

## Description

The present invention relates to an improved filter mouthpiece for a smoking article, such as a cigarette, in particular a filter mouthpiece having a hollow tube extending axially therethrough, and to a cigarette provided with such a mouthpiece, see EP-A-0 295 835.

In a conventional cigarette, the resistance to draw and air ventilation, if any, of the combined tobacco rod and filter mouthpiece stay substantially the same throughout the smoking of the cigarette. This has the effect of increasing the dry particulate matter (DPM) delivery with successive puffs. Particularly, although not solely, in the case of low delivery cigarettes, so-called "low-tar cigarettes", this may be undesirable since the first puff may be rather weak in taste and "impact" and, anyway, the taste and "impact" of the cigarette to the smoker will change as the cigarette is smoked.

It is known to vary the resistance to draw (RTD) of a cigarette by providing a filter mouthpiece having a hollow tube extending from the tobacco end thereof toward, but ending short of, the mouth end. When a cigarette provided with such a mouthpiece is smoked, smoke passes along the tube toward the mouth end and impinges on the filter material at the mouth end of the tube. Components of the smoke condense on the filter material adjacent the open mouth end of the tube, blocking the tube and causing at least some of the smoke to pass through the surrounding filter material, so increasing the resistance to draw of the cigarette. This has the effect of evening out to some extent the DPM delivery as smoking progresses.

It is also known to provide a tube having small slits along its length. This increases the resistance to draw of the filter mouthpiece more gradually and results in more even DPM delivery than if a completely impervious tube is used. However, this arrangement still provides a cigarette in which the DPM delivery increases as the cigarette is smoked.

It has also been proposed, in EP-A-0 295 835, to provide a ventilated filter mouthpiece, that is one in which ambient air is admitted to the filter by means of, for example, perforate tipping, provided with a perforate tube open at both ends, extending from the tobacco rod end of the filter toward but not so far as the mouth end of the filter. With such a filter mouthpiece a cigarette can be provided which, when smoked, displays a substantially constant DPM (dry particulate matter) delivery. The mouthpiece can be configured to provide an initially high DPM delivery, which rapidly drops to a lower level and maintains that lower level substantially throughout the smoking of the cigarette.

It has been found that filter mouthpieces of the foregoing type may exhibit significant variation in smoking characteristics, which may not be commercially acceptable. The inventors have found that by providing a further filter portion, between the tobacco rod end of the tube and the tobacco rod, a mouthpiece exhibiting more consistent smoking properties, and thus greater commercial acceptability, results.

According to the invention there is provided a filter mouthpiece for a smoking article comprising a filter rendered generally air impermeable over its peripheral surface, the filter comprising a rod-end filter portion, a middle filter portion having a tube extending axially therethrough, the tube being open at both ends; and a mouth-end filter portion.

Preferably, the peripheral surface of the filter mouthpiece is rendered air transmissive over at least one discrete area to admit air into the filter.

The filter portions may be three separate lengths of filter, or two or all three portions may be formed of the same length of filter. Preferably, the rod end filter portion abuts the middle filter portion.

Preferably, the wall of the tube extending through the middle filter portion is pervious to smoke, and particularly preferably has holes for the passage of smoke.

Preferred specifications for filter mouthpieces according to the invention are as follows:

diameter : 4mm to 9mm, most preferably 7.83 mm;

rod-end filter portion:

length : 4mm to 8mm, most preferably 6mm;

RTD : 5mm w.g. to 12mm w.g., most preferably 7mm w.g.;

middle filter portion:

length : 12mm to 21mm, most preferably 15.5mm;

RTD(tube blocked) : 120mm w.g. to 160mm w.g., most preferably 140mm w.g.;

mouth-end filter portion;

length : 4mm to 8mm, most preferably 6mm;  
RTD : 15mm w.g. to 30mm w.g., most preferably 20mm w.g.;

5 tube:

internal diameter : 0.8mm to 2.0mm, most preferably 1.1mm;  
external diameter : 1.0mm to 3.5mm, most preferably 1.3mm;  
10 diameter of holes in tube : 0.2mm to 0.4mm, most preferably 0.25mm.

The filter portions may be of cellulose acetate, crepe paper or other suitable materials, and the tube may be of cellulose acetate, polypropylene or other suitable material. Alternatively, the tube may be formed by a bore through the middle filter portion, the walls of which are partially sealed, for example by heating, or completely sealed and subsequently perforated.

15 Smoking articles, such as cigarettes, having filter mouthpieces according to the invention, are also provided.

The invention will be further described, by way of example, with reference to the drawing, which shows a cross-section through a cigarette provided with a filter mouthpiece according to a preferred embodiment of the invention.

20 The cigarette of the drawing comprises a wrapped tobacco rod 10 and a filter mouthpiece 12 according to a preferred embodiment of the invention. The mouthpiece 12 comprises a rod-end filter portion 14 abutting and in axial alignment with the tobacco rod 10, a middle filter portion 16 abutting and in axial adjustment with the rod-end portion 14, and a mouth-end filter portion 18 abutting and in axial alignment with the middle portion 16. All three filter portions are wrapped with an air permeable wrapper 20, and are joined together by an air permeable overwrap 22. They are attached to the tobacco rod 10 by a substantially air impermeable tipping 24, which extends around all three wrapped filter portions and the mouth end of the wrapped tobacco rod 10.

The middle filter portion 16 has a tube 26 running down its centre, the walls of which are perforated by holes 28, and the ends of which are open. Preferably five diametrically opposed pairs of holes 28 are provided along the length of the tube 26.

30 The tipping 24 has perforations 30 in the region of the middle filter portion 16, through which ambient air is admitted into the filter.

When a smoking article including a filter mouthpiece according to the invention is smoked, smoke initially substantially by-passes the middle filter portion 16, travelling instead along the tube 26. The smoke is only filtered by the rod-end 14 and mouth-end 18 filter portions. As smoking progresses, DPM condenses in the mouth-end filter portion 18, adjacent the open end of the tube 26. In the case of a perforate tube, the smoke then leaves the tubes through the holes 28 nearest the mouth end of the tube, and is thus subjected to a higher degree of filtration. The holes 28 become blocked progressively, subjecting the smoke to progressively higher degrees of filtration.

40 The DPM delivery against the puff number, that is, the delivery profile, was determined for three cigarettes; a cigarette (C1) having a filter mouthpiece according to the invention with a perforate tube 26 (solid line); a cigarette (C2) having a filter mouthpiece according to the invention with an impervious tube 26 (chain line); and a reference cigarette (C4) having a standard filter mouthpiece (dotted line). These results were obtained using a Borgwaldt RM 20/CS smoking machine.

45 Both the cigarettes having filter mouthpieces according to the invention exhibit a much flatter delivery profile than the standard cigarette, and the profile of the cigarette which has the filter mouthpiece with a perforate tube is somewhat flatter than that with an imperforate tube.

Filter mouthpieces according to the invention exhibit greater consistency of delivery than those of EP 0 295 835, even though the latter exhibit a relatively flat delivery profile. Table 1 compares total particulate matter (TPM) delivery of a sample of 40 of each of four cigarettes: a cigarette (C1) having a filter mouthpiece according to the invention with a perforate tube 26; a cigarette (C2) having a filter mouthpiece according to the invention with an impervious tube 26; a cigarette (C3) having a filter mouthpiece according to EP 0 295 835, that is, a filter mouthpiece composed of rod-end and mouth-end filter portions only, with a perforate tube extending through the rod-end portion; and a reference cigarette (C4) having a standard cellulose acetate filter mouthpiece. Cigarettes C1, C2 and C4 are those whose delivery profiles were determined as discussed above.  
55 Smoke analysis was conducted according to ISO norm.

TABLE 1

|    | <u>Cigarette</u> | <u>Mouthpiece</u> | <u>(TPM) delivery</u><br><u>(mg/cig)</u> | <u>Standard</u><br><u>Deviation</u> |
|----|------------------|-------------------|------------------------------------------|-------------------------------------|
| 5  |                  |                   |                                          |                                     |
|    | 1.               | Invention, with   | 5.0                                      | 0.54                                |
| 10 |                  | perforate tube    |                                          |                                     |
|    | 2.               | Invention, with   | 4.7                                      | 0.46                                |
|    |                  | impervious tube   |                                          |                                     |
| 15 |                  |                   |                                          |                                     |
|    | 3.               | EP 0 295 835      | 5.3                                      | 0.85                                |
| 20 |                  |                   |                                          |                                     |
|    | 4.               | Standard          | 5.4                                      | 0.25                                |

It is apparent from Table 1 that cigarettes (C1) and (C2) equipped with filter mouthpieces according to this invention show significantly more consistent TPM deliveries than cigarettes (C3) having filter mouthpieces according to EP 0 295 835. The standard deviations in TPM delivery of both cigarettes (C1) and (C2), having filter mouthpieces according to the invention, are closer to that of cigarette (C4), having a standard filter mouthpiece.

The specifications of the cigarettes C1, C2, C3 and C4 are as shown in Table 2.

TABLE 2

| 5  | Cigarette                | C1                                        | C2                                        | C3         | C4       |
|----|--------------------------|-------------------------------------------|-------------------------------------------|------------|----------|
| 10 | Mouthpiece               | Invention<br>with per-<br>forated<br>tube | Invention<br>with im-<br>pervious<br>tube | EP 0295835 | Standard |
| 15 | Cigarette Format:        |                                           |                                           |            |          |
| 20 | Diameter (mm)            | 7.9                                       | 7.9                                       | 7.9        | 7.9      |
|    | Filter length (mm)       | 27.5                                      | 27.5                                      | 27.5       | 27.5     |
|    | Cigarette length (mm)    | 84.0                                      | 84.0                                      | 84.0       | 84.0     |
|    | Tipping length (mm)      | 32.0                                      | 32.0                                      | 32.0       | 32.0     |
| 25 | Cigarette RTD (mm wg)    |                                           |                                           |            |          |
|    |                          | 83                                        | 86                                        | 72         | 105      |
| 30 | Dilution: %              | 57                                        | 58                                        | 64         | 56       |
|    | Puff count (no./cig)     | 9.3                                       | 9.2                                       | 8.9        | 8.7      |
| 35 | Filter:                  |                                           |                                           |            |          |
| 40 | Type (no. of sections)   | triple                                    | triple                                    | dual       | single   |
|    | length of sections       | 6/15.5/6                                  | 6/15.5/6                                  | 8.5/19     | 27.5     |
|    | RTD (mm/wg)              | 92                                        | 99                                        | 95         | 129      |
| 45 | Tube:                    |                                           |                                           |            |          |
|    | Length (mm)              | 15.5                                      | 15.5                                      | 19         | 0        |
|    | Diameter (mm): internal  | 1.1                                       | 1.1                                       | 1.1        | 0        |
| 50 | Diameter (mm): external  | 1.3                                       | 1.3                                       | 1.3        | 0        |
|    | Number of pairs of holes | 5                                         | 0                                         | 7          | 0        |

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## Claims

1. A filter mouthpiece (12) for a smoking article comprising a filter rendered generally air impermeable (24) over its peripheral surface, the filter comprising: a rod-end filter portion (14); a middle filter portion (16) having a tube (26) extending axially therethrough, the tube being, open at both ends; and a mouth-end filter portion (18).
2. A filter mouthpiece (12) according to claim 1 in which the peripheral surface of the filter is rendered air transmissive over at least one discrete area (30) to admit air into the filter.
3. A filter mouthpiece (12) according to claim 1 or 2 in which the wall of the tube (26) is pervious to smoke.
4. A filter mouthpiece (12) according to any preceding claim in which the wall of the tube (26) has holes (28) through it for the passage of smoke.
5. A filter mouthpiece (12) according to claim 4 in which the holes (28) are arranged in opposed pairs.
6. A filter mouthpiece (12) according to any preceding claim in which the rod-end (14), middle (16) and mouth-end (18) filter portions are separate filter portions.
7. A filter mouthpiece (12) according to any preceding claim in which the rod-end filter portion (14) is between 1mm and 10mm, preferably between 4mm and 8mm, most preferably 6mm, in length.
8. A smoking article comprising a filter mouthpiece (12) according to any preceding claim.
9. A cigarette comprising a filter mouthpiece (12) according to any of claims 1 to 7 axially abutting a wrapped tobacco rod (10).

## Patentansprüche

1. Filtermundstück (12) für eine Raucherware, welches einen Filter aufweist, der im allgemeinen über seinen Umfangsbereich luftundurchlässig (24) gemacht ist, wobei der Filter aufweist: ein stabseitiges Filterteil (14); ein mittleres Filterteil (16), welches ein Rohr (26) hat, welches axial durch dasselbe verläuft, und wobei das Rohr an beiden Enden offen ist; und ein mundseitiges Filterteil (18).
2. Filtermundstück (12) nach Anspruch 1, bei dem die Umfangsfläche des Filters über wenigstens einen speziellen Bereich (30) luftdurchlässig gemacht ist, um den Luftzutritt in den Filter zu gestatten.
3. Filtermundstück (12) nach Anspruch 1 oder 2, bei dem die Wand des Rohrs (26) für Rauch durchlässig ist.
4. Filtermundstück (12) nach einem der vorangehenden Ansprüche, bei dem die Wand des Rohrs (26) sie durchsetzende Öffnungen (28) für den Durchgang des Rauchs hat.
5. Filtermundstück (12) nach Anspruch 4, bei dem die Öffnungen (28) in Form von gegenüberliegenden Paaren angeordnet sind.
6. Filtermundstück (12) nach einem der vorangehenden Ansprüche, bei dem das stabseitige (14), das mittlere (16) und das mundseitige (18) Filterteil von gesonderten Filterteilen gebildet werden.
7. Filtermundstück (12) nach einem der vorangehenden Ansprüche, bei dem das stabseitige Filterteil (14) zwischen 1 mm und 10 mm, vorzugsweise zwischen 4 mm und 8 mm, und insbesondere 6 mm lang ist.
8. Raucherware, welche ein Filtermundstück (12) nach einem der vorangehenden Ansprüche aufweist.
9. Zigarette, welche ein Filtermundstück (12) nach einem der Ansprüche 1 bis 7 aufweist, welches axial anstoßend an einem umhüllten Tabakstab (10) angeordnet ist.

**Revendications**

- 5 1. Embout filtre (12) pour article à fumer comprenant un filtre (24) rendu de façon générale imperméable à l'air sur sa surface périphérique, le filtre comprenant : une portion de filtre côté tabac (14), une portion de filtre médiane (16) ayant un tube (26) la traversant axialement, le tube étant ouvert à ses deux extrémités, et une portion de filtre côté bouche (18).
- 10 2. Embout filtre (12) selon la revendication 1, dans lequel la surface périphérique du filtre est rendue perméable à l'air au moins dans une zone réduite (30) pour laisser entrer l'air dans le filtre.
- 15 3. Embout filtre (12) selon la revendication 1 ou la revendication 2, dans lequel la paroi du tube (26) est perméable à la fumée.
- 20 4. Embout filtre (12) selon l'une quelconque des revendications précédentes, dans lequel la paroi du tube (26) est percée d'orifices (28) pour le passage de la fumée.
- 25 5. Embout filtre (12) selon la revendication 4, dans lequel les orifices (28) sont disposés en paires opposées.
- 30 6. Embout filtre (12) selon l'une quelconque des revendications précédentes, dans lequel les portions de filtre côté tabac (14), médiane (16) et côté bouche (18) sont des portions de filtre séparées.
- 35 7. Embout filtre (12) selon l'une quelconque des revendications précédentes, dans lequel la portion de filtre côté tabac (14) a une longueur comprise entre 1 mm et 10 mm, de préférence entre 4 mm et 8 mm, de vive préférence égale à 6 mm.
- 40 8. Article à fumer comprenant un embout filtre (12) selon l'une quelconque des revendications précédentes.
- 45 9. Cigarette comprenant un embout filtre (12) selon l'une quelconque des revendications 1 à 7 en butée axiale contre une tige de tabac enveloppée (10).
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