

SMOKING ARTICLE WITH OVER-TIPPING BAND

The present invention relates to a self-extinguishing smoking article having a modified arrangement of tipping wrappers.

5 Combustible smoking articles, such as cigarettes, generally comprise cut or shredded tobacco (usually in the form of cut filler) surrounded by a paper wrapper forming a tobacco rod. The cut or shredded tobacco can be a single type of tobacco or a blend of two or more types of tobacco. Combustible smoking articles may also further comprise a filter aligned in an end-to-end relationship with the tobacco rod. Typically, the filter includes a plug of filtration material,
10 such as cellulose acetate tow. The combined smoking article usually includes tipping paper overlapping both the tobacco rod and the filter to keep them connected. The tipping paper usually extends to the mouth end segment of the filter.

A consumer uses a combustible smoking article, such as a cigarette, by lighting the end of the tobacco rod and burning the cut or shredded tobacco contained therein. The consumer
15 then receives mainstream smoke by drawing on the opposite end (mouth end or filter end) of the cigarette. When the consumer is finished burning the tobacco rod, the consumer typically needs to actively extinguish the cigarette in an ashtray by acting mechanically on the cigarette stub.

It has previously been proposed to provide smoking articles wherein at least a portion
20 of the tobacco rod is circumscribed by a Reduced Cigarette Ignition Propensity (RCIP) wrapper paper. By this term, reference is commonly made to a wrapper paper that comprises a base web with a nominal permeability, to which zones of low permeability add-on material are applied such that they extend transversely and are spaced from each other in the longitudinal direction of the smoking article. By way of example, the zones of add-on material may include a mixture
25 of starch and calcium carbonate. This has been found to have the desirable effect that a smoking article, when left under free burn conditions, for example in an ashtray, self-extinguishes more quickly than a standard cigarette. Features of low ignition propensity or self-extinguishment are regarded as desirable safety features. For example, self-extinguishment of a cigarette can reduce the chances of starting a fire should the cigarette fall on combustible
30 material.

It would be desirable to provide a smoking article that self-extinguishes more quickly and effectively when the combustion approaches the filter, without the consumer needing to actively put the smoking article off in an ashtray. Further, it would be desirable to provide such a smoking article without affecting the Resistance To Draw (RTD) values. At the same time, it
35 would be desirable to provide such a smoking article that also allows reducing visible staining prior to extinguishment.

According to a first aspect of the invention, there is provided a smoking article comprising: a wrapped rod of smokable material; a filter comprising one or more filter segments, wherein the filter is in axial alignment with the wrapped rod of smokable material and abuts the wrapped rod of smokable material at an interface; a tipping wrapper circumscribing at least a portion of the filter and attaching the filter to the wrapped rod of smokable material; an over-tipping band circumscribing the filter and overlying the tipping wrapper at the upstream end of the filter such that the over-tipping band overlies the interface between the wrapped rod of smokable material and the filter, wherein the over-tipping band is formed of a substantially air impermeable sheet of cellophane.

There is provided a smoking article comprising a wrapped rod of smokable material and a filter comprising one or more filter segments, wherein the filter is in axial alignment with the wrapped rod of smokable material and abuts the wrapped rod of smokable material at an interface. The smoking article further comprises a tipping wrapper circumscribing at least a portion of the filter and attaching the filter to the wrapped rod of smokable material. A substantially transparent over-tipping band circumscribes the filter and overlies the tipping wrapper at the upstream end of the filter such that the over-tipping band overlies the interface between the wrapped rod of smokable material and the filter. The over-tipping band is formed of an air impermeable sheet of a non-paper cellulosic material obtained by processing cellulose to form regenerated cellulose fibres.

According to a second aspect of the invention, there is provided a method for manufacturing a smoking article, comprising: providing a rod of smokable material having a wrapper; attaching a filter to the rod of smokable material by a tipping wrapper, wherein the filter abuts the rod of smokable material at an interface; and providing an over-tipping band around the filter and overlying the tipping wrapper at the upstream end of the filter such that the over-tipping band overlies the interface between the wrapped rod of smokable material and the filter, wherein the over-tipping band is formed of cellophane.

There is provided a method for manufacturing a smoking article. The method comprises providing a rod of smokable material having a wrapper; attaching a filter to the rod of smokable material by a tipping wrapper, wherein the filter abuts the rod of smokable material at an interface; and providing an over-tipping band around the filter and overlying the tipping wrapper at the upstream end of the filter such that the over-tipping band overlies the interface between the wrapped rod of smokable material and the filter. The over-tipping band is formed of an air impermeable cellulosic sheet of a non-paper cellulosic material obtained by processing cellulose to form regenerated cellulose fibres.

It shall be appreciated that any features described with reference to one aspect of the present invention are equally applicable to any other aspect of the invention.

As used herein, the terms "upstream" and "downstream" are used to describe the relative positions of elements, or portions of elements, of the smoking article in relation to the direction in which a consumer draws on the smoking article during use thereof. Smoking articles as described herein comprise a downstream end and an opposed upstream end. In
5 use, a consumer draws on the downstream end of the smoking article. The downstream end, which is also described as the mouth end, is downstream of the upstream end, which may also be described as the distal end.

As used in the present specification, the term "cellulosic" is not used to describe a sheet material where naturally occurring cellulose fibres from pulp (e.g. spruce pulp, pinewood pulp,
10 beech pulp, birch pulp and other wood pulp) are compressed, such as paper, paperboard, kraft paper, kraft liner board, cardboard and carton board. By contrast, the term "cellulosic" is used to describe a non-paper material obtained by processing cellulose to form so-called "regenerated cellulose fibres", such as cellophane and rayon, as well as other cellulose derivatives like cellulose acetate and cellulose triacetate, which can also be formed into films.

15 Throughout this specification, the term "self-extinguishment" is used to refer to the smouldering characteristics of a smoking article under free burn conditions. To evaluate self

extinguishment, a laboratory test is conducted at a temperature of 23 degrees Celsius plus or minus 3 degrees Celsius and relative humidity of 55 percent plus or minus 5 percent, both of which should be monitored by a recording hygrothermograph. Exhaust hood(s) remove combustion products formed during testing. Prior to testing, smoking articles to be tested are conditioned at 55 percent plus or minus 5 percent relative humidity and 23 degrees Celsius plus or minus 3 degrees Celsius for 24 hours. Just prior to testing, the smoking articles are placed in glass beakers to assure free air access.

Self-extinguishment testing takes place within an enclosure or test box. A single port smoking machine or an electric lighter is used to ignite the smoking articles for the test. During testing, an apparatus or "angle holder" holds the smoking articles to be tested by holding an end at angles of 0 degrees (horizontal), 45 degrees, and/or 90 degrees (vertical). Preferably, twenty (20) smoking articles are tested at each of the 0 degrees, 45 degrees, and 90 degrees positions. If more than one apparatus is used, the apparatuses are preferably positioned such that the smoking articles face away from each other to avoid cross interference. If a smoking article goes out before the front line of the smouldering coal reaches the tipping paper, the outcome is scored as "self-extinguishment"; on the other hand, if the smoking article continues smouldering until the front line of the smouldering coal reaches the tipping paper, then the outcome is scored as "non-extinguishment". Thus, for example, a self extinguishment value of 95 percent indicates that 95 percent of the smoking articles tested exhibited self-extinguishment under free burn conditions; while a self extinguishment value of 20 percent indicates that only 20 percent of the smoking articles tested exhibited self-extinguishment under such free burn conditions.

The self extinguishment value may be referred to in terms of "self extinguishment at 0 degrees value", "self extinguishment at 45 degrees value", or "self extinguishment at 90 degrees value", each of which refers to the value of self extinguishment at the specified tested angle. In addition, the self extinguishment value may be referred to in terms of "Self extinguishment Average value", which refers to an average of the three angular positions: namely, an average of (i) the "Self-Extinguishment at 0 degrees value", (ii) the "Self-Extinguishment at 45 degrees value", and (iii) the "self-Extinguishment at 90 degrees value". A reference to "Self-Extinguishment value" does not distinguish between self extinguishment at 0 degrees, self extinguishment at 45 degrees, self extinguishment at 90 degrees, or self extinguishment average values and may refer to any one of them.

The phrases "self extinguish under free burn conditions" or "self extinguishment under free burn conditions" as used herein, refer to the extinguishment of a smouldering cigarette without puffing, when such cigarette is subjected or exposed to free burn conditions.

The term "ignition propensity (IP)" refers to the tendency of smoking articles to cause a substrate on which they lie to burn. The ignition propensity IP should be low enough to

eliminate reduce or almost eliminate the likelihood of a smoking article causing a substrate on which it is placed to burn. The ignition propensity may be measured according to ISO 12863:2010(E).

The term "substantially air impermeable" is used throughout this specification to describe a sheet material that, when applied in the form of a band at the filter-rod interface, allows less than 5 percent dilution of the mainstream smoke through the ingress of ambient air into the filter. The substantially air impermeable sheet material may be non porous and does not include any perforations. Preferably, the substantially air impermeable plug wrap has an air permeability of less than 200 Coresta units, more preferably less than 100 Coresta units, and even more preferably less than 20 Coresta units. In some such cases, the air permeability of the substantially air impermeable sheet material can have a lower limit of 1 Coresta unit.

A Coresta unit is the unit of air permeability of a sheet material, which corresponds to the flow of air (cubic centimetres per minute) passing through a 1 square centimetre surface area of the test material at a measuring pressure of 1.00 kilopascal. The measuring pressure is the difference in pressure between the two faces of the test material during measurement. As such, the units corresponding to the Coresta unit are cubic centimetres per minute per square centimetre ($\text{cm}^3\text{min}^{-1}\text{cm}^{-2}$) at 1.00 kilopascal. A suitable method for determining the air permeability of sheet materials for use in the present invention is described in ISO Standard 2965:2009.

The air permeability in Coresta units (CU) for a test piece is calculated using the formula:

$$CU = [Q / A] \times [1 / d]$$

where Q is the measured air flow, in cubic centimetres per minute, passing through the test piece, A is the surface area, in square centimetres, of the test piece, and d is the actual measure of pressure difference, in kilopascals, across the two surfaces of the test piece.

The term "substantially transparent" is used throughout this specification to describe a sheet material which allows at least a significant proportion of incident light to pass through it, so that it is possible to see through the material. In the present invention, the substantially transparent over-tipping band allows sufficient light to pass through it that the underlying wrapper is visible through the over-tipping band. The substantially transparent over-tipping band may be completely transparent. Alternatively, the over-tipping band may have a lower level of transparency whilst still transmitting sufficient light that the underlying wrapper is visible through the over-tipping band.

The term "substantially opaque" is used throughout this specification to describe a sheet material which does not allow incident light to pass through it, so that it is not possible to see through the material.

The term "coloured" is used throughout this specification to describe a sheet material which has a colour or colours, especially as opposed to being white or neutral. A substantially transparent sheet material may also be coloured, if it absorbs or reflects incident light of various wavelengths differentially such that it appears tinted with a colour determined by the nature of that absorption (or that reflectance). In smoking articles according to the invention a filter and a rod of smokable material abut at an interface. The filter is circumscribed by a tipping wrapper. A band of an air impermeable cellulosic material is provided, around the filter at the position of the interface between the filter and the rod, overlying the tipping wrapper. The over-tipping band is formed from a cellulosic sheet material that is substantially impermeable to air.

Because the over-tipping band is formed from a substantially air-impermeable cellulosic sheet material, the self-extinguishment time of the smoking article is significantly reduced. Thus, a smoking article, such as a cigarette, left under free burn conditions in an ashtray quickly self-extinguishes. Further, the consumer does not need to act mechanically on the remainder of the smoking article to extinguish combustion. At the same time, the use of a cellulosic sheet material, such as, for example, cellophane has been shown to advantageously reduce the visible staining of the filter due to heat generated by combustion as the cone approaches the filter.

The use of an over-tipping band in accordance with the present invention can be conveniently incorporated into any existing filter arrangement and does not need to affect the existing arrangement of the tipping wrapper or wrappers. Further, an over-tipping band in accordance with the present invention can be easily incorporated into the standard tipping wrapper, so that standard manufacturing equipment and techniques can be used for putting the over-tipping band in place.

Preferably, the over-tipping band is formed of a substantially air impermeable cellulosic sheet material. As mentioned in the first aspect of the invention, the over-tipping band is formed of cellophane. This is particularly advantageous because cellophane may be provided as a substantially transparent material and so the visual impact of the over-tipping band is minimised. Other suitable materials include films capable of blocking ambient oxygen from permeating into the filter.

Preferably, over-tipping the band has a width of at least about 3 millimetres. More preferably, the over-tipping band has a width of at least about 4 millimetres. In addition, or as an alternative, the over-tipping band has preferably a width of no more than 10 millimetres. More preferably, the over-tipping band has a width of no more than about 8 millimetres. In some preferred embodiments, the over-tipping band has a width of about 5 millimetres. As a further alternative, the over-tipping band may have a width such as to substantially circumscribe the filter over the whole of its length. This also minimises the visual impact of the over-tipping band, since the over-tipping band shall have substantially the same length and shall be in substantial alignment with the underlying tipping wrapper.

Preferably, the over-tipping band has a thickness of at least about 15 micrometres. In addition, or as an alternative, the over-tipping band has preferably a thickness of less than about 60 micrometres.

Preferably, the over-tipping band may have a grammage of at least about 20 gsm, more preferably at least about 30 gsm. As an alternative, or in addition, the over-tipping band may preferably have a grammage of less than about 75 gsm, more preferably less than about 60 gms.

The over-tipping band is preferably substantially transparent. In more detail, the over-tipping band may be formed of a clear sheet material or a tinted sheet material, wherein the sheet material is transparent and coloured. As an alternative, the over-tipping band may be substantially opaque. In particular, the over-tipping band may be white, neutral, black or coloured. In some preferred embodiments, the over-tipping band may have the typical colour of tipping wrappers commonly used in smoking articles.

The over-tipping band is fixed to the tipping wrapper such that it is secured in position. Preferably, the over-tipping band is laminated onto the tipping wrapper. For example, a cellophane band may be laminated onto a paper wrapper. The tipping wrapper preferably extends over the full length of the filter. In preferred embodiments, the tipping wrapper is formed from paper wrapper, as in conventional smoking articles.

Preferably, the tipping wrapper has an air permeability of less than about 200 Coresta units, more preferably less than about 100 Coresta units, and even more preferably less than about 20 Coresta units. In some preferred embodiments, the tipping paper is substantially air-impermeable. Preferably, the tipping wrapper has a thickness of at least about 14 micrometres, more preferably at least about 20 micrometres. In addition, or as an alternative, the tipping wrapper has preferably a thickness of less than about 50 micrometres, more preferably less than about 40 micrometres.

Preferably, the smoking article comprises a ventilation zone, such that a desired level of ventilation into the filter can be ensured during smoking of the smoking article.

Preferably, the ventilation zone comprises at least one circumferential row of perforations provided through the tipping wrapper. In some preferred embodiments, the ventilation zone comprises two circumferential rows of perforations provided through the tipping wrapper. For example, the perforations may be formed online during manufacture of the smoking article. Preferably, each circumferential row of perforations comprises from 8 to 30 perforations. In particular, the one or more rows of perforations through the tipping paper shall preferably be provided at a position such as not to interfere with the self-extinguishment effect brought about by the over-tipping band. In smoking articles according to the present invention, the filter may comprise one or more filter segments. Each filter segment may comprise filtration material, and is preferably provided as a plug of fibrous filtration material, such as cellulose acetate tow 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 any additional material to the filtration material. Alternatively, or in addition, smoking articles in accordance with the present invention may include one or more filter segments containing carbon.

5 Preferably, the filter is wrapped in a plug wrap. More preferably, each filter segment is individually wrapped in a plug wrap. In alternative, a single plug wrap may circumscribe two or more adjacent filter segments to form a wrapped filter.

The self-extinguishment time for a smoking article according to the present invention is at least about 15 percent lower than the equivalent time for a smoking article without the over-tipping band. Preferably, the self-extinguishment time for a smoking article according to the
10 present invention is at least about 20 percent lower than the equivalent time for a smoking article without the over-tipping band.

The rod of smokable material is preferably a tobacco rod. The tobacco rod may typically comprise a charge of tobacco cut filler circumscribed by a paper wrapper. Preferably, the
15 tobacco rod may comprise a dense region at a downstream end, wherein the packing density of the tobacco cut filler is increased with respect to a basis packing density of the tobacco cut filler in the tobacco rod. This is advantageous in that it may further enhance the self-extinguishment effect brought about by the over-tipping band. Preferably, the packing density of the downstream end dense region is increased by at least about 3 percent with respect to the basis
20 packing density. More preferably, the packing density of the downstream end dense region is increased by at least about 5 percent with respect to the basis packing density.

Smoking articles according to the invention can be manufactured by providing a wrapped rod of smokable material and attaching a filter to the rod by a tipping wrapper, so that the filter and the rod abut at an interface. This can be done using standard equipment.

25 Further, methods for manufacturing smoking articles according to the invention require the provision of an over-tipping band around the filter and overlying the tipping wrapper at the upstream end of the filter such that the over-tipping band overlies the interface between the wrapped rod of smokable material and the filter, wherein the over-tipping band is formed of an air impermeable cellulosic sheet material. To this purpose, additional equipment may be used
30 to correctly position the over-tipping band on the smoking article over the interface, at a predetermined distance from other elements of the smoking article, such as, for example, the downstream end of the filter or the rod-filter interface.

Preferably, the over-tipping band is applied to the tipping wrapper prior to the wrapping of the tipping wrapper around the filter and rod of smokable material. By way of example,
35 tipping wrapper may have over-tipping band laminated onto it. This is intended to advantageously simplify and expedite the manufacturing process.

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

Figure 1 is a schematic perspective view of a smoking article according to a first embodiment of the present invention; and

Figure 2 is schematic perspective view of the smoking article of Figure 1, shown unwrapped.

Figure 1 is a schematic view of a smoking article 100 according to a first embodiment of the present invention. The same smoking article 100 is also illustrated, partly unwrapped, in Figure 2. The smoking article 100 comprises a tobacco rod 101 circumscribed by a rod wrapper. Further, the smoking article 100 comprises a filter 102 comprising a plug 103 of filtration material circumscribed by a filter wrapper 104. The filter 102 is provided in abutting relationship with the tobacco rod 101 so that an interface 105 is defined between the filter 102 and the tobacco rod 101. A tipping wrapper 106 circumscribes substantially the whole filter 102 and attaches the filter 102 to the wrapped tobacco rod 101. Further, the smoking article 100 comprises a substantially transparent over-tipping band 107 circumscribing the filter 102 and overlying the tipping wrapper 106 at the upstream end of the filter 102. Thus, the over-tipping band 107 overlies the interface 105 between the wrapped rod 101 and the filter 102. The over-tipping band 107 has a width of about 5 millimetres and is formed of cellophane.

Example 1

The self-extinguishment properties of a smoking article according to the invention as described above have been assessed on a smoke machine where the smoking article was smoked until the combustion cone reached a location 2 millimetres upstream of the tipping wrapper. At that time, the smoking article according to the invention was left under free burn conditions and the time it took for it to self-extinguish was measured.

The self-extinguishment behaviour of the smoking article according to the invention was compared with the self-extinguishment behaviour of other reference smoking articles. To this purpose, the same measurement described above was carried out on:

Reference smoking article 1 – a cigarette having the same characteristics of the smoking article according to the invention, but without any over-tipping band;

Reference smoking article 2 – a cigarette identical to the smoking article, but with an impermeable over-tipping band made of tipping paper;

Reference smoking article 3 – a cigarette identical to the smoking article, but with an over-tipping band made of aluminium foil having a thickness of about 10 micrometres.

The following Table 1 contains the results of these measurements. The percent reduction in self-extinguishment time was calculated with reference to the self-extinguishment time of Reference smoking article 1, namely the one with no over-tipping band.

Table 1

<i>Smoking Article</i>	<i>Self-extinguishment time [s]</i>	<i>Self-extinguishment time Reduction [percent]</i>
Reference smoking article 1	193	===
Reference smoking article 2	184	5
Reference smoking article 3	172	11
Example 1 (invention)	147	24

Thus, experimental results have shown that a smoking article according to the invention self-extinguishes significantly more quickly than a standard cigarette. Further, it appears that an over-tipping band made from an air impermeable cellulosic sheet material, such as cellophane brings about a reduction in the self-extinguishment time that is noticeably more pronounced than the reduction obtainable by applying on a same smoking article having otherwise the same structural features an over-tipping band made of other materials.

CLAIMS

1. A smoking article comprising:
a wrapped rod of smokable material;
5 a filter comprising one or more filter segments, wherein the filter is in axial alignment with the wrapped rod of smokable material and abuts the wrapped rod of smokable material at an interface;
a tipping wrapper circumscribing at least a portion of the filter and attaching the filter to the wrapped rod of smokable material;
10 an over-tipping band circumscribing the filter and overlying the tipping wrapper at the upstream end of the filter such that the over-tipping band overlies the interface between the wrapped rod of smokable material and the filter, wherein the over-tipping band is formed of a substantially air impermeable sheet of cellophane.
- 15 2. A smoking article according to claim 1, wherein the over-tipping band is substantially transparent.
3. A smoking article according to claim 1 or 2, wherein the tipping wrapper is substantially transparent.
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4. A smoking article according to any preceding claim, wherein the over-tipping band extends at least 3mm in a longitudinal direction along the smoking article.
5. A smoking article according to any preceding claim, wherein the over-tipping band
25 extends in a longitudinal direction along the smoking article by less than about a longitudinal width of the tipping wrapper.
6. A smoking article according to any preceding claim, wherein the downstream end of the over-tipping band is at least 15 millimetres from the downstream end of the filter.
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7. A smoking article according to any preceding claim, wherein the upstream end of the over-tipping band is no more than 5 millimetres from the interface between the filter and the wrapped rod of smokable material.
- 35 8. A smoking article according to any preceding claim, wherein the over-tipping band is formed of a tinted sheet material.

9. A smoking article according to any preceding claim, wherein the over-tipping band is affixed to the tipping wrapper.
10. A smoking article according to any preceding claim, wherein the tipping wrapper is a paper wrapper.
11. A smoking article according to claim 9 wherein the over-tipping band is provided as a laminated layer on the paper wrapper.
12. A smoking article according to any preceding claim, wherein the self-extinguishment time of the smoking article is at least 15 percent lower than the self-extinguishment time of a corresponding smoking article with the over-tipping band removed.
13. A method for manufacturing a smoking article, comprising:
providing a rod of smokable material having a wrapper;
attaching a filter to the rod of smokable material by a tipping wrapper, wherein the filter abuts the rod of smokable material at an interface; and
providing an over-tipping band around the filter and overlying the tipping wrapper at the upstream end of the filter such that the over-tipping band overlies the interface between the wrapped rod of smokable material and the filter, wherein the over-tipping band is formed of cellophane.
14. A method according to claim 13, wherein the over-tipping band is provided on the tipping wrapper prior to the step of attaching the filter to the rod of smokable material by the tipping wrapper.

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