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(54) **Heatable smoking article with improved wrapper**

(57) A heatable smoking article (2) comprises: an aerosol-forming substrate (6) comprising at least 5% by weight of an aerosol former; a first segment (8) adjacent the aerosol-forming substrate (6) and abutting an end of the aerosol-forming substrate at an interface (30); and a wrapper (12) circumscribing at least a part of the heatable

smoking article (2). At least one circumferential, impervious band (32) is provided on a surface of the wrapper (12), wherein the at least one impervious band (32) is provided at least in the region of the interface (30) between the aerosol-forming substrate (6) and the first segment (8) and is formed of a layer of one or more film-forming compounds.

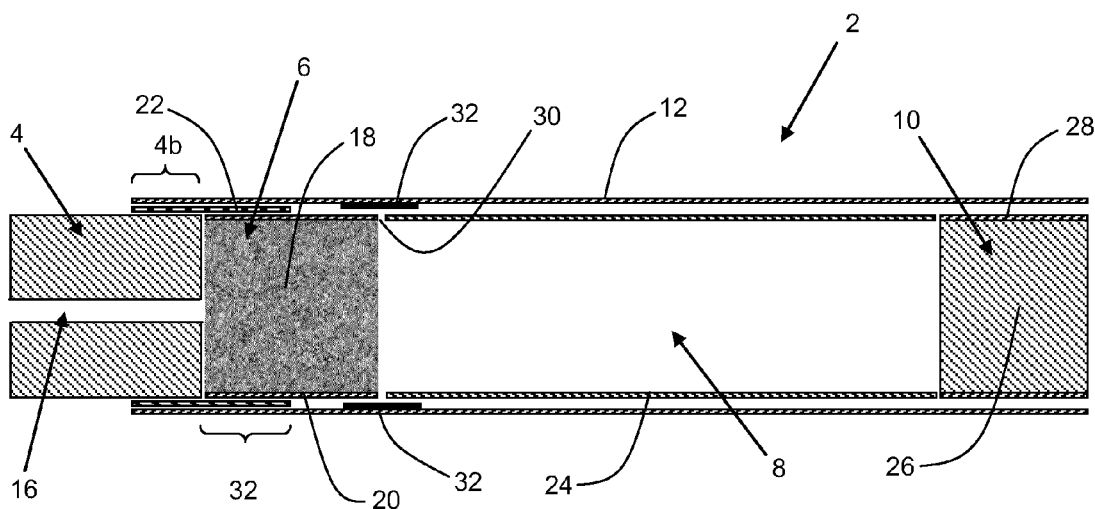


Figure 1

Description

[0001] The present invention relates to a heatable smoking article including an aerosol-forming substrate and an improved wrapper which reduces visible staining at the outside of the smoking article due to migration of aerosol former from the aerosol-forming substrate during storage.

[0002] A number of smoking articles in which tobacco is heated rather than combusted have been proposed in the art. One aim of such 'heatable' smoking articles is to reduce known harmful smoke constituents of the type produced by the combustion and pyrolytic degradation of tobacco in conventional lit-end cigarettes.

[0003] Typically in heatable smoking articles, an aerosol is generated by the transfer of heat from a heat source, for example, a chemical, electrical or combustible heat source, to a physically separate aerosol-forming substrate, which may be located within, around or downstream of the heat source.

[0004] In one known type of heatable smoking article, an aerosol is generated by the transfer of heat from a combustible heat source to a physically separate aerosol-forming substrate located downstream of the combustible heat source. During smoking, volatile compounds are released from the aerosol-forming substrate by heat transfer from the combustible heat source and entrained in air drawn through the smoking article. As the released compounds cool, they condense to form an aerosol that is inhaled by the user.

[0005] For example, WO-A-2009/022232 discloses a smoking article comprising a combustible heat source, an aerosol-forming substrate downstream of the combustible heat source, and a heat-conducting element around and in contact with a rear portion of the combustible heat source and an adjacent front portion of the aerosol-forming substrate. The heat-conducting element in the smoking article of WO-A-2009/022232 transfers the heat generated during combustion of the heat source to the aerosol-forming substrate via conduction.

[0006] Other known types of heatable smoking article are adapted to be used in an electrically heatable aerosol-generating system. In such systems, an aerosol is generated when the aerosol-forming substrate of a smoking article inserted into the system is heated by an electrical heat source.

[0007] The aerosol-forming substrate of heatable smoking articles typically comprises at least one aerosol-former and a material capable of emitting volatile compounds in response to heating, such as a tobacco material. An increased level of aerosol former is typically used in aerosol-forming substrates for heatable smoking articles compared to the smokable substrates of conventional lit-end cigarettes. In many cases, the level of aerosol former in the aerosol-forming substrate of a heatable smoking article may be two or three times the level of aerosol former in the smokable substrate of a conventional lit-end cigarette.

[0008] In smoking articles including an aerosol former, some staining of the outer wrapper of the smoking article may be observed due to the migration of the aerosol former from the aerosol-forming substrate to the outer wrapper during storage. However, the staining may be more prominent for heatable smoking articles due to the relatively high aerosol former content of the aerosol-forming substrate. Staining from the migration of aerosol former may be exacerbated when the smoking articles are subjected to changes in temperature or humidity.

[0009] In heatable smoking articles, staining has been found to be particularly apparent on the part of the outer wrapper that overlies the region around an interface between the aerosol-forming substrate and an adjacent segment. It is thought that this is due to capillary action at the interface between the aerosol-forming substrate and the adjacent segment. This effect may be particularly noticeable when the adjacent segment is formed of a porous or adsorbent material which draws the aerosol former out of the aerosol-forming substrate.

[0010] It would be desirable to provide a heatable smoking article with an improved wrapper which reduces staining at the surface of the smoking article due to migration of aerosol former from the aerosol-forming substrate to the outer wrapper during storage. It would be particularly desirable to provide such a heatable smoking article where the improved wrapper has minimum effect on the smoking characteristics of the smoking article. Furthermore, it would be desirable to provide such a heatable smoking article that can be readily produced using existing machinery and methods for producing heatable smoking articles.

[0011] According to the invention there is provided a heatable smoking article comprising: an aerosol-forming substrate comprising at least 5% by weight of an aerosol former; a first segment adjacent the aerosol-forming substrate and abutting an end of the aerosol-forming substrate at an interface; and a wrapper circumscribing at least a part of the heatable smoking article. At least one circumferential, impervious band is provided on a surface of the wrapper, in the region of the interface between the aerosol-forming substrate and the first segment. The at least one impervious band is formed of a layer of one or more film-forming compounds.

[0012] As used herein, the term "impervious" is used to describe a material that is, when applied to the wrapper of a smoking article, resistant to penetration by the aerosol former from the aerosol-forming substrate. In the heated smoking article of the present invention, the aerosol former is substantially unable to pass through the circumferential, impervious band provided on the surface of the wrapper and is therefore largely prevented from reaching the outer surface of the smoking article. In the heated smoking article of the present invention, the impervious band has a minimal effect on the smoking characteristics of the smoking article, as described in more detail below.

[0013] As used herein, the term "interface" refers to

the plane along which the end surfaces of the aerosol-forming substrate and the adjacent first segment of the heatable smoking article come into contact with each other. Typically, the interface will be substantially perpendicular to the longitudinal axis of the smoking article.

[0014] As used herein, the term "film-forming compound" refers to a compound that is capable of forming a continuous film or layer on the surface of the wrapper. Preferably, the film-forming compounds used in the present invention are polymeric film-forming compounds.

[0015] As used herein, the expression "in the region of the interface" indicates that the impervious band is provided at least in the area of the surface of the wrapper that overlies the part of the smoking article immediately adjacent to the interface. The impervious band therefore extends at least up to the interface between the aerosol-forming substrate and the first segment, on either side of the interface. In certain embodiments, described in more detail below, the impervious band additionally extends over the interface between the aerosol-forming substrate and the first segment.

[0016] As used herein, the terms "upstream", "front", "downstream" and "rear" describe the relative positions of components or portions of components of smoking articles of the invention in relation to the direction of air drawn through the smoking articles during use.

[0017] As used herein, the term "heatable smoking article" refers to any smoking article including an aerosol-forming substrate which is heated by the transfer of heat from a heat source, for example, a combustible, electrical or chemical heat source. The aerosol-forming substrate of the invention is heated rather than combusted to produce an aerosol during smoking.

[0018] As used herein, the term "aerosol-forming substrate" denotes a substrate that is capable of releasing volatile compounds upon heating to form an aerosol.

[0019] In heatable smoking articles of the present invention, a wrapper is provided which includes an impervious band extending around the smoking article in the region of the interface between the aerosol-forming substrate and the adjacent, first segment. The presence of the impervious band advantageously reduces or substantially prevents the migration of aerosol former from the aerosol-forming substrate to the surface of the smoking article around the interface. Staining of the outer surface of the smoking article during storage, for example on the outer wrapper, is thereby minimised and preferably substantially eliminated in the region of the interface, where the problem of migration of the aerosol former is typically greatest.

[0020] The wrapper including the impervious band can advantageously be wrapped around the smoking article during production, using standard wrapping apparatus and techniques.

[0021] Advantageously, the material of the impervious band on the wrapper can be selected such that the presence of the impervious band on a wrapper of heatable smoking articles according to the invention has a minimal

effect on the smoking characteristics of the smoking article, more preferably substantially no effect. In particular, the impervious band preferably has a minimal effect on the burning characteristics of the smoking article, including for example the burn time and the burn temperature. Furthermore, the impervious band preferably has a minimal effect on the sensory properties of the smoking article, including for example, the quantity and type of aerosol constituents in the aerosol generated from the aerosol-forming substrate during smoking.

[0022] As described above, the wrapper is positioned around the smoking article of the present invention such that the impervious band is in the region of the interface between the aerosol-forming substrate and the adjacent, first segment. In certain types of heatable smoking article, only one end of the aerosol-forming substrate may be in contact with an adjacent segment. For example, in one known type of heatable smoking article the aerosol-forming substrate is provided at the front end of the smoking article and is therefore only in contact with another segment on the downstream side. In such smoking articles, the impervious band is provided in the region of the interface between the aerosol-forming substrate and the downstream segment.

[0023] In other types of heatable smoking article, the aerosol-forming substrate may be provided between two segments, so that each end of the aerosol-forming substrate is in contact with an adjacent segment at an interface. A front end of the aerosol-forming substrate will therefore be in contact with an upstream segment at an upstream interface and a rear end of the aerosol-forming substrate will be in contact with a downstream segment at a downstream interface.

[0024] In embodiments of the invention in which both an upstream interface and a downstream interface are present, the wrapper may include a circumferential, impervious band provided in the region of one of the interfaces but not the other. Alternatively, the wrapper may include one or more circumferential, impervious bands in the region of both of the interfaces. This may be achieved by providing separate impervious bands in the region of each interface, or by providing a single impervious band that extends to the region of both interfaces.

[0025] The at least one impervious band may be provided adjacent to the interface between the aerosol-forming substrate and the first segment, so that the impervious band extends up to the interface, but does not overlie the interface. In this case, the impervious band is preferably provided over the region of the aerosol-forming substrate adjacent to the interface with the first segment. This arrangement may advantageously enable the use of a wrapper that circumscribes the aerosol-forming substrate only, for example where the wrapper including the impervious band is a plug wrap. Such wrappers can be readily applied using conventional wrapping techniques. The impervious band may alternatively be provided over the region of the first segment adjacent to the interface with the aerosol-forming substrate.

[0026] In other embodiments, the at least one impervious band may extend to cover the interface between the aerosol-forming substrate and the first segment. In this case, the impervious band will extend from the region adjacent to the interface on the aerosol-forming substrate, over the interface and into the region adjacent to the interface on the first segment. In such embodiments, it will be necessary for the wrapper to cover at least a portion of the aerosol-forming substrate and at least a portion of the first segment.

[0027] The use of a wrapper in which the impervious band is provided over the interface between the aerosol-forming substrate and the first segment may be preferred for certain types of first segment, where the capillary action of the first segment on the aerosol former increases the likelihood of aerosol migration to the surface of the smoking article at the interface.

[0028] The wrapper of heatable smoking articles according to the invention may be provided with a single impervious band or a plurality of separate, impervious bands.

[0029] The wrapper of heatable smoking articles according to the invention may be provided with an impervious band on the inner surface of the wrapper, wherein the inner surface is the surface that faces inwards towards the aerosol-forming substrate. Alternatively or in addition, the wrapper may be provided with an impervious band on the outer surface of the wrapper, wherein the outer surface is the surface that faces outwards away from the aerosol-forming substrate. In certain preferred embodiments, an impervious band is provided on both the inner and outer surfaces of the wrapper. The use of a wrapper with an impervious band on both surfaces has been found to provide a particularly improved reduction in the staining of the outer surfaces of the heatable smoking article due to migration of the aerosol former during storage.

[0030] The selection of the surface or surfaces on which the impervious band is provided may depend upon other features of the heatable smoking article, such as the presence of any other wrappers overlying or underlying the wrapper including the impervious band or the level of aerosol former in the aerosol-forming substrate. For example, in embodiments in which the wrapper including the impervious band is the outer wrapper of the smoking article, as described in more detail below, it may be preferred to provide an impervious band on the inner surface only. In this way, the presence of the impervious band does not affect the appearance or texture of the outer surface of the outer wrapper.

[0031] One or more additional circumferential, impervious bands may be provided on the inner surface or the outer surface of the outer wrapper, or both. The additional circumferential bands may be spaced apart from the impervious band provided in the region of the interface between the aerosol-forming substrate and the first segment, along the length of the smoking article. The use of additional impervious bands may advantageously pre-

vent the migration of aerosol former from other parts of the aerosol-forming substrate, away from the interface.

[0032] The impervious band on the wrapper of heatable smoking articles according to the invention may be provided only on the part of the wrapper in the region of the interface between the aerosol-forming substrate and the adjacent, first segment. In such embodiments, the remaining surface or surfaces of the wrapper are not covered by the impervious material.

[0033] Alternatively, the impervious band may extend along a greater length of the wrapper, on one or both sides of the interface. In certain preferred embodiments, at least one surface of the wrapper is fully coated with a layer of impervious material, so that the impervious band effectively extends along the full length of the wrapper. Only one surface of the wrapper may be coated in this way, or both the inner and outer surfaces of the wrapper may be coated.

[0034] The use of a wrapper that is fully coated on at least one surface of the wrapper may provide advantages in the production of smoking articles according to the invention, since there is no need to accurately align the impervious layer with the interface between the aerosol-forming substrate and the adjacent, first segment. In addition, through the use of a wrapper that is fully coated on at least one surface of the wrapper, other parts of the aerosol-forming substrate away from the interface may be covered by the impervious layer, thereby preventing migration of the aerosol former from these parts. In this way, the staining of the outer surfaces of the heatable smoking article, such as the surface of the outer wrapper, can be further minimised during storage.

[0035] Preferably, the impervious band at the interface extends between about 2 mm and about 20 mm along the length of the heatable smoking article, more preferably between about 5 mm and about 10 mm. Where the impervious band covers the interface between the aerosol-forming substrate and the first segment, the impervious band is preferably positioned with the interface underlying the impervious band at an intermediate position along the length of the band, so that the band extends on either side of the interface. Most preferably, the impervious band is positioned with the interface underlying the band at an approximately central position along the length of the band.

[0036] The impervious band on the wrapper of heatable smoking articles according to the present invention may be formed of any suitable film-forming compound or combination of film-forming compounds that is impervious to the aerosol former provided within the aerosol-forming substrate of that smoking article. In addition, the impervious material must be able to form a closed film or layer on the wrapper that provides a barrier against the penetration of the aerosol former through the wrapper.

[0037] Suitable impervious materials for forming the impervious band include but are not limited to polyvinyl alcohol, starch, starch derivatives, cellulose derivatives,

ethylcellulose or nitrocellulose. The selection of the impervious material may depend upon the aerosol former incorporated into the aerosol-forming substrate of the heatable smoking article. In particularly preferred embodiments of the present invention, the impervious band is formed of a layer of polyvinyl alcohol.

[0038] Preferably, the impervious band has a weight of between about 3 grams per square metre (gsm) and about 10 grams per square metre (gsm). The selected weight of the impervious band may depend upon the properties of the material used to form the wrapper, including for example the composition, weight or surface smoothness of the wrapper material.

[0039] The impervious material may be formed as a separate film or layer of material that is subsequently adhered to the surface of the wrapper to form the impervious band. In this case, the sheet or layer of impervious material may be applied to the wrapper during production of the wrapper or in a subsequent process.

[0040] Alternatively, the impervious material may be applied to the surface of the wrapper in the form of a coating layer. For example, a film-forming compound may be applied to the surface of the wrapper in the form of a solution, which is dried to form the impervious band. As above, the bands may be applied to the wrapper during production of the wrapper, or in a subsequent process. Suitable methods for the application of a band of add-on material to a base sheet would be known to the skilled person and include, for example, spraying and rolling.

[0041] Heatable smoking articles according to the invention will typically have a construction that includes a number of separate wrappers circumscribing one or more of the segments of the smoking article. The wrapper including the impervious band may be incorporated into the heatable smoking articles of the present invention in the place of one of the existing wrappers. Alternatively, the wrapper including the impervious band may be incorporated in addition to the existing wrappers.

[0042] In one preferred embodiment of the invention, the wrapper including the impervious band is the outer wrapper of the smoking article, which provides the outer surface of the smoking article. Preferably, the outer wrapper extends along substantially the full length of the smoking article. In such embodiments, the impervious band is preferably provided on the inner surface of the wrapper only. The presence of the impervious band therefore does not affect the appearance or texture of the outer surface of the smoking article. Where the wrapper including the impervious band is the outer wrapper of the heatable smoking article, the impervious band preferably extends over the interface between the aerosol-forming substrate and the first segment.

[0043] In another preferred embodiment of the invention, the wrapper including the impervious band is provided around and in contact with the aerosol-forming substrate. The wrapper may therefore be provided in place of a conventional plug wrap. In such embodiments, the

wrapper circumscribes the aerosol-forming substrate along at least a part of its length including the region adjacent to the interface between the aerosol-forming substrate and the first segment. Preferably, the wrapper extends along the full length of the aerosol-forming substrate. An impervious band may be provided on the inner surface of the wrapper, on the outer surface of the wrapper, or both.

[0044] In embodiments in which the wrapper including the impervious band is provided around and in contact with the aerosol-forming substrate, the impervious band preferably extends along the full length of the wrapper. In this way, the impervious band reduces not only the migration of aerosol former in the region of the interface between the aerosol-forming substrate and the first segment, but also migration of the aerosol former from the rest of the aerosol-forming substrate.

[0045] In another preferred embodiment of the invention, the wrapper including the impervious band is an intermediate wrapper provided between the inner wrapper or wrappers circumscribing the aerosol-forming substrate and adjacent segments and the outer wrapper circumscribing the smoking article.

[0046] The wrapper onto which the impervious band is applied may be formed of any suitable sheet material but is preferably formed of a paper material. Preferably, the sheet material forming the wrapper has a weight of between about 30 grams per square metre (gsm) and about 50 grams per square metre (gsm), more preferably about 40 grams per square metre (gsm). The impervious band may advantageously be applied to existing wrappers for heatable smoking articles, without the need for modification of the wrapper material.

[0047] Heatable smoking articles according to the present invention preferably comprise an additional wrapper around and in contact with the aerosol-forming substrate, wherein at least one circumferential, impervious band is provided on a surface of the additional wrapper. The impervious band is preferably provided at least around the end of the aerosol-forming substrate adjacent the interface between the aerosol-forming substrate and the first segment. Preferably, the at least one impervious band is formed of a layer of one or more film-forming compounds.

[0048] In such heatable smoking articles, two separate wrappers including an impervious band are therefore provided, wherein the additional wrapper underlies the wrapper described above. The additional wrapper overlies the aerosol-forming substrate along at least part of its length so that the impervious band preferably overlies the portion of the aerosol-forming substrate adjacent the interface between the aerosol-forming substrate and the first segment. Preferably, the additional wrapper extends along the full length of the aerosol-forming substrate. The additional wrapper can therefore be applied to the aerosol-forming substrate as a plug wrap, using conventional apparatus and methods. In some embodiments, the additional wrapper may also extend over the interface be-

tween the aerosol-forming substrate and the first segment.

[0049] The provision of the additional wrapper around the aerosol-forming substrate advantageously further reduces the migration of the aerosol former from the aerosol-forming substrate to the outer surfaces of the heatable smoking article during storage. The impervious band in the additional wrapper reinforces the effect of reducing the migration of the aerosol former around the interface between the aerosol-forming substrate and the first segment. In addition, the impervious band may be positioned to reduce the migration of the aerosol former from the aerosol-forming substrate at other positions along the aerosol-forming substrate.

[0050] The additional wrapper may include an impervious band on the inner surface of the wrapper, in contact with the aerosol-forming substrate. Alternatively or in addition, the additional wrapper may include an impervious band on the outer surface of the wrapper. Preferably, the additional wrapper includes an impervious band on both the inner surface and the outer surface to provide the maximum possible protection against staining of the outer wrapper due to aerosol migration during storage.

[0051] The impervious band provided on the additional wrapper may extend part way along the length of the wrapper, so that only a part of the aerosol-forming substrate is covered by the impervious band. Optionally, further impervious bands may be provided along the additional wrapper so that a plurality of impervious bands is provided along the length of the aerosol-forming substrate.

[0052] In preferred embodiments of the invention, the additional wrapper is coated on at least one surface by an impervious material, so that the impervious band effectively extends along the full length of the additional wrapper. Particularly preferably, the additional wrapper is coated on both the inner surface and the outer surface. This arrangement has been found to provide particularly effective reduction in the migration of the aerosol former to the surface of the heatable smoking article. In such embodiments, the combination of the additional wrapper with an impervious coating layer on both sides with the overlying wrapper including the impervious band in the region of the interface between the aerosol-forming substrate and the first segment can substantially eliminate the migration of the aerosol former from the aerosol-forming substrate to the surface of the smoking article during storage.

[0053] The impervious band on the additional wrapper may be formed of any of the impervious materials described above with reference to the impervious band on the overlying wrapper. Furthermore, the impervious band on the additional wrapper may be applied to the wrapper in any of the ways described above with reference to the overlying wrapper. Preferably, the impervious band on the additional wrapper has a weight of between about 3 grams per square metre (gsm) and about 10 grams per square metre (gsm). As described above in relation to

the overlying wrapper, the weight of the impervious band may depend upon the properties of the wrapper material.

[0054] In embodiments in which an impervious material is on the inner and outer surface of the additional wrapper, the impervious material on the inner surface may be the same or different from the outer surface of the wrapper.

[0055] In one particularly preferred embodiment of the invention, the additional wrapper is coated on both surfaces with a layer of polyvinyl alcohol and the overlying wrapper is coated on the inner surface with a band of polyvinyl alcohol, which overlies the interface between the aerosol-forming substrate and the first segment.

[0056] The additional wrapper onto which the impervious band is applied may be formed of any suitable sheet material but is preferably formed of a paper material. Preferably, the sheet material forming the wrapper has a weight of between about 30 grams per square metre (gsm) and about 50 grams per square metre (gsm), more preferably about 40 grams per square metre (gsm). The impervious band may advantageously be applied to existing wrappers for heatable smoking articles, for example existing plug wraps, without the need for modification of the wrapper material. The additional wrapper may be formed of the same sheet material as the overlying wrapper with an impervious band, or a different sheet material.

[0057] The aerosol-forming substrate of heatable smoking articles according to the invention comprises at least one aerosol-former and a material capable of emitting volatile compounds in response to heating.

[0058] The at least one aerosol former may be any suitable known compound or mixture of compounds that, in use, facilitates formation of a dense and stable aerosol. The aerosol former is preferably resistant to thermal degradation at the operating temperature of the smoking article. Suitable aerosol-formers are well known in the art and include, for example, polyhydric alcohols, esters of polyhydric alcohols, such as glycerol mono-, di- or triacetate, and aliphatic esters of mono-, di- or polycarboxylic acids, such as dimethyl dodecanedioate and dimethyl tetradecanedioate. Preferred aerosol formers for use in heatable smoking articles according to the invention are polyhydric alcohols or mixtures thereof, such as triethylene glycol, 1,3-butanediol and, most preferred, glycerine.

[0059] The aerosol-forming substrate includes at least 5% by weight of the aerosol former, more preferably at least 10% by weight and most preferably at least 15% by weight. In one preferred embodiment of the invention, the aerosol-forming substrate includes around 20% by weight of aerosol former.

[0060] The level of aerosol former in the aerosol-forming substrate of heatable smoking articles according to the invention is therefore significantly higher than the level typically used in the tobacco rod of a conventional lit-end cigarette. The problem of migration of the aerosol former from the aerosol-forming substrate to the outer surfaces of the heatable smoking article during storage is therefore potentially more significant for the heatable

smoking articles of the present invention. However, the provision of the wrapper or wrappers with an impervious band, as described above, reduces or substantially prevents the visible staining of the smoking article during storage. The present invention therefore enables these relatively high levels of aerosol former to be used in the aerosol-forming substrate without sacrificing the appearance of the heatable smoking article.

[0061] Preferably, the material capable of emitting volatile compounds in response to heating is a charge of plant-based material, more preferably a charge of homogenised plant-based material. For example, the aerosol-forming substrate may comprise one or more materials derived from plants including, but not limited to: tobacco; tea, for example green tea; peppermint; laurel; eucalyptus; basil; sage; verbena; and tarragon. The plant-based material may comprise additives including, but not limited to, humectants, flavourants, binders and mixtures thereof. Preferably, the plant-based material consists essentially of tobacco material, most preferably homogenised tobacco material.

[0062] The first segment of heatable smoking articles according to the invention is in abutting relationship with the aerosol-forming substrate at the interface defined above. The first segment may be upstream of the aerosol-forming substrate or downstream of the aerosol-forming substrate. The form and construction of the first segment will depend upon the type of heatable smoking article. In certain preferred embodiments, the first segment is in the form of a hollow tube, for example, a hollow cellulose acetate or cardboard tube.

[0063] In certain embodiments of the invention, the first segment is in the form of an airflow directing element downstream of the aerosol-forming substrate. The airflow directing element defines an airflow pathway through the heatable smoking article from an air inlet provided along the airflow directing element to the mouth end of the smoking article. In such embodiments, a combustible heat source will typically be provided at the upstream side of the aerosol-forming substrate.

[0064] The airflow directing element may comprise an open-ended, substantially air impermeable hollow body. In such embodiments, the air drawn in through the at least one air inlet is first drawn upstream along the exterior portion of the open-ended, substantially air impermeable hollow body and then downstream through the interior of the open-ended, substantially air impermeable hollow body.

[0065] The substantially air impermeable hollow body may be formed from one or more suitable air impermeable materials that are substantially thermally stable at the temperature of the aerosol generated during heating of the aerosol-forming substrate. Suitable materials are known in the art and include, but are not limited to, cardboard, plastic, ceramic and combinations thereof.

[0066] In other embodiments of the invention, the first segment is in the form of an elongate expansion chamber downstream of the aerosol-forming substrate. The inclu-

sion of an expansion chamber advantageously allows further cooling of the aerosol generated by heat transfer from the heat source to the aerosol-forming substrate. The expansion chamber also advantageously allows the overall length of smoking articles according to the invention to be adjusted to a desired value, for example to a length similar to that of conventional lit-endcigarettes, through an appropriate choice of the length of the expansion chamber. Preferably, the expansion chamber is an elongate hollow tube.

[0067] As described above, heatable smoking articles according to the invention may be provided with a second segment that abuts the aerosol-forming substrate at a second interface at the opposite end to the interface with the first segment. In such heatable smoking articles, the wrapper including the impervious band may be further provided with an impervious band in the region of the second interface between the aerosol-forming substrate and the second segment. Impervious bands are therefore provided in the region of both interfaces at the opposite ends of the aerosol-forming substrate.

[0068] Heatable smoking articles according to the invention may further comprise a heat source upstream of the aerosol-forming substrate. The heat source may be, for example, a heat sink, a chemical heat source, a combustible heat source, or an electrical heat source. The heat source is preferably a combustible heat source which comprises any suitable combustible fuel, including but not limited to carbon, aluminium, magnesium, carbides, nitrites and mixtures thereof.

[0069] Preferably, the heat source of smoking articles according to the invention is a carbonaceous combustible heat source.

[0070] As used herein, the term "carbonaceous" is used to describe a heat source comprising carbon. Preferably, carbonaceous combustible heat sources for use in heatable smoking articles according to the invention have a carbon content of at least about 35%, more preferably of at least about 40%, most preferably of at least about 45% by dry weight of the combustible heat source.

[0071] In some embodiments, the heat source of heatable smoking articles according to the invention is combustible carbon-based heat source. As used herein, the term "carbon-based heat source" describes a heat source comprised primarily of carbon.

[0072] Combustible carbon-based heat sources for use in heatable smoking articles according to the invention may have a carbon content of at least about 50%, preferably of at least about 60%, more preferably of at least about 70%, most preferably of at least about 80% by dry weight of the combustible carbon-based heat source.

[0073] Heatable smoking articles according to the invention may comprise combustible carbonaceous heat sources formed from one or more suitable carbon-containing materials.

[0074] If desired, one or more binders may be combined with the one or more carbon-containing materials.

Preferably, the one or more binders are organic binders. Suitable known organic binders, include but are not limited to, gums (for example, guar gum), modified celluloses and cellulose derivatives (for example, methyl cellulose, carboxymethyl cellulose, hydroxypropyl cellulose and hydroxypropyl methylcellulose) flour, starches, sugars, vegetable oils and combinations thereof.

[0075] Instead of, or in addition to one or more binders, combustible heat sources for use in heatable smoking articles according to the invention may comprise one or more additives in order to improve the properties of the combustible heat source. Suitable additives include, but are not limited to, additives to promote consolidation of the combustible heat source (for example, sintering aids), additives to promote ignition of the combustible heat source (for example, oxidisers such as perchlorates, chlorates, nitrates, peroxides, permanganates, and/or zirconium), additives to promote combustion of the combustible heat source (for example, potassium and potassium salts, such as potassium citrate) and additives to promote decomposition of one or more gases produced by combustion of the combustible heat source (for example catalysts, such as CuO , Fe_2O_3 and Al_2O_3).

[0076] In one preferred embodiment of the present invention, the heatable smoking article comprises a combustible carbon-based heat source, as described above, an aerosol-forming substrate downstream of the combustible heat source and a heat-conducting element around and in contact with a rear portion of the combustible heat source and an adjacent front portion of the aerosol-forming substrate. In this embodiment, the wrapper including the impervious band is preferably the outer wrapper of the heatable smoking article. The impervious band preferably overlies the interface between the aerosol-forming substrate and the segment downstream of the aerosol-forming substrate, which may for example be an airflow directing element, or an expansion chamber as described above. An additional wrapper with an impervious band may optionally be provided around the aerosol-forming substrate.

[0077] In an alternative preferred embodiment, the heatable smoking article of the invention is adapted to be used in conjunction with an aerosol-generating device having one or more heating elements for heating the aerosol-forming substrate. The smoking article itself therefore does not incorporate a heat source.

[0078] The aerosol-generating device may be an electrically heatable smoking system and may comprise one or more internal electric heater elements, or one or more external electric heater elements, or both. External heater elements are adapted to at least partially surround the aerosol-forming substrate when the smoking article is in place within the aerosol-generating device. Internal heater elements are adapted to be at least partially inserted into the aerosol-forming substrate when the smoking article is in place within the aerosol-generating device and may, for example, take the form of a heating blade or pin. The aerosol-forming substrate will typically be provided

at the front, upstream end of the smoking article, with one or more segments provided downstream.

[0079] In this embodiment, the wrapper including the impervious band is preferably the outer wrapper of the heatable smoking article. The impervious band preferably overlies the interface between the aerosol-forming substrate and the segment downstream of the aerosol-forming substrate, which may for example be a hollow cellulose acetate tube, as described above. An additional wrapper with an impervious band in the region of the interface may optionally be provided around the aerosol-forming substrate.

[0080] Heatable smoking articles according to all embodiments of the invention may also further comprise a mouthpiece downstream of the aerosol-forming substrate and the first segment. The mouthpiece may, for example, comprise a filter made of cellulose acetate, paper or other suitable known filtration materials. Preferably, the mouthpiece is of low filtration efficiency, more preferably of very low filtration efficiency. Alternatively or in addition, the mouthpiece may comprise one or more segments comprising absorbents, adsorbents, flavourants, and other aerosol modifiers and additives which are used in filters for conventional cigarettes, or combinations thereof.

[0081] Smoking articles according to the invention may be assembled using known methods and machinery.

[0082] The invention will be further described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 shows a schematic longitudinal cross-section of a smoking article according to a first embodiment of the invention; and

Figure 2 shows a schematic longitudinal cross-section of a smoking article according to a second embodiment of the invention.

[0083] The smoking article 2 shown in Figure 1 comprises a combustible carbonaceous heat source 4, an aerosol-forming substrate 6, an elongate expansion chamber 8 and a mouthpiece 10 in abutting coaxial alignment. The combustible carbonaceous heat source 4, aerosol-forming substrate 6, elongate expansion chamber 8 and mouthpiece 10 are overwrapped in an outer wrapper 12 of cigarette paper of low air permeability.

[0084] The combustible carbonaceous heat source 4 comprises a central airflow channel 16 that extends longitudinally through the combustible carbonaceous heat source 4. A gas-resistant, heat resistant, barrier coating (not shown) is provided on the inner surface of the central airflow channel 16.

[0085] The aerosol-forming substrate 6 is located immediately downstream of the combustible heat source 4. The aerosol-forming substrate 6 comprises a cylindrical plug of tobacco material 18 comprising about 20% by weight glycerine as aerosol former and circumscribed by filter plug wrap 20.

[0086] A heat-conducting element 22 consisting of a tube of aluminium foil surrounds and is in contact with a rear portion 4b of the combustible carbonaceous heat source 4 and an abutting front portion 6a of the aerosol-forming substrate 6. As shown in Figure 1, a rear portion of the aerosol-forming substrate 6 is not surrounded by the heat-conducting element 22.

[0087] The elongate expansion chamber 8 is located downstream of the aerosol-forming substrate 6 and comprises a cylindrical open-ended tube of cardboard 24. The upstream end of the elongate expansion chamber 8 abuts the downstream end of the aerosol-forming substrate 6 at an interface 30.

[0088] The mouthpiece 10 of the smoking article 2 is located downstream of the expansion chamber 8 and comprises a cylindrical plug of cellulose acetate tow 26 of very low filtration efficiency circumscribed by filter plug wrap 28. The mouthpiece 10 may be circumscribed by tipping paper (not shown).

[0089] The outer wrapper 12 is formed of a paper material having a base weight of 40 grams per square metre. A single impervious band 32 formed of a homogeneous coating layer of polyvinyl alcohol having a weight of 10 grams per square metre is provided on the inner surface of the wrapper 12. The impervious band 32 circumscribes the smoking article 2 and extends approximately 10 mm along the length of the smoking article 2. The impervious band 32 is positioned over the interface 30 between the aerosol-forming substrate 6 and the elongate expansion chamber 8.

[0090] The impervious band 32 of polyvinyl alcohol on the inner surface of the outer wrapper 12 is substantially impervious to glycerine, which is the principal aerosol former in the aerosol-forming substrate 6. The migration of glycerine from the aerosol-forming substrate 6 to the outer surface of the outer wrapper 12 is therefore substantially prevented in the region of the interface 30, where a relatively high level of staining may otherwise become visible after storage of the smoking article 2.

[0091] In use of the smoking article 2, the consumer ignites the combustible heat source 4 and then draws air through the central airflow channel 16 downstream towards the mouthpiece 10. The front part 6a of the aerosol-forming substrate 6 is heated primarily by conduction through the abutting non-combusting rear part 4b of the combustible heat source 4 and the combustion resistant wrapper 22. The drawn air is heated as it passes through the central airflow channel 16 and then heats the aerosol-forming substrate 6 by convection. The heating of the aerosol-forming substrate 6 releases volatile and semi-volatile compounds, including the aerosol former from the tobacco material 18, which are entrained in the heated drawn air as it flows through the aerosol-forming substrate. The heated air and entrained compounds pass downstream through the expansion chamber 8, cool and condense to form an aerosol that passes through the mouthpiece into the mouth of the consumer at about ambient temperature.

[0092] The presence of the impervious band 32 on the inner surface of the outer wrapper 12 has been found to have a negligible effect on the sensory characteristics of the aerosol generated from the smoking article 2. Furthermore, the presence of the impervious band 32 has no apparent effect on the temperature or burning of the aerosol-forming substrate 6 during smoking.

[0093] The heatable smoking article 54 according to the second embodiment of the invention shown in Figure 2 comprises a combustible carbonaceous heat source 40, in which air drawn through the smoking article for inhalation by a user does not pass through any airflow channels along the combustible heat source, an aerosol-forming substrate 6, an airflow directing element 44, an elongate expansion chamber 8 and a mouthpiece 10 in abutting coaxial alignment. The combustible carbonaceous heat source 40, aerosol-forming substrate 6, airflow directing element 44, elongate expansion chamber 8 and mouthpiece 10 are overwrapped in an outer wrapper of cigarette paper 12 of low air permeability which includes an impervious band 32 of polyvinyl alcohol on the inner surface, as described above in relation to Figure 1.

[0094] The aerosol-forming substrate 6, expansion chamber 8 and mouthpiece 10 are of the same construction and function as described above in relation to the smoking article 2 of the first embodiment.

[0095] As in the smoking article 2, a first heat-conducting element 22 consisting of a tube of aluminium foil surrounds and is in contact with a rear portion 4b of the combustible carbonaceous heat source 40 and an abutting front portion 6a of the aerosol-forming substrate 6.

[0096] The airflow directing element 44 is located downstream of the aerosol-forming substrate 6 and comprises an open-ended, substantially air impermeable hollow tube 56 made of, for example, cardboard, which is of reduced diameter compared to the aerosol-forming substrate 6. The downstream end of the open-ended hollow tube 56 is surrounded by an annular substantially air impermeable seal 58 of substantially the same diameter as the aerosol-forming substrate 6. The remainder of the open-ended hollow tube is embedded in a cylindrical plug of cellulose acetate tow 60 of substantially the same diameter as the aerosol-forming substrate 6.

[0097] The open-ended hollow tube, 56 and cylindrical plug of cellulose acetate tow 60 are circumscribed by an inner wrapper 50. The upstream end of the airflow directing element 44 abuts the downstream end of the aerosol-forming substrate 6 at an interface 70.

[0098] As also shown in Figure 2, a circumferential row of air inlets 52 are provided in the outer wrapper 12 circumscribing the inner wrapper 50.

[0099] In the smoking article 54 shown in Figure 2, the filter plug wrap 20 circumscribing the aerosol-forming substrate 6 is formed of a paper material having a base weight of 40 grams per square metre. The filter plug wrap 20 is coated on both the inner surface and the outer surface with a homogeneous layer of polyvinyl alcohol (not

shown) having a weight of 10 grams per square metre (gsm). Each surface of the filter plug wrap 20 therefore provides an impervious band extending along the full length of the aerosol-forming substrate 6.

[0100] The coating layers of polyvinyl alcohol on the inner and outer surfaces of the filter plug wrap 20 are substantially impervious to glycerine, which is the principal aerosol former in the aerosol-forming substrate 6. The migration of glycerine from the aerosol-forming substrate 6 to the outer surface of the outer wrapper 12 is therefore substantially prevented along the full length of the aerosol-forming substrate 6. In addition, any leakage of the glycerine from the end of the aerosol-forming substrate to the outer wrapper 12 due to the capillary action of the airflow directing element 44 at the interface 30 is substantially prevented. With the combination of the outer wrapper 12 and filter plug wrap 20 there should therefore be little or no visible staining of the outer wrapper 12 due to migration of the aerosol former during storage.

[0101] In use, when a user draws on the mouthpiece 10, cool air is drawn into the smoking article 54 according to the second embodiment of the invention through the air inlets 52. The drawn air passes upstream between the exterior of the open-ended hollow tube 56 and the inner wrapper 50 through the cylindrical plug of cellulose acetate tow 58 to the aerosol-forming substrate 6.

[0102] As described above, the aerosol-forming substrate 6 is heated by conduction to form an aerosol that is entrained in the drawn air as it flows through the aerosol-forming substrate 6. The drawn air and entrained aerosol pass downstream through the interior of the hollow tube 56 of the airflow directing element 44 to the expansion chamber 10, where they cool and condense. The cooled aerosol then passes downstream through the mouthpiece 10 of the smoking article 54 into the mouth of the user.

[0103] The presence of the impervious band 32 on the inner surface of the outer wrapper 12 and the impervious coating layers on the filter plug wrap 20 have been found to have a negligible effect on the sensory characteristics of the aerosol generated from the smoking article 54. Furthermore, the presence of the impervious band 32 and the impervious coating layers on the filter plug wrap 20 had no apparent effect on the temperature of the aerosol-forming substrate 6 during smoking.

Claims

1. A heatable smoking article comprising:

an aerosol-forming substrate comprising at least 5% by weight of an aerosol former;
a first segment adjacent the aerosol-forming substrate and abutting an end of the aerosol-forming substrate at an interface; and
a wrapper circumscribing at least a part of the heatable smoking article, wherein at least one

circumferential, impervious band is provided on a surface of the wrapper in the region of the interface between the aerosol-forming substrate and the first segment and wherein the at least one impervious band is formed of a layer of one or more film-forming compounds.

2. A heatable smoking article according to claim 1 wherein the at least one impervious band is formed of a layer of polyvinyl alcohol.

3. A heatable smoking article according to claim 1 or 2 wherein the at least one impervious band has a weight of between about 3 and about 10 grams per square metre (gsm).

4. A heatable smoking article according to any of claims 1 to 3 wherein the at least one impervious band extends over the interface between the aerosol-forming substrate and the first segment.

5. A heatable smoking article according to any preceding claim wherein the at least one impervious band extends between 5 mm and 10 mm along the length of the smoking article.

6. A heatable smoking article according to any preceding claim wherein the wrapper including the at least one impervious band is an outer wrapper circumscribing the heatable smoking article and wherein the at least one impervious band is applied to the inner surface of the outer wrapper.

7. A heatable smoking article according to any preceding claim further comprising an additional wrapper around and in contact with the aerosol-forming substrate, wherein at least one circumferential, impervious band is provided on a surface of the additional wrapper in the region of the interface between the aerosol-forming substrate and the first segment and wherein the at least one impervious band is formed of a layer of one or more film-forming compounds.

8. A heatable smoking article according to claim 7 wherein the at least one impervious band on the surface of the additional wrapper comprises an impervious layer covering substantially the entire surface of the wrapper.

9. A heatable smoking article according to claim 7 or 8 wherein the at least one impervious band on the additional wrapper is formed of a layer of polyvinyl alcohol.

10. A heatable smoking article according to any of claims 7 to 9 wherein the at least one impervious band on the additional wrapper is formed of a layer having a weight of about 3 to about 10 grams per square metre

(gsm).

11. A heatable smoking article according to any preceding claim wherein the first segment is downstream of the aerosol-forming substrate. 5
12. A heatable smoking article according to any preceding claim wherein the aerosol-forming substrate comprises at least 10% of an aerosol former. 10
13. A heatable smoking article according to any preceding claim wherein the aerosol-forming substrate comprises a rod of tobacco material and wherein the aerosol former comprises glycerine. 15
14. A heatable smoking article according to any preceding claim further comprising a combustible heat source upstream of the aerosol-forming substrate.
15. A heatable smoking article according to any of claims 1 to 13 for use in an electrically heatable smoking system. 20

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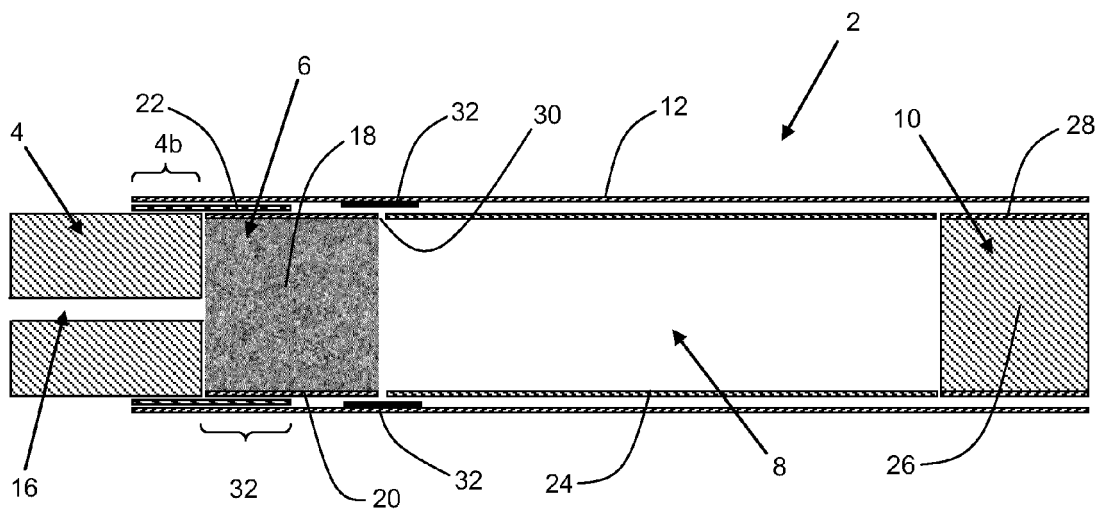


Figure 1

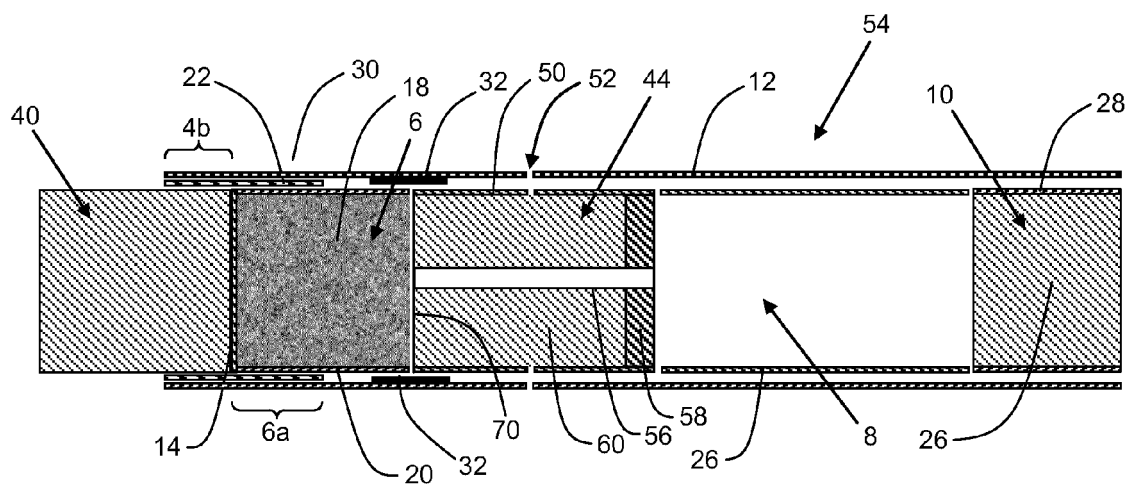


Figure 2



EUROPEAN SEARCH REPORT

Application Number
EP 12 16 2727

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 25 September 2012	Examiner Koob, Michael
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 12 16 2727

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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25-09-2012

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