

[54] TOBACCO-SMOKE FILTERS

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[58] Field of Search..... 131/10.5, 10.7, 261 B, 131/210

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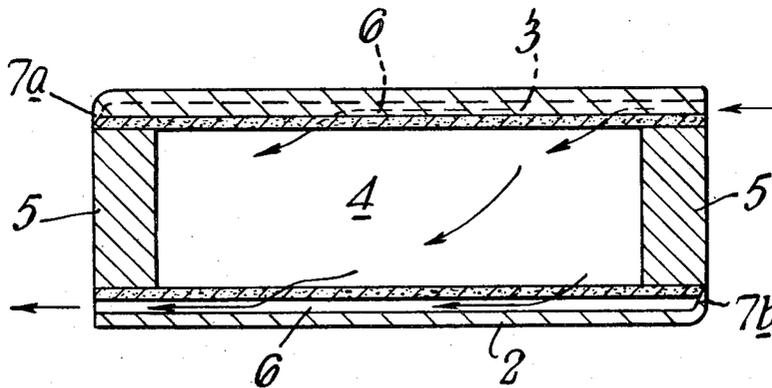
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[57] ABSTRACT

A tobacco-smoke filter comprises a tube of smoke-filtering sheet material, for example paper, extending longitudinally within and spaced radially from an outer tubular wrapper, for example an extruded smoke-impervious plastics material, the tube being blocked at both ends, while the space between the tube and the wrapper is blocked around complementary arcs at opposite ends and longitudinally in such manner that smoke entering at one end must pass through the wall of the tube twice before reaching the other end. Suitably the wrapper is formed or provided at intervals around its circumference with a number of longitudinal ribs for supporting the tube.

5 Claims, 4 Drawing Figures



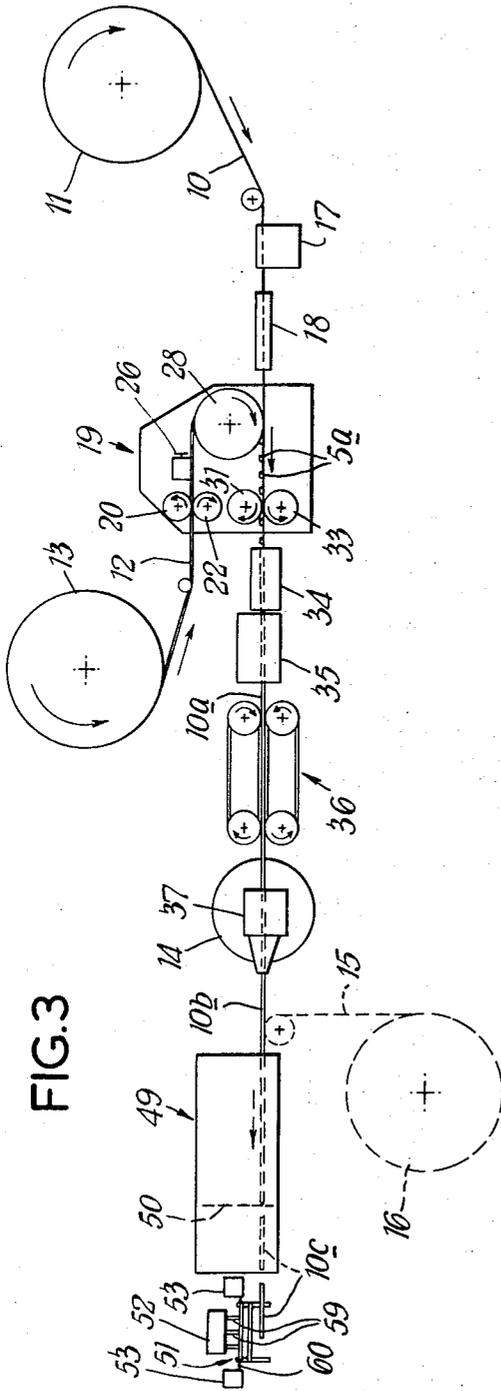


FIG. 3

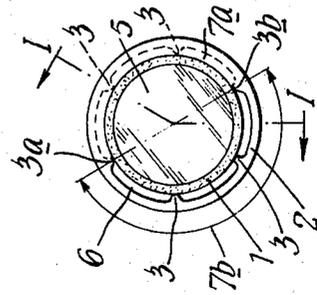


FIG. 2

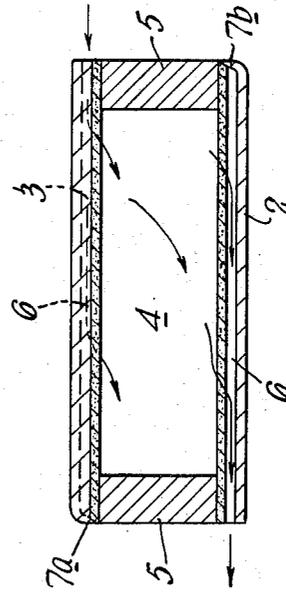


FIG. 1

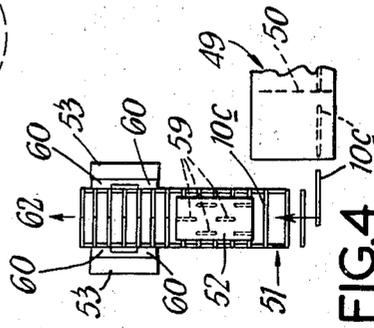


FIG. 4

TOBACCO-SMOKE FILTERS

This invention concerns improvements relating to cigarette and other tobacco-smoke filters.

A filter in accordance with the invention comprises a smoke-porous tube of smoke-filtering sheet material extending substantially longitudinally within and spaced radially from an outer tubular wrapper, the tube being blocked at both ends, and the space between the tube and the wrapper being blocked around complementary arcs at opposite ends and longitudinally in such manner that smoke entering that space at one end is forced to pass through the wall of the tube twice before reaching the other, outlet, end.

For example, in the case of a cigarette filter, the wrapper may be made of an extruded smoke-impervious plastics material and may be formed or provided at intervals around its circumference with a number of longitudinal, internal, ribs for supporting the tube, generally concentrically, along its length. The tube may be made of porous filter paper.

Smoke-impervious plugs, for example of plastics material, may be used for blocking the tube 4 at its two ends. The annular space between the wrapper and the wall of the tube may be closed by similar material at each end, the closures being offset or displaced by 180° one from the other. On smoking a cigarette through a filter of this construction, the smoke will enter through the half-annular opening at one end and pass through the tube wall to the inside of the tube, whence it will be constrained to pass through the said wall on the opposite side and out through the half-annular opening at the other end. The smoke is prevented from passing circumferentially around the tube by the longitudinal ribs, which block this path, but can pass through the wall of the tube along its whole length.

One embodiment of the invention will now be more fully described with reference to the accompanying drawings, in which:

FIG. 1 is a longitudinal section, on the lines I—I in FIG. 2, through a cigarette filter,

FIG. 2 an end view thereof,

FIG. 3 a diagrammatic side view of a form of apparatus which can be used in the production of such filters, and

FIG. 4 a plan view of a part of the said apparatus.

The single filter illustrated at an enlarged scale in FIGS. 1 and 2 comprises a tube 1 of smoke-filter paper located co-axially within a tubular wrapper or casing 2 made of a substantially smoke-impermeable plastics or other softenable material, such as polyethylene, polypropylene, ethylene vinyl acetate copolymer, polyvinyl chloride, polystyrene, cellulose acetate or the like. Suitably, it is made of polyethylene. The tube 1 is located and supported in the wrapper 2 by longitudinal internal ribs 3 formed integrally with the latter at intervals around its circumference. At each end of the filter, the interior 4 of the tube 1 is closed by a short cylindrical or disc-shaped plug 5 of substantially smoke-impermeable plastics material such as extruded, solid or foamed, polyethylene, polypropylene, ethylene vinyl-acetate copolymer, nylon, polyurethane or cellulose acetate, for instance a white cellulose acetate rendered impermeable by the use of a high concentration of plasticizer. Suitably it is made of polyethylene.

By reason of the ribs 3, there is a narrow annular space 6 between the tube 1 and the wrapper 2. This

space is closed around half of the circumference of the filter at one end thereof and around the other half of the circumference at the other end. Closure is effected by an inturned lip on the wrapper 2. In FIG. 2, which is a view of the left-hand end in FIG. 1, such a lip 7a is shown extending around one half of the circumference between ribs 3a and 3b. At the other end, a similar lip 7b, offset angularly by 180°, extends around the other half of the circumference between the said ribs 3a and 3b, as indicated by the arc marked 7b in FIG. 2. The lips 7a, 7b may be produced and sealed to the tube 1 by the application of heat and pressure to the wrapper 2. However, the seal may be assisted by adhesive, for example a polyvinyl-acetate adhesive.

On smoking a cigarette through a filter such as is shown in FIGS. 1 and 2, the smoke will enter the open one half (circumferentially) of the annular space 6 at one end, say the right-hand end in FIG. 1, and pass through the wall of the filter tube 1 to the interior 4 thereof, whence it will then be constrained to pass through the said wall on the opposite side into the other half of the said space 6 and out through the open left-hand end of the latter. The smoke is prevented from passing circumferentially around the wall of the tube 1 by the ribs 3. In particular the ribs 3a and 3b prevent the smoke from passing directly from one half of the annular space 6 into the other. The smoke can, however, pass through the filter-tube wall along its whole length. As will be evident, all of the smoke is forced to pass twice through the filtering material of the tube 1. However, this double passage through filtering material is achieved with a compact filter and economic use of materials. Finally, the filter lends itself to reliable production at high speed and by simple apparatus.

One form of apparatus by which such filters can be produced will not be described by way of example. In this apparatus, filters are produced initially, as is commonly done, in lengths providing four such filters, which are subsequently cut into single filters.

Referring to FIG. 3, a strap 10 of filter paper for the tube 1 is supplied from a bobbin 11, plastics-rod material 12 for the plugs 5 from a reel 13, plastics material for the wrapper 2 from an extruder press 14 and, if required, paper strip 15 for a conventional outer filter wrapping from a bobbin 16. From the bobbin 11, the strip 10 is fed through an applicator 17 by which both edges are provided with heat-activatable adhesive for the eventual production of a longitudinal tube seam. The strip 10 then passes through a cooler 18, which renders the adhesive inactive, to a device 19 for cutting predetermined lengths 5a, equal to the length of two plugs 5, from the rod 12 and placing them on the strip 10 at predetermined intervals. For example, for the case of a filter 20 mm long, the lengths 5a may be 5 mm and the interval 20 mm.

The rod 12 arriving at the device 19 passes between a serrated feed roller 20 and a circumferentially grooved guide roller 22. It advances along a groove in a platform towards the end of which the lengths 5a are cut off by a rotary knife 26, of a type well known in the cigarette industry. Each severed length 5a is engaged by a transfer wheel 28 and is carried through a guide past an electrical heater so as to be deposited on the strip 10. The strip 10, carrying the plug-lengths 5a, advances between a circumferentially grooved roller 31 and a plain roller 33. The rollers 20, 22, knife 26, wheel 28 and rollers 31 and 33 are driven from a common

drive shaft at co-ordinated speeds so as to produce the predetermined lengths *5a* of plug material and to deposit them at the predetermined intervals on the strip **10**. Separation of the lengths *5a* is achieved by driving the wheel **28** with a higher peripheral speed than that of the rollers **20**, **22**. The heater serves to activate heat-activatable adhesive with which the rod **12** is pre-coated, so that the plug lengths *5a* adhere to the strip **10** where they are deposited.

The paper strip **10** carrying the lengths *5a* of plug material progresses through a forming unit **34** in which it is brought to tube form around the said lengths and a heated sealing unit **35** by which the edges of the strip are sealed together and the plug lengths are sealed to the tube, followed by a cater-pillar traction unit **36**. The units **34** to **36** may be of known kind such as are used for producing tubular paper wrappings in cigarette-making or filter-making machines. Advantageously, however, the units **34** and **35** are devised to form the tube with a butt joint rather than a lap joint.

The assembly **10a** thus produced and consisting of the strip **10** wrapped as a tube around the plug lengths *5a* is next supplied by means of an extruder cross-head die **37** with a tubular wrapping of plastics material which provides the wrapper **2** of the eventual filters.

The extruded assembly **10b** then passes with or without an outer wrapping strip **15**, into a garniture **49**. If a strip **15** is not wrapped around the assembly **10b**, the garniture **49**, which may be of the kind well known in the cigarette industry, serves mainly as a haul-off device by the action of the customary garniture tape. If an outer wrapping strip **15** is provided, the garniture serves also to form the strip around the assembly **10b** and to consolidate the whole assembly. Housed with the garniture is a cut-off device, operative at **50**, which divides the assembly **10b** midway of every fourth plug length *5a*. For the case of the above example of filters 20 mm long, the assembly **10b** is thus divided into 80 mm lengths **10c**, each comprising material for four single-filter lengths. Division into the single-filter lengths is effected at a later stage, for example in known manner during the assembly of filter tip cigarettes incorporating the filters.

The lengths **10c** are supplied singly to a conveyor **51** by which they are advanced under an electrical heater **52** with projecting ribs **59** which press the material of the wrapper **2** into the paper tube **1** to produce the seals *7a* and *7b* of the inner single filters at intermediate

points in each length **10c** and past electrical-heaters **53** at each side with ribs **60** for similarly producing the seals at the ends of that said length. The conveyor **51** comprises a pair of endless chains each supporting a series of spaced recessed carried blocks which hold the lengths **10c**, deposited transversely thereon, freely near the ends, but with some overhang. The lengths **10c** are carried along by the operative upper flight of the conveyor **51** in light contact with a fixed plate so that they are caused to roll in the recesses and, in passing the heaters **52** and **53** are formed with the aforesaid seals. The ribs **59,60** are dimensioned and positioned to produce half-circular seals *7a* and *7b* of the required length and locations circumferentially of the filters. The filter-rod lengths **10c** are finally discharged from the conveyor **51** at **62**.

I claim

1. A tobacco-smoke filter comprising a smoke-porous tube of smoke-filtering sheet material having a wall and extending substantially longitudinally within and spaced radially from an outer tubular wrapper, a block at each end of the tube and a smoke passage chamber therebetween, and an inturned lip extending from said wrapper at opposite ends thereof through subtending complementary arcs totalling 360°, whereby the space between the tube and the wrapper is blocked around subtending complementary arcs at opposite ends and longitudinally from arc to arc so that smoke entering the said space at one end is constrained to pass through the wall of the tube twice before reaching the other end.

2. A filter according to claim 1, wherein the wrapper has, at intervals around its circumference, a number of longitudinal internal ribs for supporting the tube along its length.

3. A filter according to claim 1, wherein the wrapper is made of an extruded smoke-impervious plastics material.

4. A filter according to claim 1, wherein said inturned lip comprises circumferential seals around semi-circular arcs offset by 180° one from the other.

5. A filter according to claim 1, wherein said inturned lip comprises circumferential seals around semi-circular arcs offset by 180° one from the other, the said seals extending circumferentially between the same longitudinal ribs, but around the said offset arcs, at the opposite ends of the filter.

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