

The invention relates to cigarettes, the tobacco rod of which is enveloped by a cover of cigarette paper having regions with lower and higher air permeability in the form of patterned, preferably annular zones.

Cigarettes of this kind are known, e.g. from DE-A 25 59 071, in which the cigarette paper is supposed to have zones of lower porosity in a range of up to 100 and zones of higher porosity in a range of 150 to 2000, with an average porosity of 50 to 500 units, these units being determined in $\text{cm}^3\text{min}^{-1}$ per 10 cm^2 and at a pressure of 10 cm water column. In these known cigarettes, the annular zones of alternating porosity are supposed to allow for a controlled rate of combustion and/or an increased puff number.

According to DIN ISO 2965, instead of the porosity, the air permeability P is given as the air quantity in cm^3 per minute, per cm^2 and per kPa. It is calculated from the ratio of volume air flow in cm^3/min , traversing the test pattern, to the product of the test surface of the test pattern in cm^2 and the pressure difference between the two surfaces of the test pattern in kPa and was previously also given as the "CORESTA value".

Consequently, according to DE-A 25 59 071 a cigarette paper is used, the regions of which having lower porosity correspond to an air permeability value of up to 10 P and preferably 5 P , while the regions of higher porosity have a value of 15 to 200 P , with a total porosity of this cigarette paper of 5 to 50 P . Starting from paper with high porosity, the reduction in the porosity in the regions of lower porosity can be obtained, according to this document, by the application of gel-forming

agents, such as glue, methyl cellulose, gums or even lacquers and varnishes. The cigarette papers referred to there as being of low porosity with a porosity of approximately 3.6 P can also be perforated electrostatically or by means of pressure rolls or marking presses, in order to obtain zones of higher porosity, the average porosity being approximately 24 P. The combustion rates of these known cigarettes are, e.g. in the region of 3.2 mm/min with a puff number of 9.7, while, by way of comparison, cigarettes with conventional paper with an average porosity of approximately 26 P have a smouldering rate increased, e.g. to up to 4.2 mm/min with a puff number reduced, e.g. to 7.5.

Furthermore, it is known from DE-A 23 15 613 to reduce the porosity of the paper by abrasion of its thickness in order to increase the permeability of porosity of the paper. By this means it is supposedly possible to affect the taste of the cigarette in a particularly favourable manner without weakening the structure of the cigarette paper by perforations.

Furthermore it is known from DE-C 17 61 500 to provide compressed regions in the form of a latticed or honeycomb pattern, e.g. of a silicate pulp, and to reinforce the points of intersection with a non-combustible material, particularly in order to prevent the dropping of ash.

Furthermore, it is known from US-A 3 911 932 to use cigarette papers the porosity of which is increased in the direction of the mouth end in order to make the supply of smoke more uniform.

In so far as these known proposals can in fact be technically

realised, although they all result in specific advantages, these are achieved at the cost of other desired properties, as the essential parameters such as the smouldering rates of the tobacco and of the paper, the air permeability of the cigarette paper, ventilation of the tobacco rod and the filter, the tobacco quantity and moisture content, and the filling density, and the geometrical design of the cigarette influence the smoking behaviour, the formation of sidestream smoke and the puff number in a very complex manner.

E.g. in order to reduce the sidestream smoke, the smouldering rate of the cigarette rod must be reduced, as less tobacco is burned in the puff interval at lower smouldering rates (according to DIN 10240 = 58 sec) and thus less sidestream smoke is produced. During puffing (according to DIN 10240 = 2 sec), an approximately standard quantity of tobacco is burned, as the influence of the air to be drawn through the burning cone predominates (according to DIN 10240 = 35ml/2 sec).

Furthermore, GB-A-875252 discloses a cigarette, the tobacco rod of which is enveloped by a cover of cigarette paper having regions of lower and higher air permeability by means of latticed compression. This single compressed area is supposed to reduce the porosity and thus lead to a supposed improvement in the taste by cooling the smoke as a result of a higher thermal conductivity, wherein the ratio of the impressed lattice surface to the non-impressed surface gradually varies over the length of the cigarette and, also, the non-impressed lattice can be produced with a varying depth. There are no details given about the extent of the change from the initial air permeability to the average total permeability and,

likewise, there is no reduction in the sidestream smoke while retaining conventional puff numbers with differing degrees of rod ventilation.

In the case of normal combustible tobacco mixtures, the reduction in the smouldering rate of the cigarette rod can be achieved by using paper of low porosity or paper of normal porosity with additives for reducing the smouldering rate. However, in the case of non-combustible tobacco mixtures, e.g. tobacco mixtures having a higher moisture content, a low smouldering rate can only be achieved by the use of highly combustible cigarette papers. However, all of these measures produce the undesired side effect of a high puff number, as less tobacco is burned in the puff interval.

The object of the invention is to propose cigarettes which, irrespective of the combustibility of given tobacco mixtures, produce less sidestream smoke with differing degrees of rod ventilation, although with conventional puff numbers, or to provide cigarettes which, as a result of their cigarette paper of low porosity, have a low smouldering rate, but a conventional puff number, or which, in the case of cigarette paper of normal porosity, with tobacco of normal combustibility, again give a conventional puff number without additional additives for reducing the smouldering rate, or cigarettes which, in the case of a cigarette paper of high porosity, with tobacco of low combustibility, again give a conventional puff number without additives of this kind, and in any case give a cigarette with reduced sidestream smoke.

In order to solve this problem, therefore, a cigarette having a cigarette paper of the type mentioned initially is proposed,

this cigarette being designed according to the main claim and preferred embodiments being given in the subclaims.

It has been found in a surprising manner that, starting from conventional cigarette papers having an air permeability of approximately 10 P to 250 P, the air permeability of which was significantly reduced by repeated batonnéing, compared to conventional cigarette papers having the same basic paper properties and the same air permeability, a superproportional increase in the smouldering time is achieved or an unexpectedly large reduction in the smouldering rate is achieved.

By virtue of this superproportional increase in the smouldering time with still comparatively high air permeability compared to conventional cigarette papers and cigarette papers reducing the sidestream smoke, it is possible to produce cigarettes with reduced sidestream smoke and conventional puff numbers.

It has in fact been found in a surprising manner that although the superproportional increase in the smouldering time of the batonnéed cigarette paper according to the invention is associated with a correspondingly increased smouldering time for the cigarettes prepared therewith, it is not associated with an increase in the puff number. This would have been expected, as in general an increase in the smouldering time of the paper and the cigarette results in a corresponding increase in the puff number. However, in the cigarettes according to the invention, the puff number surprisingly remains constant. This means that with a clearly reduced smouldering rate for the cigarette, corresponding to the number of batonnéing steps of the cigarette paper, there is a considerable reduction in the sidestream smoke, as with a low smouldering rate of the

cigarette the combustion rate in the puff interval is small, although it is large during puffing as a result of the constant puff number. This also leads to more satisfactory utilisation of the quantity of tobacco used from the point of view of the consumer.

One advantage of the cigarette according to the cigarette is that control of the cigarette properties is achieved without additions to the tobacco or the cover. Furthermore, the cigarette paper with compressed zones can be incorporated into the production process of the cover or the cigarette, so that this measure for controlling the cigarette properties can be achieved in an extremely cost-effective manner.

The batonnéing of cigarette paper is known per se and is mentioned, e.g. in "Tobacco Encyclopedia" by E. Voges (1984). It is effected by embossing the paper on a filigree calender. The paper is guided between an embossing roll and a more resilient or elastic hard paper roll, the dry or half-dry paper being compressed at the impressed points. Company or proprietary marks are impressed by means of this embossing, the paper being thicker at the impressed points, the impressed mark appearing dark on a light background when the cigarette is viewed from the top and appearing light on a white background when viewed through the paper and giving the impression of an imitation watermark. The intensity of the batonnéing can be influenced by adjusting the absolute moisture content of the paper in a range from approximately 1 to 10 % by the pressure applied of approximately 5 to 3000 Newton/cm and at different temperatures in the range of room temperature up to 95°C.

When batonnéing the cigarette paper, e.g. an embossing calender

can be used, consisting of an upper pressure roll, a back pressure roll disposed therebelow, an embossing roll disposed below it, a lower back pressure roll disposed therebelow and a fixedly arranged lower pressure roll. The pressure rolls are usually steel rolls having a diameter of 32.0 cm and an operating width of 119 cm, while the back pressure rolls coming into engagement with the embossing roll are paper-covered rolls having a diameter of 27.0 cm and an operating width of 119 cm. The embossing roll itself is an engraved steel roll having a diameter of, e.g. 19.4 cm and an operating width of 118 cm, on the circumference of which webs are disposed in an annular arrangement, which, according to the desired batonnéing, e.g. have an individual width of 0.05 cm and a spacing of 0.05 cm, but which can also effect different embossing from web to web if the webs are designed to be wider or higher. In general, the cigarette paper is drawn via an unwinding device in an operating width of 100 cm into the pressing nip between the embossing roll and the lower back pressure roll, the path being controlled continuously by means of side regulation and paper guide rolls and the paper, if desired, being wound after batonnéing with an interposed width adjusting device. Winding is usually effected at a speed of 100 to 200 m/min, the drive of the roll combination being synchronised. Particularly good results are achieved at operating temperatures between 30 and 50°C and an absolute moisture content of the paper of 5 to 7 %.

The batonnéing of the cigarette paper can also be effected during the manufacture of the cigarette itself and is then effected outside or directly in the cigarette machine, the embossing calenders having a much smaller operating width corresponding to the already cut cigarette paper and consequently also being smaller and having a smaller operating

width corresponding to the already cut cigarette paper and requiring lower operating pressures. In this case, the additional zone batonnéing device is situated, e.g. between the cigarette paper reel and the format finger of a conventional cigarette machine, so that cycle times or control of the cigarette paper to be batonnéed can be effected in a more simple manner. It is also possible for the punching means of the cigarette machine to be coupled directly or synchronously with the additional batonnéing device.

Example 1

Test cigarettes having conventional tobacco mixtures were prepared, conventional cigarette paper being adjusted from initial air permeability values given in the following table to a low total air permeability in zones extending transversely to the running direction having a width of approximately 0.4 mm and a spacing of 1 mm by repeated batonnéing.

As a function of the number of batonnéing steps, columns A and B show a significant decrease in the air permeability, the surprisingly superproportional increase in the "paper" smouldering time together with the corresponding increase in the "cigarette" smouldering time, and the surprisingly relatively constant puff number.

Table

Type of paper	Air permeability in P values	Smouldering time		Puff number n/50 mm
		Paper s/150 mm	Cigarette s/50 mm	
11/07	11.1	65.0	616	6.8
A 1 x bat.	9.35	68.8	663	7.1
2 x bat.	8.07	76.6	707	7.6
3 x bat.	8.07	79.1	752	7.6
4 x bat.	7.86	86.4	760	7.7
83/07	90.1	56.8	523	7.7
B 1 x bat.	83.7	58.6	505	7.5
2 x bat.	80.3	65.8	524	7.3
3 x bat.	69.1	64.8	562	7.2
4 x bat.	59.5	68.6	542	7.6
5 x bat.	54.4	63.7	547	7.6
6 x bat.	52.5	74.3	584	7.2
7 x bat.	49.7	72.5	560	7.5
8 x bat.	45.9	76.0	575	7.2
9 x bat.	33.4	73.5	625	7.1
10 x bat.	28.0	73.5	618	7.2

Example 2

In the case of test cigarettes analogous to those of Example 1 having a cigarette paper of relatively high initial air permeability of 235 P, although having different basic paper properties and different impression widths obtained by batonnéing from those in Example 1, i.e. a width of 1.0 mm and a spacing of approximately 2 mm for a tobacco mixture of low combustibility, the puff number for a paper batonnéed 4 to 5 times was approximately 7.9. The values are given in Table 2 hereinbelow.

Table 2

Type of paper	Air permeability in P values	Smouldering time		Puff number n/50 mm
		Paper s/150 mm	Cigarette s/50 mm	
220/07	235	64.6	596	7.6

1 x bat.	180	65.5	612	7.4
2 x bat.	139	68.6	628	7.6
3 x bat.	128	68.8	635	7.5
4 x bat.	101	70.2	644	7.9
5 x bat.	77.9	73.4	657	7.8

As a function of the number of batonnéing steps, Table 2 shows the clear decrease in the air permeability, the clearly

increased "paper" and "cigarette" smouldering times and the surprisingly constant average puff number.



CLAIMS

1. Cigarette, the tobacco rod of which is enveloped by a cover of cigarette paper having regions with lower and higher air permeability in the form of patterned zones, characterised in that the cigarette paper is adjusted from an initial air permeability P, determined as the air quantity in cm^3 per min, per cm^2 and per kPa (in accordance with DIN ISO 2965), of 10 to 250 P to an average total air permeability of 85 to 20 % of the initial value by repeated batonnéing of annular zones.
2. Cigarette according to claim 1, characterised in that the cigarette paper is adjusted by batonnéing from an initial air permeability of 80 to 130 P to an average total permeability of 30 to 80 P.
3. Cigarette according to claims 1 to 2, characterised in that the zones compressed by batonnéing have a width of approximately 0.1 to 8 mm and a spacing of 0.1 to 5 mm.
4. Cigarette according to claim 3, characterised in that the compressed annular zones have a width of approximately 0.3 to 0.5 mm and a spacing of 1 mm.
5. Cigarette according to claims 1 to 4, characterised in that both the impression widths and the spacings of these batonnéed annular zones on a cigarette are of different sizes.
6. Cigarette according to claim 5, characterised in that the



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impression widths decrease with equal spacings from the filter.

7. Cigarette according to claim 5, characterised in that the spacings from the filter increase with equal impression widths.
8. Cigarette according to claims 1 to 7, characterised in that the cigarette paper is batonnéed on both sides.