

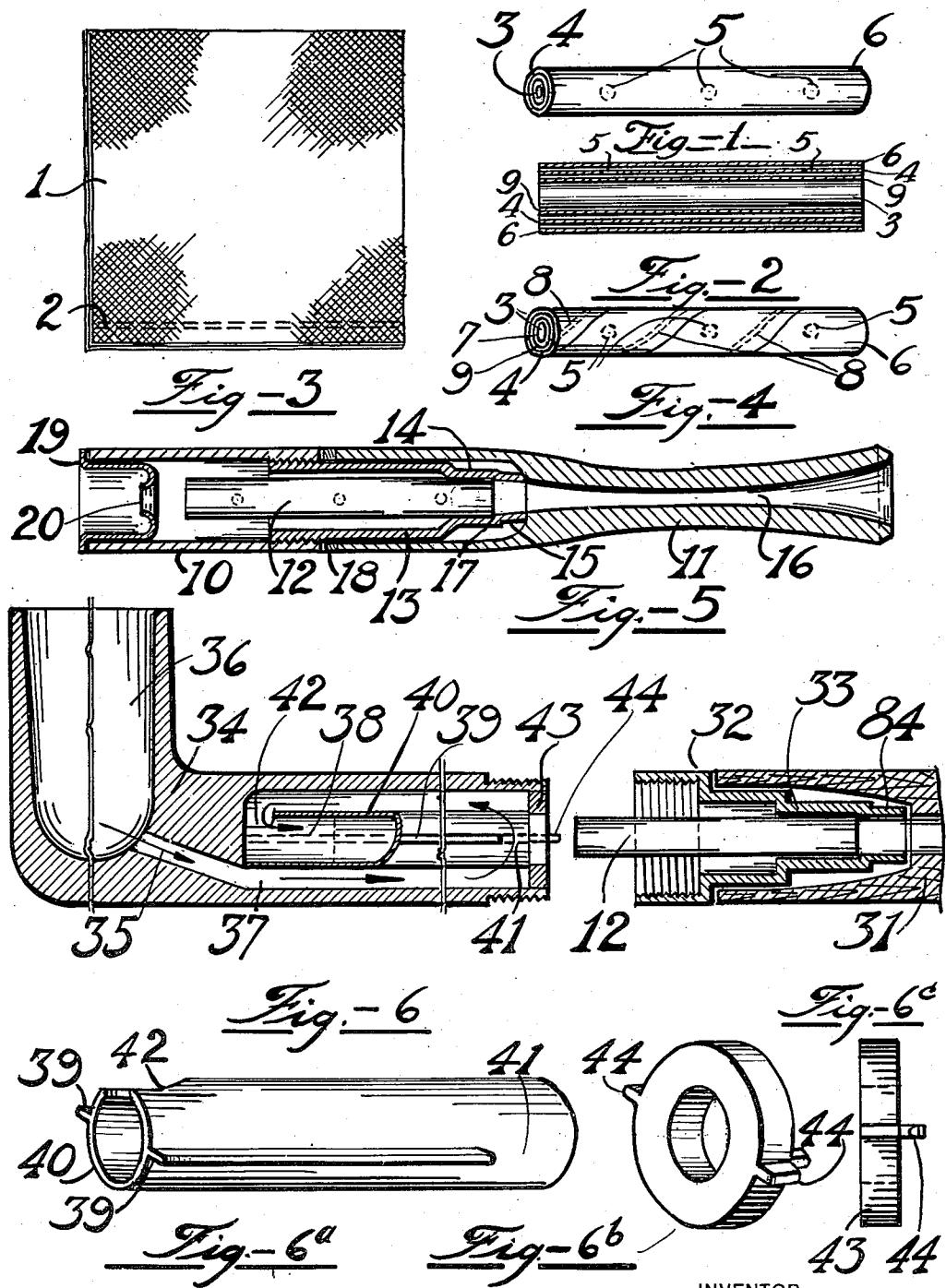
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J. G. TARRANT

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SMOKE FILTER

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INVENTOR  
JOHN G. TARRANT

BY  
j. R. Small  
ATTORNEY

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## SMOKE FILTER

John G. Tarrant, New York, N. Y.

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This invention relates to improvements in smoking devices, such as pipes and cigarette holders, and more particularly to improved smoke filters and means for using them.

It is an object of this invention to provide an improved smoke filter of low resistance to air flow and of great efficiency in removing tarry and other objectionable matter from tobacco smoke.

Another object is to provide a filter having an impervious coating which retains its fresh, clean outer appearance although it is made black and tarry on the inside by the smoke.

Another object is to provide such a filter, having an impervious coating, with means for indicating the extent of use to which the filter has been put.

Another object is to provide means for holding the filter whereby clogging of the ends is prevented.

Other and further objects of this invention will be apparent from the drawing and the following description and claims:

In the drawing,

Figure 1 is a view of one modification of the improved filter of this invention.

Figure 2 is a sectional view of the same filter.

Figure 3 is a view of one form of the improved filter element of this invention, before being rolled into the cylindrical shape in which it is used.

Figure 4 is a view of another modification of the improved filter. This filter can be made in a continuous operation, applying spiral wrappings of the various layers on a moving core, and cutting the finished filter tube into suitable lengths.

Figure 5 is a sectional view of an assembly of the filter in a cigarette holder.

Figure 6 is a sectional view of an assembly of the filter in a pipe.

Figures 6a, 6b, and 6c are views showing certain details of the assembly illustrated in Fig. 6.

Similar numbers refer to similar parts throughout the several views.

Referring to the drawing in greater detail, a piece of gauze is diagrammatically illustrated in numeral 1. This is of the type of medicinal gauze, the threads being of a loosely twisted cotton fibre, and of such size that the open spaces between threads is about 2 to 20 times the width of the thread. This gauze is made into a roll which is the preferred form of the filter. One or more rows of stitching 2 may be placed along the edge of one side to serve as an aid in starting the roll. When the thin stitched gauze is formed into a roll with the stitching at the center, this slightly compacted portion insures against an open center of the roll and serves to prevent channelling of gases. It also serves as an absorb-

ent core to take up moisture that would otherwise go to the outer edges of the roll. Instead of stitching, a similar effect is gained by weaving the gauze in strips having an edge more closely woven than the remainder, such as a thin selvage edge. In weaving larger widths than required for the filter, similar closely woven strips may be woven at distances equal to the width required for a filter, and the gauze may then be cut into strips each having one selvage edge. Two or more layers of gauze may also be superimposed preparatory to making the filter roll. In such case the layers may be stitched together along one edge, this serving to hold them in proper position in addition to the advantages noted above.

A similar roll may be prepared by folding back upon itself a narrow strip along one edge of the piece of gauze and stitching through this to form a hem. Such stitching also aids in starting the roll and forms an absorbent core which also prevents channelling of gases, as described above.

In preparing the filter the gauze is brought into a loosely packed, elongated form in which the plane of the surface of the gauze is substantially parallel to the long dimension. The gauze is preferably made into a roll of substantially cylindrical shape of any suitable size for use in a cigarette holder or pipe stem. Strips of gauze, laid roughly parallel in a bundle, may also be drawn through a suitable cylinder and may be even given a slight twist in the cylinder. However, a cylindrical roll of gauze is the preferred form for this invention.

The gauze filter 3 is preferably encased in some form of protective coating 4 to hold it in shape both before and during use, and also to provide a clean and dry outer surface of the used filters, thereby to protect the hands of the user from the odorous, tarry matter filtered out of the tobacco smoke. The coating is also substantially impervious to the flow of gas, thereby providing that the smoke passes through the filter from end to end. Such a coating may be made of waterproofed paper or of suitable synthetic materials such as cellulose acetate sheet. The coating may be also made of dense, highly-glazed paper which is not completely waterproof but is penetrated by water only slowly and with difficulty. This coating is also preferably opaque, or practically so, to conceal from view the tarry matter which is deposited on the gauze filter within.

When the coating is opaque, it is preferred to provide some indication of the extent to which the filter has become fouled in use. This may be accomplished by leaving one or more small openings through the opaque coating, in the form of a narrow slit preferably parallel to the axis

of the cylinder, or more conveniently in the form of spaced perforations 5.

A second outer coating 6 may also be provided. This coating is provided primarily for appearance. It may be a soft, pure white paper, or any other desired material and color. In using the filter, the interior of the filter will be progressively fouled in the direction of travel of the smoke; and the outer coating 6 will be stained at the spots opposite the holes 5 in the inner coating. The extent of staining of the spot or spots serves to indicate that the filter should be replaced, although its general outer appearance is still clean and neat, in sharp contrast to filters whose entire outer surface is stained in use, or which are covered with a transparent coating.

A second construction of the improved filter is shown in Figure 4. This filter is particularly adapted for manufacture by automatic machinery. It contains a core 7 which is preferably of absorbent material such as cotton string, upon which are wound spirally enough layers of gauze to make up the desired thickness. In winding the strips of gauze, each strip should overlap itself as little as possible. The center of each strip is placed over an edge of the previously wound strip, each layer thereby overlapping the joint in the next inner layer to increase the rigidity of the roll. A gas and moisture-impervious coating 4 and an outer coating 6, both of which are described above in connection with Figures 1 and 2, may also be wound as spiral layers on the gauze roll. The coating 4 may also contain perforations 5 and the edges of this coating (indicated as dotted lines 8 in Figure 4) may be sealed with a suitable adhesive to prevent leakage therethrough. Another method for indicating the extent of usage of the filter is leave these edges 8 unsealed and to wrap the outer layer strip on so that it overlaps the joint between these edges. The penetration of moisture through the joints of the coating 4 thus stains the outer coating 6 in a spiral line, the intensity of this stain indicating the extent of use of the filter.

A layer of absorbent paper, preferably soft and as thin as the gauze, may be provided between layers of the gauze to permit absorption of moisture from the gauze and thereby to aid in keeping the openings in the gauze clean and to maintain the baffling action of the gauze. If more than one layer of paper is used, at least one layer of gauze should be between the layers of paper. A layer of absorbent paper may also be wrapped around the roll of gauze before the protective layer 4 is applied. Such layer is indicated by the number 9 in Figure 2 and Figure 4.

An example of a suitable filter material for use in the improved filter of this invention is medicinal gauze, preferably the soft-fibered type recommended for use as waistbands for babies. This gauze has the advantage of being entirely antiseptic and odorless, as well as absorbent. It also has numerous soft fibres of lint projecting from the surface of the threads. It may be conveniently in the form of a print cloth of the following construction:

Warp—44 threads per inch of single 40's yarn.  
Filling or woof—40 threads per inch of single

30's yarn.

Width before cutting—44 inches.

Weight—7.25 yards per pound.

The yarn is a standard, loose twist for both the warp and the filling. This cloth is then

bleached, washed and sterilized according to the usual practice in making medicinal gauze.

While the above gauze has been described in order to illustrate this invention, it is to be understood that the invention is not to be limited to this particular gauze, but that it also includes the use of other types of cloth, such as cheese-cloth, preferably soft or unsized, in which the proportion of the total area of the holes in the cloth to the area covered by the yarn, is large, the width of the openings being about 2 to 20, and preferably about 3 to 5 times the width of the yarn, measured on both the warp and the filling, and the yarn being as soft and as loosely twisted as is compatible with the necessary strength for handling. The gauze may be made up of yarns of other textile fibres than cotton, such as wool and linen, which are preferably soft and absorbent.

20 The gauze may be medicated, if desired or perfumed, to suit the individual taste, though this is not necessary to the operation of the filter.

As indicated above, it is preferred to use sterile gauze. It is also preferred to sterilize the completed filter rolls. This may be done after they are packed in the boxes in which they are to be sold, thereby assuring the purchaser of receiving clean and sterile filters.

It has been found that filters constructed in 30 the manner described above, of rolls of gauze, are far more efficient in removing tarry and other throat-irritating matters from tobacco smoke than are even much larger filters of absorbent paper, cotton, or other matted fibre, or cigarette 35 tobacco. The gauze filters also have the advantage of very low resistance to flow of smoke so that the "pull" of the cigarette or pipe being smoked is not objectionably increased.

The close lattice-work structure of the gauze 40 roll not only produces a very large surface having absorbent properties, but also provides a great number of baffles, thereby causing the flow of smoke to be repeatedly and abruptly changed in direction and causing the solid and liquid matter 45 suspended therein to be thrown against the absorbent surfaces of the baffles. The structure of the gauze thus is such that a roll wherein the surface of each portion of gauze is contiguous on each side thereof with an adjoining surface 50 of gauze or paper, provides almost infinite baffled paths of low resistance to the flow of smoke. Even when wet by use in filtering smoke it does not mat together, but the meshes remain open and the resistance to the flow of smoke is not 55 increased.

Suitable means for using these filters in cigar and cigarette holders and in pipes are illustrated in Figures 5 and 6. It is desirable that the ends of the filter should not be obstructed by anything 60 coming in contact with the gauze. Anything touching the gauze at the ends of the roll causes deposition of matter at that point; this builds up sufficiently to interfere with and to obstruct partially the flow of air. It is also desirable, particularly when using the filter in pipes, to provide means for trapping out water, tobacco particles, etc., from the smoke before it reaches the filter.

Referring to Figure 5 in detail, a cigarette or cigar holder is divided in two sections, a tobacco holding member 10 and a bit or mouthpiece member 11. These may be constructed of any suitable material such as wood or metal or of a synthetic resinous material such as Catalin or Bakelite which can be stamped or moulded in the shapes desired. Means for holding the filter 12 com-

prises a bushing 13 fitted tightly into the member 11. The front end of this bushing has an inside diameter slightly greater than the outside diameter of the filter, thus providing for free movement of the filter in and out of this section. Near the rear end of the bushing, filter holding and aligning means 14 are provided by reducing the bushing to an inside diameter approximately the same as the outside diameter of the filter. This provides a friction fit between bushing and filter sufficiently tight to hold the filter in place, to align it along the axis of the bushing, and to prevent air from by-passing the filter in passing through the holder, and sufficiently loose to permit the filter to be inserted with a gentle push and to be removed easily, as by a slight pull or even, without touching it, by a quick flip of the member 11. At the rear end of means 14 is provided means 15 for stopping the filter and for spacing it from the end of the smoke passage 16. Means 15 may be in the form of a finger, shelf, ridge, or other projection into the reduced tube 14. The preferred structure is illustrated as a further reduction in diameter of the bushing, thereby providing a shoulder 17. This shoulder should preferably be sharp edged, and flat, in a plane perpendicular to the axis of the bushing. A blunt edged or tapering shoulder must be of much greater thickness to stop the end of the filter as effectively. The thickness of this shoulder, or, in other words, the difference in radius of the end section 15 and the section 14 of the bushing, is preferably less than the thickness of the coating layers of the gauze roll of the filter, and is suitably about one-half this thickness. Sections 14 and 15 may each have a length about equal to the diameter of the filter tube 12.

Means for connecting the sections 10 and 11 of the holder are provided by extending the front end of the bushing 13 beyond the end of section 11 and threading it for engagement with the rear end of section 10. An annular ring 18 may be provided as a washer. If of different color from the members 10 and 11, it also serves as a design feature. A cigarette or cigar holding means may be provided by suitable projections which may be moulded as a part of the front end of section 10, or a separate member 19 made conveniently of aluminum, may be pressed tightly into the open end of section 10, permitting this section to be formed simply as a straight tube. This means preferably comprises some form of baffle or trap to prevent tobacco from reaching the front end of the filter 12, such as the forwardly projecting wall 20 of the smoke passage through this member.

Figure 6 illustrates means for holding the improved filter of this invention in the stem of a pipe. The mouth-piece or bit member 31 has an enlarged smoke passage at the front end into which the bushing 32 is tightly fitted. This bushing has holding and aligning means 33 and stopping and spacing means 34 for the filter 12 as in Figure 5. The front end of the bushing is expanded to the same size as the outside diameter of the pipe stem, and is threaded on its inner side for engagement with the tobacco holding member 34. This member has a smoke passage 35 connecting the bowl 36 to the lower section of an enlarged smoke passage 37 in the stem portion. This smoke passage has grooves 38 on each side for engaging fins 39 for an inner smoke baffle element, illustrated in Figure 6a. These fins are attached to a tube 40 and separate the annular space around this tube into upper and lower 75

chambers connecting only at the rear end 41 where the fins are omitted. The tube 40 has a section cut out of its upper half at the front end to provide an opening 42 between the upper chamber and the space inside the tube. A washer 43 (illustrated in Figures 6b and 6c) has an opening of about the same inside diameter as the tube 40 and has an outside diameter slightly less than the diameter of the smoke passage 37, thereby making a snug fit in the rear end of this chamber and closing this end of the annular space about the tube 40. This washer is not necessary to the operation of the smoke baffles or the filter, but its use is preferred in order to keep smoke from contact with the threaded sections of the bushing. The washer may also have small projections 44 for fitting into the grooves 38. One of such projections may extend backwards enough to permit the insertion of a finger nail or other thin instrument in a notch therein when it is desired to remove the washer in order to clean the smoke passages. With the washer and the filter removed, all smoke passages in the member 34 are easily accessible from the rear for cleaning with an ordinary pipe cleaner.

The direction of flow of smoke through the member 34 is indicated by arrows. The front end of the lower half of the tube 40 and the fins 39 fit tightly against the wall forming the front end of the smoke passage 37, and may project slightly into suitable grooves cut therein, if desired. The tube has an inside diameter slightly larger than the outside diameter of the filter 12, thereby permitting its easy insertion and removal, and is of such length that the filter does not project into the opening 42.

One example of a filter constructed as described above is a filter roll gauze coated with a layer of thin soft absorbent paper, then a thin, 40 perforated waterproof coating and an outer coating of paper, the outside diameter being 0.170 inch and the length being  $1\frac{1}{8}$  inches. Although individual tastes vary as to extent of use of tobacco smoke filters, a gauze filter of these dimensions normally gives entirely satisfactory service during the smoking of at least 20 cigarettes of the usual size. A suitable holder for such a filter, constructed as bushing 13 illustrated in the drawing, has an inside diameter of 0.220 inch, providing a clearance between the filter and bushing of 0.025 inch. The section 14 has an inside diameter of 0.17 inch, and the section 15 an inside diameter of 0.16 inch. The bushing may suitably be stamped or spun from  $\frac{1}{4}$  inch aluminum tubing of 0.015 inch wall thickness, or it may be made as an integral part of the bit member 11.

This invention is not to be limited to any specific examples or illustrations presented above, all of which are intended solely for purpose of illustration, but is limited only by the following claims, in which it is intended to claim all novelty insofar as the prior art permits.

I claim:

1. A smoke filtering device comprising a roll of absorbent textile material, a coating having an opening therein and made of gas and water impervious material, and an outer opaque coating capable of being stained throughout its thickness by matter absorbed in the filter and transmitted through said opening.

2. A smoke filtering device comprising a roll of gauze, a coating comprising a layer of absorbent paper, a second layer of gas and moisture impervious material having an opening therein

and an outer coating of paper capable of being stained throughout its thickness by matter deposited in the filter and transmitted through said opening.

3. A smoke filtering device comprising a roll of absorbent textile material in convolute windings about an absorptive core which is relatively more compact in relation to the remainder of said roll.

4. Device according to claim 3 in which said

core comprises a plurality of layers of said textile material stitched together along one edge.

5. A smoke filtering device comprising a roll of gauze about an absorptive core comprising stitching along one edge of the gauze.

6. Device according to claim 5 in which said core comprises two layers of gauze stitched together along one edge.

JOHN G. TARRANT.