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(54) Smoking article comprising wrapper with chalk and fibre add-on material and method of manufacture

(57) A smoking article comprises a paper wrapper comprising at least one area 5 of fibrous add-on material containing between about 5 percent and about 15 percent calcium carbonate by weight of the fibrous material. The permeability of the base web 3 outside the area of add-on material is between about 25 Coresta units and about 90 Coresta units and the permeability of the base web in the areas of add-on material is below about 10 Coresta units. A method of applying at least one area 5 of add-on material to a base web 3 comprises forming a base web from a slurry of fibrous material in a liquid and applying at least one area of add-on fibrous material containing between about 5 percent and about 15 percent calcium carbonate by weight of the fibrous material to the base web, reducing the permeability in the areas of add-on material below about 10 Coresta units and drying the base web with the add-on material thereon.

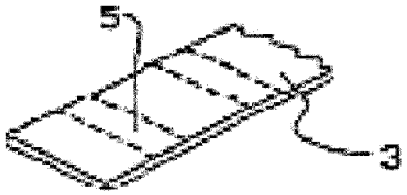

Fig. 1B

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Description

[0001] The present invention relates to a smoking article comprising a wrapper with areas of calcium carbonate and fibrous add-on material and to a method of manufacturing such wrappers. The method finds application in the manufacture of paper comprising one or more areas of add-on material, such as cigarette paper having bands or other patterns of add-on materials.

[0002] Smoking articles such as cigarettes can be provided with wrappers of paper or other web material having bands or other patterns of add-on materials such as cellulosic material or polymers such as starch to influence the burn behaviour of the cigarettes. The add-on materials can prevent the smoking articles from continuing to smoulder when they are placed on a substrate, while continuing to burn under normal smoking conditions. The tendency of smoking articles to continue smouldering when lying on a substrate is known as ignition propensity (IP). The ignition propensity should be low to reduce the likelihood of a smoking article causing a substrate on which it is placed to burn. The ignition propensity may be measured according to ISO 12863:2010(E).

[0003] The tendency of a smoking article to extinguish under normal conditions, between puffs, is known as free burn self extinguishment (SE). The self extinguishment should be adequately low to ensure that smoking articles do not go out unintentionally when not on a substrate. For the determination of the self extinguishment, the test consists in placing a lit cigarette on a holder at horizontal position and allowing it to burn freely at (55 $\pm$ 5) percent relative humidity and (23 $\pm$ 3) °C both of which should be monitored by a recording hygro-thermograph. The cigarette is observed in order to determine whether it self extinguishes before the combustion line reaches the tipping paper or if it burns up to the tipping paper. In preparation, the cigarettes are conditioned at (55 $\pm$ 5) percent relative humidity and (23 $\pm$ 3) °C, for a minimum of 24 hours prior to be tested.

[0004] The self extinguishment takes place within an enclosure or test box. A single port smoking machine or an electric lighter is used to ignite the smoking articles for the test. During testing, an apparatus or "angle holder" holds the smoking articles to be tested by holding an end at angles of 0 degrees (horizontal). If a smoking article goes out before the front line of the smouldering coal reaches the tipping paper, the outcome is scored as "self extinguishment"; on the other hand, if the smoking article continues smouldering until the front line of the smouldering coal reaches the tipping paper, then the outcome is scored as "non-extinguishment". The value for self extinguishment is the average of 20 cigarettes tested. For example, a value for SE of 15 percent means that 3 cigarettes of 20 cigarettes extinguished in free burn conditions, that is, 17 cigarettes of 20 cigarettes total burned in free burn conditions.

[0005] There are two different techniques of manufacturing wrappers with such bands or other patterns of add-on material that have an influence on the ignition propensity and on the self extinguishment. According to a first technique, reduced cigarette ignition propensity paper is formed by applying add-on material during the paper manufacturing process. According to a second technique, finished paper web is converted into reduced cigarette ignition propensity paper by applying add-on material to the paper web, for example in a printing or spray application.

[0006] International patent application WO-A-03/026807 describes a method and apparatus for applying bands of add-on cellulosic material during paper manufacture paper according to the first technique. A slurry of add-on cellulosic material is repetitively discharged upon a base web by establishing a reservoir of the add-on cellulosic slurry across the base web and moving a belt having at least one orifice along a first portion of an endless path so as to discharge the add-on cellulosic slurry from the reservoir through the orifice onto the base web during the manufacturing process of the base web.

[0007] International patent application WO-A-2008/146159 is an example of the second technique, wherein starch or other film forming materials are applied onto dried paper webs in bands or other patterns by printing techniques, such as, for example, gravure printing. Proposals have also been made for using elevated levels of chalk in the add-on formulations for printing application, like for example in WO-A-2009/001223.

[0008] There is a continued need for smoking articles that have both a low self extinguishment and a low ignition propensity.

[0009] According to the invention there is provided smoking article comprising a paper wrapper, wherein the paper wrapper comprises at least one area of add-on material comprising fibrous material and between about 5 percent and about 15 percent calcium carbonate by weight of the fibrous material and wherein the permeability of the base web outside the area of add-on material is between about 25 Coresta units, preferably 30 Coresta units, and about 90 Coresta units and where the permeability of the base web in the area of add-on material is below about 10 Coresta units

[0010] Surprisingly, it has been found that for a certain threshold the level of calcium carbonate in the add-on material has a significant impact on the self extinguishment of a smoking article while the ignition propensity is maintained at a low level, as long as the permeability of the paper wrapper in the area of add-on material and the permeability outside the area of add-on material is kept within the range noted. Within this range, smoking articles comprising a wrapper with at least one area of add-on material according to the invention have a significantly reduced tendency to self extinguish in free burn conditions while maintaining a high likelihood of extinguishing if left on a surface. Surprisingly, this advantage is more pronounced if the calcium carbonate is added in an add-on material to the base material during the paper

manufacturing process instead of applying the calcium carbonate in an area of add-on material in a printing process after the base paper has already been fully dried. Indeed, the amount of calcium carbonate that is added to the band areas when the permeability is kept within these ranges has a significant effect while requiring much less calcium carbonate during the paper manufacturing process according to the first technology than in the conversion process according to the second technology.

[0011] Without wanting to be bound by theory, it is believed that this positive effect is due to a better integration of the add-on material into the base web during the paper manufacturing process where the base web has still a high water content, like for example between 20 percent and 98 percent, and the calcium carbonate particles of the add-on material can move more freely to settle, even into the base paper. It is believed that this leads to a more homogenous structure of the areas of the wrapper that comprise add-on material. Therefore, during the paper making stage, the porosity of the web in the area of the add-on material can be better controlled across the entire thickness of the area of the add-on material than after the paper has already been fully dried and add-on material is applied at a later stage, for example by printing. The porosity of the paper wrapper is relevant to controlling the amount of oxygen to the advancing combustion zone of the cigarette. If oxygen cannot sufficiently reach the combustion zone of the cigarette, the cigarette will extinguish.

[0012] Preferably, the add-on material comprises between about 8 percent and 10 percent of calcium carbonate by weight of the fibrous material, while the permeability of the base web in the area of add-on material is between about 7 Coresta units and about 10 Coresta units. It has been found, that under these conditions, the ignition propensity is between 0 and 10 percent and at the same time, the level of self extinguishment is between 0 percent and about 25 percent. It should be noted that there appears to be a correlation between the permeability and the amount of calcium carbonate by weight of the fibrous material such that a higher amount of calcium carbonate by weight of the fibrous material leads to a lower permeability in the area of add-on material.

[0013] Preferably, the permeability of the wrapper in the area of the add-on material is adapted by the application of pressure with a Vergé embossing unit downstream of the location where add-on material is added to the base web during the wrapper production process.

[0014] Also according to the invention, there is provided a method of applying at least one area of add-on material to a base web comprising providing a slurry of fibrous material in a liquid, forming a base web of fibrous material and liquid from the slurry, applying at least one area of add-on material comprising fibrous material and between about 5 percent and about 15 percent calcium carbonate by weight of the fibrous material to the base web and reducing the permeability in the at least one area of add-on material below about 10 Coresta units before drying the base web with the add-on material thereon.

[0015] The application of add-on material reduces the permeability of the wrapper in the areas of the add-on material compared to the permeability of the base web. However, the permeability can be further reduced after the add-on material has been applied, for example through compression of the wrapper material, in, particular in the area where add-on material has been applied. It has been found, that by reduction of the permeability can be achieved particularly efficiently in the at least one area of add-on material by increasing the density of the base we with the add-on material, for example by embossing the base web with the add-on material, which can be done with, for example, a Vergé embossing press. Watermarks and Vergé lines are commonly added to wrappers for smoking articles; Vergé lines create a characteristic ring pattern along the tobacco column of a smoking article. Surprisingly, it has been found, that by application of pressure, the permeability of the areas of add on material can be controlled to reduce both self extinguishment and at the same time ignition propensity of a smoking article at relatively low amounts of calcium carbonate, if compared to the amount of calcium carbonate required in printing processes. This means that less calcium carbonate is required. Further, it has been found, that the self extinguishment can be improved with a fibrous material/calcium carbonate add-on material composition over a film forming material/calcium carbonate solution at the same levels of calcium carbonate.

[0016] Preferably, in the method according to the invention the step of applying th eadd-on material comprises applying add-on material to one side of the base web and the step of reducing the permeability comprises embossing, such as embossing Vergé lines, on the other side of the base web. Advantageously, the performance of the wrapper may be further improved by applying the embossing force on the reverse side to the wrapper while the add-on material is applied on the front side of the wrapper. Without wanting to be bound by theory, it is believed that this beneficial effect is due to a less destructive application of force where the embossing structure engages the base web side rather than the bands of add-on material.

[0017] Preferably, the add-on material comprises between about 8 percent and about 10 percent of calcium carbonate by weight of the fibrous material. This has been found to be a particularly effective range of the ratio of calcium carbonate and fibrous material such as, for example, cellulose.

[0018] It has been found that there is also an upper limit to calcium carbonate content in the add-on material. If the content of calcium carbonate relative to the content of fibrous material becomes too high, the paper loses some of its integrity and becomes brittle and dusty without further improving the self extinguishing properties.

[0019] Preferably, the calcium carbonate has a mean particle size of between about 50 nm to about 90 nm (nanometers). A suitable calcium carbonate is commercially available, for example from Solvay Chemicals, Inc. as SOCAL31®.

SOCAL31® is an ultra-fine, precipitated form of calcium carbonate having a mean particle size of about 70 nm. The mean particle size is measured according to the Lea & Nurse method, in which the air permeability of a pressed tablet of calcium carbonate is measured. Calcium carbonate particles with a mean particle size of over 90 nm are less preferred than the ultra-fine, precipitated form of calcium carbonate, as larger particles may precipitate from the slurry more quickly. This could be disadvantageous as it may require the use of greater quantities. On the other hand, smaller particles than 50 nm are not retained well on the base web material and are more likely to pass through the base web material.

[0020] Preferably, the base web has a liquid content of between about 20 percent and about 98 percent by weight when the add-on material is applied, preferably between about 50 percent and 95 percent. Preferably, the liquid is water. In particular, preferably, the add-on material is applied downstream of the wet line of the base web.

[0021] Preferably, the base web comprises between about 20 percent to about 30 percent of calcium carbonate as a filler material.

[0022] The add-on material is preferably slurry or a suspension comprising calcium carbonate and fibrous material, such as cellulose fibres, in a liquid carrier, preferably water. The add-on material may be a colloid, or any other form that is sufficiently fluid to flow from the reservoir through an orifice and onto the base web, for example in a predefined pattern.

[0023] In some preferred embodiments, the slurry comprises highly refined flax or wood pulp. Preferably, the weighted average fibre length in the flax slurry of between about 0.1 mm and about 0.5 mm. The fibre length of the highly refined flax or wood pulp in the add-on material is a further parameter that can be used to control the porosity of the finished paper. It is believed that this is due to the tendency of the smaller fibres to fill in gaps in the liquid base layer during the paper making process.

[0024] In some embodiments, the add-on material includes a film-forming material. Preferred film forming materials are polymers, preferably natural polymers. Particularly preferred polymers are starch, oxidised starch, tapioca, alginate, carrageenan, guar gum, pectin and polyvinyl acetate. Where such a film-forming material is present, preferably the slurry comprises between about 20 percent to about 100 percent of film-forming material by weight of fibrous material. The addition of film forming material may improve the integrity of the finished paper. Further, the film forming material may bind the calcium carbonate in the paper. This may, for example, prevent the formation of dust.

[0025] Optionally, anti-wrinkling agent may be included in the add-on material. Preferred anti-wrinkling agents are glycerin, propylene glycol and 1,2 propylene glycol. Glycerin and 1,2 propylene glycol are the most preferred anti-wrinkling agents. An anti-wrinkling agent is preferably present at up to 100 percent of the total dry weight of fibrous material, preferably at least 25 percent.

[0026] Preferred methods according to the invention comprise moving the base web of fibrous material and liquid along a first path and applying the add-on material to the base web by providing a reservoir of add-on material across the first path and repetitively discharging add-on material from the reservoir onto the base web to form a pattern thereon by moving a belt having at least one orifice along a second, endless, path that crosses the first path so that the orifice is in communication with the interior of the reservoir over part of the second path. According to the method the add-on material is discharged from the reservoir through the orifice onto the base web as the orifice traverses the said first path portion.

[0027] In some preferred embodiments, the add-on material is applied in continuous bands of uniform width perpendicular to the direction of travel of the base web. In other embodiments, the add-on material is applied in other patterns, such as patches, non-continuous bands, bands of non-uniform width, such as castellated bands or bands that are not perpendicular to the direction of travel of the base web, as shown for example in WO-A-2009/087479.

[0028] In some embodiments, the pressure of the add-on material is maintained constant across the reservoir of the moving orifice applicator by metering pumps that operate to pump the liquid to inlet ports disposed at intervals across the reservoir in response to signals from pressure sensors located at intervals across the reservoir. A means to achieve this in a system for applying add-on cellulosic slurry to a paper web is disclosed in WO-A-98/01233. Such an arrangement may be required in order to maintain the pressure of the liquid substantially constant across the reservoir as the passage of the belt through the reservoir may increase the pressure across the reservoir in the direction of movement of the belt.

[0029] In some embodiments, an inspection and feedback system is employed to maintain a constant pattern of add-on material on the base web. The pattern of add-on material is inspected at an inspection station downstream of the reservoir of add-on material. The inspection station feeds data on the pattern of add-on material to a processor that compares the data with the desired pattern and controls the supply of the add-on material to the reservoir or the discharge of the add-on material from the first reservoir, or both, to compensate for any departure from the desired pattern.

[0030] The invention will be further described by way of example, with reference to the drawings, in which:

Figure 1A shows an embodiment of apparatus according to the invention;
Figure 1B shows a wrapper made by a method according to the invention; and
Figure 2 shows schematically the use of a Vergé embossing press according to the invention.

[0031] Referring to Figure 1A, apparatus for carrying out methods according to the present invention comprises a cigarette paper making machine 2 that includes a head box 4 operatively located at one end of a Fourdrinier wire 6, a tank 8 of feed stock slurry in communication with the head box 4 and a moving orifice applicator 10 in operative communication with an add-on material container 12. The add-on material container 12 contains an aqueous solution of fibrous material and calcium carbonate. The add-on material may further comprise a film forming material and an anti-wrinkling agent. The apparatus is of the general type described in WO-A-03/026807.

[0032] The head box 4 is one typically utilized in the paper making industry for laying down cellulosic pulp on a Fourdrinier wire. The head box 4 is in communication with the tank 8 through a pipe 14. Preferably, the feed stock in the tank 8 is a refined cellulosic aqueous pulp such as a refined flax or wood pulp, as commonly used in the manufacture of cigarette paper.

[0033] The Fourdrinier wire 6 carries the laid slurry pulp from the head box 4 along a path in the general direction of arrow 16 in Figure 1A. Water is allowed to drain from the pulp through the wire 6 by the influence of gravity and with the assistance of vacuum boxes 18 at various locations along the Fourdrinier wire 6.

[0034] At a point along the Fourdrinier wire 6, sufficient water is removed from the base web pulp to establish what is commonly referred to as a wet line 20 where the slurry changes from having a glossy, watery appearance to having a surface appearance more like that of the finished base web (but in a wetted condition). At and about the wet line 20, the moisture content of the pulp material is about 90 percent, usually about 85 percent to 98 percent, depending upon operating conditions.

[0035] Downstream of the wet line 20, the base web 22 separates from the Fourdrinier wire 6 at a couch roll 24. From there, the Fourdrinier wire 6 continues on the return run of its endless path. Beyond the couch roll 24, the base web 22 continues on through the remainder of the paper making system which further dries and presses the base web 22 and surface conditions it to a desired final moisture content and texture. Such drying apparatus is well known in the art of paper making and may include drying felts 26 and the like.

[0036] A moving orifice applicator 10 comprises an elongate chamber box 30 of an aqueous solution of calcium carbonate disposed obliquely across the path of the Fourdrinier wire 6. The moving orifice applicator also includes an endless perforated steel belt 32 which passes round a drive wheel 34, a guide wheel 36 at the apex of the moving orifice applicator 10 and a follower wheel 38 at the opposite end of the chamber box 30 from the drive wheel 34. The endless belt 32 is directed through the lower part of the chamber box 30 and subsequently through a cleaning box 42 as it exits the chamber box 30.

[0037] As each orifice of the belt 32 passes through the bottom portion of the chamber box 30, the orifice is in communication with the add-on solution in the chamber box 30. A stream 40 of add-on solution is discharged from the orifice as the orifice traverses the length of the chamber box 30. The discharge stream 40, 40' impinges upon the base web 22 passing beneath the moving orifice so as to create a stripe of add-on material solution on the base web 22. The operational speed of the belt 32 may vary from one layout to another, but in the preferred embodiment, the belt is driven at about 7.5 m/s when the Fourdrinier wire is moving at approximately 4 m/s or more (such as 5 m/s to 15 m/s). The chamber box 30 is oriented at an angle relative to the direction of movement of the base web 22. The spacing of the orifices along the belt 32 and the operational speed of the belt 32 is selected such that a plurality of streams 40, 40' of add-on solution fall simultaneously from the chamber box 30 during operation of the moving orifice application. Because of the oblique orientation of the moving orifice applicator relative to the path 16 of the base web 22 and the relative speeds of the Fourdrinier wire 6 and the endless belt 32, each stream 40 of add-on solution will create a stripe of add-on material upon the base web 22 perpendicular to the direction of movement of the web.

[0038] By adjusting the speed of the belt and angle of the applicator 10, the moving orifice applicator 10 can repetitively generate stripes of add-on material that are oriented normal to the longitudinal edge of the base web 22. If desired, the angle or relative speeds or both may be altered to produce stripes which are angled obliquely to the edge of the base web 22.

[0039] The moving orifice applicator is disposed obliquely across the Fourdrinier wire 6 at a location downstream of the wet line 20 where the condition of the base web 22 is such that it can accept the add-on starch solution without the solution dispersing itself too thinly on the base web slurry. At that location, the base web 22 retains sufficient moisture content, approximately 85 percent to 98 percent, that the add-on solution is able to adhere to the base web 22.

[0040] Preferably, a vacuum box 19 is located beneath the chamber box 30 so as to provide local support for the Fourdrinier wire 6. The vacuum box 19 is constructed in accordance with designs commonly utilized in the paper making industry (such as those of the vacuum boxes 18). The vacuum box 19 is operated at a relatively modest vacuum level, preferably at approximately $1.5.10^4$ Pa or less. Additional vacuum boxes 18' may be located downstream of the moving orifice applicator 10 to remove the additional water that the add-on liquid may contribute. It has been found that much of the removal of water from the add-on material occurs at the couch roll 24 where a vacuum is applied of between about $7.4.10^4$ Pa and about $8.2.10^4$ Pa.

[0041] The chamber box 30 receives add-on solution from the add-on material container 12 at spaced locations along the chamber box 30. Uniform pressure can be maintained along the length of the chamber box 30 by the interaction of

a flow distribution system 60, a pressure monitoring system 62 and a programmable logic controller 64 such that the pumping action of the belt 22 and other flow disturbances along the length of the chamber box 30 are compensated locally and continuously to achieve the desired uniformity of pressure throughout the chamber box 30. A main circulation pump 15 delivers add-on solution from the add-on material container 12 to the flow distribution system 60. Details of how the controller initiates and maintains uniform pressure along the chamber box 30 can be found in US-A-5 997 691.

[0042] The preparation of the slurry for the production of the cigarette paper using the moving orifice applicator 10 can include cooking of flax straw feed stock, preferably using the standard Kraft process that prevails in the paper making industry. The cooking step is followed by a bleaching step and a primary refining step. The preferred process includes a secondary refining step before the majority of the refined slurry is directed to the tank 8 of the head-box 4. Preferably, both refining steps are configured to achieve a weighted average fibre length in the flax slurry of between about 0.1 mm and about 0.5 mm, preferably of between about 0.1 mm and about 0.3 mm. Preferably, a chalk tank can be in communication with the feed stock slurry tank 8 so as to establish a desired chalk level in the slurry supplied to the head-box.

[0043] As previously described in reference to Figure 1A, the add-on material solution is applied to the base web by the applicator 10, whereupon water is further removed from the sheet and the sheet is dried upon passage through the drying felts 26. Referring now also to Figure 1B, at the conclusion of the paper making process, a paper is constructed having a base sheet portion 3 and a plurality of uniformly applied, uniformly spaced, mutual parallel bands 5 of add-on materials. In these bands 5, the cigarette paper has a reduced air permeability in comparison to that of the regions of the base sheet 3 between the bands 5. The paper is wrapped about a column of tobacco to form the tobacco rod of a cigarette, that will at the banded regions exhibit a slower burn rate in comparison to those regions of the base sheet 3 between the bands 5.

[0044] The operation of the cigarette paper making machine and method of the preferred embodiment has been described with respect to flax feedstock. The apparatus and associated methodologies are readily workable with other feedstock such as hardwood and softwood pulps, eucalyptus pulps and other types of pulps used in the paper making industry. The alternate pulps may have different characteristics from flax, such as differences in average fibre length, which may necessitate adjustment of the degree of refining in the preparation of the base sheet slurry with some pulps.

[0045] Because the flow of the fluid stream 40 emanating from each orifice of the belt 32 of the moving orifice applicator 10 as the orifice passes along the bottom portion of the chamber box 30 is approximately proportional to the pressure differential across the orifice, it is desirable that fluid pressure be established and then held as uniformly as possible along the entire journey of each orifice along the bottom portion of the chamber box 30. Details of suitable flow controls of the add-on material are well known to the person skilled in the art, and are disclosed in, for example, US-A-5 997 691.

[0046] It will be apparent from the foregoing that the invention provides a method of applying banded regions of add-on material containing high levels of calcium carbonate to a sheet of material such as a sheet of cigarette paper during high speed production of the sheet. The apparatus can be used with large-capacity papermaking machines which tend to operate at high machine speeds (such as over 4 m/s).

[0047] Figure 1A shows a portion of a sheet of cigarette paper made by a method according to the invention. The sheet comprises a base paper web 3 with bands of add-on cellulosic material 5 across it. In use of the paper as a wrapper for cigarettes and other generally cylindrical smoking articles, the bands lie circumferentially around the article and are effective to reduce the ignition propensity of the smoking article to an acceptable level while maintaining the self extinguishment of the smoking article acceptably low.

[0048] The base sheet 3, after passing through the drying felts 26 as shown in Figure 1a and moving into a direction indicated by arrow 16 in Figure 2 runs through the nip of a Vergé embossing press 100, the Vergé embossing press comprising an engraved Vergé embossing roller 101 and a counter roller 102, in particular an elastomer covered tapered press roller. The pressure in the nip of the Vergé press is set to create permeability in the bands of below 10 Coresta units, preferably a permeability of between about 8 Coresta units to 10 Coresta units. It should be noted that the applied pressure varies depending on, for example, but not limited to, the roller materials used, the permeability of the base web outside of the areas of add-on material, the machine speed and the type of fibrous material used, for example whether flax or wood pulp is utilized. However, the setting of the pressure in the Vergé press is within the skill of the person skilled in the art Instead, what matters is the permeability of the base sheet in the areas of add-on material in the finished wrapper.

[0049] The invention finds particular application in the manufacture of smoking articles such as cigarettes. However, it is useful in any application in which it is desired to apply a pattern of a add-on material to paper or similar non-woven fibrous material.

Examples:

[0050] Table 1 below lists examples of wrappers that are manufactured to illustrate the method and wrapper of the present invention. The table gives in column 2 the ratio of the amount of pulp solids in relation to the final solution. For example for lot 1, in 1 kg of solution, 30 g of pulp solids are present. In column 3, the ratio of calcium carbonate (chalk)

to fibrous material in the pulp is given. In the example above, when applied to lot 1, this shows that for 1 kg of solution, 30 g of pulp solids were present, 2.6 g of calcium carbonate (8.6 percent of dry weight of pulp).

[0051] In all examples, the add-on material is applied in a pattern to give two parallel, transverse bands across the tobacco column of the smoking article. The band width of each band is given in column 4. The table further lists in column 5 the measured permeability in the banded region, in comparison to the permeability of the base paper (in column 6) that was manufactured by a method of the invention, once the paper is dried. The last two columns of the table give the values for self extinguishment (SE), measured in percent, and the values for ignition propensity (IP), measured in percent, both on cigarettes that are manufactured with the paper that is produced by a method of the invention. The calcium carbonate used is SOCAL31® from Solvay Chemicals, Inc.

Table

1	2	3	4	5	6	7	8
Lot	**Pulp** (/%) (% of pulp solids in final solution)	**$CaCO_3$** (/%) (% of chalk relative to pulp	**Bandwidth** (/m)	**Permeability of band** (/CU)	**Permeability of base paper** (/CU)	**SE** (/%)	**IP** (/%)
1	3	8.6	6.2	9.5	59.4	15	0
2	3	8.6	6.2	8.0	62.2	20	5
3	3	9.6	6.2	9.9	53.4	0	7.5
4	3	9.6	6.2	9.6	65.9	20	0
5	3	8.9	5.7	7.9	56.0	25	5
6	3	9.7	7.2	9.3	63.9	15	0
7	3	9.7	7.2	9.3	63.9	15	0
8	3	8.9	5.7	9.1	56.0	25	5
9	3	9.7	7.2	9.3	63.9	15	0
10	3	14.5	6.2	5.4	59.7	5	0

[0052] The ignition propensity is measured according to ISO 12863:2010(E). A value of 15 percent for IP means that 6 cigarettes of 40 cigarettes totally burned, that is, 34 cigarettes of 40 cigarettes extinguished before a total burn.

[0053] For the determination of the self extinguishment, the test consists in placing a lit cigarette on a holder in the horizontal position and allowing it to burn freely at (55 ± 5) percent relative humidity and (23 ± 3) °C both of which should be monitored by a recording hygro-thermograph. The cigarette is observed in order to determine whether it self extinguishes before the combustion line reaches the tipping paper or if it burns up to the tipping paper. In preparation, the cigarettes are conditioned at (55 ± 50) percent relative humidity and (23 ± 3) °C, for a minimum of 24 hours prior to be tested.

[0054] The self extinguishment takes place within an enclosure or test box. A single port smoking machine or an electric lighter is used to ignite the smoking articles for the test. During testing, an apparatus or "angle holder" holds the smoking articles to be tested by holding an end at angles of 0 degrees (horizontal). If a smoking article goes out before the front line of the smouldering coal reaches the tipping paper, the outcome is scored as "self extinguishment"; on the other hand, if the smoking article continues smouldering until the front line of the smouldering coal reaches the tipping paper, then the outcome is scored as "non-extinguishment". The value for self extinguishment is from 20 cigarettes tested. For example, a value for SE of 15 percent means that 3 cigarettes of 20 cigarettes extinguished in free burn conditions, that is, 17 cigarettes of 20 cigarettes total burned in free burn conditions.

Claims

1. A smoking article comprising a paper wrapper, wherein the paper wrapper comprises at least one area of add-on material comprising fibrous material and between about 5 percent and about 15 percent calcium carbonate by weight of the fibrous material and wherein the permeability of the base web outside the area of add-on material is between about 25 Coresta units and about 90 Coresta units and where the permeability of the base web in the area of add-on material is below about 10 Coresta units.

2. A smoking article according to claim 1 wherein the add-on material comprises between about 5 percent and 10 percent calcium carbonate by weight of the fibrous material and wherein the permeability of the base web in the area of add-on material is between about 7 Coresta units and about 10 Coresta units.

3. A method according to any of claims 3 to 5 wherein the add-on material comprises between about 8 percent and about 10 percent calcium carbonate by weight of the fibrous material

4. A method of applying at least one area of add-on material to a base web comprising:

providing a slurry of fibrous material in a liquid;
forming a base web of fibrous material and liquid from the slurry;
applying at least one area of add-on material comprising fibrous material and between about 5 percent and about 15 percent calcium carbonate by weight of the fibrous material to the base web;
reducing the permeability in the at least one area of add-on material below about 10 Coresta units; and
drying the base web with the add-on material thereon.

5. A method according to claim 4 wherein the step of reducing the permeability in the at least one area of add-on material comprises the step of embossing the base web with the add-on material, preferably with a Vergé embossing press.

6. A method according to claim 4 or 5 wherein the step of applying add-on material comprises applying add-on material to one side of the base web and wherein the step of reducing the permeability by embossing comprises embossing lines, preferably Vergé lines, on the other side of the base web.

7. A method according to any of claims 4 to 6 wherein the calcium carbonate has a mean particle size of between about 50 nm to about 90 nm.

8. A method according to any of claims 4 to 7 wherein the base web has a liquid content of between about 20 percent and about 98 percent by weight when the add-on material is applied, preferably between about 50 percent and about 95 percent by weight.

9. A method according to any of claims 4 to 8 wherein the slurry comprises highly refined flax or wood pulp with a weighted average fibre length of between about 0.1 mm and about 0.5 mm.

10. A method according to any of claims 4 to 9 wherein the add-on material comprises a film forming substance.

11. A method according to claim 10 wherein the film forming substance is at least one of starch, oxidised starch, tapioca, alginate, carrageenan, guar gum, pectin and polyvinyl acetate.

12. A method according to any of claims 4 to 11 wherein the base paper outside the area of add-on material has a permeability of between about 25 Coresta units and about 90 Coresta units, preferably between about 50 Coresta units and about 70 Coresta units.

13. A paper wrapper for a smoking article, wherein the paper wrapper was been manufactured by a method according to any of claims 4 to 12.

14. A smoking article comprising a paper wrapper according to claim 13

15. A smoking article according to claim 14 wherein the self extinguishment is below 25 percent and the ignition propensity is below 25 percent.

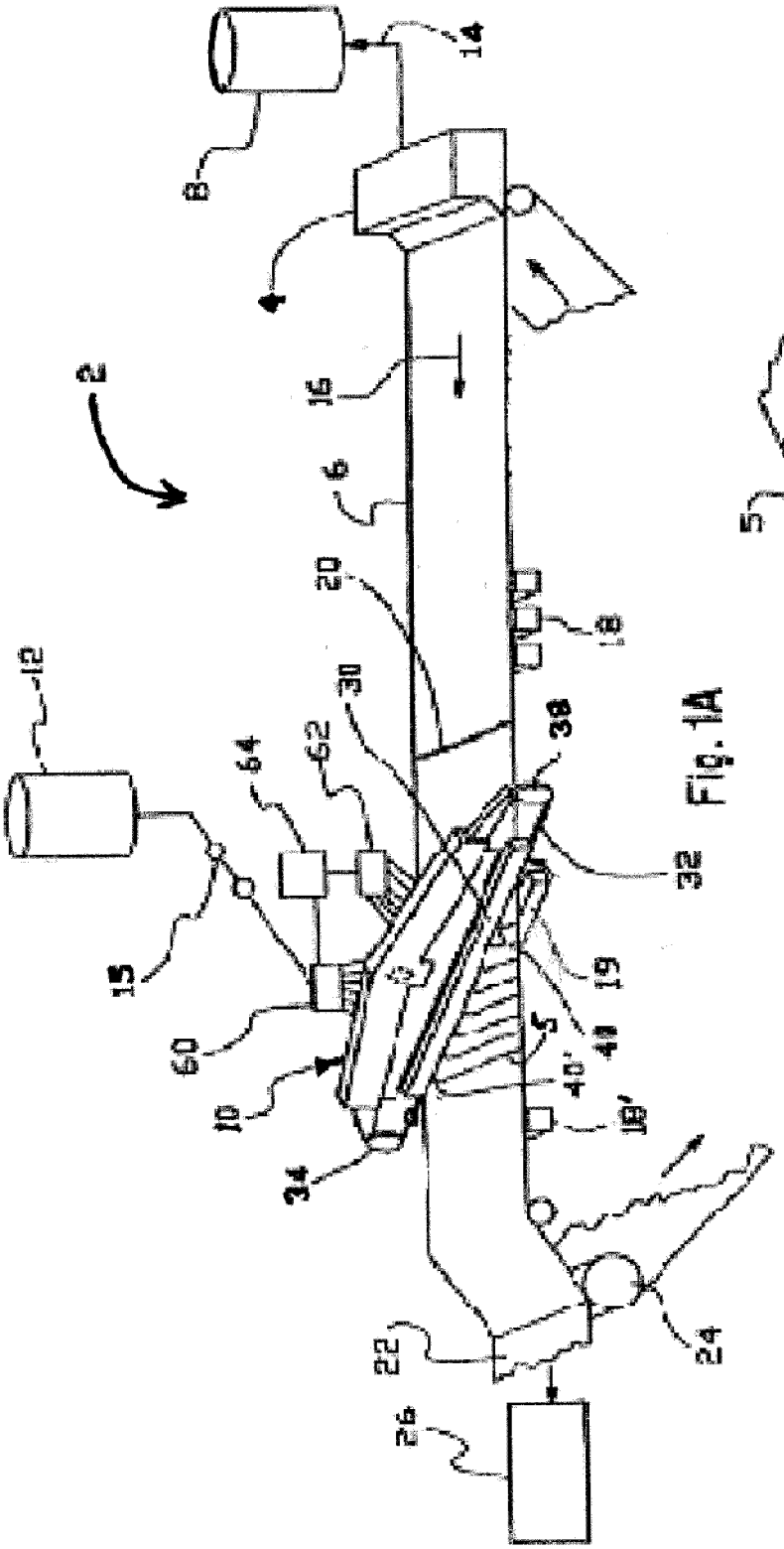

Fig. 1A

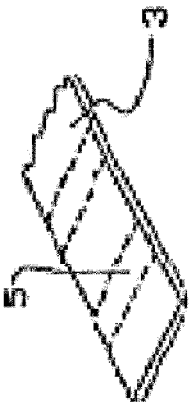

Fig. 1B

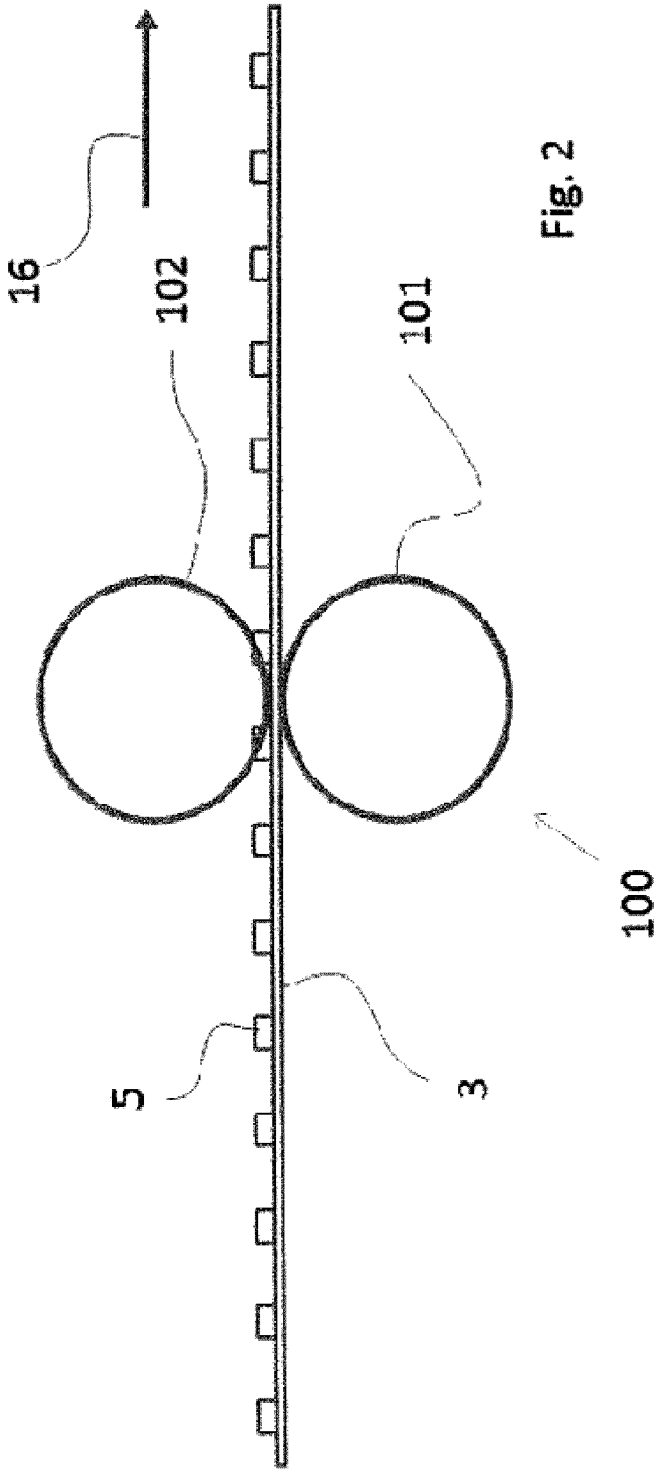

Fig. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 12 18 7134

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Place of search	Date of completion of the search	Examiner
Munich	29 May 2013	Naeslund, Per

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