

[54] IMPROVEMENTS RELATING TO
TOBACCO-SMOKE FILTERS

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[22] Filed: **Apr. 20, 1973**

[21] Appl. No.: **352,929**
Related U.S. Application Data

[62] Division of Ser. No. 181,353, Sept. 17, 1971, Pat.
No. 3,779,787.

[30] **Foreign Application Priority Data**

Oct. 7, 1970 Great Britain..... 47706/70

[52] U.S. Cl..... **93/1 C, 117/104, 117/105.3,**
131/133 R, 131/261 A, 156/180

[51] Int. Cl..... **A24c 5/50**

[58] Field of Search..... **93/1 C, 77 FT; 156/180,**
156/441; 117/105.3, 104; 131/140 R, 133 R,
261 A

[56]

References Cited
UNITED STATES PATENTS

3,017,309	1/1962	Crawford et al.....	156/161
3,253,967	5/1966	Blakey, Jr. et al.....	156/1
3,318,725	5/1967	Bryan.....	117/58 X
3,371,000	2/1968	Davenport et al.....	93/1 C X
3,387,992	6/1968	Arthur et al.....	117/105.3

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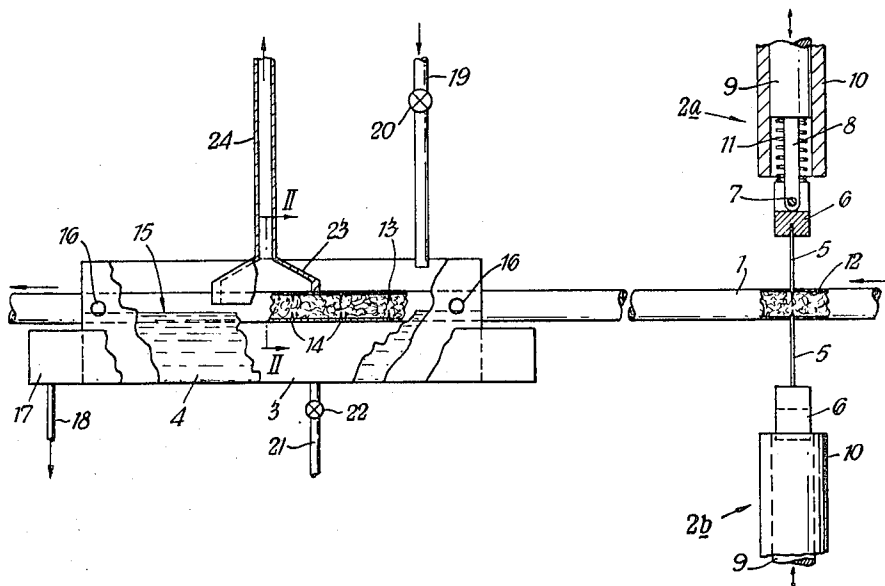
Assistant Examiner—James F. Coan

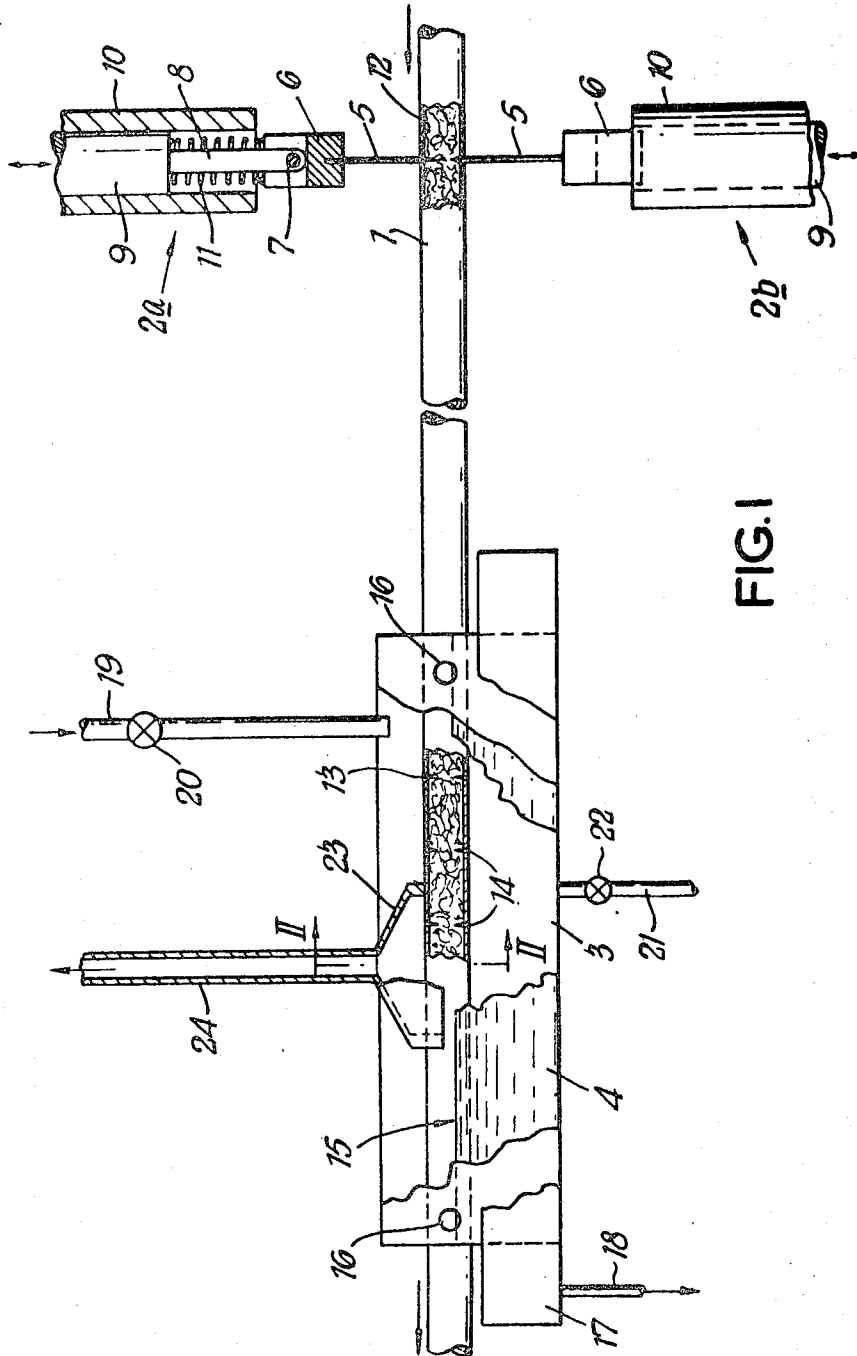
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[57]

ABSTRACT

The invention is concerned with a method for the production of tobacco-smoke filters in which an additive is introduced into a rod of tobacco-smoke filter material by means of holes pierced, for example by needles, in the said rod. The filter material may be an extruded open-cell foam material, such as polyethylene or polypropylene material. The pierced rod may be passed through a bath of the additive in such a manner that the additive is taken into the rod through the holes.

4 Claims, 4 Drawing Figures




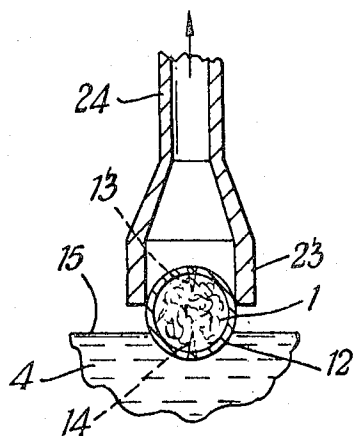


FIG. 2

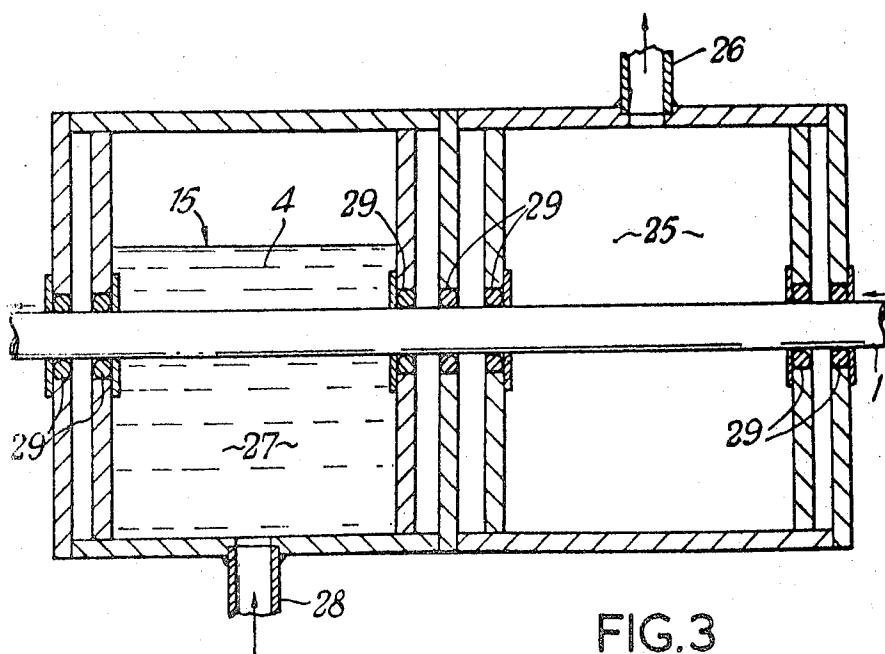


FIG. 3

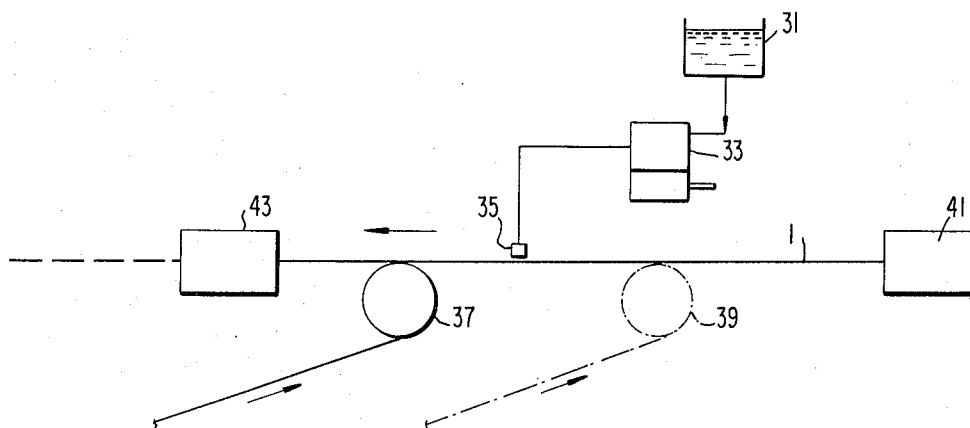


FIG.4

IMPROVEMENTS RELATING TO TOBACCO-SMOKE FILTERS

This is a continuation, of application Ser. No. 181,353, filed Sept. 17, 1971, now U.S. Pat. No. 3,779,787.

This invention concerns improvements relating to tobacco-smoke filters and their production. It is particularly concerned with the production of filter rod from which, when cut at intervals, dual or multiple filters, or the equivalents of such filters, can be produced.

Filters composed of more than one short section each having different filtration characteristics are known as multiple filters. The sections may be made of different materials such, for example, as cellulose acetate or paper and one or more may be treated with an additive or different additives. The sections are then assembled in abutting relationship and wrapped in conventional manner. The assembly of these short sections on machines operating at high speeds presents difficulties which necessitate slowing down of the machine and frequently leads to stoppages thereof. The production of such filters is expensive because two machine operations are required, i.e., manufacture of rod from which the individual sections are cut and a separate operation to combine them.

An object of the invention is to provide a method and means capable of promoting or contributing to rapid, convenient and continuous manufacture of dual or multiple filters, or their equivalents, in a single operation.

According to the invention, in a method or apparatus for producing tobacco-smoke filters, an additive is introduced into a rod of tobacco-smoke filter material by means of a hole or holes pierced in the said rod.

According to a preferred manner a carrying out the invention, a filter-rod of a material composed of or comprising an open-cell type of thermoplastic extruded foam material, such as polyethylene or polypropylene, is pierced with holes extending from its surface and is passed through a bath of an additive in such a manner that additive is taken into the rod through the holes.

A suitable extruded foam material is one produced by Monsanto Chemicals Ltd., as described in their U.K. Pat. No. 1,182,646. This material can be extruded in filter-rod form.

By way of example, two ways of carrying the invention into effect will now be more fully described with reference to the accompanying drawings, in which:

FIG. 1 is a diagrammatic side elevation, partially broken away, of one form of apparatus for introducing an additive into a filter rod,

FIG. 2 a detail section to a larger scale taken on the line II—II in FIG. 1, and

FIG. 3 a longitudinal section through another form of part of such apparatus.

FIG. 4 is a schematic illustration of an alternative method for practicing the technique of the present invention.

As shown in FIG. 1, a wrapped cigarette-filter rod 1 of open-cell extruded thermoplastic foam material, for example extruded polyethylene foam material is drawn first between upper and lower piercing devices 2a, 2b and then through a bath 3 containing a solution of additive 4. As illustrated for the upper device 2a, each piercing device comprises a perforating needle 5 fixed in a holder 6 which is connected by a pivot 7 to a stem

8 forming an extension of a constantly reciprocated plunger 9 which is slidable in a cylindrical guide 10. The needle 5 is loaded towards the rod 1 by a helical spring 11. The plungers 9 are reciprocated by cam means, for example. The upper and lower plungers 9 are operated so as to cause the needles 5 to be driven through the wrapper 12 of the filter rod 1 to produce holes 13, 14 of a depth of 1 to 2.5 mm. As shown, the upper and lower needles are operated simultaneously, but they may be operated in alternation so that the upper and lower holes 13 and 14 produced are offset slightly, say by 1 to 4 mm, longitudinally of the rod 1. Also as shown, the holes 13 and 14 are produced at equal intervals, but they may be produced at alternate long and short intervals, as hereinafter described. The upper and lower devices 2a, 2b may themselves be offset and operated simultaneously. If the upper and lower holes are to be diametrically opposite to each other, they can be pierced by a single needle passed right through the rod 1. With the arrangement illustrated, the diameter of the needles may suitably be from 0.5 to 1.5 mm. The interval between successive holes 13 or 14 on the same side of the rod 1 will be related closely, although not necessarily precisely, to the lengths of the two sections in the case of a dual filter.

The pierced rod 1 is passed into and through the bath 3, in which the level 15 of the additive 4 is so maintained that the rod is only partially immersed, say to between a third and three quarters of its diameter, the upper holes 13 being located above the said level. As illustrated, the bath level is maintained by overflow holes 16 which discharge into a trough 17 having a drain 18. The bath is supplied with additive through a pipe 19 having a supply-control valve 20 and can be emptied, when required, through a drain 21 having a cock 22. At an intermediate point in the length of the bath 3, the rod 1 passes under a hood 23 which is elongated longitudinally of the rod so that it always covers one or more upper holes 13 as the rod passes under it. As will be seen, the underside of the hood 23 is shaped to fit snugly to the rod 1 at the ends (FIG. 1) and at the sides (FIG. 2). The hood 23 is connected by a pipe 24 to a source of vacuum, whereby a pressure of between 25 and 50 cm water gauge is maintained in the hood. Within the hood, the suction thus applied to the top of the foam rod 1 will draw the additive 4 through a lower hole 14 into the rod to impregnate a region adjacent to that hole, the additive spreading slightly in the rod. Progressing out of the bath 3, the rod passes through a drying zone and is cut by known means into filter lengths, each length comprising an impregnated region or section and an untreated section, so that the equivalent of a dual filter is obtained. The drives for advancing the rod 1, the piercing devices 2a, 2b and the cutting means are synchronised.

Suitably, 25 to 150 mg of additive may be thus introduced per treated section of filter.

If the equivalent of a triple filter is required, a further set of holes may be similarly pierced, beyond the bath 3, in sections of the rod 1 different from those in which the holes 13, 14 are located. The above described procedure is repeated, using a second bath which contains an additive different from that in the bath 3, after which the rod is dried and cut into filter lengths, equivalent to triple filters.

The foam material may be such as has a relatively smoke-impervious surface layer, as may be the case

with a plastics material produced in accordance with the above-mentioned patent. In this case, the rod 1 need not be wrapped before its passage through the apparatus.

The holes 13, 14 may alternatively be produced by two spiked wheels located one above and the other below the rod 1 and rotated with a peripheral speed equal to the speed of the rod and in the direction of its movement. Alternatively, a single wheel may be used with spikes of a length slightly greater than the diameter of the rod.

According to another method, the rod 1 is pierced to form similar small holes in bands or rings extending around the circumference of the rod and spaced at intervals along it, or even at random around and along the rod over distances each corresponding to the length of a treated section of, say, a dual filter, this being repeated at distances related to the length of the filter.

An alternative means for the actual introduction of the additive, which may be used in conjunction with the piercing means shown on the right-hand side of FIG. 1, or with the other piercing means described above, is illustrated in FIG. 3. In this case, the pierced rod 1 is passed through a chamber 25 evacuated through a pipe 26 to a pressure of 600 to 980 cm water gauge and a second chamber 27 holding the additive 4 supplied by a pump through a pipe 28 and maintained at a level 15 therein such that the rod 1 is totally submerged. In this chamber, additive is drawn into the interior of the rod through the holes by the low pressure existing inside the rod. This may be assisted by pressure in the chamber 27. The rod 1 passes through the walls of the chambers 25, 27 by way of O-seals 29 which effectively seal off the said chambers. The rod may be passed through the chambers at a speed of, say, 300 mm per second, at which speed from 10 to 40 percent of additive by weight can be arranged to be taken up by the rod material in the treated sections.

Finally, according to yet another method, illustrated in FIG. 4 the rod 1 may be pierced and the additive introduced by needleless injection such as is used in medical inoculation. A reservoir 21 holding a solution or dispersion of the additive supplies a pump 33, similar to a fuel-injection pump for a vehicle engine, which delivers, at predetermined intervals, a predetermined quantity of the additive to an injection nozzle 35, similar to a fuel-injection nozzle. The nozzle is located close to or substantially in contact with the rod 1 so that jets of the additive are forced into the rod at regular, or possibly irregular, intervals of time. Preferably the rod is moved past a stationary nozzle, but the rod and/or the nozzle could be stationary or moving during injection. The additive is ejected from the nozzle with such force as to penetrate the rod and impregnate a section thereof with the additive. More than one nozzle associated with a pump, may be used to inject the rod with different additives in different sections. The injection means may be so located on or in relation to a machine 37 or 39 which produces the rod that injection occurs either immediately before (37) or after (39) wrapping of the rod or immediately following extrusion from the die of an extruder 41 by which the rod is formed. The rod is cut into sections 43 as previously described.

Substances which may be added to the rod in any of the above-described ways are solutions or dispersions of organic or inorganic, acidic or alkaline, materials, or

slurries, for instance of carbon or alumina, of finely divided metals such as zinc or of small beads of ion-exchange material. They may be substances with specific or selective smoke filtration properties or substances which promote filtration. Specific substances which may be used include manganese dioxide, zinc oxide or acetate, polyethylene imines, lithium chloride, sodium carbonate, trisodium phosphate, ethylenediamine diacetate and zeolites. In addition to additives concerned with filtration, additives concerned with smoke-flavour improvement or modification, such for example as menthol sweetening agents and the like, or combinations of such may be similarly introduced. In all cases, naturally, the substance should not be such as to interfere deleteriously with the substance of the rod.

Dual or multiple filters or their equivalents in one of the ways described above are ready to be assembled with cigarettes on a conventional filter-tip cigarette making machine.

Examples of the production of specific filters will now be described:

EXAMPLE 1

Using apparatus such as has been described with reference to FIGS. 1 and 2, a cigarette-filter rod of extruded polyethylene foam material was pierced, above and below at diametrically opposite points, to a depth of 2 mm, using needles of 1 mm diameter. The holes were pierced at alternate intervals of 24 and 6 mm along the rod. The rod then passed through a bath (similar to the bath 3 in FIG. 1) containing, as additive, a 10 percent solution of sodium carbonate at room temperature. The rod was immersed to a depth of half its diameter in the solution, so that the lower holes were submerged below the surface, but not the upper holes. The upper holes were subjected (by a hood similar to the hood 23 in FIGS. 1 and 2) to suction at a pressure of 30 cm water gauge, thereby producing treated regions at, alternately, 24 and 6 mm intervals along the rod. After emerging from the bath, the rod was dried and cut, midway between treated regions at the 6 mm interval, into 90 mm lengths, each of which formed six dual filters, 15 mm long, when finally cut, again midway between treated regions at the 6 mm interval. Each such dual filter comprised a section about 5 mm long containing 6.5 mg of sodium carbonate and a section 10 mm long of untreated material.

EXAMPLE 2

A filter rod of the same material as in Example 1 was pierced above and below to a depth of 2 mm as in that Example, but the upper and lower holes were offset 1 mm along the rod.

The rod was then passed in the manner described in Example 1 through a bath, which in this case contained a 10 percent solution of zinc acetate, and suction was applied at a pressure of 75 cm water gauge. The rod was dried and cut as in Example 1. The treated section of each dual filter contained 6.5 mg of zinc acetate.

EXAMPLE 3

A filter rod of polypropylene foam material was pierced to a depth of about 1 mm with a needle of 0.25 mm diameter in such a way as to form bands of holes around the circumference of the rod, the bands being again at alternate intervals of 24 mm and 6 mm along

the rod. The rod was then passed through an evacuation chamber (similar to the chamber 25 in FIG. 3) at a speed of 300 mm per second, the chamber being evacuated to a pressure of 830 cm water gauge. From the evacuation chamber, the rod passed through a chamber (similar to the chamber 27 in FIG. 3) containing a 2.5 percent solution of menthol in methanol, the rod being totally submerged. By this means, 120 microliter of the solution was drawn into the filter rod through each band of holes. On emergence from this chamber, the rod was dried and cut, midway between treated regions at 6 mm intervals, into 90 mm length and finally into dual filters of 15 mm length, the treated sections of which each contained 3 mg of menthol.

We claim:

1. A method of applying an additive to a smoking tobacco product component which comprises:
applying a wrapper to a continuous rod of a smoking

tobacco product;

feeding said continuous rod past an additive applying station;

forming a liquid jet of the additive at such station and impelling it against the rod with sufficient force to penetrate the rod and the wrapper, thereby impregnating at least a section of said rod with said additive.

2. The method in accordance with claim 1 wherein the rod is composed of an open-cell foam material.

3. The method in accordance with claim 2 wherein the rod is composed of an extruded thermoplastic material.

4. The invention in accordance with claim 1 wherein a plurality of additives are needlelessly injected into said rod.

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