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(54) **Title:** ADDITIVE RELEASE COMPONENT

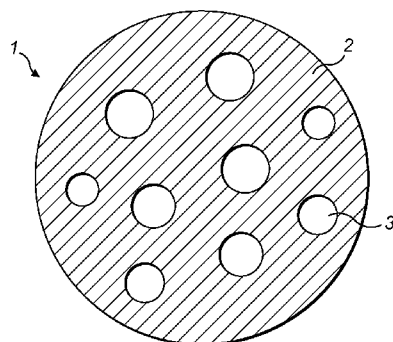


FIG. 1A

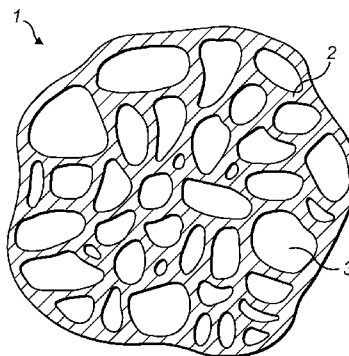


FIG. 1B

(57) **Abstract:** An additive release component for a smoking article is disclosed. The additive release component comprises a closed cell structure (1) comprising support material (2) with voids which form a plurality of closed cells (3) containing an additive. A filter for a smoking article that comprises said additive release component, a smoking article that comprises said additive release component, and a method of manufacturing said additive release component are also disclosed.



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Additive Release Component

Technical Field

The present invention relates to additive release components that may be suitable for
5 use in smoking articles.

Background

As used herein, the term “smoking article” includes smokeable products such as
cigarettes, cigars and cigarillos whether based on tobacco, tobacco derivatives,
10 expanded tobacco, reconstituted tobacco or tobacco substitutes and also heat-not-burn
products (i.e. products in which flavour is generated from a smoking material by the
application of heat without causing combustion of the material) and other articles
capable of generating tobacco derived aerosols. Typically, smoking articles are provided
with filters for removing constituents from the gaseous flow.

15 Additive release components in the form of capsules are known to be incorporated into
smoking articles. These capsules may be actuated to release additive by the application
of a compressive force by the user of the smoking article. A known capsule may
comprise an outer frangible shell surrounding a hollow core, the hollow core containing
20 liquid additive before release.

Summary

According to a first aspect, there is provided an additive release component for a
smoking article, the additive release component comprising a closed cell structure
25 comprising support material with voids which form a plurality of closed cells containing
an additive.

In some embodiments, the support material of the closed cell structure comprises a
polymer such as, for example, a polysaccharide and/or a cellulose acetate, or a
30 derivative thereof.

In some embodiments, the closed cell structure is at least partially surrounded by an
encapsulating structure. Optionally, the encapsulating structure comprises a polymer
such as, for example a polysaccharide and/or cellulose acetate, or a derivative thereof.

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In some embodiments, the additive release component is configured to release a plurality of discrete deliveries of additive.

5 According to a second aspect, there is provided a filter for a smoking article that comprises an additive release component according to the first aspect.

According to a third aspect, there is provided a smoking article comprising an additive release component according to the first aspect or a filter according to the second aspect.

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According to a fourth aspect, there is provided a method of manufacturing an additive release component according to the first aspect, the method comprising: providing a first liquid comprising a precursor of a support material; providing a second liquid comprising an additive, wherein the first and second liquids are immiscible; forming an emulsion of the first and second liquids; and treating the emulsion so as to form a support material having at least one closed cell containing the additive.

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In some embodiments, the first liquid is treated by drying, curing and/or heating to form the support material.

20

In some embodiments, the method further comprises a step of at least partially encapsulating the closed cell structure.

Brief Description of the Drawings

25 Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figures 1A and 1B are schematic illustrations of cross-sections through closed cell structures according to embodiments of the present invention;

30

Figures 2A and 2B show cross-sections of additive release components including a closed cell structure and encapsulating structures, according to some embodiments of the present invention; and

Figure 3 is a schematic illustration of a perspective view of an additive release component according to an embodiment of the present invention, the component being positioned in within a smoking article.

5 Detailed Description

There is provided an additive release component for a smoking article, the additive release component comprising a closed cell structure which comprises an additive.

10 An additive release component is anything which is capable of retaining an additive and releasing it as and when desired.

In some embodiments of the present invention an additive release component for a smoking article is provided, wherein the additive release component is configured to release a plurality of discrete deliveries of additive. Thus, the additive release
15 component provides for a release of a controllable quantity of additive. Preferably, at least a part of the additive release component is deformable to release the additive.

In some embodiments, the closed cell structure comprises a plurality of cells, which are cavities or voids in or surrounded by walls formed from a support material. At least
20 some of the cells in the closed cell structure are formed so that there is no pathway from the interior of the cells to the exterior of the closed cell structure prior to use (i.e. prior to actuation). In some embodiments, the interior of at least some of the cells is also not connected to the interior of one or more other cells by channels or the like within the closed cell structure prior to use.

25 In some embodiments, the closed cell structure has at least 5 cells, or at least 10 cells.

In certain embodiments of the invention, at least 50% of the cells in the closed cell structure are closed cells. This means that they are not open to the exterior of the
30 structure and, in some embodiments, means that they are also not in communication with other cells. In other embodiments, at least 60%, 70%, 75%, 80%, 85%, 90%, 95%, 97%, 98%, 99%, or at least 99.5% of the cells in the closed cell structure are closed cells.

In some preferred embodiments, the additive is held within at least one of the closed
35 cells of the closed cell structure.

The closed cell structure thus comprises cells which hold an additive and which enclose the additive, thereby isolating it from the exterior of the closed cell structure until the closed cell structure is actuated, for example, by compression, to disrupt the structure, and more specifically the walls formed from the support material, and create one or
5 more pathways from the cell(s) to the structure's exterior to allow release of the additive.

Holding the additive in the closed cells of the closed cell structure means that the additive may be retained within the structure without the need for a further
10 encapsulating layer. The closed cell structure protects the additive from the environment and prevents its release before the additive release component is actuated.

Holding the additive in the closed cells of the closed cell structure also allows the additive to be held in relatively small, isolated quantities, the release of which can, to an
15 extent, be controlled to provide some degree of control over the volume of the additive released and the timing of its release, with multiple doses being releasable.

Figures 1A and 1B are illustrations of cross-sections through closed cell structures according to some embodiments. The closed cell structure 1 comprises support
20 material that forms walls 2 which define closed cells 3, which can contain additive (not shown). The cell size shown is purely illustrative, and is not intended to be limiting. Any suitable cell size may be used.

According to some embodiments, the additive should be incorporated into the cells of the closed cell structure upon manufacture of the closed cells, rather than being added
25 to the cells after they have been formed. This ensures that the walls of the closed cells are not disrupted by a filling process which takes place after the closed cells have been formed.

Additive may be released from one or more cells of the closed cell structure when force, for example a compressive force, is applied to the closed cell structure. One or more cracks and/or openings may form in the support material of the closed cell structure when force is applied, thereby creating pathways between the previously closed cells and the exterior of the structure and thus allowing the release of additive from the
30 ruptured closed cells and from the closed cell structure. In some embodiments the support material of the closed cell structure is brittle, frangible or rupturable in order to
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allow development of these cracks and/or openings. In this way, additive may be released when desired.

5 The application of force may cause the rupture of one or more cells. Where this rupture results in the opening of a pathway between the interior of a formerly closed cell which contains additive and the exterior of the closed cell structure, the additive from said cell may be released. The applied force may also distort or compress the cells, thereby forcing the additive out through the pathway(s) formed and potentially resulting in forceful ejection of the additive from the closed cell structure.

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In some embodiments, the magnitude of the force applied will determine the number of cells ruptured and the number of pathways formed to allow release of the additive, thus determining the amount of additive released. Furthermore, repeated application of force may, in some embodiments, result in the rupture of progressively more closed
15 cells and the release of progressively more additive, potentially in multiple separate doses.

In some embodiments, the approximate quantity of additive which is released in a single delivery may be controlled by the user. For example, the user may modify the
20 magnitude, location and/or direction of force that is applied to the additive release component, thereby controlling the proportion of closed cells that are opened and the amount of additive that is released.

A plurality of discrete deliveries may be achieved by application of a plurality of
25 separate compressions of the additive release component by the user. In some embodiments, the application of force to different parts of the closed cell structure, and/or in different directions, may result in different cells being ruptured and further additive being released.

30 The support material of the closed cell structure may comprise any suitable material or materials, provided it is or they are capable of retaining the contained additive until its release is desired. It may also be desirable to ensure that the support material is compatible with the additive to be held in the cells and/or does not react with the additive.

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In some embodiments, the support material is a solid material. In other embodiments, the support material may be a semi-solid or quasi-solid, such as a gel or wax. In certain embodiments, the support material is preferably a solid. This may assist in the rupture or fracture of the cells by breaking of the solid support material to form cracks or gaps which form a pathway through which the additive may move to the exterior of the structure.

In some embodiments, the support material may comprise one or more polymer. The polymer(s) may be natural or synthetic. The polymer(s) may be crosslinked. For example, the support material may comprise one or more polysaccharides. In some embodiments, the polymer may be cellulose acetate or any suitable derivative thereof. In particular, the support material may be formed from cellulose acetate. Alternatively or in addition, the support material may comprise gelatin. In some embodiments, a foamed support material may be used to form the closed cell structure, which may be a foamed plastic polymer such as polyvinyl alcohol (PVOH). In some embodiments, the support material used to form the body of the closed cell structure does not have any effect on the taste or any other properties of the mainstream smoke of the smoking article into which the closed cell structure is incorporated.

In certain embodiments, polysaccharides are preferred as the support material of the closed cell structure because they are biocompatible, non-toxic and hypo-allergenic. In addition, they can be made water insoluble and relatively heat stable at lower temperatures (e.g. below approximately 75°C) through crosslinking, for example by salt bridges.

In some embodiments, the closed cell structure deforms upon application of a compressive force. As the closed cells rupture and collapse under the force, the closed cell structure also collapses. In some embodiments, the closed cell structure makes little or no return to its original form. This largely irreversible collapse is particularly observed where the support material is brittle or frangible, and/or where the material is not resiliently deformable. Even where the closed cell structure comprises a support material which is inherently a resiliently deformable material, the nature of the closed cell structure may mean that the structure does not recover fully or recovers only slightly following the application of a compressive force used to actuate the additive release component.

The additive held within the closed cell structures may be anything which may be added to smoke and/or which may modify the composition of smoke. The additive may be a flavour or flavourant (where permitted by local regulations), a deodoriser, a diluent, an adsorbent, or any other substance that is capable of modifying the smoke. The additive
5 may be water.

An additive may be a solid, such as a powder; a liquid; or a gas. In some embodiments, the additive is preferably a liquid.

10 As used herein, the terms "flavour" and "flavourant" refer to materials which, where local regulations permit, may be used to create a desired taste or aroma in a product for adult consumers. They may include extracts (e.g., licorice, hydrangea, Japanese white bark magnolia leaf, chamomile, fenugreek, clove, menthol, Japanese mint, aniseed, cinnamon, herb, wintergreen, cherry, berry, peach, apple, Drambuie, bourbon, scotch,
15 whiskey, spearmint, peppermint, lavender, cardamon, celery, cascarilla, nutmeg, sandalwood, bergamot, geranium, honey essence, rose oil, vanilla, lemon oil, orange oil, cassia, caraway, cognac, jasmine, ylang-ylang, sage, fennel, piment, ginger, anise, coriander, coffee, or a mint oil from any species of the genus *Mentha*), flavour enhancers, bitterness receptor site blockers, sensorial receptor site activators or
20 stimulators, sugars and/or sugar substitutes (e.g., sucralose, acesulfame potassium, aspartame, saccharine, cyclamates, lactose, sucrose, glucose, fructose, sorbitol, or mannitol), and other additives such as charcoal, chlorophyll, minerals, botanicals, or breath freshening agents. They may be imitation, synthetic or natural ingredients or blends thereof. They may be in any suitable form, for example, oil, liquid, or powder.

25 The flavour may be a tobacco flavour. Where the flavour is delivered in liquid form the tobacco flavour could be derived from tobacco extract. Where the flavour is derived from a solid product, the product could be tobacco leaf in shredded, particulate or granular form, or in the form of reconstituted tobacco sheet material.

30 In some embodiments, the or one of the additives contained in the additive release component may be menthol.

The closed cell structure may comprise one or more additives. One or more additives
35 may be contained in a single cell in the closed cell structure. The same single additive or the same combination of additives may be contained in each cell of the closed cell

structure. Alternatively, different additives and/or different combinations of additives may be contained in each cell of the closed cell structure. In some embodiments, an additive release component comprises multiple closed cell structures and different additives may be included in different closed cell structures.

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In some embodiments, the additive release component consists essentially only of the closed cell structure and the additive.

10 In other embodiments, the additive release component comprises the closed cell structure, the additive contained therein, and an encapsulating structure which at least partially surrounds the closed cell structure and the additive.

Figures 2A and 2B are illustrations of cross-sections through additive release components according to some embodiments of the invention. In these embodiments, 15 the additive release components 10 comprise closed cell structures 11. The closed cell structures 11 comprises support material that forms walls 12 which define closed cells 13, which can contain additive (not shown). The cell size shown is purely illustrative, and is not intended to be limiting. In Figure 2A, the closed cell structure 11 is surrounded by an encapsulating structure which is in the form of a shell 14. The 20 illustrated shell is a rigid capsule or similar casing which may, for example, be formed from gelatin or other suitable materials, into which a closed cell structure has been placed. In Figure 2B, the closed cell structure 11 is surrounded by an encapsulating structure which is in the form of a coating 15. The illustrated coating is a membrane-like structure which surrounds the surface of the closed cell structure 11. This coating 25 may be rigid or flexible. In the illustration, the coating 15 is shown as not being attached to the closed cell structure 11. However, in some other embodiments, the coating 15 may be applied to the surface of the closed cell structure 11 so that it is in contact with, and may be bonded to, the surface of the closed cell structure 11.

30 An encapsulating structure may comprise any suitable material and may partially or completely surround or encapsulate the closed cell structure. An encapsulating structure may be frangible, plastically deformable, or resiliently deformable in response to the application of force. If the encapsulating structure is frangible, then it may be ruptured when a force is applied thereto and the additive may subsequently be 35 squeezed from the additive release component. In one embodiment, for example, the encapsulating structure has a thickness of approximately 0.2 mm. If the additive

release component comprises more than one encapsulating structure, the encapsulating structures may have the same or different thickness, shape and/or material composition.

- 5 Encapsulation of the closed cell structure may help the closed cell structure to retain the additive until its release is desired, for example by reducing the risk of accidental actuation of the additive release component by increasing the force required for actuation and release of the additive.
- 10 Alternatively or in addition, encapsulation may allow release of the additive from the additive release component in a predetermined, directional manner. When the additive is released from the closed cell structure, it may not be possible to predict or control the direction in which the additive will leave the closed cell structure. However, if the closed cell structure is at least partially surrounded by an encapsulating structure, this
- 15 structure may be configured to release the additive out of the additive release component in a predetermined direction. For example, the encapsulating structure may include one or more apertures through which the additive will exit the additive release component. These apertures may be present in the encapsulating structure before actuation (where the encapsulating structure partially surrounds the closed cell
- 20 structure), or they may be formed or opened when the additive release component is actuated (for example, by the application of a compressive force).

In some embodiments, the encapsulating structure may be resiliently deformable so that the structure and/or the additive release component reverts to its original shape and size following compression, even if the closed cell structure held therein does not.

25 This means that the size and shape of the additive release component is substantially the same before and after actuation. In other embodiments, the size and shape of the encapsulating structure may be affected by actuation. For example, in some embodiments the encapsulating structure does not revert or does not revert fully to its

30 original form after compression. This may happen, for example, where the encapsulating structure is a coating on the surface of the closed cell structure which collapses following actuation; the encapsulating structure may also remain collapsed after actuation. Alternatively, the encapsulating structure may be a rigid capsule and this will be crushed upon actuation of the additive release component and will be

35 unlikely to revert to its pre-actuation shape and size once the compressive force is no longer applied.

Figure 3 shows an exemplary additive release component 45 in a filter 40 of a smoking article, according to an embodiment of the present invention. The additive release component 45 comprises a closed cell structure containing an additive which is held within the closed cells of said structure (not shown). In this embodiment, the closed cell structure is encapsulated by an encapsulating structure in the form of a capsule. The additive release component 45 extends longitudinally in the filter 40, surrounded by filter material (which could be, for example, cellulose acetate tow) in region 42 around the additive release component. The additive release component 45 has an aperture 47 through which the contents of the closed cell structure (the additive) 49 can be released. The aperture 47 is at a longitudinal end of the additive release component 45, and is preferably located on a central longitudinal axis. A portion of the additive contents 49, preferably a fluid, is ejected from additive release component 45 on an initial partial compression, and further doses of additive may be released on subsequent compressions. The aperture may be formed by a frangible area of weakness, or alternatively, a slit valve for example. For example, the outer wall may be provided with a narrow slit, which substantially prevents additive from exiting when the additive release component is not compressed. On compression of the additive release component, the closed cells are ruptured, opening connections or pathways between the cells and allowing release of additive from the closed cell structure. The encapsulating structure may partially contain the additive, and allow exit of the additive through the aperture 47.

The aperture has been shown at only one end of the additive release component. Alternatively, the additive release component may be at both longitudinal ends. Alternatively, the additive release component may define apertures at any two spaced apart locations.

The additive release component is arranged so that under the application of force, additive is ejected, squirted or driven forcibly from the additive release component. The ejection of additive from the additive release component means that the additive may be deposited further from the component and over a larger area than would otherwise be possible. For example, the encapsulating structure may comprise a region configured such that additive is released is ejected or squirted through that (optionally relatively small) region when a force is applied thereto.

In some embodiments, the encapsulating structure may include one or more apertures. In some embodiments, these apertures may be closed before actuation of the additive release component. Alternatively, the encapsulating structure may be configured to rupture or break in a predetermined region only upon actuation, for example by
5 compression. A region of the encapsulating structure may have a greater tendency to rupture because it has a reduced thickness compared to other parts of the encapsulating structure, or because it is formed from an otherwise weaker or weakened material, and/or as a result of the overall shape of the encapsulating structure and/or other parts of the additive release component.

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In some embodiments, the encapsulating structure is configured to transmit force to the closed cell structure in such a way that facilitates the rupture of a greater proportion of the closed cells. For example, the encapsulating structure may be configured to spread the compressive force applied by the user so that it will be applied over a greater
15 area of the closed cell structure, so that a greater number of the cells are ruptured than would be ruptured by application of the same amount of force to an additive release component which does not include the encapsulating structure.

The additive release component may comprise one or more closed cell structures. In
20 some embodiments, the additive release component comprises a plurality of closed cell structures and these may comprise the same or different additives.

Any encapsulating structure included as part of the additive release component comprises an encapsulating material and this material may be the same as or different
25 from the support material forming the body of the closed cell structure.

Thus, in some embodiments, the encapsulating material may comprise one or more polymers. These polymers may be natural or synthetic, and may be crosslinked. For example, the polymer may be a polysaccharide, such as cellulose acetate, or any suitable
30 polysaccharide derivative, such as cellulose acetate. In some embodiments, both the encapsulating material and the support material are formed from cellulose acetate. Alternatively or in addition, both the encapsulating material and the support material may comprise gelatin.

In some embodiments, the encapsulating material does not have any effect on the taste or any other properties of the mainstream smoke of the smoking article into which the additive release component is incorporated.

- 5 In some embodiments, polysaccharide polymers are preferred because they are biocompatible, non-toxic and hypo-allergenic. In addition, they can be made water insoluble and relatively heat stable at lower temperatures (e.g. below approximately 75°C) through crosslinking, they can be crosslinked by salt bridges, and they can be heated and burned to yield tasteless products.

10

- In certain embodiments, the encapsulating structure may be formed from one or more of the following encapsulating materials: polysaccharides (including, for example, starch, alginate, agar, pectin, carrageenan and gums), proteins (including, for example, gelatine and casein), fats and fatty acids, cellulose derivatives, lipids (including, for
15 example, waxes, shellac, caruba and beeswax).

- In some embodiments, the encapsulating structure may be constructed from a frangible material. In one embodiment the encapsulating structure is composed of a low solubility, high molecular weight polyvinyl alcohol. A number of suitable alternative
20 materials are known, and by way of example, capsules typically utilized in the pharmaceutical industry may be used. Such capsules may be gelatin-based, for example, or may be formed from a polymeric material, such as modified cellulose. One type of modified cellulose which may be used is hydroxypropylmethyl cellulose. Many biodegradable materials are known which may be suitable for use in the production of
25 additive release components and these include high molecular weight polyethylene glycols, polylactic acid, plastarch material, polycaprolactone, polyglycolide, a polyhydroxyalkanoate such as poly-3-hydroxybutyrate, and zein-derived bioplastics.

- In some embodiments, the additive release component comprises a matrix with a
30 closed cell structure, in particular, a closed cell foam substrate. The description refers to a foam, but applies to any type of matrix with a closed cell structure. The closed cell foam defines a matrix having a plurality of small cavities which contain additive. The cavities are closed by the foam material, retaining the additive until selective release. On application of a compressive force, the closed cell foam is configured to release
35 additive. The compressed substrate develops cracks and/or openings, which allow release of the additive. The additive release component is configured to release only a

part of the contents when partially compressed. The substrate preferably substantially plastically deforms on compression. Alternatively, the substrate may partially return towards its original dimensions.

- 5 The closed cell foam substrate does not require an outer shell to retain the additive, and so may form the additive release component without an outer shell. Alternatively, the additive release component may comprise the closed cell foam substrate encapsulated in an outer shell. The outer shell may be frangible, plastically deformable or resiliently deformable on compression.

10

The substrate may be formed by extrusion of the material containing the additive. The extruded closed cell foam is then cut to a suitable length. The closed cell foam may be made from cellulose acetate. The open or closed cell substrate may contain a plurality of additive release components, each comprising encapsulated additive.

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The substrate is optionally surrounded by a frangible, elastically deformable or plastically deformable outer shell. The substrate is preferably configured such that the additive can be released in a plurality of discrete deliveries, preferably by a plurality of separate compressions.

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Any suitable method of manufacture may be used to fabricate the closed cell structure of the additive release component comprising closed cells defined by walls of a support material, with at least one of the closed cells holding an additive.

- 25 In some embodiments, the method comprises: providing a first liquid comprising a precursor of the support material; providing a second liquid comprising the additive, wherein the first and second liquids are immiscible; forming an emulsion; treating the emulsion so as to form a support material having at least one closed cell containing the additive.

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The first liquid (comprising a precursor to the support material) may comprise any materials that are suitable for generating the support material which will form the closed cell structure. Examples of suitable materials are discussed above.

- 35 In some embodiments, the first liquid may comprise gelatin and water, for example.

The second liquid (comprising the additive) may, in addition to the additive, comprise one or more further components. For example, the second liquid may include a diluent which may adjust the concentration of the additive that will be incorporated into the closed cell structure. For example, in some embodiments where the additive is menthol,
5 a suitable diluent may be glycerine and/or any suitable oil.

Any suitable method of emulsification may be used, and any suitable emulsifiers may be used to facilitate emulsification if necessary. For example, if the second liquid comprises a hydrophobic additive, such as menthol, then a hydrophobic emulsifier,
10 such as oil or propylene glycol, may be used to promote the formation of an emulsion and/or may enhance the thermodynamic stability of the liquid-in-liquid emulsion.

In some embodiments, the liquid-in-liquid emulsion is extruded into droplets using any suitable extrusion process. The formed droplets comprise an emulsion in which a
15 plurality of droplets of the second liquid (comprising additive) is dispersed in the first liquid (comprising the support material precursor).

In some embodiments, the emulsion is treated to form the body of support material from the first liquid in the emulsion. This treatment may occur during the extrusion
20 process. Alternatively or in addition, the treatment of the emulsion may occur after the extrusion process. The treatment may involve any suitable method in order to generate a support material from the first liquid (comprising the support material precursor), to form the body of a closed cell structure. The first liquid may be chemically and/or thermally treated or dried, so that it is hardened and/or solidified. For example, the
25 emulsion may be exposed to conditions which result in the first liquid solidifying. In some preferred embodiments, the treatment alters the first liquid whilst having little or no effect on the second liquid.

Where the support material precursor comprises one or more polymer molecules, the
30 liquid may be hardened and/or solidified by treating the first liquid comprising said precursor so that crosslinks are formed between the polymer molecules. The formation of crosslinks between the polymer molecules may, for example, provide structural stability to the material. Any suitable method of forming crosslinks may be used, and any type of crosslink may be formed between the polymer molecules of the support
35 material. Ionic and/or covalent bonding may be utilised, for example.

Ionic bonds, in particular, could be utilised in the following way. Chemical ions could be introduced between electrostatically-charged polymers to result in the formation of salt bridges there between. These salt bridges would act as crosslinks and would generate a three-dimensional network of polymer chains and salt bridges. The formed crosslinked structure would be an effective support material as it would not be able to flow or melt, and it would be heat-stable and structurally stable. In some embodiments, the chemical ions utilised for the formation of the salt bridges are multivalent cations, since these would be able to form salt bridges with anionic polymers, such as polysaccharides.

In some embodiments, multivalent cations are added to the non-crosslinked polymers in solution, which may, for example, be an aqueous or alcohol solution. In some embodiments, the multivalent cations used are iron, aluminium, manganese, copper, zinc, and/or lanthanum. In some embodiments, calcium is a particularly preferred multivalent cation. These multivalent cations may, for example, be used to crosslink polysaccharides. In some embodiments, the multivalent cations are provided in solution as metal salts, such as lanthanum or calcium salts. In some embodiments, calcium salts, such as calcium acetate, calcium chloride or other calcium salts are used.

Various properties of the support material and/or of the body of the closed cell structure may be controlled by modifying the crosslinking process. The hardness of the support material may be controlled, for example, by controlling the degree or extent of crosslinking which takes place. The formation of more crosslinks would most likely result in the formation of a harder material, while the formation of fewer crosslinks would most likely result in the formation of a softer, more malleable material. Therefore, the hardness of the support material and of the closed cell structure may be controlled by modifying the extent to which the polymers and the multivalent cations are able to react. For example, the length of time over which the polymers and cations are able to react may be limited in order to limit the number of crosslinks that are able to form. This could, for example, result in the formation of a gel. Alternatively, the length of time over which the polymers and cations are able to react may be extended in order to increase the number of crosslinks that are formed and thereby result in the formation of a solid structure.

In other embodiments, polymers that do not form crosslinks may be incorporated into the support material of the closed cell structure. These polymers may be incorporated

in order to act as filler polymers. Filler polymers are able to decrease the porosity of the formed material, and may, for example, do so by filling naturally-occurring voids and fissures between polymer chains and crosslinks. In some embodiments, any incorporated filler polymers are polysaccharides, such as xanthan gum, and/or
5 synthetic polymers, such as polyethylene glycol.

In some embodiments the second liquid, which comprises the additive, is preferably a liquid which is not affected by the treatment process to which the emulsion is exposed. Thus, the droplets of the second liquid in the emulsion of the first and second liquids
10 will remain in liquid form as the first liquid which surrounded these droplets is solidified by the treatment step. This results in the formation of a closed cell structure in which the closed cells hold the second liquid, preferably in unchanged form, although in some embodiments, the treatment step may affect the second liquid. For example, the treatment step may involve the application of heat and so the first liquid
15 may be dried or concentrated, or may be otherwise changed.

In alternative embodiments, the closed cell structure may be formed by a foaming process. A gaseous phase material comprising the additive may be used to foam a liquid comprising a precursor of the support material that will form the walls of the closed cell
20 structure. Upon treatment of the foam, the support material is formed. The additive may thus become trapped within the closed cells of the solidified foam which forms the closed cell structure. In some embodiments, the additive may cool and form a liquid. In other embodiments, the additive may remain in the gaseous phase.

25 In some embodiments, the liquid to be foamed may include components which facilitate the formation of the foam and/or stabilise it to allow the foam structure to dry without collapsing. Such components would be well known to a person skilled in the art.

30 In some embodiments, the closed cell structure may optionally be completely or partially encapsulated with one or more encapsulating structures. Any suitable method may be used to apply an encapsulating layer. For example, the encapsulating material may be applied to the surface of the closed cell structure by spraying.

35 In other embodiments, the closed cell structure is encapsulated by placing the structure in a pre-formed shell, such as a capsule.

In yet further embodiments, closed cell structures are coated in an outer shell material, for example, gelatin. The structures are dipped into a bath of fluid outer shell material. The structures are lowered on a support into the outer shell material bath until the
5 structures are fully immersed in the fluid. The support is then raised, removing the structures from the fluid and leaving them coated in the outer shell material to form additive release components. The outer shell material may be dried or treated to form a solid outer shell which is frangible, resiliently deformable or plastically deformable.

10 In other embodiments, the outer shell may be formed by a variety of different known processes and the process used may determine the material from which the shell is formed. For example, the outer shell may be manufactured by a known co-extrusion process. Alternatively, a soft-gel process may be used, which is known for making soft-gel type capsules. The shell fluid used in these processes may be a warm gelatin
15 solution. Alternatively, the shell material may be alginate, agar-agar, gum arabicum, latices or waxes. Alternatively, capsules may be formed by interfacial polymerisation, which may, for example, produce a capsule size of 0.2µm to a few millimetres. The shell may be made of a polymer, for example, polyester, polyamide, polyurea, polyurethane, or a biodegradable polymer e.g. protein, polysaccharides or oligosaccharides.

20 Alternatively, the shell may be formed by complex coacervation, which may produce a particle size of 10µm to a few millimetres. The shell may be made from gelatine and gum arabic. Alternatively, the shell may be formed by single extrusion, which may produce a particle size of 200µm to a few millimetres. The shell may be made from alginate, chitosan, carrageenan, cellulose derivatives, or waxes. Alternatively, the shell
25 may be formed by melt extrusion, which may produce a particle size of 300µm to a few millimetres. The shell may be made from gelatine, sugars, maltodextrins, corn syrup, food polymers or modified starches. Alternatively, the shell may be formed by melt injection, which may produce a particle size of 200µm to a few millimetres. The shell may be made from carbohydrate materials, e.g. sucrose, glucose syrups and modified
30 starches. Alternatively, the shell may be formed by a spray drying process, which may produce a particle size of 10µm to a few millimetres. The shell may be made from polysaccharides (starch, alginate, agar, pectin, carrageenan, gums), proteins (gelatine, casein), fats and fatty acids, cellulose derivatives, lipids (waxes, shellac, caruba or beeswax).

Materials for the additive, additive release components or filter comply with and/or are subject to applicable regulatory requirements/approvals.

One or more additive release components may be incorporated into a smoking article.

5 An additive release component may be positioned at any suitable location in a smoking article.

In some embodiments, the additive release component is preferably located in a filter, within the filter material. Alternatively or in addition, the additive release component
10 may be located in a tobacco rod. Alternatively or in addition, the additive release component may be located in a separate section of the smoking article, not surrounded by filter material. For example, the additive release component may be located in a separate section located between the tobacco rod and filter or may be included in a cavity in the filter section.

15 In yet further embodiments, the additive release component may be positioned so that at least part of it is external to the smoking article. For example, the additive release component may be attached to an external, radial recess or groove formed in the surface of the smoking article, for example around a part of the filter section.

20 Where the additive release component is located within a filter, the filter material in which the component is held may comprise any suitable filter material, such as cellulose acetate, polypropylene, paper or any other suitable material.

25 The filter may comprise a reaction surface against which the additive release component can be urged, in order to facilitate actuation of the additive release component and release of the additive. In some embodiments, the additive release components may be located on a periphery of the filter. The radially adjacent filter material may provide a reaction surface against which the additive release component
30 can be urged. Preferably, the filter material may be relatively hard (e.g. containing an increased amount of plasticiser) to form the reaction surface, and may have a hardness on the Filtrona scale of more than 90%. The additive release component may be located within the filter material, or may be located in a cavity adjacent to the filter material. The cavity may be formed by an elongate inner rod of filter material, which one or two
35 annular outer sections of filter material surround. A covering layer forming an exterior of the filter is attached to one or both of the outer sections of filter material, and spaced

from the inner rod to define a cavity. Preferably, the inner rod is harder than the annular outer sections, optionally by containing more plasticiser.

As discussed above, the closed cell structure may collapse after being compressed to
5 release the additive contained therein. Where the additive release component collapses following actuation (for example, because the closed cell structure is not enclosed in an encapsulating structure or the like, or because the encapsulating structure does not revert substantially to its original size and shape after actuation), actuation will either cause the section of the smoking article containing the additive release component to
10 collapse, or the outer shape of the section of the smoking article will be retained and a void will be created within the section. The smoking article may be provided with a strengthened outer section surrounding the additive release component to ensure that the smoking article retains its shape after actuation of the additive release component. This strengthened outer section may constitute an annular portion of greater structural
15 rigidity, such as an additional surrounding layer or a layer of filter material having increased hardness (as described above). A void in the smoking article created by actuation of the additive release component may generally correspond to the difference between the original shape of the additive release component and its shape after actuation. In embodiments where the additive release component is embedded in filter
20 material in the filter section of a smoking article, actuation of a collapsing additive release component will leave a void around the component. In some embodiments, the filter is designed to allow for this creation of a void and its effect on the airflow through the filter.

25 The additive release component may be sized, shaped, or positioned so that at least a portion of the component is within the smoking article, and a portion is external to the smoking article. In other words, at least a portion of the external component may not be encompassed by the smoking article. For example, when the smoking article is a cigarette, at least a portion of the external component may not encompassed by the
30 plugwrap, cigarette paper, tipping paper, or any other paper or covering of the cigarette. In other words, at least a portion of the component may be outside of all of the other components of the smoking article both prior to and during use. In particular, the user may be able to see, touch, and feel at least a portion of the component directly. In some embodiments, the component may protrude from the smoking article filter.
35 The external portion may merely comprise a single surface. For example, the component may be shaped to fit within a cavity in a smoking article filter, one surface

of the component being shaped so that when the component is combined with the filter, the external surface of the component is flush with the outer surface of the filter.

Where at least a portion of the component is external to the smoking article, at least
5 this portion of the component will be directly accessible to the user. Therefore, the user will be able to readily detect the release of the additive from the component, for example, by simply feeling the movement of the component, by observing the release of the additive, or by detecting an aroma. Furthermore, in some embodiments, release of the additive from the component may be accompanied by an audible noise, or a
10 detectable change in the feel of the component.

The portion of the component that is at or near the surface of the smoking article, or is external to the smoking article may be a section of the component structure towards which force should preferably be exerted in order to release the additive. For example,
15 in components in which the additive is released due to one part of the component being pushed into another part of the component, the part of the component that is pushed may be at or near the surface, or may protrude from the surface, of the smoking article. The smoking article may include some indication that force should be exerted in this region in order to release the additive. For example, the component may comprise a
20 surface having pimples or ridges, or other features, that may be detectable through any filter material or wrapping layers of the smoking article; alternatively or in addition, the smoking article filter may comprise a graphic or other printed indication on the outer surface.

25 The size of the additive release component and/or closed cell structure may be dependent on the volume of additive required, which in turn may be dependent on a number of factors, including the potency of the additive and the degree of smoke modification desired. Generally, it is preferable for the volume of the additive release component and/or closed cell structure to be as large as possible, so that as much
30 additive as possible may be provided, to modify the smoke as significantly as possible. It should be noted that substantially no air flow through the closed cell structure will be possible. In some embodiments no air flow through the additive release component will be possible.

35 The additive release component and/or closed cell structure should not be so large that it has an adverse effect on the filtration or draw characteristics of the filter.

Furthermore, as the size of the additive release component and/or closed cell structure is increased, the risk of accidental release of additive from the component may also be increased.

- 5 In some embodiments, the length of the component is within the range 1 mm to 50 mm, and may be from 3 mm to 350 mm, or from 15 mm to 35 mm. The diameter of the component is preferably within the range 0.1 mm to 6 mm, and more preferably 1 mm to 5 mm. In one particular embodiment, the component is at least 7mm in length. In some embodiments the component is elongate in shape, being longer than it is wide.

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- The additive release component and the closed cell structure incorporated therein may have essentially any shape. The component and/or foam may be, for example, spherical, toroidal, hemispherical, conical, trapezoidal, pyramidal, oblate, ellipsoidal, elongate, cylindrical, cubic, or any other suitable shape. The shape of the component
15 and/or foam may only be restricted by the desired manner of release of the additive.

The size and/or shape of the additive release component and the closed cell structure incorporated therein may be substantially identical or may be different.

- 20 If a large amount of additive is required, then more than one additive release component may be incorporated into a smoking article. The components may have the same or different shapes, may be of the same or of different sizes, and may comprise the same, similar or different additives.

- 25 Preferably, the components are incorporated into a filter or filter element of a smoking article. Multiple components may be positioned, for example, at regularly spaced intervals along the length of the filter. Alternatively, multiple components may be situated as a cluster within the filter, for example within a cavity formed between two sections of filter material.

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- The multiple components may be engineered to release additive substantially simultaneously in response to a single application of force towards the filter. Alternatively, when multiple components are present, the filter may require a number of sequential applications of force for release of the contents from all of the
35 components. The components may be arranged to directionally release the additives

into substantially the same area of filter material, or each component may have a different target area of directional release.

In some embodiments, the additive release component may comprise two or more
5 separate chambers. The separate chambers may be different chambers, or be formed from a single chamber that is divided into two or more separate chambers, for example by means of septa or other internal barriers. In this case, the chambers of the component may comprise the same additive, or a combination of different additives. The chambers may also comprise two reagents, one or both of which may not function
10 as an additive, but which reagents react or mix together to form an additive. The two more additives may chemically react in an exothermic or endothermic reaction, for example. The additives could be an organic acid and an alcohol, which react to form an ester.

15 The additive or other reagents within each chamber may be released substantially simultaneously in response to a single application of force, such as compressive force. Alternatively, the different chambers may release the additive in response to a number of sequential applications of force to the component.

20 Multiple additive release components and/or multiple closed cell structures may all contain a single type of additive contents. Alternatively, they may contain a plurality of types of additive contents. At least one additive release component and/or closed cell structure contains a first type of additive, and at least one additive release component and/or closed cell structure contains a second, different, type of additive. For example,
25 the different types may be different flavourants, or, one type may be a flavourant and another type may be an additive which is not a flavourant. The first and/or second additive may be a flavourant (e.g. menthol), a cooling agent (e.g. menthol or a menthol-based compound, for example an amide type coolant compound, such as that known as Wilkinson Sword cooling compound 23 (or WS-23)), or an additive which affects
30 filtration properties (e.g. water or charcoal).

The first and/or second additive may be any suitable further substance, for example, a substance that provides or creates a sensory effect (e.g., stimulating the trigeminal nerve) in a tobacco substitute or heat-not-burn product. In some embodiments, the
35 first and second additives may be selected to react with each other to generate a third,

different, substance. The third substance may have a different effect than the first and second additives.

5 Embodiments of the invention are configured to comply with applicable laws and/or regulations, such as, by way of non-limiting example, regulations relating to flavours, additives, emissions, constituents, and/or the like. For example, the invention may be configured such that a smoking article implementing the invention is compliant with applicable regulations before release of an additive, after release of a first additive, and remains compliant after the release of one or more additional additives. Similarly, in
10 embodiments where two or more additives react with each other to generate another substance, the generated substance complies with applicable laws/regulations.

In some embodiments, additive is released from the additive release component in one or more predetermined directions. Additive may be released into the smoking article in
15 any specific direction, and may be directed towards a particular region of the smoking article, such as the filter. The region may be, for example, a cavity, a particular region of filter material, or a peripheral region of the smoking article filter. The region into which the additive is released may comprise an active component, such as a second additive, which may or may not be held by another additive release component.

20 Directional release of additive from the component may be facilitated by the use of a wicking element, such as absorbent material within the smoking article, and in particular, the use of absorbent material that is more absorbent than any filter material which surrounds the additive release component (such as cellulose acetate). For
25 example, a wicking element may be positioned adjacent to the component within the filter in the area in which directional release of additive from the component is desired. In this way, the wicking element may draw the additive in the desired direction. Any suitable wicking element may be used. Suitable absorbent material may include, for example, uncrimped cellulose acetate thread, other cellulosic materials such as
30 hydroxymethyl cellulose, starch, or foamed polyvinyl alcohol.

As described above, an encapsulating structure may provide directional release of the additive.

35 In some embodiments, the additive release component may be further carried in a second container, or a sheath, or the like. This may allow greater control over the

directional release of the additive. It may also provide greater protection from accidental or premature breakage, or incidental leakage. In this way, for example, single wall or multi-wall additive release components may be used to tailor additive release component stability, strength, rupture resistance, processing ease in
5 manufacture, etc.

The smoking article may comprise one or more components that are arranged to directionally release additive towards a particular region of the smoking article or smoking article filter, which may be any region of the smoking article or smoking article
10 filter. This region may comprise a material which is activated by the additive released from the additive release component. For example, this material may comprise a solid that is active when in solution, and is thus activated by the action of additive in the form of water or a specific solvent.

15 The target region of directional additive release may be a cavity within the centre of the filter, which may or may not comprise other active materials. For example, the cavity may comprise crystalline flavourant, which may be activated when additive in the form of a solvent is directionally released into the cavity to contact the crystals. Alternatively, the cavity may comprise a material which is sensitive to additive in the form of water:
20 for example, a material which in contact with water changes colour, dissolves, makes a sound, emits a flavour or an odour, etc.

The particular region towards which additive is directed may be a region of filter material comprising a solid material in the form of small granules evenly distributed
25 within the material. Such an arrangement may be useful, for example, when a granular crystalline flavourant is to be used in combination with a component comprising a solvent additive. In this case, a plurality of components may be used, from which additive may be sequentially released to provide flavourant over the duration of use of the smoking article. In this arrangement, additive may be directed into the same or
30 different regions of the granule-containing filter material.

The region to which additive is directed may be a peripheral region of the smoking article or smoking article filter, such as a region at or near the circumferential surface of the smoking article, or at the mouth end of the filter. Such an arrangement may be
35 suitable, for example, when the additive is coloured, to provide an interesting appearance to the smoking article, and/or to provide a visual indication that the

additive has been released, for example, where the component comprises a combination of coloured and colourless additives. This arrangement may also be suitable when the additive is an odorant, to facilitate diffusion of the odour out of the smoking article.

5

A smoking article or smoking article filter may comprise two or more additives, each carried within a separate additive release component. This arrangement may be suitable, for example, when the two or more additives chemically react, or where the additives are subject to oxidation, diffusion, or other means of loss of intensity over time.

10

Two or more additive release components may be arranged to directionally release additive towards each other. Such an arrangement may be useful, for example, where the additives chemically react, such as to produce an exothermic or endothermic reaction, or a reaction in which an odour or a gas is evolved, or a colour or other visual effect is produced.

15

Alternatively or in addition, the two or more components may be arranged to directionally release additive towards a common region of the filter. This may be suitable where a significant quantity of additive is required to be supplied to a particular region of the filter, for example, where the additive is water, and the target region of the filter comprises a water sensitive material, such as a water swellable, water soluble, or water degradable material.

20

Any part of the additive release component may be coloured, such as the support material of the closed cell structure and/or any encapsulating material. Any part of the component may comprise a colouring agent. The colouring agent may be used to position the component more easily and more accurately in a smoking article during the manufacturing process. Alternatively or in addition, the colouring agent may provide an interesting appearance to the smoking article, particularly if the component is intended to be only partially enclosed within a filter material, or if the tipping paper (and plugwrap if applicable) is intended to have a transparent window portion.

25

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Alternatively or in addition, the additive incorporated into the component may be coloured. This would give the user an additional, visual indication that the additive has been successfully released, as the additive may be seen to be released from the

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component. This may be particularly useful if the component comprises a combination of additives, wherein one of the additives is coloured, and thereby serves to indicate release of the other, colourless, additive(s).

5 When the additive is coloured, it may be desirable for the component to directionally release additive into a region of the smoking article or smoking article filter in which the colour may be observed. For example, the additive may be directionally released into a peripheral region of the smoking article, such as a circumferential region or towards the mouth end. The coloured additive may be directionally released into a
10 section of the smoking article that is visible via a transparent window portion.

In some embodiments, smoking article filters comprising the components of the invention may comprise a transparent window which may allow observation of the component within the filter. In this way, the user is able to observe the component
15 within the filter, and may be able to observe whether additive has been released. Any encapsulating structure surrounding the closed cell structure of the additive release component may also be transparent, or comprise a transparent section, in order to enable the user to see the closed cell structure.

20 To produce the effect of a transparent window, the tipping paper (and plugwrap if applicable) may comprise a single piece of transparent material, which can be, but is not limited to, one of polypropylene, polyvinyl chloride (PVC), cellulose acetate film, polyethylene terephthalate (PET), polyethylene oxide (PEOX), polyethylene, cellophane, Natureflex™, polylactic acid, plastarch material, polycaprolactone,
25 polyglycolide, a polyhydroxyalkanoate such as poly-3-hydroxybutyrate, and zein-derived bioplastics. The tipping paper may have an opaque coating on certain portions to leave a transparent uncoated section which defines the window.

In some embodiments, the additive release component is incorporated into the
30 smoking article in combination with a secondary element. This secondary element may function to further ensure that the additive is released from the additive release component when a force is applied towards the smoking article and/or may facilitate the release of additive in a pre-determined direction, for example.

35 Alternatively or in addition, the secondary element may function to direct the force applied to the smoking article onto the additive release component in a particular

manner. For example, the secondary element may be a shield, which prevents force from being applied to a particular area of the additive release component. The secondary element may provide a reaction surface against which the additive release component may be compressed. The secondary element may alternatively focus the
5 force applied to the smoking article on a particular area of the additive release component.

The secondary element may be an additive release component support structure, being a structure which supports an additive release component and which may be positioned
10 within a smoking article. The additive release component support structure may allow controlled release of the additive from the additive release component. The support structure may function to focus the force applied to the smoking article on a particular area of the additive release component. For example, the support structure may comprise a spike or point which, when force is applied to the smoking article, is
15 brought into contact with the additive release component and thereby focuses the force on a predetermined area of the additive release component. The area towards which the force is focussed may be where the closed cell structure is positioned in the additive release component, for example.

20 In addition to assisting the release of additive, the support structure may allow further control of the release of additive from the additive release component. For example, release may be controlled in terms of the timing of release, the quantity of release, the direction of release and/or the duration of release.

25 The size and shape of the additive release component support structure is preferably determined in combination with the size and shape of the additive release component to be used. In this way, the additive release component may be supported by the support structure, and the support structure may offer physical protection to the additive release component until such time that the release of the additive is required.

30 In some embodiments, the additive release component support structure has a cross-sectional shape that is substantially similar to that of the smoking article in which the support structure is to be used. For example, support structures for use in conventional cigarettes may be circular in cross-section. The reason for this is that the support
35 structure may also function to provide shape, format, or strength to the smoking article.

The additive release component support structure may comprise on its outer surface one or more pimples, grooves, raised elements, or any other deviation from a smooth surface. In addition, or as an alternative, the support structure may be hexagonal or other polygonal, elliptical, or irregular shape in cross-section, rather than circular. Such elements may be detectable to the user of the smoking article, and may thus provide an indication of the position of the additive release component support structure in the smoking article or smoking article filter, and the region of the support structure to which activating force must be applied in order to induce the release of additive from the additive release component. The additive release component support structure may also provide feedback to the user that the additive has been released from the additive release component. Feedback may be in the form of an audible sound, and/or a detectable change in the conformation of the support structure.

The additive release component support structure may induce the release of the additive from the additive release component via any possible mechanism. The support structure may be configured to impart activating force on the additive release component to provide a pumped release, a directional release, a multi-stage release or a single release of additive. The type of release is dependent upon the particular type and shape of the support structure and additive release component used, and the materials from which they are manufactured.

The additive release component support structure may be a moulded plastic structure. In some embodiments, the support structure is manufactured from a biodegradable plastic such as PLA (polylactic acid), CA (cellulose acetate) or PVOH (polyvinyl alcohol). However, the support structure could in principle be produced using any mouldable plastic, ceramic, starch, paper, or other suitable material known to the skilled person.

The additive release component support structure may induce the release of the additive from the additive release component in a single dose, in multiple doses, or by means of a variable release, for example in which the release is proportional to the strength or duration of force applied to the support structure. This may be achieved by appropriate selection of the material from which the support structure is manufactured. For example, if the support structure is moulded from a flexible plastic, then upon the application of force, following the activation, the support structure may return to its original conformation. In this case, depending on the nature of the additive release

component, further additive may be released from the additive release component by subsequent applications of force to the support structure. On the other hand, if the support structure is made from an inflexible material, such as an inflexible plastic, then as the support structure is activated, it may break. Such an arrangement may limit the support structure to a single activation, and thus the additive release component may deliver a single release of additive.

In some embodiments, the secondary element may function to facilitate directional release of additive from the additive release component. For example, the secondary element may be a funnel, a channel, or an adsorbent material, which assists the directional release of the additive from the additive release component.

The additive release component may be inserted into the smoking article by any suitable method of insertion. The additive release component may be inserted into any position of the smoking article, although preferably the component is inserted into a filter or filter element of the smoking article.

Any suitable method may be used to insert the additive release component into a filter or filter element. Suitable apparatus may, for example, include a means for supplying a continuous stream of filter material from a source of such material (e.g., a bale, bobbin, or the like). The apparatus may further include an additive release component insertion unit for inserting or depositing the individual additive release components at predetermined intervals within the filter material. The filter material having additive release components deposited therein may then be received into a rod-making means for providing a continuous rod which may subsequently be subdivided into the desired length at predetermined intervals to form the individual filters

Any suitable alternative technique may also be used if applicable. For example, the additive release component may be inserted into a cavity within the filter, or known dual or triple filter combining techniques may be used. The additive release component may also be incorporated into the filter using a vertical feed method.

In order to address various issues and advance the art, the entirety of this disclosure shows by way of illustration various embodiments in which the claimed invention(s) may be practiced and provide for superior additive release components and products including the same. The advantages and features of the disclosure are of a

representative sample of embodiments only, and are not exhaustive and/or exclusive. They are presented only to assist in understanding and teach the claimed features. It is to be understood that advantages, embodiments, examples, functions, features, structures, and/or other aspects of the disclosure are not to be considered limitations
5 on the disclosure as defined by the claims or limitations on equivalents to the claims, and that other embodiments may be utilised and modifications may be made without departing from the scope and/or spirit of the disclosure. Various embodiments may suitably comprise, consist of, or consist essentially of, various combinations of the disclosed elements, components, features, parts, steps, means, etc. In addition, the
10 disclosure includes other inventions not presently claimed, but which may be claimed in future.

Claims

1. An additive release component for use in a smoking article, wherein the additive release component comprises a closed cell structure comprising support material with
5 voids which form a plurality of closed cells containing an additive.
2. An additive release component according to claim 1, wherein the support material comprises a polymer.
- 10 3. An additive release component according to claim 2, wherein the polymer is a polysaccharide and/or a cellulose acetate, or a derivative thereof.
4. An additive release component according to any one of the preceding claims, wherein the closed cell structure is at least partially surrounded by an encapsulating
15 structure.
5. An additive release component according to claim 4, wherein the encapsulating structure comprises a polymer.
- 20 6. An additive release component according to claim 5, wherein the polymer is a polysaccharide and/or cellulose acetate, or a derivative thereof.
7. An additive release component according to any of the preceding claims, configured to release a plurality of discrete deliveries of additive.
25
8. A filter for a smoking article, the filter comprising an additive release component according to any one of the preceding claims.
9. A smoking article comprising an additive release component according to any
30 one of claims 1 to 7, or a filter according to claim 8.
10. A method of manufacturing the closed cell structure for use in an additive release component according to any one of claims 1 to 7, the method comprising:
providing a first liquid comprising a precursor of a support material;
35 providing a second liquid comprising an additive, wherein the first and second liquids are immiscible;

forming an emulsion of the first and second liquids; and
treating the emulsion so as to form a support material having at least one closed cell containing the additive.

- 5 11. A method as claimed in claim 10 wherein the first liquid is treated by drying, curing and/or heating to form the support material.
12. A method as claimed in claim 10 or 11, further comprising a step of at least partially encapsulating the closed cell structure.

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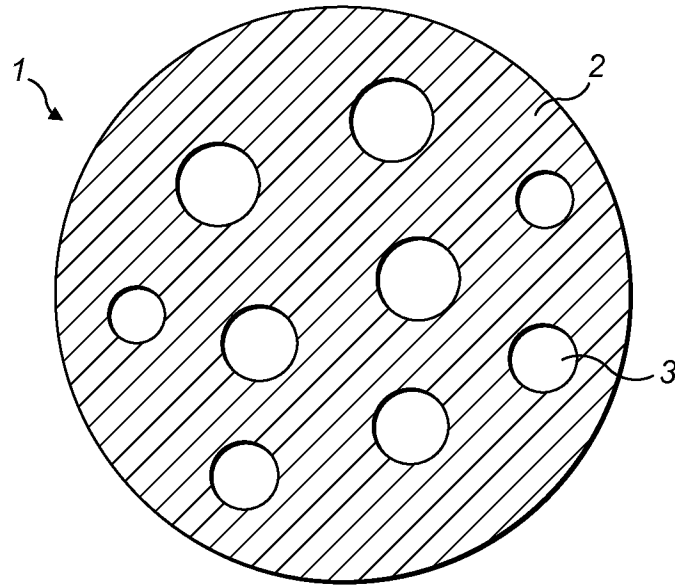


FIG. 1A

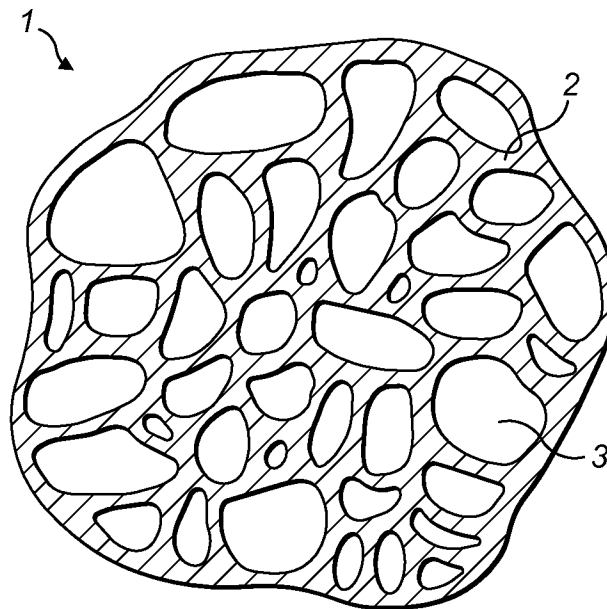


FIG. 1B

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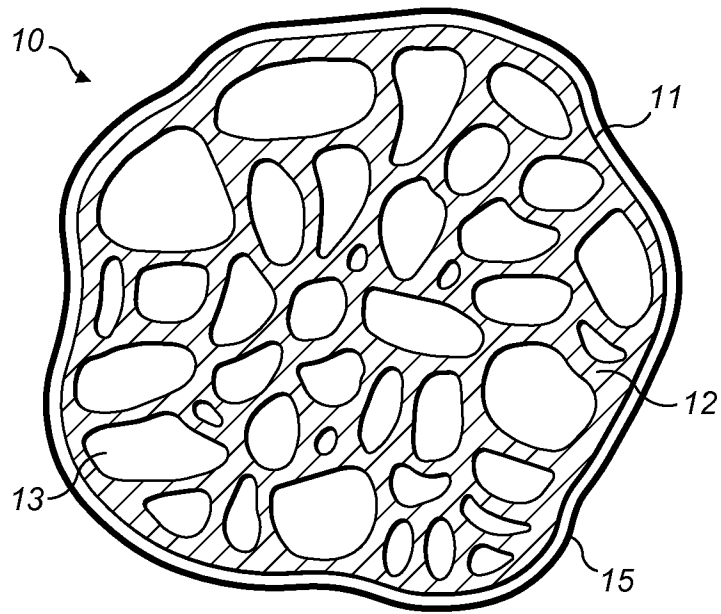


FIG. 2A

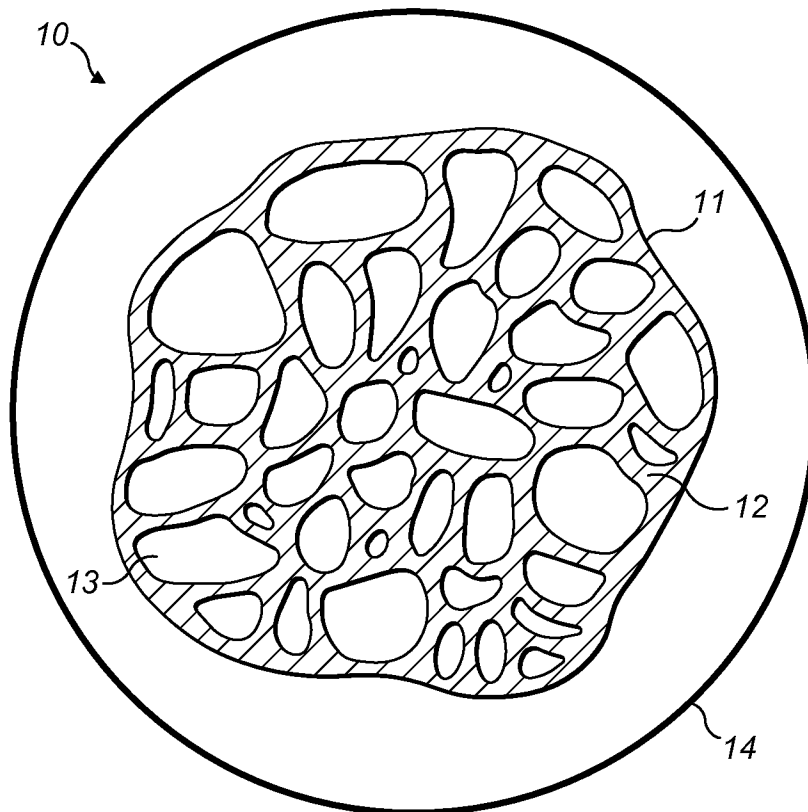


FIG. 2B

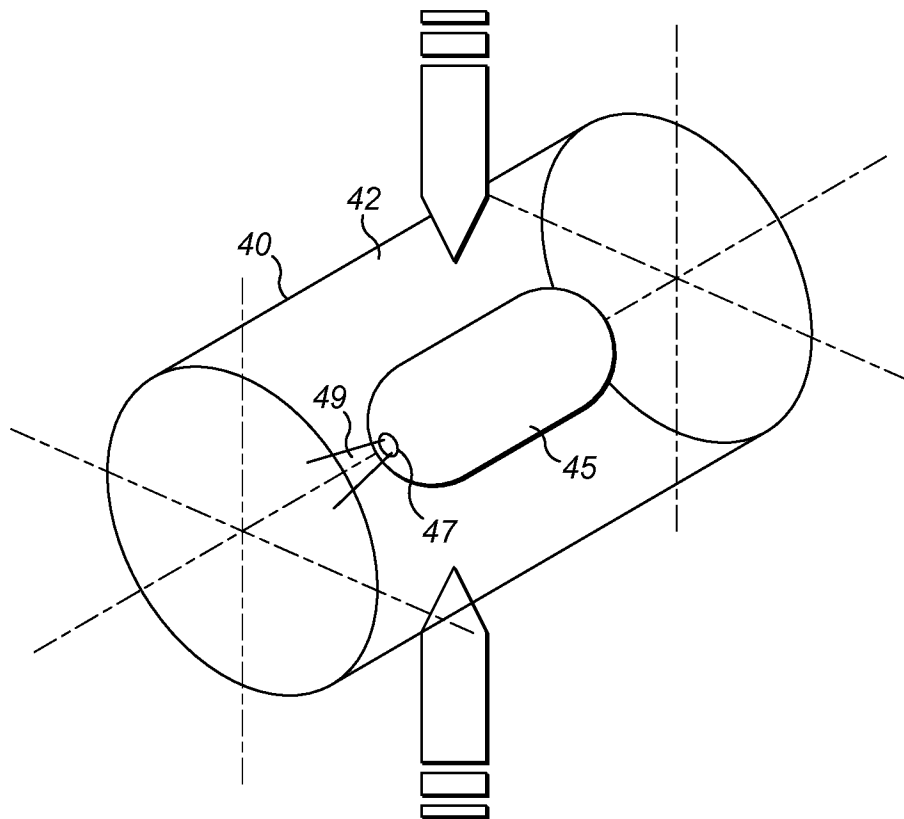


FIG. 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2012/051043

A. CLASSIFICATION OF SUBJECT MATTER

INV. A24D3/04
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A24D A24F A61M

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

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

EP0-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009/288669 A1 (HUTCHENS RONALD KEITH [US]) 26 November 2009 (2009-11-26) paragraph [0025] - paragraph [0076] -----	1-9
X	US 3 762 422 A (DOCK M) 2 October 1973 (1973-10-02) column 1, line 42 - column 4, line 9 -----	1,2,4,5, 7-9
X,P	WO 2011/121326 A2 (BRITISH AMERICAN TOBACCO CO [GB]; BRITISH AMERICAN TOBACCO JAPAN LTD []) 6 October 2011 (2011-10-06) page 7, line 31 - page 9, line 18 -----	1,4,7-9



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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

"&" document member of the same patent family

Date of the actual completion of the international search

30 August 2012

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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			WO 2011121326 A2	06-10-2011
