(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 888 960 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
01.07.2015 Bulletin 2015/27

(51) Int Cl.:
A24D 3/06 *(2006.01)*

(21) Application number: **13199598.7**

(22) Date of filing: **24.12.2013**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

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(54) **Smoking article mouthpiece with fibrous segment**

(57) A mouthpiece (12) for a smoking article (10) comprises a filter segment (18), the filter segment (18) comprising particles dispersed in a filtration material. The mouthpiece (12) further comprises a fibrous segment (20) of randomly oriented fibres positioned downstream of the filter segment (18) and a flow restriction segment (22) positioned downstream of the fibrous segment (20).

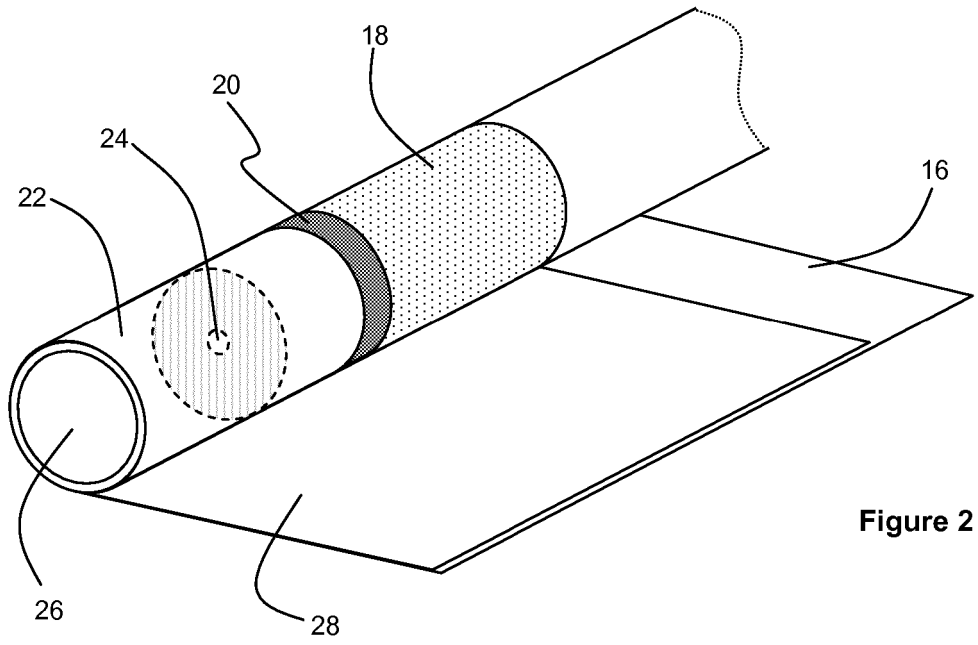

Figure 2

EP 2 888 960 A1

Description

[0001] The present invention relates to a mouthpiece for a smoking article, the mouthpiece comprising a fibrous segment of randomly oriented fibres positioned between a flow restriction segment and a filter segment comprising particles dispersed in a filtration material. The present invention also relates to smoking articles comprising such mouthpieces.

[0002] Filter cigarettes typically comprise a cylindrical rod of tobacco cut filler surrounded by a paper wrapper and a cylindrical filter axially aligned in an abutting end-to-end relationship with the wrapped tobacco rod. The cylindrical filter typically comprises a filtration material circumscribed by a paper plug wrap. Conventionally, the wrapped tobacco rod and the filter are joined by a band of tipping paper, normally formed of an opaque paper material that circumscribes the entire length of the filter and an adjacent portion of the wrapped tobacco rod.

[0003] A number of smoking articles in which an aerosol generating substrate, such as tobacco, is heated rather than combusted have also been proposed in the art. In heated smoking articles, the aerosol is generated by heating the aerosol generating substrate. Known heated smoking articles include, for example, smoking articles in which an aerosol is generated by electrical heating or by the transfer of heat from a combustible fuel element or heat source to an aerosol generating substrate. During smoking, volatile compounds are released from the aerosol generating substrate by heat transfer from the heat source and entrained in air drawn through the smoking article. As the released compounds cool they condense to form an aerosol that is inhaled by the consumer. Also known are smoking articles in which a nicotine-containing aerosol is generated from a tobacco material, tobacco extract, or other nicotine source, without combustion, and in some cases without heating, for example through a chemical reaction.

[0004] Some smoking articles comprise a mouthpiece including a filter segment and a flow restrictor having a small orifice to provide a required resistance to draw. It is also known to provide smoking articles with a filter segment containing a particulate material, such as particles of activated carbon to adsorb mainstream smoke constituents. It would be desirable to combine a particle containing filter segment and a flow restrictor in such a way that contamination of the flow restrictor with the particulate material is substantially reduced or eliminated.

[0005] Accordingly, the present invention provides a mouthpiece for a smoking article, the mouthpiece comprising a filter segment, the filter segment comprising particles dispersed in a filtration material. The mouthpiece further comprises a fibrous segment of randomly oriented fibres positioned downstream of the filter segment and a flow restriction segment positioned downstream of the fibrous segment.

[0006] Advantageously, the fibrous segment functions as a trap to retain any of the particles that may become dislodged from the filter segment during smoking of the smoking article. Therefore, the fibrous segment substantially reduces breakthrough of the particles to the flow restriction segment and prevents the particles from blocking the flow restriction segment. The random orientation of the fibres provides a tortuous path for airflow through the fibrous segment, thus optimising the retention of particles by the fibrous segment, particularly when compared to a conventional segment of cellulose acetate tow in which the fibres are axially aligned in the longitudinal direction of the filter.

[0007] The fibrous segment preferably has a length of about 8 millimetres or less, preferably a length of about 5 millimetres or less. Preferably, the fibrous segment has a length of at least about 3 millimetres.

[0008] The fibrous segment may be formed as a single plug of fibrous material. Alternatively, the fibrous segment may be formed from multiple layers of fibrous material combined to form the segment. For example, the fibrous segment may comprise multiple discs of fibrous material positioned adjacent to each other in the upstream-downstream direction. Advantageously, forming the fibrous segment from multiple layers of fibrous material provides a simple means for adjusting the length of the fibrous segment as desired. For example, to accommodate a filter with an increased particle load in the filter segment, the length of the fibrous segment can be increased by simply increasing the number of layers of fibrous material. Forming the fibrous segment from multiple layers of fibrous material can therefore eliminate the need to produce fibrous segments of different lengths, since any fibrous segment can be formed simply by selecting the required number of layers of fibrous material for a given application.

[0009] In some embodiments, the fibrous segment comprises thermally bonded bicomponent fibres. The bicomponent fibres may each comprise a core formed from polyethylene terephthalate (PET) and a sheath formed from polypropylene or nylon-6. Exemplary bicomponent fibres that can be used to construct the fibrous segment include Colback® WA bicomponent fibres manufacture by Colbond and Filtrete™ manufactured by 3M™.

[0010] Preferably, the fibrous segment is formed from a sheet material that has a basis weight of between about 10 and about 500 grams per square metre, more preferably between about 20 and about 300 grams per square metre, most preferably between about 30 and about 150 grams per square metre.

[0011] The fibrous segment preferably has an air permeability of between about 1000 and about 8000 l/m^2s, more preferably between about 2000 and about 7000 l/m^2s and most preferably between about 3000 and about 6000 l/m^2s, measured according to the Coresta Recommended Method Number 40.

[0012] To provide an optimum resistance to draw, the flow restriction segment preferably comprises a tubular element, wherein the narrowest portion of the tubular element has an internal diameter of between about 0.3 and about 1.5

millimetres, preferably an internal diameter of about 0.95 millimetres.

[0013] The particles in the filter segment may comprise adsorbents such as: zeolites, activated carbon, ion exchange resin, aluminium oxide, iron oxide supported by an adsorbent, silica based materials, chitosan composite and combinations thereof. Additionally, or alternatively, the filter segment may also comprise particles of plant material.

[0014] To simplify the construction of the mouthpiece and to reduce the cost of manufacture, the fibrous segment is preferably positioned adjacent to the filter segment and the flow restriction segment is preferably positioned adjacent the fibrous segment. In other words, the filter segment, the fibrous segment and the flow restriction segment are preferably positioned consecutively within the mouthpiece such that there are no intervening segments or cavities.

[0015] The mouthpiece may further comprise a wrapper, such as a plug wrap, circumscribing the filter segment, the fibrous segment and the flow restriction segment to maintain the relative positions of the different segments during construction of a smoking article incorporating the mouthpiece.

[0016] In this regard, the present invention also extends to smoking articles including a mouthpiece in accordance with any of the embodiments described above. Therefore, the present invention also provides a smoking article comprising an aerosol generating substrate and a mouthpiece in accordance with the present invention, the mouthpiece connected to the aerosol generating substrate. Similarly, the present invention also encompasses the use of a fibrous segment of randomly oriented fibres to reduce breakthrough of particles from a filtration segment to a flow restriction segment in a smoking article.

[0017] In some embodiments, the flow restriction segment may be the most downstream segment in the mouthpiece. In other words, there may be no intervening segments between the flow restriction segment and the mouth end of the smoking article.

[0018] Preferably, the smoking article further comprises a wrapper, such as a tipping wrapper, connecting the aerosol generating substrate to the mouthpiece. In some embodiments, the wrapper extends downstream of the flow restriction segment to define a mouth end cavity adjacent to the downstream end of the flow restriction segment. Alternatively, the wrapper may terminate at the downstream edge of the flow restriction segment such that the flow restriction segment forms the mouth end of the smoking article. In another alternative, the flow restriction segment may comprise a downstream tubular portion, wherein the downstream tubular portion forms a mouth end cavity.

[0019] Smoking articles in accordance with the present invention preferably have a resistance to draw of between about 40 and about 150 mmWG, more preferably between about 70 and about 120 mmWG, most preferably between about 80 and 110 mmWG. Resistance to draw is measured in accordance with ISO 6565-2002.

[0020] The mouthpiece may abut the aerosol-generating substrate, or the mouthpiece may not abut the aerosol-generating substrate. For example, the mouthpiece may be spaced apart from the aerosol-generating substrate so as to define a gap or a cavity therebetween. Alternatively, an intervening material may be positioned between the mouthpiece and the aerosol-generating substrate.

[0021] Smoking articles in accordance with the present invention may be filter cigarettes or other smoking articles in which tobacco material is combusted to form smoke. For example, the aerosol-generating substrate may comprise a tobacco rod.

[0022] Alternatively, smoking articles according to the present invention may be articles in which an aerosol-generating substance, such as tobacco, is heated to form an aerosol rather than combusted. In one type of heated smoking article, an aerosol generating substance 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 or chemical heat source to a physically separate aerosol generating substrate, which may be located within, around or downstream of the heat source. The present invention further encompasses smoking articles in which a nicotine-containing aerosol is generated from a tobacco material, tobacco extract, or other nicotine source, without combustion, and in some cases without heating, for example through a chemical reaction.

[0023] The invention will now be further described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 shows a smoking article in accordance with the present invention;
Figure 2 shows the mouth end of the smoking article of Figure 1 with the mouthpiece unwrapped.

[0024] Figures 1 and 2 show a filter cigarette 10 comprising a mouthpiece 12 in accordance with the present invention. The cigarette 10 comprises a wrapped rod 14 of tobacco cut filler which is attached at one end to the axially aligned mouthpiece 12. A tipping wrapper 16 circumscribes the mouthpiece 12 and a portion of the wrapped rod 14 of tobacco to join together the two portions of the cigarette 10.

[0025] As shown in Figure 2, the mouthpiece 12 comprises a filter segment 18 formed from cellulose acetate tow and containing adsorbent particles formed from activated carbon. A fibrous segment 20 formed from randomly oriented and thermally bonded bicomponent fibres is positioned adjacent to the downstream end of the filter segment 18. A flow restrictor 22 is positioned adjacent to the downstream end of the fibrous segment 20, the flow restrictor 22 comprising

a flow restriction orifice 24. The fibrous segment 20 prevents significant breakthrough of the adsorbent particles from the filter segment 18 to the flow restrictor 22, thus preventing obstruction of the flow restriction orifice 24 by adsorbent particles.

[0026] The downstream end of the flow restrictor 22 defines a mouth end cavity 26 at the mouth end of the cigarette 10. The segments 18, 20 and 22 are circumscribed by a combining plug wrap 28 which connects the three segments to form the mouthpiece 12. One or more of the segments 18, 20, 22 may also be wrapped in an individual plug wrap.

Examples

[0027] The following examples illustrate the effectiveness of a fibrous segment in reducing breakthrough of particles from an upstream mouthpiece segment.

Example 1

[0028] A reference smoking article was constructed using a mouthpiece consisting of an upstream segment of cellulose acetate tow containing 136 milligrams of activated carbon particles and a downstream filter segment of cellulose acetate tow. The length of the upstream segment was 17 millimetres and the length of the downstream segment was 10 millimetres.

[0029] Four test articles were constructed in which the downstream segment was replaced with a 5 millimetre segment of cellulose acetate tow and a 5 millimetre fibrous segment was positioned between the upstream filter segment and the downstream filter segment. The following fibres were used to construct the fibrous segments in the four test articles: Colback® WA 30, Colback® WA 50, Colback® WA 75 and Colback® VA 60. The test articles were then dry-puffed (that is, puffed without lighting the smoking articles) for a total of 12 puffs each, the puffs spaced apart by 13 seconds. Each puff was 55 millilitres during 2 seconds. The number of activated carbon particles that reached the downstream end of each smoking article during the dry puffing test was recorded using an AeroTrak® laser scattering particle counter, recording particle sizes in the range of 0.3 micrometres to 10 micrometres. The dry puffing test was repeated for a total of 10 smoking articles of each type:

Fibre	**Particle breakthrough [Particle counts] - average value for 10 articles**	**Percentage reduction in particle breakthrough compared to reference article**
None (reference)	80.3	-
Colback® WA 30	37.3	53.5
Colback® WA 50	42.9	46.6
Colback® WA 75	53.0	34.0
Colback® VA 60	38.0	52.7

Example 2

[0030] A reference smoking article was constructed using a mouthpiece consisting of upstream and downstream segments of cellulose acetate tow. The length of the upstream segment was 6 millimetres and the length of the downstream segment was 16 millimetres. The upstream and downstream segments were spaced apart to form a 5 millimetre cavity that was filled with 110 milligrams of activated carbon particles.

[0031] Three test articles were constructed in which the downstream segment was replaced with an 11 millimetre segment of cellulose acetate tow and a 5 millimetre fibrous segment was positioned between the cavity containing the activated carbon particles and the downstream filter segment. The following fibres were used to construct the fibrous segments in the three test articles: Filtrete™, Colback® WA 100 and Colback® PWS 75. The test articles were then dry-puffed (that is, puffed without lighting the smoking articles) for a total of 12 puffs each, the puffs spaced apart by 13 seconds. Each puff was 55 millilitres during 2 seconds. The number of activated carbon particles that reached the downstream end of each smoking article during the dry puffing test was recorded using an AeroTrak® laser scattering particle counter, recording particle sizes in the range of 0.3 micrometres to 10 micrometres. The dry puffing test was repeated for a total of 10 smoking articles of each type:

Fibre	Particle breakthrough Particle counts] - average value for 10 articles	Percentage reduction in particle breakthrough compared to reference article
None (reference)	180	-
Filtrete™	20	90
Colback® WA 100	160	9
Colback® PWS 75	50	70

Claims

1. A smoking article comprising an aerosol generating substrate and a mouthpiece connected to the aerosol generating substrate, wherein the mouthpiece comprises:

   a filter segment comprising particles dispersed in a filtration material;
   a fibrous segment of randomly oriented fibres positioned downstream of the filter segment; and
   a flow restriction segment positioned downstream of the fibrous segment.

2. A smoking article according to claim 1, wherein the fibrous segment has a length of 8 millimetres or less.

3. A smoking article according to claim 1 or 2, wherein the fibrous segment comprises thermally bonded bicomponent fibres.

4. A smoking article according to claim 3, wherein the bicomponent fibres each comprise a core formed from polyethylene terephthalate (PET) and a sheath formed from polypropylene or nylon-6.

5. A smoking article according to any preceding claim, wherein the fibrous segment is formed from a sheet material that has a basis weight of between 100 and 1500 grams per square metre.

6. A smoking article according to any preceding claim, wherein the fibrous segment has an air permeability of between 3000 and 6000 l/m^2s measured in accordance with the Coresta Recommended Method Number 40.

7. A smoking article according to any preceding claim, wherein the flow restriction segment comprises a tubular element, and wherein the narrowest portion of the tubular element has an internal diameter of between 0.3 and 1.5 millimetres.

8. A smoking article according to any preceding claim, wherein the fibrous segment is positioned adjacent to the filter segment and wherein the flow restriction segment is positioned adjacent the fibrous segment.

9. A smoking article according to any preceding claim, wherein the flow restriction segment is the most downstream segment in the mouthpiece.

10. A smoking article according to claim 9, further comprising a wrapper connecting the aerosol generating substrate to the mouthpiece, wherein the wrapper extends downstream of the flow restriction segment to define a mouth end cavity adjacent to the downstream end of the flow restriction segment.

11. A smoking article according to any preceding claim, wherein the particles comprise at least one of zeolites, activated carbon, ion exchange resin, aluminium oxide, iron oxide supported by an adsorbent, a silica based material, chitosan composite, plant material and combinations thereof.

12. A smoking article according to any preceding claim, wherein the smoking article has a resistance to draw of between 40 and 150 mmWG measured in accordance with ISO 6565-2002.

13. A mouthpiece for a smoking article, the mouthpiece comprising:

a filter segment comprising particles dispersed in a filtration material;
a fibrous segment of randomly oriented fibres positioned downstream of the filter segment; and
a flow restriction segment positioned downstream of the fibrous segment.

14. A mouthpiece according to claim 13, wherein the fibrous segment comprises thermally bonded bicomponent fibres.

15. Use of a fibrous segment of randomly oriented fibres to reduce breakthrough of particles from a filtration segment to a flow restriction segment in a smoking article.

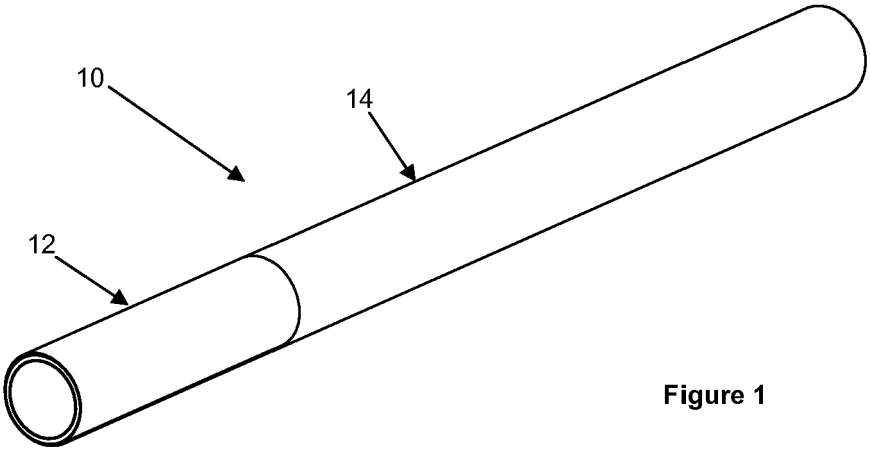

Figure 1

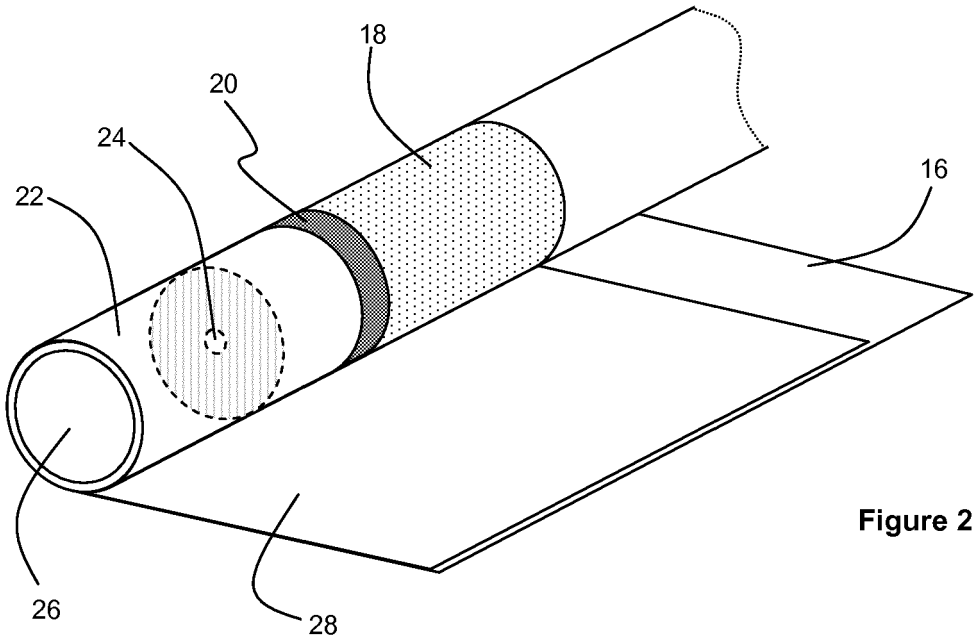

Figure 2

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EUROPEAN SEARCH REPORT

Application Number
EP 13 19 9598

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

A24D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	22 May 2014	Cardan, Cosmin

CATEGORY OF CITED DOCUMENTS

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