Title: EMBOSSED PAPER FOR VENTILATION

Abstract: An embossed tipping paper for a filter of a smoking article, the tipping paper comprising one or more embossed portions of reduced porosity configured to allow a gaseous transfer from an exterior of the smoking article to the filter.
Embossed paper for ventilation

Field of the invention
The present invention relates to a ventilated tipping paper and a smoking article comprising the ventilated tipping paper. The tipping paper is ventilated by embossing the paper.

Background to the invention
Conventional filter cigarettes generally comprise a rod of tobacco wrapped in a porous cigarette paper and a plug of filter material wrapped in a porous plug wrap. The ends of the rod of tobacco and the filter material are axially joined by a sheet of overlapping tipping paper, which is wrapped around and adhered to the outside of both the cigarette paper and the plug wrap to hold the cigarette together.

In many filter cigarettes, the tipping paper is perforated to provide vent channels between the filter material and the external air around the cigarette. Often, the vent channels are arranged in a ring around the circumference of the filter. When a smoker draws on the cigarette, external air enters the filter through the vent channels to dilute the smoke passing through the filter.

Conventionally, vent channels in tipping paper are formed by perforating the tipping paper using a series of pins during the paper manufacturing or cigarette assembly process. Another known method is to create the vent channels by passing the tipping paper under a pulsing laser beam in the cigarette assembly machine. Both of these techniques require the use of expensive, specialised perforation equipment.

It will be appreciated that consistent ventilation of a cigarette filter is dependent upon the vent channels remaining unobstructed. If one or more of the vent channels is blocked, the level of ventilation is undesirably reduced. The reduction in ventilation caused by obstruction of a vent channel may be very significant when only a relatively small number of relatively large diameter vent channels are present.
in the tipping paper, as is the case with the two conventional methods of forming vent channels described above.

The overall cost of producing ventilated tipping paper by either of the conventional methods described above is approximately double that of non-ventilated tipping paper. It would be advantageous if the cost of producing ventilated tipping paper could be reduced.

**Summary of the invention**

According to a first aspect of the invention, there is provided an embossed tipping paper for a filter of a smoking article, the tipping paper comprising one or more embossed portions of reduced porosity configured to allow a gaseous transfer from an exterior of the smoking article to the filter.

Each of the embossed portions may comprise a plurality of vent holes through which the gaseous exchange may take place.

The tipping paper may further comprise one or more laser-formed vent channels.

The tipping paper may comprise a printed pattern corresponding with the locations of the embossed portions.

A porosity of the embossed tipping paper may be between 50 and 600 Coresta Unit.

A porosity of the embossed tipping paper may be between 100 and 600 Coresta Unit.

A porosity of the embossed tipping paper may be between 200 and 600 Coresta Unit.

A porosity of the embossed tipping paper may be between 300 and 500 Coresta Unit.
A porosity of the embossed tipping paper may be between 400 and 500 Coresta Unit.

A porosity of the embossed tipping paper may be between 400 and 600 Coresta Unit.

A porosity of the embossed tipping paper may be between 500 and 600 Coresta Unit.

A vent level provided to the filter by the gaseous transfer may be between 10% and 50%.

A vent level provided to the filter by the gaseous transfer may be between 20% and 50%.

A vent level provided to the filter by the gaseous transfer may be between 30% and 50%.

A vent level provided to the filter by the gaseous transfer may be between 40% and 50%.

A vent level provided to the filter by the gaseous transfer may be between 20% and 30%.

A vent level provided to the filter by the gaseous transfer may be between 30% and 40%.

A vent level provided to the filter by the gaseous transfer may be between 20% and 40%.
The only ventilation provided through the tipping paper to the filter may be the gaseous transfer through the one or more embossed portions.

Optionally, no other ventilation means may be provided in the tipping paper other than the one or more embossed portions.

A vent level provided to the filter through the tipping paper may be predetermined and may be provided only by the gaseous transfer through the one or more embossed portions.

According to another aspect of the invention, there is provided a smoking article comprising a filter and the tipping paper, the tipping paper being wrapped around an external surface of the filter.

The smoking article may further comprise an adhesive between the tipping paper and the filter, the adhesive being located beneath at least one embossed portion to restrict the gaseous transfer through the embossed portion.

According to the invention, there is further provided a method of ventilating a gaseous flow in a filter of a smoking article, comprising embossing a tipping paper to create one or more embossed portions of reduced porosity configured to allow a gaseous transfer from an exterior of the smoking article to the filter through the tipping paper.

The method may further comprise wrapping the tipping paper around an external surface of a filter of a smoking article.

The method may further comprise providing an adhesive between the tipping paper and the filter, the adhesive being located beneath at least one embossed portion to restrict the gaseous transfer through the embossed portion.

Embossing the tipping paper may comprise applying a pressure of between 800 and 1600 Newtons per square metre to the tipping paper.
Embossing the tipping paper may comprise applying a pressure of between 800 and 2000 Newtons per square metre to the tipping paper.

5 Embossing the tipping paper may comprise applying a pressure of between 1000 and 2000 Newtons per square metre to the tipping paper.

Embossing the tipping paper may comprise applying a pressure of between 1200 and 2000 Newtons per square metre to the tipping paper.

10 Embossing the tipping paper may comprise applying a pressure of between 1200 and 1800 Newtons per square metre to the tipping paper.

Embossing the tipping paper may comprise applying a pressure of between 1400 and 1800 Newtons per square metre to the tipping paper.

15 Embossing the tipping paper may comprise applying a pressure of between 1600 and 1800 Newtons per square metre to the tipping paper.

20 The method may further comprise forming one or more vent channels in the tipping paper using a laser.

The method may further comprise forming one or more vent channels in the tipping paper using one or more pins.

25 The method may further comprise printing a pattern on the tipping paper at the locations of the embossed portions.

The method may further comprise performing the embossing of the tipping paper in a cigarette assembly machine.
The method may further comprise providing an adhesive between the tipping paper and the filter, the adhesive being located beneath at least one embossed portion to restrict the gaseous transfer through the embossed portion.

5 Brief description of the drawings

Figure 1 is an illustration of a cigarette having a filter and rod of tobacco axially connected by a sheet of overlapping tipping paper.

Figure 2 is an illustration of a generally cylindrical plug of filter material for forming a filter of a cigarette.

Figure 3 is an illustration of a filter for a cigarette comprising a generally cylindrical plug of filter material and a sheet of plug wrap extending around a circumferential face of the plug of filter material.

Figure 4 is diagram of an embossed portion on a tipping paper, comprising vent holes formed during an embossing process for permitting gaseous exchange through the tipping paper.

Figure 5 is a schematic diagram of a cigarette manufacturing machine, comprising embossing rollers for forming embossed portions on a tipping paper and vent holes through the tipping paper.

Figure 6 is an illustration of one of a pair of embossing rollers for forming embossed portions on a tipping paper and vent holes through the tipping paper.

Description of exemplary embodiments

Referring to Figure 1, a smoking article 100 comprises a cigarette 100 comprising a filter 200 and a paper-wrapped rod of smokeable material 300 such as tobacco.

The filter 200 and the rod of smokeable material 300 are co-axially connected by a sheet of tipping paper 400, which overlaps a join (shown by dashed line in Figure 1) between the filter 200 and the rod of smokeable material 300.
Referring to Figure 2, the filter 200 may comprise a generally cylindrical plug of filter material 210 such as cellulose acetate, having first and second generally circular end faces 211, 212 and a circumferential, longitudinally extending surface 213 substantially perpendicular to the first and second end faces 211, 212. As shown in Figure 3, the longitudinally extending surface 213 may be wrapped in a plug wrap 220, comprising a layer of sheet material such as paper. The plug wrap 220 may be held in place around the plug of filter material 210 by gluing along a seam of overlapping material. For example, a stripe of suitable adhesive 230 such as a conventional PVA material may be applied to the interior surface of an overlapping section of the plugwrap 220. The first and second end faces 211, 212 of the filter material 210 may be left open.

The plug wrap 220 is highly porous to allow a gaseous flow between the plug of filter material 210 and the outwardly facing surface of the plug wrap 220. For example, the plug wrap may comprise a paper with a base weight of 25 gsm and a porosity of 3000 Coresta (CU). This allows external air entering through the tipping paper 400 to enter the filter material 210 and dilute the smoke, as is described in detail below.

The tipping paper 400 comprises a layer of embossed paper sheet configured to allow external air to enter the filter 200 through embossed sections of the tipping paper 400 during smoking. The natural porosity of the tipping paper 400 may be very low such that it is substantially non-porous, for example one Coresta (1 CU), but is increased by embossing the paper 400 to open the paper's fibrous structure. To give a specific example, the tipping paper 400 may comprise an embossed TP595DW paper supplied by Tann Papier with a natural (unembossed) porosity of less than 2 CU. After being embossed, the porosity of the tipping paper 400 may be five hundred Coresta (500 CU) or higher. The tipping paper 400 of this example is provided with an embossed pattern comprising embossed portions 410 spaced at short, regular intervals over substantially the entire external surface of the tipping paper 400. The effect of the increased porosity is to provide a corresponding increase in the rate at which gas (e.g. external air) can
flow through the tipping paper 400 into the filter 200 of the cigarette 100. The
effect may be that a desired level of filter ventilation can be achieved without the
need to form the conventional vent channels discussed above.

An example area of the embossed tipping paper 400 is shown in Figure 4, in
which the tipping paper 400 is embossed with a pattern comprising a series of
embossed portions 410. Each of the embossed portions 410 may comprise small
vent holes 411 in the tipping paper 400, which are formed automatically as the
fibrous structure of the paper 400 is opened during the embossing process. The
individual size of the vent holes 411 may be significantly smaller than the
conventional vent channels discussed above, for example one to ten microns (1
to 10 \( \mu \text{m} \)).

The embossed pattern may comprise a plurality of equally spaced embossed
portions 410, which are each approximately circular in shape with an outer
diameter of approximately one thousand, eight hundred microns (1800 \( \mu \text{m} \)). It
will be appreciated, however, that the embossed portions 410 may be of any
suitable shape and size. The embossed portions 410 may each extend radially
outwards from the generally smooth surface profile of the smoking article 100 to
provide a textured surface at the exterior of the tipping paper 400.

In the example shown in Figure 4, each embossed portion 410 comprises eight
substantially parallel ridges 412. The centre of each of the ridges 412 is spaced
from the centre of its neighbouring ridges 412 by a distance of approximately
three hundred microns (300 \( \mu \text{m} \)). The ridges 412 are of varying lengths and have
their centre points aligned along a single axis so as to form an approximately
circular embossed portion 410. A first pair of central ridges pass either side of
the diametric centre of the embossed portion 410, and have a length of
approximately one thousand, eight hundred microns (1800 \( \mu \text{m} \)). A pair of second
ridges are spaced to the right and left of the first ridge by approximately three
hundred microns (300 \( \mu \text{m} \)), and each have a length of approximately one
thousand, seven hundred microns (1700 \( \mu \text{m} \)). A pair of third ridges are spaced to
the right and left of the respective right and left second ridges by approximately three hundred microns (300 µη), and each have a length of approximately one thousand, three hundred and fifty microns (1350 µη). A pair of fourth ridges are spaced to the right and left of the respective right and left third ridges by approximately three hundred microns (300 µη), and each have a length of approximately three hundred and ten microns (310 µη). The width of each of the ridges 412 may be approximately one hundred microns (100 µη).

Each of the ridges 412 may comprise a plurality of the vent holes 411 referred to above. Additionally or alternatively, vent holes 411 may be located between the ridges 412 or at the periphery of the embossed portion 410. It will appreciated that the vent holes 411 represent the areas at which the highest rate of gaseous exchange through the tipping paper 400 can take place, and that their presence in the tipping paper 400 significantly increases the average porosity of the tipping paper 400 as a whole.

The embossed portions 410 are provided over a wide area of the tipping paper 400, rather than in a circumferential ring as is common for conventional vent channels. For example, as referred to above in relation to Figure 4, the embossed pattern may comprise embossed portions 410 spaced at short, regular intervals over substantially the entire external surface of the tipping paper 400 on the filter 200. The distance between adjacent embossed portions 410 may be of the same order of magnitude as that of the width or diameter of the embossed portions 410, or may be approximately equal to the width or diameter of the embossed portions 410 as in Figure 4.

The spread of embossed portions 410 over a large surface area of the filter 200 reduces the probability of a significant proportion of the available air passageway between the filter 200 and the external air being simultaneously obstructed during smoking of the cigarette 100. This provides an advantage over conventional vent holes, which are confined to a small area of the tipping paper 400 (for example a circumferential ring) and therefore have a higher chance of
being simultaneously obstructed. Furthermore, the large number of small
diameter vent holes provided by embossing the tipping paper may
provide a more consistent percentage volume of external air in the gaseous flow.
As discussed above, the ventilation provided by the embossed tipping paper may be such that conventional vent channels are not required. For example, an embossed tipping paper with an average porosity of 500 CU may provide a vent level of approximately 50% when a standard gaseous flow rate of 1.05 litres per minute is passing axially through the filter material. More specifically, when the cigarette is lit and gas is flowing through the filter from the tobacco rod at a constant rate of 1.05 litres per minute towards the mouth end of the filter, 50% of the gas delivered to the mouth end of the filter may consist of external air drawn into the filter through the embossed tipping paper.

The vent level provided by the embossed tipping paper may be substantially independent of the gaseous flow rate through the filter. For example, for the 500 CU embossed tipping paper referred to above, a 50% vent level may be observed at gaseous flow rates of 2.05 litres per minute and 3.1 litres per minute. A lower or higher vent level can be achieved by respectively reducing or increasing the porosity of the embossed tipping paper. One way in which this may be achieved is by reducing or increasing the pressure applied to the tipping paper during the paper embossing process, as is discussed in more detail further below. However, it will be appreciated that other techniques may also be used such as increasing or decreasing the size of the individual protrusions used to create the embossed pattern on the tipping paper, or increasing or decreasing the surface area of the tipping paper which is embossed.

Varying the porosity of the paper by changing the surface area of the paper to which the embossed pattern is applied is a potentially simpler technique than the other techniques discussed above because there will be no need to make significant adjustments to the embossing equipment. The area of the paper subjected to the embossing process can be adjusted whilst keeping the pressure settings and embossing rollers constant.
For example, tipping papers 400 configured to provide vent levels of anything between 1 and approximately 60% may be produced by varying the embossing pressure. Tipping papers 400 configured to produce vent levels of 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45% and 50% may all be included within this range. The tipping paper 400 may be glued around the circumferential surface of the plug wrap 220 and the circumferential surface of an abutting end of the rod 300 using circumferential stripes of adhesive PVA material to secure the two together. In order ensure that the adhesive material does not undesirably obstruct the embossed portions 410 and thereby reduce the vent level provided by the tipping paper 400, the adhesive material between the plug wrap 220 and the tipping paper 400 may be confined to single narrow stripe proximate the mouth end of the filter 200. Alternatively, additional stripes of adhesive between the plugwrap 220 and the tipping paper 400 may be provided to deliberately obstruct some of the embossed portions 410 to reduce the vent level. In this way, a single embossed tipping paper 400 can be used to manufacture cigarettes 100 with different vent levels by varying the area of the tipping paper 400/plug wrap 220 to which adhesive is applied.

Optionally, the embossed tipping paper 400 may be provided with a ring of conventionally formed, larger diameter vent channels around the circumference of the tipping paper 400 overlapping the filter. The conventional vent channels may act in combination with the embossed portions 410 to increase the amount of ventilation provided to the filter 200. For example, a tipping paper 400 comprising both embossed portions 410 and a ring of conventional vent channels may provide a vent level of 80% or 90%.

The tipping paper 400 may be pre-printed with a pattern. For example, the pattern may include a plurality of logos associated with a particular brand of
cigarette 100. The printed pattern on the tipping paper 400 may correspond to the pattern of embossed portions 410, such that the printed pattern is accentuated by the embossed portions 410. The printed pattern may also be used to locate the correct area of the tipping paper 400 on which to form the embossed portions 410 during the paper and/or cigarette 100 manufacturing process. For example, the printed pattern may be used to detect and adjust the location of the tipping paper 400 in a cigarette assembly machine 500 using a photocell 1300. This is described in more detail further below.

Referring to Figures 5 and 6, the embossed portions 410 in the tipping paper 400 may be formed in an on line process by incorporating an embossing unit into a cigarette assembly machine to emboss the tipping paper 400 immediately before the tipping paper is wrapped around the filter 200. This process is described below for exemplary purposes, in relation to the manufacture of a cigarette 100. However it will be appreciated that the embossed portions 410 could alternatively be formed separately, for example by embossing a reel of tipping paper 400 before the reel is installed in a smoking article assembly machine.

Referring to Figure 5, a machine 500 for making a cigarette 100 may include a holder 600 in the form of a bobbin. The bobbin 600 may be configured to hold a reel 700 of tipping paper material 400. Conveying rollers 800 may be arranged to convey the tipping paper material 400 in the form of a tipping paper ribbon from the reel 700 through the machine 500. A tensioning arm 900 may be connected to the conveying rollers 800 to adjust the tension at which the tipping paper 400 passes through the machine 500.

A pair of registration rollers 1000 may draw the tipping paper 400 from the reel 700 towards an embossing unit 1100. The registration rollers 1000 may be driven by a motor (not shown), such as a servo motor. The motor may be controlled by a central controller of the machine 500, such as a micro-processing unit. The registration rollers 1000 may retard or advance the tipping paper 400, and may therefore accurately position the tipping paper 400 with respect to the
embossing unit 1100. For example, the tipping paper 400 may be advanced or retarde"d in dependence of a signal from the photocell 1300 to align a printed pattern on the tipping paper 400 with the embossing unit 1100. The registration rollers 1000 may also serve as drive rollers for driving other components of the machine 500.

Optionally, before the tipping paper 400 reaches the embossing unit 1100, an on machine laser 1200 may perforate the tipping paper 400 to form a series of conventional vent channels in the tipping paper 400. For example, the on machine laser may comprise a fixed position laser pulsing at regular intervals to create conventional vent channels in the tipping paper 400 as it moves beneath the path of a pulsing laser beam. As described above, the conventional vent channels may be used in combination with embossed portions 410 in the tipping paper 400 to ventilate the filter 200 of a cigarette 100. The individual size of the conventional vent channels may be significantly larger than that of the vent holes 411 in the embossed portions 410.

The embossing unit 1100 may include a pair of embossing rollers 1110 of the type shown in Figure 6, which are arranged to form the embossed portions 410 on the tipping paper 400. One or both embossing rollers 1110 may be engraved with one or more patterns so as to form a plurality of embossed portions 410 on the tipping paper 400 as it passes between the rollers 1110. For example, the embossing rollers 1110 may be engraved with a pattern for producing the plurality of the approximately circular embossed portions 410 described above. The pattern may include a series of embossing protrusions 1111. These protrusions 1111 may be approximately circular at their base and comprise a series of ridges for forming ridges 412 in the paper 400 similar to those shown in Figure 4. The embossing roller speed may be adjusted by inputting a command to the central controller of the machine 500.

The engraved pattern on the first of the rollers 1110 may be configured to interlock and cooperate with the engraved pattern on the second of the rollers
1110 to stretch the tipping paper 400 and thereby form the embossed portions 410 and vent holes 411.

The pressure applied to the tipping paper 400 by the embossing rollers 1110 may be varied by adjusting a control setting in the embossing unit 1100. For example, the embossing rollers 1110 may be coupled to a piston which is supplied with compressed air from a regulator to set the amount of force applied by the embossing rollers 1110 to the tipping paper 400. The compressed air pressure may be adjusted by supplying a command to the central controller in the machine 500.

The pressure exerted on the tipping paper 400 by the engraved pattern on the embossing rollers 1110 may be sufficient to open the fibrous structure of the tipping paper 400 and create the vent holes 411 in the embossed portions 410. The extent to which the fibrous structure of the tipping paper 400 is opened is proportional to the pressure exerted on the paper 400 by the rollers 1110 in the embossing unit 1100. This dictates the porosity of the embossed portions 410 in the tipping paper 400, and therefore also the ventilation capacity of the embossed paper 400.

As referred to above, the tipping paper 400 may be a TP595DW paper supplied by Tann Papier, with a base weight of 37gsm. The table below shows how the porosity of the TP595DW paper 400 may vary with increasing pressure applied by the embossing rollers 1110.

<table>
<thead>
<tr>
<th>Pressure at embossing rollers (N/m²)</th>
<th>CORESTA porosity (CU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>1.70</td>
</tr>
<tr>
<td>257.11</td>
<td>1.60</td>
</tr>
<tr>
<td>514.21</td>
<td>3.30</td>
</tr>
<tr>
<td>771.32</td>
<td>14.20</td>
</tr>
<tr>
<td>1028.42</td>
<td>113.20</td>
</tr>
</tbody>
</table>
The porosity values in the table above show the measured porosity of a 1cm² section of the TP595DW paper when embossed at the shown pressures using a particular set of embossing rollers. It will be appreciated that tipping paper 400 could be embossed to a higher porosity, for example 600 Coresta, by increasing the size of the embossing protrusions 1111 on the embossing rollers 1110, or by further increasing the pressure applied to the paper 400. Fine adjustment of the pressure applied by the embossing rollers 1110 can accurately produce tipping paper porosities at any value between 100 and 600 CU, for example 50, 100, 150, 200, 250, 300, 350, 400, 450 and 500 CU.

At an extreme position of the embossing rollers 1110, the magnitude of the distance between the rollers 1110 may be greater than the depth of the tipping paper 400, such that the tipping paper 400 can pass freely between the rollers 1110 without any embossed portions 410 being formed. This may allow the registration rollers 1000 to adjust the position of the tipping paper 400 independently of any rotational movement in the embossing rollers 1110. This may be desirable in order to align a pattern printed on the tipping paper 400 with a particular position of the engraved pattern on the embossing rollers 1110.

The machine 500 optionally includes a photocell 1300 for detecting the position of the tipping paper 400. For example, the photocell 1300 may detect the location or position of a printed pattern on the tipping paper 400. The central controller, or other suitable means, may receive a signal from the photocell 1300 and advance or retard the tipping paper 400 in dependence on the detected location or position of the pattern on the tipping paper 400. The embossing position may be determined such that tipping paper 400 in the embossing position is embossed with a pattern in register with the printed pattern on the tipping paper 400.
The machine 500 may also include gummer rollers 1400 for applying glue to the tipping paper 400 to prepare it for attachment to the filters 200 and tobacco rods 300 that are assembled into cigarettes 100.

The ribbon of embossed tipping paper 400 may be sliced into sections suitable for making a double length cigarette by a cutting unit 1500. The cutting unit 1500 may comprise a knife drum 1510 and a vacuum drum 1520. In operation, the vacuum drum 1520 may rotate faster than the knife drum 1510 to ensure that each section of tipping paper 400 is removed from the knife drum 1510 before the next section is sliced from the ribbon. A gearing mechanism, coupled to the drums 1510, 1520, may be employed to achieve the required difference in rotational speed. The central controller may be configured to control the cutting unit such that each section of sliced tipping paper 400 has a single printed sub-pattern and a single embossed sub-pattern.

The sections of tipping paper 400 sliced from the ribbon may be used to form a pair of cigarettes 100 at an assembling station 1600. For example, the assembling station 1600 may use a single tipping paper section to attach a rod of smokeable material 300 to either end of a double length filter 200 using circumferential stripes of adhesive as described above. The double length filter is then cut in half to form a pair of cigarettes 100. Such assembling stations 1600 are well known per se and will not be described in detail herein.

It will be appreciated that although the invention has been described with reference to a filter cigarette 100, the invention is equally applicable to any smoking article incorporated a tipping paper through which it is desired to ventilate a gaseous flow.
Claims

1. An embossed tipping paper for a filter of a smoking article, the tipping paper comprising one or more embossed portions of reduced porosity configured to allow a gaseous transfer from an exterior of the smoking article to the filter through at least one embossed portion.

2. A tipping paper according to claim 1, wherein each of the embossed portions comprises a plurality of vent holes through which the gaseous transfer may take place.

3. A tipping paper according to any preceding claim, wherein the tipping paper comprises a printed pattern which corresponds with the locations of the embossed portions.

4. A tipping paper according to any preceding claim, wherein a porosity of the tipping paper is between 50 and 600 Coresta.

5. A tipping paper according to any one of claims 1 to 3, wherein a porosity of the tipping paper is between 100 and 600 Coresta.

6. A tipping paper according to any one of claims 1 to 3, wherein a porosity of the tipping paper is between 200 and 600 Coresta.

7. A tipping paper according to any one of claims 1 to 3, wherein a porosity of the tipping paper is between 300 and 500 Coresta.

8. A tipping paper according to any one of claims 1 to 3, wherein a vent level provided to the filter by the gaseous transfer is between 10% and 50%.

9. A tipping paper according to any one of claims 1 to 3, wherein a vent level provided to the filter by the gaseous transfer is between 20% and 50%.
10. A tipping paper according to any one of claims 1 to 3, wherein a vent level provided to the filter by the gaseous transfer is between 30% and 50%.

11. A tipping paper according to any one of claims 1 to 3, wherein a vent level provided to the filter by the gaseous transfer is between 40% and 50%.

12. A tipping paper according to any preceding claim, wherein the only ventilation provided through the tipping paper to the filter is the gaseous transfer through the one or more embossed portions.

13. A tipping paper according to any preceding claim, wherein a vent level provided to the filter through the tipping paper is predetermined.

14. A tipping paper according to any one of claims 1 to 11, wherein the tipping paper further comprises one or more laser-formed vent channels.

15. A smoking article comprising a filter and a tipping paper according to any preceding claim, the tipping paper being wrapped around an external surface of the filter.

16. A smoking article according to claim 15, further comprising an adhesive between the tipping paper and the filter, the adhesive being located beneath at least one embossed portion to restrict the gaseous transfer through the embossed portion.

17. A smoking article substantially as described herein, with reference to the accompanying figures.

18. A method of ventilating a gaseous flow in a filter of a smoking article, comprising:

   embossing a tipping paper to create one or more embossed portions of reduced porosity configured to allow a gaseous transfer from an exterior of the smoking article to the filter through the tipping paper.
19. A method according to claim 18, wherein embossing the tipping paper comprises applying a pressure of between 800 and 1600 Newtons per square metre to the tipping paper.

20. A method according to claim 18 or 19, further comprising forming one or more vent channels in the tipping paper using a laser.

21. A method according to any one of claims 18 to 20, further comprising forming one or more vent channels in the tipping paper using one or more pins.

22. A method according to any one of claims 18 to 21, further comprising printing a pattern on the tipping paper at the locations of the embossed portions.

23. A method according to any one of claims 18 to 22, comprising performing the embossing of the tipping paper in a cigarette assembly machine.

24. A method according to any one of claims 18 to 23, further comprising wrapping the tipping paper around an external surface of a filter of a smoking article.

25. A method according to claim 24, further comprising providing an adhesive between the tipping paper and the filter, the adhesive being located beneath at least one embossed portion to restrict the gaseous transfer through the embossed portion.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

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)

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category*</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>col umn 1, line 62 - col umn 2, line 23 col umn 2, line 65 - col umn 3, line 46 col umn 3, line 65 - col umn 4, line 8 tables 1, 2 figures -----</td>
<td>3, 14, 20, 22</td>
</tr>
<tr>
<td>X</td>
<td>EP 0 724 846 Al (HAUNI MASCHINENBAU AG [DE]) 7 August 1996 (1996-08-07)</td>
<td>1, 15, 18</td>
</tr>
<tr>
<td></td>
<td>col umn 3, lines 4-15 col umn 5, lines 44 - col umn 6, line 21 col umn 7, lines 16-22 figures -----</td>
<td>---</td>
</tr>
</tbody>
</table>

X Further documents are listed in the continuation of Box C. X See patent family annex.

* Special categories of cited documents:
  "A" document defining the general state of the art which is not considered to be of particular relevance
  "E" earlier document but published on or after the international filing date
  "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
  "O" document referring to an oral disclosure, use, exhibition or other means
  "P" document published prior to the international filing date but later than the priority date claimed
  "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
  "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
  "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
  "K" document member of the same patent family

Date of the actual completion of the international search: 9 March 2011
Date of mailing of the international search report: 17/03/2011

Name and mailing address of the ISA:
European Patent Office, P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk Tel: (+31-70) 340-2040, Fax: (+31-70) 340-3016

Authorized officer: Kock, Soren
### DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>US 3 915 090 A (HORST ROBERT L ET AL)</td>
<td>3,22</td>
</tr>
<tr>
<td></td>
<td>28 October 1975 (1975-10-28)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>* abstract</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>EP 0 325 921 A1 (SCHOELLER &amp; HOESCH PAPIERFAB [DE]; REEMTSMA H F &amp; PH [DE])</td>
<td>1,15,18</td>
</tr>
<tr>
<td></td>
<td>2 August 1989 (1989-08-02)</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>page 3, lines 32-41; claim 1</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>JP 2004 248569 A (JAPAN TOBACCO INC)</td>
<td>1,15,18</td>
</tr>
<tr>
<td></td>
<td>9 September 2004 (2004-09-09)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>* abstract</td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td>GB 2 137 058 A (MOLINS PLC)</td>
<td>14,20</td>
</tr>
<tr>
<td></td>
<td>3 October 1984 (1984-10-03)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>page 1, lines 74-88; figures</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>EP 1 437 213 A1 (BOEGLI GRAVURES SA [CH])</td>
<td>1,15,18</td>
</tr>
<tr>
<td></td>
<td>14 July 2004 (2004-07-14)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>* abstract; figures</td>
<td></td>
</tr>
<tr>
<td>Patent document cited in search report</td>
<td>Publication date</td>
<td>Patent family member(s)</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-----------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>US 5394895</td>
<td>07-03-1995</td>
<td>NON E</td>
</tr>
<tr>
<td>EP 0724846</td>
<td>07-08-1996</td>
<td>CN 1135313 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DE 19503123 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JP 8238082 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 5623952 A</td>
</tr>
<tr>
<td>US 3915090</td>
<td>28-10-1975</td>
<td>NON E</td>
</tr>
<tr>
<td>EP 032592 1</td>
<td>02-08-1989</td>
<td>AU 2884989 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CA 1330413 C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DE 3802646 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JP 1225472 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 4928715 A</td>
</tr>
<tr>
<td>GB 2137068</td>
<td>03-10-1984</td>
<td>NON E</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JP 4426836 B2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JP 2004203046 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 2004151796 A</td>
</tr>
</tbody>
</table>