United States Patent

[11] 3,596,664

[72] Inventor **Jesse R. Pinkham**
Winston-Salem, N.C.

[21] Appl. No. **859,969**
[22] Filed **Sept. 22, 1969**
[45] Patented **Aug. 3, 1971**
[73] Assignee **R. J. Reynolds Tobacco Co.**
Winston-Salem, N.C.

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

[52] **U.S. Cl.** **131/10.5,** 131/10.7, 131/201
[51] **Int. Cl.** **A24d 01/04**
[50] **Field of Search** ..... 131/10.5, 10.7, 201, 210, 261 B, 216

[56] **References Cited**

UNITED STATES PATENTS

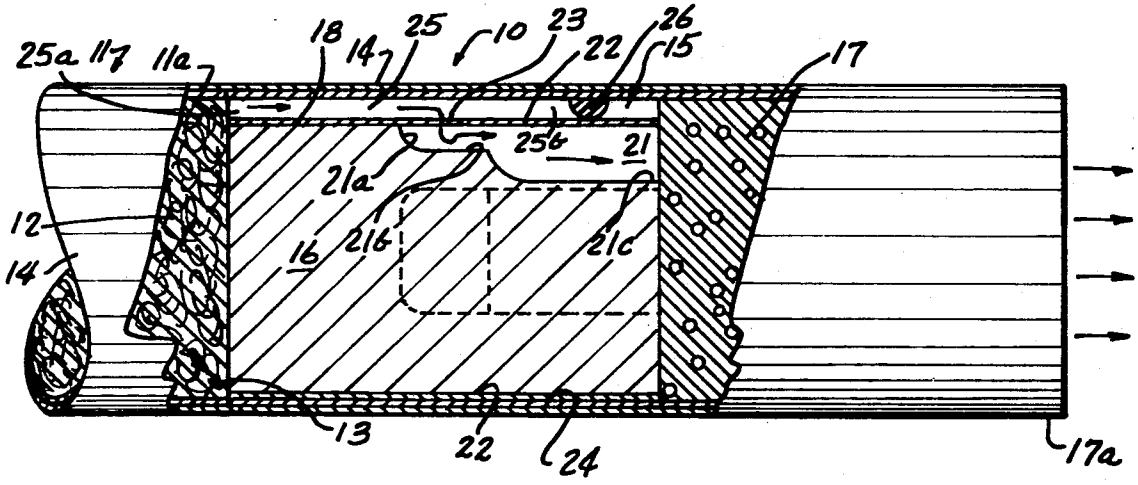
1,996,990	4/1935	Cullen	131/10.5
2,954,774	10/1960	Lebert	131/10.5
3,472,238	10/1969	Blount et al.	131/201 X
3,496,946	2/1970	Griffith	131/10.5

FOREIGN PATENTS

1,508,121	11/1967	France	131/261 B
234,188	12/1944	Switzerland	131/261 B

Primary Examiner—Aldrich F. Medbery
Assistant Examiner—J. F. Pitrelli
Attorney—Pendleton, Neuman, Williams & Anderson

ABSTRACT: A filter cigarette is provided which includes an elongated tobacco rod and an axially aligned filter assembly affixed to one end thereof. The filter assembly comprises a smoke-impervious core piece, and a smoke-pervious member disposed in abutting relation with respect to the downstream end of the core piece. The core piece is provided with a plurality of elongated facets; each facet being provided with an elongated indentation through which smoke is adapted to flow. The core piece is encompassed by a thin perforated membrane having perforations thereof aligned with the indentations. A sleeve is also provided which encompasses the perforated membrane. Portions of the sleeve and perforated membrane are in spaced relation and form a plurality of elongated longitudinally extending shallow passageways through which smoke is adapted to flow. Each passageway is in communication with an adjacent indentation through a membrane perforation. The smoke is emitted from the membrane perforations at a very high velocity and impinges against an adjacent surface before flowing through the smoke-pervious member.



PATENTED AUG 3 1971

3,596,664

SHEET 1 OF 2

Fig. 1

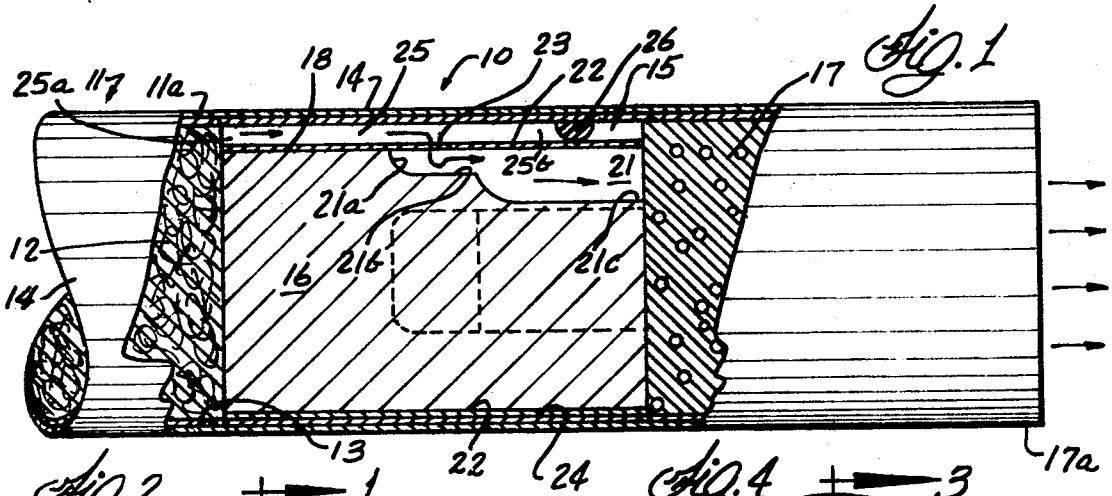


Fig. 2

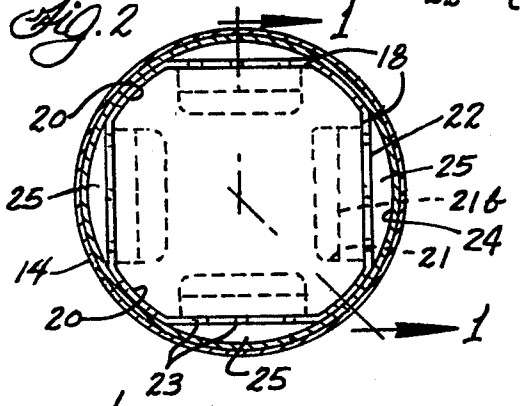


Fig. 4

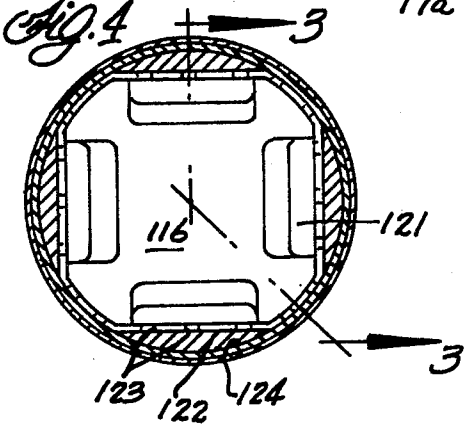
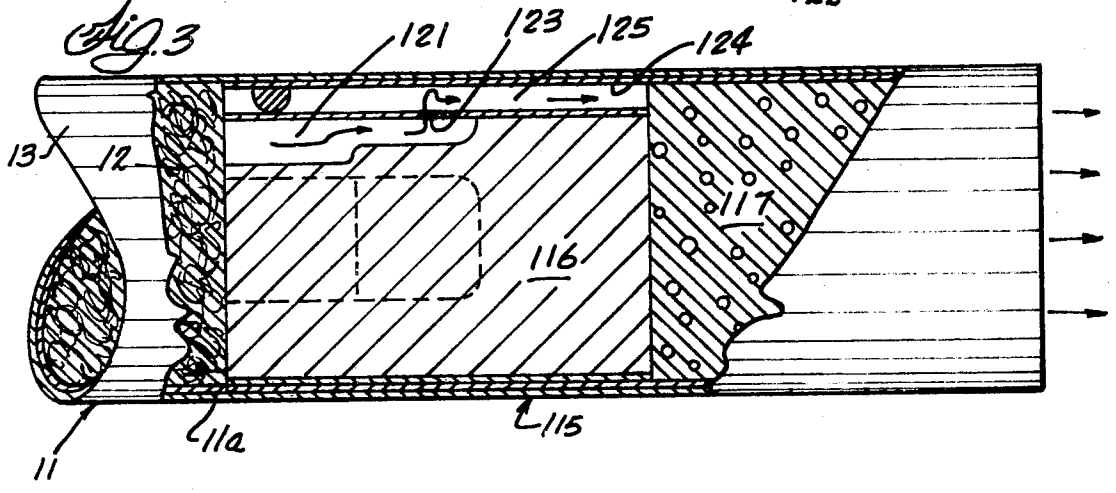


Fig. 3



Inventor
Jesse R. Pinkham
By Pendleton, Neuman,
Seibold & Williams
Attorneys

Fig. 5.

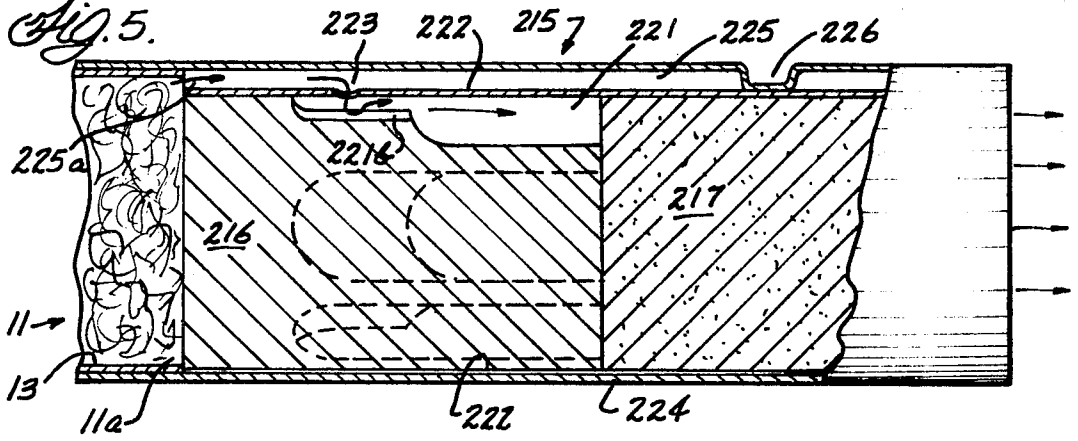


Fig. 6

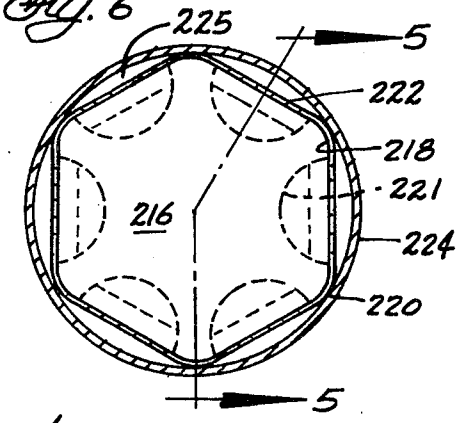


Fig. 8

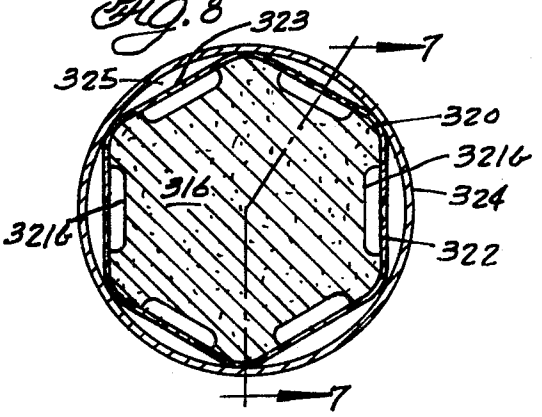
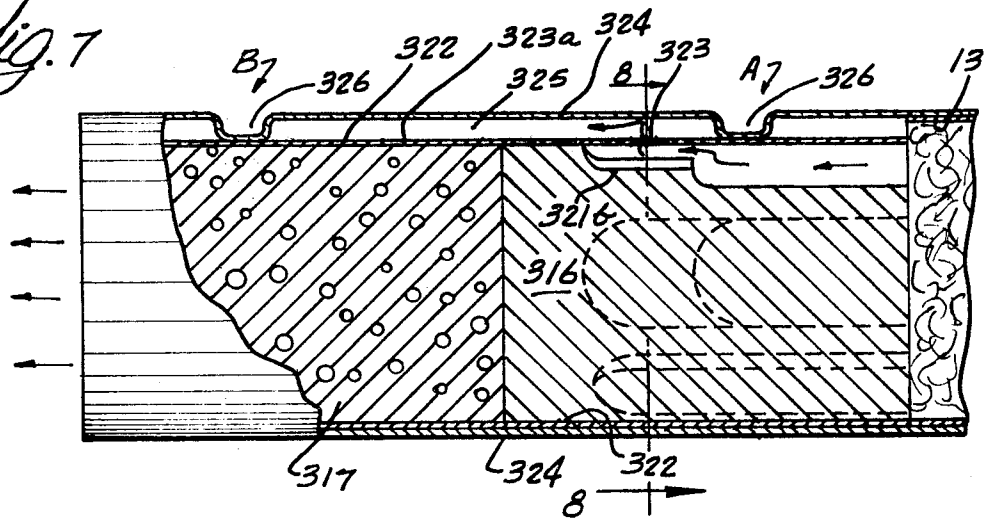


Fig. 7



Inventor
Jesse R. Pinkham
By: Pendleton, Newman,
Seibold & Williams
Attorneys

FILTER CIGARETTE

BACKGROUND OF THE INVENTION

It is important that a filter cigarette to be commercially acceptable be possessed of certain characteristics such as (a) that it is of simple inexpensive construction; (b) that it can be assembled at speeds comparable to those presently used in forming filter or nonfilter cigarettes; (c) that it is efficient in removing solid and/or liquid particles from the circulating smoke without causing a substantial pressure buildup across the filter assembly during smoking of the cigarette; and (d) that the filter assembly will not have a deleterious effect on the taste and aroma of the smoke. Heretofore various filter cigarettes have been provided; however, because of certain design features they lack one or more of the aforesaid characteristics.

SUMMARY OF THE INVENTION

Thus, it is an object of this invention to provide a filter cigarette which possesses all of the aforenoted desirable characteristics.

It is a further object of this invention to provide a filter cigarette wherein the various component parts thereof may be formed by utilizing techniques and methods well known in the cigarette-making art.

Further and additional objects will appear from the description, accompanying drawings, and appended claims.

In accordance with one embodiment of the invention a filter cigarette is provided which comprises an elongated tobacco rod, and a filter assembly affixed to one end thereof. The assembly in one form includes a smoke-impervious core piece which is disposed in abutting axial alignment with respect to the rod one end, and a smoke-pervious member disposed in abutting axial alignment with the downstream end of the core piece. The exterior of the core piece is provided with a plurality of elongated, longitudinally extending facets, each of which being provided with an elongated indentation which is closed at one end and open at the other end. Overwrapping the core piece exterior is a thin perforated membrane. Each core piece indentation has a membrane perforation in registration therewith. Encompassing the perforated membrane is an elongated smoke-impervious sleeve. Portions of the sleeve and the perforated membrane are disposed in spaced relation and form a plurality of elongated, longitudinally extending shallow passageways. Each passageway is in communication with an adjacent indentation through a membrane perforation. The configuration of each perforation is such that smoke is emitted therefrom at a very high velocity. The high velocity smoke impinges against an adjacent surface causing solid and/or liquid particles entrained in the smoke to be deposited on said adjacent surface prior to the smoke flowing through the smoke-pervious member.

DESCRIPTION

For a more complete understanding of the invention reference should be made to the drawings wherein:

FIG. 1 is an enlarged fragmentary side elevational view of one form of the improved filter cigarette and with a portion thereof shown in a section taken along line 1–1 of FIG. 2.

FIG. 2 is an elevational view of the upstream end of the filter assembly shown in FIG. 1.

FIG. 3 is similar to FIG. 1 but showing a first modified form of the improved filter cigarette; portions of the latter being shown in a section taken along line 3–3 of FIG. 4. FIG. 4 is an elevational view of the upstream end of the filter assembly shown in FIG. 3.

FIG. 5 is similar to FIG. 1 but showing a second modified form of the improved filter cigarette; portions of the latter being shown in a section taken along line 5–5 of FIG. 6.

FIG. 6 is an elevational view of the upstream end of the filter assembly shown in FIG. 5.

FIG. 7 is similar to FIG. 1, but showing a third modified form of the improved filter cigarette; portions of the latter being shown in a section taken along line 7–7 of FIG. 8.

FIG. 8 is a sectional view taken along line 8–8 of FIG. 7.

Referring now to the drawings and more particularly to FIGS. 1 and 2, one form 10 of the improved filter cigarette is shown. The cigarette 10 includes an elongated tobacco rod 11 having a core 12 of compacted shreds of blended tobacco which is encompassed by a wrapper 13 of suitable thin cigarette paper. Secured to an end 11*a* of the rod 11 by a sleeve 14 of tipping paper is a filter assembly 15.

The assembly 15 in the illustrated embodiment includes an elongated core piece 16 which is formed of a suitable smoke-impervious material (e.g. an extruded foam plastic, such as expanded polystyrene), and an elongated cylindrically shaped member 17 formed of a smoke-pervious material (e.g. fibers of cellulose derivative such as Estron).

The exterior of the core piece 16 is provided with a plurality (four in number) of elongated, longitudinally extending, symmetrically arranged facets or planar faces 18. The facets are separated from one another by arcuate elongated portions 20, see FIG. 2. Each facet 18 is provided with an elongated longitudinally extending indentation 21. Each indentation 21 is closed at one end 21*a*. The portions 21*b* of the indentation adjacent the closed end thereof is shallower, or of less depth, than the remainder of the indentation. The downstream end 21*c* of each indentation is open and terminates at the smoke-pervious member 17.

Encompassing the core piece 16 is a thin perforated membrane 22 which may be formed of paper, foil, or plastic film. One or more of the perforations 23 formed in the membrane are disposed in registered relation with respect to the portion 21*b* of an adjacent indentation 21. The membrane 22 is adhesively secured to the arcuate exterior portions 20 of the core piece 16. Because of the configuration of portions 20, good adhesive bond can be obtained between the membrane and the core piece. Overlapping of the membrane opposite edges may occur at one of the arcuate portions.

Encircling the membrane 22 and the smoke-pervious member 17 is an elongated sleeve 24. The sleeve retains the core piece and member 17 in aligned, abutting relation, see FIG. 1. The sleeve is cylindrical in configuration and cooperates with the portions of the membrane 22 overlying the core piece facets 18 to form a plurality of elongated passageways 25. The upstream end 25*a* of each passageway is in communication with the end 11*a* of the tobacco rod 11. The downstream end 25*b* of each passageway, on the other hand, is blocked by a smoke barrier 26 which in the FIG. 1 embodiment may be formed by a bead of adhesive applied to the interior surface of the sleeve 24 prior to the latter being brought into encircling relation with the core piece and member. By reason of the smoke barrier 26 which is located downstream of the membrane perforations 23, the smoke, which is drawn into the passageway 25 upon suction being applied to the downstream end 17*a* of member 17, is caused to flow through the perforations 23 into the indentations 21 and then from the indentations through the member 17. The perforations 23 which are preferably arranged in an encircling row are sized (e.g. 0.010-inch diameter where 12 perforations are utilized; three for each indentation) so as to cause the smoke upon being emitted from the perforations to attain a very high velocity. The high velocity smoke impinges against an adjacent surface (in the FIG. 1 embodiment, the adjacent surface is that of the raised portion 21*b* of the indentation). Due to the impingement of the smoke, the solid and/or liquid particles entrained in the smoke are deposited on the adjacent surface before the smoke continues on to member 17. In order to have optimum deposit of said solid and/or liquid particles on the adjacent surface, when the initial pressure buildup across the filter assembly is approximately 2.0 inches of water, it is preferred that the distance between the perforations and the adjacent surface (portion 21*b*) be within the range from approximately 0.008 inch to approximately 0.015 inch. The

filter assembly **15** as previously mentioned is secured to the rod end **11***a* by a sleeve **14** of tipping paper. Because of the direction of smoke flow through tee membrane perforations **23**, filter assembly **15** is designated as an "Out to In" style.

The indentations **21** of core piece **16** are normally formed by after-forming wheels, not shown, which engage the periphery of the core piece after it has been extruded. The after-forming wheel technique is well known in the art and permits accurate dimensioning of the indentations. Thus, with the "Out to In" filter assembly **15**, the spacing between the membrane perforations **23** and portion **21***b* of the indentation can be arcuately controlled and maintained during smoking of the cigarette.

FIGS. **3** and **4** illustrate a first modified filter assembly **115** which is the same structurally as filter assembly **15**, except core piece **116** is in an inverted position with respect to the smoke-pervious member **117**. Corresponding parts comprising filter assemblies **15** and **115** are given like identifying numerals, except as to assembly **115** they will be in the 100 series. The same procedure will be followed as to the other modified assemblies to be hereinafter described except said numerals will be in the 200 and 300 series.

By reason of inverted disposition of the core piece **116**, the smoke upon leaving the rod end **11***a* passes initially through the indentations **121**, then out through the membrane perforations **123** and into the elongated passageway **125**. With assembly **115**, the high velocity smoke emitted from perforations **123** impinges against the adjacent surface, which is the portion of the interior surface of the sleeve **124** opposite the perforation. The distance between the perforations **123** and the sleeve surface portion should be approximately 0.008 inch to approximately 0.015 inch.

In both assemblies **15** and **115**, the smoke-pervious member **17** or **117** has a cross-sectional configuration which approximates that of the rod end **11***a* and thus, simplifies assembly of the various component parts of the filter assembly to the tobacco rod.

FIGS. **5** and **6** show a modified form of improved filter assembly **215** wherein both the core piece **216** and the smoke-pervious member **217** have a substantially hexagonal cross-sectional configuration, see FIG. **6**. As in the case of the aforedescribed core pieces **17** and **117**, the exterior surface of core piece **216** is provided with a plurality of elongated, longitudinally extending facets **218**, each of which has formed therein an elongated, longitudinally extending indentation **221**. The hexagonal configuration of core piece **216** is formed preferably by extrusion, and the indentations **221**, in turn, are formed by means of after-forming wheels or the like.

Encompassing both the core piece **216** and smoke-pervious member **217** is a thin perforated membrane **222** which is formed of the same material as in the case of membrane **22** or **122** previously described. Membrane **222**, in addition to providing perforations **223** in registration with the indentations **221**, serves also as a means for retaining the core piece **216** and member **217** in aligned, abutting relation.

Encompassing the exterior of membrane **222** is a cylindrically shaped sleeve **224**. The interior surface of sleeve **224**, in registered relation with the core piece facets **218**, is spaced from the latter and cooperates therewith to form a plurality of longitudinally extending passageways **225**. Each passageway has an open upstream end **225***a* which terminates at the rod end **11***a*. In order to assure diversion of the smoke from the passageways **225** through the membrane perforations **223**, each passageway has the downstream end thereof closed off by a smoke barrier **226** which is formed by an elongated depression formed in the downstream portion of the sleeve **224**.

Each depression **226** takes the form of a circular segment. The corners **220** formed between adjacent facets **218** of the core piece supportingly engage the interior surface of the sleeve **224**. Sleeve **224** may, if desired, serve a dual function namely; (a) to form the passageways **225**, and (b) to act as tipping paper for securing the core piece and member to the end of the tobacco rod. The assembly **215**, as illustrated, shows the sleeve **224** functioning in said dual capacity.

Each indentation **221** has a portion **221***b* adjacent the closed end **221***a* thereof of lesser depth than the remainder of the indentation. Each indentation portion **221***b* is opposite a membrane perforation **223** so that the high velocity smoke emitted inwardly through the perforation will impinge against said portion **221***b* and effect deposition of the smoke solid and/or liquid particles thereon. Like filter assembly **15**, the second modified filter assembly **215** may be designated as an "Out to In" style.

The third modified filter assembly **315**, shown in FIGS. **7** and **8** closely resembles assembly **215**, except that the core piece **316** is disposed in inverted relation with respect to the smoke-pervious member **317**. By reason of this inversion and in order to assure that the initial flow of the smoke, upon leaving the tobacco rod, is directed through the open ends of the core piece indentations **321**, the sleeve **324** is provided with two rows A and B of smoke barrier-forming depressions **326**. The row A of depressions is disposed upstream of the perforations **323** and the row B of depressions is disposed downstream of the downstream end of the core piece **316**. Each of the depressions **326** is again in the form of a circular segment.

To permit the smoke to flow from the passageways **325**, formed by the interior surface of sleeve **324** and the facets **318** of the core piece, through the smoke-pervious member **317** it is necessary that membrane **322** be provided with a second set of perforations **323***a* which are arranged in encircling relation with respect to member **317**, see FIG. **7**. The second set of perforations **323***a* are of larger size than the first set of perforations **323** and thus, do not contribute in any significant way to the pressure buildup created by the filter assembly. If desired, the sleeve **324** may be overwrapped by a sleeve, not shown, of tipping paper. In the embodiment illustrated in FIG. **7**, no additional sleeve is required.

While four variations of the improved filter cigarette have been disclosed, the invention is not intended to be limited thereto. For example, two or more smoke-pervious members (one being of a cellulose derivative and the other being of a bonded granular material) arranged in tandem relation may be employed in combination with the core piece. Furthermore, the number of facets and the shape of the indentations formed therein may be varied from that shown without departing from the scope of the invention.

Thus, it will be seen that an improved filter cigarette has been provided which is inexpensive and may be easily and expeditiously assembled utilizing techniques and methods well known in the cigarette-making art. Furthermore, the improved filter assembly is highly effective in removing the solid and/or liquid particles from the smoke and in no way deleteriously affects the taste and aroma of the smoke.

I claim:

1. A filter cigarette comprising an elongated tobacco rod and a filter assembly affixed to one end of said rod; said assembly including an elongated core piece of smoke-impervious material disposed in axially aligned abutting relation with respect to said rod one end, said core piece having a plurality of elongated facets on its peripheral exterior, each facet being provided with an elongated indentation, through which smoke is caused to flow, said facets being separated from one another by elongated arcuate unindented portions; an elongated smoke-pervious member abutting the downstream end of said core piece; a perforated membrane overlying each core piece indentation; and a sleeve encompassing and being secured to said core piece exterior, portions of said sleeve being in registered spaced relation with respect to each facet and the perforated membrane overlying same, and cooperating therewith to form a plurality of elongated shallow passageways through which smoke is caused to flow, each passageway being in communication with a core piece indentation through a membrane perforation, each perforation being of such dimension that smoke passes therethrough at a high velocity whereby the

solid and/or liquid particles entrained in the emitted smoke impinge against and are deposited on a surface disposed in close proximity to said membrane perforation prior to the smoke continuing its flow through said smoke-pervious member.

2. A filter cigarette comprising an elongated tobacco rod and a filter assembly affixed to one end of said rod; said assembly including an elongated core piece of smoke-impervious material disposed in axially aligned abutting relation with respect to said rod one end, said core piece having a plurality of elongated facets on its peripheral exterior, each facet being provided with an elongated indentation, through which smoke is caused to flow, said facets being separated from one another by elongated arcuate unindented portions; a perforated membrane overlying each core piece indentation; and a sleeve encompassing and being secured to said core piece exterior, portions of said sleeve being in registered spaced relation with respect to each facet and the perforated membrane overlying same, and cooperating therewith to form a plurality of elongated shallow passageways through which smoke is caused to flow, each passageway being in communication with a core piece indentation through a membrane perforation, each perforation being of such dimension that smoke passes therethrough at a high velocity whereby the solid and/or liquid particles entrained in the emitted smoke impinge against and are deposited on a surface disposed in close proximity to said membrane perforation prior to the smoke continuing its flow through said filter assembly.

3. The filter cigarette of claim 2 wherein said indentations are closed at a corresponding one end.

4. The filter cigarette of claim 3 wherein the maximum depth of each indentation adjacent the membrane perforation is less than the maximum depth of the remainder of said indentation.

5. The filter cigarette of claim 2 wherein the perforated membrane encompasses said core piece and is secured to the arcuate unindented portions of said core piece.

6. The filter cigarette of claim 1 wherein said smoke-pervious member is formed of bonded granules of activated charcoal.

7. The filter cigarette of claim 1 wherein said smoke-pervious member is formed of a cellulose derivative.

8. The filter cigarette of claim 2 wherein the surface against which the high velocity smoke impinges comprises the passageway-forming surface of said sleeve.

9. The filter cigarette of claim 2 wherein the surface against which the high velocity smoke impinges comprises a portion of said indentation.

10. The filter cigarette of claim 8 wherein each indentation has a closed end and an open end and the open end of each indentation is disposed adjacent said tobacco rod one end.

11. The filter cigarette of claim 1 wherein each indentation has a closed end and an open end and the open end of each indentation is disposed adjacent to said smoke-pervious member.

12. The filter cigarette of claim 2 wherein said elongated core piece is provided with four, symmetrically arranged, longitudinally extending facets.

13. The filter cigarette of claim 12 wherein the longitudinal dimension of each core piece indentation is less than the overall longitudinal dimension of said core piece.

14. The filter cigarette of claim 1 wherein said smoke-pervious member has substantially the same cross-sectional configuration as said tobacco rod one end.

15. The filter cigarette of claim 1 wherein said core piece and said smoke-pervious member have substantially the same cross-sectional configuration.

16. The filter cigarette of claim 15 wherein the sleeve therefor is provided with a plurality of inwardly extending smoke-barrier projections arranged in two longitudinally spaced rows, one of said rows encircling said smoke-pervious member and the other of said rows encircling said core piece; corresponding projections of each row being in registration with an elongated facet of said core piece and defining an end limit of the shallow passageway formed by the facet.

17. The filter cigarette of claim 2 wherein said sleeve includes a plurality of inwardly extending smoke-barrier projections, each projection being in registration with a passageway and forming one end limit thereof.

18. The filter cigarette of claim 2 wherein the smoke flow through said perforated membrane is in an out to in direction and the portion of each indentation adjacent the closed end thereof comprising an impingement target area for the high velocity smoke flowing through the adjacent membrane perforations, said target area remaining at a predetermined distance from the adjacent membrane perforations during the high velocity smoke flow therethrough.