United States Patent

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[54] CIGARETTE FILTER
2 Claims, 2 Drawing Figs.

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[51] Int. Cl. A24b 15/02, A24d 1/06
[50] Field of Search ..... 131/10.7, 10.9, 265, 266, 261 B

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ABSTRACT: A cigarette filter including crushed and screened substantially uniformly sized particles of flux calcined diatomaceous earth, the smaller particles being approximately no less than 25 percent of the size of the larger particles to prevent undesirable smoke flow restriction from filling of voids, wherein an exemplary broad size range is from approximately 100 to 425 microns and an exemplary optimum size range, when the particles are associated with conventional cellulose filters, in order to prevent undue draft restriction, is from 175 to 210 microns.

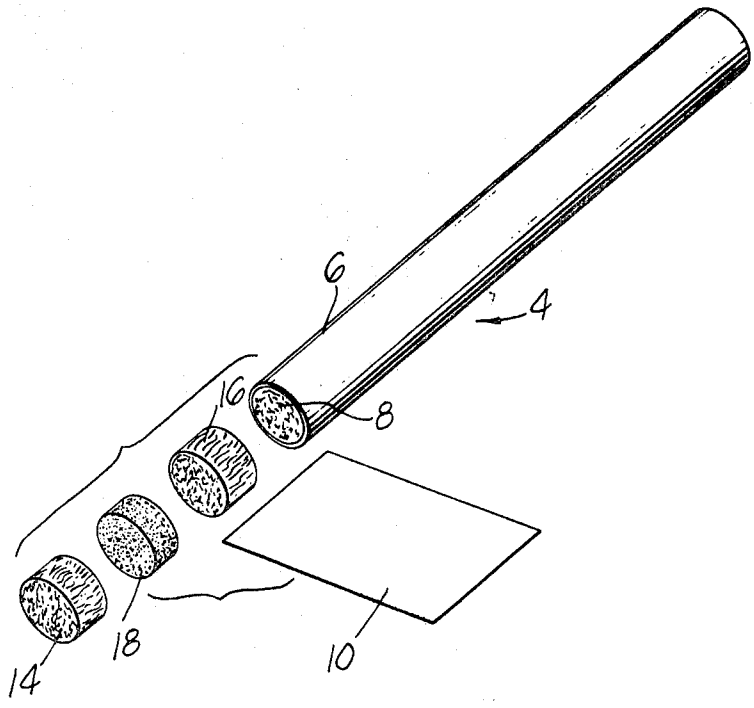

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FIG. 1.

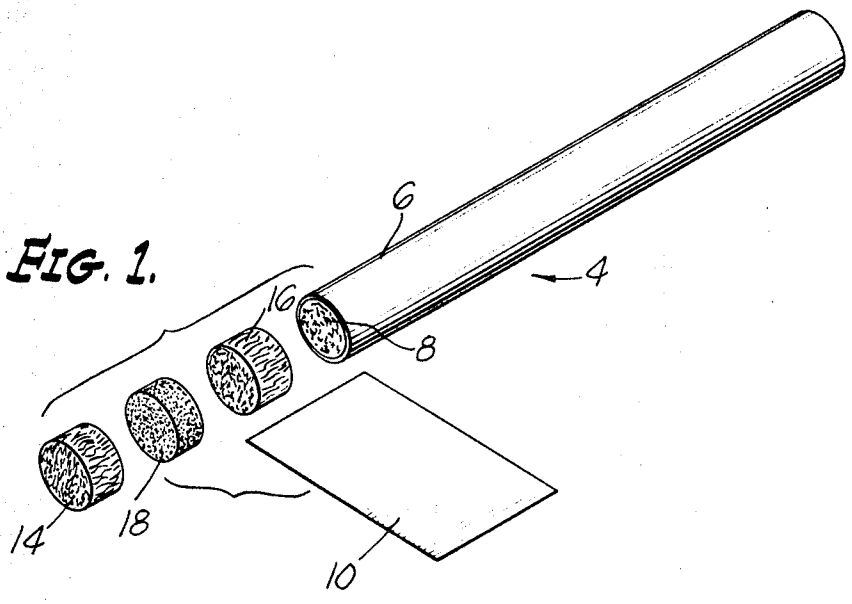
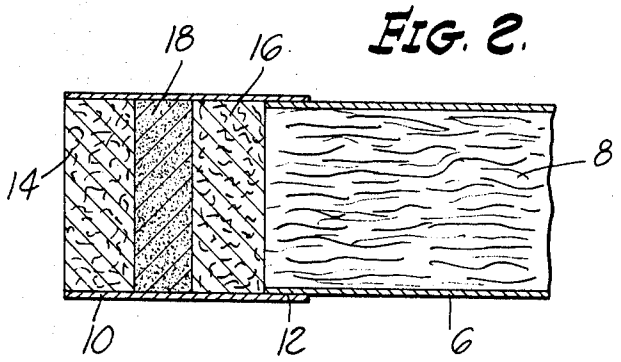


FIG. 2.



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CIGARETTE FILTER

This invention relates to a cigarette filter and primarily to a filter material which will collect undesirable particulate matter, said particulate matter in this disclosure referring to tars and nicotine in condensed form and any other undesirable products of combustion in smoking tobacco.

My improved filter material can conveniently be used in conjunction with conventional cellulose fiber filter material, such as is presently used. However, it has considerably greater efficiency than the fibrous material and I use the latter primarily for retaining my improved filter material and also for giving body to the mouthpiece of the cigarette.

Various granular substances have been utilized as filter material in cigarettes heretofore. Currently, activated charcoal particles are being used.

I have discovered that a highly efficient economical tasteless filter material is diatomaceous earth carefully screened to provide relatively uniform particle size within a range which will collect the above mentioned particulate matter directly or by condensation and yet which will not interfere with the comfortable drawing of smoke through the cigarette by the user.

In my copending application for patent, Ser. No. 700,924, filed Jan. 26, 1968, now abandoned, I disclose the use of diatomaceous earth broadly and in uncalcined form. However, since the filing of that application, extensive further investigation has brought me to the present concept that flux calcined diatomaceous earth in rather carefully controlled particle size results in a highly efficient filter which does not obstruct the normal draft of smoke through the cigarette and the filter.

I have discovered that where diatomaceous earth is merely crushed so its largest particles are reduced to a certain approximate size adaptable for efficient filtering, much of the material is reduced to infinitely smaller sizes which will fill the voids between the larger particles and obstruct the passage of smoke and air to the extent that the filtering material must be reduced to an insufficient amount. In other words, in order to comfortable draw smoke through the material with its voids rather completely filled, I could not use enough filtering material to trap the amount of particulate matter desired.

The object of the present invention therefore is to provided a cigarette filter comprising diatomaceous earth suitably confined of course in a tubular filter structure which will entrap or collect a far greater percentage of particulate matter than presently known filter structures and materials, while at the same time maintaining ease of flow of the smoke through the cigarette and the filter.

The above and other objects will appear more fully from the following description in connection with the accompanying drawing:

FIG. 1 is an exploded view of an embodiment of the invention;

FIG. 2 is an enlarged sectional detail of a portion of a cigarette and the filter.

In the drawing there is shown a cigarette 4 including a tubular paper 6 containing shredded tobacco 8. At the rear of the cigarette is a filter wrapper or tube 10 which may be secured to the paper 6 by adhesive at 12. The filter tube 10 contains therein spaced plugs 14 and 16 which may conveniently be of a conventional cellulose fiber cigarette filter material.

Between the filter plugs 14 and 16 is a quantity of granules or particles 18 of diatomaceous earth. While the fibrous filter plugs 14 and 16 do to some degree absorb or adsorb particulate matter from the smoke of the cigarette, I have found through actual and extensive tests that diatomaceous earth in the condition determined by me is much more efficient than the cellulose fiber filter material. However, I utilize plugs of the cellulose fiber at 14 and 16 as convenient means for confining the diatomaceous earth particles 18 in the filter structure.

In my above mentioned earlier application, it was my opinion at that time that uncalcined diatomaceous earth would be more efficient in collecting the particulate matter from the smoke. However, since then I have discovered that

flux calcined diatomaceous earth is necessary. Flux-calcined diatomaceous earth is obtained by calcination of the diatomaceous earth in the presence of a flux, generally soda ash, although sodium chloride may also be employed, as set forth in Kirk-Othmer, 1965 edition, Vol. 7, page 60, on *Diatomite*. What is more important is the fact that the filter will act with great efficiency and maintain easy draw characteristics when the diatomaceous earth particles are kept within reasonable range of size uniformity. While a particle crushed from a certain maximum down to dust would collect more of the particulate matter from the smoke, it rendered the flow of smoke through the filtering material quite difficult. This made the filter impractical because of the effort required by the smoker to draw the smoke through the filter.

I have determined that I can produce a highly efficient easy draw filter, approximately within the size limits of conventional cigarette filters, by using two short plugs of cellulose fiber material to retain a quantity of the diatomaceous earth particles. In order to maintain approximately the same proportions or dimensions of over all filter structure as are conventionally used, I found it necessary to, within a reasonable extent, maintain a degree of uniformity of size of the diatomaceous earth particles.

Tests were made to determine the retention of dry particulate matter by a presently marketed cigarette with a cellulose fiber filter. Cigarettes of this type showed retention of 8 mg. of dry particulate matter. These tests were conducted under the same conditions as with other tests utilizing diatomaceous earth, using a smoking machine with the same degree of differential pressure so that the cigarettes were maintained as nearly as possible to a uniform burning temperature and smoking time.

In one series of tests with flux calcined diatomaceous earth, I utilized particles which would pass a No. 48 Tyler screen aperture and would remain on a No. 60 screen aperture (297 to 250 microns) and secured dry particulate matter retention in the amount of 14.5 mg.

With diatomaceous earth particles which would pass a No. 60 Tyler screen and remain on a No. 65 screen (250 to 210 microns), I secured 16.5 mg. dry particles retention in the filter material.

Using diatomaceous earth particles which would pass through a No. 65 Tyler screen and be retained on a No. 80 screen (210 to 177 microns), I secured the maximum dry particulate matter retention of 17 mg.

From my experiments I have determined that diatomaceous earth particles are most efficient and comfortable to use where the particle sizes range from 100 to 425 microns, or, approximately in that range where the particle sizes do not vary more than one to four except of course for insignificant incidental amounts of dust which is present to such a minor degree that it has no effect in the function of the filter.

While the broad range of 100 to 425 microns, or something somewhere in that neighborhood, where the particles range in size from one to four is considerably more efficient than a conventional cellulose fiber filter, I have found that where the size range is between 175 and 297 microns, the efficiency of the filter is greatly increased while the smoking qualities are retained and where even more care is taken to secure the more uniform sizes of 175 to 210, 210 to 250 or 250 to 297 microns, an extremely high degree of efficiency is secured which is more than twice that of the conventional cellulose fiber filters tested as mentioned above.

It should be understood that variations can be made in the specific size ratios set forth herein without departing from the spirit of the invention.

I claim:

1. A filter for cigarettes and the like, wherein the improvement comprises: a filtering section having a cross-sectional area conforming to that of the tobacco smoke passage with which it is to be used and including a number of confined discrete flux calcined diatomaceous earth particles, the sizes of which are uniform to the extent that the smaller particles,

other than negligible amounts of incidental dust, are approximately 25 percent of the sizes of the larger particles, and the particles being greater than 100 microns and less than 425 microns in size.

2. A filter for cigarettes and the like, wherein the improvement comprises: a filtering section having a cross-sectional area conforming to that of the tobacco smoke passage with which it is to be used, and including a number of confined discrete flux calcined diatomaceous earth particles in intimate contact, the size of said particles being substantially uniform and substantially between 100 microns and 425 microns in size.