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(54) Smoking article wrapper with reduced ignition propensity

(57) The present invention relates to a method of producing a smoking article wrapper with reduced ignition propensity. Specifically the present invention relates to a method of producing a wrapper for a smoking article comprising the steps of:
(a) providing a wrapper;
(b) applying one or more additives to the surface of the wrapper to form regions of applied additive having reduced porosity and/or reduced oxygen diffusion sufficient to reduce the ignition propensity of a smoking article and regions having substantially reduced or zero additive such that the wrapper maintains its physical integrity during processing and has improved visual appearance by reduced wrinkling; and
(c) machining the wrapper to form a wrapper which upon incorporation in to the smoking article forms rings of additive.

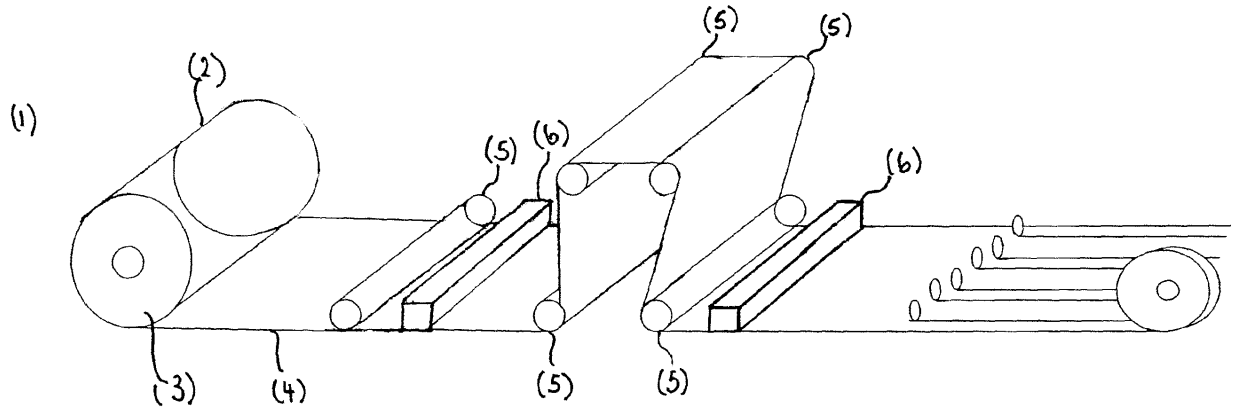

FIGURE 1

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Description

[0001] The present invention relates to a method of producing a smoking article wrapper and a smoking article wrapper obtainable by the method.

[0002] There have been attempts to design smoking articles that extinguish when inadvertently left unattended on a substrate. A "low ignition propensity" smoking article is one that has been designed to be less likely than a conventional cigarette to ignite soft furnishings such as a couch or mattress. Ideally, a low ignition propensity smoking article will continue to burn when freely suspended such as in the holder of an ashtray or when being held in the hand without puffing ("free burn"). The tendency for a cigarette to go out during free burn is referred to as "self extinguishment".

[0003] Attempts have been made in the art to produce a smoking article with reduced ignition propensity by designing a smoking article wrapper with rings of reduced porosity and/or reduced diffusion of oxygen. The rings are applied to the wrapper by a printing an additive or combination of additives as bands on to a "jumbo" roll of a preformed cigarette wrapper. Typically, the additive is applied with an aqueous or non-aqueous liquid carrier which evaporates from the wrapper once the additive has been delivered.

[0004] It is necessary to apply the additives in sufficient quantities in order to achieve the required reduction in porosity and/or oxygen diffusion. However, there are limitations to the amount of additive that may be present in the carrier system such that generally the required additive loading on to the wrapper is achieved by over-wetting the wrapper with the carrier system comprising the additive.

[0005] The physical parameters of the wrapper, such as tensile strength, burst strength, elongation and stretch, need to be preserved in order for the wrapper to maintain its integrity when transported through the printing process. However, over wetting of the wrapper by the addition of carrier liquids during the printing process has a detrimental effect on the physical properties of the wrapper, for example, by reducing its tensile strength which in turn causes breakages within its structure. As a result, the printing process needs to be stopped from time to time when the paper breaks in order to repair or replace the wrapper which is time consuming and expensive.

[0006] Furthermore, the use of liquid carrier systems can be detrimental to the visual finish of the wrapper and hence the finished smoking article. For example, wetting a cigarette wrapper can lead to "cockling", an effect whereby the surface of the wrapper undergoes a cycle of expansion and contraction due to uptake and removal of carrier liquid causing it to become uneven or wrinkled.

[0007] The aim of the present invention is to overcome the problems associated with the prior art methods. In particular, an aim of the present invention is to provide a method of producing a wrapper for a smoking article with acceptable self-extinguishment and low ignition propensity characteristics, but during such process the physical integrity of the wrapper are maintained and the final smoking article is visually acceptable.

[0008] In a first aspect, the present invention provides a method of producing a wrapper for a smoking article comprising the steps of:

(a) providing a wrapper;
(b) applying one or more additives to the surface of the wrapper to form regions of applied additive having reduced porosity and/or reduced oxygen diffusion sufficient to reduce the ignition propensity of a smoking article and regions having substantially reduced or zero additive such that the wrapper maintains its physical integrity during processing and has improved visual appearance by reduced wrinkling; and
(c) machining the wrapper to form a wrapper which upon incorporation in to the smoking article forms rings of additive.

[0009] In a second aspect the present invention provides a smoking article comprising a wrapper obtainable by a process of the present invention.

[0010] The term "wrapper for a smoking article" is to be understood in a broad sense. A typical example is a cigarette paper. Another example is a tobacco roll wrapper. Further examples include a cigar having a wrapper, a cigarillo and a fine-cut tobacco unit wrapper.

[0011] The term "machine direction" is understood to mean in the machine direction through which the wrapper passes during the processing steps including unwinding, application of additive, slitting and formation of the smoking article.

[0012] The term "cross direction" and is understood to mean perpendicular to the machine direction through which the wrapper passes during application of additive.

[0013] The wrapper may be supplied from a storage roll, a so called jumbo-roll. The wrapper supplied from the storage roll may have a width of up to a few meters. The width of the wrapper is determined by its manufacturing process and is generally trimmed to the desired wrapper width before incorporation into the wrapper manufacturing process. The width of the wrapper may be 26.75mm which corresponds to the circumference of a typical cigarette plus the width of the gluing seam of the wrapper. More preferably the jumbo roll may have a width of one or more multiples of the standard 26.75mm width. Such a jumbo roll may be cut after the additive is applied to the required dimensions for incorporation in to the smoking article.

[0014] The method of the present invention may be applied to the manufacture of individual smoking papers. Such rolling papers are used by consumers who make ("roll") their cigarettes from a supply of tobacco and individual rolling papers provided in a booklet containing folded and interleaved rolling paper sheets.

[0015] The method of the present invention may be

used in a smoking article rod making machine during the manufacture of smoking article rods. Generally, existing commercial smoking rod making machines may be equipped with the necessary means to carry out the present invention.

[0016] The additive may be applied to the wrapper by any printing method typically used in the field. Preferably, gravure printing is used which allows for a much higher level of printing quality and for large block areas of colour to be uniformly applied. Gravure printing may be used on line in the printing process.

[0017] The additive is applied to the wrapper at a print station within a printing machine. The additive is applied as a series of discontinuous lines in the cross direction to form areas of applied additive and areas of substantially reduced or zero additive. The complete pattern of additive can be applied at a single print station or applied at two or more print stations within a single printing machine. Alternatively, multiple pass printing may be used. Preferably, the surface pattern of the wrapper is formed by single pass through the printing machine whereby multiple print stations each produce one or more discontinuous lines of area of applied additive on the surface of the wrapper in the machine direction simultaneously such that multiple discontinuous lines are printed on to the base wrapper in a single pass.

[0018] Where multiple print stations are used, each station applied additive to only part of the base wrapper with the sum of the applications from the individual print station equalling the complete pattern of additive over the base wrapper. In the single pass embodiment, where multiple print stations are used each print station is spaced apart along the machine direction of the wrapper such that the physical properties of the wrapper may be sufficiently restored after passing through one print station and drying station before further additive is applied to the wrapper. Thus, during the entire printing process the average physical properties of the wrapper are maintained to enable effective and efficient processing.

[0019] Typically the additive is applied to the wrapper as two or more discontinuous lines such that the applied regions of additive from adjacent discontinuous lines are arranged in columns across the machine direction of the wrapper and spaced apart with regions of substantially reduced or zero additive. In the cross direction the regions of applied additive may be aligned across the width of the wrapper. In an alternative embodiment, the applied regions of additive may be offset from adjacent applied regions of additive to form a staggered pattern. The extent of this offset between adjacent applied regions of additive and in totality can be further optimised to maximise the residual physical properties of the wrapper.

[0020] Preferably, each discontinuous line of additive may be offset of an angle perpendicular to the machine direction of the jumbo roll. Preferably the regions of print additive may be offset at an angle of up to 15° from perpendicular to the machine direction. More preferably the angle of offset is up to 10° and most preferably it is 5°. This can be beneficial in improving the durability of print rollers used in the print stations. When direct Gravure printing is used excess liquid carrier may be removed from the surface the printing roller by means of a doctor blade, running essentially perpendicular to the machine direction. Cross direction printing patterns typically used to produce wrapper having leading and trailing edges coincident with the doctor blade. The pressure exerted by the doctor blade effectively reduces cylinder life. By offsetting the leading and trailing edges of the printing pattern relative to the doctor blade, wear can be reduced and the cylinder life extended. The angle and direction of offset may be varied between discrete regions of printing or be consistent throughout the total printing pattern.

[0021] In the cross direction of the paper, the regions of applied additive typically have a width corresponding to width of the final wrapper used to produce the smoking article or multiples thereof. Therefore when the jumbo wrapper is machined down to widths typically employed in the manufacture of smoking articles, the regions of applied additive from continuous transverse sections across this width Hence when the wrapper is formed into the cigarette the additive region forms a continuous ring. More preferably the widths of these regions in the cross direction correspond to only the circumference of a smoking article excluding overlap; hence the region of the final wrapper used to form the overlap in the smoking article is left essentially unprinted. The width of the regions of reduced additive are typically up to a maximum of twice the overlap width of the wrapper incorporated in to the final smoking article. The overlap seam in a smoking article typically comprises two layers of the wrapper held together by an adhesive; the addition of an additive to this overlap region does not significantly reduce the permeability or oxygen diffusibility and hence does not significantly alter ignition propensity characteristics of the cigarette. In this preferred embodiment, when the wrapper is formed into a smoking article, the additive regions forms a continuous ring around the circumference of the smoking article except the overlap regions thereby maintaining the desired ignition propensity characteristics.

[0022] In the machine direction of the paper the regions of applied additive are generally from 4 to 12mm wide. Preferably the regions of applied additive are 5~10mm wide, and most preferably 6~9mm wide Preferably, the regions of reduced additive in the machine direction are generally less than 30 mm wide, more preferably from 10 to 30mm wide. Most preferably the regions of reduced additive are 18~20 mm wide.

[0023] By using discontinuous printing with regions of reduced additive means that the wrapper has continuous regions of reduced or zero additive in both the machine and cross directions. As these areas have little carrier liquid applied to them, the physical properties remain similar to the original jumbo roll wrapper. Thus the final printed wrapper may be considered as a continuous mesh of unprinted wrapper with isolated regions of additive. While the physical properties of the printed regions may be re-

duced, overall the final wrapper retains its integrity through the residual mesh of unprinted wrapper. In addition, the discontinuous nature of the printed areas will hinder the linear propagation of any tears within the paper and reduced the effect of cockling.

[0024] The step of printing the additive on to the wrapper may be done in a single pass or multiple pass process. Two or more discontinuous lines of additive may be added simultaneously to the wrapper by a single pass of the wrapper through a print station. In a preferred embodiment two or more discontinuous lines of additive may be printed on to the wrapper sequentially by multiple passes of the wrapper through a print station whereupon after each pass one or more individual lines of additive are printed on to the wrapper.

[0025] The additives applied to the wrapper may be applied with a liquid carrier. Preferably the liquid carrier is in the form of a solution, suspension, emulsion or combination thereof. Preferably the liquid carrier is aqueous, non-aqueous or a combination thereof and may contain an emulsifying agent depending on the nature of the additives.

[0026] In one embodiment, a suspension of additive may be applied within an aqueous carrier. The aqueous carrier penetrates the wrapper transporting the additive into the matrix of the wrapper. Once the carrier evaporates, the additive is left within the wrapper matrix where it can reduce the porosity and/or oxygen diffusibility either before or during the burning of the smoking article. Once applied to the wrapper the liquid carrier is allowed to evaporate allowing the wrapper to dry and for the additive to set within the matrix of the wrapper.

[0027] The evaporation process may occur naturally or may be aided by the application of an external heat source or forced air movement to the surface of the wrapper at a "drying station". Preferably the external heat source is selected from heated contact rollers, hot air drying, microwave drying, radio frequency drying, infrared lamps or combinations thereof. The drying station may be positioned at any point along the length of the wrapper as it is processed. Preferably, in the embodiment where multiple print stations are used, a drying station is provided between adjacent print stations. The wrapper is allowed to dry after application of the additive in the liquid carrier from a first print station before further additive is applied from second and subsequent print stations. This configuration is advantageous since it allows the integrity of the wrapper to be maintained after addition of additive by a print station before being processed by subsequent print stations.

[0028] The additives that may be applied to the wrapper may be any of those used in the art to reduce the ignition propensity of smoking articles. Preferably, the additive is selected from alginates, polyvinyl alcohol, polyvinyl acetates including partially hydrolysed derivatives and copolymers, modified and unmodified starches, cellulose derivatives such as carboy-methyl cellulose, ethylcellulose and hydroxymethyl-cellulose and combinations thereof. Preferably the additive further comprises inorganic ions such as phosphates, mono or divalent metal salts, silicas and other agents know in the art to modify the burn rate and combinations thereof.

[0029] Following addition of the additive the base wrapper is machined to produce a wrapper which upon in incorporation into the smoking article.

[0030] Following is a description by way of example only, with reference to the accompanying drawings, of method of putting the invention in to effect, wherein

Figure 1 is a schematic drawing of a standard machine for printing additive on to cigarette wrappers to which the method of the present invention may be carried out;

Figure 2 is a schematic drawing of three consecutive print stations and associated heat sources;

Figure 3 is a schematic drawing of a jumbo wrapper having multiple discontinuous lines of printed additive regions applied obtainable by a method of the present which is slit to making widths of wrapper;

Figure 4 is an alternative jumbo wrapper obtainable by a method of the present invention; and

Figure 5 is a further alternative jumbo wrapper obtainable by a method of the present invention.

Figures 6a and 6b is a graph of the distribution of additive loading levels in the cross direction of the wrapper;

Figure 7 is a graph of an alternative distribution of additive loading levels in the cross direction of the wrapper;

Figure 8 is a graph of a further alternative distribution of additive loading levels in the cross direction of the wrapper;

Figure 9 is a schematic drawing of a final wrapper showing the additive pattern and the wrapper incorporated in to a smoking article with annular rings of additive except in the overlap region.

[0031] A typical printing machine 1 comprises a compartment 2 for holding a jumbo roll 3 of wrapper 4, a series of rollers 5 and a series of print stations 6. In use, the leading edge of the jumbo roll 3 in fed through the rollers 5 such that the jumbo roll 3 is unwound. Additive is applied to the surface of the wrapper as it passes through the each print station 6.

[0032] The printing machine comprises multiple printing stations 6 arranged along the length of the unwound wrapper 4. As the wrapper 4 passes through the first printing station additive is applied to the surface of the

wrapper 4 to form a discontinuous line running in the cross direction of the wrapper such that regions of additive 7 are formed on the surface of the wrapper 4 interspersed with regions of reduced or no additive 8. As the wrapper 4 passes through the second print station a second discontinuous line of additive is applied to the surface of the wrapper adjacent to the first discontinuous line across the machine direction of the wrapper 4. Multiple lines may be sequentially printed on to the surface of the wrapper by passing through consecutive print stations 6.

[0033] A drying station incorporating a heat source 9 is positioned between adjacent printing stations 6 such that when the wrapper 4 emerges from a print station it passes through the drying station 9 and the liquid carrier in which the additive is loaded evaporates from the surface of the wrapper 4. As a result, the integrity of the wrapper 4 is maintained before it enters the next print station 6 and further liquid carrier is applied to its surface.

[0034] A wrapper according to a first aspect of the present invention is shown in Figure 3. The additive is printed on to the surface of the wrapper 4 such that adjacent discontinuous lines running across the machine direction axis of the wrapper form columns of regions of additive in the cross direction across the wrapper 7 surrounded by regions of reduced or no additive 8. Thus within a column of printing in the machine direction, the printing pattern remains consistent with that required for reduced ignition propensity performance. In the machine direction the printed regions of additive 7 have dimensions of 4-12mm width whilst the regions of reduced or no additive 8 are 10~30mm wide.

[0035] After the wrapper 4 emerges from the printing machine 6 with the additive printed on to its surface it is machined to form an individual wrapper 13 which is incorporated in to the final smoking article 14. Each column of region of printed additive plus its surrounding envelope may be cut in the machine direction at 11 (parallel to wrapper edge 10) and 12 by a slitting machine to from an individual wrapper as shown in figure 3. The wrapper making width has multiple continuous additive lines across its width with unprinted edges 15. Although a continuous pattern is not formed across the jumbo roll 3, by rolling the individual wrapper 13 into a cylinder when incorporating it into the final smoking article an essentially continuous printing region sufficient to form a ring on the smoking article 14 having reduced porosity and/or oxygen diffusion is formed as shown in figure 9.

[0036] Wrappers according to alternative embodiments of the invention are shown in Figures 4 and 5. In the first alternative embodiment the printing stations 6 are configured such that the columns of regions of additive 7 formed in the machine direction by printing multiple series of discontinuous lines are offset between adjacent columns. In the second alternative embodiment, the printing stations 6 are arranged such that the regions of additive 7 are printed on to the surface of the wrapper at an angle of up to 15° from the perpendicular to the machine direction.

[0037] Alternatively double width bobbins or double bobbins may be machined from the source jumbo in the machine direction and these can then be further machined to yield individual wrappers at the smoking article or cigarette making machine as would be typical in currently available machinery.

[0038] The distribution of additive loading levels in the cross direction of the base wrapper 4 may be constant in a region of applied additive 7 as shown in Figure 6a such that there is no additive applied at the outermost edges of the individual wrapper 13 when the wrapper 4 is slit. This distribution of additive loading is repeated cyclically in the cross direction of the wrapper 4 at each region of applied additive 7. In alternative embodiments, as shown in figures 6a and 7, the additive may be applied in increasing concentration in the cross direction of the wrapper 4 to a maximum level such that the region of applied additive 7 has maximum concentration of additive in an area at the centre of the individual wrapper 13 when the wrapper 4 is slit. In a still further embodiment, the additive loading level in the cross direction may be may be concentrated in a smaller region of applied additive 7 at the centre of the wrapper 13 when the wrapper 4 is slit.

[0039] The use of discontinuous printing of additive and multiple print stations 6 interspersed with heating sources allows the wrapper 4 to maintain its physical integrity during processing. The printing process is therefore not interrupted to repair any tears that may appear in the wrapper due to over wetting when applying the additive. In addition, as the wrapper 4 is generally less wet during the process of the invention compared to prior art methods, the wrapper does not experience "cockling" and the final smoking article has an improved appearance. Hence the complete process of taking a width of base paper, printing discontinuous regions of additive, drying, machining to wrapper width and forming smoking articles can be integrated into a sequential or on-line process by the suitable modification of currently existing cigarette making machinery.

Claims

1. A method of producing a wrapper for a smoking article comprising the steps of:

   (a) providing a wrapper;
   (b) applying one or more additives to the surface of the wrapper to form regions of applied additive having reduced porosity and/or reduced oxygen diffusion sufficient to reduce the ignition propensity of a smoking article and regions having substantially reduced or zero additive such that the wrapper maintains its physical integrity during processing and has improved visual appearance by reduced wrinkling; and
   (c) machining the wrapper to form a wrapper which upon incorporation in to the smoking ar-

ticle forms rings of additive.

2. The method of claim 1 wherein the wrapper is selected from cigarette paper, cigar wrapper, cigarillo wrapper, fine-cut tobacco unit wrapper, unsmokable tobacco roll wrapper and a cigarette filter tube wrapper.

3. The method of claim 1 or claim 2 wherein the wrapper is provided as a jumbo roll and said regions of applied additive and regions of reduced or zero additive are formed by discontinuous application of the additive in one or more lines across the surface of the wrapper as is it unwound.

4. The method of any preceding claim where in the additive is applied to the wrapper by one or more printing stations.

5. The method of any preceding claim wherein two or more discontinuous lines of additive are applied to the surface of the wrapper simultaneously in a single pass of the wrapper through the one or more printing stations or sequentially by multiple passes.

6. The method of claim 3 wherein one or more drying stations is positioned between adjacent print stations to dry the applied additive.

7. The method of any preceding claim wherein two or more discontinuous lines of additive are printed on to the surface of the wrapper in the cross direction across the wrapper such that the applied regions of additive from adjacent lines are arranged in columns in the machine direction across the wrapper and spaced apart with regions of substantially reduced or zero additive.

8. The method of claim 7 wherein the applied regions of additive are offset across the cross direction axis of the wrapper from the applied regions of additive of an adjacent discontinuous line.

9. The method of any preceding claim wherein the additive is applied to the wrapper in a discontinuous line at an angle of up to 15° from the cross direction axis of the wrapper.

10. The method of any preceding claim wherein the regions of applied additive correspond to the circumference of the smoking article or the circumference of the smoking article less the side seam overlap in the cross direction.

11. The method of any preceding claim wherein the regions of applied additive are from 4 to 12 mm wide and the regions of substantially reduced or zero additive between adjacent lines of applied additive are from 10 to 30 mm wide in the machine direction.

12. The method of any preceding claim wherein the additive is applied to the wrapper by a printing process selected from Gravure, off-set Gravure, flexography or intaglio printing.

13. The method of any preceding claim where in the additive is selected from the group consisting of vinyl alcohols, vinyl acetates including partially hydrolysed derivatives, their homopolymers and co-polymers, alginates, modified or unmodified starch, cellulose and its derivatives such as carboxymethyl cellulose, ethyl-cellulose and hydroxypropyl-cellulose, natural or synthetic waxes, inorganic ions or combinations thereof.

14. The method of claim 13 wherein the additive further comprises inorganic phosphate, mono or divalent metal salt, silica, burn retardants or combinations thereof.

15. The method of any preceding claim wherein the additive is provided within a liquid carrier.

16. The method of any preceding claim wherein the steps of unwinding, printing, dying and machining to form a wrapper are linked directly to a smoking article making machine in an on-line process.

17. A smoking article comprising a wrapper obtainable by a method of any preceding claim.

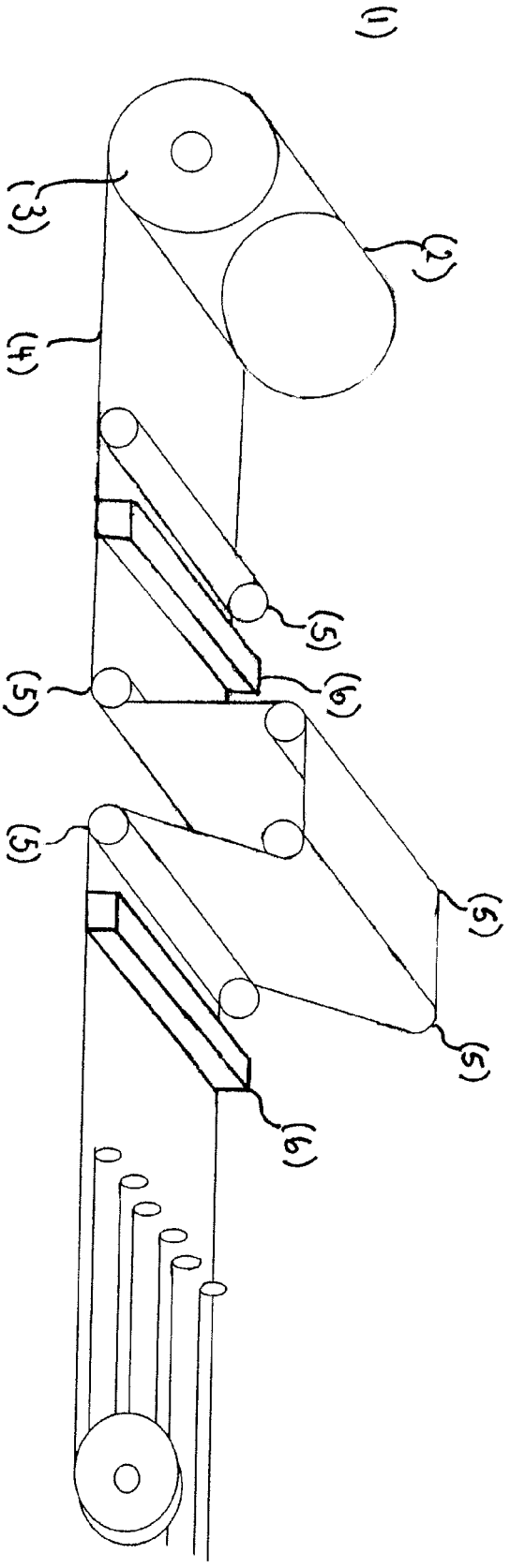

FIGURE 1

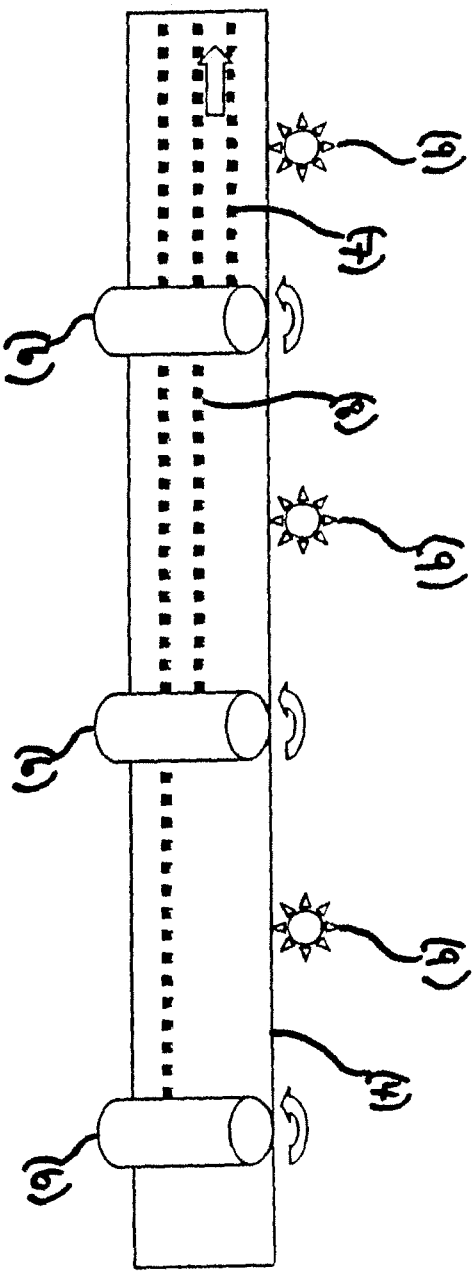

FIGURE 2

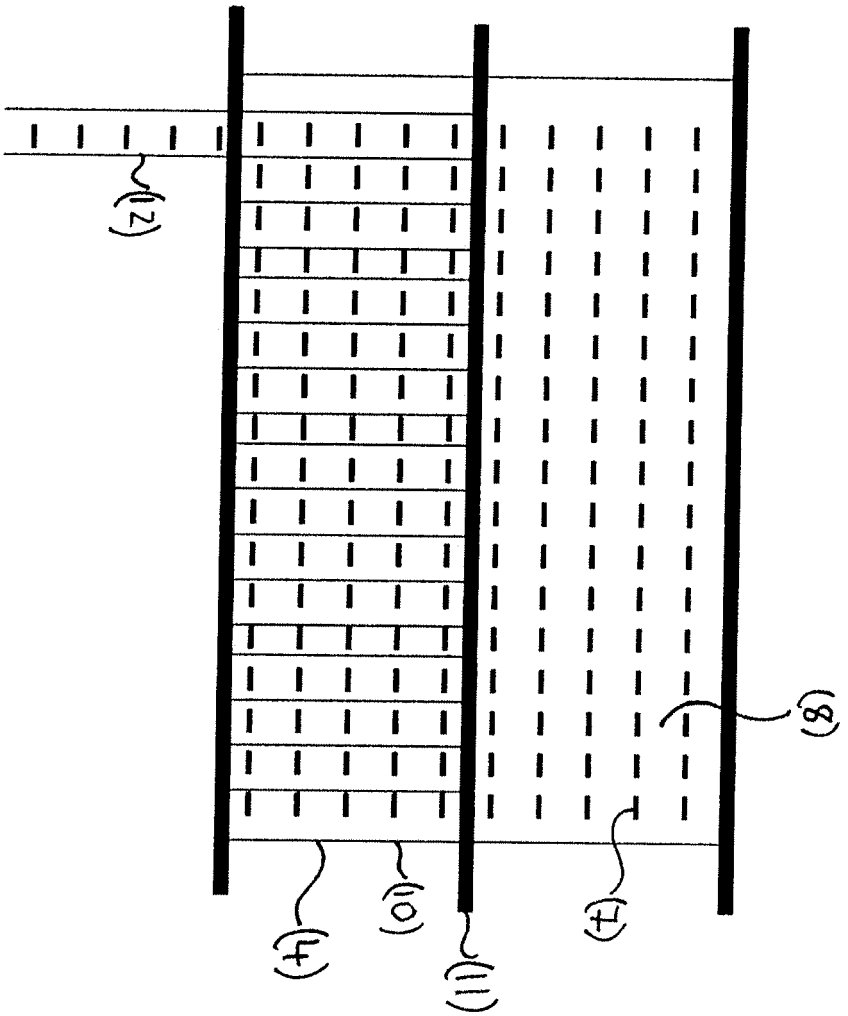

FIGURE 3

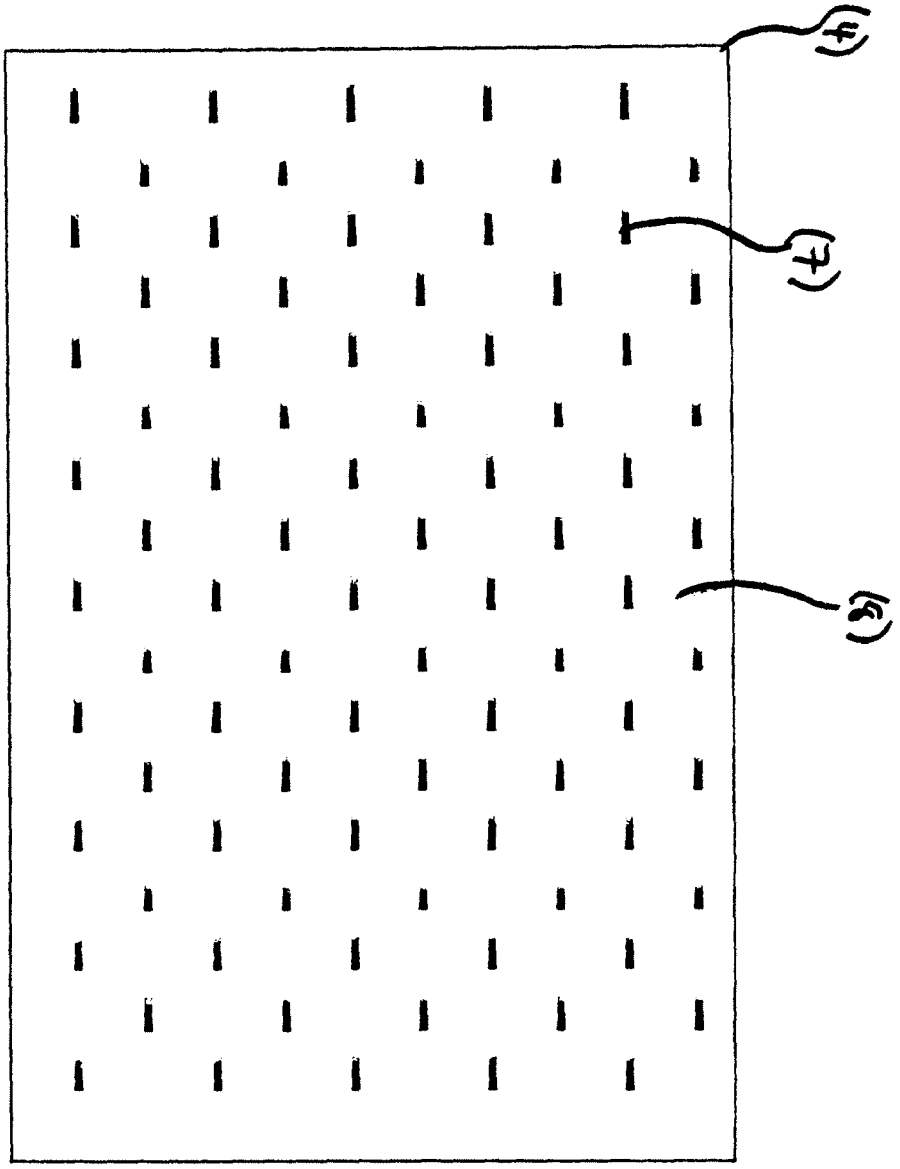

FIGURE 4

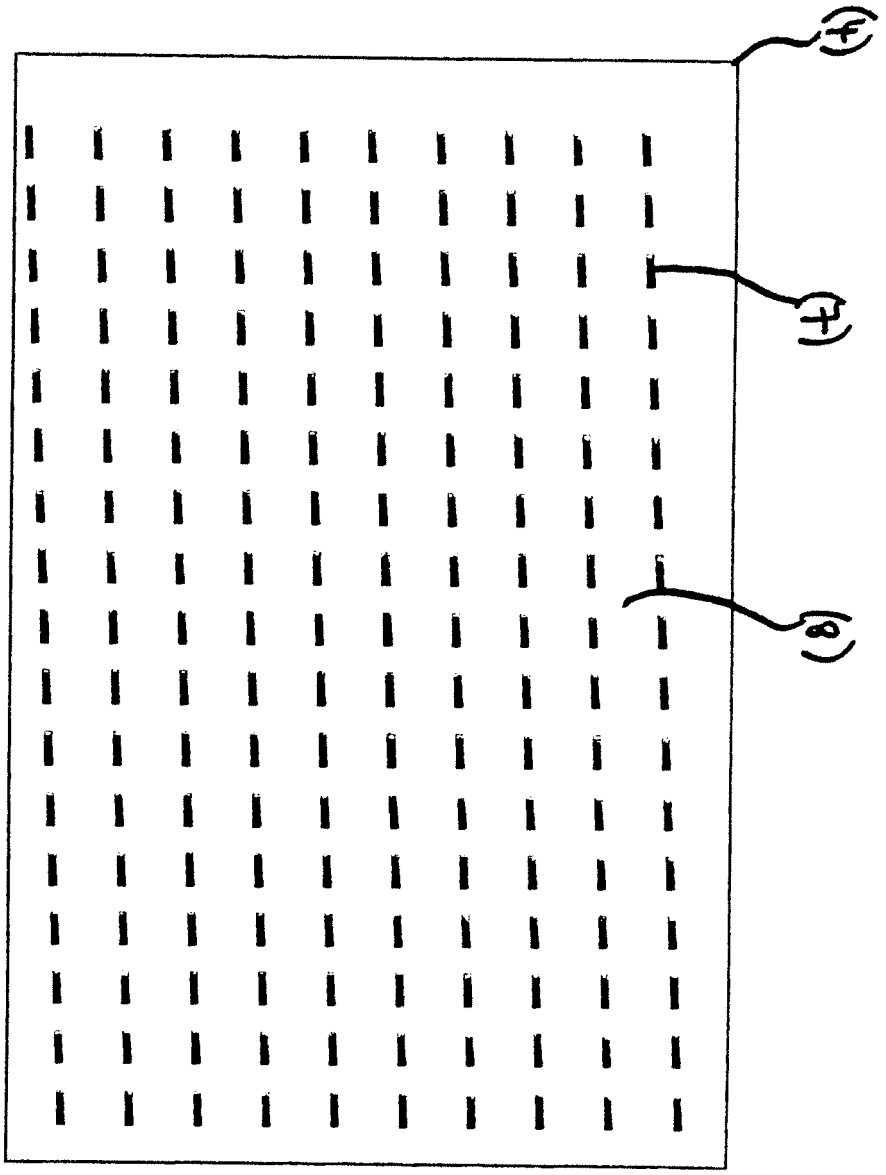

FIGURE 5

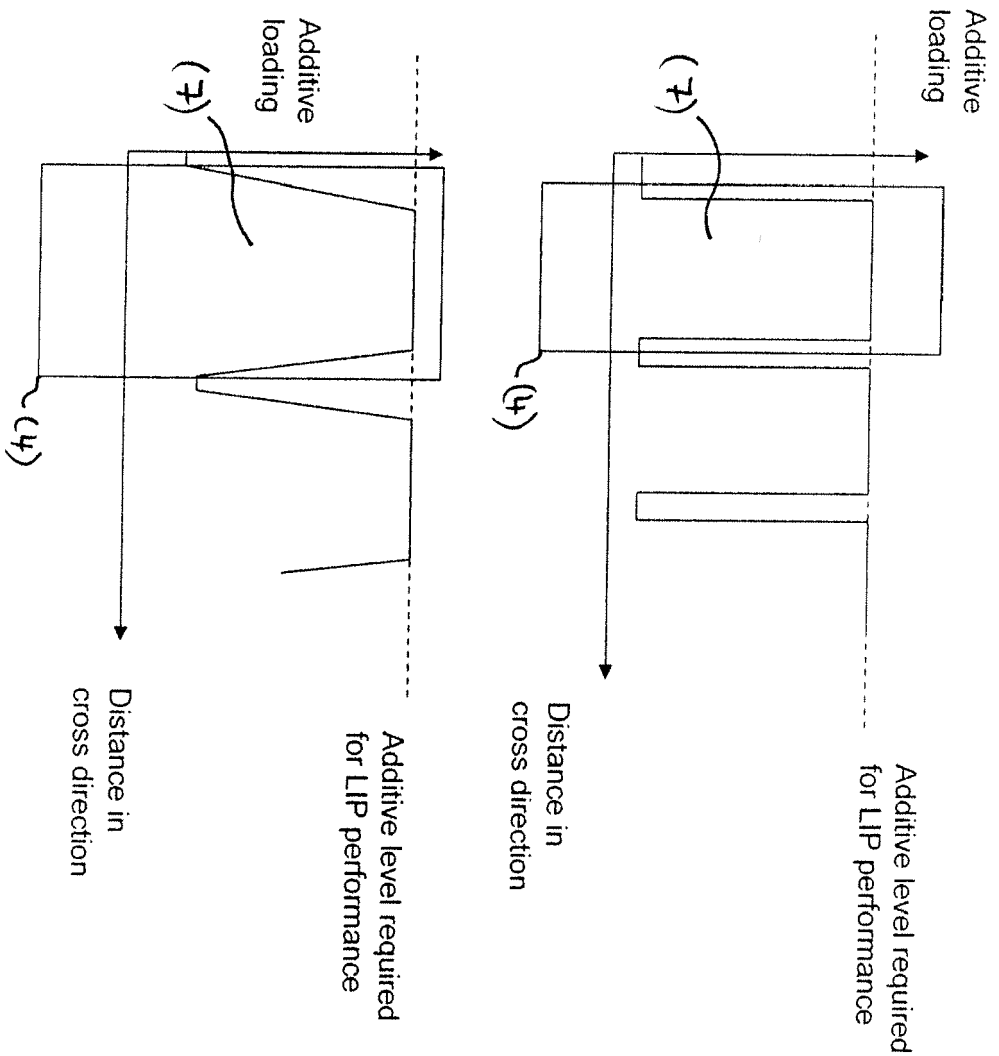
Additive loading
(7)
(4)
Distance in cross direction
Additive level required for LIP performance
Additive loading
(7)
(4)
Distance in cross direction
Additive level required for LIP performance

FIGURE 6

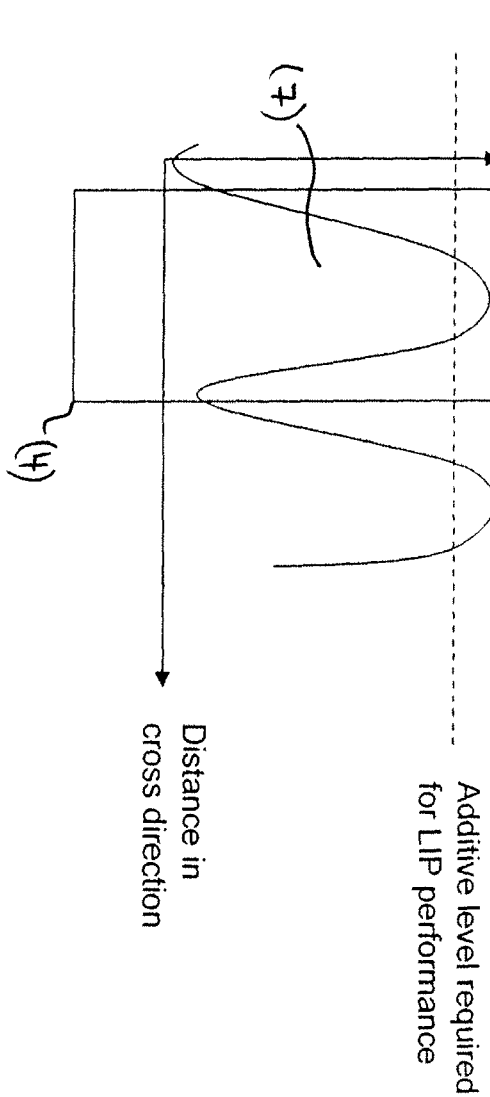
Additive loading
(7)
(4)
Additive level required for LIP performance
Distance in cross direction

FIGURE 7

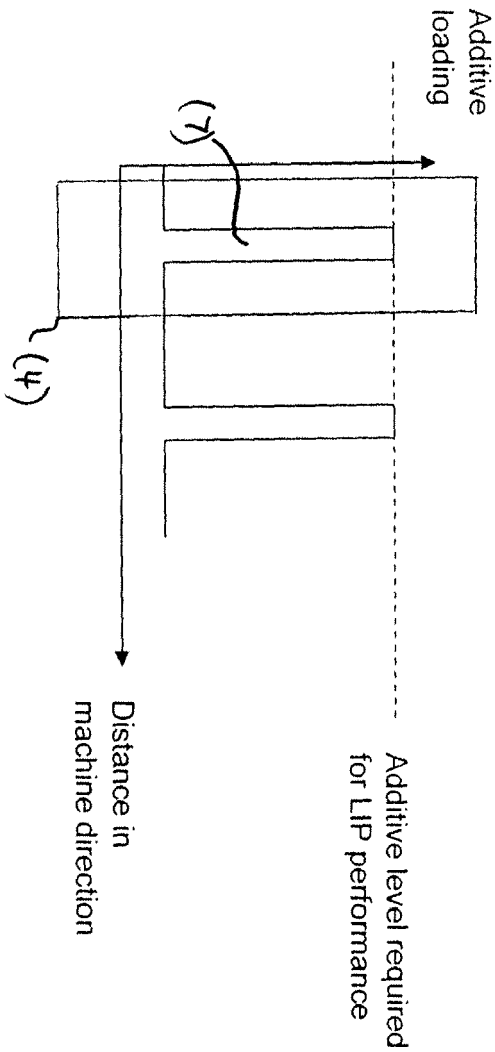
Additive loading
(7)
(4)
Additive level required for LIP performance
Distance in machine direction

FIGURE 8

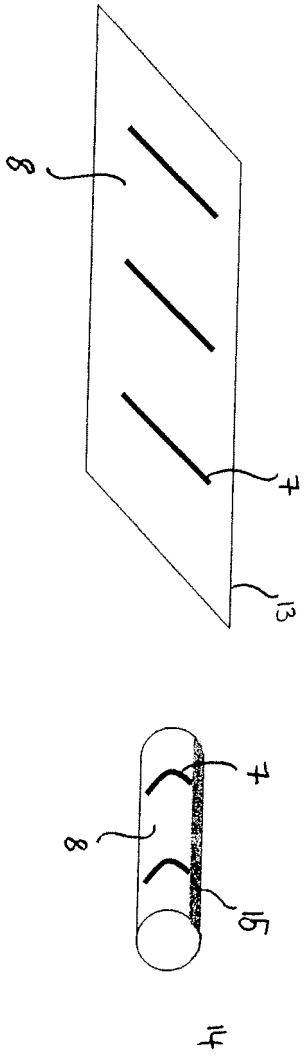

FIGURE 9

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EUROPEAN SEARCH REPORT

Application Number
EP 09 17 8107

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2009/004482 A2 (PHILIP MORRIS PROD [CH]) 8 January 2009 (2009-01-08) * page 2, line 12 - line 30 * * page 4, line 6 - page 5, line 3 * * page 6, line 17 - page 7, line 27 * * claims 1,19; figures *	1-17	INV. A24D1/02
X	WO 2008/149241 A2 (PHILIP MORRIS PROD [CH]) 11 December 2008 (2008-12-11) * page 3, line 13 - page 5, line 8 * * claims 1,2,10,12,13,16,18; figures *	1-17	
X	US 5 450 863 A (COLLINS ALFRED L [US] ET AL) 19 September 1995 (1995-09-19) * column 2, line 42 - column 3, line 20 * * column 7, line 50 - column 8, line 16 * * figures 3, 4, 6 *	1,17	
X	EP 0 486 213 A1 (PHILIP MORRIS [US] PHILIP MORRIS PROD [US]) 20 May 1992 (1992-05-20) * column 1, lines 3-38 * * column 2, line 43 - column 3, line 11 * * column 3, lines 41-55 * * column 4, lines 38-48 *	1,17	TECHNICAL FIELDS SEARCHED (IPC) A24D
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	22 April 2010	Kock, Søren

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 09 17 8107

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22-04-2010

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