United States Patent

Labbe

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[54] **TOBACCO SMOKE FILTER**

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[30] **Foreign Application Priority Data**

June 27, 1969 Great Britain.....32635/69

[52] **U.S. Cl.**.....**131/261 B,** 131/10.5, 131/210

[51] **Int. Cl.**.....**A24d 01/04,** A24f 07/04

[58] **Field of Search**.....131/10.3, 10.5, 10.7, 10.9, 131/210, 211

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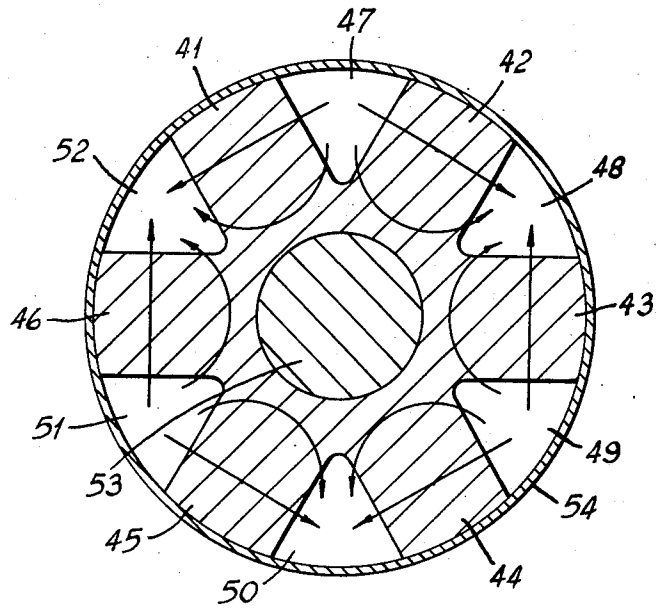
[57] **ABSTRACT**

A cigarette filter is provided with axially extending channels divided by axially extending walls of filtering material through which smoke is induced to pass from one channel to another, different channels being blocked at different ends so that smoke enters the filter by one channel and leaves by another. In the preferred embodiment, the filter comprises a core having a resistance to compression from which arms of filtering material extend to the covering wrapper. These arm define smoke passageways alternate ones of which are blocked at opposite ends so that the smoke is constrained to pass from one channel or passageway through a filtering arm to at least one of the adjacent channels.

2 Claims, 9 Drawing Figures



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2 Sheets-Sheet 1

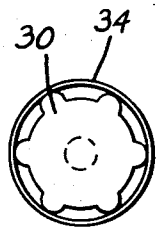

FIG. 2

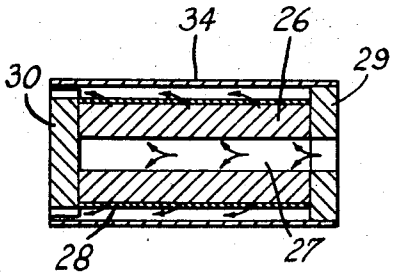

FIG. 1

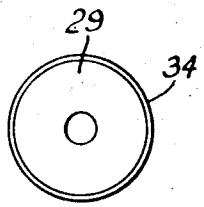

FIG. 3

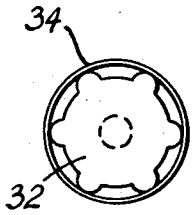

FIG. 5

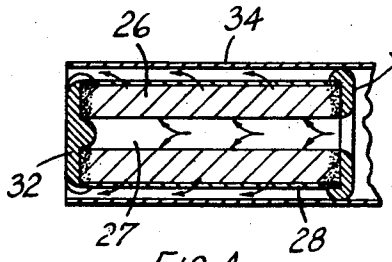

FIG. 4

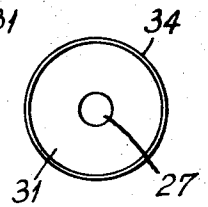

FIG. 6

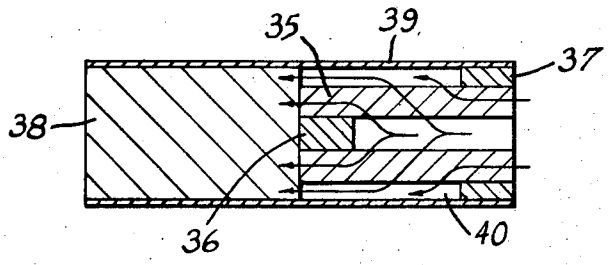

FIG. 7

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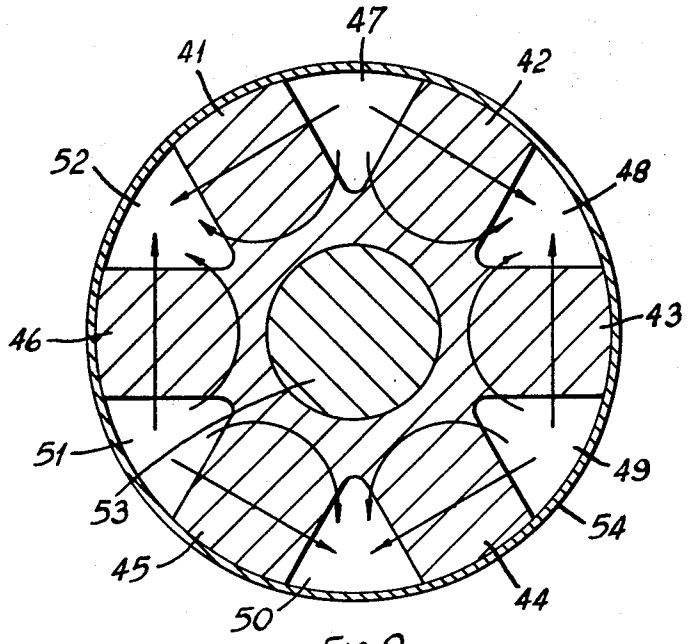

FIG. 8

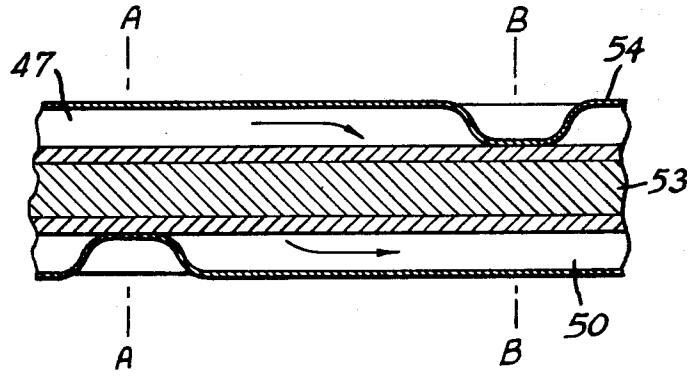

FIG. 9

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TOBACCO SMOKE FILTER

The present invention relates to cigarette filters and more particularly to those which have a non-axial smoke path through them.

According to the present invention there is provided a cigarette filter comprising a shaped filter element enclosed in a tubular wrapper, and having at least two passages extending substantially axially of the filter, at least one of said passages being formed between the filter element and the inner surface of the wrapper, different passages being blocked at different ends to allow smoke to enter the filter by one passage and leave by another passage, and being divided from each other by part of said filter element through which smoke is constrained to pass.

How the invention may be carried out will now be described, by way of example only, with reference to the accompanying drawings in which:

FIG. **1** is a sectional view of one embodiment of the invention;

FIG. **2** is a first end view of the filter shown in Figure **1**;

FIG. **3** is a second end view of the filter shown in Figure **1**;

FIGS. **4** to **6** are views similar to FIGS. **1** to **3** respectively;

FIG. **7** is a sectional view of a third embodiment of the invention;

FIG. **8** is a cross sectional view of a fourth embodiment of the invention; and

FIG. **9** is a fragmentary sectional view in elevation of the embodiment shown in FIG. **8**.

FIGS. 1 to 6

A cigarette filter comprises a cylindrical filter element **26** which has an axial channel **27** through it and which is wrapped in a thin porous paper web **28**. The element **26** may be formed from paper sheet or tow already pre-loaded with finely divided filter material, i.e., the paper or tow can be freely handled without any significant loss of filtering material from it. The paper sheet or tow may be formed around a stationary or spinning spindle so as to form the axial channel **27**.

The filter element is sealed at each end. At one end the central axial passage **27** is sealed whereas at the other end the central axial passage **27** is left open and a seal is formed around the outer periphery of the element **26** to project radially outwardly from the periphery in order to close the annular gap formed between the element **26** and an outer wrapper **34**. This may be done by locating the filter plug in the flute of a rotating fluted drum, the plug being held in the flute by suction. The sealing may be effected by caps **29** and **30** of appropriate shape being stuck to the ends of the plugs, as shown in FIGS. **1** to **3**, or by the deposition of the filling, such as hot melt adhesive, over the appropriate areas of the ends of the plug to form seals **31** and **32** as shown in FIGS. **4** to **6**.

The plug, with its ends carrying the seals referred to, is then combined end-on with a porous plug such as that shown at **38** in FIG. **7**, and held together by a strip of relatively stiff paper **34** wrapped and stuck around them.

The filter element **26** is relatively thick, i.e., its thickness is equal to at least half the radius of the whole

filter plug. Smoke from a cigarette is drawn through the above mentioned porous plug (not shown), such as **38** in FIG. **7**, to cause smoke to enter the axial channel **27** to the right of FIGS. **1** or **4** and then pass in a generally radially outward direction through the filter element **26** and porous wrapper **28** into the annular channel between the element **26** and the outer wrapper **34**. The seals **29**, **30** and **31**, **32** prevent the smoke from passing through the ends of the cylindrical filter element **26**.

FIG. 7

In the embodiment shown in FIG. **7** the filter element **35** is again cylindrical but comprises an homogenous substance which has equal resistance to the passage of smoke in both an axial and a radial direction. Because the material is homogeneous it is possible to use an alternative sealing arrangement to the seals **29**, **30** and **31**, **32** of the embodiments of FIGS. **1** to **3** and **4** to **6** respectively.

With such a material its ends do not require to be sealed because any excess pressure between one side of the material and the other will result in a smoke flow through the thickness of the material, provided that the central bore and the outer annulus are closed over a length which is at least equal to the thickness of the cylinder so that the shortest path length is through the wall of the cylinder and not through its ends. Therefore, plugs **36**, **37** are provided whose lengths are greater than the thickness of the cylinder **35**. Thus, as the filter material is in the form of a cylinder excess pressure applied between the inner bore and the outside of the cylinder will cause smoke to pass through the thickness of the cylinder and not through the ends of the cylinder.

As in the previously described embodiments the filter element **35** is combined with a porous plug **38** and the two are held together by a substantially nonporous outer wrapper **39**.

The way in which this filter plug may be manufactured will now be briefly described. The cylinder **35** may be extruded from a suitable filter material or it may comprise fiber which is highly loaded with finely divided filter material so that the loss coefficient is completely controlled by the finely divided filter material. These filter lengths are then fed into the flutes of a rotatable drum and held there by suction. As the drum rotates a non-porous plug **36** is inserted into the central bore of one end of each cylinder and an annular non-porous plug **37** is located around the other end of the cylinder. The cylinder is then taken from the fluted drum and brought end on with a filter stub **38**, the two then being wrapped in a tube **39** of relative thick paper so as to form an annular air gap **40** round the cylinder, the two being spaced from the outer periphery of the cylinder by the annular plug **37**.

FIGS. 8–9

In this embodiment the filter element is again made of a homogeneous substance but instead of having a simple cylindrical form in which smoke enters through the central bore, passes through the walls of the cylinder and exits through the surrounding annulus, or vice versa, the filter material is extruded in a generally wheel-like cross section, i.e., a cross section consisting of a hub or core having plurality of radially outwardly

extending arms so that, an equal number of channels are formed between adjacent arms.

In particular, the extrusion shown in FIG. **8** has six arms **41** to **46** with six smoke passages **47** to **52** between adjacent pairs of arms. With such a construction the channels **47**, **49**, and **51** would be open at the tobacco end of the filter plug and sealed at the other end whereas the channels **48**, **50**, and **52** would be open at the mouthpiece end of the filter plug but closed at the tobacco end. Thus smoke would enter the channels **47**, **49**, and **51**, pass through the filter arms **41** and **42**, **43** and **44**, and **45** and **46** respectively and leaves the filter plug through the channels **48**, **50**, and **52**.

With such a construction the smoke flow through the filter arms is substantially by the shortest path, as indicated by the arrows, and thus avoids the center zone of the extruded filter element. This zone is thus ineffective as a filter and can with benefit be replaced by a core **53** which has a relatively high resistance to axial compression, as compared with the extruded filter material. It is useful because in the production of such a filter the plugs can be subjected to relatively high compressive forces in an axial direction and if constructed entirely of the extruded filter material would be liable to collapse axially. The central core **53** could be made of a relatively cheap material thus saving the cost of the relatively expensive filter material which it replaces.

Various methods may be employed to effect the end sealing of the channels **47** to **52** and in particular a 60° triangular section stub could be used in each channel. However, in the illustrated embodiment (FIG. **9**) this is effected by localized deformation by heat sealing of a polythene skin **54** which encloses the cruciform filter material. This is done prior to the cut-off of the continuous filter rod at the lines A—A and B—B (FIG. **9**). For a filter plug length contained between the lines A—A and B—B the tobacco end of the filter is adjacent the line A—A and the mouthpiece and adjacent the line B—B.

What I claim as my invention and desire to secure by Letters Patent is:

1. A cigarette filter comprising a tubular wrapper, a filter element disposed within said wrapper, said filter element being comprised of an axial core member from which a plurality of radially directed arms extend so as to contact the wrapper, and which define a plurality of smoke passage ways, alternate passageways being blocked by smoke impervious means at opposite ends, the arms being constituted of a filter material so that smoke entering one passageway is constrained to pass through an adjacent passageway before exiting after coursing through a filter arm, the said core element being ineffective as a filter and having resistance to compression higher than the filter.

2. A filter element according to claim **1**, in which the filter element is enclosed in a thermoplastic skin located within the wrapper, the thermoplastic skin being deformed at localized spots to form seals by which the ends of the passages are closed.

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