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PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements in Tobacco Smoke Filter Element

We, THE AMERICAN TOBACCO COMPANY, a corporation organized and existing under the laws of the State of New Jersey, United States of America, of 150 East 42nd Street, New York, State of New York, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to tobacco smoke filters and, more particularly, to a tobacco smoke filter element that introduces a smoke-treating or smoke-modifying liquid into the path of smoke drawn through the filter element.

Numerous proposals have been made heretofore for introducing water or other liquids into a tobacco smoke filter. For example, United States Patent No. 2,808,057 discloses a fibrous filter body containing absorbed water and enclosed in a waterproof cylindrical wrapping sheet having open ends, and United States Patent No. 2,755,206 United States Patent No. 2,863,461 and United States Patent No. 3,162,199 as well as British Patent No. 243,199 describe smoke filters containing collapsible or frangible capsules filled with water or other liquids. Filter elements, containing free liquid pose a problem of retaining the liquid during storage, and those containing capsules or other containers of a liquid often present, after release of the liquid, a problem of holding the released liquid in place without permitting the filter element to remain collapsed after capsule-breaking pressure has been released.

We have now devised a tobacco smoke filter element which does not contain free liquid until released by the smoker and which, after the liquid is released, establishes its shape and function as a smoke filter. The filter element of the present invention comprises an outer wrapper surrounding a body of compressed absorbent material having in its expanded condition passages arranged to permit axial filter-

ing flow of smoke therethrough, and at least one frangible capsule containing a tobacco smoke-treating liquid medium positioned within said body. The capsule is broken to release its liquid medium content into the body of compressed absorbent material when squeezing pressure is applied to the outer wrapper of the filter element, and the compressed body material expands inwardly to fill the tubular outer wrapper substantially completely with the absorbent material in its smoke-filtering expanded condition.

These features of the invention will be more readily understood from the following description taken in conjunction with the accompanying drawing in which:

Figure 1 is a longitudinal cross-sectional view of one embodiment of the filter element of the invention incorporated with a second conventional filter into a dual filter cigarette;

Figure 2 the same view of the same dual filter cigarette after the frangible capsule has been ruptured and the compressed sleeve of absorbent material has expanded to its smoke-filtering condition; and

Figure 3 is a longitudinal cross-sectional view of another embodiment of the filter element of the invention.

As shown in the modification of Figure 1, the filter element of the invention comprises an outer wrapper 5 surrounding a body of absorbent material in the form of a cylindrical sleeve 6 of compressed absorbent material.

Positioned within the sleeve 6, and advantageously frictionally supported thereby, is a frangible capsule 7 containing a tobacco smoke-treating liquid medium 8, such for example as water. In the modification shown in Figure 3, the body of compressed absorbent material is in the form of slivers 9 arranged in generally axial alignment and with a number of frangible liquid-containing micro-capsules distributed therebetween.

The outer wrapper 5 can be of conventional plug wrap paper used in making cigarette filter

[Price 4s. 6d.]

plugs. It does not have to possess significant wet strength because the liquid in the capsule is not released until after the filter element is enclosed in the stronger tipping paper conventionally used to secure the filter element to a cigarette or cigar, or the like. It should, however, have sufficient body to be resilient so that it can permit the filter to be compressed when the tube is squeezed to rupture the capsule and so that it will return substantially to its initial tubular shape when squeezing pressure is released.

The tubular body of absorbent material enclosed by the outer wrapper can consist of any compressed smoke filter material which expands when wetted. Cellulose sponge is particularly suitable, but other compressed materials such as polyurethane foam, cotton, sponge, crimped paper of good wet strength and resiliency, cellulose acetate tow compressed with an adhesive soluble in the liquid filler component of the capsule, and other similar materials. The requirements of the body material are that it be capable of being compressed to a relatively stable shape and that it have sufficient resiliency, when wet by the liquid component of the capsule, to expand and fill the void originally occupied by the capsule.

The capsule is composed of a thin-walled frangible shell filled with a tobacco smoke treating liquid. The shell is advantageously formed from a thermoplastic or thermoset resin, such as polyethylene, polypropylene, ethylene-vinylacetate copolymers, vinylidene chloride copolymers, polyesters, phenol-formaldehyde and urea-formaldehyde resins, petroleum waxes, gases and gelatin. Either a single capsule or several smaller capsules or a multiplicity of microcapsules can be positioned within the sleeve of compressed filter material, all such forms being referred to herein and in the claim as "capsules".

Capsules of a size such that only one or a few capsules are contained in a single filter element are readily produced by techniques and procedures common in the pharmaceutical industry. Smaller capsules, known as "microcapsules" and having a representative diameter of about 0.001 to 0.12 inch, are produced by the various microencapsulating procedures described in United States Patent No. 2,800,457, United States Patent No. 2,800,458, United States Patent No. 2,969,330 United States Patent No. 2,969,331, United States Patent No. 3,015,128 and United States Patent No. 3,041,289 in the article by H. W. Mattson entitled "Miniature Capsules", published in the April, 1965, issue of International Science and Technology, (New York, N.Y.) pages 66 et seq., and in "Microencapsulation", a report recently published by Management Reports, Boston, Massachusetts.

The liquid contained in the capsule or microcapsules can be any aqueous or non-

aqueous liquid useful for treating tobacco smoke. This is, the liquid can be one useful in removing or otherwise sequestering undesirable constituents of the vapor phase or particulate phase of the smoke, such for example as water either alone or with an added surfactant or other useful component, or the liquid can be one useful in augmenting or supplementing the flavor of the smoke, such for example as a menthol solution or lemon oil, or it can be a solution of a tobacco extract or of a medicament such as a decongestant. Regardless of the composition of the liquid medium within the capsule, it should be sufficient in amount when released from the capsule or microcapsules to effect expansion of the compressed absorbent material to a smoke-filtering state and to provide enough free liquid absorbed or entrained in the expanded filter material to effect the desired treatment of the smoke. In general, it has been found that a total volume of 0.05 to 0.20 milliliter of treating liquid contained in the capsule or microcapsules per 10 mm. length of filter element is particularly effective, although as little as about 0.01 to 0.3 milliliter of liquid can be used in practicing the invention.

The filter element of the invention can be the only filter for a cigarette, cigar or pipe, or it can be combined with other conventional filter elements to form dual or triple filters. When so combined with other filters, our present preference is to place the filter of the invention between the tobacco and a mouth-end filter element such as cellulose acetate tow, or crimped paper.

In producing a filter element of the invention, we presently prefer to use as the sleeve material a cellulosic sponge having in its normal expanded condition a pore structure such as to permit smoke flow through a cigarette embodying the filter of the invention at the rate of about 5 to 30 cc, and preferably about 15cc., per second under a suction or draft of about 2 and 5/8 inches of water. This sponge is compressed to a flat strip about 2 mm. thickness and 20 mm. wide and is fed continuously from a roll into a filter rod making unit.

Simultaneously, a smoke-treating liquid is fed into a conventional pillow-pack making unit which continuously converts a flat plastics film about 16 mm. wide into a tube. As the tube is formed, the smoke treating liquid is introduced into its interior, and seals are made perpendicular to the direction of tube travel in order to encapsulate the liquid. The sealing intervals are preferably such that the individual pillows of liquid are about 5 mm. in diameter and about 7 mm. long with the sealed section between pillows about 3 mm. long.

The sponge sheet and a chain of plastics pillows containing smoke-treating liquid are then fed into a filter rod-making device which

wraps these two rod components with paper, and sections 80 mm. in length are cut in the usual manner. The resulting 80 mm. rods are then fed into a compositing machine to combine them with a conventional fibrous filter element composed essentially of cellulose acetate tow in order to make a composite rod of the customary 120 mm. length which is fed directly to a cigarette making machine for making dual filter cigarette embodying the filter element of the invention. This filter materially reduces the concentration of vapor phase smoke constituents, compared to the smoke from the same cigarette without such a filter element, and the water component in the filter element also substantially increases the water content of the particulate phase of the smoke.

WHAT WE CLAIM IS:—

1. A tobacco smoke filter element comprising a tubular outer wrapper surrounding a body of compressed absorbent material having in its expanded condition passages arranged to permit axial filtering flow of smoke there-through, and at least one frangible capsule containing a tobacco smoke-treating liquid medium positioned within said body, whereby the capsule is broken to release its liquid medium content into the body of compressed

absorbent material when squeezing pressure is applied to the outer wrapper of the filter element and the compressed body material expands to fill the tubular outer wrapper substantially completely with the absorbent material in its smoke-filtering expanded condition.

2. A tobacco smoke filter element according to claim 1 in which the body of absorbent material comprises a cylindrical sleeve of compressed absorbent material and the capsule is positioned within the interior of the sleeve.

3. A tobacco smoke filter element according to claim 1 in which the body of absorbent material comprises slivers of compressed absorbent material arranged in substantially axial alignment within the tubular outer wrapper and a plurality of the liquid-containing capsules are distributed in the body of slivers.

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