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(54) Title: ADDITIVE RELEASE COMPONENT

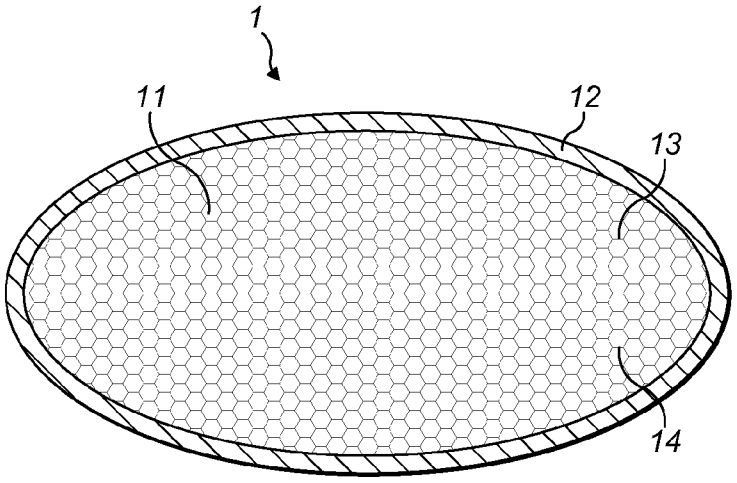

FIG. 1

(57) Abstract: An additive release component (1) for a smoking article is disclosed. The additive release component comprises an open cell structure (11) that comprises an additive and is at least partially surrounded by an additive-impermeable layer (12). A filter for a smoking article that comprises said additive release component, a smoking article that comprises said additive release component, and methods 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 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, 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.

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 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 an open cell structure which comprises an additive and is at least partially surrounded by an additive-impermeable layer.

In some embodiments, the additive impermeable layer forms an integral part of the open cell structure.

In some embodiments, the open cell structure comprises a support material defining one or more voids which form open cells, within which additive may be held.

In some embodiments, the support material of the open cell structure comprises a polymer such as, for example, PVOH, a polysaccharide and/or a cellulose acetate, or a derivative thereof. In some embodiments, the support material is an auxetic material.

In some embodiments, the open 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.

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

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.

According to a fourth aspect, there is a provided a method of manufacturing an additive release component according to the first aspect, the method comprising: providing an open cell structure; introducing an additive into at least some of the open cells of the open cell structure; and at least partially surrounding the open cell structure with an additive-impermeable layer.

Brief Description of the Drawings

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

Figure 1 is a schematic illustration of a cross-section through an additive release component comprising an open cell structure according to embodiments of the present invention;

Figure 2 is a schematic illustration of a cross-section of a smoking article containing an ovoid additive release component according to an embodiment of the present invention;

Figure 3 is a schematic illustration of a cross-section of a smoking article containing a cuboid additive release component according to an embodiment of the present invention;

Figure 4 is a schematic illustration of a cross-section of a smoking article containing a toroidal or tubular additive release component according to an embodiment of the present invention;

Figure 5 is a schematic illustration of a cross-section of a smoking article containing a toroidal or tubular additive release component comprising two open cell structures, according to an embodiment of the present invention;

Figure 6 shows a cross-section of a toroidal or tubular additive release component shown in Figure 5;

Figure 7 is a schematic illustration of a cross-section of a smoking article containing a plurality of additive release components according to an embodiment of the present invention; and

Figure 8 is a schematic illustration of a perspective view of an additive release component comprising an encapsulating structure according to an embodiment of the present invention, the component being positioned in within a smoking article.

Detailed Description

There is provided an additive release component for a smoking article, the additive release component comprising an open cell structure which comprises an additive and is at least partially surrounded by an additive-impermeable layer.

In some embodiments, the additive-impermeable layer is applied to or added to the open cell structure. Alternatively, the layer may be formed as an integral part of the open cell structure, for example, by closing the open cells which open directly onto the surface of the open cell structure.

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 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 open cell structure comprises a plurality of cells, which are gaps, cavities or voids in or surrounded by walls formed from a support material. At least some of the cells in the open cell structure are formed so that there is at least one pathway from the interior of the cells to the exterior of the open cell structure. In some

embodiments, the interior of at least some of the cells is also connected to the interior of one or more other cells by channels or the like within the open cell structure.

In certain embodiments of the invention, at least 50% of the cells in the open cell structure are open cells. This means that they are open to the exterior of the open cell structure and, in some embodiments, means that they are also 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 open cell structure are open cells. In some preferred embodiments, the additive is held within at least one of the open cells of the open cell structure.

In some embodiments, the additive release component comprises an open cell foam material, which is compressible and configured to release only a part of the additive contents when compressed. According to one possible embodiment, the open cell structure or substrate may be formed of a filtration material, for example, cellulose acetate tow. The structure or substrate may be resiliently deformable, contained within a plastically deformable outer wall but is prevented from returning to its original shape by the outer wall when compression ceases. Alternatively, the open cell structure or substrate may actuate or follow a resilient outer wall at least partially towards its original shape when compression ceases. Alternatively, the open cell foam structure or substrate may not resiliently return towards to its original size, and may plastically deform when compressed.

Since at least some of the cells in the open cell structure are open to the exterior of the open cell structure, in order for the additive release component of the invention to retain additive before actuation, the open cell structure is at least partially surrounded by an additive-impermeable layer.

In some embodiments which may be particularly preferred, the additive-impermeable layer substantially completely surrounds the open cell structure and therefore prevents the release of any of the additive contained in the open cell structure before actuation of the additive release component.

In some embodiments, the additive-impermeable layer is formed as an integral part of the open cell structure. This may mean that the cells which open directly onto the surface of the open cell structure are closed by sealing the support material forming the

cells. This may be done by heat sealing or wet sealing the support material so as to close at least some of the open cells at the surface of the open cell structure. In this embodiment, no additional material is added to the open cell structure once it has been sealed.

In other embodiments, a layer of additive-impermeable material is added to the open cell structure. The additive-impermeable material may be the same as the support material. Using the same material would mean that it may be difficult or impossible to distinguish between the original open cell structure and the additive-impermeable layer applied thereto, so that the layer may not be considered to be a separate structure.

The additive-impermeable layer may be formed so that it is clearly a separate structure to the open cell structure. For example, it may form a bag-like structure around the open cell structure, being only intermittently attached to the surface of the open cell structure, being attached only in localised areas.

The additive-impermeable layer may be of any suitable composition, form and thickness as long as it is substantially impermeable to the additive contained in the open cell structure.

The additive-impermeable layer may comprise any suitable materials, which may be, may be derivatives of, or may be products following the treatment of: polylactic acid (PLA); polyvinyl alcohol (PVOH), polyvinyl acetate (PVA); polyurethane; any suitable polyester; any suitable polysaccharide, such as an alginate or agar, for example.

In some embodiments, the additive-impermeable layer comprises a cellular structure, such as an open cell structure like the one it surrounds, or a closed cell structure. Such a cellular structure could be additive impermeable because of the small size of its constituent cells. In this case, the constituent cells of the additive-impermeable layer may be so small that the rate of additive permeation therethrough is negligible and essentially zero.

The additive-impermeable layer acts to prevent the release of additive from the open cell structure before actuation of the additive release component. Upon actuation of the component however, the additive-impermeable layer may be modified in any suitable

way necessary to enable a greater amount of additive to leave the open cell structure than was able to leave before actuation.

In some embodiments, the additive-impermeable layer may be rupturable, frangible, or brittle, so that when the user of the smoking article applies force, such as compressive force, the layer is broken and a greater amount of additive is able to escape than was able to leave before the application of force.

Upon a single actuation of the additive release component, in some embodiments only a fraction of the additive contained in the open cell structure is released, while in other embodiments substantially all the additive contained in the open cell structure is released.

In embodiments in which a fraction of additive is released, it may be possible for the user of the smoking article to release additive in a plurality of discrete deliveries, in which case it may also be possible for the user to control the approximate quantity of additive released in each discrete delivery.

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

Control of the approximate quantity of additive released in a single delivery may be achieved by the user modifying the magnitude, location and/or direction of force that is applied to the additive release component.

It may be possible to release only a fraction of additive upon a single actuation, and therefore also possible to release additive in a plurality of discrete doses, from the open cell structure. In some embodiments, the additive is held in a large number of cells distributed throughout the open cell structure. As a result, any single actuation may apply pressure to, and may cause additive to be released from, only a subset of the cells containing additive. Further actuations may act on other cells, releasing further additive.

Alternatively or in addition, in some embodiments the additive-impermeable layer surrounding the open cell structure may be progressively ruptured or otherwise opened with each actuation of the additive release component, thereby uncovering and exposing a greater number of pathways extending from the open cells in the open cell structure to the exterior of the additive release component.

In this way, with each compression another dose or delivery of additive may be released. Once again, in some embodiments, the magnitude, location and/or direction of the applied force may determine the quantity of additive that is delivered in a single actuation, by determining how and/or how much of the additive-impermeable layer is ruptured.

Alternatively or in addition, in some embodiments the open cells in the open cell structure, by which is meant original open cells or cells opened upon actuation, may contain additive that has access the exterior of the open cell structure by one or more pathways but cannot leave without the cells in which it is contained being distorted or compressed. In some embodiments, this inability of the additive to leave the open cells may be due to the relatively high viscosity of the additive. The application of force may achieve the required distortion and/or compression, and therefore force the additive to leave through the pathways. In some embodiments, the distortion and/or compression and also potentially result in the forceful ejection of the additive from the open cell structure.

The additive-impermeable layer may be fabricated by the application of one or more suitable methods.

In some embodiments, the additive-impermeable layer is a distinct layer surrounding the open cell structure. This additive-impermeable layer may be a preformed flexible or rigid structure into which the open cell structure is incorporated. In some embodiments, the structure includes an opening through which the open cell structure may be inserted. Thereafter, the opening may be closed or sealed. In the case of a rigid layer, the rigid material may be provided in two parts which are sealed once the open cell structure is in place. In the case of a flexible layer, the layer may be in the form of a sack into which the open cell structure is placed before one or more edges are sealed. In some of these embodiments, the open cell structure is attached to the inner surface

of the flexible or rigid layer in at least one area, and in some embodiments in a plurality of areas.

In some alternative embodiments, the additive-impermeable layer is applied to the surface of the open cell structure. For example, a preformed sheet or shell structure may be attached substantially over the entire external surface of the open cell structure. The preformed sheet or shell may be attached to the outer surface of the open cell structure, for example by a wet or heat sealing step. Alternatively, the additive-impermeable layer may be applied in liquid form and then dried. For example, a bath of additive-impermeable layer material or a precursor material may be provided into which the open cell structure may be immersed. Once the open cell structure is removed from the bath, the coated structure is treated so that the material or precursor is dried or cured to form the additive-impermeable layer. Alternatively, the liquid additive-impermeable layer material or precursor may be sprayed or otherwise applied to the surface of the open cell structure and then dried or otherwise treated to form the additive-impermeable layer.

In some yet further embodiments, the additive-impermeable layer may be formed by locally plugging the open cells on or at the surface of the open cell structure. This may be done allowing a liquid or semi-solid additive-impermeable material to impregnate the outer cells of the open cell structure. Optionally, this material may then be treated so that it solidifies or partially solidifies, which may assist in ensuring that it remains in place. Such a layer may be continuous or discontinuous on the surface of the open cell structure.

In alternative embodiments, the additive-impermeable layer is formed by sealing the support material of the open cell structure. The material surrounding the open cells on the outer surface of the open cell structure may be sealed to close at least some of the cells and preferably all of the cells. This sealing may be achieved by a variety of methods. One example is wet sealing, wherein the support material of the open cell structure is wetted to seal it. Optionally the wetting is accompanied by distortion of the open cell structure and/or the addition of further support material, e.g. in liquid form. Suitable support materials to be sealed by a wet sealing process using water or a suitable aqueous solution include, for example, PVOH. Suitable support materials to be sealed by a wet sealing process using other liquids include, for example, cellulose acetate, in which case the liquid used may include triacetin, TEC or other material

which acts as a plasticizer or binder. Alternatively, the sealing technique used may be heat sealing, where heat is applied, optionally with distortion of the open cell structure, to weld the open cells closed.

In some embodiments, the method of impregnation and encapsulation may include a step following impregnation of the open cell structure with the additive in which the impregnated material is frozen. Whilst frozen, the impregnated open cell structure may be encapsulated by any of the aforementioned methods. The freezing helps to keep the additive in place within the open cell structure and/or can prevent or reduce mixing of the additive with the material of the additive-impermeable layer.

Figure 1 is an illustration of a cross-section through an additive release component 1 according to some embodiments. The open cell structure 11 comprises support material that forms walls 13 which define open cells 14 (details of which are not shown in this schematic illustration). The figure is intended to illustrate a reticulated structure formed from a foam, providing a large open interconnected cell form. The cells 14 can contain additive (not shown). The open cell structure 11 is surrounded by an additive-impermeable layer 12 which completely surrounds the open cell structure. The cell size shown is purely illustrative, and is not intended to be limiting. Any suitable cell size may be used. The cell size may be variable or uniform.

Figure 2 to 4 show various different shape additive release components incorporated into the filter of a smoking article. In Figure 2, the additive release component is ovoid and is positioned largely centrally in the filter 2 of the smoking article. The smoking article further comprises a rod 3 of smokeable material. The additive release component of Figures 2 includes an integral impermeable skin or shell 12, surrounding the open cell structure 11.

In Figure 3, the additive release component 1 has a generally cuboid shape and it is positioned in the filter 2 so that it is adjacent to, and optionally in contact with, the rod of smokeable material 3. The additive release component of Figure 3 includes an integral, homogeneous impermeable skin or shell 12, surrounding the open cell structure 11.

In Figure 4, the additive release component 1 has a generally toroidal or tubular shape and it is positioned in the filter 2 so that it is adjacent to, and optionally in contact with,

the rod of smokeable material 3. The additive release component of Figure 4 includes an integral impermeable skin or shell 12, surrounding the open cell structure 11 on both its inner and outer surface. The positioning of the additive release component within the filter provides a central flow path 16 through the centre of the additive release component. In addition, there is filter material 2 surrounding the outer surface of the additive release component 1 and this provides a second, outer flow path 15.

Figure 5 also shows a smoking article containing a toroidal or tubular additive release component 21. In this embodiment, the outer surface of the additive release component 21 is substantially aligned with the surface of the filter 2. There is nothing between the additive release component and any plugwrap and/or tipping paper circumscribing the filter. This means that the only flow path 28 for smoke through the filter 2 is through the central core of the toroidal or tubular additive release component 21. The illustrated additive release component comprises two distinct open cell structures 22, 24. As shown is some greater detail in Figure 6, there is an impermeable layer 23 on the inner surface of the additive release component, an impermeable layer 25 between the two open cell structures 22, 24, and an impermeable layer 27 on the outer surface of the additive release component. There is a central region 28 through which smoke may flow when the additive release component is incorporated into a smoking article.

Figure 7 shows a cross-section of a smoking article containing a plurality of additive release components 1 arranged in a spaced configuration along the longitudinal axis of the smoking article. The components are mainly positioned within the rod of smokeable material 3, but one additive release component is shown as being positioned half within the rod of smokeable material and half within the filter 2. In other embodiments, some or all of the multiple components may be positioned wholly or partially within the filter 2. The additive release components may be positioned along the longitudinal axis of the smoking article, or they may be positioned peripherally or in a more random configuration.

According to some embodiments, the additive should be incorporated into the cells of the open cell structure. This may be achieved by simply impregnating the open cell structure with the additive. Where the additive is in liquid form, this may be done by simply immersing the open cell structure in the additive liquid, for example in a bath of the additive. Alternatively, the additive may be injected into the open cell structure. A

vacuum may assist in ensuring that the additive penetrates deep into the open cell structure. For example, one way may be to reduce the pressure in a chamber in which the open cell structure is exposed, bathe it in the material to be absorbed, and then allow the environment to come up to atmospheric pressure.

In some embodiments, the additive is preferably added to the open cell structure before the addition of an additive-impermeable layer. This ensures that the layer is not disrupted by a filling process which takes place after the layer is in place.

The support material of the open 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.

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 additional or larger pathways through which the additive may move to the exterior of the structure.

In some embodiments, the support material may comprise one or more polymers. 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 or any suitable derivative thereof, such as cellulose acetate. 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 an open cell structure which is a reticulated foam. For example, open cell structure may comprise a polyvinyl alcohol (PVOH) reticulated foam. In some embodiments, the support material used to form the body of the open 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 open cell structure is incorporated.

In certain embodiments, polysaccharides are preferred as the support material of the open 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 open cell structure is resiliently deformable. Upon compression, the additive is forced out. After the compression, the open cell structure reverts substantially to its original size and shape. This may prevent actuation from creating a void when the open cell structure is positioned in a smoking article. In other embodiments, the open cell structure does not revert to its formed shape and size after compression. Rather, the structure collapses and remains substantially in its collapsed form.

In some embodiments, the open cell structure comprises an auxetic material, that is, a material with a negative Poisson's ratio. This means that when contracted by the application of compressive force in one direction, the structure simultaneously contracts in the direction perpendicular thereto, as a result of the material's hinge-like structure. This can be advantageous. When the structure is compressed, this will generally involve the application of force in a single direction. An auxetic material, such as an auxetic foam, will simultaneously contract in the perpendicular direction. This will not only cause the volume of the structure to decrease more than it would if the structure were not auxetic, but may also enable actuation to affect more of the open cells and thereby potentially cause the release of more additive in a single actuation than would be possible for a non-auxetic material.

In embodiments in which the open cell structure is auxetic, the open cell structure may comprise any suitable auxetic material(s), such as auxetic variants of polytetrafluorethylene polymers, for example Gore-Tex®.

The additive release component may comprise one or more further auxetic structures formed from auxetic material, in addition to an auxetic open cell structure

The additive held within the open 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 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.

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, 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 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.

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.

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

The open cell structure may comprise one or more additives. One or more additives may be contained in a single cell in the open cell structure. The same single additive or the same combination of additives may be contained in each cell. Alternatively, different additives and/or different combinations of additives may be contained in different cells of the open cell structure. In some embodiments, an additive release component comprises multiple open cell structures and different additives may be included in different open cell structures.

In some embodiments, the additive release component consists essentially only of the open cell structure, the additive and the additive-impermeable layer.

In other embodiments, the additive release component comprises a further encapsulating structure which may or may not be additive impermeable. In some embodiments, this further structure at least partially surrounds the open cell structure, additive and additive-impermeable layer.

An encapsulating structure may comprise any suitable material and may partially or completely surround or encapsulate the open 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 squeezed from the additive release component. In one embodiment, for example, the encapsulating structure has a thickness of approximately 0.05 to 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.

Encapsulation of the open cell structure may help the open 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.

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 open cell structure, it may not be possible to predict or control the direction in which the additive will leave the open cell structure. However, if the open cell structure is at least partially surrounded by an encapsulating structure, this 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 open cell 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 open cell structure held therein does not. 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 original form after compression. The encapsulating structure may be a rigid capsule and this will be crushed upon actuation of the additive release component and will be unlikely to revert to its pre-actuation shape and size once the compressive force is no longer applied.

Figure 8 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 an open cell structure containing an additive which is held within the open cells of said structure (not shown) by an additive-impermeable layer. 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 open 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 additive-impermeable layer is ruptured, opening the interconnected open cells to the exterior of the open 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 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.

In some embodiments, the encapsulating structure is configured to transmit force to the open cell structure in such a way that facilitates the release of additive from the open cell structure. 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 area of the open cell structure, so that a greater number of the cells are distorted and/or compressed than would be distorted and/or compresses 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 open cell structures. In some embodiments, the additive release component comprises a plurality of open 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

from the support material forming the body of the open cell structure and/or the material of the additive-impermeable layer.

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, one or more of the polymers may be polysaccharides, and for example, one or more of these polysaccharides may be cellulose, or any suitable derivative thereof, such as cellulose acetate. In some embodiments, both the encapsulating structure and the support material are formed from cellulose acetate. Alternatively or in addition, both the encapsulating structure 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.

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.

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 example, waxes, shellac, carnuba 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 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 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.

Any suitable method of manufacture may be used to fabricate the open cell structure of the additive release component comprising open cells defined by walls of a support material, with at least some of the open cells holding an additive. For example, a person skilled in the art would have no difficulty in forming a suitable open cell structure by creating and reticulated form.

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

In some embodiments, the additive release component is located in a filter, within the filter material. Alternatively or in addition, the additive release component 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.

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. In such embodiments, the additive release component may, for example, have a toroidal or tubular shape. In some embodiments, the external or partially external additive release component may release the additive onto the fingers of the smoker, for example to reduce, mask or neutralise odour. Alternatively or in addition, the external or partially external additive release component could provide a tactile and/or audible indication that the component has been actuated.

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.

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 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 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 open cell structure may collapse after being compressed to release the additive contained therein. Where the additive release component collapses following actuation (for example, because the open cell structure is not resiliently deformable, or is not enclosed in an encapsulating structure which reverts 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 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 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 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.

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 be encompassed by the 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. 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 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 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, 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 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.

The size of the additive release component and/or open 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 open cell structure to be as large as possible, so that as much additive as possible may be provided, to modify the smoke as significantly as possible.

It should be noted that in some embodiments, air flow through the open cell structure may be possible once the additive-impermeable layer has been ruptured or otherwise opened. In some embodiments, this airflow will be minimal. In other embodiments, no air flow through the additive release component will be possible.

The additive release component and/or open 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 open cell structure is increased, the risk of accidental release of additive from the component may also be increased.

In some embodiments, the length of the component is within the range 1 mm to 50 mm, and may be from 3 mm to 35 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.

The additive release component and the open cell structure incorporated therein may have essentially any shape. The component and/or open cell structure 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 and/or open cell structure 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 open cell structure incorporated therein may be substantially identical or may be different.

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.

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.

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 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 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 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.

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.

Multiple additive release components and/or multiple open 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 open cell structure contains a first type of additive, and at least one additive release component and/or open cell structure contains a second, different, type of additive. For example, 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 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 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.

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 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 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.

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 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 hydroxymethyl cellulose, starch, or foamed polyvinyl alcohol.

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

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 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 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.

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: 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 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 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 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.

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.

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.

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.

Any part of the additive release component may be coloured, such as the support material of the open cell structure and/or the additive-impermeable layer, 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 a differentiating 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.

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 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).

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 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 within the filter, and may be able to observe whether additive has been released. Any encapsulating structure surrounding the open 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 open cell structure.

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, 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 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.

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 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 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 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 open cell structure is positioned in the additive release component, for example.

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.

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.

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 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 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 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 an open cell structure which comprises an additive and is at least partially surrounded by an additive-impermeable layer.

2. An additive release component according to claim 1, wherein the additive impermeable layer forms an integral part of the open cell structure.

3. An additive release component according to either of the preceding claims, wherein the open cell structure comprises a support material with a plurality of voids which form open cells.

4. An additive release component according to claim 3, wherein the support material and/or the additive-impermeable layer comprises a polymer, optionally PVOH, a polysaccharide and/or a cellulose acetate, or a derivative thereof.

5. An additive release component according to any of the preceding claims, wherein the open cell structure comprises an auxetic material.

6. An additive release component according to any of the preceding claims, wherein the open cell structure is a reticulated foam.

7. An additive release component according to any of claims 1 to 6, wherein the open cell structure comprises a fibrous cellulose acetate tow.

8. An additive release component according to any one of the preceding claims, further comprising an encapsulating structure which at least partially surrounds the open cell structure and additive-impermeable layer.

9. An additive release component according to claim 8, wherein the encapsulating structure comprises a polymer, optionally a polysaccharide and/or cellulose acetate, or a derivative thereof.

10. An additive release component according to any of the preceding claims, configured to release a plurality of discrete deliveries of additive.

11. A filter for a smoking article, the filter comprising an additive release component according to any one of the preceding claims.

12. A smoking article comprising an additive release component according to any one of claims 1 to 10, or a filter according to claim 11.

13. A method of manufacturing the additive release component according to any one of claims 1 to 10, the method comprising:

impregnating the open cell structure with the additive; and

forming the additive-impermeable layer around the open cell structure.

14. A method as claimed in claim 13 wherein the additive-impermeable layer is formed by wet sealing or heat sealing the open cell structure to form an integral layer.

15. A method as claimed in claim 13 or 14, further comprising a step of forming an encapsulating structure around the open cell structure and additive-impermeable layer.

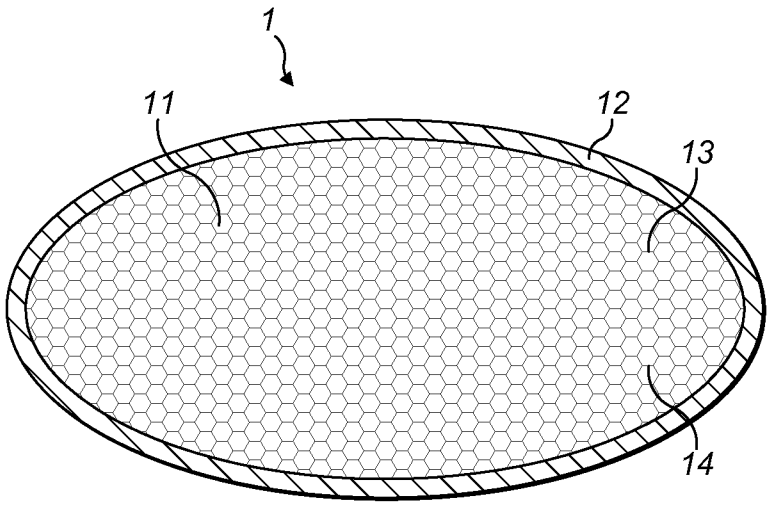

FIG. 1

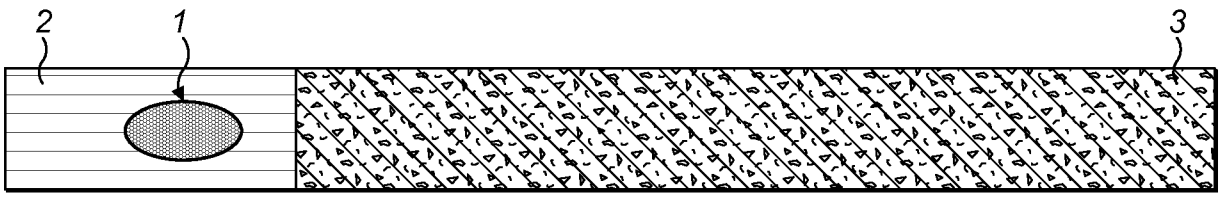

FIG. 2

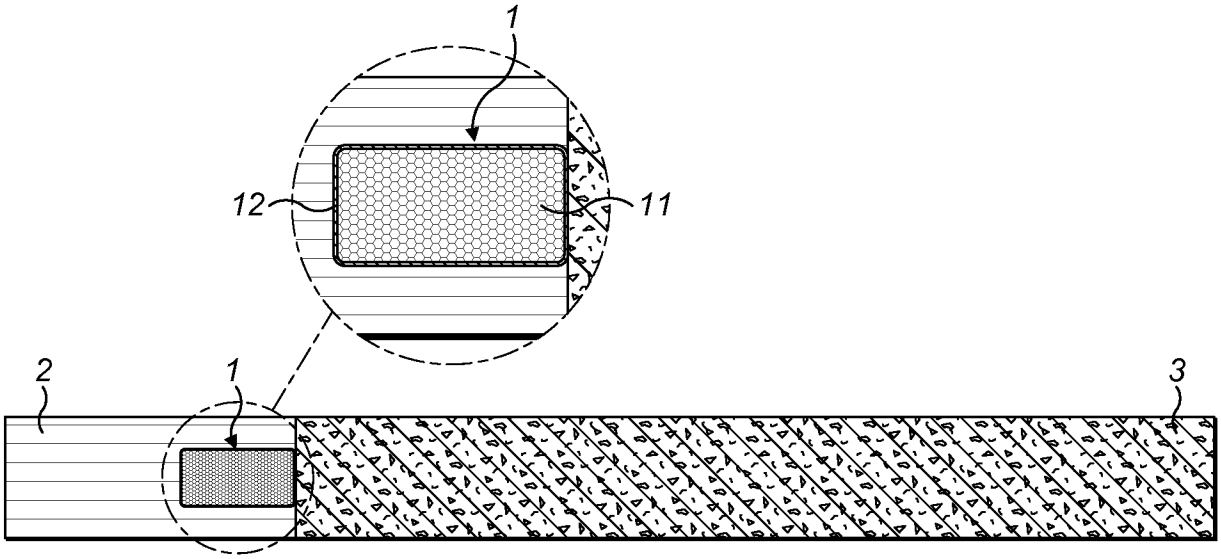

FIG. 3

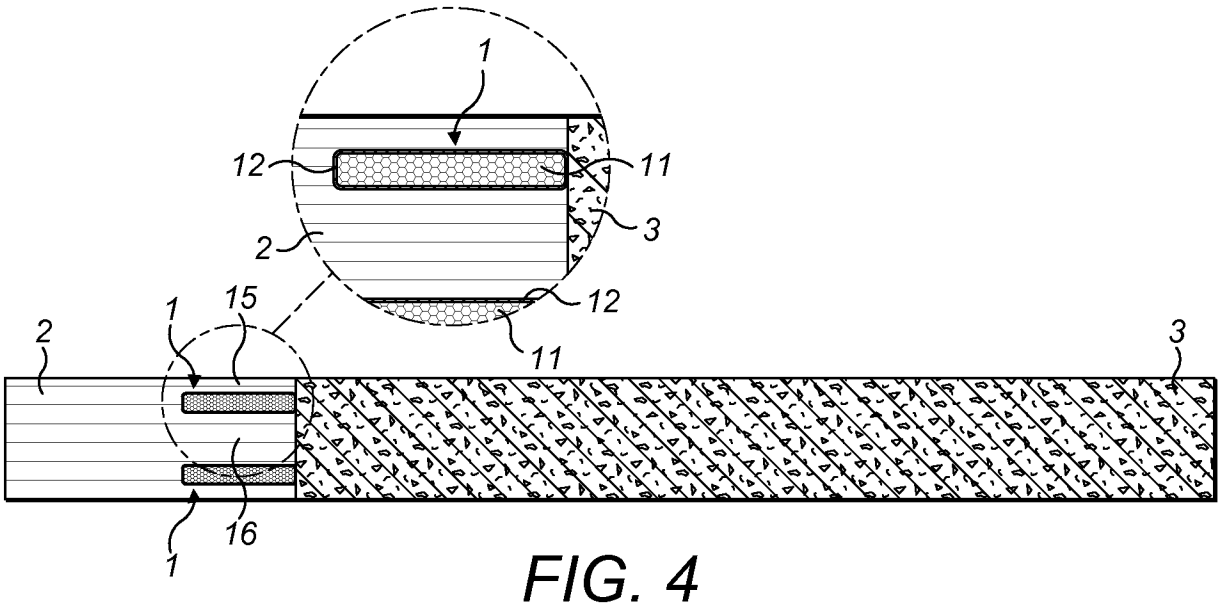

FIG. 4

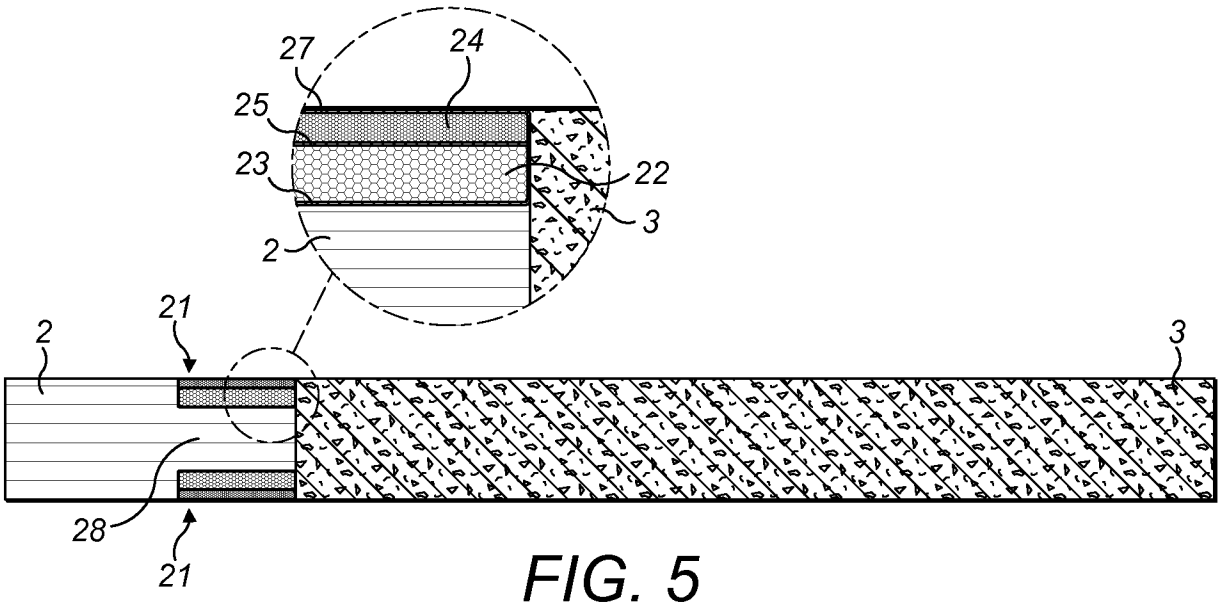

FIG. 5

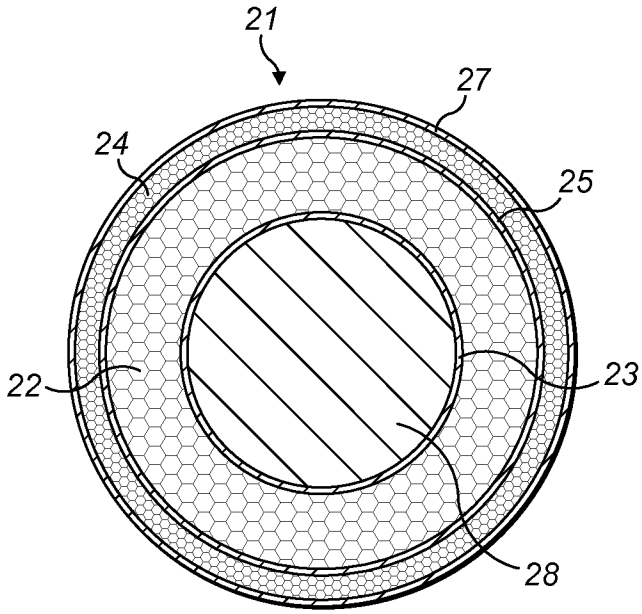

FIG. 6

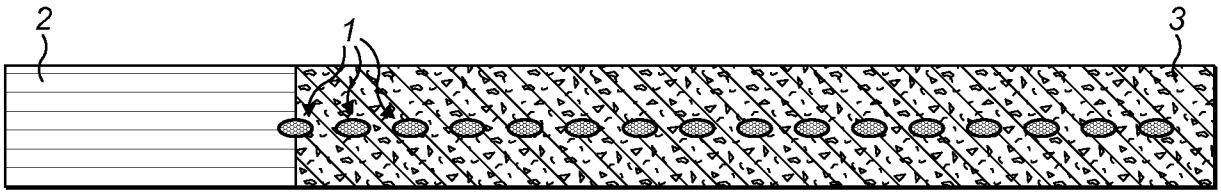

FIG. 7

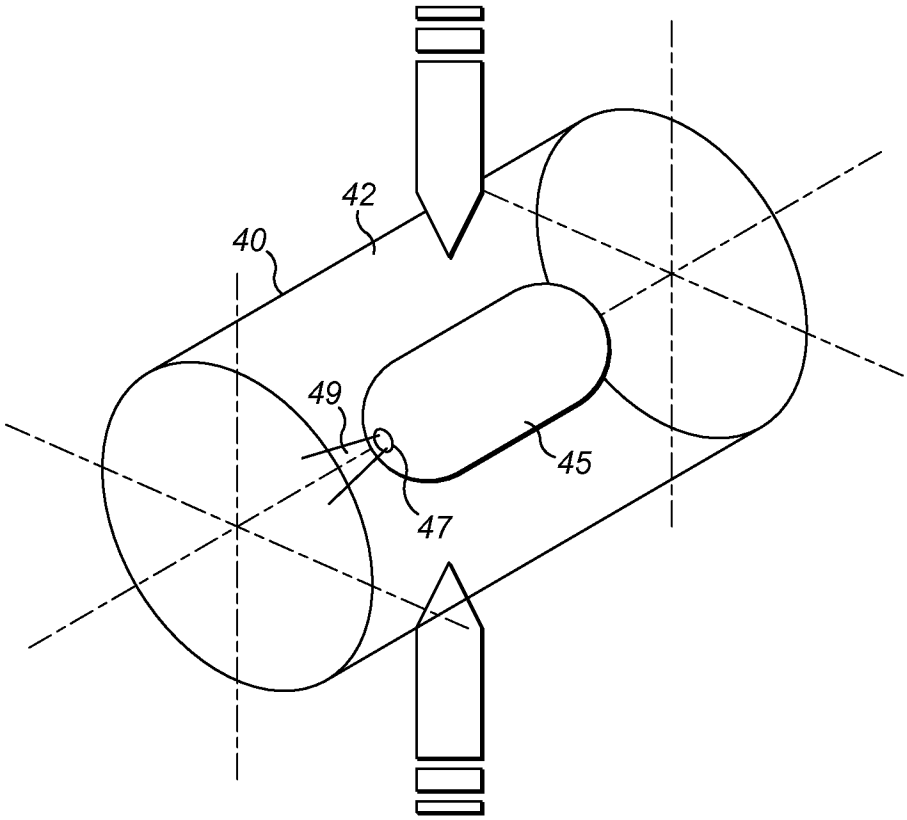

FIG. 8

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2012/051044

A. CLASSIFICATION OF SUBJECT MATTER
INV. A24D3/04 A24D1/00 A61M15/00
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A24D A24F A61M

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X Y	WO 2006/082529 A2 (PHILIP MORRIS PROD [CH]) 10 August 2006 (2006-08-10) page 3, line 30 - page 25, line 24 -----	1,3,4, 8-13,15 8,9
X	US 2006/130861 A1 (LUAN ZHAOHUA [US] ET AL) 22 June 2006 (2006-06-22) paragraph [0060] - paragraph [0081] -----	1,3,7, 11-13
X,P	WO 2011/107737 A1 (KIND CONSUMER LTD [GB]; HEARN ALEX [GB]; MCDERMENT IAIN [GB]) 9 September 2011 (2011-09-09) page 4 - page 13 -----	1,3,4,6, 10,12

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 August 2012	10/09/2012

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Koob, Michael

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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