating may be substantially dry (e.g. non-sticky or viscous).

A plurality of coated cores may be provided. At least two of the coated cores may be separated or constrained by a further support structure.

The smoking product may bes provided in a plurality of discrete portions, each of the discrete portions comprising a different effective surface area of smoking product. The discrete portions may comprise different sizes and/or shapes. The discrete portions may comprise different shape/size cores. The discrete portions may comprise different shape/thickess coatings on the cores. The discrete portions may comprise smoking product particulate of different shape/sizes. The discrete portions may be provided in different shape/size compartments/cells.

The smoking product may comprise portions having different cross-sectional area or different volume to surface area ratio such the different portions of the smoking product are consumed at different rates during heating.

The total rate of vaporised smoking product produced by the capsule may remain within a predetermined margin over a predetermined time period of use (e.g. the amount of vaporised smoking product remains substantially constant over time).

The smoking product ingredients may comprise one or more: a binder; a mist maker; or a flavouring.

The support structure may comprise a metal. This may assist with thermal conduction inside the capsule in use, e.g. to promote a desired temperature profile through the capsule interior when heated through an external wall of the housing. The increased contact area between the support structure and the smoking product may be beneficial in this regard.

BRIEF DESCRIPTION OF THE DRAWINGS

Practicable embodiments of the disclosure are described below in further detail, by way of example only, with reference to the accompanying drawings, of which:

Figure 1 shows a perspective view of a water pipe (e.g. hookah pipe) and associated capsule;

Figure 2 shows a sectional side view of the capsule;

Figure 3 shows a top-down view of the capsule;

Figure 4A shows a sectional side view of the capsule comprising a first example of a separator;

Figure 4B shows a sectional side view of the capsule comprising an alternative of the first example of a separator;

Figure 5A shows a sectional top-down view of the capsule comprising a second example of a separator;

Figure 5B shows a sectional side view of the capsule comprising an alternative of a second example of a separator;

Figure 6 shows a sectional top-down view of the capsule comprising a third example of a separator;

Figure 7 shows a sectional top-down view of the capsule comprising a fourth example of a separator;

Figure 8 shows a sectional top-down view of the capsule comprising a fifth example of a separator;

Figure 9 shows a sectional top-down view of the capsule comprising a sixth example of a separator;

Figure 10 shows a sectional top-down view of the capsule comprising a seventh example of a separator;

Figure 11 shows a sectional top-down view of the capsule comprising an eighth example of a separator;

Figure 12 shows a sectional side view of the capsule comprising a first example of a layered separator;

Figure 13 shows a sectional side view of the capsule comprising a second example of a layered separator;

Figure 14 shows a perspective view of a first example of a flexible separator;

Figure 15 shows a sectional top-down view of the capsule comprising a second example of a flexible separator;

Figure 16 shows a perspective view of a third example of a flexible separator;

Figure 17 shows a perspective view of a fourth example of a flexible separator;

Figure 18 shows a sectional side view of the capsule comprising a fourth example of a flexible separator;

Figure 19 shows a sectional side view of an encased product;

Figure 20 shows a sectional top-down view of the capsule comprising the encased product;

Figure 21 shows a sectional side view of the capsule comprising a first example of a finger separator;

Figure 22 shows a sectional top-down view of the capsule comprising the first example of the finger separator;

Figure 23 shows a sectional top-down view of the capsule comprising a second example of the finger separator;

Figure 24 shows a sectional top-down view of the capsule comprising a second and third example of the finger separator;

Figure 25 shows a sectional view of product coated on a substrate;

Figure 26 shows a sectional side view of the capsule comprising the coated substrate;

Figure 27 shows a first graph showing the distribution of bead sizes;

Figure 28 shows a second graph showing the distribution of bead sizes;

Figure 29 shows a graph showing smoking intensity curves of different bead sizes;

Figure 30 shows a sectional side view of the capsule comprising a first example of a coated product;

Figure 31 shows a sectional side view of the capsule comprising a second example of a coated product;

Figure 32 shows a sectional side view of the capsule comprising a first example of a product comprising inclusions;

Figure 33 shows a sectional side view of the capsule comprising a second example of a product comprising inclusions;

DETAILED DESCRIPTION

Figure 1 shows an example of a water pipe 2, referred to herein as a hookah device, although it will be appreciated that the pipe may otherwise be referred to as a shisha pipe. The hookah device 2 in this example is electrically heated and/or electronically controlled.

The hookah 2 comprises a base 4, an electronics compartment 6 and a tank 8 configured to be filled with a liquid coolant (e.g. water). The device 2 may be supported by a wide base 4.

The electronics compartment 6 comprises a lid 12 to provide an opening thereto. Mounted within the electronics compartment 6 is a heater 10 (shown schematically) configured to receive a capsule 14 comprising a smoking product. The heater heats the capsule 14 to vaporise or otherwise disperse one or more ingredient of smoking product. A plurality of apertures 16 are provided on the capsule 14 to allow the vaporised product to escape

therefrom. The heater may be controlled by electronics in the electronics compartment 6. A power switch 18 or the like may be provided.

The heater is connected to the tank 8 via a conduit 15 passing through the electronics compartment 6. The vaporised smoking product therefore passes from the conduit 15 through the coolant in the tank 8 and is cooled and/or filtered therein.

A suction hose 20 is provided in communication with a portion of the tank 8 above the coolant level and comprises a mouthpiece 22. The user can therefore inhale to draw the vaporised product through the device 2 and out through the hose 20. Such a system emulates a conventional non-powered shisha/hookah pipe. Air can be drawn through the heated capsule and the vapourised product in the capsule can be carried by the airflow through the conduit

It can be appreciated that the device 2 shown in figure 1 is merely exemplary and any suitable such device may be used. In some embodiments, the electronics compartment 6 may be provided below the coolant tank 8 such that the vaporised smoking product in use passes up through the device 2. The electronics compartment 6 may therefore form a base portion of the device 2. A conduit 15 may extend from the heater and up into the coolant to pass the vaporised product thereinto.

Examples of suitable hookahs 2 and associated heaters 10 can be found in earlier published patent applications WO 2017/080545 A1 and WO 2015/172224 A1. Such details will not be repeated herein for brevity.

Referring to figure 2, the capsule 14 comprises a top wall 24 and a bottom wall 26. The top wall 24 and the bottom 24 26 are connected via a side wall 28, e.g. a continuous side wall. The top, bottom and side walls thus provide an enclosure/cavity for a smoking product 30.

A plurality of apertures 16a,16b are provided in the top wall 24 and the bottom wall 26 respectively. During use, air 32 passes through the apertures in the top wall 24 and into/through the smoking product 30. The air 32 entrains the vaporised product 34 in the capsule 14, when heated in use, and passes out from the apertures in the bottom wall 26.

Such an arrangement provides a pre-packaged or prefilled capsule. The apertures 16a, 16b are shown as spanning the entire width of the top wall 24 and bottom wall 26 in this example but it will be appreciated that the apertures may be provided in only a portion of the top 24 and/or bottom 26 wall as desired, e.g. as shown in figure 1.

It can be appreciated that the term “top”, “bottom” and “side” are merely used to aid in description the capsule, and the capsule may be used in any suitable orientation in use.

In some embodiments, apertures 16 may only be provided in one of the top wall 24 and bottom wall 26. Air thus enters and exits the capsule via the same apertures 16. In some embodiments, apertures 16 may be provided in the side walls 28.

In some embodiments, the device 2 is configured to puncture, perforate or otherwise open the capsule 14 to allow air enter/exit. The capsule 14 may therefore be sealed before opening. This may help to retain freshness. The top wall could be punctured by suitable formations in the lid 12 and/or bottom surface could be punctured by an end of the smoke conduit 15. Thus the apertures need not be formed at the point of manufacture but could be formed during use of the capsule.

The capsule 14 may comprise a seal to cover the apertures 16. The seal is removed before use to uncover the apertures 16. The seal thus helps to retain freshness. A seal may be provided on the top/bottom/side surfaces as appropriate. The seal may be attached to the capsule 14 using a peelable adhesive or the like.

In some examples, the entire capsule (either with or without a one or more seal over the apertures 16) may be retained in a sealed pouch or sleeve so as to provide a retail article that can maintain the capsule in a fresh condition for extended periods of time. The pouch may be filled with a gas (e.g. not air), such as nitrogen. Thus either or both of the capsule and pouch can be filled with a gas to help preserve the smoking product therein until use. Even if the capsule itself is air filled, it has been found that flushing the pouch with a suitable gas can be sufficient, e.g. if the gas in the pouch and the air inside the capsule can mix over time such that the overall oxygen content within the pouch is low.

The top surface 24 may comprise a closure 35 (e.g. a lid). This allows the product 30 to be placed into the capsule 14. The apertures 16a may or may not be provided in the lid 35. The closure 35 is then fixed to capsule (i.e. the upper edge of side wall(s) 28 thereof)

to retain the product 30 therein. The closure may be permanently fixed to the capsule 14 to prevent removal of the product 30 from therein. For example, the closure 35 may be crimped or adhered onto the capsule 14. The upper edge of the side wall could comprise a flange for this purpose.

In other embodiments, the closure 35 may be releasably connected to the capsule 14, thereby allowing the user to access the interior of the capsule 14 (i.e. to refill the capsule 14). The closure 35 may be connected to the capsule via a releasable connection means. The releasable connection means may comprise one or more of: an interference fit; a snap fit; a screw thread; a releasable latch or clip; a clamp; hook and loop; a press stud; a bayonet; or the like.

In the present embodiment, the bottom surface 26 is integrally formed with the capsule 14 (i.e. integral with the side wall 28). The apertures 16b are thus formed in the capsule 14. In alternative embodiments, the bottom surface 26 may comprise a permanent/removable closure.

The capsule 14 in the examples of Figures 1-3 has a top wall 24 of greater area in plan than the bottom wall 26 such that the capsule is tapered in form. The capsule 14 is tapered toward the bottom wall 26. The capsule 14 is thus trapezoidal in cross-section (from a side view).

As shown in figure 3, the capsule 14 comprises a circular profile (from a top view). The capsule 14 is thus frustoconical. However, it can be appreciated that the shape of capsule 14 is merely exemplary and the capsule may comprise any suitable shape for the intended purpose. Different shapes of capsule can be provided to achieve the desired contact with the interior of the device 2, e.g. a being shaped for a close fit and/or good thermal contact with the heater 10. For example, capsules that are ovoid or polygonal in plan could be accommodated.

The capsule 14 comprises a heat-resistant material. The capsule 14 is therefore stable at the heating temperatures of the device 2. The capsule 14 comprises a metallic material, for example, aluminium. The metallic material ensures adequate heat conduction into the capsule. In other embodiments, the capsule 14 may comprise a ceramic material.

The product 30 comprises a chemically inert filler that does not melt or degrade at temperatures equal to or below those at which tobacco or its substitutes are typically heated inside water-pipes. As such, the filler does not melt/combust/decompose at a temperature below 250ºC; more preferably at a temperature below 300ºC; more preferably at a temperature below 350ºC; more preferably at a temperature below 400ºC.

The presence of the filler may or may not confer a glittery appearance to the product. The inert filler may comprise an inorganic or mineral filler.

In some embodiments, the inert material comprises a non-crystalline amorphous material, such as glass. The glass may comprise a silica (SiO_2) based glass. The glass may comprise one or more of: fused quartz (also known as fused-silica or vitreous silica); soda-lime-silica glass; sodium borosilicate glass; lead-oxide glass; foamed glass; or aluminosilicate glass.

In some embodiments, the inert material comprised a mineral. For example, the mineral may comprise one or more of: silica; limestone (calcium carbonate); feldspar (tectosilicate minerals); gypsum; magnetite (Fe_3O_4); chlorite ($(Mg,Fe)_3(Si,Al)_4O_{10}(OH)_2{\cdot}(Mg,Fe)_3(OH)_6$); glauconite ($(K,Na)(Fe_{3+},Al,Mg)_2(Si,Al)_4O_{10}(OH)_2$); or alumina.

In some embodiments, the inert material comprises a stone/rock material (i.e. a natural substance containing one or more minerals or mineraloids). For example, the stone material may comprise one or more of: granite; basalt; marble; quartz; pumice; obsidian; jet; biotite; or the like.

In some embodiments, the inert material may comprise a ceramic. The ceramic may be semi-crystalline, vitrified or amorphous. The ceramic may be clay and/or alumina based.

In some embodiments, the inert materials comprises one or more of: activated carbon powder; graphite powder; graphene; carbon fibre or the like.

In some embodiments, the inert material may comprise an agglomeration or composite of one or more inert material. For example, inert material may comprise a cementitious material or mixture of liquid phase and solid phase (e.g. granular) materials.

In some embodiments, the inter filler may comprise a sand or granules (e.g. a crushed or fine particulate). The sand may comprise particles of one or more of the above materials. The average particle size of the granules is such that the filler has a grainy/sandy consistency and does not form suspensions in the air in the manner of finer particulates such as powders and dust. This may reduce the health risks associated with fine powders.

The granules may comprise an average diameter of less than 2mm; preferably less than 1.5mm; more preferably less than 1mm. The granules may comprise an average diameter between 0.0625mm and 2mm; preferably between 0.125mm and 2mm; more preferably between 0.25mm and 1mm.

The product 30 comprises an absorbent binder. The absorbent binder comprises a powdery material. The powdery materials comprise fine grains. The grains may be finer than grains of the inclusions. The absorbent binder thus comprises a high specific surface area. The absorbent binder particles may comprise an average diameter of less than 200µm; preferably less than 100µm; more preferably less 80µm. The absorbent binder particles may comprise an average diameter of between 2.5µm and 100µm; preferably between 5 µm and 60µm.

Without being bound to any particular theory, it is believed that the absorbent binder stabilizes the product likely by binding the granules to the other components of the product and by absorbing liquids that may be present in the ingredients from which the paste is prepared. This results in the formation of a blend that is free of fluid residues such as liquids or syrups and is also resistant to heat, as opposed to gels that melt when heated due to their inherently less stable structure.

The absorbent binder comprises an inorganic/mineral material. The absorbent binder may comprise silica. The absorbent binder may comprise “fumed silica”. Fumed silica comprises a powdery substance also known as pyrogenic silica made of primary particles of amorphous silica fused into branched, chainlike, three dimensional secondary beads which then agglomerate into tertiary beads. It is believed that the three-dimensional structure and high surface area of fumed silica render it an excellent binder for forming the paste. The fumed silica may comprise a BET specific surface area of between 50 and 400 m^2/g. In other embodiments, the silica comprises amorphous silica.

The binder may comprise one or more of: talc powder; gypsum powder or other inorganic or mineral powders.

The product 30 comprises a mist-maker. The mist-maker is configured to generate a visible cloud during heating thereof, thus emulating tobacco smoke. The mist-maker comprises a volatile material configured to provide a light-scattering cloud in a vaporised state.

The mist-maker comprises a polyol. The polyol may comprises one of more of: glycerin; 1,2-propylene glycol; 1,3-propylene glycol; 1,2-butylene glycol; 1,3-butylene glycol; 1,4-butylene glycol; 2,3-butylene glycol; 1,2,4-butanetriol; triethylene glycol; triacetin; mannitol; sorbitol; xylitol; inositol; isosorbide; polydextrose; or dianhydro-D-glucitol. The polyol may comprise a “sugar alcohol” (hydrogenated sugar).

The product 30 may comprise a sweetener. The sweetener may comprise carbohydrate sweeteners (e.g. monosaccharides of 5 or 6 carbon atoms), for example, one or more of: arabinose; xylose; ribose; glucose; mannose; galactose, fructose; dextrose; or sorbose. The sweetener may comprise disaccharides, for example, one or more of: sucrose, such as cane or beet sugar; lactose; maltose; or cellobiose. The sweetener may comprise polysaccharides, for example, one or more of: partially hydrolyzed starch or dextrin; polyols, such as sorbitol, mannitol, xylitol; and mixtures with one or more of the above sugars.

In some embodiments, the sweetener comprises high-fructose corn syrup (also known as glucose-fructose isoglucose and glucose-fructose syrup).

In some embodiments, the sweeteners comprise artificial sweeteners. The artificial sweeteners may comprise one or more of: sodium, calcium or ammonium saccharin salts; dihydrochalcones; rebaudiosides; mogrosides; glycyrrhizin; dipotassium glycyrrhizin; glycyrrhizic acid ammonium salt; L-aspartyl-L-phenylalanine methyl ester (aspartame); the sodium or potassium salt of 3,4-dihydro-6-methyl-l,2,3-oxathiazine-4-one- 2,2-dioxide (Acesulfame-K); extracts of Stevia rebaudiana (Stevioside); extracts of Richardella dulcifica (Miracle Berry); orextracts of Dioscoreophyllum cumminsii (Serendipity Berry).

It can be appreciated that any of the above sweeteners may be combined with any of the other above sweeteners or classes of sweeteners.

The product 30 comprises a flavouring. The flavouring may comprise, inter alia, one or more of: mint; such as peppermint and spearmint; chocolate; liquorice; citrus and other fruit flavours; gamma octalactone; vanillin; ethyl vanillin; or breath freshener flavours. The above-described sweeteners may comprise an example of a flavouring but typically both a sweetener and a further flavouring are provided.

The flavouring may comprise spice flavours, for example, one or more of: cinnamon; methyl salicylate; linalool; bergamot oil; geranium oil; lemon oil; or ginger oil. The flavouring may comprise plant extracts or essential oils. The flavouring may comprise a food-based flavouring, for example, one or of: apple flavouring; blueberry flavouring; coconut flavouring; grape flavouring; guava flavouring; pomegranate flavouring; or lemon flavouring etc. The flavouring may comprise a fruit or plant flavour. The flavouring may comprise one or more of: an acid; an alcohol; an ester; an aldehyde; a ketone; or a pyrazine.

The product 30, e.g. the flavouring thereof, may comprise a stimulant. The stimulant has a stimulatory effect on the central nervous system and may induce alertness in a subject. The stimulant may comprise one or more: caffeine (1,3,7-trimethylxanthine); taurine (2-aminoethanesulfonic acid); theobromine (3,7-dimethylxanthine); or their derivatives.

In some embodiments, the stimulant is provided by a plant-based extract forming part of the flavouring. The plant extract may comprise one or more of: coffee; black tea; green tea; matcha; mate; kola nut; cocoa; ginseng; guarana; or a cannabinoid such as tetrahydrocannabinol (THC) or cannabidiol (CBD). In other embodiments, the stimulant may comprise an additive provided in addition to the flavouring. For example, a coffee flavouring may be enhanced with additional caffeine.

The product 30 may comprise a colourant. The colourant may provide a coloured product 30 and/or smoke. The colourant comprises a food, pharmaceutical or cosmetic safe colourant. The colourant comprises a water-soluble colourant. The colourant comprises a plant based colourant, for example, one or more of: beet juice; brazilwood; caramel; carminic acid; litmus; logwood; orchil; or saffron. In some embodiments, the colourant comprises an artificial colourant.

In some instances, one or more solvents may also be present, for example when one or more ingredients are added to the mixture in the form of liquid solutions. When advantageous, for example to promote the formation of a uniform and homogeneous paste, aliquots of a pure solvent or of a combination of solvents may be added while the mixture is being formed or subjected to further steps, such as kneading or manipulation into the capsules.

The inert filler may comprise less than 25wt% of the weight of the product 30; preferably less than 20wt%; more preferably less than 15wt%. The inert filler may comprise between 5 and 25wt% of the weight of the product 30; preferably between 5 and 15wt%

The absorbent binder may comprise less than 25wt% of the weight of the product 30; preferably less than 20wt%; more preferably less than 15wt%. The absorbent binder may comprise between 5 and 20wt% of the weight of the product 30; preferably between 5 and 15wt%.

The mist-maker may comprise less than 80wt% of the weight of the product 30; preferably, less than 70wt%; more preferably, less than 60wt%. The mist-maker may comprise greater than 20% or 30% by weight of the product, e.g. between 20 and 70wt% of the weight of the product 30; more preferably, between 40 and 60wt%.

The sweetener may comprise less than 40wt% of the weight of the product 30; preferably, less than 35%. The sweetener may comprise between 15 and 40wt% of the weight of the product 30; more preferably, between 15 and 35wt%.

The flavouring may comprise less than 20wt% of the weight of the product 30; preferably, less than 15%. The flavouring may comprise between 0.5 and 15wt% of the weight of the product 30; more preferably, between 2 and 10wt%.

The colourant may comprise less than 0.1wt% of the weight of the product 30; preferably less than 0.05wt%. The colourant may comprise between 0.01 and 0.05wt% of the weight of the product 30; more preferably, between 0.01 and 0.03wt%.

The composition of the product 30 may provide a paste-like smoking product. The product is therefore a semi-solid or a highly viscous liquid. The paste may be dispensed into the capsule and may allow simple handling during manufacture of storage thereof.

The paste may comprise a viscosity a greater than 100Pa·s or 300Pa.s (at standard conditions); preferably greater than 500Pa·s. The paste may comprise a viscosity of between 100 and 3000Pa·s; preferably between 500 and 2000Pa·s

Unlike traditional gel-based tobacco substitutes, the paste is heat resistant and does not melt or lose shape when exposed to temperatures typically generated inside water-pipes. The paste is therefore temperature stable. The paste may not melt when exposed to temperatures less than 200°C or 250°C.

These attributes make the paste easy to handle and significantly reduces the volume of liquid that may be present during heating. As such, a variety of types of water-pipe heater bowl or capsule can be used. The paste can also be made free or substantially free of combustible substance, thereby preventing the formation of toxic combustion products that typically form from the burning combustible materials like tobacco leaves. Different colorants and flavourings can be included to obtain an assortment of pastes to suit all types of consumer preferences.

The specific composition of the paste provides numerous advantages. When heated to temperatures suitable for generating smoke in a waterpipe, the paste releases the mist-maker, sweetener, and flavouring into the smoke generated by the water-pipe without melting. In some embodiments, the paste releases the mist-maker, sweetener, and flavouring and degrades into a dry residue rather than melting when exposed to temperatures typical of water-pipes. In instances where melting or partial melting of the paste does occur, it only takes place after heating-induced release of the mist-maker, sweetener, and flavouring has begun. Without being bound to any particular theory, it is believed that the absorbent-binder stabilizes the paste likely by binding the granules to the other components of the paste and by absorbing liquids that may be present in the ingredients from which the paste is prepared. This results in the formation of a blend that is generally free of fluid residues such as liquids or syrups and is also resistant to heat, as opposed to gels that melt when heated due to their inherently less stable structure.

In a second aspect, there is provided a method of manufacturing capsules containing such a paste smoking product for its delivery to consumers. The ingredients of the paste, including the granules of an inert material, absorbent-binder, sweetener, and flavouring

are mixed together and then dispensed into a capsule, using a support structure of the type described herein to provide consistent shape/form of the paste.

In one embodiment, the ingredients are blended together at room temperature, although mild heating may be applied when it is conducive to better or quicker mixing. Excessive amounts of solvent that may render the paste wet or syrupy to the touch may be removed by standards methods such as exposure to an airflow. Advantageously, the paste may be stored in soft, flexible packaging and dispensing pumps for more convenient, less messiness and easier setup than traditional gels.

An example of the paste is described below:

A number of pastes were formed by blending ingredients at room temperature in relative amounts within the ranges as follows:

INGREDIENT	AMOUNT (wt%)
High-Fructose Corn Syrup	20-25%
Colorant	0.01-0.02%
Glycerin	50-55%
Flavoring	1-10%
Fumed Silica	5-10%
Silica Sand	7-10%
Additives	0.2-0.4%

The glycerin of the pastes had a specific gravity of 1.2612 g/ml at 25 ºC, a maximum moisture content of 0.3 % and a minimum glycerin content of 99.7 %. The fumed silica was characterized by a pH of 3.8 to 4.3, a BET surface area of 175-225 m2/g, and a tamped density of 60 g/L. The high-fructose corn syrup was characterized by a pH of 3.3 to 4.5, an acidity of max 4ml, a dry substance content of 76.8 to 77.4%, and a refractive index of 1.4774 - 1.4798 at 20 ºC. The colour of the fructose scored a maximum of 20 on the ICUMSA (International Commission for Uniform Methods of Sugar Analysis) grading system. The fructose content of the aqueous solution was measured to be between 74.80 and 75.80 on the degrees Brix (ºBx) scale.

Samples of each paste were tested by heating to temperatures of about 300 ºC in a water-pipe. In all instances, the paste maintained its shape and did not melt when heated, and when subjected to air suction it released an aerosol containing fructose, glycerin, and the flavouring.

Next, samples of one of the pastes were analyzed by rotational viscosimetry on a rheometer. The composition of the tested paste is reported below:

Composition of Tested Paste	
Components	wt%
Fructose	25%
Colorant	0.015%
Glycerin	52.3%
Flavor	5%
Fumed Silica	9%
Silica Sand	8.5%
Additives	0.2%

First, the rheometer was verified with an ASTM N15000 oil (41.1°C) that was chosen as standard because of it having a similar viscosity to the samples. On each day of analysis, the instrument setup was successfully verified with the standard oil and a 25 mm plate-plate geometry, deviating less than 4% from the certified viscosity of the standard oil.

The viscosity of the paste samples was measured in the course of shear rate sweeps carried out at 25.0 °C in a 25 mm plate-plate geometry with a gap of 1mm. The shear ramp included shear rates of 10, 18.8, 32.6, 56.9, and 100 s-1, respectively. The analysis was completed in duplicate, and the results are reported below

Shear rate (s-1)	Viscosity (Pa·s) 1	Viscosity (Pa·s) 2	Viscosity (Pa·s)
10.00	908.58	855.17	881.88
18.80	300.30	330.66	315.48
32.60	158.18	173.03	165.60
56.90	84.10	99.85	91.98
100.00	50.67	52.57	51.62

The samples are shear-thinning and non-Newtonian fluids. This property helps the paste flow more easily during application but stay in place once it is applied.

The product 30 is substantially tobacco and/or nicotine free. The product 30 thus may provide a healthier alternative to conventional products.

In some embodiments, the product 30 comprises a nicotine (or derivatives thereof) containing product. The product 30 may comprise tobacco. The product may comprise a tobacco substitute (e.g. an organic substrate).

In some embodiments, the product 30 may comprise a conventional shisha or tobacco product (e.g. shisha or Mu'assel). The product 30 may comprise a tobacco product comprising a sugar syrup (e.g. molasses). The product 30 may comprises glycerol or other mist-maker. The product may contain flavouring and/or other additives. The product may therefore comprise a mixture of tobacco, or other plant-based smoking product, with any of the other aforementioned ingredients to provide a smoking product that is a mixture of solid and liquid components, e.g. as a wet mass.

The capsule 14 comprises an internal structure for the smoking product, referred to herein as a separator or support structure, configured to at least partially divide, separate, space or maintain a desired surface area of the smoking product. The separator may help control the dispersion/uniformity of the smoking product within the capsule and/or may divide the product into a plurality of at least partially spaced or separate portions. This may provide one or more of a number of possible advantages:

- Prevent settling of the product into a singular mass, e.g. during handling or transportation.
- Increase the specific surface area of the product, thereby increasing the amount/quality of smoke created in use.
- Tailoring the surface area to volume ratio for the product within the capsule so as to achieve a desired strength and/or longevity of the experience for the user when applying a heating regime by an electric heater.
- Provide an air pathway into/through the product to increase contact with the product.

In some embodiments, the support structure may constrain the smoking product to only a portion of the capsule interior. The support structure may partially fill the capsule, e.g. filling an upper and/or lower portion of the capsule interior. The support structure may define air pathway(s), e.g. to ensure suitable airflow and/or pressure drop through the capsule during use.

In some embodiments, the separator/support structure comprises an air permeable member or spaced elements forming air pathways therebetween. The air permeable nature of the support structure can provide separation of product and increases airflow within the capsule. Such an arrangement may be beneficial where the product 30 comprises a liquid or semi-liquid (e.g. a paste) and the air permeable member acts as a substrate to distribute and/or separate the product 30.

In some embodiments, the air permeable member comprises a mesh. The mesh may be woven or non-woven. The mesh may be metallic. The metallic mesh may comprise a food safe metal. The mesh may comprise a fine mesh (e.g. <1mm), thus preventing particulate passing through. Alternatively, the mesh may comprise a coarse mesh (e.g. >1mm) to increase flow through the capsule 14.

In some embodiments, the air permeable member comprises a foam. The foam may comprise a porous and/or open-celled foam. The foam may comprise a high-temperature (e.g. greater than 200°C) resistant material. The foam may comprise an inorganic foam, for example, one or more of: a porous glass (e.g. pumice); a porous ceramic; a porous mineral (e.g. zeolites).

The foam may comprise a rigid/hard material. In alternative embodiments, the foam may be flexible or deformable/compliant.

In some embodiments, the air permeable member may comprise a paper-based material. The paper-based material may comprise parchment paper or baking paper or the like. The paper-based material may comprise card or card-board or the like.

Air permeability may be provided by the intrinsic properties of the air permeable member material (e.g. mesh or foam). Alternatively, where the air permeable member material is impermeable or has low permeability (e.g. the paper), apertures, channels, recesses or

like may be provided to increase air permeability. For example, the paper-based material may comprise a plurality of perforations (e.g. arranged in an array).

In some embodiments, the permeability of the intrinsically air permeable materials may be enhanced/modified by providing apertures, channels, recesses or like.

The air permeable member may be configured to combust, decompose or otherwise deteriorate during heating of the capsule. This may increase the airflow or product flow during use of the capsule. Alternatively, the air permeable member may not deteriorate in use and may remain substantially intact even after use.

A first example of the air permeable/porous member 36 is shown in figure 4A. In a specific example, the air permeable member 36 comprises a mesh. The air permeable member 36 extends along the bottom surface 26 and the side walls 28 of the capsule 14. The air permeable member 36 thus provides a bowl or basket like arrangement. The air permeable member 36 may substantially conform to the shape of the capsule 14 (i.e. extends the full height/width of the capsule 14).

The product 30 may merely rest on the air permeable member 36. Where the product 30 comprises a more liquid or semi-solid composition, the product may be spread onto at least a portion of the air permeable member 36. The product 30 may therefore at least partially cover and/or penetrate the air permeable member (e.g. filling the interstices of the mesh).

The air permeable member 36 may be loosely held in the capsule 14. Movement of the air permeable member 36 may be prevented by the tight fit with the capsule wall. Alternatively, the air permeable member 36 is fixed in place.

In some embodiments, the bottom portion of the air permeable member 36 may be absent. The air permeable member 36 may therefore comprise frustoconical annulus.

The capsule 14 comprises a partition 38 configured to divide the product 30 into separate portions 30a,30b and/or increase the surface area thereof. The partition 38 extends between from the bottom surface 26 towards the top surface 24. The partition 38 may extend substantially the full height of the capsule 14. Thus, the product 30 is divided into discrete portions 30a,30b. The partition may therefore provide a baffle or the like.

The air-permeable member 36 and/or the partition 38 comprise a substantial thickness. The air-permeable member 36 and/or the partition 38 may therefore provide a fluid pathway through/into the product, thus increasing airflow within the capsule 14.

Turning to figure 4B an alternative is shown in which the support structure defines a central flow channel 37 through the capsule interior, e.g. extending towards the flow outlet of the capsule or between the inlet and outlet. The support structure may define an enclosure for the smoking product that is annular in form. In this example, the partition 38A may itself be annular, e.g. separating a central flow channel from an outer space for the smoking product. The partition 38A may or may not be porous in this example since the desired flow through the capsule is ensured by channel 37 rather than requiring flow to pass through the support structure walls. The base of the support structure may or may not be present, e.g. with the partition being formed by a shaped internal the wall of the capsule. As such the side wall and floor of the capsule may be integral with the partition 38A, e.g. with the partition forming an extension of the base/floor of the capsule.

In the example of figure 4B, the partition wall 38A terminates a distance below the top surface 24 of the capsule. This allows some head room in which air can enter the capsule interior and mix with gas/vapour within the capsule before exiting the capsule through flow passage 37.

In various embodiments, the capsule 14 may comprise a plurality of partitions. In the specific example shown in figures 5A and 5B, a plurality of partitions 38 are provided to define a plurality of compartments 40a-f to contain respective product 30 therein.

The partitions 38 extend in a radial direction (i.e. from a centre point in figure 5A). The partitions 38 thus provide a spoke-like arrangement. The compartments therefore comprise a sectorial shape. Any number of partitions 38 may be provided to divide the capsule 14 into any number of sectors. For example, 1-10 partitions may be provided to provide 2-10 sectors accordingly. The partitions may help prevent the smoking product in the capsule becoming a singular mass in the capsule.

In the example of figure 5B, the radial partitions 38 terminate at the annular partition wall 38A which defines the flow passage 37 through the capsule.

A third example of a support structure or air permeable member 36 is shown in figure 6. In this example, the partitions 38 are provided in a parallel arrangement. The partitions 38 thus define a plurality of elongate compartments 40. The partitions 38 may be evenly spaced. In other embodiments, the spacing of the partitions 38 may be such that each compartment 40 comprises an equal volume.

As fourth example is shown in figure 7. In this example, the partitions 38 are arranged in a grid. The partitions 38 thus define a plurality of cells 42. The number of partitions 38 in one direction (e.g. left/right) may be different the number of partitions in a second orthogonal direction (e.g. up/down the page). This may provide elongate cells. In other embodiments, the cells 42 may be evenly divided (e.g. to provide square cells or cells of more uniform area).

In some embodiments, the cells 42 may be substantially the same shape/size. For example, as shown in figure 8, the cells 42 may be arranged in a hexagonal array. Each cell 42 may therefore comprise a hexagonal shape.

In some embodiments, the cells 42 may comprise different shapes/size. For example, as shown in figure 9, the cells comprise a triangular cell 42a and a segment cell 42b.

In some embodiments, the cells 42 may comprise a random and/or irregular shape.

In some embodiments, the partition 38 may only partially extend across the capsule (i.e. only partially extend between the side walls 28 of the capsule). The partition 38 may therefore only partially divide the smoking product 30. For example, as shown in figure 10, a plurality of partitions 38 extend radially inward from the capsule side wall 28. The partitions therefore provide a crosshair like arrangement. The central partition 38A may or may not be provided in different embodiments.

In some embodiments, the partitions or support members may be arranged in a formation/pattern that has rotational symmetry about an axis/centre of the capsule.

In some embodiments, the partial partition 38 may be spaced from the side wall 28. In some embodiments, a plurality of partial partitions 38 may be connected. For example, a plurality of partitions 38 may provide an X-shape partition distal from the side wall 28 (e.g. in the centre of the capsule 14).

In some embodiments, the partition(s) 38 may only partially extend in the height direction of the capsule 14 (i.e. only partially extends between the top surface 24 and the bottom surface 26). As shown in figure 11, the partition 38 does not extend the full distance to top surface 24 and the bottom surface 24. The partition 38 may therefore be directly fixed to the capsule wall 28. Respective gaps 44 are therefore provided between the partition and the top/bottom surface. Such an arrangement may be beneficial where some spreading of the product 30 is required during smoking (e.g. when the product 30 is a liquid/semi-solid).

Although gaps 44 are provide between the partition 36 and the top/bottom surface in figure 9, it can be appreciated that a gap 44 may be provided between only one of the top surface 24 or bottom surface 26 and the partition 36. Spacing from the top or bottom of the capsule top 24 and/or bottom 26 surfaces can provide plenum/manifold zones for mixing of gases/vapour in use.

In some embodiments, the partition 38 may only partially extend the height of the capsule 14 at select portions thereof. The gaps 44 may therefore be provided as one or more discrete portions. Such an arrangement may provide a “window” to allow a select amount of product to flow within the capsule 14. The gaps 44 may be provide adjacent the top/bottom surface and/or may be spaced therefrom.

In some embodiments, the partitions 38, 38A may be air impermeable (i.e. continuous) in form. The partitions 38 therefore act to divide the product 30 into separate portions. The impermeable partitions 38 may be arranged in substantially the same fashion as the permeable partitions hereinbefore described.

The impermeable partitions 38 may be integrally formed with the capsule 14. This may be beneficial where the capsule 14 comprises a mouldable material (e.g. plastics etc.) or malleable material (e.g. aluminium or other metal).

In other embodiments the impermeable partitions 38 may comprises discrete members. The impermeable partitions 38 may be fixed to the capsule using any suitable technique (e.g. welding or adhesives). In some embodiments, the partitions 36,46 may be held in the capsule 14 by an interference fit or a close/friction fit. In any of the embodiments of figures 4-10, the partitions may be provided by an insert member 36 or else may be affixed to the wall(s) of the capsule as a structural component of the capsule body.

In some embodiments, the impermeable partitions 38 may be loosely held within the capsule 14, however, the tight fit with the capsule 14/product 30 ensures the partitions 38 stay in place. The partitions 38 may be removable. The partitions 38 may be removed before use or after use for recycling or re-filling. The partitions 38 may be affixed to a lid or the like to allow convenient removal thereof. Where the insert 36 is removable from the capsule interior or loosely inserted therein, it may be referred to as a basket-like inert for the capsule.

As shown in figure 12, the air permeable member 36 may extend across the capsule (i.e. between the side wall 28). In a specific embodiment, the air permeable member 38 comprises a foam, gauze, wool-like material or similar. The product 30 rests on top of the air permeable member 36. A further air permeable member 38 may then be placed on top of the product 30. The product 30 is therefore interposed a plurality of air permeable members 36,38. The process is repeated to provide a layered arrangement. The layered arrangement alternates between the product 30 and the air permeable member 38 (e.g. to form a lasagne like arrangement). The layers may be substantially parallel.

The layer may be parallel to the top surface 24 and/or bottom surface 26. The air may therefore pass perpendicularly through the layers 36.

The uppermost and/or the lower most portions of the layered arrangement comprise an air permeable member 36. This may prevent leakage of the product from the capsule 14.

As shown in figure 13, in some embodiments of the layered arrangement, the product 30 may be supported on a carrier 46. The carrier 46 then rests on/supports the air permeable member 38. This arrangement may provide numerous advantages:

- May aid with inserting the product into the capsule 14 during manufacture.
- Separates the product to increase the surface area thereof and/or prevent settling.
- Prevents crushing of the product by the above layers

The carrier 46 comprises an undulating/corrugated sheet. The undulations thus define a plurality of compartments 48 for the product 30. The carrier 46 thus divides the product 30. In a specific example, the carrier comprises a paper-based material.

In some embodiments, the carrier 46 may comprise a tray like arrangement (i.e. comprising a base portion and side walls). The product may therefore be contained within the tray. The tray may comprise one or more partitions to divide the tray into a plurality of compartments.

In some embodiments, the carrier 46 may comprise a plate or sheet like arrangement (i.e. substantially flat).

In some embodiments, one or more layers of product 30 may be separated by a spacer. The spacer may comprise a post, pedestal, spike, column, table or the like. The product 30 may be provided in a tiered arrangement.

As shown in figure 14, air permeable member 36 may comprise a flexible sheet 48. The flexible sheet 48 may comprise a plurality of perforations 50 or the like to permit airflow. The flexible sheet 48 may comprise an elongate strip. The product 30 is deposited onto the flexible sheet 48. The flexible sheet 48 is shaped to provide a separator/support for the product.

The perforations may comprise a size (e.g. a diameter/width) of 0.2mm to 5mm; preferably, 0.2mm to 2mm; preferably, 0.2mm to 1mm; preferably, 0.5mm to 1mm. The perforations may comprise a size greater than or equal to 0.2mm; preferably, greater than or equal to 0.5mm. The perforations may comprise a size less than or equal to 5mm; preferably, less than or equal to 2mm. The perforation may be spaced by greater than or equal to 5mm; preferably greater than or equal to 100mm.

The product may be deposited in a linear fashion on the flexible sheet 28 (as shown in figure 15). In some embodiments, the product may be provided in an undulating fashion (e.g. zig-zagging) across the surface of the flexible sheet 28.

In some embodiments, the product 20 may be provided as a layer across a portion of or the entire surface of the flexible sheet 28. The product 30 may therefore provide a coating or partial coating. The coating may be provided on one or both sides of the flexible sheet 28. In examples, where the product 20 is applied as a layer or partial layer, the product may have a layer depth of 1-10 mm, e.g. between 1 and 5 mm.

A first embodiment of the flexible sheet arrangement is shown in figure 15. The flexible sheet 48 is wound onto itself to provide a spiral shape. The product 30 is thus forms a spiral shape accordingly (i.e. to form concentric spirals). The arrangement provides a "swiss-roll" type arrangement. The spiral arrangement is then placed into the capsule 14. The spiral arrangement is placed such the side edges 52 of the sheet face the top surface 24 and bottom surface 26 of the capsule 14 respectively. This allows the air to flow across the flexible sheet 48 in use.

In the embodiment in figure 15, the flexible sheet 48 is loosely wound, so that gaps 54 are provided between wound layers. The gaps 54 may enhance airflow therethrough. In other embodiments, the flexible sheet 38 may be tightly wound such that adjacent layers contact one another.

Although a single spiral arrangement is shown, it can be appreciated any number of individual spirals may be provided.

In some embodiments, the flexible sheet 48 is configured to at least partially encapsulate the product to provide individual parcels or the like.

A first embodiment is shown in figure 16. The flexible sheet 48 comprises a hollow cylinder. The product 30 is provided within the hollow cylinder. This arrangement forms a pellet or "cannoli" like arrangement. The cylinder comprises open ends 56 thus only partially enclosing the product and permitting airflow therethrough.

A plurality of pellets are provided within each capsule 14. The cylindrical sheet thus acts as a separator for the individual portions of product 30.

In some embodiments, the flexible sheet 48 may comprise a conical shape. The product 48 is provided within the cone interior, thus providing a "cream horn" like arrangement.

A second embodiment is shown in figures 17 and 18. As shown in figure 18, the product 30 is interposed two portions of flexible sheet 48a,48b. The portions 48a,48b are sealed at the respective edges 58 thereof to form a sachet 60 or the like. The product 30 is fully encapsulated to provide a "ravioli" like arrangement. A plurality of sachets may be provided in the capsule 14. Air gaps are naturally formed between the sachets, thus providing airflow.

The flexible sheets 48a,48b may comprise provision for depth of the product 30. For example, one or both sheets 48a,48b may comprise a recess 62 or pocket to accommodate the product 30. In other embodiments, the product 30 is accommodated by the flexibility/compliance or folding of the sheet 48.

In some embodiments, the sheet portions 48a,48b are formed from separated sheets 48. The sheets 48a,48b are then unified to encapsulate the product 30. A plurality of product portions may be provided on a sheet 48a in a spaced arrangement. A second sheet 48b may be overlaid the first sheet 48a to encapsulate the plurality of products. Individual sachets may then be formed by cutting between the portions.

In other embodiments, the sheet portions 48a,48b may be formed a single piece of material (i.e. by folding over thereof). It can be appreciated that such an arrangement can be used to provide a plurality of products as hereinbefore described.

Although the sachet 60 shown in figure 18 comprises a rectangular/cuboid type shape, it can be appreciated that sachet 60 may comprise any suitable shape. For example, the sachet 60 may comprise: a circular/spherical/cylindrical; or a triangular/pyramidal (e.g. tetrahedral).

In an embodiment, the product 30 is encased within a casing 62 to form a “sausage” like arrangement. As shown in figure 19, the casing 62 completely surrounds or envelopes the product. The casing 62 thus acts as a separator.

As shown in figure 20, encased products 30 are elongate. For example, the encase products have a length:width ratio greater than 5, preferably greater than 10. Such an arrangement increases the surface area thereof. The casing 62 may comprise a seal 64 at one or both ends thereof. The seal 64 may be provided by any suitable means, for example: heating sealing; adhesive; tying; or by using fasteners. In some embodiments, the ends of the casing 62 may remain open.

The casing 62 is flexible. The encased product is there able to curl up or otherwise deform to fit inside the capsule. Flexibility of the casing 62 may be provided by the thinness of the casing 62 or the elastic/compliant nature thereof. As shown in figure 20, a plurality of cased products 30 are provided in a single capsule. The encased products.

In some embodiments, the casing 62 comprises a mesh. In some embodiments, the casing 62 comprises an air or liquid permeable membrane.

In some embodiments, the capsule 14 comprises an impingement member. The impingement member extends into the product 30 to help reduce flow of the product 30 due to impingement thereon.

A first example is shown in figure 21. The impingement member 64 comprises a plurality of “fingers” 66. The fingers 66 comprise elongate rods or pins or the like. The fingers 50 are parallel to one another. The fingers 66 are mounted to a base 68. As shown in figure 23, the fingers 66 are spaced about the base 68 (i.e. about a 2D plane). The fingers 66 are therefore spread throughout the product 30.

The fingers 66 comprise a circular cross-section. However, it can be appreciated the fingers 66 may take any suitable form, for example: triangular; rectangular; or hexagonal. The fingers 66 may be solid or hollow.

The fingers 66 are arranged in a hexagonal array. This provides an even distribution of the fingers 66. Again, it can be appreciated that this arrangement is merely exemplary and finger 66 may be spaced in any suitable arrangement, for example: a rectangular array; or randomly.

In some embodiments, fingers 66 may be provided in only select portions of the capsule 14/product 30. This may be provided where only certain portions of the product 30 are prone to settling. In some embodiments, the size and/or spacing of the fingers 66 may varied across the capsule 14.

The impingement member 64 is configured to be removable from the capsule 14. Thus, as the fingers 66 are withdrawn from within the product 30, channels may remain therein. This may increase airflow within the capsule 14. The fingers 66 are shape/sized/spaced such that they may be inserted into the apertures in the top surface 24 and/or bottom surface 26. Thus, when the impingement member 64 is removed, the apertures in the top surface 24 and/or bottom surface 26 are exposed.

The base portion 68 is sealed against the top surface 24 and/or bottom surface 26.

The impingement member 64 may therefore provide a lid/seal for the capsule 14. This ensures the product 30 stays fresh. The base portion 14 may be sealed to capsule using any suitable means, for example, adhesive.

The impingement member 64 may comprise a handle 70 to aid with the removal thereof from the capsule 14. In other embodiments, the use may simply prise the edge of the base 68 away from capsule. Alternatively, a pull-tab or the like may be provided.

In some embodiments one or more of the fingers 66 comprise an agitator 72 thereon. Therefore, as the fingers 66 are withdrawn, the agitator 72 engages and re-distributes/disturbs the product 30.

In a first example shown in figure 21, the agitator 72a comprise a flange or the like. The flange may comprise a substantially flat plate. In a second example, the agitator 72b comprises a barb (e.g. chevron or arrowhead shape). The agitator 72 may be provided at the end of the finger 66. The agitator 72 may therefore travel the full height of the capsule 14 during withdrawal of the fingers 66. In some embodiments, multiple agitators 72 may be provided on the respective fingers 66.

In alternative embodiments, the impingement member 64/fingers 66 may be fixed to the capsule (i.e. not removable).

A second example of the impingement member is shown in figure 23. In this example, the fingers 66 are substantially hollow. The fingers 66 are aligned with the apertures in the top surface 24. The fingers 66 therefore provide an air pathway into/through capsule 14 and/or product 30 (e.g. a chimney or flue like arrangement). The air pathway is thus similar to the flow passage 37 of figures 4B and 5B discussed above. Such an arrangement thus provide impingement and improves air flow.

The fingers 66 are substantially D-shaped/semi-circular. In alternative embodiments, the fingers 66 may take any suitable form.

A first examples of the fingers 66a is shown in the left-hand side of figure 24. In this example, the fingers 66a extend only part way between the top surface 24 and the bottom surface 26. An end 74 of the fingers 66a thus remains within the product 30 in use.

The fingers 66a are sufficiently sized such that the product does not enter the inside the fingers 66a.

A second example of the fingers 66b is shown in the right-hand side of figure 24. In this embodiment, the fingers 66b extend the full length between the top surface 24 and the bottom surface 26. The fingers 56b comprise an air-permeable surface (e.g. provided by perforations/mesh). The perforations/mesh are sized such that the product 30 does enter the fingers 66b. The fingers 66b thus provide an air pathway extending through the product 30.

In some embodiments, the product 30 is provided on a porous/permeable or substantially air-impermeable substrate. The substrate comprises an inert or food safe material. The inert material is configured to not melt, combust, decompose or otherwise deteriorate when exposed to heat. For example, the inert material is temperature stable to at least 200°C; at least 300°C; or at least 350°C. The inert material may comprise any of the "inert filler" materials or 'elements' as hereinbefore described. In a specific embodiment, the substate comprises: stone; glass; ceramic; pumice or sand.

A first embodiment of the substrate is shown in figure 26. The product 30 is provided on the surface of the substrate 76. The product 30 therefore provides a coating on the substrate 76. The substrate 76 provides a core. The coating 30 covers substantially the whole surface of the substrate 76, thus maximising the surface area of the product 30. The coating 30 may comprise a uniform thickness across the surface of substrate 76. In alternative embodiments, the coating 30 only partially cover the surface of the substrate 76 and/or the thickness of the coating 30 may vary.

The coating 30 may comprise the same composition as the "paste" hereinbefore described. The absorbent binder may help the coating 30 to bind with the substrate 76.

In some embodiments, the coating 30 may not comprise the granular inert filler material.

In some embodiments, coating 30 may comprise a thickener. The thickener may comprise a gel forming agent. The gel-forming agent may form a gel in aqueous mixtures at room temperature. The thickener may increase the viscosity of the coating layer and provide a shiny appearance. The thickener may comprise one or more polysaccharide (e.g. starches, gums, or pectin). The starches may comprise one or more of: arrowroot;

cornstarch; katakuri starch; potato starch; sago; tapioca; or their derivatives. The gums may comprise microbial and/or vegetable gum, for example, one or more of: alginate; guar gum; locust bean gum; Arabic gum; or xanthan gum. The thickener may comprise a protein thickener, for example, one or more of: collagen; egg whites; or gelatin. The thickener may comprise a sugar polymer, for example, one or more of: agar; carboxymethyl cellulose; pectin; or carrageenan.

It can be appreciated, that the composition of the coating 30 may used in any of the embodiments, as herein described. Conversely, the paste composition may be used to coat the substrate 76. For the avoidance of doubt, the coating 30 and/or the paste may comprise any suitable combination of: the inert filler; the absorbent binder; the mist-maker; the sweetener; the flavouring; or the thickener.

The substrate 76 comprises rounded/spherical shape. The product 30 and the substrate 76 thus define a bead 78 like arrangement. However, it can be appreciated that the substrate 78 may comprise any suitable shape, for example, cuboid or pyramidal. In some embodiments, the substrate 76 may comprise a plate, disc or puck like shape. In some embodiments, the substrate 76 may comprise an elongate rod or lozenge shape. In some embodiments, the substate 76 comprises an ovoid shape. In some embodiments, the substrate 76 may comprise a ring (i.e. toroidal) shape. In some embodiments, the substrate 76 comprises one or more of the above shapes.

The substrate/core 76 may comprise an average diameter of between 0.5mm and 20mm; preferably between 1mm to 15mm; more preferably between 2mm 15mm; more preferably between 2mm and 10mm; and most preferably between 3mm and 10mm.

The substrate 76 may comprise greater than 30wt% of the weight of bead 78; preferably greater than 40wt%. The substrate 76 may comprise between 30wt% and 70wt% of the weight of bead 78; preferably between 40wt% and 60wt%.

The beads 78 may comprise about 1.5-2wt% thickener, about 6-9wt% mist-maker, about 14-18wt% carbohydrate sweetener, about 2-5wt% flavouring, and about 0.0 wt% colorant. In instances where the coating is formed from an aqueous mixture of ingredients, the amount of water in the coating is about 6-8wt% of the overall weight of the capsules.

The composition may provide a “dry” product. The coating 30 is therefore not sticky or syrupy, thus ensuring the beads 78 do not stick to one another. The coating 30 may be smooth (e.g. the coating provides a smooth shell). The beads 78 may freely flow within the capsule 14. The beads 78 may be easy to handle by the user or during filling of the capsule 14.

A method of manufacturing the beads 78 comprises forming of a coating mixture containing the flavouring and its application to core beads, to form a coating layer precursor. An absorbent-binder is then added, turning the precursor into a coating layer encapsulating the core bead.

A coating mixture is first created by dissolving or suspending ingredients including the flavouring, a mist-maker, a sweetener, and a thickener in a solvent. In some embodiments, one or more of the ingredients, for example the flavouring, may be introduced at a later stage of the process rather than as components of the coating mixture. Selection of the appropriate solvent is dependent, inter alia, on the need of forming homogeneous mixtures having the appropriate viscosity and other desired attributes when the solvent is combined with the other ingredients. In some embodiments, the solvent is water either alone or in combination with aqueous dissolvable solvents such as methanol, ethanol, isopropanol, glycol ether solvents, and combinations thereof.

The coating mixture may also include additives such as colorants and stimulants. Certain additives may be used, among other purposes, to aid in dispersing the other ingredients in the solvent.

Once ready, the coating mixture is applied to core beads. In one exemplary embodiment, a batch of core beads are placed in the pan of a spray coating machine which is made to rotate in an orbital manner. The rotating motion causes the beads to tumble within the pan. During the orbital tumbling motion of the beads, the coating mixture is added, to form a coating layer precursor on the surface of the beads. The coating mixture may be introduced by spraying which can produce a faster and more even distribution than simply introducing it as a liquid.

Once a sufficient amount of coating mixture has been added, an absorbent-binder is introduced. In instances where the absorbent-binder is a powdery substance, it may be applied by feeding into the coating machine while the pan is rotating, resulting in a dusting

of the absorbent-binder onto the beads. Rotation may be protracted until the applied absorbent-binder is evenly distributed and the particles are covered by a homogeneous coating, then the beads are dried by evaporating at least a portion of the solvent present in the coating layer precursor, for example by flowing air through the pan, producing beads with a dry and smooth touch and feel that have no liquid or sticky residues on their surface. Where desirable, one or more ingredients, for instance the flavouring, may be added to the coating at this stage rather than as component(s) of the coating mixture.

In some instances, it may prove beneficial to divide the coating mixture into two or more portions. The first portion is combined with the absorbent-binder on the surface of the beads, as described above, to form a first stratum of the encapsulating layer.

Then, the second portion is applied and formed into a second stratum overlaying the first stratum. The process may be to apply one more additional portion until the encapsulating layer has attained a desired thickness.

In the present embodiment, the substate 76 comprises a substantially smooth surface 80. In some embodiments, the surface 80 may be roughened. This may enhance bonding with the coating 70. In some embodiments, the surface 80 may be undulating/complex to increase the surface area of the substrate 76.

Whilst a specific example of a suitable coating for the substrate (e.g. beads/elements) is described above, the coating may comprise only some of the described coating materials. For example, the coating may comprise a flavorant coating and the capsule may contain other types of smoking material aside from the coating.

As shown in figure 26, a plurality of beads 78 are provided in the capsule 14. The stacking of beads provides gaps 82 therebetween. The bead arrangement thus provides an air pathway and helps to distribute the product 30. The capsule 14 may be partially filled thus providing a free space 84 within the capsule. The beads 78 are loosely held in the capsule (i.e. they are free-flowing). This may allow the user to shake the capsule 14 before use to help disperse the beads 78. The beads 78 may occupy less than or equal to 80% of the internal volume of the capsule; preferably, less than or equal to 70%; more preferably less than or equal to 60%.

In some embodiments, the plurality beads 78 may comprise different sizes (e.g. different diameters or volumes). For example, at least one bead 78 has a first size and at least one bead 78 comprises a second, different size and so on.

In some embodiments, the different bead 78 sizes are selected from a finite set of discrete sizes (i.e. from a predetermined list of sizes). For example, a first set beads may comprise a 1mm diameter, a second set 2mm and third set 3mm. An example of such a distribution is shown in figure 27. The discrete/quantised bead sizes thus produce a number of discrete peaks 86 in the distribution curve.

The number of beads 78 in each of the peaks 86 (i.e. the discrete bead size) may vary between the different discrete bead sizes (i.e. to produce different peak 86 heights). In alternative embodiments, the number of beads 78 in each of the peaks 86 may remain substantially constant. The bead size distribution may therefore be substantially uniform.

In alternative embodiments, the different bead 78 sizes are continuously distributed. As shown in figure 28, the bead sizes may therefore comprise a continuous distribution curve 88. The bead sizes may lie within a predetermined size range 90.

The number of beads may vary across the bead size distribution, thus producing a non-uniform curve 88a. In some embodiments, the bead size distribution may comprise a Poisson, Normal or Weibull distribution. The number of beads may increase toward a central portion of the bead size distribution.

In some embodiments, the size distribution comprises a substantially uniform curve 88b (the number of each different sizes of beads 78 is the same). This may be achieved by providing a random bead size.

It can be appreciated that the graphs shown in figures 27 and 28 are merely exemplary and aid in the description of the present disclosure.

The distribution of the bead 78 sizes may be tuned to produce optimum smoking conditions. For example, a small bead size will create more surface area of product 30, thus increasing the smoke intensity (i.e. the density of volatile products). However, this will increase the rate of the depletion of the product, thus leading to low intensity product toward the end of use. Additionally, the small bead size provides a low thermal inertia,

thus decreasing the time the beads reach the temperature required for the coating to become volatile. The small beads are thus fast acting.

Conversely, a large bead will provide a low intensity smoke, however, the rate of depletion will be reduced compared to the small bead. Additionally, the thermal inertia of the bead results in an increased time to reach the temperature required for the coating to become volatile. The large bead are therefore slow-acting. Thus, a combination of different size beads 78 will ensure the intensity of the smoke produced by the capsule will remain at least partially consistent. This arrangement is shown schematically in figure 29.

A smoke intensity over time curve 92a is shown for a small bead 78. The curve 92a comprises a high intensity peak 94a, however, the intensity rapidly increases and/or diminishes over time. A second smoke intensity curve 92b is shown for an intermediate sized bead 78. The curve 92b comprises an intermediate intensity peak 94b and an intermediate intensity increase and/or depletion. A third smoke intensity curve 92c is shown for a large sized bead 78. The curve 92c comprises a low intensity peak 94c and a slow intensity increase and/or depletion. It can be seen that the respective peak intensities 94a-c are spaced over time.

A resultant intensity curve 96 shows a sum total of the curves 92a-c. In an initial phase 98a, the capsule 14 and the content thereof are beginning to heat up. The resultant intensity increases. During an intermediate phase 98b, the resultant intensity remains substantially constant due to different intensity contributions from the different size beads 78. The intermediate phase 98b thus provides a consistent and balance experience for the user. Once, the small and intermediate beads 78 have been depleted and the large beads 78 begin to deplete, the resultant curve 98 enters a terminal phase 98c, where the intensity diminishes. At this point the user may cease using the device 2 and/or replace the capsule 14.

The distribution of bead 78 sizes can be tuned to ensure the intermediate phase 98b provides a consistent smoke intensity 96. Although the smoke intensity in the intermediate phase 98b is shown as substantially constant in figure 30, it can be appreciated, that the intensity 96 may be configured to lie within the specific margin. The margin may vary according to the sensitivity of the user to the specific product 30 used. For example, a product with a high flavour intensity may be able to accommodate a significant drop in intensity 96, as the flavour intensity experienced by the user may be “saturated” even at

low smoke intensity 96. The intermediate phase 98b intensity 96 may be configured to be within a ±50% margin of the average intensity 96 in the intermediate phase 98b, preferably within ±40% margin; more preferably, ±20% margin; more preferably, ±10% margin.

In some embodiments, the distribution of bead 78 sizes may be altered to vary the user experience. For example, a relatively higher number of small beads 78 may be provided to create an “intense” experience for the user. Conversely, relatively higher number of large beads 78 may be provided to create a “mellow” experience for the user.

In some embodiments, the plurality beads 78 may comprise different shapes. For example, at least one bead 78 comprises a first shape, at least one bead comprises a second, different shape and so on. This may provide a distribution of effective surface areas of the beads 78 and thus have the same/similar effect as varying the size of the beads 78. The distribution of the shapes of the bands 78 may therefore be tuned to alter or add consistency the user experience as hereinbefore described. The different shapes may further alter the air pathway through the capsule 14.

Although the different shape/sizes of the product 30 has been described in the context of the beads 78, it can be appreciated that such an arrangement may be provided where the product 30 is provided in individual portions. For example, the arrangement may be provided any of the embodiments are herein described, more specifically:

- The compartments 40,44/cells 42 may comprise different shapes/sizes or contain different amounts of product 30 therein.
- The amount of product 30 and/or spacing between the air-permeable layers 36 (e.g. in figures 13 and 14)
- The amount of product disposed on the flexible sheet 48 along the length thereof.
- The size/shape of the portions contained within the flexible sheet 48 (e.g. the shape/size of the cylinder (figure 17), sachet 60 or casing 62) and/or the product 30 contained therein.

In some embodiments, the smoking product 30 may be provided individual portions without a discrete separator or the like. This may be provided where smoking product is solid or a semi-solid.

A first example is shown in figure 30. The capsule 14 comprises a plurality of discrete/individual product portions 100. The portions 100 may be loosely contained within the capsule (e.g. free flowing therein). The shapes shown in figure 30 are substantially spherical/ovoid, however, they may comprise any suitable shape. The portions 100 may provide pellets or the like.

A second example is shown in figure 31. The portions 100 are substantially flat/elongate. The portions may comprise a sheet, plate, string, or flake like shapes.

The portions 100 may comprise different sizes, shapes and/or orientations, to provide a consistent user experience (as described with reference to the beads 78). Free space 102 is provided within the capsule 14 to allow the user to disperse the portions 100 before use.

The portions 100 comprise a coating to prevent sticking or merging of adjacent portions 100. The coating may reduce the stickiness of the outer surface of the portions 100. The coating may comprise a powder. The coating thus acts as an effective separator. The coating may comprise an anhydrous and/or hydroscopic (water absorbing) material. The coating may comprise an anti-caking agent.

The coating may comprise a food-based material. The coating may comprise one or more of: flour (wheat or maize); sugar (e.g. icing sugar); or starch (e.g. potato starch)

The coating may comprise an inert material. The coating may comprise one or more of: sand; calcium carbonate; a zeolite; or granular/powdered mineral. The coating may comprise a fine grain material (e.g. less than 0.50mm or less than 0.25mm)

In some embodiments, the portions 100 may be at least partially, dried, hardened or cured, thus reducing the stickiness of the outer surface thereof. The coating may provide on the beads 78 to prevent sticking thereof.

In some embodiments, the product 30 may comprises one or more inclusion therein. The inclusions may help disperse the product 30 and/or provide an air pathway through the product 30.

A first embodiment is shown in figure 32. The inclusions 86 are freely dispersed within the product 30. When the capsule 14 is moved the inclusions 86 are free to move within the

product 30/capsule 14, thus dispersing the product. This may disperse the product, for example, during transportation of the capsule 14, or the user may shake the capsule 14 before use. Such arrangement may be beneficial where the product 30 is homogenous/liquid/semisolid, however, it can be appreciated the arrangement may be useful where the product is supplied in individual portions (e.g. to unstick the beads 78).

The inclusions 78 may comprise the same material of hereinbefore described inert filler. In a specific example, the inclusions 78 comprise a stone or rock material. The inclusions 78 may comprise glass beads.

In some embodiments, the inclusions 78 comprise a metallic material. The metallic material may increase the effective thermal conductivity of the smoking product, thereby ensuring more even heating. The metallic material may further act as an inductor (when exposed to varying magnetic/electric field), to provide heating of the smoking product. The metallic material may comprise iron. The metallic material may comprise ferrite (Fe_2O_3). The metallic material may comprise Aluminium.

In some embodiments, the inclusions 78 comprise one or more of: a flake; wire; sponge; or wool-like arrangement.

The inclusions 78 may be greater in diameter than 3mm, 4mm or 5mm; potentially greater than 8mm or 10mm. The inclusions 78 shown in figure 33 are spherical, however, the inclusions 78 may comprise any suitable shape, such as ovoid or polyhedral.

In a specific embodiment, the product 30 comprises a shisha/tobacco product. The inclusions 78 comprise inert beads. The beads may provide air pathways and/or break up the tobacco/shisha. In some embodiments, the beads may be embedded and/or dispersed within the shisha product.

In some embodiments, the beads may be provided in one or more layer. The layer may be provided at the base of the capsule. A shisha/smoking product may be laid on top of the beads. In some embodiments, one or more layers of bead may be laid on top of the shisha product. In some embodiments, the bead layers and shisha product may be provided in alternating layered arrangement. The smoking product and/or layered arrangement may be compressed and/or otherwise compact to mix/disperse the beads into the shisha product.

The inclusion 78 to product 30 ratio (volume or mass) may be 1:0.2-5; preferably; 1:0.3-3 preferably, 1:0.5-2; preferably, 1:0.7-1.5.

As shown in figure 33, the inclusions 86 may be air permeable. In some embodiments, the inclusions 86 may comprise a mesh and/or porous structure (e.g. a foam or pumice like material).

The inclusions may passively distribute the product in a desired manner within the capsule for use. Additionally or alternatively, the capsule could be agitated shortly before use such that the inclusions help to redistribute the product in the capsule ready for use. The inclusions 86 may thus provide a more rigid structure within the product that serves to create a desired distribution of the product in the capsule interior.

The support structure may also provide one or more air pathways and/or voids within the smoking product, thereby increasing air penetration and/or smoke release. Generally, the support structure and/or smoking product may only partially fill the housing, e.g. the internal chamber thereof. A portion of the internal chamber may comprise voids, e.g. gas/air filled voids. The support structure and/or smoking product may occupy less than or equal to 90% of the internal volume of the capsule; preferably, less than or equal to 80%; preferably, less than or equal to 70%; preferably less than or equal to 60%; preferably less than or equal to 50%; preferably less than or equal to 40%. The support structure and/or smoking product may occupy greater than or equal to 20% of the internal volume of the capsule; preferably, greater than or equal to 30%; preferably, greater than or equal to 40%; more preferably greater than or equal to 50%. The support structure and/or smoking product may occupy between 20% and 90% of the internal volume of the capsule; preferably, between 30% and 80%; preferably, between 40% and 70%.

Any of the above embodiments, or specific features thereof, may be combined with any of the other embodiments disclosed or claimed herein, except where mutually exclusive. For example, the smoking products described in conjunction with any of the examples of figures 25-33 may be provided in combination with any of the support structures described in any of figures 4 to 18.

In any of the examples of the invention, the product within the capsule may be a liquid, viscous liquid, semi-solid/paste or else a soft/malleable solid. However, the product is

typically deformable to the extent that it requires mechanical support or controlled deformation to achieve a desired surface profile or shape at the point of use. It is possible that the product could be applied to the capsule or support structure as a flowing liquid, viscous liquid or paste form but could harden on the support structure, e.g. within the capsule, to provide a more rigid product in situ. In some examples, the product may comprise a tobacco component mixed with other viscous material(s).

Although the capsule has been described for use with an electronic hookah device, it can be appreciated that the capsule may be used with a suitable conventional hookah or water pipe.

Claims

1. A capsule for a hookah device comprising:

a smoking product comprising at least one ingredient configured to vaporise during heating of the smoking product in use;

a housing comprising a plurality of walls shaped to define an internal chamber containing the smoking product and defining at least one air pathway to allow the vaporised ingredient to exit the capsule in use; and

a support structure within the housing defining a surface area within the internal chamber away from the plurality of walls over which at least a portion of the smoking product is disposed, wherein the smoking product and support structure only partially fill the internal chamber.

2. A capsule according to claim 1, where the capsule comprises first and second walls, the internal chamber being between the first and second walls, wherein the first and second walls comprise at least one respective aperture therein, such that in use, air passes through the respective apertures and over the smoking product in the internal chamber.

3. A capsule according to claim 1 or 2, where the support structure has greater mechanical strength than the smoking product.

4. A capsule according to any preceding claim, where the support structure is shaped to maintain a desired dispersion of the smoking product within the internal chamber.

5. A capsule according to any preceding claim, where the support structure substantially spans a height and/or width dimension of the internal chamber.

6. A capsule according to any preceding claim, where the support structure is loosely disposed within the internal chamber and movement of the support structure is constrained by contact with the plurality of walls and/or smoking product.

7. A capsule according to any preceding claim, where the support structure comprises a partition configured to divide the internal chamber of the capsule into two or

more compartments or cells, at least one of the compartments or cells configured to contain a portion of the smoking product.

8. A capsule according to claim 7, where the partition defines an annular internal chamber containing the smoking product and a central air pathway extending therethrough.

9. A capsule according to any preceding claim, where the support structure comprises a sheet material at least partially encasing the smoking product.

10. A capsule according to any preceding claim, where the support structure comprises a hydroscopic powder.

11. A capsule according to any preceding claim, where the support structure comprises a plurality of elongate arms configured to extend into the smoking product and impinge movement thereof.

12. A capsule according to any preceding claim, where the support structure is at least partially embedded within or coated by the smoking product.

13. A capsule according to claim 12, where in use is the support structure is removable or displaceable from the capsule to leave an air channel within the smoking product after displacement therefrom.

14. A capsule according to any preceding claim, where the support structure is air-permeable, for example comprising one or more of: a mesh; a foam; a perforated sheet material; or a web.

15. A capsule according to any preceding claim, where the support structure comprises one or more partition shaped to define an air pathway in the form of a flow passage through the internal chamber whereby the one or more partition prevents entry of the smoking product into the flow passage.

16. A capsule according to any preceding claim, where the support structure comprises a plurality of discrete elements or beads contained within the capsule.

17. A capsule according to any preceding claim, where the smoking product at least partially encapsulates the support structure such that support structure provides a core and smoking product comprises a coating on the core.

18. A capsule according to claim 17, where the core comprises an inert, inorganic material.

19. A capsule according to claim 17 or 18, where the core comprises one or more of: stone; glass; ceramic; or sand.

20. A capsule according to any one of claims 17 to 19, where the coating comprises an organic thickener.

21. A capsule according to any one of claims 17 to 20, where the coating is substantially dry.

22. A capsule according to any one of claims 17 to 21, where a plurality of coated cores are provided and a further support structure, at least two of the coated cores being separated or constrained by the further support structure.

23. A capsule according to any preceding claim, where the smoking product is provided in a plurality of discrete portions, each of the discrete portions comprising a different effective surface area of smoking product.

24. A capsule according to any preceding claim, where the smoking product comprises portions having different cross-sectional area or different volume to surface area ratio such the different portions of the smoking product are consumed at different rates during heating.

25. A capsule according to claim 24, where the total rate of vaporised smoking product produced by the capsule remains within a predetermined margin over a predetermined time period of use.

26. A capsule according to any preceding claim, where the smoking product ingredients comprise a binder, a mist maker and a flavouring.

27. A capsule according to claim 26, where the smoking product comprises an absorbent-binder, such as one or more of: fumed silica; amorphous silica; or talc.

28. A capsule according to any preceding claim, where the smoking product comprises a viscous liquid, or semi-solid, such as a paste.

29. A capsule according to any preceding claim, where the smoking product comprises an inert, granular filler.

30. A hookah pipe comprising the capsule of any preceding claim.

31. A method of manufacture of a capsule for a water pipe, the method comprising: providing smoking product comprising at least one ingredient configured to vaporise during heating; forming a housing of the capsule having an internal chamber; providing a support structure for the internal chamber having a surface area arranged to receive the smoking product; applying the smoking product to the surface area of the support structure; and, closing the housing over the support structure with the smoking product applied thereto.

32. A method of using the capsule of any preceding claim comprising:
heating the capsule to vaporise one or more ingredient of the smoking product;
passing air into the capsule to entrain and extract the vaporised product from within the capsule.

1/16

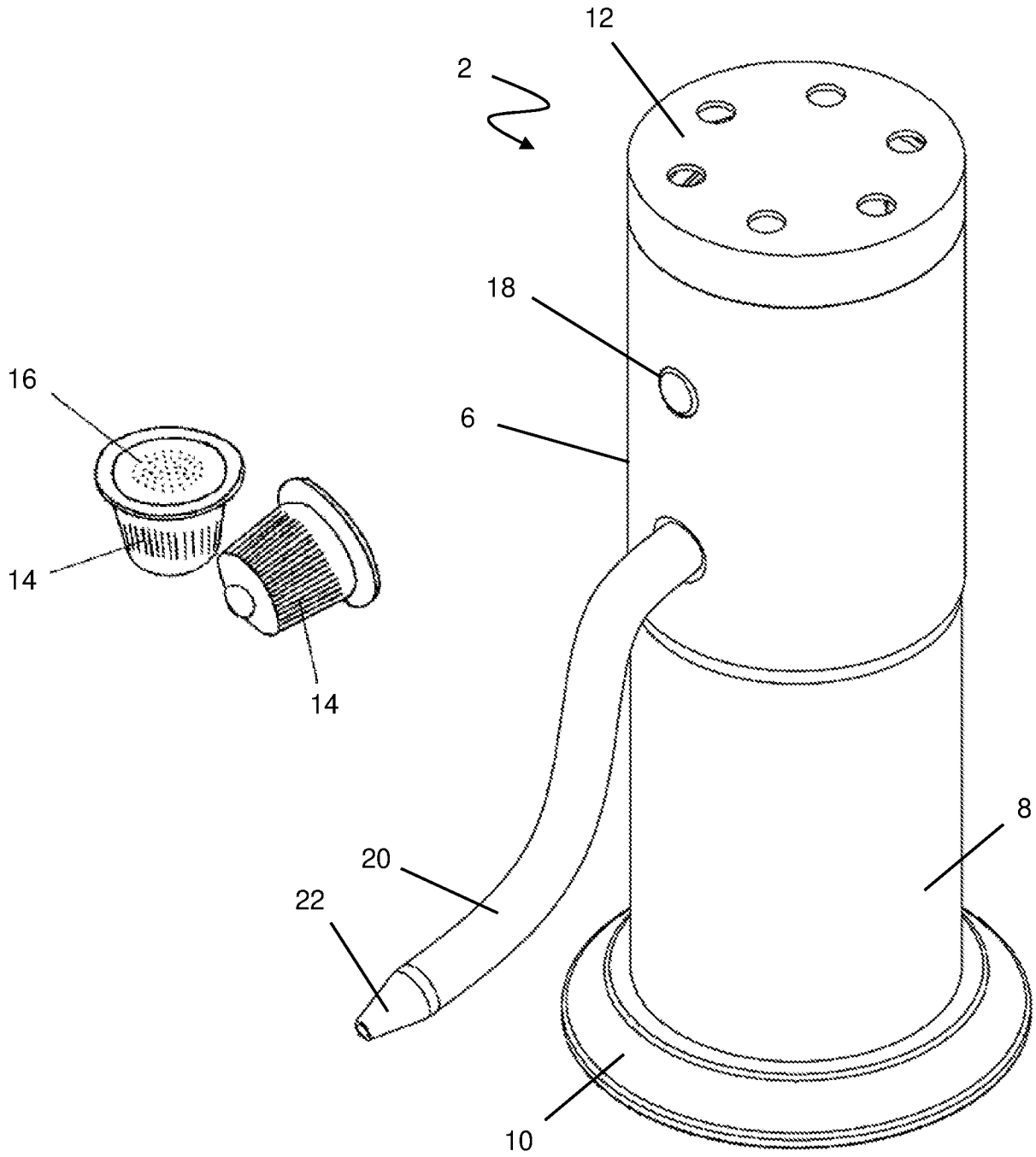


Figure 1

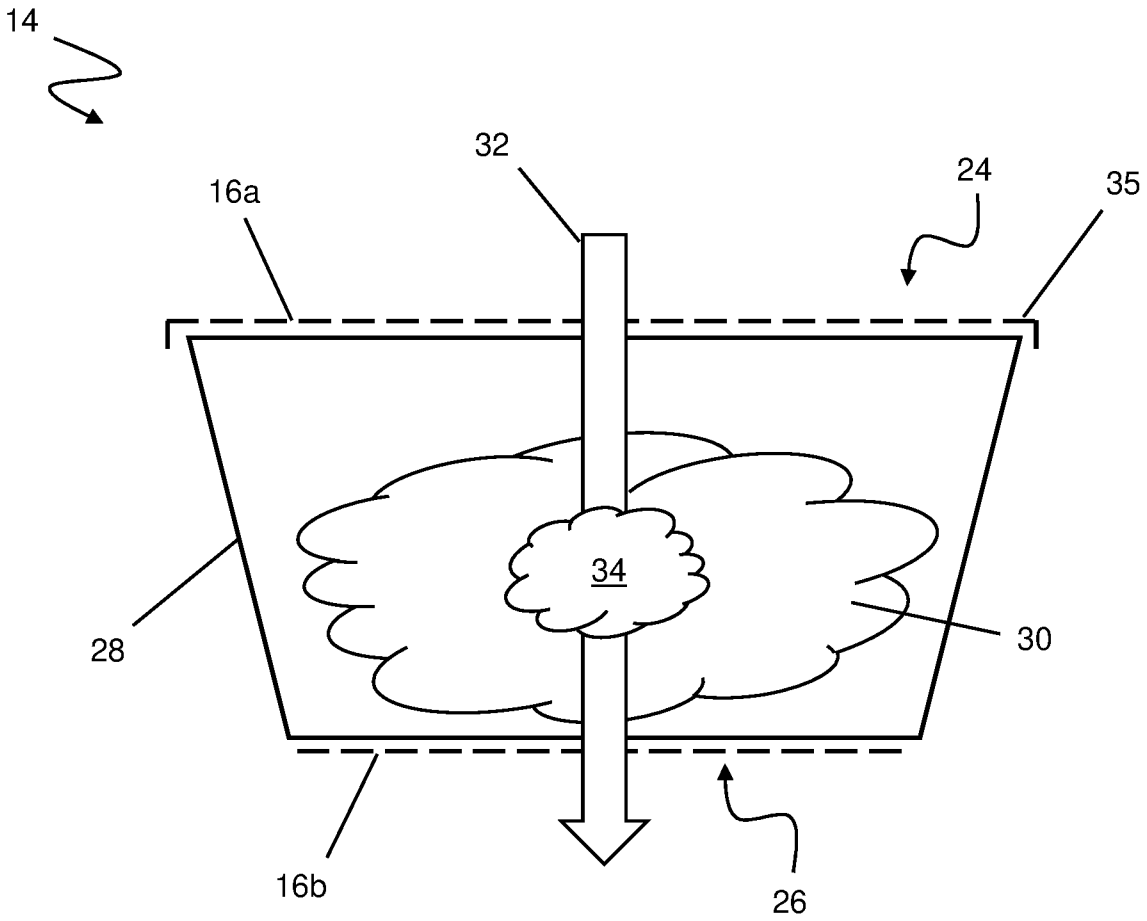
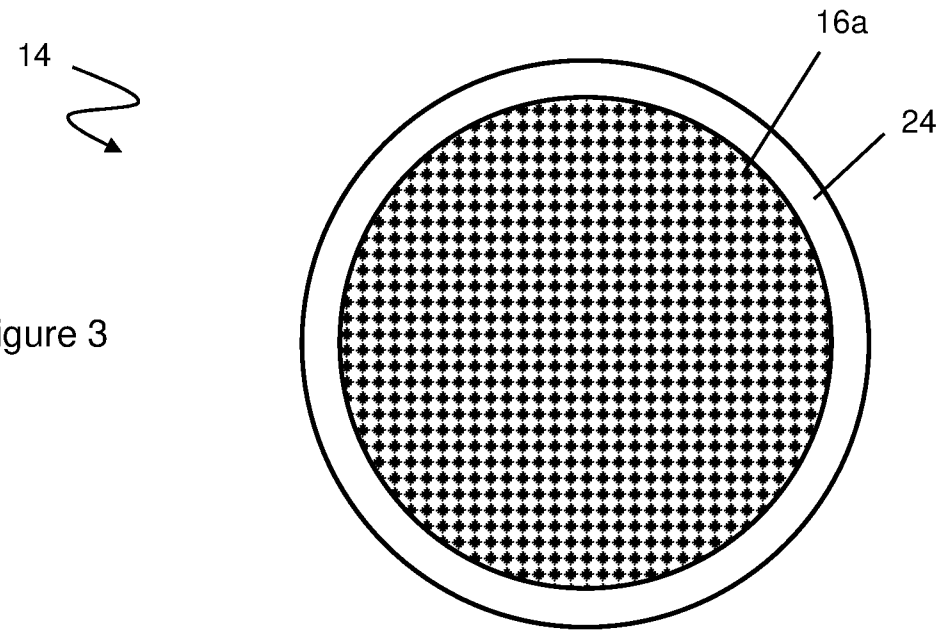


Figure 2



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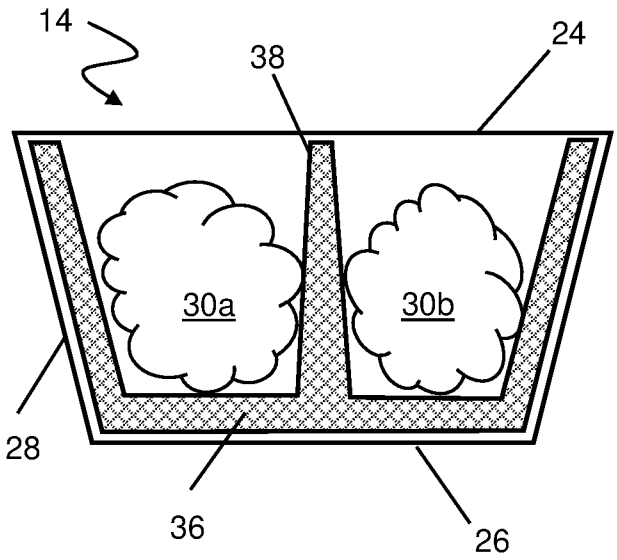

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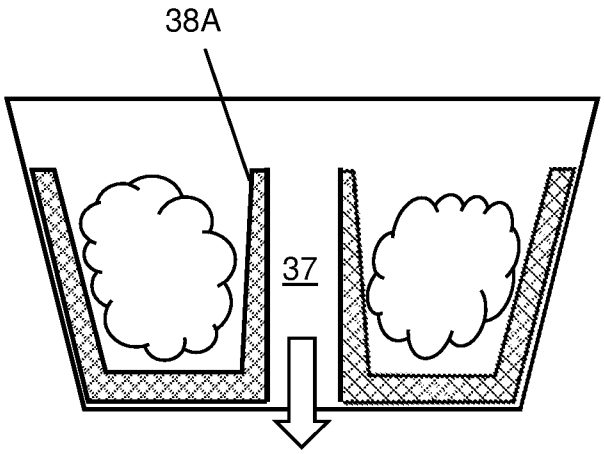
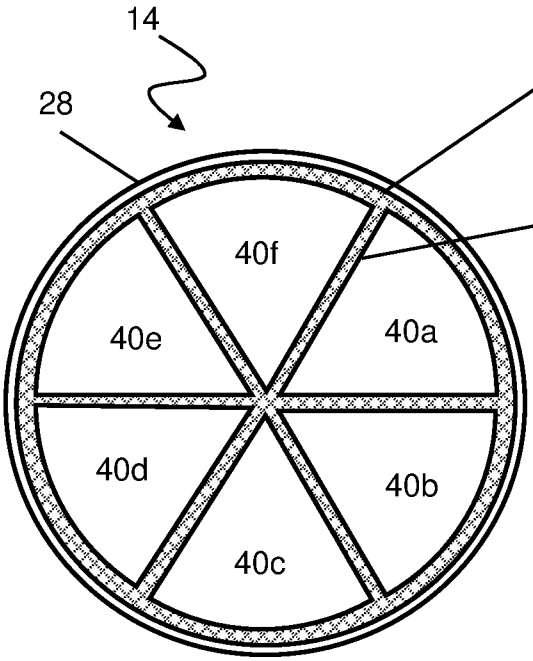


Figure 4B



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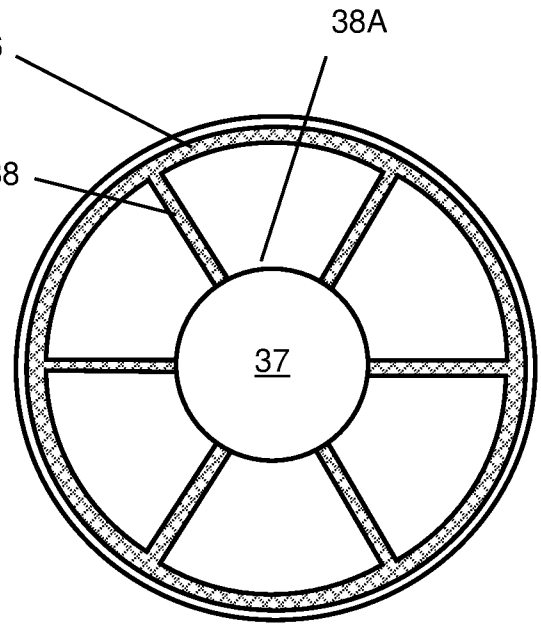

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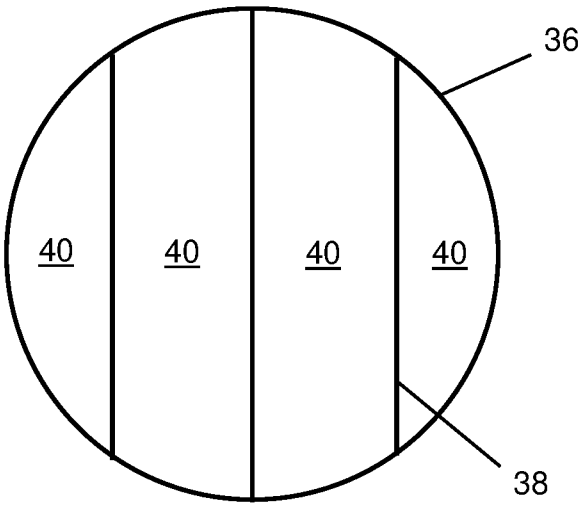

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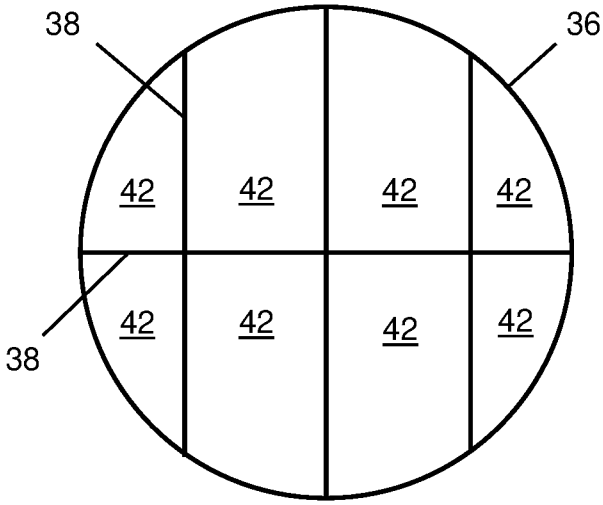

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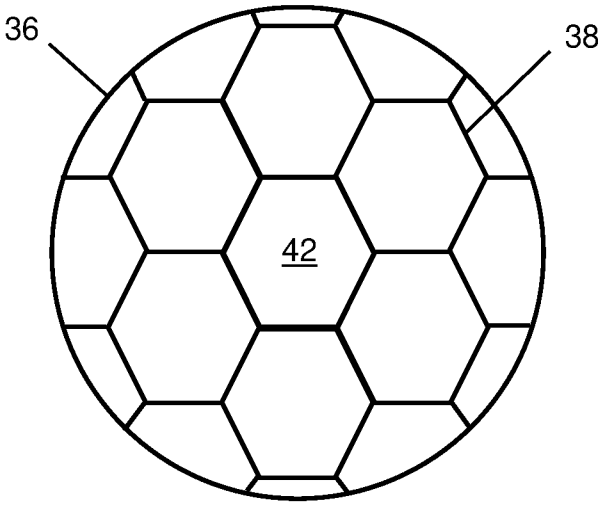

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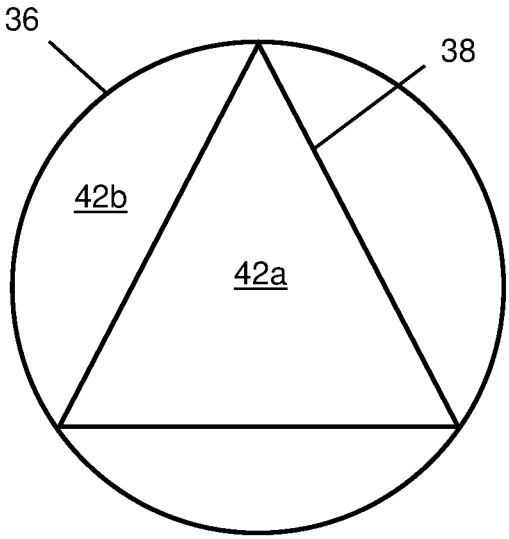
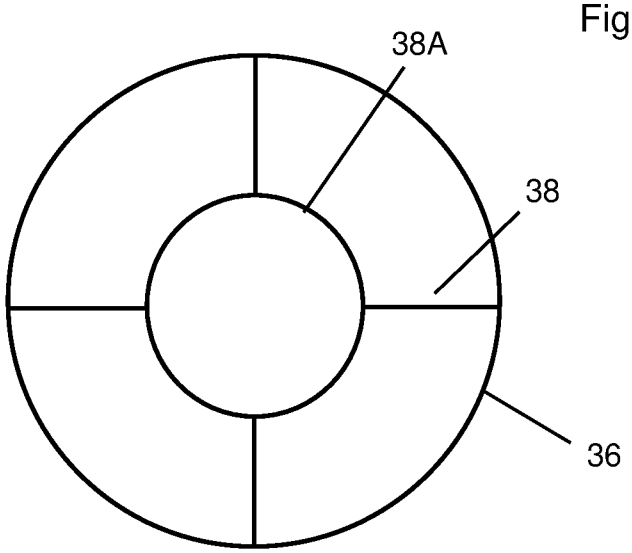
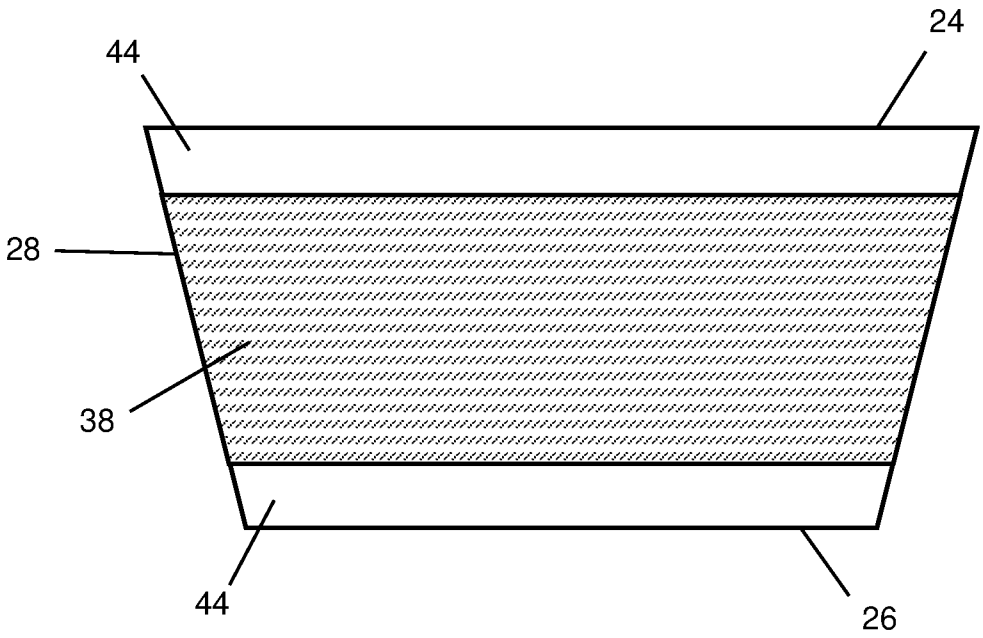


Figure 9

Figure 10





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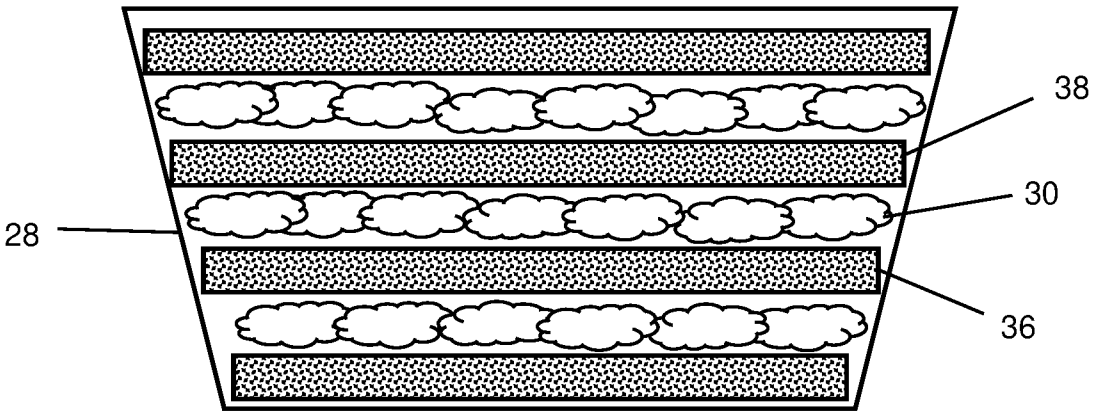

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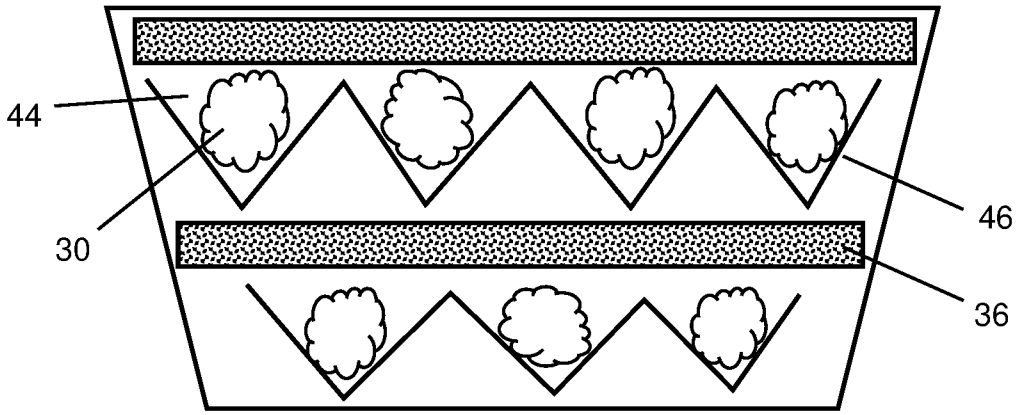

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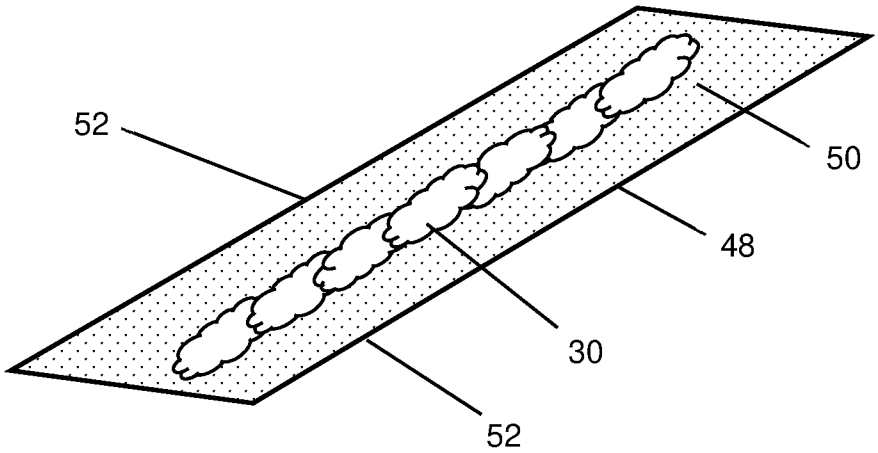

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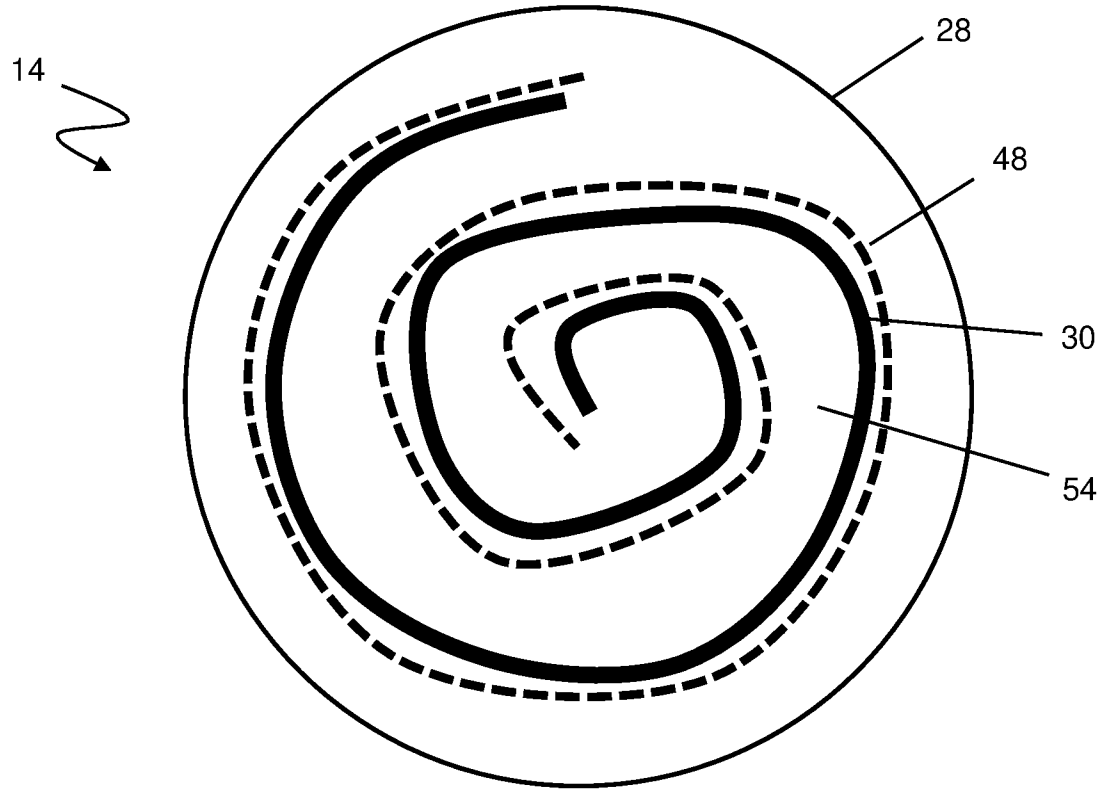

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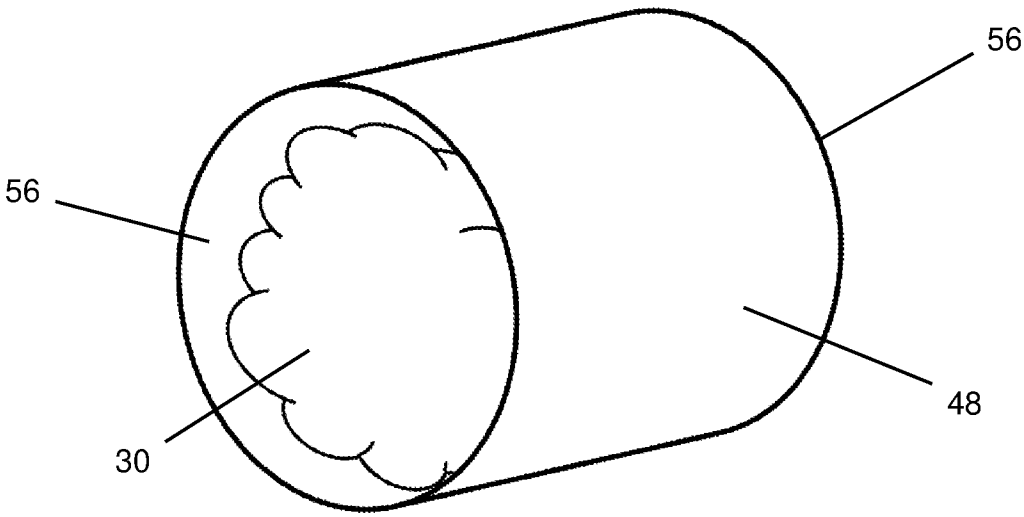

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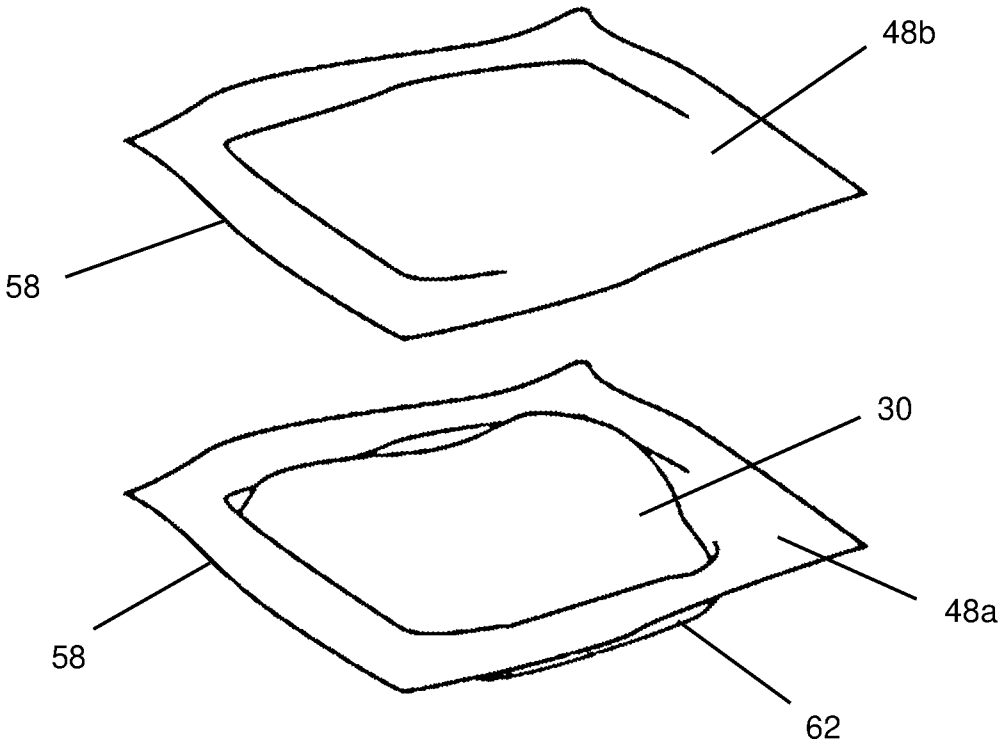

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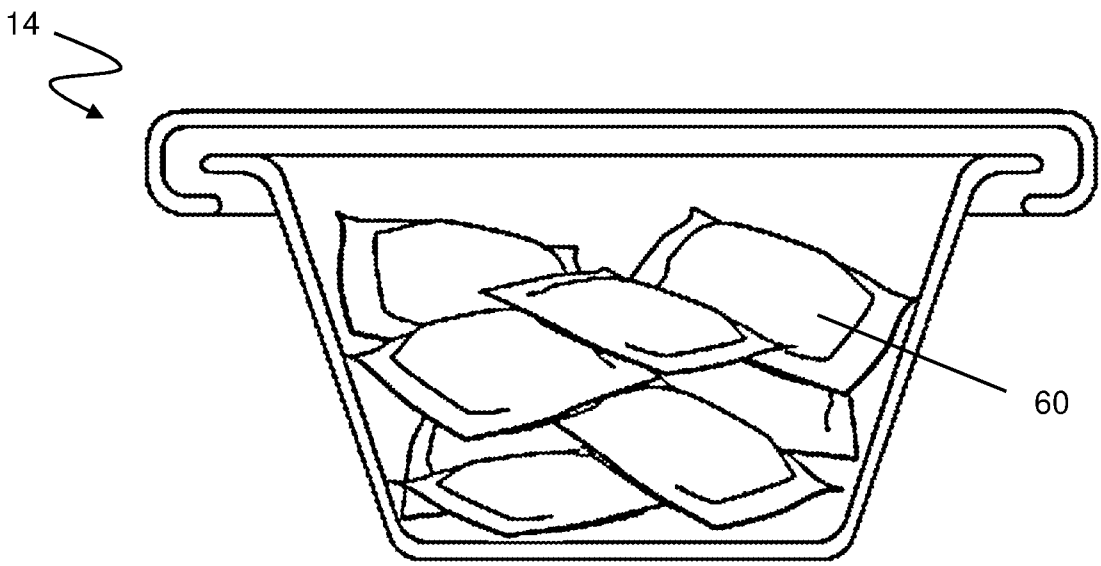
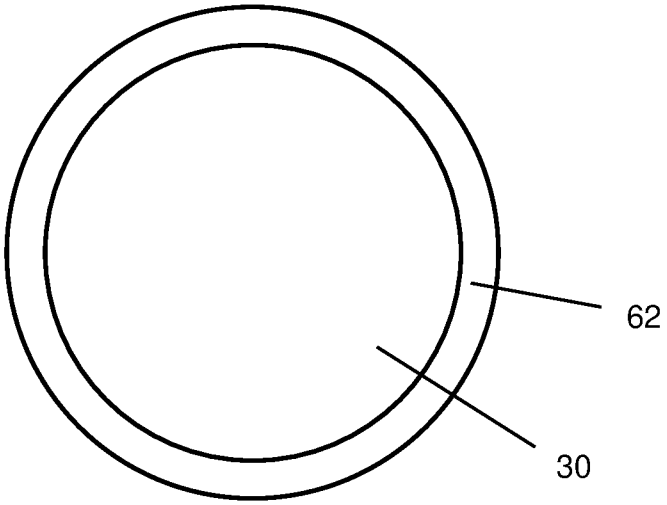


Figure 18

Figure 19



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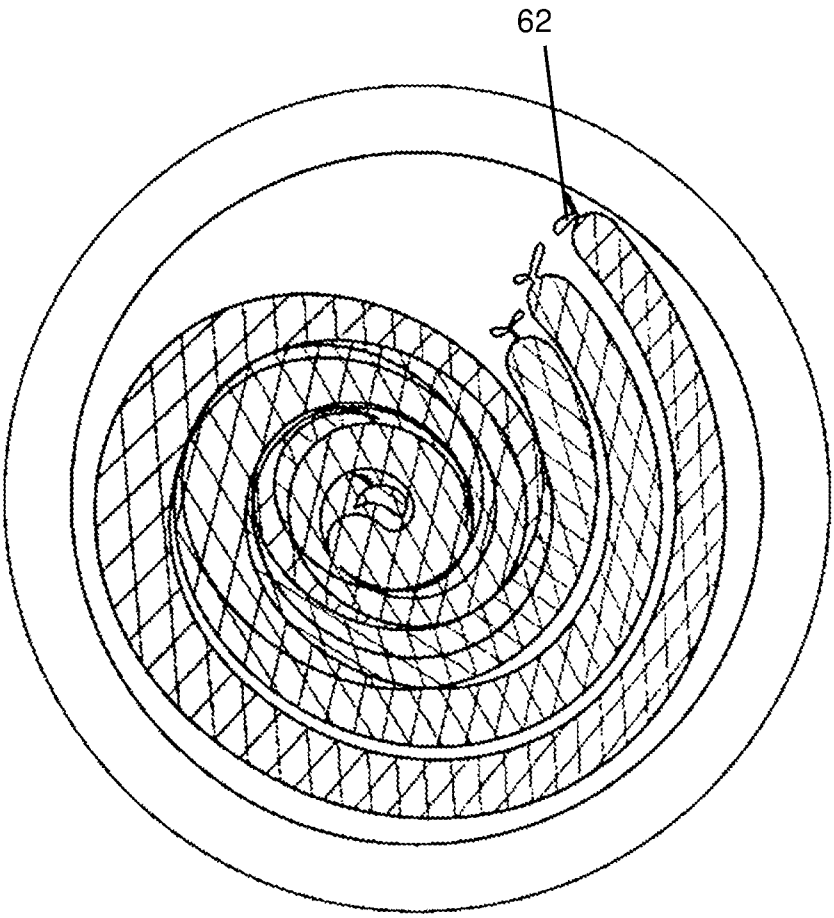

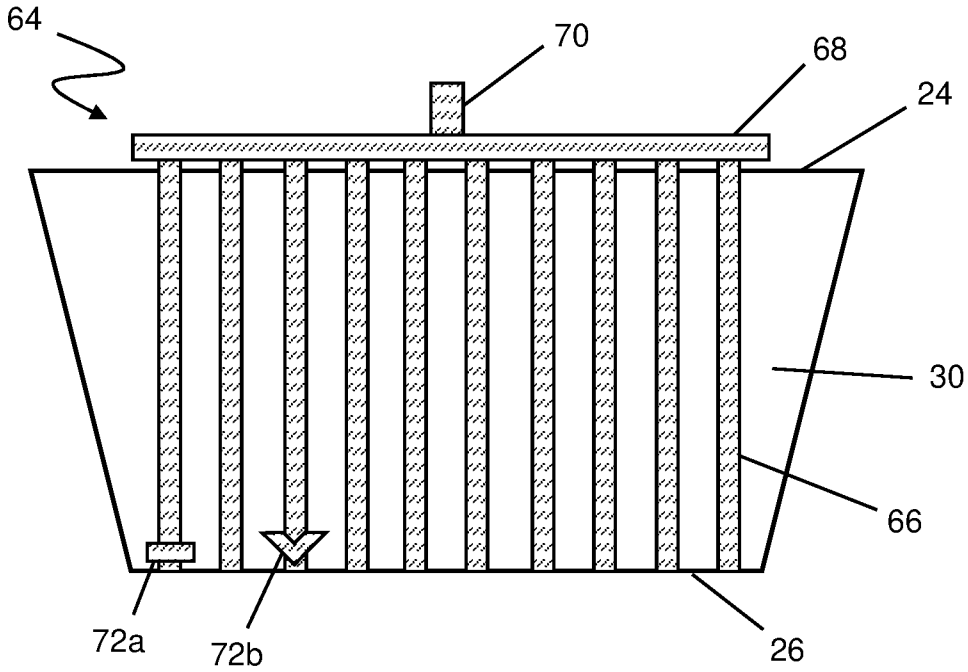

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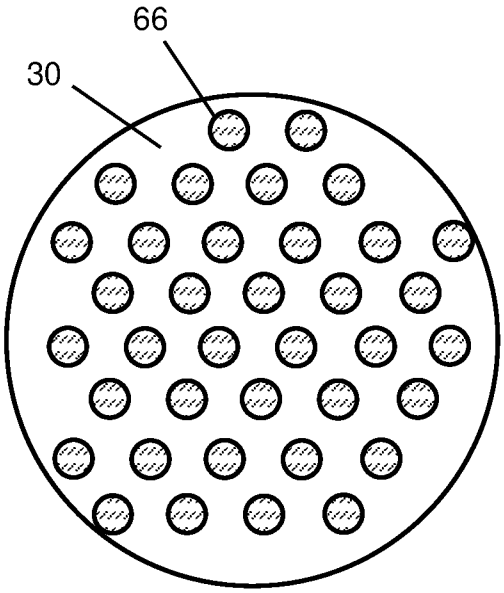

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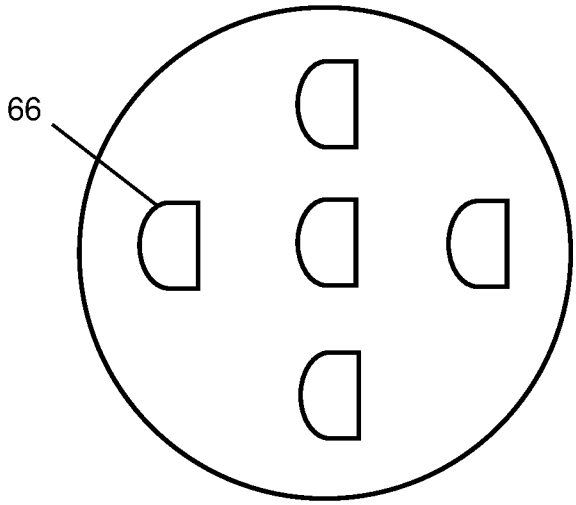

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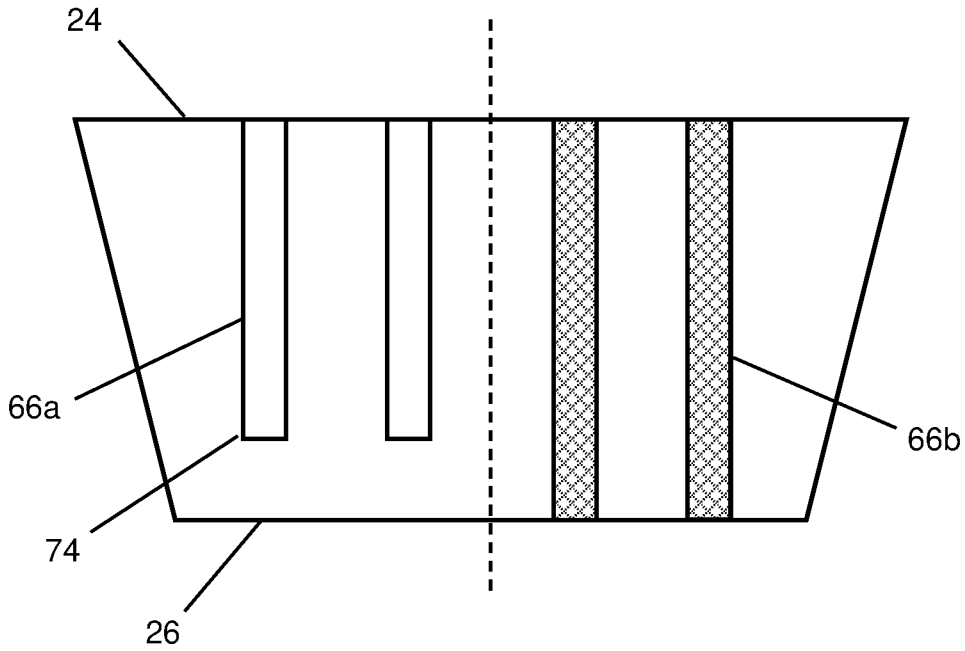

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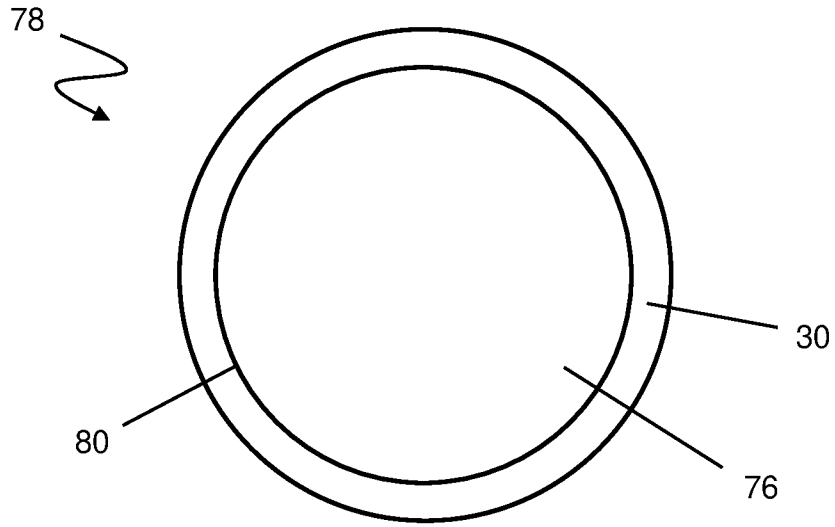

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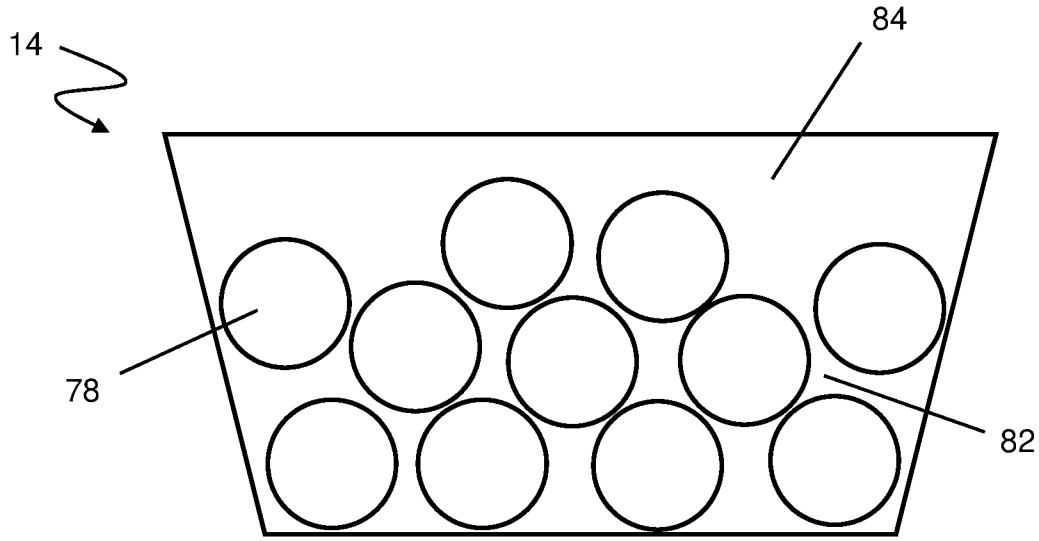
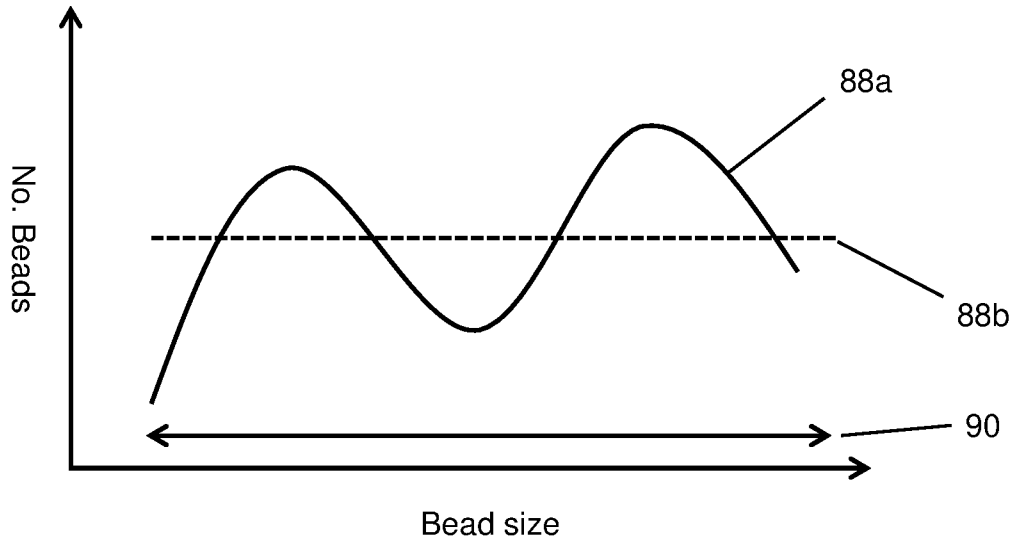


Figure 26

Figure 27



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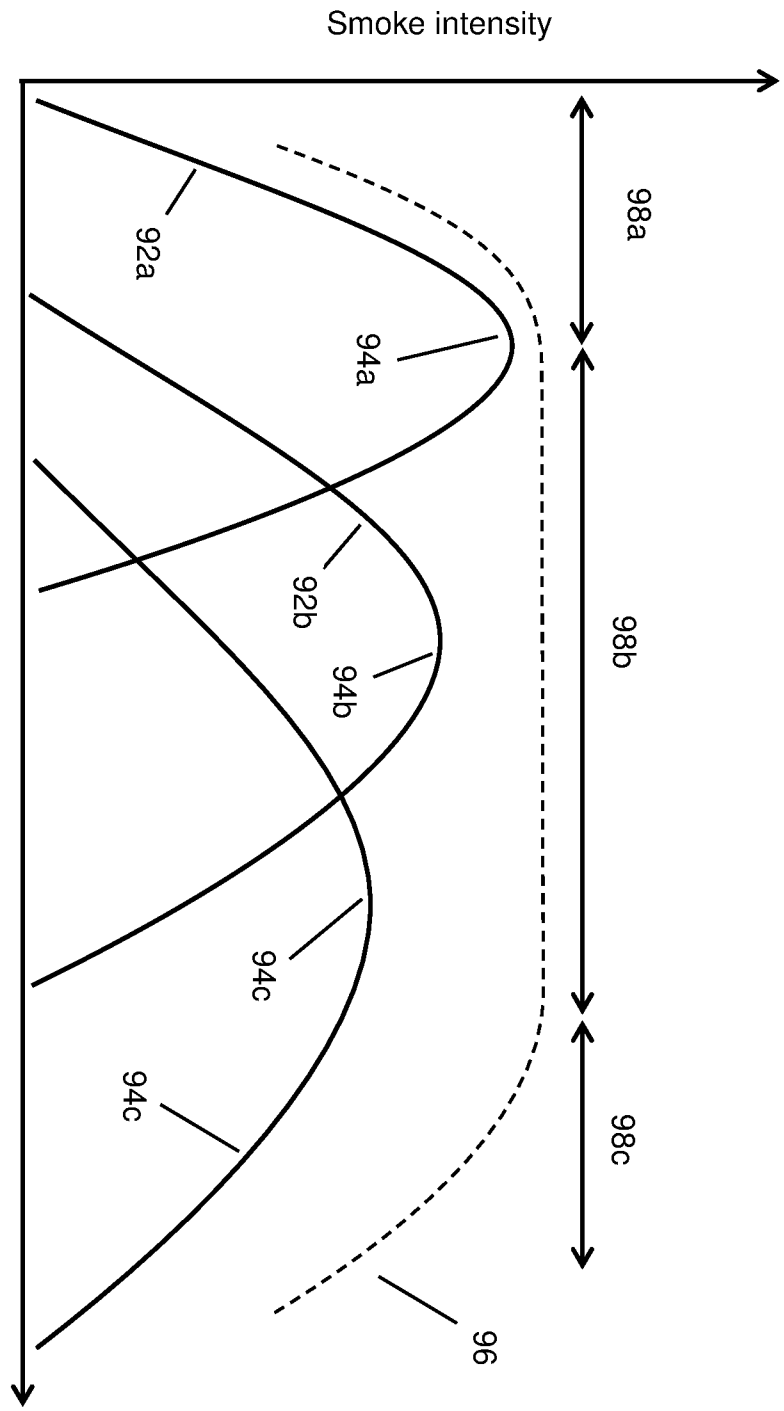

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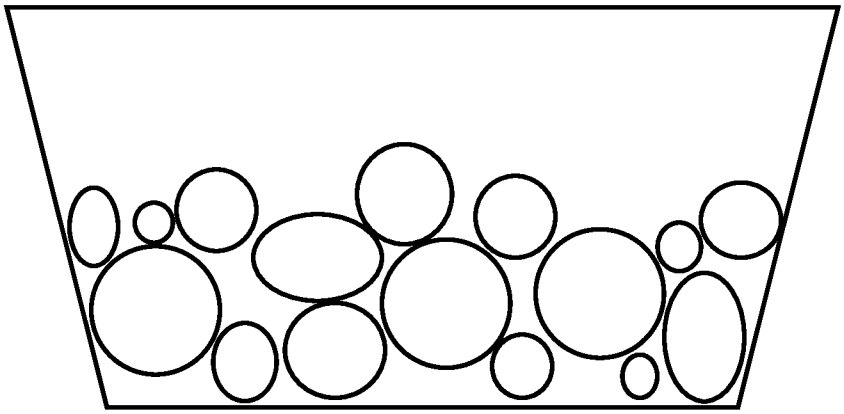

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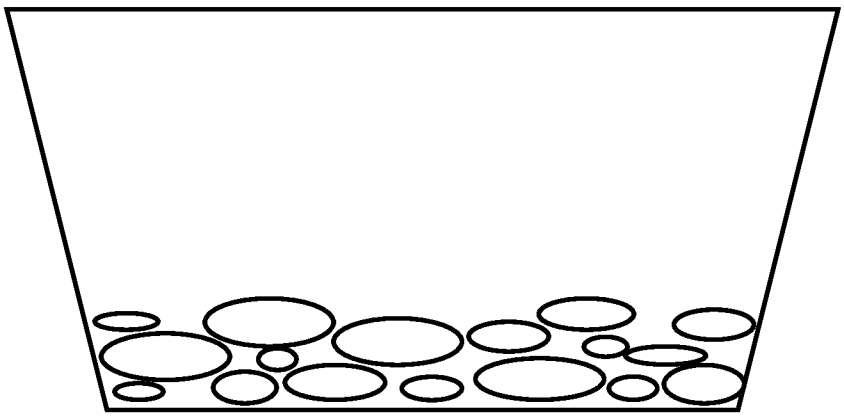

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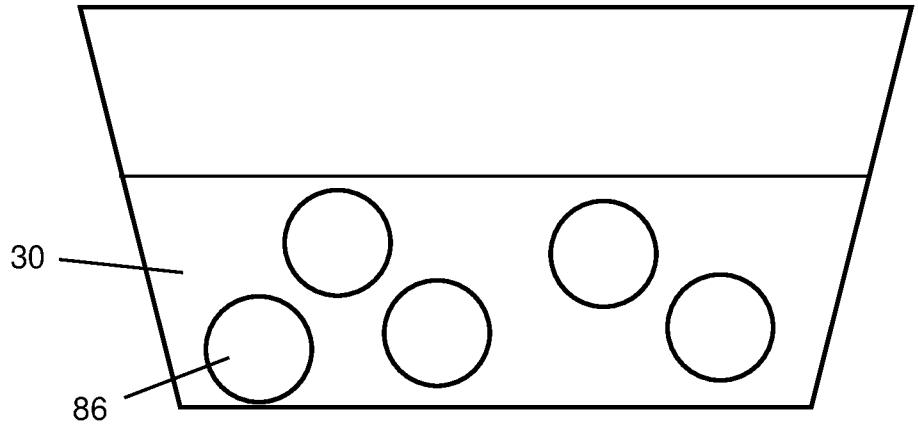

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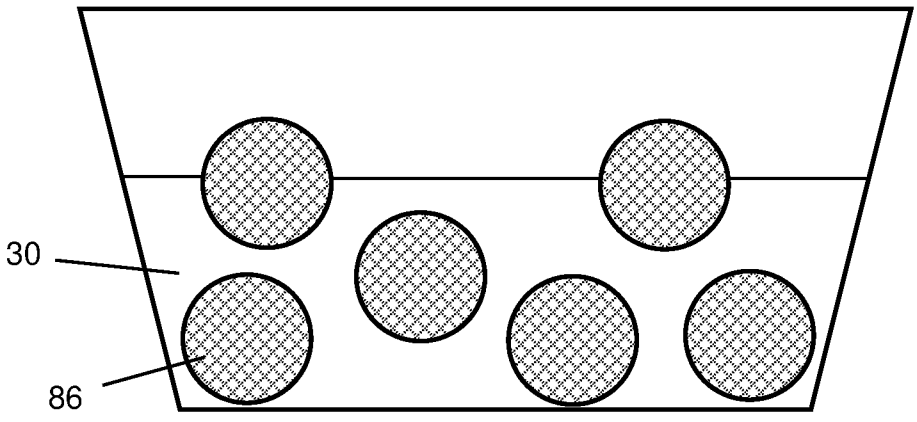

Figure 33

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2022/054625

A. CLASSIFICATION OF SUBJECT MATTER

A24F 1/30 (2006.01) A24F 40/42 (2020.01) A24F 5/04 (2006.01)

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)

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)

Google Patents, Google, Espacenet and PATENW search using keywords: SHEESHA, WALL, CAPSULE, MULTIPLE, AIRFLOW, PATH, CORE, BOWL, ORIENTATION, ARM, ELONGATE, BEADS, CHAMBER, COMPOSITION, TOBACCO, SMOKING PRODUCT, PERFORATIONS, SUPPORT STRUCTURE, HOUSING and like terms. Relevant results viewed.
IPC and CPC symbols: A24F1/30, A24F1/24, A24F40/42, A24F5/04, A24D1/14, H05B1/0244. Relevant results viewed.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	

[X] Further documents are listed in the continuation of Box C [ ] See patent family annex

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"D" document cited by the applicant in the international application
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"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	Date of mailing of the international search report
15 August 2022	15 August 2022
Name and mailing address of the ISA/AU	**Authorised officer**
AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA Email address: pct@ipaustralia.gov.au	Raihan Rumman AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No. +61 2 6283 2443

INTERNATIONAL SEARCH REPORT C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		International application No. **PCT/IB2022/054625**
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2019/167038 A1 (NAKASH ET AL.) 06 September 2019 Abstract, title, Figs. 1, 3, 4, 11, 13, 14, page 4 paragraph 2	1-32
X	CN 109171016 A (SHIMON ET AL.) 11 January 2019, English translation retrieved from Google Patents. Figs. 1-4, abstract, title, paragraph 0002, claim 1.	1-32
X	EP 2179667 B1 (PFLAUM ANDRE [CH]) 16 April 2014 Figs. 2, 4-8, 10, 11, 13, claim 7, column 10 lines 1-20	1-32
X	US 2007/0215164 A1 (MEHIO) 20 September 2007 Figs. 1, 4, 6, abstract, title, paragraph 0026.	1-32
A	CN 210143816 U (KALOUD INC.) 17 March 2020, English translation retrieved from Google Patents. Fig. 18E	11, 16
A	US 4,223,686 A (MRRAY, JR) 23 September 1980 Whole document.	1-32
A	CN 104287090 B (ZHANG) 27 October 2017, English translation retrieved from Google Patents. Whole document.	1-32
A	US 2019/0124977 A1 (PHILIP MORRIS PRODUCTS S.A.) 02 May 2019 Whole document.	1-32