Oct. 31, 1961 E. I. GOLDING 3,006,346

FILTERS FOR CIGARETTES AND CIGARS AND METHOD OF MANUFACTURING SAME

Filed Dec. 15, 1958

Fig. 1.

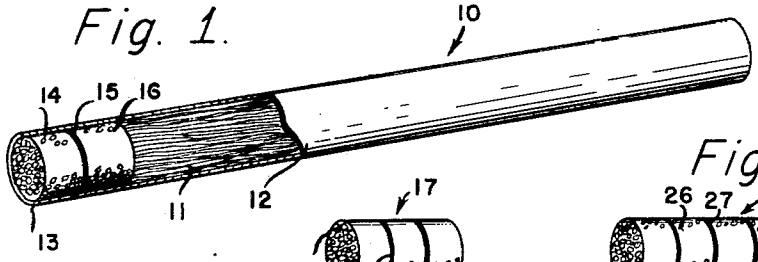


Fig. 3.

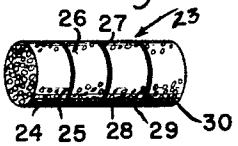


Fig. 2.

Fig. 4.

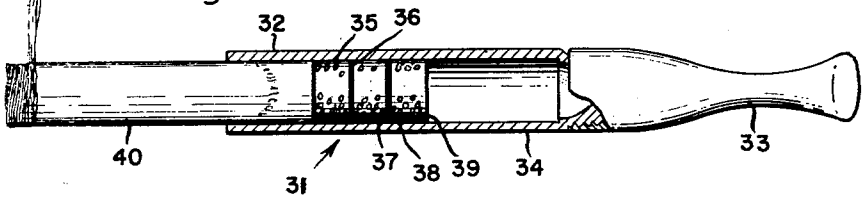


Fig. 5.

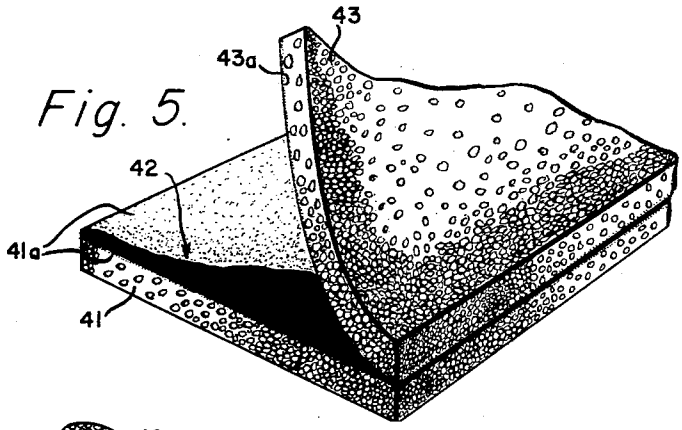
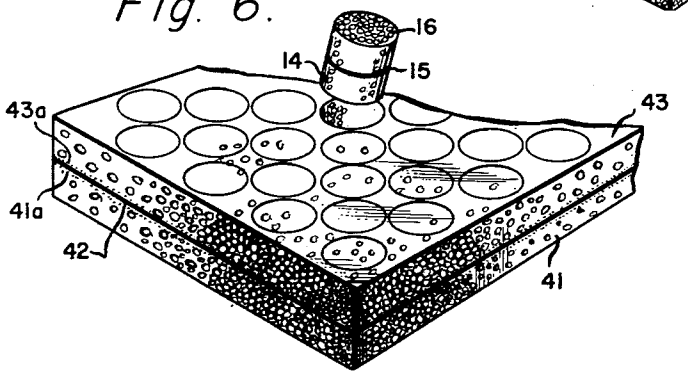


Fig. 6.



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FILTERS FOR CIGARETTES AND CIGARS AND METHOD OF MANUFACTURING SAME

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The present invention relates to novel filters for cigarettes, cigars and the like as well as to cigarettes and the like incorporating such filters as a component thereof. It also relates to a method for the manufacture of such filters.

An object of the invention is to provide a filtering member which can effectively remove a substantial proportion of the nicotine, tars and other undesirable residues produced during combustion of tobacco.

A further object of the invention is to provide a filtering member which can be cheaply produced in large quantities and can be handled as an individual unit so that it can be incorporated in cigarette and cigar holders or inserted in cigarettes in place of existing filters.

An additional object of the invention is to provide a unitary filter member which is highly efficient and which can be readily incorporated in a cigarette during its manufacture.

A still further object of the invention is to provide a method for the manufacture of cigarette filters of the type described which is simple and yet efficient and which is adapted to large volume production.

An additional object of the invention is to provide a method for the assembly of a laminated filter element incorporating a layer of granules or particles which will retain such particles in place without substantially interfering with circulation or drawing capacity.

Filters of the type presently utilized are generally composed of cellulosic material in the form of rolled thin paper or pads of cotton, paper or similar material. Cellular materials such as sponge, either alone or in combination with cotton or the like, have also been tried. Attempts have also been made to incorporate adsorptive materials in such filters by impregnating paper or the like with finely divided activated carbon and utilizing this material as a filter. Such filters have only been partially successful since they remove only small proportions of harmful ingredients, and in the case of paper impregnated with carbon, the use of any significant amount of carbon has been found to inhibit the drawing characteristics of the cigarette while the carbon tends to be removed from the paper and carried into the stream of smoke. Furthermore, such filters are fragile and can be handled only with difficulty.

Applicant has discovered that an effective filter may be prepared by interposing one or more separate layers of a particulate or granular adsorptive material such as active carbon between layers of cellular material and assembling these layers in a unitary manner to form a composite filter which can be handled as a unit without injury. Furthermore, such a filter enables the incorporation of the active material in a particle size which is highly effective as an adsorbent with no danger of disintegration during use and while permitting ready circulation of smoke through the cigarette or cigar to the smoker.

The accompanying drawings and description thereof illustrate the manner in which the invention is applied.

FIGURE 1 is a view in elevation of a cigarette incorporating one form of filter of the invention with the end tube and cigarette paper broken away.

FIG. 2 is a view in elevation of another form of filter made according to the invention.

FIG. 3 is a view in elevation of still another modified form of the filter of the invention.

FIG. 4 is a view partly in elevation and partly in cross section showing a filter of the invention introduced into a cigarette holder.

FIG. 5 is a view in elevation illustrating the assembly of the filter material.

FIG. 6 is a plan view illusrating the manner in which the individual filter elements are formed.

Referring now to the drawings, **10** represents a cigarette as a whole, **11** is the tobacco filling, and **12** the cigarette paper. Tubular paper end portion **13** is provided to receive the filter cylinder which is composed of a unitary laminated assembly with layers **14** and **16** or cellular material and intermediate layer **15** of active adsorbent material such as active carbon or charcoal and bonded between the cellular layers. The cellular layers are preferably composed of cellular sponge of the at least partially open type. This material may be of foam rubber or viscose sponge of the conventional type or may be of sponge rubber or polyvinyl chloride foam treated or formed to possess an interconnected cell structure as by rolling between pressure rollers or the like as is well known to the art. Other cellular materials permitting circulation of air therethrough may also be used. Preferably, however, applicant has found that cellular material of the foamed urethane type offers certain advantages in filtering effect, circulation of smoke, freedom from taste and odor, and ease of fabrication and assembly. This material may be of the flexible, rigid, or semirigid type and is formed by methods well known in the art as by U.S. Patent Nos. 2,785,739, 2,780,606, 2,785,739, 2,764,565 and others and as described in numerous publications such as "Modern Plastics," August 1955, pp. 102–104, 212–215, and "British Plastics," January 1956, pp. 5–9, 39. These materials have varying degrees of porosity, but even those considered as closed cell types have a certain percentage of open cells making them porous when used in relatively thin sections. The flexible foams have a greater degree of porosity and are preferred for use in making these filters. In general, the cell size ranges from about 0.01 to 0.1 inch in diameter.

The adsorbent material is composed of granules or particles of an active or activated adsorbent, a preferred example of which is active carbon or activated charcoal. Other suitable active adsorbent materials such as silica gel or the like may also be used. Activated carbon is generally prepared by the charring of animal matter, or by destructive distillation of vegetable matter or by selective oxidation at relatively high temperatures in the presence of water vapor in the manner well known in the prior art. The term active or activated carbon applies to various forms of carbon or charcoal which have been made active for the adsorption of gaseous and liquid materials.

The method for the manufacture of the filter element shown in FIG. 1 is illustrated in FIGS. 5 and 6. A sheet **41** of cellular material of the desired thickness is formed. To the upper surface of this sheet is applied a thin layer of a suitable adhesive **41***a*. In order to avoid excessive blocking of the pores or cells of the material, the adhesive is preferably applied in dilute form in a thin film. A suitable "non-blocking" adhesive has been found to be a diluted rubber latex emulsion in which the latex is diluted to about 10–12 percent rubber solids. The latex has had incorporated therewith a small proportion of a surface active agent so that when the latex is beaten or whipped a foam will be generated. This surface active agent may be of any well-known type, such as conventional soaps, or synthetics, such as sodium lauryl sulfate, or the like. The foamed diluted latex is then applied to the surface of the cellular material by brushing to deposit a thin film of the adhesive material. Apparently the foamed adhesive permits application of the film without

obstructing the pores of the cellular material. At this point, while the adhesive is still tacky, a layer of granular adsorbent particles of charcoal or the like is applied over the surface by sprinkling or dusting it on, a continuous layer being thereby anchored to such surface, the excess being then removed. Any desired particle size may be utilized, but a mesh size of 20–40 per inch is preferred. The thickness of the layer may also be varied but from about 1/10 to about 1/40 of an inch is suitable with about 1/30 inch being preferred, this representing a layer approximately the diameter of an average particle so that a layer one particle thick is obtained. However, a greater thickness may be utilized as long as the layer is satisfactorily retained between layers of cellular material. This layer is substantially continuous and is formed by the applying of particles in such manner that adjacent particles are in contact with each other throughout the layer. In this way products of combustion pass through the layer in contact with the particles so that tar, nicotine and similar impurities are adsorbed.

After the adsorbent layer is applied, a layer of adhesive **43***a* is similarly applied to the under surface of the sheet of cellular material **43**. This sheet is then applied over the lower sheet and the layer of adsorbent material and the layers lightly pressed together. In this way the adsorbent particles are anchored between layers without substantial blocking of the pores of the adsorbent or the cells of the cellular material. Instead of using the latex emulsion adhesive referred to, satisfactory results may be obtained by means of a highly diluted solvent type adhesive which is brushed or sprayed on to leave a tacky surface to which the carbon can adhere.

The composite laminated sheet is then subjected to a coring operation using multiple cores to form individual cylindrical filter elements illustrated in FIG. 6. As illustrated therein, a filter element having the structure shown in FIG. 1 is obtained. In this way a great many filter elements may be produced from a sheet of any desired area. Since the dimensions of a filter element for cigarettes are approximately 5/32 inch in diameter and ½ to ¾ inch in length, it can be seen that a great many such elements can be produced cheaply per square foot of laminated assembly.

In view of the fact that the porosity of the assembly is not appreciably affected by the use of the intermediate layers of adhesive and adsorbent, a plurality of separate, spaced layers of adsorbent may be utilized as illustrated in FIGS. 2 and 3. As shown in FIG. 2 filter **17** is formed of layers **19** and **21** of charcoal interposed between layers **18**, **20** and **22** of cellular material. In FIG. 3, filter member **23** is formed with layers **25**, **27** and **29** of charcoal, bonded and spaced between layers **24**, **26**, **28** and **30** of cellular material.

The individual filter members may be introduced into the filter tip sections of cigarettes in the conventional manner, or may be inserted in place of existing filters in cigarettes by removing the old filter and replacing it with one of the present type. These elements may also be utilized in cigar and cigarette holders as replaceable elements as illustrated in FIG. 4. As shown, holder **31** is formed with a tubular barrel **32** and mouthpiece **33**. A filter member of the type illustrated for example in FIG. 2 is inserted into cavity **34**. This filter is provided with charcoal layers **36** and **38** bonded between layers **35**, **37** and **39** of cellular material. Cigarette **40** is shown in smoking position. If desired, the shape of the barrel may be designed to accommodate a cigar or cheroot. A single filter has been found to remain effective during the smoking of several cigarettes.

Filter elements of the type described have been found to draw well while effectively filtering a substantial proportion of the undesirable constituents of tobacco smoke. In tests carried out with two well-known popular brands of cigarettes comparing a filter constructed according to FIG. 1 using flexible urethane foam end segments and an intermediate layer of activated charcoal formed of particles averaging 30 mesh, the layer being 1/30 of an inch in thickness, with conventional cellulose or charcoal impregnated paper filters as used in the cigarettes, it was found that the filter of this invention removed from 20 to 25 percent more tar and from 15 to 20 percent more nicotine than the conventional filters. At the same time filter drawing ability was noted along with freedom from charcoal or other particles in the effluent smoke stream.

It will be apparent that various changes or modifications may be made in the above-described invention, within the scope of those skilled in the art without departing from the spirit of the invention as defined in the appended claims.

I claim:

1. A filter comprising: at least two layers of porous material; and a relatively thin layer of adhesive having openings therethrough disposed between said layers of porous material and adapted to bond said layers of porous material together, said adhesive layer comprising adsorbent, finely divided material.

2. A filter comprising: at least first and second layers of porous cellular material; first and second relatively thin layers of adhesive having openings therethrough disposed upon juxtaposed surfaces of said first and second layers of cellular material respectively; and a layer of adsorbent, finely divided material disposed between and bonded to said layers of said adhesive to thereby effectively bond said layers of cellular material and form a unitary filter.

3. A filter according to claim 1 wherein said adsorbent material comprises activated charcoal.

4. A filter according to claim 3 wherein said porous material is a foamed urethane polymer.

5. A filter according to claim 2 wherein the cellular material is a porous, resilient sponge and the adsorbent material is activated charcoal.

6. A filter according to claim 5 wherein the cellular resilient material is formed of a foamed urethane polymer.

7. A filter for use in combination with cigarettes, cigars and the like comprising: a cylindrical assembly having a plurality of layers of porous cellular resilient material disposed along the longitudinal axis of the cylinder; and a relatively thin layer of adhesive having openings therethrough disposed between and adapted to bond together adjacent layers of said celular material, said adhesive layer comprising adsorbent, finely divided material.

8. A tobacco cigarette comprising a column of tobacco and a filter arranged end to end; and a wrapper surrounding said filter and tobacco, said filter including a plurality of cylindrical segments of cellular sponge material and a continuous relatively thin layer composed of separate adjacent and contiguous particles of finely divided activated carbon disposed between said segments and adhesive material having openings therethrough and bonding said particles together and said segments to said layer and to said segments.

9. A cigarette and cigar holder which comprises a hollow cylindrical member open at one end to receive a cigarette or cigar and communicating at the other end with a mouthpiece, and a filter removably positioned in said hollow member comprising: a plurality of cylindrical segments of cellular sponge material and a continuous relatively thin layer composed of separate adjacent and contiguous particles of finely divided activated carbon disposed between said segments and adhesive material having openings therethrough and bonding said particles together and said segments to said layer.

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