

IMPROVEMENTS RELATING TO TOBACCO SMOKE FILTERS

This invention relates to tobacco smoke filters for use with smoking articles, cigarettes for example.

It is well known to provide filter-tipped cigarettes with ventilation means which permit the ingress of ventilation air into the filter. A purpose of this is to effect a decrease in the mainstream delivery of smoke components. Another purpose of ventilating a filter is to cool the mainstream smoke. It has been observed that when ventilation air flows into a filter comprising a plug of fibrous filtration material, cellulose acetate for example, through a circumferentially extending ventilation zone in a tipping which surrounds around the filter, the tobacco smoke is constrained by the inflowing air to occupy a restricted axial zone of the filter plug. Thus a comparatively narrow stream of smoke passes from the mouth end of the plug into impingement with the taste preceptors in the mouth of the smoker. It is also the case that there is only a limited degree of mixing of the ventilation air which the tobacco smoke and therefore only a limited cooling of the smoke occurs.

It is an object of the invention to provide a tobacco smoke filter such that in use of that filter the

smoker perceives an enhanced smoke character and the mainstream smoke is cooled to an improved degree.

The present invention provides a tobacco smoke filter for a smoking article, including a rod-like plug of filtration material; wherein said plug has at least one airflow groove at its periphery, said groove increasing in depth from an inlet end to an outlet end of the groove; wherein the groove, when viewed as a development view of the plug, has a component of its length which is transverse to the axis of said plug; and wherein said groove has at its outlet end an outlet face which is pervious to airflow.

In order that the invention may be clearly understood and readily carried into effect, reference will now be made, by way of example, to the accompanying diagrammatic drawing, in which:-

FIGURE 1 shows a filter plug having helically extending peripheral airflow grooves;

FIGURE 2 shows part of the plug of Figure 1 on the section line II-II and part of an overlying tipping wrapper;

FIGURE 3 shows part of a filter-tipped cigarette, the filter of which comprises a plug the form of which is a modification of the plug of Figure 1;

FIGURE 4 shows a sectional view of a filter having a plug of a form different from that of the plug of

Figure 1; and

FIGURE 5 shows a cross-sectional view taken at section line 8-8 of Figure 4.

The filter plug 1 of Figure 1 is formed of fibrous
5 cellulose acetate filtration material and is of self-sustaining construction. At the periphery of the plug 1 there extends a number of helical grooves 2. Figure 2 shows one of the grooves 2 in section taken along the length of the groove. As may be seen from Figure 2, the
10 depth of the groove increases from an inlet end 3 to an outlet end 4 thereof. When assembled with a cigarette rod to provide a filter-tipped cigarette, the plug 1 is secured to the rod (not shown in Figure 2) by a
tipping 5, the cigarette rod being to the right of the
15 plug 1 as viewed in Figure 2. A row of perforations 6 in the tipping 5, one of which is depicted in Figure 2, encircles the plug 1 at a location overlying an inlet end region of the grooves 2, the arrangement being such that at least a respective one of the perforations 6 is in
20 communication with each of the grooves 2.

A convenient method of forming the grooves 2 is to subject the plug 1, or preferably a piece of filter rod material from which several of the plugs 1 are to be
cut, to a hot-moulding process such as, for example, that
25 disclosed in United Kingdom Patent Specification No. 1,507,765, using suitably shaped forming means.

By a judicious selection of hot-moulding process conditions, the grooves 2 are so formed that the longitudinal surfaces 7 thereof are rendered substantially impervious to airflow therethrough, whereas the end face 8, the outlet face, of each groove 2 is pervious to airflow.

When a cigarette incorporating a filter plug 1 as per Figures 1 and 2 is smoked, ambient air is drawn through the perforations 6 into the grooves 2. Since the grooves 2 follow helical paths and since the depth of each groove 2 increases in the direction of air flow, the ventilation air enters the body of the plug 1 with a helical and inwardly directed swirling motion. This has the effect of promoting an enhanced degree of mixing of the ventilation air with the tobacco smoke being drawn through the filter plug 1.

The cigarette of Figure 3 comprises a rod 10 of cut tobacco enwrapped in cigarette paper 11, and a filter plug 13 which is secured to the rod 10 by a tipping 14. The filter plug 13 is similar to the plug 1 of Figure 1 except that, in addition to being provided with helically extending grooves 15 at an upstream zone, the plug 13 is additionally provided with a number of parallel, longitudinally extending grooves 16 which open at the mouth end of the plug 13. As with the grooves 2 of Figures 1 and 2, the

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longitudinal surfaces of the grooves 15 may be substantially air-impervious as may also the surfaces of the longitudinal grooves 16. Two rows of perforations 17, 18 encircle the plug 13 at respective locations overlying the upstream ends of the helical and the longitudinal grooves 15 and 16 to provide means of ingress for ambient air into the grooves 15 and 16.

The plug 13 may, if desired, be replaced by two abutting sub-plugs of which one includes the grooves 15 and the other includes the airflow ducts 16.

When the cigarette of Figure 3 is smoked, a first stream of ventilation air enters the body of the filter plug 13 from the peripheral grooves 15 and, by reason of the swirling motion imposed upon it, it mixes intimately with the tobacco smoke. A further stream of ventilation air enters the mouth of the smoker from the grooves 16 unmixed, or substantially unmixed, with the tobacco smoke.

The filter shown in Figure 4 has its filter plug 20, which again is of self-sustaining construction, provided with peripheral grooves 21 disposed in an encircling row. Each of the grooves 21 has an inlet end and an outlet end between which the groove 21 extends in a direction substantially perpendicular to the axis of the filter plug 20. As may be seen from Figure 5, each of the grooves 21 increases in depth towards its

outlet end. An end face 22, defining the outlet face, of each groove 21 is pervious to airflow. The other surfaces of the grooves 21 are substantially impervious to airflow.

5 Overlying the filter plug 20 for the purpose of securing the plug 20 to a cigarette rod (not shown in Figure 4) is a tipping 23, which tipping 23 is provided with a band 24 of micro-perforations encircling the plug 20 at a location overlying the grooves 21.

10 When a cigarette incorporating a filter plug 20 as per Figures 4 and 5 is smoked, ambient air is drawn through the microperforated band 24 into the grooves 21. The air enters the body of the filter plug 20 through the outlet end faces 22 of the grooves 21 with a spiral
15 motion which ensures intimate mixing of the air with the tobacco smoke.

 In any of the embodiments described above the ventilation perforations may comprise microperforated regions of the tipping.

20 The tipping may, if desired, overlie a plug wrapper of air pervious nature in which case the tipping may form an outer impervious layer in which the perforations are formed. The tipping 5 would of course be longer than the plug wrapper.

25 It will be understood that the perforations 6, 17 and 18 shown in the drawings have been exaggerated in size so as to facilitate their illustration.



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CLAIMS

1. A tobacco smoke filter for a smoking article, including a rod-like plug of filtration material; wherein said plug has at least one airflow groove at its periphery, said groove increasing in depth from an inlet end to an outlet end of the groove; wherein the groove, when viewed as a development view of the plug, has a component of its length which is transverse to the axis of said plug; and wherein said groove has at its outlet end an outlet face which is pervious to airflow.

2. A filter according to claim 1, wherein said inlet end of the groove is further from the mouth end of said filter plug than is said outlet end.

3. A filter according to claim 2, wherein said groove is of helical form.

4. A filter according to claim 1, wherein the inlet and outlet ends of said groove are equidistant from the mouth end of said plug.

5. A filter according to any one of claims 1 to 4, wherein there is a plurality of said grooves arranged at equiangularly spaced locations around said plug.



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6. A filter according to any one of the preceding claims, wherein said at least one groove has sides and a floor which are less pervious to airflow than is said outlet face of the groove.

5 7. A filter according to any one of the preceding claims in combination with wrapping means enwrapping said plug and permitting the ingress of ambient air into said at least one groove in the region of the inlet end of the groove.

10 8. The combination of a filter and wrapping means according to claim 7, wherein the periphery of said plug around the said at least one groove is relatively impervious to air in comparison with the air permeability of said outlet face of the groove.

15 9. A filter according to any one of claims 1 to 6 or the combination according to claim 7 or 8, and further including ventilation airflow ducts extending along the plug from the mouth end of the plug and stopping short of the region of said plug at which the grooves are formed.

20 10. A combination according to claim 9, wherein said wrapping means include first ventilation perforations in the region of said inlet end of the said at least one groove, and second ventilation perforations in the region of those ends of said ventilation airflow ducts which are further
25 from said mouth of the plug.



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11. A combination according to claim 7 or 8, or to claim 9 when appendant thereto, wherein said wrapping means has an inner air-pervious layer in contact with said plug and an outer layer through which the ingress of ambient air
5 into said at least one groove occurs through perforations formed in the outer layer.
12. A combination according to claim 10 or 11, wherein said perforations comprise micro-perforated regions of the wrapping means.
- 10 13. A combination according to claim 9 or 10, or to claim 11 or 12 when claim 11 is appendant to claim 9, wherein said plug comprises two abutting sub-plugs of which a first includes said at least one groove and a second includes said ventilation airflow ducts.
- 15 14. A tobacco smoke filter for a smoking article, substantially as hereinbefore described with reference to, and as illustrated in, Figures 1 and 2, or Figure 3; or Figures 4 and 5, of the accompanying drawings.
15. A smoking article including a tobacco smoke
20 filter according to any one of the preceding claims.
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