United States Patent

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[73] Assignee **R. J. Reynolds Tobacco Company**
Winston-Salem, N.C.
a corporation of New Jersey

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[54] **TOBACCO SMOKE FILTERING MEANS AND ADAPTATIONS**
8 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** **131/10.5,** 131/10.3, 131/10.7, 131/12, 131/187, 131/207
[51] **Int. Cl.** **A24d 01/04;** A24f 07/04, A24f 13/06
[50] **Field of Search** 131/10.5, 10.7, 11, 187, 201, 207, 261B, 10.3, 12

[56] **References Cited**

UNITED STATES PATENTS

1,983,926	12/1934	Zirmer	(131/10.5UX)
2,511,898	6/1950	Brothers	131/187X
3,094,128	6/1963	Dearsley	131/94
3,253,967	5/1966	Blakey, Jr. et al.	131/269X
3,310,056	3/1967	Rieder	131/10.5
3,313,309	4/1967	Wang	131/10.7X
3,388,707	6/1968	Harris	131/10.7X

FOREIGN PATENTS

28,335	1908	Great Britain	131/187
989,464	4/1965	Great Britain	131/10.5

Primary Examiner—Samuel Koren
Assistant Examiner—James H. Czerwonky
Attorney—Pendleton, Neuman, Williams & Anderson

ABSTRACT: A disposable tobacco smoke filtering means comprising a cylindrical short segment of wrapped fibrous filter material, having its downstream end cut at an oblique angle. The cut end is completely covered with elastic perforated adhesive tape such that all the smoke must pass through the elastic perforations. The perforations accelerate the smoke stream velocity as a plurality of small jets with a significant pressure drop thereby causing deposition of tobacco smoke impurities. The tobacco smoke filtering means is adaptable for use as a component in the manufacturing process of filter-tipped cigarettes or for use as a disposable unit in other tobacco smoking devices.

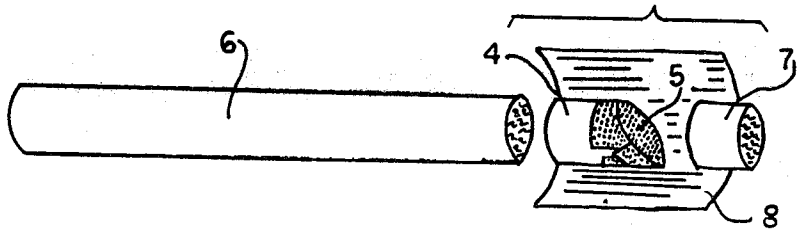


FIG. 1

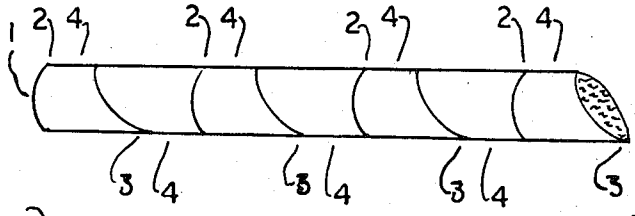


FIG. 2

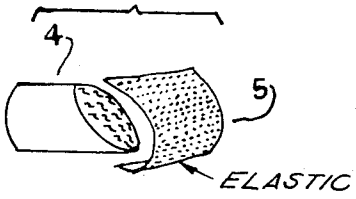


FIG. 3



FIG. 4

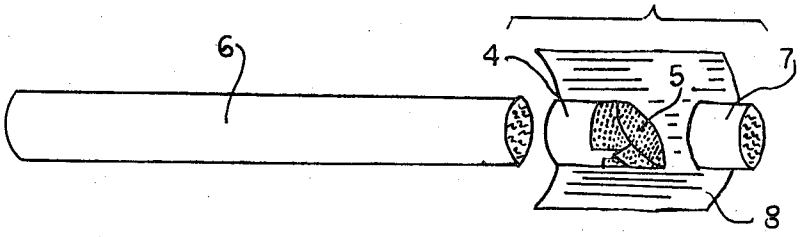


FIG. 5

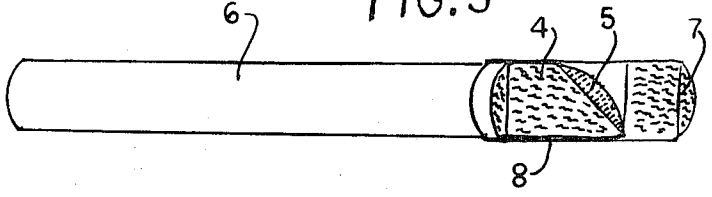


FIG 6

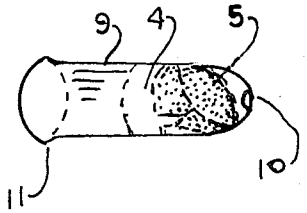
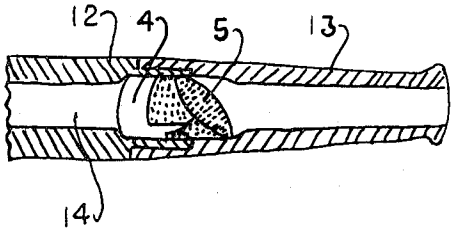


FIG. 7



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TOBACCO SMOKE FILTERING MEANS AND ADAPTATIONS

The tobacco smoke filter improvements which have been produced thus far have been of costly complex construction, and have produced a hard draw or have had unpleasant smoke taste characteristics.

Therefore, it is a principal object of this invention to provide an efficient tobacco smoke filtering means which will significantly reduce liquid and/or solid particles from the tobacco smoke.

It is a further object of this invention to provide an efficient tobacco smoke filtering means wherein the manufacturing and material cost have been reduced to a minimum.

It is also a further object of this invention to provide an efficient tobacco smoke filtering means wherein the taste of the tobacco smoke is not adversely affected.

It is also a further object of this invention to provide a tobacco smoke filtering means wherein the hard draw problem of other improved tobacco smoke filters is effectively overcome.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as are more fully hereinafter described and claimed, reference being had to the accompanying drawings wherein like numerals refer to like parts throughout and in which:

FIG. 1 illustrates in horizontal elevation a wrapped charge of fibrous filter material which is cut into like segments which are used in constructing the tobacco smoke filtering means, with said segments being cut in such a manner as to avoid waste of material.

FIG. 2 illustrates in horizontal elevation a fragmentary exploded view of one form of the improved tobacco smoke filtering means.

FIG. 3 illustrates in horizontal elevation one component of one form of the improved tobacco smoke filtering means as illustrated in FIG. 2, after it has been assembled.

FIG. 4 illustrates in horizontal elevation an exploded view of a filter cigarette embodying one form of the improved filtering means as illustrated in FIG. 3.

FIG. 5 illustrates in horizontal elevation the filter cigarette of FIG. 4, after assembly thereof, and with the filtering means shown in vertical section.

FIG. 6 illustrates in horizontal elevation a modified form of the improved tobacco smoke filtering means.

FIG. 7 illustrates in vertical section a second modification of the improved tobacco smoke filtering means.

In carrying out the invention it can be seen in FIG. 1, that the segments 4 which form the main body of the tobacco smoke filtering means as illustrated in FIG. 2, can be produced easily and without waste, simply by slicing a rolled section of paper-wrapped fibrous filter material into multiple segments 4, which are exactly similar in shape and size. This is accomplished by alternately employing right-angle ninety degree cuts 2, and oblique angle cuts 3, of approximately one hundred and thirty five degrees, whereby each segment 4 has a downstream beveled end and a transverse flat upstream face. For the sake of brevity, the downstream end of segment 4, shall hereinafter be referred to simply as the downstream end. It is to be noted in FIG. 2 and FIG. 3 that only one segment 4, is used in the construction of each tobacco smoke filtering means and that said segment 4 serves primarily as a smoke conducting body. The downstream end of the segment 4 is encompassed by and covered with a perforated and adhesively undercoated elastic tape section 5. The bevel of the downstream end serves a double function of increasing the open face area of the downstream end of segment 4, and causes the tobacco smoke stream to be deflected at a sharp angle as it emerges through the profusion of small holes located in perforated tape section 5. Section 5 is folded around the downstream end of segment 4, so as to completely cover and overlap the beveled downstream end. Section 5 is caused to adhere to the downstream end by reason of the adhesive undercoating applied to the section 5. The invention is not intended to be limited to a segment 4 of the type illustrated, but may have a configuration whereby the upstream end thereof may be conical or wedge shape. It is further contemplated that a short section of plastic or cardboard tubing or even a short cylindrical section of plastic foam or sponge rubber could be used to replace the fibrous filter section 4. The wrapped cellulose acetate and beveled downstream end construction of section 4, however, is to be preferred, because the cigarette manufacturers for the most part, presently use cellulose acetate as filter material and consequently have the equipment and methods of handling same. Furthermore, it is preferred because the material is economical. The single cut beveled downstream end of segment 4 is preferred because this is the only method wherein the downstream end of segment 4 can be shaped without waste of material.

It should also be pointed out that the perforated and adhesively undercoated tape 5, which is used in the construction of the tobacco smoke filtering means is a commercially developed pharmaceutical product which is readily available at low cost. It is one-half inch in width and has latex characteristics and is manufactured by the Johnson and Johnson Pharmaceutical Co. under the trade name of Band-Aid Air Vent Tape.

The improved tobacco smoke filtering means as thusly described and constructed is readily adaptable for use in the manufacture of filter-tipped cigarettes or for use in practically all types of tobacco smoking devices as is illustrated in FIG. 4, FIG. 5, FIG. 6, and FIG. 7, and as will be subsequently explained.

In the filter-tipped cigarette shown in FIGS. 4 and 5, the tobacco smoke filtering means, as illustrated in FIG. 3, has the transverse upstream end of segment 4 arranged in abutting with the downstream end of a paper-wrapped charge of tobacco 6. In addition to segment 4, a cylindrical plug 7 filter material similar to or different from that of segment 4 is preferably placed downstream of segment 4. The segment 4 and plug 7 are secured to the downstream end of the tobacco charge 6 by means of moisture-resistant and adhesively undercoated wrapper or tipping 8.

Referring now to the FIG. 6 adaptation, in this configuration, the tobacco smoke filtering means as illustrated in FIG. 3 is pressed frictionally into the open upstream end of a plastic cylindrical section 9, of the medicinal type. The downstream end of section 9 is substantially hemispherical and is provided with a hole 10 of not less than one-sixteenth inch in diameter. The open upstream end 11 of capsule section 9 may be flared slightly to facilitate the insertion therein of the downstream end of a tobacco charge 6. Methods of punching holes in cylindrical section 9 are well known to those skilled in the art and the open end 11 of the section may easily be flared by use of a conical shaped metal tool which is heated to about one hundred and eighty degrees Fahrenheit. Furthermore, in an embodiment wherein the section 9 is of a gelatin material, the section should be externally moisture-proofed by use of a coating of U.S.P. Flexible collodion or some other suitable moisture resistant agent.

The need for having both the embodiment as illustrated in FIG. 6, and FIG. 7, is that the FIG. 6 embodiment is intended as a disposable unit wherein the entire unit may be discarded after a period of use, whereas the FIG. 7 embodiment contemplates the use of a permanent type tobacco smoking device wherein only the tobacco smoke filtering means will be periodically replaced. Furthermore, it is believed that in some instances, the cigarette manufacturers may prefer to factory-install the FIG. 6 embodiment on their products instead of the FIG. 4 and FIG. 5 embodiment.

The FIG. 7 embodiment includes a seperable two-piece stem section of a tobacco smoking device such as a cigarette holder, a cigar holder, or a pipe stem. In any event, the use of the tobacco smoke filtering means would be identical in all three applications. The only requirements being that the stem section of the tobacco smoking device be of two-piece con-

struction 12, and 13, and that the smoke passageway 14, therein be sized at the point of juncture so that the segment 4, may be inserted frictionally as indicated into aforesaid smoke passageway 14 in an airtight manner insofar as smoke passage around the tobacco smoke filtering means is concerned.

To facilitate an understanding of the invention, the operation thereof is hereby described. Referring now to all of the adaptations which have been heretofore illustrated and described, when the smoker imposes a vacuum on the downstream end of the cigarette filter assembly or the tobacco smoking device, tobacco smoke is caused to jet through the profusion of small holes in tape section 5, which effectively seals the beveled downstream end of segment 4. In addition, it can be seen that the direction of the smoke stream flow is deflected at an angle of about forty-five degrees. It is also to be noted that in the description of this invention thus far that no mention has been made as to the advantages of using materials which have a high rate of heat transfer, or as to the benefits to be gained by impinging the smoke stream at high velocity against a sidewall. Practically all of the prior art patents which relate to tobacco smoke filter improvements are based on the utilization of these principles, and this is primarily why most of these tobacco smoke filter ideas are not economically feasible. It is true that these aforesaid principles are beneficial in cases where only a limited number of jet holes are used. Insofar as can be determined from a study of the prior art relating to tobacco smoke filters which use small jet holes, it seems that about ten or twelve such holes is about the maximum number of such holes which was anticipated. Undoubtedly the reason was, that this is about the maximum practical number of holes which can be drilled or punched into a filter element made of such materials as metal, metal foil, cardboard, plastic or such like materials when it is as small as it must necessarily be in order to be incorporated into a cigarette filter, or the smoke channel of a conventional tobacco smoking device.

A microscopic examination of the previously described perforated adhesive undercoated tape which is used in the subject invention, however, reveals that a one-inch section of this material contains over three hundred perforations and that these holes are so small that in order for my tobacco smoke filtering means to have an easy draw, that the tape area through which smoke is drawn must be at least one-sixth of one square inch and contain at least one hundred such holes. This is primarily why the downstream end of segment 4 is beveled, since a square cut does not give sufficient effective tape area. Proof that rapid heat transfer materials or close proximity impingement construction are not necessary requirements in a high efficiency tobacco smoke filter means can well be demonstrated by use of the subject invention since obviously no special attempt has been made to incorporate either factor into the design thereof. It is true that considerable tar deposition does take place when using the subject invention, on the filter housing or tobacco smoking device smoke channel sidewall at those points which are in close contact with the effective tape area, however approximately as much tar deposition occurs on the effective tape area in the form of small stalactites on that portion which is not in close proximity to a sidewall. It is believed by the inventor that the tar deposition on the downstream surface of the perforated tape is due to condensation resulting from pressure drop of the smoke stream as it emerges from the aforesaid profusion of extremely small holes in the absence of sufficient smoke volume at any one hole to disperse or blow the tar away. It is also believed by the inventor that this latter condition explains why the subject invention does not produce the acrid smoke taste which is characteristic of those filter elements wherein the smoke is caused to jet through a limited number of fairly large holes and impinge at high velocity against a sidewall. As can be assumed, such action would disperse a portion of the acrid tasting condensed tars back into the smoke stream in the form of microscopic droplets.

Another advantage of using flexible and elastic tape which is perforated instead of perforated rigid elements made of plastic, metal, metal foil or such like materials is that perforations in rigid materials cannot expand any significant amount and a hard draw is experienced when a faster than normal smoking rate is attempted, whereas the holes in the flexible and elastic tape may expand slightly when subjected to such a condition, thus compensating for the faster than normal smoking rate.

I claim:

1. A tobacco smoke filtering means comprising a cylindrical section of smoke pervious material through which tobacco smoke is adapted to flow, the downstream end of said section having a surface configuration which is obliquely disposed relative to the axis of said cylindrical section; and a segment of elastic perforated tape affixed to and completely overlying the downstream end surface of said section whereby all of the tobacco smoke flowing through said section is discharged therefrom through said tape perforations as a plurality of smoke jets.

2. The tobacco smoke filtering means of claim 1 in combination with a paper-wrapped charge of tobacco, and a cylindrical plug of filter material; said cylindrical section being disposed intermediate and axially aligned with said charge and said plug, and smoke impervious means encompassing said plug, said cylindrical section, and the downstream end of said charge and retaining same in said relative positions.

3. The tobacco smoke filtering means of claim 1 including a hollow cylindrical section having an open upstream end and a substantially closed downstream end except for a hole formed therein; said cylindrical section of smoke pervious material being inserted through said cylindrical section open end and frictionally retained within said cylindrical section; the open upstream end of said hollow cylindrical section being connectable to an end of a paper-wrapped charge of tobacco.

4. The tobacco smoke filtering means of claim 1 in combination with a separable two-piece cigarette holder, said holder being provided with an elongated smoke passageway; said tobacco smoke filtering means being frictionally disposed within said elongated smoke passageway whereby all the smoke flow through said passageway must pass through said tobacco smoke filtering means; said filtering means being replaceable when the pieces of said cigarette holder are separated.

5. A tobacco smoke filtering means as defined in claim 1, wherein it is used with and includes a pipe having a stem section of two-piece construction and wherein a smoke passageway in said two-piece stem section is sized at the point of juncture in such a manner that the tobacco smoke filtering means can be fitted frictionally in said smoke passageway so that smoke flow through said passageway must necessarily be through said tobacco smoke filtering means; the filtering means constituting a disposal unit which can be periodically replaced.

6. The tobacco smoke filtering means of claim 1 wherein the portion of said perforated tape segment coincident with and overlying the downstream end of said smoke pervious cylindrical section includes more than fifty perforations.

7. The tobacco smoke filtering means of claim 1 wherein said smoke pervious cylindrical section is formed of a fibrous filtering material.

8. The tobacco smoke filtering means of claim 1 wherein the downstream end of said smoke pervious cylindrical section is formed by an oblique angle cut.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,547,132 Dated December 15, 1970

Inventor(s) JON W. BEAM

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 54 - numeral --1-- was omitted after "material"

Column 2, line 34 - after "abutting" insert --intimate contact--

Column 4, line 56, claim 5 - "disposal" should be --disposable--

Signed and sealed this 13th day of April 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents

FORM PO-1050 (10-69)