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(54) Title: LOW IGNITION PROPENSITY SMOKING ARTICLE AND AN APPARATUS AND METHOD FOR FORMING A LOW IGNITION PROPENSITY SMOKING ARTICLE

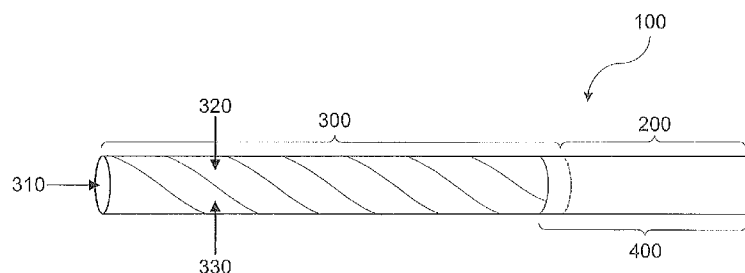


FIG. 2

(57) Abstract: A smoking article is described having a continuous spiral of low ignition propensity banding. An apparatus and method for forming the smoking article are also described.

Low ignition propensity smoking article and an apparatus and method for forming a low ignition propensity smoking article

Field of the Invention

5 This invention relates to low ignition propensity (LIP) smoking articles and an apparatus and method for forming the smoking articles.

Background to the Invention

As used herein, the term “smoking article” includes smokeable products such as
10 cigarettes, cigars and cigarillos whether based on tobacco, tobacco derivatives, expanded tobacco, reconstituted tobacco or tobacco substitutes and also heat-not-burn products.

Low ignition propensity (LIP) smoking articles generally comprise a specific low
15 ignition propensity wrapper wrapped around a core of tobacco. When the smoking article is lit, the low ignition propensity wrapper restricts the access of external air to the burning tobacco core and, as such, may cause the smoking article to self-extinguish if it is not regularly drawn upon by the smoker.

20 ASTM E2187-04 and ASTM E2187-09 specify standardized tests against which the ignition propensity properties of smoking articles can be assessed. National regulation often requires that low ignition propensity smoking articles exhibit full length burn percentages of less than a particular threshold, for example 25%, when tested in accordance with ASTM E2187-04 or ASTM E2187-09.

25 The wrappers of commercially available low ignition propensity smoking articles generally comprise a base paper onto which bands of burn limiting additive material have been applied. The bands of additive material generally have a lower air permeability than the inherent air permeability of the base paper, and thus reduce
30 the air permeability of the wrapper in the banded regions. This reduction in air permeability decreases the amount of air available to the burning tobacco and consequently can be used to reduce the ignition propensity of smoking articles in accordance with industry standards such as ASTM E2187-04 and ASTM E2187-09.

One method for making wrappers for smoking articles having reduced ignition propensity is to add bands of paper to the base wrapping paper, wherein the composition of the wrapper and the band paper are selected to yield a composite
5 paper having the desired burn rate, as disclosed in EP 0 483998 and EP 0 262550. The bands are typically applied to the base paper before it is wrapped around a tobacco core, and when the paper is wrapped around the tobacco the bands are on the inside of the paper, facing the tobacco.

10 Pre-banded materials can be expensive compared to materials used in conventional smoking article wrappers.

Another method for making smoking articles having reduced ignition propensity is to apply a burn retardant additive solution to the smoking article wrapper, usually in
15 a printing process. The burn retardant additive is typically applied in bands which, in the final assembled product, extend as a ring around the circumference of the smoking article. It can be preferable to apply these bands on-line during the smoking article manufacture process and this on-line application of banding is disclosed in WO 2004/057986 and US 2004/0261805. However, these processes
20 have additional drawbacks, in particular that the machines used for applying smoking article wrappers, which may be modified to include a section for applying a burn retardant solution, apply significant tension to the paper. When the paper is damp as a result of the application of the burn retardant additive solution its tensile strength is significantly reduced so that tearing of the paper easily occurs,
25 significantly reducing the performance of such techniques.

Summary of the Invention

According to the invention, there is provided a smoking article comprising a continuous spiral of low ignition propensity banding.

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The low ignition propensity banding may comprise a low permeability spiral zone and the smoking article may further comprise a high permeability spiral zone.

The smoking article may comprise a rod of smokeable material wrapped in a base wrapper, and the continuous spiral of low ignition propensity banding may comprise a coating on the base wrapper.

- 5 An uncoated area of the base wrapper may comprise the high permeability spiral zone.

The permeability of the low permeability spiral zone may be 30 Coresta or less and the permeability of the high permeability zone may be between 50 and 150 Coresta.

10

The spiral of low ignition propensity banding may comprise an overwrap material.

The overwrap material may comprise a low permeability paper.

- 15 The spiral of low ignition propensity banding may comprise a sprayed-on additive material.

According to the invention, there is also provided an apparatus for applying the continuous spiral of low ignition propensity banding to a smoking article,

- 20 comprising a drive means configured to rotate the smoking article and a banding unit for providing said banding to the smoking article as the smoking article is rotated.

The banding unit may comprise an applicator, which may comprise a nozzle

- 25 configured to spray the additive material onto the smoking article as the smoking article is rotated.

The drive means may be configured to simultaneously rotate the smoking article and move the smoking article in a longitudinal direction past the applicator or nozzle as the applicator or nozzle sprays the additive material, thereby creating the continuous spiral of low ignition propensity banding.

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The banding unit may comprise a feeding unit for feeding an overwrap material onto said smoking article to form said banding.

According to the invention, there is also provided a method of forming a smoking
5 article, comprising wrapping a core of smokeable material in a base wrapper and applying a continuous spiral of low ignition propensity banding to the base wrapper.

Applying the low ignition propensity banding may comprise wrapping the low ignition propensity banding around the smoking article.

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The low ignition propensity banding may comprise an overwrap material.

The overwrap material may comprise a low permeability paper.

15 Applying the low ignition propensity banding may comprise spraying an additive material in a spiral band around the smoking article as the smoking article is rotated.

Embodiments of the invention will now be described by way of example with reference to accompanying figures, in which:

20

Brief Description of the Figures

Figure 1 is an illustration of a smoking article comprising a core of smokeable material wrapped in a base wrapper.

25 Figure 2 is an illustration of a smoking article comprising a core of smokeable material wrapped in a base wrapper and a continuous spiral of low ignition propensity banding.

Figure 3 is a schematic illustration of an apparatus for applying a continuous spiral
30 of low ignition propensity banding to a smoking article.

Figure 4 is a perspective illustration of an apparatus for employing a drive belt to wrap an overwrap material in a spiral band around a core of smokeable material wrapped in a base wrapper.

5 Figure 5 is a cross sectional side-on illustration of the apparatus shown in Figure 4.

Figure 6 is a plan view of the apparatus shown in Figures 4 and 5.

10 Figure 7 is side-on illustration of the apparatus shown in Figures 4 to 6, additionally comprising a nozzle for spraying additive material onto the base wrapper of the smokeable material core.

Figure 8 is a flow diagram of a method of applying a LIP spiral band to a base wrapper.

15

Detailed Description

An LIP smoking article is shown in Figure 1.

20 The smoking article 100 is discussed below in the context of a cigarette 100 comprising a substantially cylindrical cellulose acetate filter 200 and an axially aligned substantially cylindrical smokeable material rod 300 connected to the filter 200 by a sheet of overlying tipping paper 400. However, the invention is not confined to cigarettes. It is applicable to other types of smoking article, including those referred to above.

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The smokeable material rod 300 comprises a substantially cylindrical core of tobacco material 310 wrapped in a base wrapper 320. The base wrapper 320 may comprise a base paper 320, which can for example be a cigarette paper. As shown in Figure 1, the base wrapper 320 provides a circumferential boundary for the
30 cylindrical core 310 and may extend along the whole length of the rod 300. The end faces of the core 310 are left unwrapped in a conventional manner.

The permeability of the base wrapper 320 is between 50 and 150 CU. For example, the permeability of the base wrapper 320 may be any value between 70 and 120 CU, such as all integer and half integer values between 70 and 120 CU. The relatively high permeability of the base wrapper 320 is such that it allows a significant
5 quantity of external O₂ and other air molecules to permeate through the base wrapper 320 into the tobacco core 310. When the cigarette 100 is lit, the permeation of external air molecules through the base wrapper 320 dilutes the smoke and gaseous flow in the tobacco core 310 during puffing.

10 Referring to Figure 2, the smokeable material rod 300 may further comprise an overwrap 330 wrapped around the base wrapper 320 described above. The overwrap 330 partially covers the circumferential surface of the base wrapper 320 so as to provide a coating, also referred to as a layer, on the surface of the base wrapper 320. As such, the outer surface of the rod 300 comprises one or more
15 exposed regions of the base wrapper 320 and one or more regions of the overwrap 330. The overwrap 330 may be fixed to the base wrapper 320 using a suitable adhesive, as described further below in the explanation of the manufacturing process for the cigarette 100.

20 As shown in Figure 2, the regions of overwrap 330 and exposed base wrapper 320 can be created by wrapping the overwrap 330 around the smokeable material rod 300 in a spiral or helical pattern over the top of the base wrapper 320. In order to leave regions of the base wrapper 320 exposed at the circumferential surface of the rod 300, the overwrap 330 may be wrapped around the base wrapper 320 so as not
25 to overlap itself. More specifically, the overwrap 330 may be configured to spiral around the longitudinal surface of the base wrapper 320 in a continuous spiral band so as to leave a gap between each revolution of the band. The gaps between the spiralling revolutions of the overwrap 330 leave exposed areas of underlying base wrapper 320, thereby creating a corresponding spiral band of uncoated or
30 uncovered and therefore exposed base wrapper 320. The number of revolutions in the spiral band of overwrap 330 can be varied to adjust the LIP and self-extinguishment properties of the cigarette 100, and can be at least one, preferably two, three or more. It is not necessary that the number of revolutions is an integer.

A corresponding number of revolutions will also be present in the spiral band of exposed base wrapper 320.

The permeability of the overwrap 330 may be significantly less than the permeability of the base wrapper 320. For example, the permeability of the overwrap 320 may be less than 30 Coresta and preferably is less than 20 Coresta. The relatively low permeability of the overwrap 330 significantly limits the permeation of external air molecules such as oxygen (O₂) into the burning tobacco core 310 in the regions of the overwrap 330, meaning that the permeation of external air molecules into the smokeable material core 310 is much lower in the regions of the overwrap 330 than in the exposed regions of the base paper 320.

The relatively high permeability of the base wrapper 320 compared to the relatively low permeability of the overwrap 330 results in the external circumferential surface of the smokeable material rod 300 comprising a high permeability spiral zone 320 and low permeability spiral zone 330. The effect of the reduction in air permeation caused by the low permeability spiral zone 330 is to reduce the ignition propensity of the cigarette 100 so that the cigarette 100 conforms to recognized LIP standards. For example, the cigarette 100 may exhibit a total burn length of less than 25%, and preferably less than 15%, when tested under the conditions defined in ASTM E2187-04 and ASTM E2187-09.

As can be seen in Figure 2, the low permeability spiral zone 330 may extend fully along the length of the smokeable material rod 300. However, the low permeability spiral 330 may alternatively extend only partially along the rod 300. The length of the low permeability spiral 330 may be adjusted to vary the LIP characteristics and self-extinguishment characteristics of the smoking article 100. Alternatively, similar LIP characteristics can be achieved with different low permeability spiral lengths by varying the permeability of the overwrap 330 and/or base wrapper 320.

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As can also be seen in Figure 2, the width of the low permeability spiral 330 may substantially correspond to the width of the higher permeability spiral of exposed base wrapper 320. However, it will be appreciated by the skilled person that the

relative widths of the low permeability spiral 330 and higher permeability spiral 320 can be varied to adjust the LIP and self-extinguishment properties of the cigarette 100. Alternatively, similar LIP and self-extinguishment characteristics can be achieved with different relative widths of low and high permeability spirals 330, 320
5 by varying the permeability of the overwrap 330 and/or base wrapper 320.

Selection of the length and width of the low permeability spiral 330 may be made in dependence of the desired LIP characteristics, taking into account the total length of the rod 300 and the properties of the base wrapper 320 and smokeable material
10 310.

As an alternative to the overwrap 330 described above, the low permeability spiral zone may be formed by applying a stream of material capable of lowering the permeability of the base wrapper 320, such as a fluid or solution containing the low
15 permeability material, to the base wrapper 320. For instance, a solution can be applied by spraying or a similar technique. As with the overwrap 330 described above, the application of a stream of low permeability material creates a continuous low permeability spiral zone 330 on the higher permeability base wrapper 320 to reduce the permeation of external air molecules into the core 310 of smokeable
20 material. The permeability, width, length and number of revolutions of the low permeability spiral 330 formed using this technique can correspond to the overwrap 330 described above and shown in Figure 2.

Examples of manufacturing methods for applying the low permeability spiral 330, as
25 a wrapper and as an additive material, are set out below.

An apparatus 500 for manufacturing the LIP smoking article 100 is schematically shown in Figure 3. An example manufacturing method is shown in Figure 8. The apparatus 500 comprises a base wrapping unit 510 configured to wrap the core 310
30 of smokeable material in the base wrapper 320. For example, the base wrapper 320 can be secured around the smokeable material by gluing along a lap seam of overlapping material 320 in a manner known in the art.

Referring to Figures 3 to 6, the wrapped core of smokeable material 310 is fed in a longitudinal direction through a pipe to a cutting unit 520 which divides a continuous length of wrapped smokeable material 310 into longitudinal sections suitable for smoking article 100 assembly. For cigarettes 100, the length of the sections may be approximately 61mm. Alternatively, the length may be a double cigarette length such as 122mm or larger cigarette lengths. The circumference of the core 310 may be approximately 24.6mm.

The sections of wrapped smokeable material 310 are then fed through the pipe into an LIP spiral application unit 530 which applies the low permeability spiral zone or banding 330 referred to above. Referring to Figure 4, the spiral application unit 530 comprises a drive belt 531 which is configured to draw the sections of wrapped smokeable material 310 longitudinally through the spiral application unit 530. For example, the drive belt 531 may be provided directly above or below the sections of wrapped smokeable material 310 such that the drive belt 531 frictionally engages with the base wrapper 320 at the exterior of the wrapped sections of smokeable material 310 to draw the sections through the application unit 530. This is shown in Figure 4.

The angle of the drive belt 531 with respect to the longitudinal axis of the sections of smokeable material core 310 may be selected so that the drive belt 531 rotates the sections of wrapped smokeable material 310 about their longitudinal axis at a desired rate of rotation as they are drawn longitudinally through the application unit 530 at a desired longitudinal rate.

This dual (rotational/longitudinal) functionality of the drive belt 531 can be achieved by configuring the drive belt 531 such that the direction of movement of the drive belt 531 is at an angle A of between 1 and 89 degrees to the longitudinal axis of the sections of wrapped smokeable material 310. An angle A of between 30 and 60 degrees is preferred in order to provide a favourable ratio of longitudinal and rotational speeds for the sections of smokeable material core 310 in the spiral application unit 530.

As illustrated in Figures 4 to 6, the rotation of the sections of smokeable material core 310 in the application unit 530 can be used to apply the low permeability spiral zone 330 to the exterior of the higher permeability base wrapper 320.

5 In a first example, a continuous length of the overwrap material 330 referred to above is fed into the spiral application unit 530, on the opposite side of the smokeable material core 310 to the drive belt 531, by a banding unit comprising an overwrap feeding unit 533. In the present example, the overwrap feeding unit 532 is provided as a secondary belt beneath the smokeable material core 310 for feeding
10 the overwrap material 330 onto the smokeable material core 310. The overwrap feeding unit 533 can additionally or alternatively comprise a guide to guide/feed the overwrap 330 into the spiral application unit 530 at the desired angle, position and orientation. For example, in Figures 4 to 6 the overwrap material 330 is fed into the application unit 530 on the underside of the sections of smokeable material core
15 310 whilst the drive belt 531 is located above the sections of smokeable material core 310 to frictionally engage and drive the upper surface of the core sections 310. The positions of the drive belt 531 and overwrap 330 could however be reversed.

The angle B between the main axis of the length of overwrap 330 and the
20 longitudinal axis of the sections of smokeable material core 310 is between 1 and 89 degrees. This causes the overwrap 330 to form a spiral band 330 around the base wrapper 320 as the smokeable material core 310 is rotated by the drive belt 531 and drawn longitudinally through the spiral application unit 530. Preferably, the angle B between the length of overwrap material 330 and the longitudinal axis of the core of
25 smokeable material 310 is between 30 degrees and 60 degrees, as shown in Figures 4 and 6. The angle B between the overwrap material 330 and the longitudinal axis of the sections of smokeable material core 310, together with the angle A between the drive belt 531 and the core 310, determines the width of the gaps between the revolutions of the spiral band of overwrap 330 on the cigarette 100 and therefore
30 the relative size of the high and low permeability spiral zones 320, 330, as well as the number of revolutions of the low permeability spiral banding 330 about each smoking article.

Referring to Figure 4, the length of overwrap 330 comprises a suitable wrapper adhesive 331 on its rear face to provide adhesion between the spiral of overwrap 330 and the underlying base wrapper 320 as the overwrap 330 is wrapped around the base wrapper 320 by the spiral application unit 530. Thus, sections of
5 smokeable material core exiting the spiral application unit 530 are double wrapped with an underlying base wrapper 320 and a continuous, non-overlapping spiral of overwrap 330.

Once the sections of smokeable material core 310 exit the spiral application unit
10 530, a second cutting unit 540 is employed to cut the spiral overwrap 330 at either end of the smokeable material core sections 310.

The cutting units 520, 540 and spiral application unit 530 are preferable integrated together in a combined smoking article assembly unit. The base wrapper unit 510
15 may also be integrated in the smoking article assembly unit, although alternatively it may be located separately.

Optionally, rather than feeding an overwrap 330 into the apparatus 500 for manufacturing the low ignition propensity smoking article, the banding unit can
20 comprise an additive material application element 532. The additive material application element may be provided in the spiral application unit 530 for spraying an additive material, capable of lowering the permeability of the base wrapper 320, onto the outer surface of the base wrapper 320. The application element 532 may comprise a nozzle 532 located on the opposite side of the sections of smokeable
25 material core 310 to the drive belt 531. For example, referring to Figure 7, the application element 532 may be provided underneath the sections of smokeable material core 310 for continuously spraying a coating of low permeability additive on the rotating base wrapper 320. The application element 532 may be connected to a reservoir (not illustrated) of additive material.

30

The additive material sprayed onto the base wrapper 320 may be in fluid or particulate form. It is configured to adhere to the surface of the base wrapper 320 upon contact.

The position of the application element 532 is fixed relative the housing and other elements of the spiral application unit 530 so that, as the drive belt 531 simultaneously rotates the sections of smokeable material core 310 and draws the sections 310 through the application unit 500, the additive material is sprayed onto the base wrapper 320 in a continuous spiral band to form the low permeability spiral zone 330. A spiral gap between the revolutions of the low permeability spiral band 330 exposes a spiral region of the underlying base wrapper 320. Thus, the spirals 320, 330 of high and low permeability are duly formed on the surface of the smokeable material rod 300.

As would be appreciated by those skilled in the art, the rate of ejection of the additive material from the nozzle 532, the area over which the nozzle is arranged to apply additive material to the smokeable material core 310 and the angle A between the drive belt 531 and the core 310 can be adjusted to alter the properties of the low permeability spiral band 330 and accordingly the low ignition propensity characteristics of the smoking article 100.

Spraying the additive material onto the base wrapper 320 after the formation of the smokeable material core 310 provides several advantages over alternative application techniques. Firstly, the base wrapper 320, once wrapped around the smokeable material to form the smokeable material core 310, is no longer placed under significant stress and therefore applying the additive after formation of the smokeable material core 310 alleviates the problem of the paper tearing when damp. Secondly, the present technique does not require short-range cooperation between a print head and the base wrapper 320. The spray nozzle 532 can instead be a relatively large distance from the base wrapper 320. As such, the rotation and longitudinal movement of the base wrapper 320 in the spiral application unit 530 is much less likely to affect the quality of the spiral band 330, which can be applied uniformly and reliably regardless of the rotational and longitudinal movement of the base wrapper 320. The spraying technique described above therefore provides a more reliable technique for applying an LIP additive “on-line” in a smoking article assembly unit than with alternative techniques such as close range printing.

The continuous spiral bands 320, 330 of lower permeability and higher permeability provided by the overwrap layer or coating 330 or sprayed-on additive material coating 330 ensure that, when the cigarette 100 is placed on a substrate by a user, at least one section of the higher permeability zone 320 will always be in contact with the substrate. The contact between the high permeability zone 320 and the substrate therefore substantially prevents air molecules from permeating into the core of smoking material 310 through the region of the high permeability zone 320 in contact with the substrate. The effect is that less oxygen is available to burning smokeable material in the core 310 when the cigarette 100 is placed on the substrate than when the cigarette 100 is held in the air, for example by a user during smoking. The reduced amount of oxygen available during contact with the substrate increases the probability that the cigarette 100 will self-extinguish under such conditions, regardless of the orientation at which the cigarette 100 is placed on the substrate.

Claims

1. A smoking article comprising a continuous spiral of low ignition propensity banding.
5
2. A smoking article according to claim 1, wherein the low ignition propensity banding comprises a low permeability spiral zone and the smoking article further comprises a high permeability spiral zone.
- 10 3. A smoking article according to claim 2 comprising a rod of smokeable material wrapped in a base wrapper, wherein the continuous spiral of low ignition propensity banding comprises a coating on the base wrapper.
4. A smoking article according to claim 3, wherein an uncoated area of the base
15 wrapper comprises the high permeability spiral zone.
5. A smoking article according to any one of claims 2 to 4, wherein the permeability of the low permeability spiral zone is 30 Coresta or less and the permeability of the high permeability zone is between 50 and 150 Coresta.
20
6. A smoking article according to any preceding claim, wherein the spiral of low ignition propensity banding comprises an overwrap material.
7. A smoking article according to claim 6 wherein the overwrap material
25 comprises a low permeability paper.
8. A smoking article according to any one of claims 1 to 5, wherein the spiral of low ignition propensity banding comprises a sprayed-on additive material.
- 30 9. An apparatus for applying the continuous spiral of low ignition propensity banding to a smoking article according to claim 8, comprising:
a drive means configured to rotate the smoking article; and

a banding unit for providing said banding to the smoking article as the smoking article is rotated.

10. An apparatus according to claim 9, wherein the banding unit comprises an applicator comprising a nozzle configured to spray the additive material onto the smoking article as the smoking article is rotated.

11. An apparatus according to claim 10, wherein the drive means is configured to simultaneously rotate the smoking article and move the smoking article in a longitudinal direction past the nozzle as the nozzle sprays the additive material, thereby creating the continuous spiral of low ignition propensity banding.

12. An apparatus according to claim 9, wherein the banding unit comprises a feeding unit for feeding an overwrap material onto said smoking article to form said banding.

13. A method of forming a smoking article, comprising:
wrapping a core of smokeable material in a base wrapper; and
applying a continuous spiral of low ignition propensity banding to the base wrapper.

14. A method according to claim 13, wherein applying the low ignition propensity banding comprises wrapping the low ignition propensity banding around the smoking article.

25

15. A method according to claim 13 or 14, wherein the low ignition propensity banding comprises an overwrap material.

16. A method according to any one of claims 13 to 15, wherein the overwrap material comprises a low permeability paper.

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17. A method according to claim 13, wherein applying the low ignition propensity banding comprises spraying an additive material in a spiral band around the smoking article as the smoking article is rotated.

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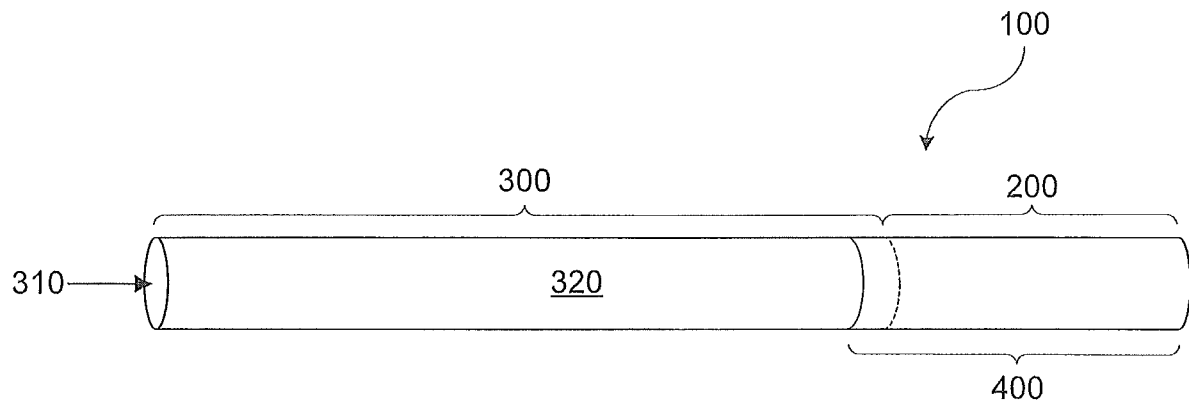


FIG. 1

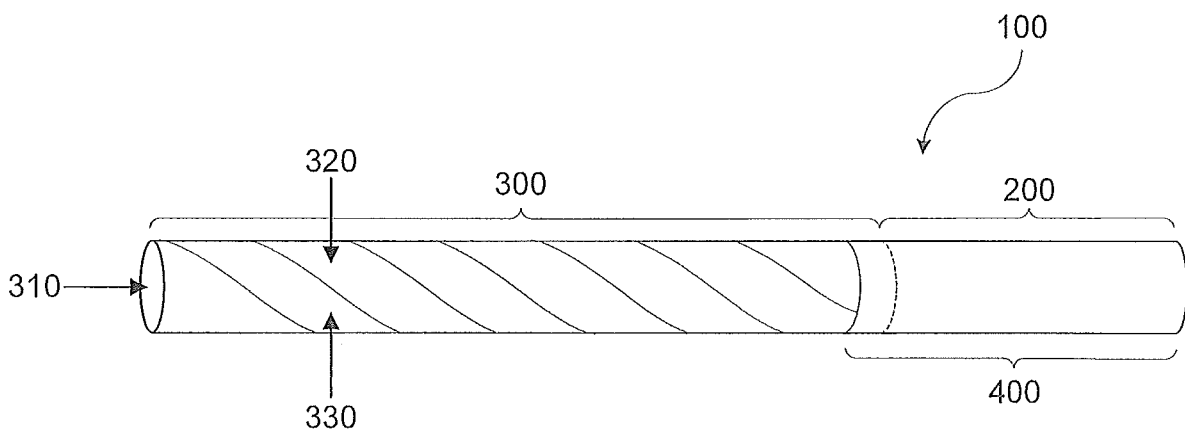


FIG. 2

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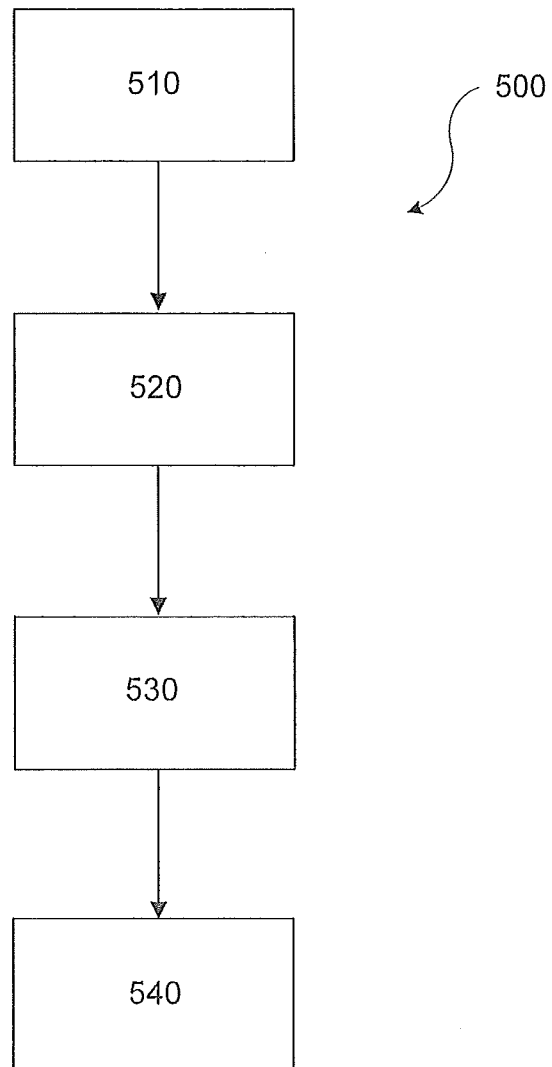


FIG. 3

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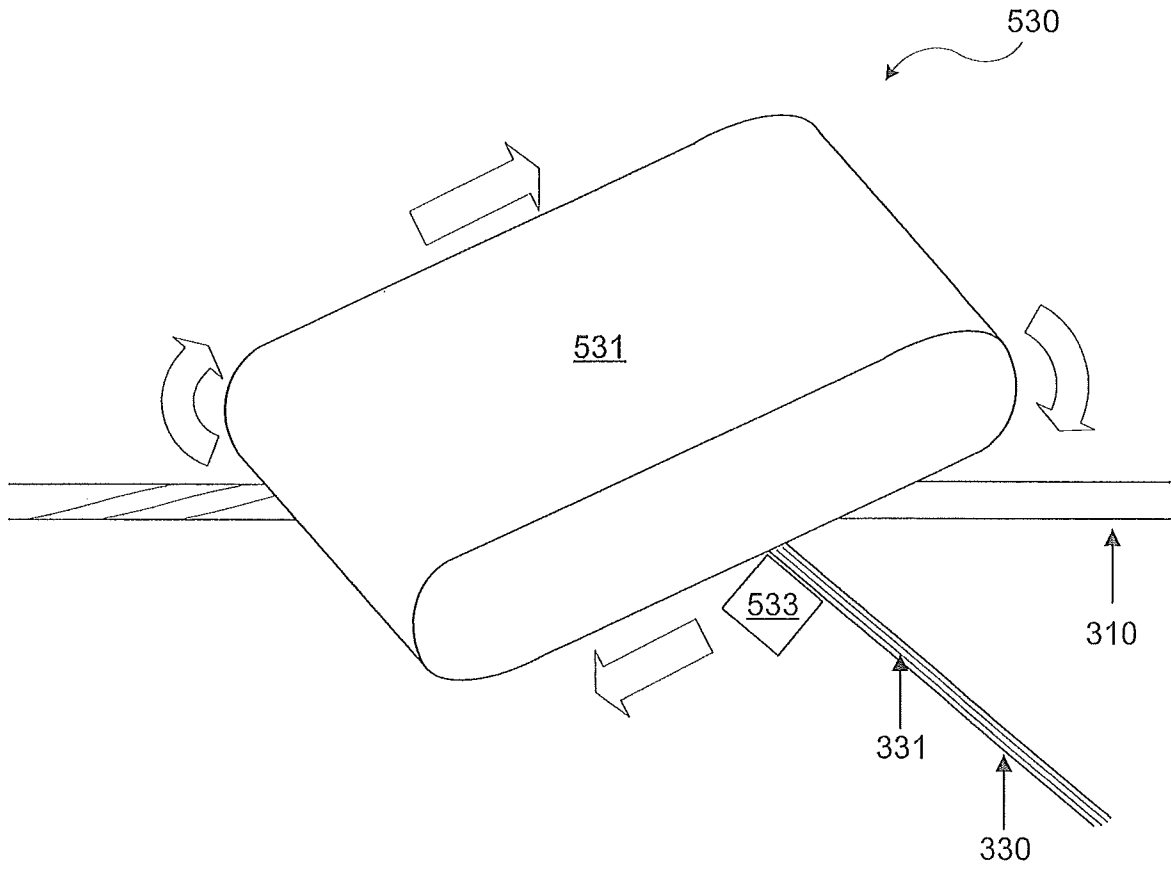


FIG. 4

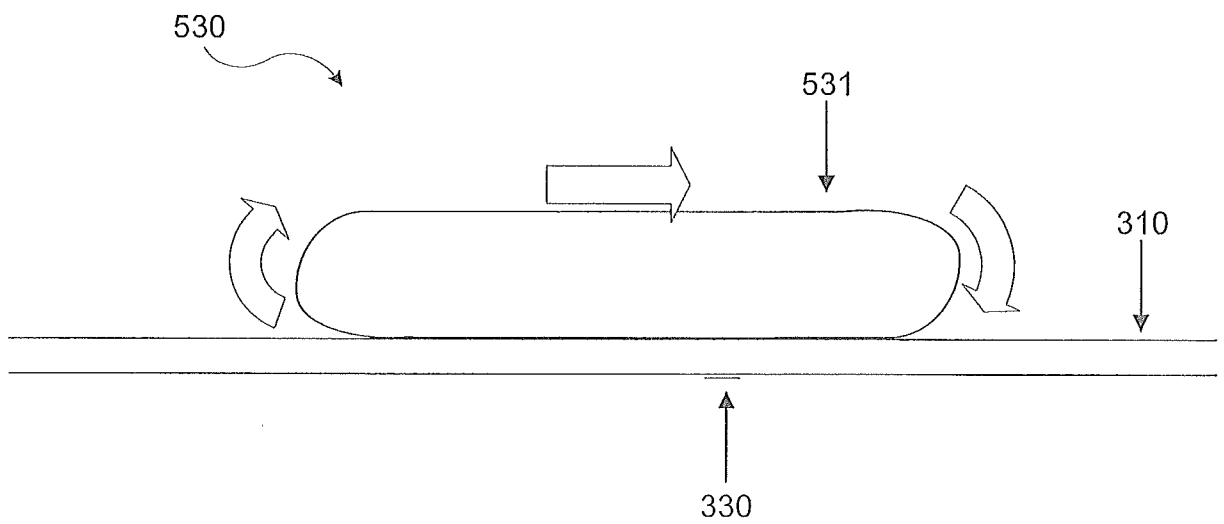


FIG. 5

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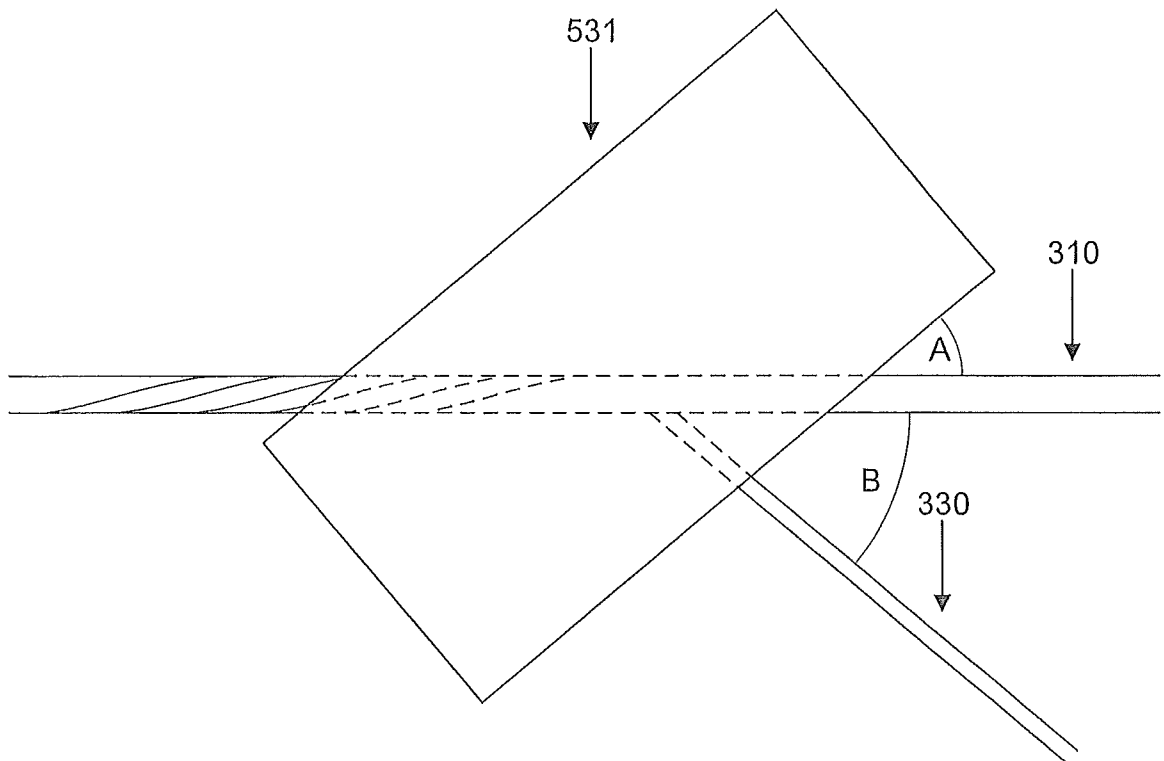


FIG. 6

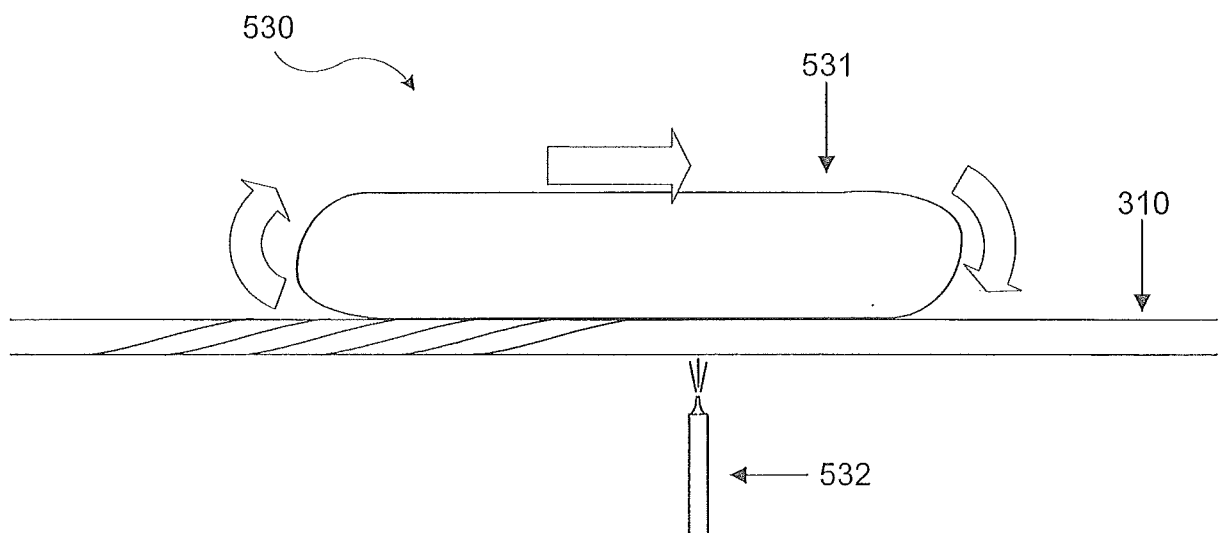


FIG. 7

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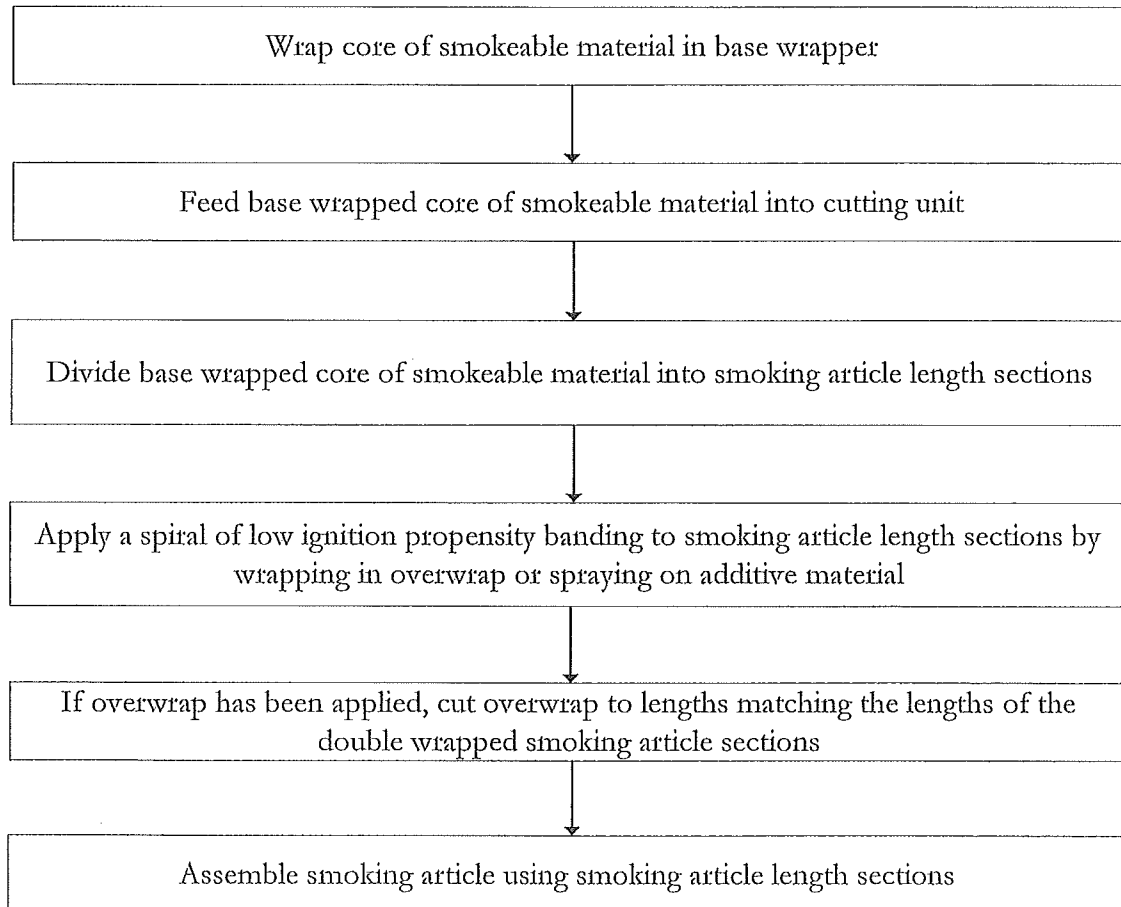


FIG. 8

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2011/054981

A. CLASSIFICATION OF SUBJECT MATTER

INV. A24C5/60 A24D1/02
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A24C A24D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2008/146159 A2 (PHILIP MORRIS PROD [CH]) 4 December 2008 (2008-12-04)	1-8
A	page 29, line 4 - line 10; figure 12	9-17
X	US 2005/005947 A1 (HAMPL VLADIMIR [US] ET AL) 13 January 2005 (2005-01-13)	1-8
A	paragraph [0065]	9-17
X	US 2004/237979 A1 (SEYMOUR SYDNEY KEITH [US] ET AL) 2 December 2004 (2004-12-02)	1-8
X	DE 10 2004 031185 A1 (HAUNI MASCHINENBAU AG [DE]) 19 January 2006 (2006-01-19)	9,10
A	abstract; figures	11-17
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☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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PCT/EP2011/054981

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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