

RESTRICTOR ATTACHMENT FOR UNFILTERED SMOKING ARTICLE

This application claims priority from US 60/906,116, filed March 9, 2007, which is incorporated herein by this reference in its entirety.

5 BACKGROUND

Heretofore, cigarettes with high levels of ventilation usually have usually had unacceptably low levels of resistance to draw (RTD) unless some counter measure was in place to make-up the shortfall in RTD.

Resistance to draw is the pressure drop of a smoking article at FTC conditions.

10 In the past, high-density cellulose acetate filter segments were used to address the short fall. However such filtered segments tended to remove tar, with little or no effect upon gas phase components of mainstream tobacco smoke, such as carbon monoxide (CO) and nitrogen oxide (NO). This solution tended to worsen the CO to tar (FTC) ratios in lower delivery (FTC tar) cigarettes.

15 Ventilation has a desirable attribute that it, when operating alone, will reduce both the particulate phase and the gas phase of mainstream smoke. Highly ventilated cigarettes, however, have drawbacks in RTD as previously discussed.

In addition, most filter cigarettes are typically designed to have the tobacco rod attached to a cellulose acetate filter. While filter ventilation affects the particulate phase (PP) and the
20 gas-vapor phase proportionally, cellulose acetate only removes the particulate phase. Such a conventional filter cigarettes with ventilation holes have a ratio of carbon monoxide to tar (FTC) that is between 0.8 and 2.5, depending on the overall cigarette design. The ratio of carbon monoxide to tar ("CO to tar ratio") for unfiltered cigarettes is typically between 0.45 and 0.65.

25 SUMMARY

Accordingly, it is desirable to have smoking articles with a high ventilation level, acceptable resistance to draw (RTD) and favorable CO to tar ratio.

In accordance with one embodiment, a smoking article comprises a tobacco rod; and a connector adapted to attach to the tobacco rod at an upstream end portion of the connector, the
30 connector comprising: a cavity; a transverse partition within the cavity, the transverse partition having at least one orifice; and a plurality of ventilation passages disposed along an outer periphery of the connector, the plurality of ventilation passages having an inlet at the upstream end portion of the connector and an outlet in communication with the cavity.

In accordance with a further embodiment, a kit comprises a connector adapted to
35 receive a tobacco rod at an upstream end portion, the connector comprising: a cavity; a transverse partition within the cavity, the transverse partition having at least one orifice; and a plurality of ventilation passages positioned around an outer periphery of the connector, the

plurality of ventilation passages having an inlet and an outlet to provide ventilation to the cavity; a mouthpiece insertable into a downstream end portion of said connector; and a tobacco rod insertable into said upstream end portion of said connector.

In accordance with another embodiment, a kit comprises a plurality of connectors adapted to receive a tobacco rod at an upstream end portion and wherein the plurality of connectors have different ventilation levels, the plurality of connectors comprising: a cavity; a transverse partition within the cavity, the transverse partition having at least one orifice; and a plurality of ventilation passages positioned around an outer periphery of the connector, the plurality of ventilation passages having an inlet and an outlet to provide ventilation to the cavity.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a smoking article in the form of an unfiltered cigarette, a connector and a mouthpiece in accordance with an embodiment.

FIG. 2 is a cross sectional view of the smoking article of FIG. 1, which includes an unfiltered cigarette, a connector (or restrictor attachment) and a mouthpiece with a plurality of ventilation passages on an upstream side of a transverse partition within the connector.

FIG. 3 is a cross sectional view of the connector of FIG. 2 along the line 3-3.

FIG. 4 is a cross sectional view of the transverse partition of the smoking article of FIG. 2 along the line 4-4.

FIG. 5 is a cross sectional view of the transverse partition of the smoking article of FIG. 2 along the line 5-5.

FIG. 6 is a cross sectional view of the transverse partition of the smoking article of FIG. 2 along the line 6-6.

FIG. 7 is a cross sectional view of the transverse partition of FIG. 6 along the line 7-7.

FIG. 8 is a cross sectional view of the transverse partition according to a further embodiment.

FIG. 9 is a cross sectional view of the smoking article of FIG. 1 with a plurality of ventilation passages or ventilation holes on an upstream side of a transverse partition.

FIG. 10 is a cross sectional view of the smoking article of FIG. 1 with a plurality of ventilation passages or ventilation holes on a downstream side of a transverse partition.

FIG. 11 is a cross sectional view of another embodiment of the smoking article of FIG. 1 having a porous or screening material on an upstream side of the transverse partition.

FIG. 12 is a cross sectional view of an alternative embodiment, wherein the orifice of the transverse partition has a frustoconical shape.

FIG. 13 is a cross sectional view of another embodiment, wherein the restriction connector includes a pair of transverse partitions.

DETAILED DESCRIPTION

FIG. 1 shows a smoking article 10 in the form of an unfiltered cigarette (tobacco rod) 20, a connector (or restrictor attachment) 30 and a mouthpiece 40. The unfiltered cigarette 20 preferably comprises a generally cylindrical rod 22 (*i.e.*, tobacco rod) of smoking material 21 (FIG. 2), contained in a circumscribing outer wrapper 24. The outer wrapper 24 is typically a porous wrapping material or paper wrapper. The connector (or restrictor attachment) 30 connects the unfiltered cigarette 20 with different types of mouthpieces 40.

FIG. 2 shows a cross sectional view of the smoking article 10 of FIG. 1 with the connector 30 having a plurality of longitudinal ventilation passages 60 in the form of longitudinal ventilation channels, which provide ventilation to the mainstream smoke of the smoking article 10. As shown in FIG. 2, the generally cylindrical rod 22 of smoking material 21 is typically referred to as a "tobacco rod," and has a lit or upstream end 12 and a downstream end 14. The smoking material 21 is preferably a shredded tobacco or tobacco cut filler. However, any suitable smoking material 21 can be used.

The connector 30 extends over the mouth end 14 of the tobacco rod 22 such that the connector 30 and tobacco rod 22 overlap one another. The connector 30 has a generally cylindrical bore forming a cavity 32 therein. The inner diameter of the cavity 32 is essentially equal to the outer diameter of the tobacco rod 22, preferably so as to establish a sliding fit therebetween. The connector 30 includes an upstream end 16 and a downstream end 18, which are open to permit the passage of air and mainstream smoke therethrough.

Ventilation to the cavity 32 can be established with a plurality of longitudinal ventilation passages 60, which are preferably disposed along an outer periphery 39 of the connector 30. The plurality of ventilation passages 60 can be formed within a wall 37 of the connector 30 or extend into the outer periphery 39 of the connector 30. In accordance with a preferred embodiment, the plurality of ventilation passages 60 have an inlet 62 at an upstream end portion 11 of the connector 30 and an outlet 64 in communication with the cavity 32. The plurality of ventilation passages 60 are preferably circumferentially spaced about the outer periphery 39 of the connector 30. During smoking, the plurality of ventilation passages 60 admits ventilation air to the cavity 32 within the connector 30, wherein the air is allowed to mix with the mainstream smoke before arriving at the mouthpiece 40. Preferably, the ventilation passages 60 in the connector 30, achieves a ventilation level of at least 10%, and more preferably at least 50% to 90%.

In accordance with one embodiment, the connector 30 can include a transverse partition 50 that defines at least one orifice (or flow restrictor) 52 (FIG. 6) of reduced diameter. The transverse partition 50 can be comprised of an annular plate 54 having at least one orifice 52. The transverse partition 50 divides the cavity 32 of the connector 30 into a first or upstream cavity 34, and a second or downstream cavity 36. During smoking, the transverse partition 50

introduces a resistance-to-draw (RTD) to the smoking article 10, which is at a level typically expected by the ordinary smoker. The transverse partition 50 is preferably positioned an equal distance from each end 16, 18 of the connector 30. However, it can be appreciated that by changing the location or position of the transverse partition 50 and/or the number and location of the at least one orifice 52, that the resistance to draw (RTD) can be varied and/or changed to establish levels of RTD, which are expected by the smoker of the smoking article 10.

The at least one orifice 52 on the transverse partition 50 provides a desirable resistance to draw (RTD) for the smoking article 10, which is comparable to a conventional filtered cigarette. It can be appreciated that different ventilation levels (e.g., 10% - 90%) can be incorporated into the connector 30 through a plurality of ventilation passages 60, which provides desired delivery (FTC tar) from the same cigarette 20 or tobacco rod 22. The geometry of the connector 30 can also be adapted so that the chance of fingers blocking or obstructing some or all of the plurality of ventilation passages 60 during a puff is reduced.

As shown in FIG. 2, the connector 30 extends over an upstream end 17 of the mouthpiece 40 such that the connector 30 and mouthpiece 40 overlap one another. The mouthpiece 40 also has a generally cylindrical shape, and the diameter thereof is essentially equal to the diameter of the tobacco rod 22 and the connector 30 preferably, so as to establish a sliding fit between the mouthpiece 40 and the connector 30. The ends 17, 19 (i.e., the upstream end 17 and a downstream or mouth end 19) of the mouthpiece 40 are open to permit the passage of air and mainstream smoke therethrough. In addition, the ends 17, 19 of the mouthpiece 40 can have different diameters, wherein the downstream or mouth end 19 can have a smaller diameter than the upstream end 17, which results in the tapering of the flow channel (not shown) between the ends 17, 19 of the mouthpiece 40. In a preferred embodiment, the mouthpiece 40 comprises a molded piece of polymer material or a segment of filtering material 70 (FIG. 9) such as a length of cellulose acetate in a paper wrapper.

It can be appreciated that since the transverse partition 50 preferably provides the desirable resistance to draw to the smoking article 10, the mouthpiece 40 does not need to counter the low resistance-to-draw normally associated with smoking articles 10 having high levels of ventilation. Instead, the mouthpiece 40 is preferably constructed to be of low particulate efficiency.

In accordance with an embodiment, the connector 30 is preferably made of a paper product or a biodegradable plastic or other suitable material have degradability properties. For example, the mouthpiece 40 is preferably formed of a suitable, self-supporting material, which can be easily molded, such as a synthetic plastic, paper, or other biodegradable material. The connector 30 and mouthpiece 40 can also be constructed with or without flavor or any special application materials (such as catalysts, smoke diluents, carbon, etc.), and with or without porous paper plug on the mouth or downstream end 19 for appearance.

The connector 30 has a generally cylindrical shaped body, and an inner diameter 31 thereof that is essentially equal to the outer diameter of the tobacco rod 22. The connector 30 includes an outer surface 33 and an inner surface 35. The inner surface 35 is preferably smooth to receive the mouth end or downstream end 14 of the tobacco rod 22 or the upstream end 17 of the mouthpiece 40. In accordance with an embodiment, the mouthpiece 40 is insertable into a downstream end portion 13 of the connector 30 and a tobacco rod 22 is insertable into the upstream end portion 11 of the connector 30.

As shown in FIG. 3, the connector 30 includes a plurality of inlets 62, which are preferably positioned on the upstream end 16 of the connector 30. The inlets 62 of the ventilation passages 60 are preferably in communication with the upstream end 16 of the connector 30, such that the fingers of the smoker will not block the airflow during smoking.

The plurality of ventilation passages 60 are located inside the restriction connector 30 and extend longitudinally along a portion of the length of the connector 30. As shown in FIG. 4, the plurality of ventilation passages 60 have a generally elliptical cross-section, and are preferably equally spaced around the outer periphery 39 of the connector 30. However, it can be appreciated that the ventilation passages 60 can have any suitable cross-sectional shape including circular, rectangular, or V-shaped. The connector 30 preferably has a smooth cylindrical inner surface 35 at the ends 16, 18 adjacent to the tobacco rod 20 and the mouthpiece 40. It can be appreciated that different ventilation levels can be incorporated into the connector 30, through combinations of channel or groove 60 size and number of ventilation passages 60, to provide a desired smoke delivery level (FTC tar) from the same unfiltered cigarette 20 or single tobacco rod 22. In addition, the geometry of the connector 30 and the plurality of ventilation passages 60 can be configured so that blockage of the ventilation passages 60 is difficult. With such safeguard against blockage, the connector 30 may be made short in length, much akin to the length of a filter of a conventional lit-end filtered cigarette.

As shown in FIG. 5, the connector 30 includes an outlet 64 to the cavity 32 of the connector 30. The outlet 64 provides air ventilation to the cavity 32, wherein the airflow (*i.e.*, ventilation) is mixed with the mainstream smoke from the tobacco rod 22. The outlets 64 can be located within the upstream cavity 34 of the connector 30. However, and now referring also to FIG. 10, it can be appreciated that in an alternative embodiment, the outlets 64 are located in the downstream cavity 36 of the connector 30 (*i.e.*, downstream of the transverse partition 50). The distance between the outlets 64 of the ventilation passages 60 from the mouthpiece 40 is at least 5 mm and more preferably in the range of 5-25 mm. It is to be appreciated that the bore (*i.e.*, inner diameter of ventilation passages) and the length of the ventilation passages 60 can be selected to impart a desired level of pressure drop to the flow of ventilation air.

As shown in FIG. 6, the transverse partition 50 comprises a plate 54 having at least one orifice 52. The orifice 52 is preferably sized to contribute sufficient pressure drop such the

smoking article 10 presents a resistance to draw of at least 40 mm water or greater, and more preferably in the range of 50mm to 80mm water. Preferably, the transverse partition 50 has a diameter of approximately 7.0mm to 8.0mm and more preferably approximately 7.4mm to 7.8mm. The transverse partition 50 preferably has at least one or optionally, at least two orifices 52 of a diameter of about 0.2mm to about 0.8mm and more preferably about 0.3mm to 0.6mm and most preferably about 0.4mm each. The transverse partition 50 is also preferably integrally formed as a unit with the connector 30. In addition, the transverse partition 50 is preferably not visible to the smoker. The transverse partition 50 can be made of paper, biodegradable plastic, or metal and more preferably made of a paper product or other suitable material having degradability properties.

It can be appreciated that the connector 30 in accordance with one embodiment is preferably dimensioned such that the tobacco rod 20 and the mouthpiece 40 fit snugly within the connector 30 and that a desired spaced-apart relation is maintained between the transverse partition 50 and the tobacco rod 20 and/or mouthpiece 40. Alternatively, a detent, an annular stop, a circular ring or portion thereof, or other suitable stopping element can be used to maintain the tobacco rod 20 and/or mouthpiece 40 in a desired spaced-apart relation with the transverse partition 50.

FIG. 7 shows a cross sectional view of the transverse partition 50 of FIG. 6 along the line 7-7. As shown in FIG. 7, the transverse partition 50 preferably has a thickness 56 of about 0.5 mm to about 1.5 mm and more preferably a thickness 56 of about 1.0 mm.

FIG. 8 shows a cross sectional view of another embodiment of a transverse partition 50 comprising a plate 54 having at least two orifices 52. As shown in FIG. 8, the plate 54 has at least two orifices 52, which can be equally spaced around the center (or center portion) of the transverse partition 50. However, it can be appreciated that the plurality of orifices 52 can be spaced in any suitable arrangement. The number of orifices 52 as well as their size and position in the plate 54 depend on the desired resistance-to-draw (RTD) or pressure drop, and efficiency for the transverse partition 50.

In another embodiment, the transverse partition 50 can be coated with microencapsulated flavorants 58. As shown in FIG. 8, the plate 54 of the transverse partition 50 is coated with microencapsulated flavorants 58. During a puff, upon impact of the high velocity smoke against the plate 54 and/or moisture from the mainstream smoke, the flavorant of the microencapsulated flavorants 58 are released into the mainstream smoke. Instead of microencapsulated flavorants 58, any other suitable material 58' or catalyst may be used to generate flavor upon impact from the mainstream smoke at or about the partition 50. Alternatively, it can be appreciated that moisture from the mainstream smoke can release the flavorants 58 as a result of expansion, evaporation, distillation, decomposition or other suitable reactions to the moisture within the mainstream smoke.

The flavorants 58 can be a single component or a multi-flavored component that is suitable for use in cigarette manufacturing such as menthol and vanillin. Alternatively, the flavorants 58 can be an aroma of choice, such as peppermint, coconut, roasted, and/or toasted aromas. However, almost any flavor oil or composition can be used. In addition, the concentration of flavorants 58, on the transverse partition 50 can be adjusted or modified to provide the desired amount of flavorants 58. Thus, the concentration of the flavorants 58, on the transverse partition 50 can vary depending on the desired aroma and/or organoleptic qualities of the smoke.

FIG. 9 shows a cross sectional view of another embodiment of the smoking article 10 of FIG. 1 with a connector 30 having a transverse partition 50 and a ventilation zone 90 on a downstream side of the transverse partition 50. The ventilation zone 90 is preferably comprised of at least one row of holes or perforations 92, each of which extends through (*i.e.*, through the outer surface 33 and the inner surfaces) the connector 30 into the downstream cavity 36 of the connector 30. In an alternative embodiment, the ventilation zone 90 can be located on an upstream side of the transverse partition 50, such that the at least one row of holes or perforations 92 extend into the upstream cavity 34 of the connector 30.

In another embodiment as shown in FIG. 9, the mouthpiece 40 can include a filtering material 70. The filter material 70 is preferably cellulose acetate; however, any suitable filtering material 70 can be used. For example, in an alternative embodiment, the filtering material 70 can be comprised of cellulose acetate with an activated carbon disposed throughout (often referred to as carbon-on-tow) or any other suitable filtering material 70 and/or sorbents and/or other additives such as flavorants.

FIG. 10 shows a cross sectional view of another embodiment of the smoking article 10 of FIG. 1 with a cigarette filter 40 having a transverse partition 50 and a plurality of ventilation passages 60, wherein the outlets 64 of the plurality of ventilation passages 60 extend to the downstream cavity 36 of the connector 30. In the alternative, outlets 64 may be situated at locations both downstream of the partition 50 and upstream of the partition 50.

It can be appreciated that since the mouthpiece 40 is not directly attached to the cigarette 20 or tobacco rod 22, the mouthpiece 40 can be stored separately. Thus, the mouthpiece 40 can include different flavorants 72 as shown in FIG. 10, such as menthol, or functional mediums 74, such as catalysts or smoke diluents, which can be applied and retained or added to the mouthpiece 40. In addition, the flavorants 72 and/or functional mediums 74 can be individually sealed and separately retained until such time that is placed within the mouthpiece 40 for use.

FIG. 11 shows a cross sectional view of another embodiment of the connector 30 of FIG. 1, wherein at least a portion of the upstream cavity 34 includes a screening material 80. In accordance with an embodiment, the screening material 80 prevents loose bits of smoking

material 21 in the form of loose tobacco filler from blocking the orifices 52 of the transverse partition 50. It can be appreciated that the screening material 80 can be any suitable porous material, which prevents loose tobacco or smoking material 21, from blocking the at least one orifice 52 of the transverse partition 50.

5 FIG. 12 shows an alternative embodiment, wherein the transverse partition 50 establishes that the flow restriction may be frustoconical and convergent either into or away from the direction of flow of mainstream smoke passing therethrough. As shown in FIG. 12, the transverse partition 50 includes an orifice 52 having a frustoconical shape 53.

10 FIG. 13 shows another embodiment, wherein the connector 30 includes a pair of transverse partitions 50. As shown in FIG. 13, the pair of transverse partitions 50 comprises a pair of plates 54 (FIG. 6), wherein each plate 54 has at least one orifice 52.

15 It can be appreciated that the restriction connector 30 can eliminate or minimize the usage of cellulose acetate filter components. In addition, the tobacco rod 20, the connector 30 and the mouthpiece 40 can be made of biodegradable materials. The smoking article 10 can also achieve different tar deliveries from the same pack of cigarettes 20 (or tobacco rods 22) using different ventilation connectors 30 having various ventilation capabilities. The smoking article 10 as shown also results in cost savings from an easier cigarette making process.

20 It will be understood that the foregoing description is of the preferred embodiments, and is, therefore, merely representative of the article and methods of manufacturing the same. It can be appreciated that variations and modifications of the different embodiments in light of the above teachings will be readily apparent to those skilled in the art. Accordingly, the exemplary embodiments, as well as alternative embodiments, may be made without departing from the spirit and scope of the articles and methods as set forth in the attached claims.

CLAIMS:

1. A smoking article comprising:
a tobacco rod; and
a connector adapted to attach to the tobacco rod at an upstream end portion of the
5 connector, the connector comprising:
a cavity;
a transverse partition within the cavity, the transverse partition having at least
one orifice; and
a plurality of ventilation passages disposed along an outer periphery of the
10 connector, the plurality of ventilation passages having an inlet at the upstream end portion of the
connector and an outlet in communication with the cavity.
2. The smoking article of Claim 1, further comprising a mouthpiece insertable into a
downstream end portion of the connector.
- 15 3. The smoking article of Claim 1, wherein the plurality of ventilation passages are
longitudinal and formed within a wall of the connector.
4. The smoking article of Claim 1, wherein the plurality of ventilation passages have an
20 elliptical cross-section.
5. The smoking article of Claim 1, wherein the inlets are located on an upstream end of the
connector.
- 25 6. The smoking article of Claim 1, wherein the transverse partition separates the cavity into
an upstream cavity and a downstream cavity, and the outlets of the plurality of ventilation
passages extend into the upstream cavity.
7. The smoking article of Claim 1, wherein the transverse partition separates the cavity into
30 an upstream cavity and a downstream cavity, and the outlets of the plurality of ventilation
passages extend into the downstream cavity.
8. The smoking article of Claim 1, wherein the at least one orifice comprises a plurality of
orifices, the plurality of orifices being equally spaced around a center portion of the transverse
35 partition.

9. The smoking article of Claim 1, wherein the connector further includes a screening material on an upstream side of the transverse partition.

10. The smoking article of Claim 2, wherein the mouthpiece further comprises a plug of
5 filtering material.

11. The smoking article of Claim 1, wherein the transverse partition is coated with microencapsulated flavorants.

10 12. The smoking article of Claim 1, wherein the transverse partition has a frustoconical shape.

13. The smoking article of Claim 1, further comprising at least two transverse partitions.

15 14. A kit comprising:

a connector adapted to receive a tobacco rod at an upstream end portion, the connector comprising:

a cavity;

a transverse partition within the cavity, the transverse partition having at least
20 one orifice; and

a plurality of ventilation passages positioned around an outer periphery of the connector, the plurality of ventilation passages having an inlet and an outlet to provide ventilation to the cavity;

a mouthpiece insertable into a downstream end portion of said connector; and

25 a tobacco rod insertable into said upstream end portion of said connector.

15. The kit of Claim 14, wherein the plurality of ventilation passages are longitudinal and formed within a wall of the connector.

30 16. The kit of Claim 14, wherein the inlets are located on a downstream end portion of the connector.

17. The kit of Claim 14, wherein the at least one orifice comprises a plurality of orifices, the plurality of orifices being equally spaced around a center portion of the transverse partition.

35 18. The kit of Claim 14, wherein the connector further includes a screening material on an upstream side of the transverse partition.

19. The kit of Claim 14, wherein the transverse partition is coated with microencapsulated flavorants.

5 20. The kit of Claim 14, wherein the transverse partition has a frustoconical shape.

21. The kit of Claim 14, wherein the connector further includes at least two transverse partitions.

10 22. A kit comprising:

a plurality of connectors adapted to receive a tobacco rod at an upstream end portion and wherein the plurality of connectors have different ventilation levels, the plurality of connectors comprising:

a cavity;

15 a transverse partition within the cavity, the transverse partition having at least one orifice; and

a plurality of ventilation passages positioned around an outer periphery of the connector, the plurality of ventilation passages having an inlet and an outlet to provide ventilation to the cavity.

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