



(43) International Publication Date  
18 October 2012 (18.10.2012)

(51) International Patent Classification:  
*A24D 3/04* (2006.01)

(21) International Application Number:  
PCT/EP2012/056815

(22) International Filing Date:  
13 April 2012 (13.04.2012)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
11250475.8 15 April 2011 (15.04.2011) EP

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: VENTILATED SMOKING ARTICLE INCLUDING SORBENT MATERIAL

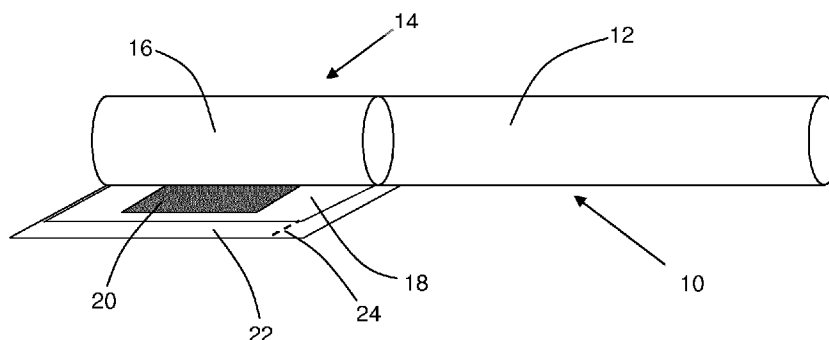


Figure 1

(57) Abstract: A smoking article (10) comprises: a tobacco rod (12); and a filter (14) connected to the tobacco rod and comprising one or more filter segments (16) circumscribed by a filter wrapper (18), including a sorbent material (20). The filter includes a ventilation zone (24) provided upstream of the sorbent material (20). The level of mainstream gas phase smoke constituents delivered (14) during smoking of the smoking article (10) with the ventilation zone (24) open is within up to 40% of the level of mainstream gas phase smoke delivered during smoking of the smoking article (10) with the ventilation zone (24) blocked.



WO 2012/140217 A1

**VENTILATED SMOKING ARTICLE INCLUDING SORBENT MATERIAL**

The present invention relates to a ventilated smoking article incorporating a filter wrapper with a sorbent.

5 Filter cigarettes typically 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, with the filter attached to the tobacco rod by tipping paper. In conventional filter cigarettes, the filter may consist of a plug of cellulose acetate tow wrapped in porous plug wrap.

10 It is common to provide a ventilation zone in a smoking article, typically in the form of perforations provided in the tipping paper or the plug wrap, or both. The ventilation zone allows air to enter the filter during smoking and the air dilutes the mainstream smoke coming through the filter from the burning tobacco rod, thereby reducing the levels of smoke constituents delivered to the consumer.

15 The ventilation zone typically includes perforations provided at one or more positions along the filter of the smoking article and some of the perforations can be inadvertently blocked during smoking, for example, by the lips or fingers of the consumer. Air is thereby prevented from entering the filter and the level of dilution of the mainstream smoke decreases.

20 In addition to the inclusion of a ventilation zone, it is also known to provide a sorbent material such as activated carbon within the filter of a smoking article as an additional means to reduce the level of certain smoke constituents. However, sorbent materials may adversely affect the taste of the mainstream smoke in a way that is unfavourable to some consumers.

25 It would be desirable to provide a novel filter arrangement for a smoking article that substantially maintains the delivery level of certain smoke constituents whether the ventilation zone is open or blocked, so that inadvertent covering of the ventilation zone does not significantly impact smoke constituent delivery. It would further be desirable if such a filter arrangement could be readily manufactured using existing apparatus and techniques.

30 According to the invention there is provided a smoking article comprising: a tobacco rod; a filter connected to the tobacco rod and comprising one or more filter segments circumscribed by a filter wrapper including a sorbent material. The filter includes a ventilation zone provided upstream of the sorbent material. The result of this arrangement is that the level of mainstream gas phase smoke constituents delivered during smoking of the smoking article with the ventilation zone open is within up to 40% of the level of mainstream gas phase smoke constituents delivered during smoking of the smoking article with the ventilation zone blocked.

35 The ventilation zone refers to the arrangement of perforations or holes that are provided on the filter to allow ventilation of the filter and dilution of the mainstream smoke during smoking, through the ingress of air through the holes into the filter.

The ventilation zone is 'open' when it is fully uncovered and air is free to enter the filter during smoking. The ventilation zone is 'blocked' when it is covered or closed so that air is prevented from entering the filter through the ventilation zone. With the present invention, the level of gas phase mainstream smoke constituents delivered during smoking of the smoking article when the ventilation zone is blocked is within up to 40% of the level of the same mainstream gas phase smoke constituents delivered during smoking with the ventilation zone open. Preferably, the level of gas phase smoke constituents delivered with the ventilation zone blocked is within up to 30% of the level delivered with the ventilation zone open, more preferably within up to 20% and most preferably within up to 10%.

In the context of the present invention, the term 'smoke constituents' is intended to refer to the gas phase constituents in the mainstream smoke. In particular, the smoke constituents referred to herein are gas phase carbonyl compounds, including aldehyde and ketone compounds. For example, the gas phase constituents may include one or more of formaldehyde, acetaldehyde, acetone and acrolein.

For the purposes of the present invention, the level of mainstream gas phase smoke constituents delivered during smoking of a smoking article according to the invention with the ventilation zone open may be determined by smoking the smoking article under ISO conditions (35ml puffs lasting 2 seconds each, every 60 seconds). In the ISO test method, the smoking article is smoked with the ventilation zone fully uncovered. For the purposes of the present invention, the level of mainstream gas phase smoke constituents is normalised to nicotine delivery, so that the level is expressed per mg of nicotine.

The level of mainstream gas phase smoke constituents delivered during smoking of a smoking article according to the present invention with the ventilation zone blocked may be determined by smoking the smoking article in a Health Canada test method (55ml puffs lasting 2 seconds each, every 30 seconds). In the Health Canada test method, the tipping paper is covered by an air impermeable film or tape so that air cannot enter the filter through the ventilation zone and the dilution of the mainstream smoke is approximately 0%. As above, for the purposes of the present invention, the level of mainstream smoke constituents is normalised to nicotine delivery, so that the level is expressed per mg of nicotine.

The level of gas phase smoke constituents in the mainstream smoke is determined as an average for a sample of 20 smoking articles with the ventilation zone open and 20 smoking articles with the ventilation zone blocked. The level of smoke constituents is measured as the aggregate amount of carbonyl compounds.

The present invention provides an effective way of maintaining a relatively constant delivery of gas phase smoke constituents in a ventilated smoking article, regardless of whether the ventilation zone is open or blocked.

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In the present invention, the sorbent material is positioned within the filter of smoking articles such that under normal smoking conditions with the ventilation zone open, the dilution of the mainstream smoke by air entering the filter through the ventilation zone will be the main mechanism by which the level of smoke constituents in the mainstream smoke is reduced. The ventilation air will provide an air cushion that will isolate much of the mainstream smoke from the sorbent. As such, the sorbent will have a minimal effect on the level of gas phase smoke constituents and the flavour of the mainstream smoke when the ventilation zone is open.

In contrast, when the ventilation zone is fully blocked and air is prevented from entering the filter and diluting the mainstream smoke, the flow of the mainstream smoke through the filter changes so that the smoke passes over the sorbent and certain gas phase smoke constituents are adsorbed or adsorbed by the sorbent. In this case, the sorption of smoke constituents will be the main mechanism by which the level of smoke constituents in the mainstream smoke is reduced.

In some cases, when the ventilation zone is partly blocked, the reduction of smoke constituents in the mainstream smoke will be achieved both through the dilution of the mainstream smoke and by the sorbent. The arrangement of the sorbent and ventilation zone is such that there is a balance between the reduction of gas phase smoke constituents by dilution and the reduction of the same gas phase smoke constituents by the sorbent, wherein the balance will automatically shift depending on the degree to which the ventilation zone is blocked. If the level of dilution decreases as a result of blocking of the ventilation zone, the sorption of smoke constituents by the sorbent material will increase to compensate for the lower dilution. The total level of smoke constituents can therefore be maintained with as little variation as possible, irrespective of whether the ventilation zone is open, partially blocked, or fully blocked.

The balance between the level of dilution of the mainstream smoke achieved by the ventilation zone and the sorption of mainstream smoke constituents by the sorbent at the surface of the filter wrapper can be controlled by adjusting parameters of the filter, including but not limited to the positioning and distribution of the ventilation zone, the level of dilution achieved by the ventilation zone, and the positioning, distribution and amount of sorbent provided, as described in more detail below. For example, the amount and position of the ventilation zone and the amount and position of the sorbent can be adjusted such that the delivery of gas phase smoke constituents is the same whether the ventilation zone is open or blocked.

In the filters of smoking articles according to the invention, the ventilation zone may be provided upstream of most or all of the sorbent material. With this arrangement, the flow of the mainstream smoke within the filter changes depending on how much air is drawn through the filter from the ventilation zone. With the ventilation zone open, the ventilated air is typically

drawn through the filter on the outside of the filter material, constraining the flow of the mainstream smoke towards the centre of the filter. The air drawn through the ventilation zone therefore provides an outer, concentric layer which effectively separates and shields the mainstream smoke from the sorbent that is included in the filter wrapper. In this way, the mainstream smoke does not significantly come into contact with the sorbent. During normal smoking of the smoking article, the sorbent will therefore have a minimal effect on the mainstream smoke.

The ventilation is 'upstream' of the sorbent material, meaning that the ventilation is provided further from the mouth end of the smoking article than the sorbent. During smoking, the mainstream smoke is drawn through the smoking article from an upstream end, closest to the burning end of the tobacco rod, to a downstream end, at the mouth end of the filter. The mainstream smoke will therefore pass the ventilation zone first, before reaching the sorbent in the filter wrapper.

Preferably, the ventilation zone is in the form of one or more rows of perforations extending circumferentially around the filter. In certain embodiments, a plurality of rows of perforations may be provided at spaced apart locations along the filter, for example at least 5mm from one another, or at least 10mm from one another. This arrangement means that air is admitted into the filter at different positions during smoking and may help to maintain a consistent layer of air between the mainstream smoke and the sorbent along the full length of the sorbent. In such a case, the most upstream ventilation zone may be upstream of all or most of the sorbent.

When the ventilation zone is blocked, the volume of air entering the filter will be reduced and in the case where the ventilation zone is fully blocked, substantially no air will enter the filter. In the absence of the layer of air towards the outside of the filter, the mainstream smoke will no longer be confined to the central portion of the filter and the smoke flowing through the outside of the filter will come into contact with the sorbent included in the filter wrapper. The smaller the volume of air that is drawn through the filter, the larger the volume of mainstream smoke that will come into contact with the sorbent and the sorbent will remove an increased amount of smoke constituents.

In cases where the ventilation zone is partially blocked, the flow of air and smoke through the filter will be a combination of the two flow patterns, depending upon the relative position of the blocked ventilation zone on the filter and the extent of the blockage. For example, if part of the ventilation zone towards the mouth end of the filter were blocked but the upstream ventilation zone remained open, the mainstream smoke may initially be separated from the sorbent by a layer of air at the outside of the filter but the ventilated air and the smoke may mix towards the mouth end of the filter, causing more of the smoke to come into contact with the sorbent.

Preferably, the ventilation zone provides between 10% and 80% dilution of the mainstream smoke, wherein the 'dilution' refers to the percentage by volume of air that is included in the smoke delivered to the consumer from the mouth end of the filter with the ventilation zone completely open. More preferably, the ventilation zone provides between 30% and 70% dilution of the mainstream smoke, more preferably between 50% and 80%. The level of ventilation or dilution achieved by the ventilation zone can be determined using ISO test method 9512:2002.

The ventilation level can advantageously be adjusted to control the thickness of the concentric air layer flowing through the outer concentric region of the filter and separating the mainstream smoke from the sorbent. The thicker the layer of air at the outside of the filter, the greater will be the effect of the air layer at shielding the mainstream smoke from the sorbent. This will also reduce the effect the sorbent will have on the flavour of the smoke delivered to the consumer when smoking with the ventilation zone open. As another alternative, the level of ventilation through the ventilation zone may be set and the amount of sorbent may be adjusted so that the delivery of gas phase smoke constituents is similar whether the ventilation zone is open or blocked.

Preferably, the most upstream portion of the ventilation zone is provided between 20 mm and 30 mm from the mouth end of the smoking article. Preferably, the most upstream portion of the ventilation zone is provided at least 2 mm from the rod end of the filter, where the filter abuts the rod of tobacco. This positioning of the ventilation zone away from the mouth end of the filter and towards the rod of tobacco advantageously increases the available area in which the sorbent may be placed downstream of the ventilation zone.

The ventilation zone is provided upstream of all, or substantially all of the sorbent material. Whilst the ventilation zone is preferably provided upstream of all of the sorbent material, the skilled person will appreciate that the desired effect of the present invention can be achieved where the majority of the sorbent is downstream of the ventilation zone, even if a small proportion is provided at the position of the ventilation zone, or upstream of the ventilation zone. Preferably, the ventilation zone is provided upstream of at least 80% of the sorbent.

The sorbent material may be formed of any suitable adsorbent or absorbent material. A variety of sorbents for use in smoking articles would be known to the skilled person. Suitable sorbents include but are not limited to activated carbon, zeolites, sepiolites, alumina, molecular sieves and combinations thereof. In particularly preferred embodiments, the sorbent is activated carbon.

In preferred embodiments, the filter wrapper of smoking articles according to the invention comprises a layer of sorbent applied over an area of a surface of the filter wrapper. Preferably, the amount of sorbent in the layer is at least about 20 mg. The amount of sorbent is preferably up to about 120 mg, more preferably up to about 100 mg, more preferably up to

about 60 mg. Particularly preferably, the amount of sorbent is between about 20 mg and about 120 mg, more preferably between about 40 mg and about 60 mg.

The sorbent material is preferably provided in the form of a particulate or granular sorbent, which is preferably applied to a layer of adhesive or binder on the surface of the filter wrapper. In alternative embodiments, the sorbent may be provided as a separate layer located at the surface of the filter wrapper. In other alternative embodiments, the sorbent material may be applied as a separate layer to the outer surface of a filter segment and the filter wrapper may be wrapped over the sorbent layer to bring the surface of the filter wrapper into contact with the sorbent.

In addition or as an alternative to the provision of sorbent material in a layer at the surface of the filter wrapper, a sorbent material may be incorporated towards the outside of the filter material itself. For example, where the filter comprises a plug of fibrous filter material such as cellulose acetate tow, a particulate sorbent material may be provided in a concentric, outer layer of the filter tow, for example a concentric, outer layer that is less than 1mm thick. The sorbent may be provided uniformly in a concentric outer layer of the filter tow, or there may be a concentric gradient of sorbent within the filter, wherein the proportion of sorbent in the filter tow increases towards the outside of the filter.

In addition or as an alternative to the arrangements of sorbent described above, a sorbent may be incorporated into the sheet material forming the filter wrapper, for example, the sorbent may be incorporated into a paper material during production of the material.

Where the sorbent material is on a surface of the filter wrapper, the sorbent material preferably covers at least 50% of the outer or inner surface of the filter wrapper, more preferably at least 60%. The sorbent material may be provided within a single area, or may be provided in a plurality of areas over the surface of the filter wrapper, for example, in the form of a pattern applied to the surface of the filter wrapper.

The sorbent material is preferably provided on the inner surface of the filter wrapper, wherein the 'inner' surface refers to the radially inner surface of the wrapper, which is closest to the filter segment. However, in certain alternative embodiments it may be effective to provide the sorbent on the outer surface of the wrapper in addition to or as an alternative to sorbent on the inner surface, provided the mainstream smoke will still be brought into contact with the sorbent during smoking. For example, where the filter wrapper is highly porous or air permeable, the sorbent may be provided on either or both of the inner and outer surfaces since the mainstream smoke will be in contact with both surfaces during smoking.

In certain preferred embodiments of the present invention, the filter wrapper to which the sorbent is applied is a plug wrap circumscribing the filter along at least a part of its length. The sorbent may be applied to an inner layer of plug wrap, the inner surface of which is in contact with the underlying filter material.

In some cases, the filter is wrapped with a second layer of plug wrap, for example a layer of plug wrap that combines the different segments of a multi-component filter. Alternatively or in addition to the sorbent on the inner layer of plug wrap, sorbent material may be applied to this second layer of plug wrap, which overlies one or more inner layers of an air permeable plug wrap. The sorbent material may be applied to an area of the inner surface of the second layer of plug wrap. Alternatively or in addition, the sorbent material may be applied to the outer surface of the second layer of plug wrap, in particular where the second layer of plug wrap is formed of a substantially air permeable sheet material so that the mainstream smoke will readily permeate through the second layer of plug wrap to come into contact with the sorbent.

In other preferred embodiments of the present invention, the filter wrapper to which the sorbent is applied is a tipping wrapper, such as a tipping paper, circumscribing the filter and connecting the filter to the tobacco rod. Where the sorbent material is provided on the tipping wrapper, the material should be applied to the inner surface of the tipping wrapper so that it is not exposed at the outside of the filter.

The filter of smoking articles according to the present invention may include a single filter segment. Alternatively, the filter may comprise two or more filter segments in axial alignment with each other. The filter segment or segments may take a variety of forms and suitable filter segments would be known to the skilled person. Where two or more filter segments are included, the filter segments may be of the same construction and materials as each other, or may have a different construction, or contain different filtration material or additives. Preferably, the filter segment or segments are each formed of a plug of fibrous filtration material, such as cellulose acetate tow or paper, and wrapped with a plug wrap.

One or more of the filter segments may include a particulate material. The particulate material is preferably incorporated in an upstream filter segment, for example, in a rod end filter segment.

The particulate material may be dispersed through a plug of fibrous filtration material, such as cellulose acetate or paper. A filter plasticiser may be applied to the fibrous filtration material in a conventional manner, by spraying it onto the separated fibres, preferably before applying the particulate material to the filtration material. Alternatively or in addition, the filter may include a filter segment with a hollow cavity at least partially filled with a particulate material. In such cases, the hollow cavity is preferably provided between two plugs of a filtration material.

The particulate material incorporated into the filter may include at least one sorbent material, such as those indicated above for inclusion in the filter wrapper. Where a sorbent is incorporated within the filter, the amount of sorbent within the filter should be less than the

amount of sorbent included in the filter wrapper so that the performance characteristics of the filter can be maintained.

Additionally or as an alternative, the particulate material incorporated into the filter may include at least one flavourant material. For example, the particulate material may include particles of a sorbent or cellulosic material loaded with a liquid flavourant, such as menthol. Alternatively, the particulate material may comprise particles of plant material. The plant material may be in the form of plant leaf, as described in EP-A-1,958,523. For example, the filter segment may include leaf from tobacco, green tea, mint, such as peppermint or spearmint, laurel, eucalyptus, basil, sage, verbenas and tarragon. The plant material may alternatively be in the form of a seed, root, bark or flower, such as those typically used as spices.

Alternatively, one or more of the filter segments may have a liquid flavourant such as menthol applied directly to the filtration material.

Preferably, the overall length of smoking articles according to the invention is between 70 mm and about 128 mm, for example about 84 mm.

Preferably, the external diameter of smoking articles according to the invention is between about 5 mm and about 8.5 mm, more preferably about 7.9 mm.

Preferably, the overall length of the filters of smoking articles according to the invention is between about 18 mm and about 36 mm, more preferably about 27 mm.

The smoking articles of the present invention comprise a rod of tobacco material, which is attached to the filter by a tipping wrapper. The rod of tobacco material may include cut tobacco taken from one or more types of tobacco leaf, expanded tobacco, reconstituted tobacco, or combinations thereof.

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

Figure 1 shows a perspective view of a smoking article according to the invention, with the filter unwrapped;

Figure 2 shows a side view of the smoking article of Figure 1, with a schematic representation of the flow of air and smoke through the filter when the ventilation zone is open; and

Figure 3 shows a side view of the smoking article of Figure 1, with a schematic representation of the flow of smoke through the filter when the ventilation zone is fully blocked.

The filter cigarette 10 shown in Figure 1 comprises a wrapped rod 12 of tobacco cut filler, which is attached to an axially aligned filter 14. The tobacco rod 12 is wrapped with a cigarette paper (not shown). The filter 14 comprises a single segment 16, which is formed of a plug of cellulose acetate tow. The filter segment 16 is wrapped with a plug wrap 18 which circumscribes the entire length of the filter 14.

The plug wrap 18 is formed of a sheet of an air permeable paper material and includes a sorbent layer 20 covering an area corresponding to approximately 50% of the inner surface of the plug wrap 18. The sorbent layer 20 is formed of a substantially evenly distributed layer of around 50 mg of particulate activated carbon, which has been affixed to the inner surface of the plug wrap 18 by a suitable adhesive. In the assembled filter, the sorbent layer 20 extends circumferentially around the filter segment 16 and is in contact with the outer surface of the filter segment 16.

The wrapped tobacco rod 12 and the wrapped filter 14 are joined to each other by an outer tipping wrapper 22, which circumscribes the entire length of the filter 14 and an adjacent portion of the tobacco rod 12, and overlies the plug wrap 16. The tipping wrapper 22 is formed of a tipping paper which has been provided with ventilation zone comprising a row of perforations 24 extending circumferentially around the filter 14. The row of perforations 24 is positioned on the filter at the rod end of the filter segment 16, adjacent the interface between the filter 14 and the tobacco rod 12. The entire area of the sorbent layer 20 is downstream of the row of perforations 24. With the perforations open, the ventilation zone provides about 60% dilution of the mainstream smoke during smoking.

During normal smoking of the filter cigarette 10, the perforations will be fully uncovered and as shown schematically in Figure 2, air will be admitted into the filter 14 through the perforations in the tipping wrapper 22. In Figure 2, the air flow is indicated by the hollow arrows whilst the mainstream smoke flow is indicated by the shaded arrows. As shown, the air will be drawn along through the filter 14 towards the mouth end of the filter 14 and will form a concentric air layer 26 around the outside of the filter segment 16. The mainstream smoke will be drawn from the tobacco rod and the presence of the air layer 26 forces the mainstream smoke towards the centre of the filter segment 16 so that the mainstream smoke is separated from the inner surface of the plug wrap 18 by the air layer 26. This means that during smoking with the perforations 24 fully open, contact will be limited between the mainstream smoke and the activated carbon in the sorbent layer 20 on the inner surface of the plug wrap 18. As such, the presence of the sorbent layer 20 will have a negligible effect on the levels of the gas phase constituents in the mainstream smoke. The air flowing into the filter 14 will, however, dilute the mainstream smoke thereby reducing the level of gas phase constituents in the smoke received by the consumer by around 60%.

The positioning of the row of perforations 24 upstream of the entire sorbent layer 20 ensures that the mainstream smoke is directed away from the outside of the filter segment 16 into the centre of the filter before the mainstream smoke reaches the part of the filter segment at which the sorbent layer 20 starts.

Figure 3 illustrates the condition where all of the perforations 24 are fully covered so that no air is admitted to the filter 14 during smoking. Under these conditions, there is no dilution of

the mainstream smoke in the filter and therefore no reduction of the gas phase constituents as a result of the ventilation zone. As shown schematically by the shaded arrows in Figure 3, in the absence of the air layer 26 the mainstream smoke is not constrained to the centre of the filter segment 16 and can be drawn through the full cross section of the filter segment 16. Unlike in  
5 the situation shown in Figure 2, the mainstream smoke therefore comes into contact with the sorbent layer 20 on the inner surface of the plug wrap 18 as the smoke is drawn through the filter 14. The activated carbon in the sorbent layer 20 adsorbs certain gas phase constituents from the mainstream smoke and the total level of these constituents in the smoke delivered to the consumer is therefore reduced.

10 The level of the gas phase constituents (carbonyl compounds) in the mainstream smoke under the conditions shown in Figure 3 is within up to 40% of the level of the same gas phase constituents as a result of the dilution under the conditions shown in Figure 2.

In reality, during smoking the consumer is unlikely to fully block all of the perforations 24 in the tipping paper 22 and the conditions illustrated in Figure 3 are therefore only likely to be  
15 brought about during an experimental Health Canada smoking test. The consumer may, however, inadvertently block some of the perforations 24, for example, by placing their fingers around the filter in the region of the ventilation zone, so that air cannot be admitted into the filter 14 through the perforations covered by the fingers. In this case, the conditions will be between the two examples shown in Figures 2 and 3, wherein the air layer 26 does not extend all around  
20 the filter 14 and the mainstream smoke will flow into contact with the sorbent layer 20 in certain places.

Due to the partial blocking of the perforations 24, the volume of air admitted to the filter 14 will decrease and the dilution of the mainstream smoke will also decrease so that the reduction in the levels of gas phase constituents as a result of dilution will be less. However,  
25 the contact of the mainstream smoke with the activated carbon in the sorbent layer 20 will increase the reduction of the gas phase constituents by the sorbent so that the overall level of the gas phase constituents is still within up to 40% of the level under the conditions shown in Figures 2 and 3.

It can therefore be seen that the overall level of gas phase constituents in the  
30 mainstream smoke as a result of the combination of the dilution and the sorbent layer 20 remains relatively consistent whether the perforations 24 are open, partially blocked or fully blocked.

Whilst in the example described above and shown in the figures, the sorbent layer is provided on the inner surface of the plug wrap, it will be appreciated that different arrangements  
35 of the sorbent layer on the plug wrap and/or the tipping wrapper could be provided with the same effect on the reduction of the gas phase constituents of the mainstream smoke, as described above.

**CLAIMS**

1. A smoking article comprising:  
a tobacco rod; and

5 a filter connected to the tobacco rod and comprising one or more filter segments circumscribed by a filter wrapper including a sorbent material, wherein the filter comprises a ventilation zone provided upstream of the sorbent material,

10 wherein the sorbent material and the ventilation zone are provided such that the level of mainstream gas phase smoke constituents when the ventilation zone is open is within up to 40% of the level of mainstream gas phase smoke constituents when the ventilation zone is blocked.

15 2. A smoking article according to claim 1 wherein the level of mainstream gas phase smoke constituents with the ventilation zone open is within up to 20% of the level of mainstream gas phase smoke constituents with the ventilation zone blocked.

20 3. A smoking article according to claim 1 or 2 wherein the ventilation zone comprises one or more rows of perforations extending circumferentially around the filter.

4. A smoking article according to claim 3 wherein the rows of perforations are spaced at least 5 mm from each other.

25 5. A smoking article according to any of claims 1 to 4 wherein the filter wrapper is a plug wrap or a tipping wrapper.

6. A smoking article according to any preceding claim wherein the filter wrapper comprises a layer of sorbent applied to at least a portion of the inner surface of the filter wrapper.

30 7. A smoking article according to any of claims 1 to 5 wherein the filter wrapper is substantially air permeable and wherein a layer of sorbent is applied to at least a portion of the outer surface of the filter wrapper.

35 8. A smoking article according to claim 6 or 7 wherein the filter wrapper comprises between about 40 mg and about 60 mg of sorbent material.

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9. A smoking article according to any preceding claim wherein the sorbent covers at least 60% of one of the inner or outer surfaces of the filter wrapper.

10. A smoking article according to any preceding claim wherein the sorbent comprises  
5 particulate sorbent applied to a layer of adhesive on a surface of the filter wrapper.

11. A smoking article according to any of the preceding claims wherein the sorbent material comprises a particulate sorbent incorporated into the filter wrapper.

10 12. A smoking article according to any preceding claim wherein the filter comprises one or more segments of a fibrous filtration material.

13. A smoking article according to any preceding claim wherein the most upstream portion of the ventilation zone is provided between 20 mm and 30 mm from the mouth end of the  
15 smoking article.

14. A smoking article according to any preceding claim wherein the ventilation zone provides between 30% and 70% dilution of the mainstream smoke of the smoking article during smoking with the ventilation zone fully open.

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15. A smoking article according to any preceding claim wherein the ventilation zone is provided upstream of at least 80% of the sorbent of the filter wrapper.

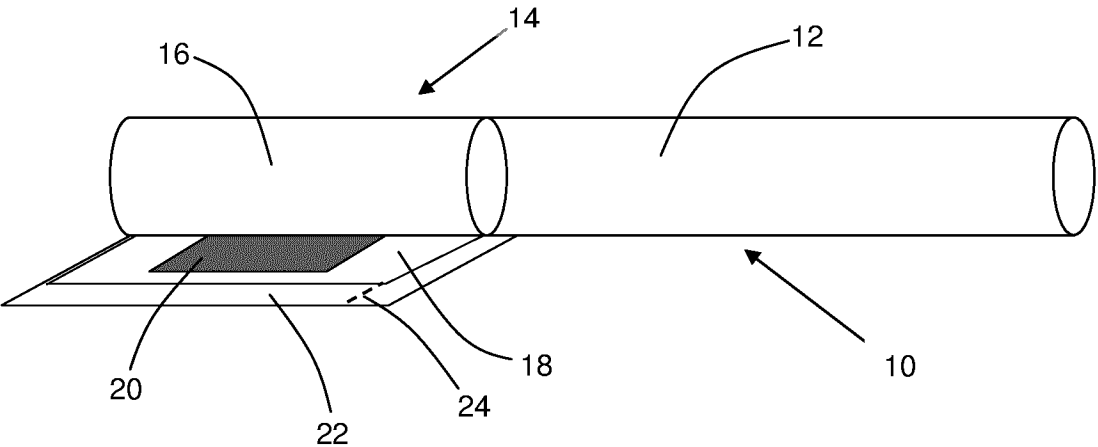


Figure 1

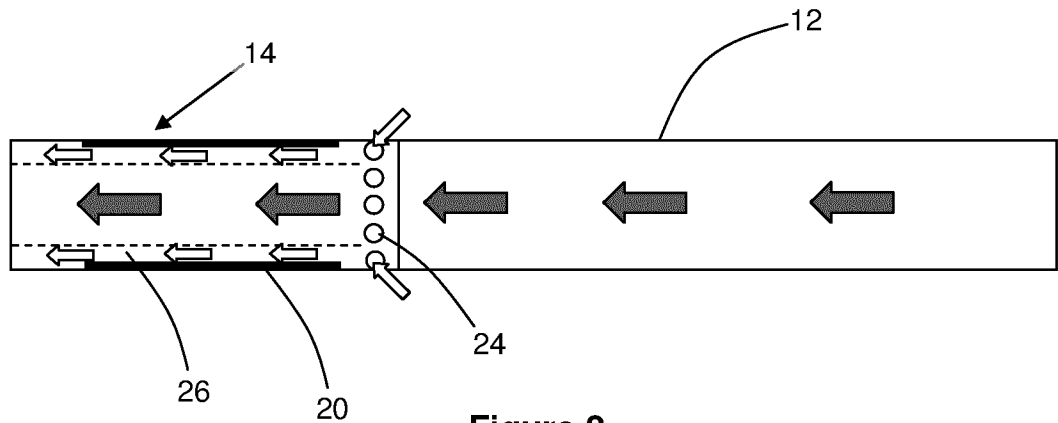


Figure 2

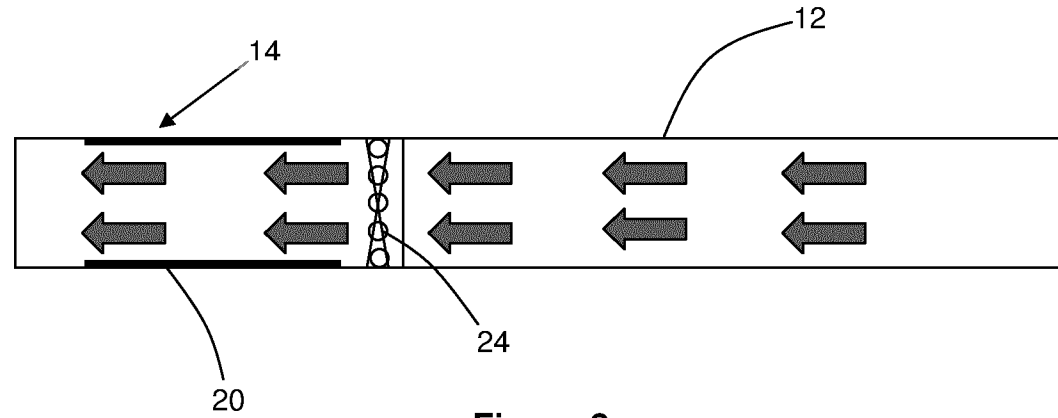


Figure 3

## INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2012/056815

## A. CLASSIFICATION OF SUBJECT MATTER

INV. A24D3/04

ADD.

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

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A24D

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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|           | -----<br>-/--                                                                                                                                                                                            |                       |



Further documents are listed in the continuation of Box C.



See patent family annex.

## \* Special categories of cited documents :

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Date of the actual completion of the international search

4 June 2012

Date of mailing of the international search report

13/06/2012

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## INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2012/056815

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