

NOVEL FILTER SEGMENT COMPRISING A SUBSTRATE LOADED WITH A SMOKE-MODIFYING AGENT

The present invention relates to a filter segment comprising at least one smoke-modifying agent for use in a filter of a smoking article and to a filter and a smoking article comprising such a filter segment.

Filter cigarettes generally comprise a rod of tobacco cut filler surrounded by a paper wrapper and a cylindrical filter aligned in end-to-end relationship with the wrapped tobacco rod and attached thereto by tipping paper. Typically, filter cigarettes are ventilated and allow for the entry of atmospheric air into the cigarette elsewhere than through its front area (that is the end of the cigarette to be lit). In use, the entry of ventilating air dilutes the mainstream smoke in each puff. The higher the level of ventilation, the greater the dilution of the mainstream smoke drawn through the cigarette filter.

In conventional ventilated filter cigarettes, the filter may consist of a single segment of filtration material, typically cellulose acetate tow, wrapped in porous plug wrap. Alternatively, the filter may be a multi-segment filter comprising two or more segments of filtration material for the removal of particulate and gaseous components of the mainstream smoke. To enhance or modify the flavour of the mainstream smoke, it is also known to provide filter cigarettes and other smoking articles with single and multi-segment filters that include flavourants.

For example, US-A-4,281,671 describes a tobacco smoke filter comprising a rod of tobacco smoke filtering material, such as cellulose acetate tow, a thread passing longitudinally through the body of the rod, and a smoke-modifying agent, such as a flavouring material, carried by the thread. In use, the flavouring material or other smoke-modifying material becomes entrained in smoke passing through the filter. Other filters for smoking articles comprising flavour-bearing threads or yarns have also been described in the art.

Known flavour-bearing threads for use in filters are typically formed from cotton or cellulose acetate. There is a need for an improved carrier for smoke-modifying agents for use in filters for smoking articles such as cigarettes.

In accordance with a first aspect of the present invention, there is provided a filter segment for use in a filter of a smoking article, the filter segment comprising a non-laminar substrate loaded with at least one smoke-modifying agent, wherein the non-laminar substrate is located within the body of the filter segment and is formed from filter plug wrap having an air permeability of at least about 3000 Coresta units.

In accordance with a second aspect of the present invention, there is provided a bobbin of thread for use in the manufacture of a filter segment according to the first aspect of the present invention, wherein the thread is formed from filter plug wrap having an air permeability of at least about 3000 Coresta units and has a diameter of between about 0.5 mm and about 3 mm.

In accordance with a third aspect of the present invention, there is provided a filter for a smoking article comprising a filter segment according to the first aspect of the present invention.

In accordance with a fourth aspect of the present invention, there is provided a multi-segment filter for a smoking article comprising a filter segment according to the first aspect of the present invention at the mouth end thereof.

In accordance with a fifth aspect of the present invention, there is provided a smoking article comprising a filter according to the third and fourth aspect of the present invention.

In accordance with a sixth aspect of the present invention, there is provided the use of filter plug wrap having an air permeability of at least about 3000 Coresta units as a non-laminar substrate for at least one smoke-modifying agent within the body of a filter segment for a filter for a smoking article.

In accordance with a seventh aspect of the present invention, there is provided a method of modifying smoke produced by a smoking article comprising a filter, the method comprising providing a non-laminar substrate formed from filter plug wrap having an air permeability of at least about 3000 Coresta units loaded with at least one smoke-modifying agent within the body of a filter segment of the filter.

According to the present invention there is provided a filter segment for use in a filter of a smoking article, the filter segment comprising a non-laminar substrate loaded with at least one smoke-modifying agent, wherein the substrate is located within the body of the filter segment and is formed from filter plug wrap having an air permeability of at least about 3000 Coresta units.

The air permeability in Coresta units is the amount of air in cubic centimetres that passes through one square centimetre of the filter plug wrap in one minute at a constant pressure difference of one kilopascal (that is, 1 Coresta unit corresponds to an air permeability of $1 \text{ cm}^3/\text{min.cm}^2$ at a pressure differential of 1 kPa).

As used herein, the term 'filter segment' is used to describe a segment for use in a filter. Use of the term 'filter segment' does not signify that the segment has significant filtration effect. It will be appreciated that filter segments according to the invention may have little or substantially no filtration effect.

Filter segments according to the invention may advantageously be used in filters for filter cigarettes and other smoking articles in which material is combusted to form smoke. Filter segments according to the invention may also be used in smoking articles in which material is heated to form an aerosol, rather than combusted. In one type of heated smoking article, tobacco material or another aerosol forming material is heated by one or more electrical heating elements to produce an aerosol. In another type of heated smoking article, an aerosol is produced by the transfer of heat from a combustible fuel element or heat source to a physically separate aerosol forming material, which may be located within, around or downstream of the heat source.

As used herein, the term 'smoke' is used to describe smoke produced by combustible smoking articles, such as cigarettes, and aerosols produced by non-combustible smoking articles, such as heated smoking articles of the types described above.

The term "filter plug wrap" is commonly used in the tobacco industry to describe the wrapper surrounding the filter rod of a filter cigarette. As is well known in the art, a variety of papers are suitable for use as filter plug wrap. Filter plug wrap is commercially available from a large number of suppliers including, but not limited to: Schweitzer-Mauduit International Inc., Papeteries de Mauduit Mill, Quimperlé, France; delfortgroup AG, for example, Papierfabrik Wattens GmbH & Co. KG, Wattens, Austria; Glatz Feinpapiere, Julius Glatz GmbH, Neidenfels, Germany; and Miquel y Costas & Miquel, S.A., Barcelona, Spain.

It will be appreciated that not all commercially available filter plug wrap is suitable for use in the present invention. Filter plug wrap suitable for use in the present invention has an air permeability of at least about 3000 Coresta units as measured in accordance with ISO 2965:2009.

Filter plug wrap having an air permeability of at least about 3000 Coresta units has excellent liquid absorption capability. Without wishing to be bound by theory, the open structure of such filter plug wrap enables it to absorb large quantities of liquid. This advantageously enables substrates within the body of filter segments according to the invention to be loaded with large quantities of smoke-modifying agents. In use, the open structure of filter plug wrap having an air permeability of at least about 3000 Coresta units also advantageously facilitates the release of liquid absorbed by the filter plug wrap.

In contrast to filter plug wrap for use in the present invention, cigarette paper used to wrap the tobacco rod of filter cigarettes typically has an air permeability of between about 10 Coresta units and about 300 Coresta units.

As stated above known flavour-bearing threads for use in filters are typically formed from cellulose acetate. Cellulose acetate is more expensive than filter plug wrap suitable for use in the present invention. The use of substrates formed from filter plug wrap in filter segments according to the invention thus presents a significant cost advantage.

Preferably, filter plug wrap for use in the present invention has an air permeability of at least about 5000 Coresta units, more preferably of at least about 10000 Coresta units as measured in accordance with ISO 2965:2009.

Preferably, filter plug wrap for use in the present invention has an air permeability of less than or equal to about 60000 Coresta units as measured in accordance with ISO 2965:2009.

Preferably, filter plug wrap for use in the present invention has an air permeability of between about 3000 Coresta units and about 60000 Coresta units, more preferably of between about 5000 Coresta units and about 40000 Coresta units, most preferably of between about 5000 Coresta units and about 30000 Coresta units as measured in accordance with ISO 2965:2009.

In certain preferred embodiments, filter plug wrap for use in the present invention has an air permeability of between about 6000 Coresta units and 24000 Coresta units, more preferably of between about 7500 Coresta units and about 20000 Coresta units, most preferably of between about 10000 Coresta units and about 14000 Coresta units as measured in accordance with ISO 2965:2009.

A person skilled in the art will appreciate that to measure the air permeability of the filter plug wrap from which they are formed, non-laminar substrates may be removed from filter segments according to the invention and untwisted, unbraided, unwoven or otherwise unfurled and the filter plug wrap then flattened using, for example, an iron.

Capillary rise is also a measure of liquid absorption capability. Preferably, filter plug wrap for use in the present invention has a capillary rise of at least about 40 mm as measured by the Klemm method in accordance with ISO 8787:1986. Preferably, filter plug wrap for use in the present invention has a capillary rise of less than or equal to about 150 mm as measured by the Klemm method in accordance with ISO 8787:1986.

Preferably, filter plug wrap for use in the present invention has a capillary rise of between about 40 mm and about 150 mm, more preferably of between about 40 mm and about 130 mm, most preferably of between about 60 mm and about 120 mm as measured by the Klemm method in accordance with ISO 8787:1986.

Preferably, filter plug wrap for use in the present invention has a sufficiently high tensile strength to resist breakage during the manufacture of filter segments according to the invention. Preferably, filter plug wrap for use in the present invention has a tensile breaking strength of at least about 12 N/15mm, more preferably of at least about 15 N/15mm, most preferably of at

least about 20 N/15mm at a constant rate of elongation of 8mm/min for a sample width of 15 mm, as measured in accordance with the principles set out in ISO 1924-2:2008.

Preferably, filter plug wrap for use in the present invention has a grammage of between about 10 g/m² to about 80 g/m², more preferably of between about 18 g/m² to about 80 g/m², most preferably of between about 20 g/m² to about 50 g/m².

Filter plug wrap for use in the present invention is preferably made from pulp comprising a mixture of short and long fibres. Short fibres include, but are not limited to: hardwood fibres such as aspen, beech, birch, chestnut, eucalyptus, gum, maple, oak, poplar and walnut. Long fibres include, but are not limited to: softwood fibres such as, for example, cedar, fir, pine, redwood and spruce; and non-wood fibres such as abaca, flax, hemp, kenaf and sisal.

The higher the air permeability of filter plug wrap for use in the present invention, the more preferred is the inclusion of long fibres in the pulp from which the filter plug wrap is made. In such embodiments, the inclusion of long fibres in the pulp advantageously ensures that the filter plug wrap has an adequate tensile breaking strength, and so resistance to breakage during the manufacture of filter segments according to the invention.

Preferably, filter plug wrap for use in the present invention is made from pulp comprising between about 60% to about 90% by weight of softwood fibres (such as, for example, cedar, fir, pine, redwood, spruce and mixtures thereof), between about 10% to about 40% by weight of hardwood fibres (such as, for example, aspen, beech, birch, chestnut, eucalyptus, gum, maple, oak, poplar, walnut and mixtures thereof) and between about 0% and about 40% by weight of non-wood fibres (such as, for example, abaca, flax, hemp, kenaf, sisal and mixtures thereof).

Preferably, filter plug wrap for use in the present invention is formed from filter plug wrap made from pulp comprising between about 5% and about 30% by weight of sisal fibres.

Filter plug wrap suitable for use in the present invention is known in the art and commercially available from, for example, Schweitzer-Mauduit International Inc., Papeteries de Mauduit Mill, Quimperlé, France under the brand names PPW240, PPW120, PPW115ST and PPW75ST.

The non-laminar substrate formed from the filter plug wrap is loaded with at least one smoke-modifying agent. As used herein, the term smoke-modifying agent is used to describe any agent that, in use, modifies one or more features or properties of mainstream smoke passing through the filter segment. Suitable smoke-modifying agents include, but are not limited to, agents that, in use, impart a taste or aroma to mainstream smoke passing through the filter segment and chemesthetic agents.

Preferably, the non-laminar substrate is loaded with at least one flavourant. The non-laminar substrate may be loaded with any flavourant or combination of flavourants capable of releasing flavour into mainstream smoke drawn through the filter segment.

The non-laminar substrate may be loaded with two or more flavourants of the same or different types. For example, the substrate may be loaded with one or more natural flavourants or with one or more synthetic flavourants or with a combination of one or more natural flavourants and one or more synthetic flavourants.

5 Natural flavourants suitable for use in the invention are well known in the art and include, but are not limited to, essential oils (for example, cinnamon essential oil, clove essential oil or eugenol, eucalyptus essential oil, peppermint essential oil and spearmint essential oil), oleoresins (for example, ginger oleoresin and clove oleoresin), absolutes (for example, cocoa absolute), fruit concentrates, botanical and fruit extracts (for example, blueberry extract, coffee
10 extract, cranberry extract, geranium extract, green tea extract, orange extract, tobacco extract and vanilla extract), and combinations thereof.

Synthetic flavourants suitable for use in the invention are also well known in the art and include, but are not limited to, synthetic menthol, synthetic vanillin and combinations thereof

15 In a particularly preferred embodiment of the invention, the non-laminar substrate is loaded with menthol, more preferably with liquid or molten menthol.

The non-laminar substrate may be loaded with at least one liquid smoke-modifying agent by, for example, dipping, spraying or otherwise applying the at least one liquid smoke-modifying agent to the filter plug wrap.

20 Preferably, the non-laminar substrate is a thread. As used herein, the term 'thread' is used to describe any elongate non-laminar substrate. For example, the non-laminar substrate may be a thread formed from one or more twisted, laminar strips of filter plug wrap.

25 Preferably, the elongate non-laminar substrate has a diameter of between about 0.5 mm and about 3 mm, more preferably of between about 0.5 mm and about 2.5 mm, most preferably of between about 0.8 mm and about 2 mm.

30 For example, the elongate non-laminar substrate may be a thread having a diameter of about 0.8 mm formed from a twisted laminar strip of filter plug wrap having a width of about 11 mm, a thread having a diameter of about 1.3 mm formed from a twisted laminar strip of filter plug wrap having a width of about 40 mm, or a thread having a diameter of about 1.6 mm formed from a twisted laminar strip of filter plug wrap having a width of about 50 mm.

According to the invention there is also provided a bobbin of thread for use in the manufacture of a filter segment according to the invention, wherein the thread is formed from filter plug wrap having an air permeability of at least about 3000 Coresta units and has a diameter of between about 0.5 mm and about 3 mm.

35 Preferably, the elongate non-laminar substrate extends axially within the body of the filter segment. More preferably, the elongate substrate extends axially through the centre of the filter segment.

Preferably, the length of the elongate non-laminar substrate is substantially equal to the length of the filter segment.

Preferably, the length of the non-laminar substrate is between about 5 mm and about 22 mm, more preferably between about 8 mm and about 18 mm, most preferably about 15 mm.

However, filter segments according to the invention may comprise non-laminar substrates having other forms. For example, the substrate may be a ball or pellet of filter plug wrap.

Preferably, the filter segment comprises a plug of filtration material, more preferably a plug of fibrous filtration material, most preferably a plug of cellulose acetate tow. In a particularly preferred embodiment of the invention, the filter segment comprises a plug of cellulose acetate tow having a denier per filament of between about 1.5 and about 8.0 and a total denier of between about 15000 and about 46000.

Preferably, the non-laminar substrate is located within the plug of filtration material. Preferably, the non-laminar substrate extends axially through the plug of filtration material. More preferably, the non-laminar substrate extends axially through the centre of the plug of filtration material.

The non-laminar substrate may, however, be located elsewhere within the body of the filter segment. For example, the non-laminar substrate may be located in a cavity within the body of the filter segment.

Preferably, filter segments according to the invention comprise a single non-laminar substrate loaded with at least one smoke-modifying agent, more preferably a single elongate non-laminar substrate loaded with at least one smoke-modifying agent, most preferably a single thread loaded with at least one smoke-modifying agent.

In a preferred embodiment of the invention, the filter segment comprises a plug of filtration material and a single elongate non-laminar substrate or thread loaded with at least one flavourant extending axially through the centre of the plug of filtration material. In a particularly preferred embodiment of the invention, the filter segment comprises a plug of filtration material and a single elongate non-laminar substrate loaded with menthol extending axially through the centre of the plug of filtration material.

However, filter segments according to the invention may comprise two or more non-laminar substrates formed from filter plug wrap having an air permeability of at least about 3000 Coresta units, each of which is loaded with at least one smoke-modifying agent.

Filter segments according to the invention may, for example, comprise two or more elongate non-laminar substrates formed from filter plug wrap having an air permeability of at least about 3000 Coresta units, each of which is loaded with at least one smoke-modifying agent. For instance, filter segments according to the invention may comprise a plug of filtration material with two or more threads formed from filter plug wrap having an air permeability of

between about 6000 Coresta units and about 24000 Coresta units extending axially there through, each of which is loaded with at least one smoke-modifying agent.

Alternatively or in addition, filters according to the invention may include two or more of balls or pellets formed from filter plug wrap having an air permeability of at least about 3000 Coresta units. For instance, filter segments according to the invention may comprise a cavity containing a plurality of balls or pellets formed from filter plug wrap having an air permeability of between about 6000 Coresta units and about 24000 Coresta units, each of which is loaded with at least one smoke-modifying agent.

Where filter segments according to the invention comprise two or more non-laminar substrates, the two or more non-laminar substrates may be loaded with the same or different smoke-modifying agent or agents.

Preferably, the filter segment has a resistance to draw (RTD) of between about 40 mm WG and about 100 mm WG, more preferably a resistance to draw of about 70 mm WG as measured in accordance with ISO 6565:2002.

Preferably, the length of the filter segment is between about 5 mm and about 22 mm, more preferably between about 8 mm and about 18 mm, most preferably about 15 mm.

Filter segments according to the invention may comprise substrates that are coloured. Where filter segments according to the invention comprise two or more non-laminar substrates, the two or more non-laminar substrates may be the same colour or different colours.

Preferably, filter segments according to the invention comprise one or more coloured elongate non-laminar substrates.

Preferably the one or more coloured elongate non-laminar substrates are of substantially the same length as the filter segment. In such embodiments, the one or more coloured elongate non-laminar substrates extend along the entire length of the filter segment, so as to be visible at each end thereof.

Where filter segments according to the invention comprise one or more non-laminar substrates loaded with at least one flavourant, the colour of the one or more non-laminar substrates may advantageously be used to indicate to a consumer the type of flavour imparted to mainstream smoke drawn through the filter segment by the at least one flavourant. For example, where the filter segment comprises one or more non-laminar substrates loaded with menthol, the one or more non-laminar substrates are advantageously green in colour.

Filter segments according to the invention may be produced using existing methods and apparatus for forming known filter segments for filters for smoking articles. For example, filter segments according to the invention comprising one or more axially extending elongate non-laminar substrates loaded with at least one smoke-modifying agent may be produced using existing methods and apparatus for forming known filters comprising flavour-bearing cotton or cellulose acetate threads.

According to the invention, there is also provided a filter for a smoking article comprising a filter segment according to the invention.

As used herein, the term 'filter' is used to describe a mouthpiece for a smoking article. Use of the term 'filter' does not signify that the filter has significant filtration effect. It will be appreciated that filters according to the invention may have little or substantially no filtration effect. This is particularly the case for filters according to the invention for use in heated smoking articles of the types previously described above or other non-combustible smoking articles.

Preferably, the external diameter of filters according to the invention is between about 4.5 mm and about 8.5 mm, more preferably between about 7.7 mm and about 8.1 mm, most preferably about 7.9 mm.

Preferably, the overall length of filters according to the invention is between about 17 mm and about 36 mm, more preferably between about 24 mm and about 30 mm, most preferably about 27 mm.

Preferably, the overall encapsulated resistance to draw (RTD) of filters according to the invention is between about 100 mm WG (water gauge) and about 180 mm WG as measured in accordance with ISO 6565:2002.

Filters according to the invention may be single segment filters.

Alternatively, filters according to the invention may be multi-segment filters comprising a filter segment according to the invention and at least one additional filter segment.

Multi-segment filters according to the invention may include one or more additional filter segments according to the invention or one or more additional filter segments not according to the invention or any combination thereof.

Multi-segment filters according to the invention may include one or more additional filter segments upstream of the filter segment according to the invention. Alternatively or in addition, multi-segment filters according to the invention may include one or more additional filter segments downstream of the filter segment according to the invention.

Throughout the specification, the terms 'upstream' and 'downstream' are used to describe the relative positions of components of filters according to the invention in relation to the direction of mainstream smoke drawn through the filters during use thereof.

Multi-segment filters according to the invention preferably comprise a filter segment according to the invention at the mouth end thereof (that is at the downstream end of the multi-segment filter). Where the filter segment according to the invention comprises one or more coloured elongate non-laminar substrates of substantially the same length as the filter segment, the downstream ends of the one or more coloured elongate non-laminar substrates at the mouth end of the multi-segment filter are thereby advantageously visible to a consumer. As previously stated above, the colour of the non-laminar substrates of filter segments according to

the invention may be used to indicate to a consumer the type of smoke-modifying agent with which the non-laminar substrates are loaded. For example, where the multi-segment filter comprises a filter segment according to the invention comprising a non-laminar substrate loaded with a flavourant, the colour of the non-laminar substrate may be used to indicate to a consumer the type of flavour released into the mainstream smoke by the filter segment according to the invention during use of the multi-segment filter.

Preferably, the length of each individual filter segment of multi-segment filters according to the invention is between about 5 mm and about 22 mm, more preferably between about 8 mm and about 18 mm, most preferably about 15 mm.

Multi-segment filters according to the invention may include additional filter segments comprising, for example, one or more filtration materials, one or more sorbents, one or more catalysts, one or more flavourants or any combination thereof.

Suitable filtration materials for inclusion in additional filter segments of multi-segment filters according to the invention are known in the art and include, but are not limited to, fibrous filtration materials such as, for example, cellulose acetate tow, paper and combinations thereof.

Suitable sorbents for inclusion in additional filter segments of multi-segment filters according to the invention are known in the art and include, but are not limited to, activated carbon, activated alumina, zeolites, molecular sieves, silica gel and combinations thereof.

Suitable catalysts for inclusion in additional filter segments of multi-segment filters according to the invention are known in the art and include, but are not limited to, catalysts for the conversion of carbon monoxide in mainstream smoke to carbon dioxide and catalysts for the conversion of nitric oxide in mainstream smoke to nitrogen such as, for example, iron oxide and copper oxide.

Suitable flavourants for inclusion in additional filter segments of multi-segment filters according to the invention are known in the art and include, but are not limited to, those previously described above for use in the filter segment according to the invention.

Where multi-segment filters according to the invention include a filter segment according to the invention comprising one or more non-laminar substrates loaded with at least one flavourant and one or more additional filter segments comprising a flavourant, the one or more non-laminar substrates of the filter segment according to the invention may be loaded with the same or different flavourant or flavourants as the one or more additional segments.

In preferred embodiments, multi-segments filters according to the invention comprise at least one filter segment according to the invention comprising a non-laminar substrate loaded with at least one flavourant and at least one additional flavour release segment comprising a flavourant.

For example, multi-segment filters according to the invention may comprise a filter segment according to the invention comprising a non-laminar substrate loaded with at least one

flavourant and an additional flavour release segment comprising a plurality of granules loaded with at least one flavourant. In one embodiment, the additional flavour release segment comprises a plug of cellulose acetate tow having a plurality of granules loaded with at least one flavourant distributed substantially evenly therein. In another embodiment, the additional flavour
5 release segment comprises a cavity containing a plurality of granules loaded with at least one flavourant.

However, it will be appreciated that multi-segment filters according to the invention may comprise one or more additional flavour release segments of different construction.

For example, multi-segment filters according to the invention may further comprise one
10 or more additional flavour release segments comprising: plant leaf material (for example, shredded or cut tobacco or peppermint leaf); a plug of filtration material impregnated with one or more liquid flavourants (for example, a plug of cellulose acetate tow impregnated with menthol), a plurality of inert beads or granules loaded with one or more flavourants (for example, a plurality of cellulosic beads or granules loaded with menthol), or a combination thereof.

5 Alternatively or in addition, multi-segment filters according to the invention may further comprise one or more additional flavour release segments according to the invention comprising a non-laminar substrate formed from filter plug wrap having an air permeability of at least about 3000 Coresta units loaded with at least one flavourant.

Alternatively or in addition to one or more additional flavour release segments, multi-
15 segment filters according to the invention may comprise a rod end filter segment upstream of the filter segment according to the invention. Preferably, the rod end filter segment comprises filtration material, more preferably a fibrous filtration material. The rod end filter segment may, for example, comprise cellulosic material, such as cellulose acetate tow, or other suitable fibrous filtration materials such as paper. The inclusion of a rod end filter segment comprising
20 filtration material advantageously provides additional filtration efficiency. The inclusion of a rod end filter segment comprising a fibrous filtration material is particularly preferred in multi-segment filters according to the invention for use in filter cigarettes having a total tar delivery of about 6 mg or less.

Alternatively or in addition, the rod end filter segment may comprise at least one sorbent
25 capable of removing at least one gas phase constituent from mainstream smoke drawn through the filter. Preferably, the at least one sorbent is selected from the group consisting of activated carbon, active alumina, zeolites, sepiolites, molecular sieves, silica gel and combinations thereof.

The rod end filter segment may comprise one or more flavourants to enhance flavour
30 delivery to the consumer during smoking.

Preferably, the length of the rod end filter segment is between about 5 mm and about 14 mm, more preferably between about 6 mm and about 8 mm.

It will be appreciated, however, that in multi-segment filters according to the invention for use in filter cigarettes having a higher total tar delivery, for example a total tar delivery of about 6 mg or higher, the rod end filter segment may be omitted.

Alternatively or in addition to one or more additional flavour release segments and a rod end filter segment, multi-segment filters according to the invention may include a mouth end filter segment downstream of the filter segment according to the invention. Preferably, the mouth end filter segment preferably has substantially no particulate phase filtration efficiency or very low particulate phase filtration efficiency. For example, the mouth end filter segment may comprise cellulosic material, such as cellulose acetate tow, or other suitable fibrous material of low filtration efficiency. Alternatively, the mouth end filter segment may consist of a hollow tube or recess located at the mouth end of the multi-segment filter that has substantially no filtration efficiency. Where the mouth end filter segment of a multi-segment filter according to the present invention is a hollow tube or recess, the mouth end filter segment may be formed when the multi-segment filter is attached to, for example, a rod of smokable material by tipping paper to form a combustible smoking article.

Preferably, the length of the mouth end filter segment is between about 3 mm and about 12 mm, more preferably between about 6 mm and about 8 mm. Where the mouth end filter segment comprises a hollow tube or recess, the length of the mouth end filter segment is preferably between about 3 mm and about 6 mm.

Preferably, the mouth end filter segment has a resistance to draw of about 20 mm WG or less as measured in accordance with ISO 6565:2002.

A mouth end filter segment may advantageously be included downstream of the filter segment according to the invention to balance the overall resistance to draw of multi-segment filters according to the invention in order to achieve a desired overall resistance to draw for a smoking article comprising the multi-segment filter. For example, where the mouth end filter segment comprises a plug of cellulose acetate tow, the denier per filament and total denier of the tow may be selected in order to achieve a desired overall resistance to draw for the multi-segment filter. Preferably, where the mouth end filter segment comprises a plug of cellulose acetate tow, the cellulose acetate tow has a denier per filament of about 5 or more.

The mouth end filter segment may include one or more flavourants to enhance flavour delivery to the consumer during smoking.

Preferably, multi-segment filters according to the invention include a maximum of five filter segments.

Multi-segment filters according to the invention may be produced by forming separate continuous rods comprising multiple units of each filter segment of the filter and then combining these separate rods in a known manner in one or more stages to form a continuous filter rod comprising multiple units of the multi-segment filter. The continuous filter rod may then be

subsequently severed at regular intervals by a cutting mechanism to yield a succession of discrete multi-segment filters according to the invention.

Filters according to the invention may be particularly advantageously used as filters for "low tar" filter cigarettes, and in particular "low tar" ventilated filter cigarettes, having a total nicotine free dry particulate matter (NFDPM) or "tar" delivery of between about 4 mg and about 6 mg and "ultra low tar" filter cigarettes having a total nicotine free dry particulate matter (NFDPM) or "tar" delivery of about 3 mg or less.

However, it will be appreciated that single and multi-segment filters according to the invention may be used as filters for filter cigarettes and other smoking articles having a higher total nicotine free dry particulate matter (NFDPM) or "tar" delivery, for example a total nicotine free dry particulate matter (NFDPM) or "tar" delivery of about 6 mg or more.

According to the invention there is also provided a smoking article comprising a filter according to the invention.

Preferably, smoking articles according to the invention have an overall length of between about 68 mm and about 128 mm, more preferably about 84 mm.

Smoking articles according to the invention may be combustible smoking articles comprising a wrapped rod of smokable material and a filter according to the invention.

Preferably, the smokable material is tobacco cut filler.

Preferably, the rod of smokable material is wrapped in cigarette paper.

Preferably, the filter is attached to the rod of smokable material by tipping paper. The tipping paper may be transparent along at least a portion of its length.

Combustible smoking articles according to the invention preferably further comprise at least one circumferential row of perforations at a location along the filter in order to ventilate mainstream smoke drawn through the filter from the rod of smokable material by a consumer.

Preferably, the at least one circumferential row of perforations is located at least 12 mm from the mouth end of the filter.

Preferably, combustible smoking articles according to the invention have a ventilation of between about 40% and about 80%, more preferably a ventilation of about 70% as measured in accordance with ISO 9512:2002.

Preferably, ventilated combustible smoking articles according to the present invention have a resistance to draw (RTD) of between about 60 mm WG and about 110 mm WG as measured in accordance with ISO 6565:2002.

Preferably, combustible smoking articles according to the invention have a total nicotine free dry particulate matter (NFDPM) or "tar" delivery of between about 0.2 mg and about 12 mg, more preferably of between about 4 mg and about 10 mg, most preferably of about 7 mg or less.

Smoking articles according to the invention may alternatively be non-combustible smoking articles. For example, smoking articles according to the invention may be heated smoking articles of the types previously described above.

According to the invention there is further provided a method of modifying smoke produced by a smoking article comprising a filter, the method comprising providing a non-laminar substrate formed from filter plug wrap having an air permeability of at least about 3000 Coresta units loaded with at least one smoke-modifying agent within the body of a filter segment of the filter.

According to the invention there is also provided use of filter plug wrap having an air permeability of at least about 3000 Coresta units as a non-laminar substrate for at least one smoke-modifying agent within the body of a filter segment for a filter for a smoking article.

Table 1 illustrates the absorption capabilities of threads formed from filter plug wrap suitable for use in the present invention. Individual strips of filter plug wrap obtained from Schweitzer-Mauduit International Inc., Papeteries de Mauduit Mill, Quimperlé, France having the properties specified in Table 1 were manually twisted to form threads of the diameter specified in Table 1.

Sample No.	1	2	3	4	5
Brand name	PPW240	PPW120	PPW120	PPW115ST	PPW75ST
Filter plug wrap					
Width (mm)	26.5	26.5	14.5	26.5	26.5
Grammage (g/m ²)	22.5	25.5	25.5	45	77.5
Capillary rise (mm)	50	64	64	110	120
Tensile breaking strength (N/15 mm)	13	22	22	34	84
Air permeability (Coresta units)	24000	12000	12000	11500	7500
Flavour-bearing thread					
Diameter (mm)	1.4	1.5	1.0	2.2	2.8
Absorption capability (%)	201	112	116	165	142

Table 1

The threads were weighed prior to being immersed in a solution comprising 85% synthetic menthol and 15% ethanol by weight for 10 seconds. The flavour-bearing threads were then removed from the solution and left for 10 minutes before being reweighed.

The absorption capability of each flavour-bearing thread was calculated as a percentage using the following equation:

$$\frac{(\text{weight of thread after immersion}) - (\text{weight of thread prior to immersion})}{(\text{weight of thread prior to immersion})} \times 100$$

The absorption capabilities for each thread sample recited in Table 1 are the average of the absorption capabilities measured for five individual flavour-bearing threads.

Cigarette paper used to wrap the tobacco rods of filter cigarettes and tipping paper used to attach the wrapped tobacco rods of filter cigarettes to the filters thereof contain fillers such as, for example, calcium carbonate. Typically, cigarette paper comprises about 40% filler. Some commercially available filter plug wrap also contain fillers.

Preferably, filter plug wrap having an air permeability of at least about 3000 Coresta units suitable for use in the present invention includes substantially no filler.

As illustrated by the data shown in Table 1, threads formed from filter plug wrap suitable for use in the present invention are capable of absorbing more than 100 percent of their own weight. This high absorption capacity advantageously enables threads and other non-laminar substrates within filter segments according to the invention to be loaded with increased amounts of flavourants and other liquid smoke-modifying agents compared to cotton or cellulose acetate threads or yarns in known filters, and so to provide improved flavour enhancement to mainstream smoke during use.

Table 2 shows the menthol delivery of filter cigarettes comprising a wrapped tobacco rod and an axially aligned single segment filter comprising a plug of cellulose acetate tow and a single central thread loaded with liquid menthol that extends axially through the plug of cellulose acetate tow parallel to the longitudinal axis of the filter cigarette. The threads in the single segment filters of the filter cigarettes of samples 1 and 2 are formed from filter plug wrap having an air permeability of at least about 3000 Coresta units in accordance with the present invention. The central threads in the single segment filters of the filter cigarettes of samples 3 and 4 are formed from cellulose acetate tow in accordance with the prior art.

The menthol deliveries for each sample recited in Table 2 are the average of the menthol deliveries measured for twenty individual filter cigarettes using the ISO machine smoking method.

As illustrated by the data shown in Table 2, the menthol delivery of the filter cigarettes according to the present invention comprising threads formed from filter plug wrap having an air permeability of at least about 3000 Coresta units is advantageously increased compared to the menthol delivery of the filter cigarettes comprising threads formed from cellulose acetate.

Sample No.	1	2	3	4
Filter cigarette				
Total length (mm)	84	84	84	84
Total menthol loading (mg)	6.9	6.9	6.9	6.9
Single segment filter				
Length (mm)	27	27	27	27
Menthol-bearing thread				
Material	filter plug wrap	filter plug wrap	cellulose acetate	cellulose acetate
Diameter (mm)	0.8	0.8	0.8	0.8
Grammage (g/m ²)	25.5	25.5	-	-
Air permeability (Coresta units)	12000	12000	-	-
Denier	-	-	3720	3720
Menthol loading (mg)	2.997	2.997	2.997	2.997
Menthol delivery (mg/cigarette)	1.03	0.98	0.96	0.96

Table 2

The invention will be further described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 shows a schematic longitudinal cross-section of a filter cigarette comprising a tobacco rod and a single segment filter according to a first embodiment of the invention;

Figure 2 shows a schematic longitudinal cross-section of a filter cigarette comprising a tobacco rod and a multi-segment filter according to a second embodiment of the invention;

Figure 3 shows a schematic longitudinal cross-section of a filter cigarette comprising a tobacco rod and a multi-segment filter according to a third embodiment of the invention;

Figure 4 shows a schematic longitudinal cross-section of a filter cigarette comprising a tobacco rod and a multi-segment filter according to a fourth embodiment of the invention; and

Figure 5 shows a schematic longitudinal cross-section of a filter cigarette comprising a tobacco rod and a multi-segment filter according to a fifth embodiment of the invention.

The filter cigarettes 10, 20, 30, 40, 50 according to the first to fifth embodiments of the invention shown in Figures 1 to 5, respectively, have several components in common; these components have been given the same reference numerals.

Each filter cigarette generally comprises an elongate, cylindrical wrapped tobacco rod 12 attached at one end to an axially aligned, elongate, cylindrical, filter 14. The wrapped tobacco rod 12 and the filter 14 are joined in a conventional manner by tipping paper (not shown), which circumscribes the entire length of the filter and an adjacent portion of the wrapped tobacco rod 12. A plurality of annular perforations (not shown) is provided through the tipping paper at a location along filter 14 to ventilate mainstream smoke drawn through the filter 14 with ambient air.

The single segment filter 14 of the filter cigarette 10 according to the first embodiment of the invention includes a single filter segment 16 according to the invention adjacent to and abutting the wrapped tobacco rod 12. As shown in Figure 1, the filter segment 16 comprises a plug of cellulose acetate tow 18 and a central flavour-bearing thread 20 that extends axially through the plug of cellulose acetate tow 18 parallel to the longitudinal axis of the filter 14 and wrapped tobacco rod 12. The central flavour-bearing thread 20 is of substantially the same length as the plug of cellulose acetate tow 18, so that the ends of the central flavour-bearing thread 20 are visible at the ends of the filter segment 16. The central flavour-bearing thread 20, which is loaded with menthol, is formed from twisted filter plug wrap having an air permeability of at least about 3000 Coresta units.

During smoking of the filter cigarette 10, mainstream smoke is drawn downstream from the lit end of the wrapped tobacco rod 12 through the single segment filter 14 by the consumer. As the mainstream smoke enters the single segment filter 14 it passes through the filter segment 16 according to the invention, where the cellulose acetate tow filters out particulate phase components of the smoke and menthol is released into the mainstream smoke from the central flavour-bearing thread 20 extending axially through the cellulose acetate tow. The menthol loaded on the central flavour-bearing thread 20 of the filter segment 16 according to the invention thus provides flavour enhancement to the mainstream smoke.

The multi-segment filter 14 of the filter cigarette 20 according to the second embodiment of the invention shown in Figure 2 includes two filter segments in abutting end-to-end relationship: a mouth end filter segment 22, distant from the wrapped tobacco rod 12; and a rod end filter segment 16 according to the invention located upstream of the mouth end filter segment 22 and adjacent to and abutting the wrapped tobacco rod 12.

The rod end filter segment 16 of the multi-segment filter 14 of the filter cigarette 20 according to the second embodiment of the invention shown in Figure 2 is of the same construction as the filter segment 16 of the single segment filter 14 of the filter cigarette 10 according to the first embodiment of the invention shown in Figure 1.

The mouth end filter segment 22 of the multi-segment filter 14 of the filter cigarette 20 according to the second embodiment of the invention is a recess, which has substantially no

filtration efficiency, formed by the tipping paper joining the wrapped tobacco rod 12 and the filter 14.

In an alternative embodiment of the invention (not shown), the mouth end filter segment 22 of the multi-segment filter 14 shown in Figure 2 is replaced by a plug of cellulose acetate tow of low filtration efficiency. In this alternative embodiment, the mouth end filter segment 12 balances the overall resistance to draw of the multi-segment filter 14 and hence the filter cigarette.

The multi-segment filter 14 of the filter cigarette 30 according to the third embodiment of the invention shown in Figure 3 also includes two filter segments in abutting end-to-end relationship: a mouth end filter segment 16 according to the invention, distant from the wrapped tobacco rod 12; and a rod end filter segment 24 located upstream of the mouth end filter segment 16 and adjacent to and abutting the wrapped tobacco rod 12.

The mouth end filter segment 16 of the multi-segment filter 14 of the filter cigarette 30 according to the third embodiment of the invention shown in Figure 3 is of the same construction as the filter segment 16 of the single segment filter 14 of the filter cigarette 10 according to the first embodiment of the invention shown in Figure 1.

The rod end filter segment 24 of the multi-segment filter 14 of the filter cigarette 30 according to the third embodiment of the invention comprises a plug of cellulose acetate tow of high filtration efficiency having a plurality of granules loaded with menthol substantially evenly distributed there through.

In use, mainstream smoke drawn downstream from the lit end of the wrapped tobacco rod 12 of the filter cigarette 30 passes through the rod end filter segment 24 of the multi-segment filter 14, where the high filtration efficiency cellulose acetate tow partially filters out particulate phase components of the smoke and menthol is released into the mainstream smoke from the granules distributed in the cellulose acetate tow. The mainstream smoke then passes downstream through the mouth end filter segment 16 according to the invention, where the cellulose acetate tow also partially filters out particulate phase components of the smoke and further menthol is released into the mainstream smoke from the central flavour-bearing thread 20 extending axially through the cellulose acetate tow.

The cellulose acetate tow in the rod end filter segment 24 and mouth end filter segment 16 of the multi-segment filter 14 provides filtration of particulate phase components of the mainstream smoke. At the same time, the granules of the rod end filter segment 24 and the central flavour-bearing thread 20 of the mouth end filter segment 16 of the multi-segment filter 14 provide dual flavour enhancement to the mainstream smoke.

The multi-segment filter 14 of the filter cigarette 40 according to the fourth embodiment of the invention shown in Figure 4 includes three filter segments in abutting end-to-end relationship. The multi-segment filter 14 comprises a rod end filter segment 24 of the same

construction as the rod end filter segment 24 of the multi-segment filter 14 of the filter cigarette 30 according to the third embodiment of the invention shown in Figure 3. The multi-segment filter 14 also comprises a central filter segment 16 according to the invention immediately downstream of the rod end filter segment 24 of the same construction as the filter segment 16 of the single segment filter 14 of the filter cigarette 10 according to the first embodiment of the invention shown in Figure 1. In addition, the multi-segment filter 14 includes a mouth end filter segment 22 located downstream of the central filter segment 16 comprising a plug of cellulose acetate tow of low filtration efficiency. The mouth end filter segment 12 balances the overall resistance to draw of the multi-segment filter 14 and hence the filter cigarette 40.

In an alternative embodiment of the invention (not shown), the mouth end filter segment 22 of the multi-segment filter 14 shown in Figure 4 is replaced by a recess, which has substantially no filtration efficiency, formed by the tipping paper joining the wrapped tobacco rod 12 and the filter 14.

The multi-segment filter 14 of the filter cigarette 50 according to the fifth embodiment of the invention shown in Figure 5 also includes three filter segments in abutting end-to-end relationship. The multi-segment filter 14 comprises a mouth end filter segment 16 according to the invention of the same construction as the filter segment 16 of the single segment filter 14 of the filter cigarette 10 according to the first embodiment of the invention shown in Figure 1. The multi-segment filter 14 also comprises a central filter segment 24 immediately upstream of the mouth end filter segment 16 of the same construction as the rod end filter segment 24 of the multi-segment filter 14 of the filter cigarette 30 according to the third embodiment of the invention shown in Figure 3. In addition, the multi-segment filter 14 includes a rod end filter segment 26 located upstream of the central filter segment 24 and adjacent to and abutting the wrapped tobacco rod 12. The rod end filter segment 26 comprises a plug of cellulose acetate tow of medium to low filtration efficiency having a plurality of particles of activated carbon substantially evenly distributed there through.

In use, mainstream smoke drawn downstream from the lit end of the wrapped tobacco rod 12 of the filter cigarette 50 passes through the rod end filter segment 26 of the multi-segment filter 14, where the medium to low filtration efficiency cellulose acetate tow partially filters out particulate phase components of the mainstream smoke and the activated carbon distributed amongst the cellulose acetate tow filters out gas phase components of the mainstream smoke. The mainstream smoke then passes downstream through the central filter segment 24, where the high filtration efficiency cellulose acetate tow partially filters out particulate phase components of the smoke and menthol is released into the mainstream smoke from the granules distributed in the cellulose acetate tow. Finally, the mainstream smoke passes downstream through the mouth end filter segment 16 according to the invention, where the cellulose acetate tow also partially filters out particulate phase components of the

smoke and further menthol is released into the mainstream smoke from the central flavour-bearing thread 20 extending axially through the cellulose acetate tow.

The cellulose acetate tow in the rod end filter segment 26, central filter segment 24 and mouth end filter segment 16 of the multi-segment filter 14 maximises filtration of particulate phase components of the mainstream smoke, while the activated carbon distributed amongst the cellulose acetate tow of the rod end filter segment 26 of the multi-segment filter 14 maximises filtration of gas phase components of the mainstream smoke. At the same time, the granules of the central filter segment 24 and the central flavour-bearing thread 20 of the mouth end filter segment 16 of the multi-segment filter 14 provide dual flavour enhancement to the mainstream smoke.

In further embodiments of the invention (not shown), a mouth end filter segment may be included downstream of the filter segment 16 according to the invention of the multi-segment filter 14 of the filter cigarette 50 according to the fifth embodiment of the invention.

In yet further embodiments of the invention (not shown), the filter segments 24 comprising a plug of cellulose acetate tow of high filtration efficiency having a plurality of granules loaded with menthol substantially evenly distributed there through of the multi-segment filters 14 of the filter cigarettes 30, 40, 50 according to the third, fourth and fifth embodiments of the invention shown in Figure 3, 4 and 5, respectively, are replaced by filter segments comprising plant leaf.

For example, in certain alternative embodiments of the invention (not shown), the filter segments 24 comprising a plug of cellulose acetate tow of high filtration efficiency having a plurality of granules loaded with menthol substantially evenly distributed there through of the multi-segment filters 14 shown in Figures 3, 4 and 5 are replaced by filter segments comprising a plug of shredded or cut plant leaf, for example a plug of fine cut tobacco.

In other alternative embodiments of the invention (not shown), the filter segments 24 comprising a plug of cellulose acetate tow of high filtration efficiency having a plurality of granules loaded with menthol substantially evenly distributed there through of the multi-segment filters 14 shown in Figures 3, 4 and 5 are replaced by filter segments comprising a plug of filtration material having plant leaf distributed there through, for example a plug of cellulose acetate tow having dried peppermint leaf substantially evenly distributed there through.

In the multi-segment filters 14 of the filter cigarettes 30, 40, 50 according to the third, fourth and fifth embodiments of the invention shown in Figures 3, 4 and 5, respectively, the filter segment 24 comprising a plug of cellulose acetate tow of high filtration efficiency having a plurality of granules loaded with menthol substantially evenly distributed there through is located upstream of the filter segment 16 according to the invention. However, it will be appreciated that multi-segment filters according to the invention may alternatively or additionally include an additional filter segment that releases flavour into the mainstream downstream of the filter

segment according to the invention. For example, in alternative embodiments of the invention (not shown), the relative positions of the filter segment 16 according to the invention and the filter segment 24 comprising a plug of cellulose acetate tow of high filtration efficiency having a plurality of granules loaded with menthol substantially evenly distributed there through of the multi-segment filters 14 of the filter cigarettes 30, 40, 50 according to the third, fourth and fifth embodiments is reversed, such that the filter segment 16 according to the invention is located upstream of the filter segment 24 comprising a plug of cellulose acetate tow of high filtration efficiency having a plurality of granules loaded with menthol substantially evenly distributed there through.

The multi-segment filters 14 of the filter cigarettes 30, 40, 50 according to the third, fourth and fifth embodiments of the invention shown in Figures 3, 4 and 5 include two flavour release segments: a filter segment 16 according to the invention comprising a central flavour-bearing thread 20; and a filter segment 24 comprising a plug of cellulose acetate tow having a plurality of granules loaded with menthol substantially evenly distributed there through. However, it will be appreciated that multi-segment filters according to the invention may include more than two flavour release segments. For example, in alternative embodiments of the invention (not shown), in addition to a filter segment according to the invention comprising a substrate loaded with at least one flavourant, the multi-segment includes a second flavour release segment and a third flavour release segment of the same or different construction. In such embodiments, the filter segment according to the invention comprising a substrate loaded with at least one flavourant may be located: (i) upstream of both the second and third flavour release segments; (ii) downstream of both the second and third flavour release segments; or (i) between the second and third flavour release segments. For example, in one alternative embodiment of the invention (not shown), the rod end filter segment of the multi-segment filter 14 of the filter cigarette 50 according to the fifth embodiment of the invention shown in Figure 5 is replaced by a third flavour release segment of substantially the same construction as the mouth end filter segment 16 according to the invention.

To produce each of the multi-segment filters 14 of the filter cigarettes, 30, 40, 50 according to the second to fifth embodiments of the invention shown in Figures 2 to 5, separate continuous rods comprising multiple units of each segment 16, 22, 24, 26 of the multi-segment filter 14 are produced in a known manner and then combined to form a continuous filter rod comprising multiple units of the multi-segment filter 14. The continuous filter rod is then severed at regular intervals by a cutting mechanism to yield a succession of discrete multi-segment filters 14.

To form the filter cigarettes 10, 20, 30, 40, 50 according to the first to fifth embodiments of the invention shown in Figures 1 to 5, the filters 14 are produced and then joined to the

wrapped tobacco rods 12, which are produced in a conventional manner, by tipping paper using known filter cigarette making equipment.

Example

A filter cigarette according to the third embodiment of the invention shown in Figure 3 is produced having the dimensions and properties given in Table 3 below:

	Filter Cigarette		
Encapsulated RTD (mm WG)	95		
Length (mm)	84		
Circumference (mm)	24.8		
NFDPM (mg)	4.8		
Nicotine (mg)	0.43		
	Multi-segment filter		Wrapped Tobacco rod
Encapsulated RTD (mm WG)	106		-
Ventilation (%)	51		-
Length (mm)	27		57
Filter segment:	Mouth end	Rod end	
Length (mm)	15	12	-
RTD (mm WG)	56	50	-
Cellulose acetate: denier per filament	2.7	3.7	-
Cellulose acetate: total denier	35000	35000	-
Menthol loading (mg)	7.8	7.0	-
Substrate (mg)	5.25	-	-
Substrate and menthol (mg)	13.05	-	-
Diameter of non-laminar substrate (mm)	1.3		
Air permeability of filter plug wrap (Coresta units)	12000		
Width of filter plug wrap (mm)	14.5		
Tensile breaking strength of filter plug wrap (N/15 mm ²)	22		
Capillary rise of filter plug wrap (mm)	64		
Granules (mg)	-	25	-

Table 3

While the invention has been exemplified above with reference to smoking articles and filters that include a filter segment comprising a single, axially extending central thread, it will be appreciated that filters according to the invention may include segments comprising two or more axially extending, elongate non-laminar substrates.

It will also be appreciated that filters according to the invention may include segments comprising one or more non-laminar substrates of different form loaded with at least one smoke-modifying agent. For example, filters according to the invention may include one or more beads or pellets loaded with at least one smoke-modifying agent that are formed from filter plug wrap having an air permeability of at least about 3000 Coresta units.

In addition, while the invention has been exemplified above with reference to combustible smoking articles, it will be appreciated that filter segments according to the invention may also be used in filters for non-combustible smoking articles.

CLAIMS:

1. A filter segment for use in a filter of a smoking article, the filter segment comprising a non-laminar substrate loaded with at least one smoke-modifying agent, wherein the non-laminar substrate is located within the body of the filter segment and is formed from filter plug wrap having an air permeability of at least about 3000 Coresta units.
2. A filter segment according to claim 1 wherein the non-laminar substrate is formed from filter plug wrap having an air permeability of between about 5000 Coresta units and about 30000 Coresta units.
3. A filter segment according to claim 2 wherein the non-laminar substrate is formed from filter plug wrap having an air permeability of between about 6000 Coresta units and about 24000 Coresta units.
4. A filter segment according to claim 1, 2 or 3 wherein the non-laminar substrate is formed from filter plug wrap having a grammage of between about 10 g/m² and about 80 g/m².
5. A filter segment according to any of claims 1 to 4 wherein the non-laminar substrate is loaded with menthol.
6. A filter segment according to any preceding claim wherein the non-laminar substrate is coloured.
7. A filter segment according to any preceding claim wherein the non-laminar substrate is a thread formed from one or more strips of filter plug wrap.
8. A filter segment according to claim 7 wherein the non-laminar substrate has a diameter of between about 0.5 mm and about 3 mm.
9. A filter segment according to claim 7 or 8 wherein the non-laminar substrate extends axially within the body of the filter segment.

10. A bobbin of thread for use in the manufacture of a filter segment according to any preceding claim, wherein the thread is formed from filter plug wrap having an air permeability of at least about 3000 Coresta units and has a diameter of between about 0.5 mm and about 3 mm.
11. A filter for a smoking article comprising a filter segment according to any of claims 1 to 9.
12. A multi-segment filter for a smoking article comprising a filter segment according to any of claims 1 to 9 at the mouth end thereof.
13. A smoking article comprising a filter according to claim 11 or 12.
14. Use of filter plug wrap having an air permeability of at least about 3000 Coresta units as a non-laminar substrate for at least one smoke-modifying agent within the body of a filter segment for a filter for a smoking article.
15. A method of modifying smoke produced by a smoking article comprising a filter, the method comprising providing a non-laminar substrate formed from filter plug wrap having an air permeability of at least about 3000 Coresta units loaded with at least one smoke-modifying agent within the body of a filter segment of the filter.