Oct. 7, 1958 W. W. WATKINS 2,854,985

ARTICLE OF COMMERCE

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FIG. 1

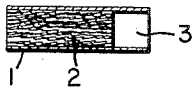


FIG. 2

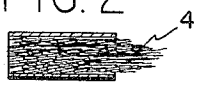


FIG. 3

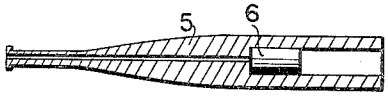


FIG. 4

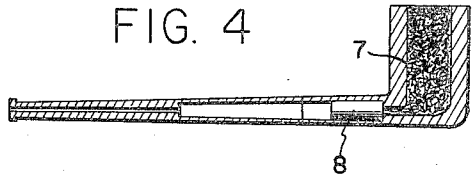
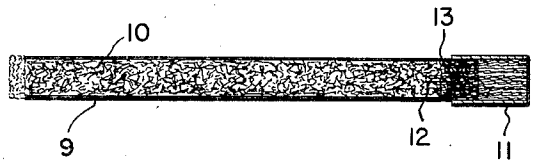


FIG. 5



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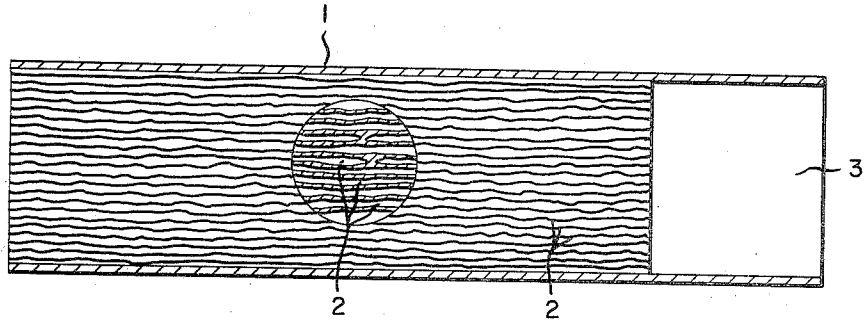
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FIG. 6



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ARTICLE OF COMMERCE

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Application April 12, 1954, Serial No. 422,297

6 Claims. (Cl. 131—10)

This invention relates to a novel filter for gaseous media. More particularly it is concerned with an improved filter tip for cigarettes.

It is an object of the present invention to provide a novel process for the filtering of a gas.

Another object is to provide an improved apparatus for the filtering of tobacco smoke.

A further object is to provide a filter-tipped cigarette of high tar absorptive capacity.

The and other objects will become apparent in the course of the following specification and claims.

In accordance with the present invention a filter tip for cigarettes is provided comprising a bundle of adjacently disposed hollow capillary filaments fitted snugly in a hollow tube in such manner that the long dimension of the said filaments lies along the length of the said tube.

The invention will be more readily understood by reference to the drawings.

Figure 1 is a sectional elevation of a cropped ended filter of the present invention.

Figure 2 is a sectional elevation of a filter of the present invention having a long-haired end.

Figure 3 is a sectional elevation of a cigarette or cigar holder with a filter of the present invention in the gas stream.

Figure 4 is a sectional elevation of a pipe having a filter with a long-haired end disposed in the gas stream.

Figure 5 is a cross sectional illustration of a burning cigarette having a filter of the present invention attached thereto.

Figure 6 is an enlarged veiw of Figure 1 showing the hollow capillary filaments employed in the present invention.

Referring particularly to Figures 1 and 6 a tube **1** is shown, into which is snugly fitted a bundle of adjacently disposed hollow filaments **2**, the long dimension of the said fiber lying along the length of the tube. An overhang **3** may be provided for convenience in connecting the device into a gas flow system. For instance, by adjusting tube **1** to appropriate diameter, a tipped or untipped cigarettte or cigar may be inserted within and supported by the overhang.

Figure 2 represents in cross section a further embodiment wherein the hollow filaments are permitted to extend from one end of the tube to present a long-haired end **4**. This long-haired extension may be squared off or have filaments of random length as shown. In certain applications as explained hereinafter it may be advantageous to employ a filter having both ends of the long-haired structure.

Figure 3 shows a cigarette or cigar holder **5** in cross section wherein the filter **6** of Figure 1 is situated in the line of normal gaseous flow. Figure 4 shows an elevation of a pipe **7** in cross section with the filter **8** of Figure 2 inserted in the draw tube at the base of the bowl with the long hairs extending into the bowl. The intimate contact of the hollow filaments with the tobacco expedites pickup of liquid tars which tend to collect at the

base of the bowl. Furthermore saliva and liquid condensations which occur within the draw-tube are absorbed by the draw-tube or cropped side of the filter. If the structure of the draw-tube pemits, it is often preferable to employ a double-ended long-haired filter in this capacity to assist in moisture removal, especially for a soggy pipe enthusiast.

Figure 5 is a cross sectional elevation of a lighted cigarette to which a filter **11** of the present invention is permanently affixed. The paper **9** into which tobacco particles **10** are packed is fitted within the tube of filter **11**. The filter is of the one end long-haired construction. The filament ends **12** extend into the packed tobacco. This construction improves the strength of the union between cigarette and filter. It also provides for removal of liquid tars and condensed gases in the section of the cigarette wherein they tend to accumulate in highest concentration.

The hollow filaments used in the filter construction are of sufficiently small diameter to possess capillary attraction in water. Due to its natural absorptive capacity, it is preferred that they be made of cellulose acetate. They may be produced in a number of ways as for instance by any of the methods described in U. S. Patents 1,427,330, 1,652,206, 1,883,347, 1,904,209, 2,026,730 or 2,032,565. The filaments are preferably prepared so as to contain relatively continuous voids or internal tubular passages extending usually through the short length used in a filter tip for a cigarette, i. e., from about ¼ to ½ inch or longer. The filaments themselves are substantially reduced in density for instance the density may be reduced any degree down to about 0.5 to 0.9 as compared with 1.3 for normal solid cellulose acetate filaments. It is preferred to employ crimped filaments, thereby reducing the apparent density of the filter.

The bundles can be readily prepared by gathering a large number of hollow filaments together to form a tow having a total denier of the order of about 50,000 to 100,000 made up from individual filament sizes ranging from about 2 up to 20 denier/filament more or less. Within any one bundle the individual filament size may be uniform or mixed filament sizes may be used. To improve handling and filter formation a light coating of solvent, plasticizer or a suitable adhesive may be applied to the tow to maintain a unitary structure. The amount of crimp which it is preferred to impart to the filaments may vary from 40 or more crimps per inch down to less than 5 crimps per inch. For use in cigarette filters the bundles of the many filaments are preferably prepared to about equal the diameter of the tobacco core of the cigarette and are cut to the desired length. They aer eminently suitable in filter-tipped cigarette manufacture on conventional cigarette-making machinery.

The material of construction of the tube in which the hollow filaments are fitted is not critical. Suitable materials include tobacco leaf, paper, cork, wood, metal or the like.

By this invention cigarettes are produced with means for obtaining improved filtration of tars and nicotine, providing the smoker with a mild light smoke and with minimum loss of flavor or aroma.

While applicant does not wish to be bound by any theory of operation it is felt that the high efficiency of his filter is due to the combined capillary action of the hollow filaments which absorbs moisture and the tortuous gaseous path around the outside of the filaments which removes solids and tends to precipitate entrained liquids. It is felt that the imbibing action of the hollow structures in cigarettes may also be enhanced by the venturi effect created as a result of the natural contraction of the filter in the smoker's lips which results in increased gas velocity

in this area thus placing the two ends of the filamentary structure at different pressure levels.

Although the invention has been particularly described as valuable in the filtering of tobacco smoke, many industrial applications are adaptable to it as well. Many equivalent modifications will be apparent to those skilled in the art without a departure from the inventive concept due to a reading of the above description.

What is claimed is:

1. A filter comprising a filtering means and a hollow tube, the said filtering means comprising a bundle of adjacently disposed hollow capillary filaments of cellulose acetate having a denier per filament within a range of from about 2 to about 20, with the said filaments fitted snugly in the said hollow tube in such a manner that the long dimension of the filaments lie along the length of the hollow tube.

2. The structure of claim 1 wherein the filaments are crimped.

3. The structure of claim 1 wherein the filaments are cropped at the ends of the tube.

4. The structure of claim 1 wherein the filaments extend from the end of the tube.

5. The structure of claim 4 wherein the extension of the filaments is non-uniform.

6. A filter tipped cigarette wherein the filter comprises a bundle of adjacently disposed, crimped, hollow capillary filaments of cellulose acetate ranging in size from about 2 up to about 20 denier per filament fitted snugly in a hollow tube in such manner that the long dimension of the said filaments lies along the length of the said tube, the union of filter and cigarette in abutting relationship being enhanced by the extension of the said filaments into the packed tobacco.

References Cited in the file of this patent

UNITED STATES PATENTS

586,343	Pollak	July 13, 1897
606,537	Goldenfarb	June 28, 1898
1,652,206	LaHousse	Dec. 13, 1927
1,904,209	Dreyfus	Apr. 18, 1933
2,126,422	Tarrant	Aug. 9, 1938
2,228,383	Berl	Jan. 14, 1941
2,520,502	Haux	Aug. 29, 1950
2,707,308	Taylor et al.	May 31, 1955
2,774,680	Hackney	Dec. 18, 1956

FOREIGN PATENTS

300	Great Britain	1872
41,939	Germany	Dec. 10, 1887
121,414	Australia	May 14, 1946
145,160	Great Britain	June 28, 1920
276,403	Switzerland	Oct. 1, 1951
451,682	Great Britain	Aug. 10, 1936
665,278	Great Britain	Jan. 23, 1952
694,436	Great Britain	July 22, 1953
845,177	Germany	July 28, 1920