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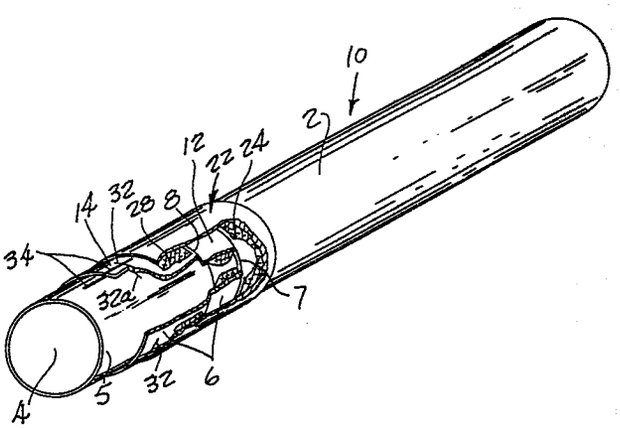
(54) Adjustable air dilution filter.

(57) An adjustable air dilution filter is provided for a smoking article such as a cigarette. The adjustable filter generally comprises a filter plug 4, overlain by a plurality of bands. At least one first air dilution opening 32a is formed in the surface of the filter plug, and at least one second air dilution opening 32 is formed through one or more bands 6, in longitudinal alignment with the first opening. An inner band 6 overlies the filter plug and has several longitudinally spaced zones. Over the inner band lies an outer band 22, which has several longitudinally spaced areas. One of the inner band zones 12 is joined to the filter plug 4 to form a first unit; one of the outer band areas 28 is joined to an inner band zone to form a second unit. The cooperative relationship thus created between the zones and areas of the two bands and the filter plug permits one of these units to rotate freely, while the other unit holds it in axial position. Rotation of the rotatable unit causes the air dilution openings to become more or less aligned, varying the air dilution delivered to the mainstream smoke, and, hence, varying the particulate delivery to the consumer.



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ADJUSTABLE AIR DILUTION FILTER

This invention relates to cigarette filters, and more particularly to filters having means whereby the consumer may vary the particulate delivery of the mainstream smoke by varying the amount of air dilution.

The tobacco industry has been searching for a practical, adjustable filter cigarette for over 30 years. Filter cigarettes were introduced on a wide scale in the early 1950's, and since that time, cigarette manufacturers have experimented with different ways to allow the consumer to vary the perceived strength of the cigarette smoke. Various approaches have been attempted, primarily aimed at either varying the amount of filter material through which the mainstream smoke must pass or by varying the amount of air dilution of the mainstream smoke. The simple fact that no such product exists testifies eloquently to the complete failure of the prior art to solve this problem.

Primarily, this failure has been caused by the complexity of the suggested approaches. Complexity

results in a product which is difficult to manufacture, and thus too expensive to appeal to consumers. Typical of such devices are the inventions disclosed by Riegel, U. S. Patent No. 3,503,406, and Thomson, U. S. Patent No. 3,359,988. Both of these devices depend upon varying the amount by which mainstream smoke is diluted with air. Also, both devices require special inserts in the cigarette, or its filter rod, itself, as well as special sleeves. In Riegel, a flue element at the tip of the cigarette or filter plug is required, as well as a sleeve, having another flue element, fitted over the end of the cigarette. Thomson requires two inserts in the filter element -- a horizontal insert and a semi-circular vertical insert, which separate the filter into two zones, one passing mainstream smoke and the other passing only air. These inventions share the characteristic of great manufacturing difficulty. Not only are the individual elements costly relative to other components of the cigarette, but also such elements do not lend themselves to conventional cigarette manufacturing machinery.

Other suggested approaches not only would be expensive and difficult to manufacture, but also they would be impractical from a consumer point of view. The multi-part mouthpiece disclosed by Pelletier in U. S. Patent No. 2,693,193 would have to be purchased separately by the consumer, as such construction would not lend itself to present manufacturing and marketing channels. Similarly, the axially adjustable filter shown in U. S. Patent No. 3,486,508, to Sipos, would be very difficult for a consumer to use, as adjustment depends upon moving the filter plug axially within the mouthpiece tube. It easily can be seen that devices such as these lack practicality because they make it

difficult for the consumer to achieve the desired result.

A preferred but non-limiting embodiment of the present invention comprises a filter plug, axially abutting a smoking article, such as a cigarette tobacco rod. The filter plug is overwrapped by a plurality of bands. At least one first air dilution opening is formed in the surface of the filter plug, and at least one second air dilution opening is formed through one or more bands, in longitudinal alignment with the first opening. An inner band overlies the filter plug and has several longitudinally spaced zones. Over the inner band lies an outer band, which has several longitudinally spaced areas. One of the inner band zones is joined to the filter plug to form a first unit; one of the outer band areas is joined to an inner band zone to form a second unit. The cooperative relationship thus created between the zones and areas of the two bands and the filter plug permits one of these units to rotate freely, while the other unit holds it in axial position. Rotation of the

rotatable unit causes the air dilution openings to become more or less aligned, varying the air dilution delivered to the mainstream smoke, and, hence, varying the particulate delivery to the consumer.

In the accompanying drawings:-

FIGURE 1 is a perspective of an embodiment of the present invention.

FIGURES 2 and 3 are plan views of the inner and outer band, respectively, of the embodiment shown in FIG. 1, in flat configuration before being wrapped about the cigarette assembly.

FIGURE 4 is a section view of the present invention taken along line IV of FIG. 1, showing the air dilution perforations in alignment. FIGURE 4a, also a section view along line IV of FIG. 1, shows the adjustment in air dilution made possible by misaligning the air dilution perforations.

FIGURE 5 is a perspective of another embodiment of the invention.

FIGURES 6 and 7 are plan views of the inner band and outer band, respectively, of the embodiment show in FIG. 5, in flat configuration before being wrapped about the cigarette assembly.

FIGURE 8 is a perspective of another embodiment.

FIGURES 9 and 10 are plan views of the inner band and outer band, respectively, of the embodiment shown in FIG. 8, in flat configuration before being wrapped about the cigarette.

FIGURE 11 is a detail of the plan view of FIG. 2, showing an alternative slit-forming technique.

FIGURE 12 is a perspective of a means for joining the filter to a smoking article.

Referring to the drawings, Figures 1-3 depict an embodiment 10 of the present invention. Generally, a tobacco rod 2 is axially abutted to a filter plug 4 to form a cigarette assembly. The tobacco rod may be of any conventional length and circumference. The filter plug comprises filter material, known in the art, and a wrapper 5. Rather than the normal, porous plug wrap, the wrapper is a low-shear-strength tipping paper, impermeable to air, likewise known in the art. The filter plug may be of any suitable material known in the art, such as an extruded foam filler having an impervious outer skin. The filter material and the tobacco blend may be chosen to deliver a desired particulate level, as discussed hereinafter.

An inner band 6 encircles the filter plug. The forward edge of this inner band may extend to the line of abutment 7 between the filter and the tobacco rod. Figure 2 depicts the inner band in a flat configuration, before being wrapped around the filter plug. A circumferential parting slit 8 is formed in the inner band, preferably after the band is wrapped about the filter plug, defining a rotating zone 12, which lies between the slit and the tobacco rod, and a retaining zone 14, which extends rearward toward the filter mouthpiece. Adhesive is applied to the underside of the rotating zone 12 to join the inner band to the filter plug. The retaining zone is left free of adhesive. Adhesive also may be applied between the longitudinal edges 20 and 20a of the inner band to insure a solid seam after wrapping. The adhesive may be of any conventional type, such as hot-melt or polyvinyl acetate (PVA).

An outer band 22 encircles the cigarette assembly partially covering the inner band. This band may be conventional tipping paper known in the art. Adhesive is applied to the underside of the outer band, defining three longitudinally spaced areas, as best seen in Figure 3, which shows the outer band in a flat configuration. An overlap area 24 corresponds to the portion of the outer band in contact with the tobacco rod; this area has adhesive applied thereto, joining it to the tobacco rod. A locking area 26 extends rearward from the overlap area and overlies the inner band rotating zone 12. It has no adhesive applied thereto. An attachment area 28 extends rearward from the locking area. It constitutes the portion of the outer band overlapping the inner band retaining zone 14, and it has adhesive applied to join it to that zone. Adhesive also may be applied between edges 30 and 30a to form a complete seam when the outer band is wrapped around the cigarette assembly.

After the complete cigarette is assembled, inner band rotating zone 12 is joined to filter plug 4 to form a first unit. The inner band retaining zone 14 is joined to the outer band 22 to form a second unit, which is attached to the tobacco rod 2. The filter plug thus is not attached to either the tobacco rod or the outer band, and thus is able to rotate freely. Yet, the combined action of the second unit serves to hold the first unit in axial position. Furthermore, the retaining zone, extending rearward toward the mouthpiece of the filter, holds the second unit sufficiently firmly to prevent wobble.

After the inner band and the outer band are attached to the cigarette assembly, first and second air dilution openings 32 and 32a are formed therein.

These openings are formed by piercing apertures of selected shape through one or more bands and penetrating the filter plug 4. Figure 1 shows the air dilution openings 32 and 32a located in the retaining zone of the inner band, not covered by the outer band. Based upon known techniques of achieving air dilution, this position could be adjusted forward, so that the openings are formed through the outer band, the inner band (in either the retaining or rotating zone) and the filter wrapper. The openings can take the form of slits or perforations. It is preferred that the openings comprise three slits, spaced about the circumference of the filter plug at 120° intervals (Fig. 4). The length of the slits is chosen to provide the desired level of air dilution.

As is known in the art, air dilution openings, filter material, and tobacco blend cooperate to produce a desired level of particulate delivery. Using known techniques, persons having ordinary skill in the art will appreciate how to balance these factors in order to achieve a cigarette of desired particulate delivery, combined with other smoke characteristics.

The completed cigarette may be adjusted by the consumer to vary the level of particulate delivery. As delivered to the consumer, the cigarette is in its lowest particulate delivery form, i.e., having maximum air dilution, because dilution opening 32 through the inner band 6 is circumferentially aligned with corresponding opening 32a through the filter plug wrapper 5, as shown in Figure 4. To adjust air dilution, the consumer merely rotates the filter plug. Figure 4a shows the cigarette after rotation of the filter, with openings 32 and 32a misaligned and air dilution reduced by about 50%. The amount of air dilution thus depends

upon the degree to which the perforation slits are aligned. An index line 34 or other indicia may be printed on the filter plug or inner band retaining zone to guide the consumer in selecting levels of particulate delivery. Preferably, this line longitudinally extends from a rotatable to a non-rotatable portion of the cigarette, so that alignment of the portions indicates alignment of the air dilution means. Various ways to accomplish such a result will be apparent to those in the art.

A significant advantage of the present invention is its ease of manufacture. Conventionally, filters are made in one section of a manufacturing operation and are joined to tobacco rods in an assembly operation. No change in this procedure need be implemented to assemble adjustable-filter cigarettes. The filter can be made in its normal form, a rod sufficiently long so that four or six filter plugs will be formed therefrom when the rod is severed during assembly. The only alterations required in the filter-making process are the substitution of a different filter plug wrap for the normal plug wrap, and the addition of one piece of equipment at the output end of the filter rod making machine. This equipment wraps the required number of inner bands 6 around the filter rod. The inner band material preferably receives slit 8 therein after being wrapped around the filter rod. Application of adhesive to the rotating zone 12 and edge 20 occurs prior to wrapping.

The cigarette assembly operation proceeds entirely normally. The primary difference between application of conventional tipping paper and the outer band is the manner in which adhesive is applied to the outer band to define the overlap area 24, void area 26,

attachment area 28. The precise dimensions of these areas are chosen based upon manufacturing tolerances in the application of adhesive, as will be apparent to those having skill in the art. It is preferable to utilize PVA adhesive rather than hot-melt for this component. Finally, air dilution openings 32 are formed in the assembled cigarette, preferably utilizing a known on-line laser perforator. Dimension and location of the air dilution slits is controlled by regulating the pulse time and power output of the laser perforator.

Another embodiment 110 of the present invention is shown in Figures 5-7. The complete cigarette, shown in Figure 5, again generally comprises a tobacco rod 102, having a wrapper and filler, axially abutted to a filter plug 104. The filter plug is overwrapped in this instance by inner band 106, which can be conventional tipping paper or other suitable material.

The inner band 106 is shown in flat configuration in Figure 6. This inner band is separated by circumferential, longitudinally spaced parting slits 108 and 109 into three zones: a forward rotating zone 113 extending from the line of abutment 107 between the filter plug and the tobacco rod rearward to the forward parting slit 108, a rear rotating zone 112 extending from the rear parting slit 109 to the mouthpiece end of filter plug 104, and a retaining zone 114 lying beween the parting slits. Adhesive is applied to the forward and rear rotating zones to join those portions of the inner band to the filter plug. Adhesive also may be applied between edges 120 and 120a of the retaining zone in order to form a complete seam when the inner band is wrapped about the filter plug.

Outer band 122 is wrapped around the cigarette assembly so that it overlaps both the tobacco rod and the filter plug, but does not completely cover the latter. Prior to being wrapped, adhesive is applied to the outer band to define four areas (Fig.7). At the forward end of the outer band, overlap area 124 corresponds to that portion of the outer band in contact with the tobacco rod 102, and it is adhesively joined thereto. A forward locking area 126 extends rearward from the overlap area for a distance equal to the width of the inner band forward rotating zone 113, which this area overlies. No adhesive is applied to this area. Attachment area 128 extends rearwardly from the forward clamp area and corresponds to that portion of the outer band in contact with the inner band retaining zone 114. It has adhesive applied to its underside joining it to the retaining zone. Rear locking area 127 has no adhesive applied thereto, and it extends rearward overlying the inner band rear rotating zone 112 for a distance chosen to provide stability to the completed cigarette, as apparent to those in the art. Adhesive also may be applied between edges 130 and 130a of the locking areas to insure a complete seam when the outer band is wrapped. Conventional adhesive may be used for attaching both the inner band and outer band, with PVA preferred.

After assembly, the inner band rotating zones 112 and 113 are joined to the filter plug 104 to form a first unit. Outer band 122 is joined to the inner band retaining zone 114 to form a second unit, which is attached to the tobacco rod 102. Because the first unit is not joined to the tobacco rod in any way, it is free to rotate. Yet, the action of the second unit serves to hold the first unit in axial position.

Because the retaining zones prevent axial movement of the rotating zones, the first unit is held in axial position, and the portion of the outer band extending rearwardly in contact with the inner band rear rotating zone 112 prevents wobble.

Air dilution openings 132 and 132a are formed through the outer band and inner band respectively and penetrates the filter plug. An index line 134, or other indicia, may be added to aid the consumer. The prior discussion concerning the position, dimensions, and number of air dilution means applies equally to this embodiment.

As with the first embodiment, the consumer receives the adjustable filter cigarette in its lowest particulate delivery configuration. Adjustment of the perceived mainstream smoke strength is accomplished by rotating the filter, thus varying the amount of air dilution supplied by the air dilution means.

Manufacturing techniques associated with this embodiment differ little from those discussed previously. Inner bands 106 are attached to a multiple filter rod by an on-line adaptation of conventional filter manufacturing apparatus. A further minor adaptation allows the parting slits 108 and 109 to be cut in the inner band. The outer band 122 is applied in the assembly operation in the same way that conventional tipping paper is now applied. Only minor modification of existing cigarette making apparatus is required to accomplish this result. The air dilution openings 132 and 132a are formed utilizing conventional on-line perforating apparatus.

Another embodiment 210 of the present invention is depicted in Figures 8-10. Again, the cigarette assembly generally comprises a tobacco rod 202, having

a conventional filler and wrapper, axially abutted to a filter 204. The filter in this embodiment is manufactured having a conventional plug wrap (not shown).

The inner band 206 in this embodiment closely resembles conventional tipping paper, in that it is dimensioned to extend the length of the filter and overlap the tobacco rod. Figure 9 shows the inner band 206 in flat configuration before wrapping. Adhesive is applied to the underside of the inner band before it is wrapped around the cigarette assembly, defining three zones: a forward retaining zone 215 is adhesively joined to the filter and overlaps the abutment 207 between the filter plug and tobacco rod, and extends rearward over the filter plug. A rear retaining zone 214 also is adhesively joined to the filter, and is in contact with the rear portion of the filter plug. Rotating zone 212 has no adhesive applied thereto, and overlies the filter plug between the two retaining zones. Two circumferential parting slits 208 are formed in the rotating zone after the inner band is wrapped around the cigarette assembly. Each slit is located within the rotating zone adjacent the boundary between it and a retaining zone, spaced at a distance dictated by manufacturing tolerances. As envisioned, these slits are formed by apparatus such as an on-line laser perforator set for continuous operation, adjusted so that the depth of perforation penetrates but does not extend substantially into the filter plug. Adhesive may be added between edges 220 and 220a to insure a complete seam.

Outer band 222 is shown in flat configuration before wrapping in Figure 10. This band is wrapped around the cigarette assembly as shown in Figure 8. Before being wrapped, adhesive is applied to the under-

side of the outer band to define three areas: An attachment area 224 corresponds to the portion of the outer band in contact with the inner band rotating zone 212 and is adhesively joined thereto. Cover areas 226 have no adhesive applied thereto and lie on either side of adhesive area 224, in contact with the inner band retaining zones 214 and 215. Adhesive also may be applied between edges 230 and 230a of the cover areas in order to secure a complete seam when the outer band is wrapped around the cigarette assembly.

Air dilution openings 232 and 232a are formed through a cover area of the outer band and a retaining zone of the inner band, respectively, and penetrate the filter plug wrap. An index line 234, or other indicia, may be added to aid the consumer. The previous discussion of the location, dimensions, and formation of the air dilution openings applies equally here.

After assembly, the inner band retaining zones 214 and 215, joined to filter plug 204, constitute a first unit, which is adhesively attached to the tobacco rod 202. Outer band 222, joined to the inner band rotating zone 212 constitutes a second unit. Because the retaining zones prevent axial movement of the inner band rotating zone, the second unit is free to rotate, but is constrained from axial displacement. In contrast to other embodiments, here the filter plug remains stationary and the outer band rotates, allowing adjustment of the amount of air dilution supplied to the mainstream smoke.

Manufacturing techniques associated with this embodiment differ from those of the first two embodiments. First, the filter rod manufacturing process proceeds exactly as is done conventionally. After the filter plug and tobacco rod are brought into axial

alignment on a cigarette making machine, the inner band is applied to the assembly exactly as is conventional tipping paper. The only modification of conventional manufacturing techniques comes in applying adhesive to the inner band, forming the parting slits, and wrapping the outer band around the assembly by techniques known in the art. Air dilution openings are formed in the third embodiment exactly as are on-line perforations at present.

An alternative technique exists for forming the parting slits 8, 108, 109, and 208. Figure 11 illustrates this technique as applied to the embodiment of Figures 1-3. Instead of forming completely circumferential slits, the slitting apparatus can be adjusted to form partial slits 11, leaving the inner band retaining zone 14 connected to the rotating zone 12 by a series of small bridges 13. This expedient prevents the angular rotation of the rotating zone during manufacture or shipment. When the consumer desires to adjust the amount of air dilution, rotating the filter severs the bridges, allowing free rotation and adjustment. This technique is adaptable to all embodiments of the invention.

An alternative method for joining the adjustable filter to the tobacco rod is shown in Figure 12. In all embodiments discussed so far, the means employed for joining the adjustable filter to the tobacco rod is an extension of one of the bands. For example, the embodiment shown in Figure 1 is joined to the tobacco rod by the overlap area of the outer band. In the technique shown in Figure 12, which applies this technique to the embodiment shown in Figures 8-10, the inner band 206 extends only as far forward as the end of the filter plug 204. After being aligned axially

with a tobacco rod 202 on a filter cigarette machine, a junction band 228, with adhesive applied to its underside, is wrapped around the completed cigarette assembly, overlying the line of abutment 207 between the tobacco rod and the filter plug. The rearward end of the junction band is shown as not overlapping the outer band 222; this point is a matter of design preference, with the only requirement being that the rearward edge of the junction band must not cover the air dilution opening 232. The advantage of this alternative is that it allows the adjustable filter to be assembled completely during the filter-making process. Filter cigarette assembly would be carried on exactly as is done conventionally. Application of the junction band 228 would proceed exactly as does application of conventional tipping paper, the only difference being the dimension of the band applied.

Persons having ordinary skill in the art will appreciate that variations may be made in the particular embodiment selected, within the spirit of the present invention. For example, different materials could be chosen for the outer band, inner band, or filter wrap to impart selected collateral or decorative characteristics. The air dilution openings can be dimensioned and located to provide a desired range of particulate deliveries. None of these or other variations depart from the scope of the present invention.

CLAIMS:

1. An adjustable air dilution filter for a smoking article, comprising:

a filter plug, axially abutting the smoking article, having at least one first air dilution opening formed in the surface thereof;

means for joining said filter plug to the smoking article; and

a plurality of bands encircling said filter plug, at last one of said bands having formed therein at least one second air dilution opening, in longitudinal alignment with said first opening; said bands including,

an inner band overlying said filter plug, having a plurality of longitudinally spaced zones;

an outer band overlying said inner band, having a plurality of longitudinally spaced areas;

at least one of said inner band zones being attached to said filter plug to constitute a first unit; at least one of said outer band areas being attached to one of said inner band zones to constitute a second unit; one of said units being free to rotate with respect to the smoking article, axially retained by the other said unit, for rotatably varying the radial alignment of

said first and second dilution openings.

2. The adjustable filter of Claim 1, wherein:

said inner band zones include a rotating zone adjacent the smoking article, overlying and attached to said filter plug; and a retaining zone extending rearward from said rotating zone, free of adhesive;

said outer band areas include an overlap area, overlying and attached to the smoking article; a locking area, overlying said inner band rotating zone, free of adhesive; and an attachment area, overlying and attached to said inner band retaining zone;

said filter plug and said inner band rotating zone constitute said first unit; said inner band retaining zone and outer band constitute said second unit; said first unit being free to rotate, retained in axial position by said second unit.

3. The adjustable filter of Claim 1, wherein:

said inner band zones include a forward rotating zone overlying and attached to said filter plug adjacent the smoking article; a rear rotating zone overlying and attached to said filter plug adjacent the filter mouthpiece; and a retaining zone disposed between said rotating zones, free of adhesive;

said outer band areas include an overlap area, overlying and attached to the smoking article; forward and rear locking areas, overlying said forward and rear inner band rotating zones, respectively, free of adhesive; and an attachment area, overlying and attached to said inner band retaining zone;

said filter plug and said inner band rotating zones constitute said first unit; said inner band retaining zone and said outer band constitute said second unit; said first unit being free to rotate, retained in axial position by said second unit.

4. The adjustable filter of Claim 1, wherein:

said inner band zones include a forward retaining zone, attached to said filter plug adjacent the smoking article; a rear retaining zone, attached to said filter plug adjacent the filter mouthpiece; and a rotating zone, disposed between said retaining zones, free of adhesive;

said outer band areas include an attachment area, overlying and attached to said inner band rotating zone; and

at least one cover area, overlying one of said inner band retaining zones and having said second air dilution opening formed therein;

said inner band retaining zone and said filter plug constitute said first unit; said outer band and said inner band rotating zone constitute said second unit; said second unit being free to rotate, axially retained by said first unit.

5. The adjustable filter of Claim 1, wherein said second air dilution opening passes through both of said bands.

6. The adjustable filter of Claims 1, 2, 3, or 4, wherein said dilution openings inlude a plurality of circumferentially elongated slits.

7. The adjustable filter of Claims 1, 2, 3, or 4, wherein said dilution openings include a plurality of perforations.

8. The adjustable filter of Claims 1, 2, or 3, wherein said attachment means includes a portion of said outer band, overlying and attached to the smoking article.

9. The adjustable filter of Claims 1 or 4, wherein said attachment means includes a portion of said inner band, overlying and attached to the smoking article.

10. The adjustable filter of Claims 1 or 4, wherein said attachment means includes a junction band overlying and attached to said inner band and the smoking article.

11. The adjustable filter of Claim 1, 2, 3 or 4 wherein said underband further includes bridges connecting said rotating zone to said retaining zone for holding said rotating zone in fixed position until said bridges are severed by a rotational force applied to said filter plug.

12. A method for making an adjustable air dilution filter, comprising the steps of:

forming a filter rod having a length equivalent to a plurality of filter plugs;

attaching adhesively a plurality of inner bands each having a plurality of longitudinally spaced zones, including a rotating zone and a retaining zone to said filter rod;

severing said filter rod into a plurality of filter plugs;

abutting each of said filter plugs to a tobacco rod;

wrapping an outer band around said tobacco rod and said filter plug such that said tobacco rod and said underband are partially covered and such that said outer band is adhesively joined to said tobacco rod and said inner retaining zone; and

cutting air dilution openings through said inner band and said filter plug wrapper.

13. A method for making an adjustable air dilution filter, comprising the steps of:

forming a filter rod having a length equivalent to a plurality of filter plugs;

attaching a plurality of inner bands circumferentially around said filter rod, each said inner band having a rotating zone and a retaining zone connnected by bridges, by adhesively

joining said rotating zone to said filter rod;

severing said filter rod into a plurality of filter plugs;

abutting each of said filter plugs to a tobacco rod;

wrapping an outer band around said tobacco rod and said filter plug such that said tobacco rod and said inner band are partially covered and such that said outer band is adhesively joined to said toacco rod and said inner band retaining zone; and

cutting air dilution openings through said underband and said filter plug wrapper.

14. A method for making an adjustable air dilution filter, comprising the steps of:

providing a cigarette assembly including a tobacco rod axially abutting a filter;

applying adhesive to an inner band to define a rotating zone and two retaining zones;

wrapping said inner band abut the cigarette assembly such that said filter is covered entirely and said tobacco rod is overlapped, and at least one of said inner band retaining zones is adhesively attached to said filter and said tobacco rod;

separating said rotating zone from said retaining zones;

attaching an outer band around said inner band such that said outer band is adhesively attached to said rotating zone and said outer band overlaps said retaining zone;

cutting air openings means through said underband and said joining band.

15. The method of Claims 12 or 13, wherein said cutting step includes cutting a plurality of circumferential slits.

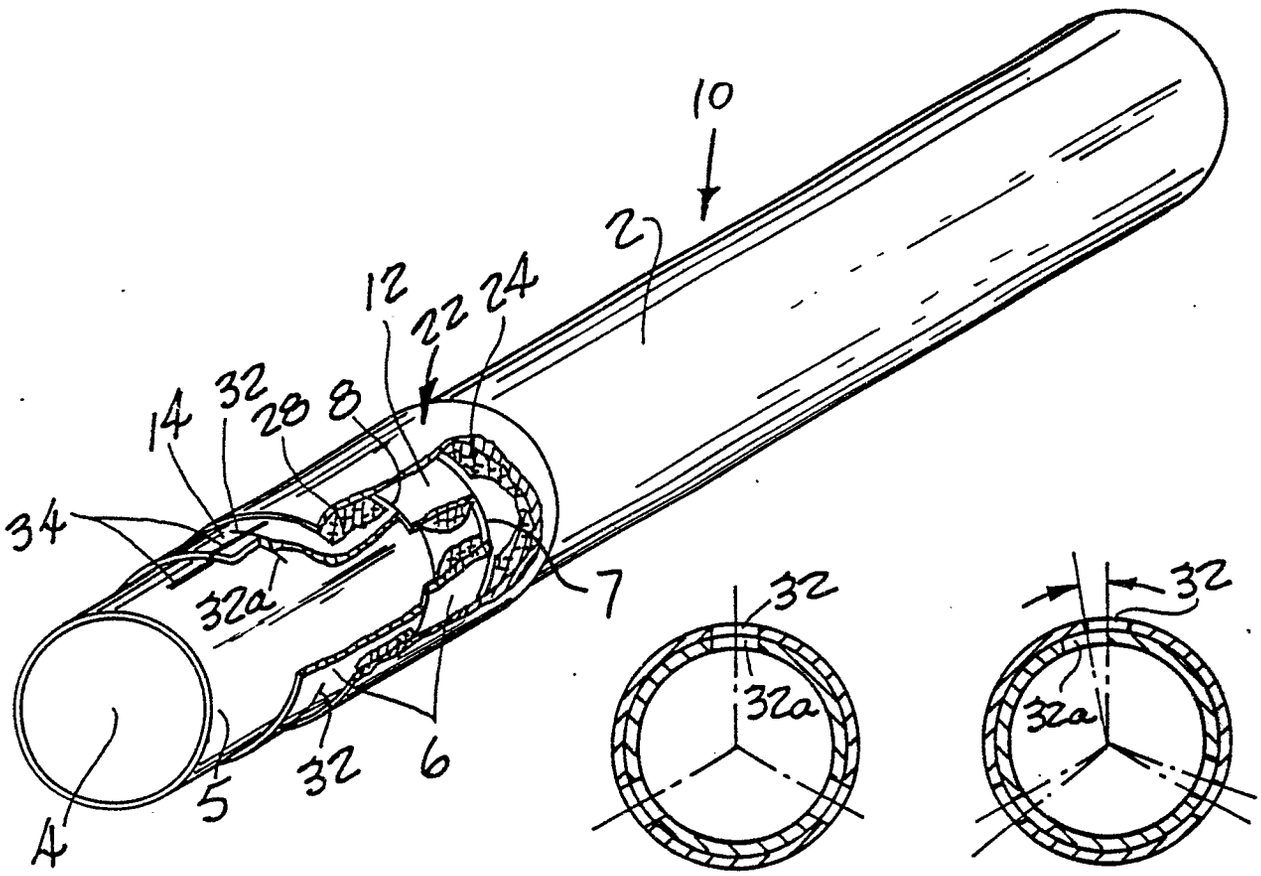

Fig.1

Fig.4

Fig.4a

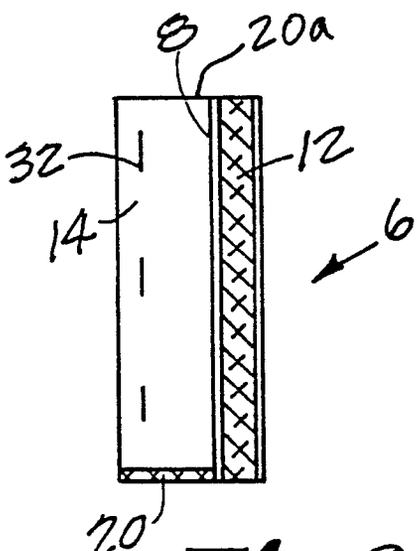

Fig.2

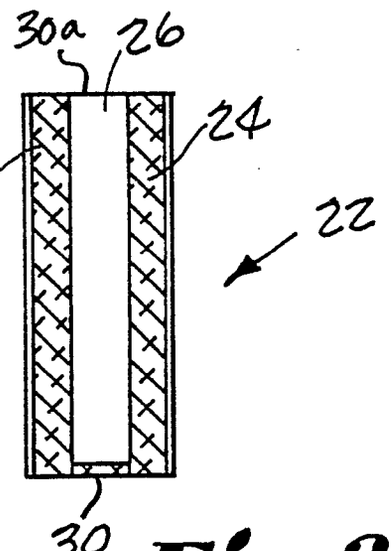

Fig.3

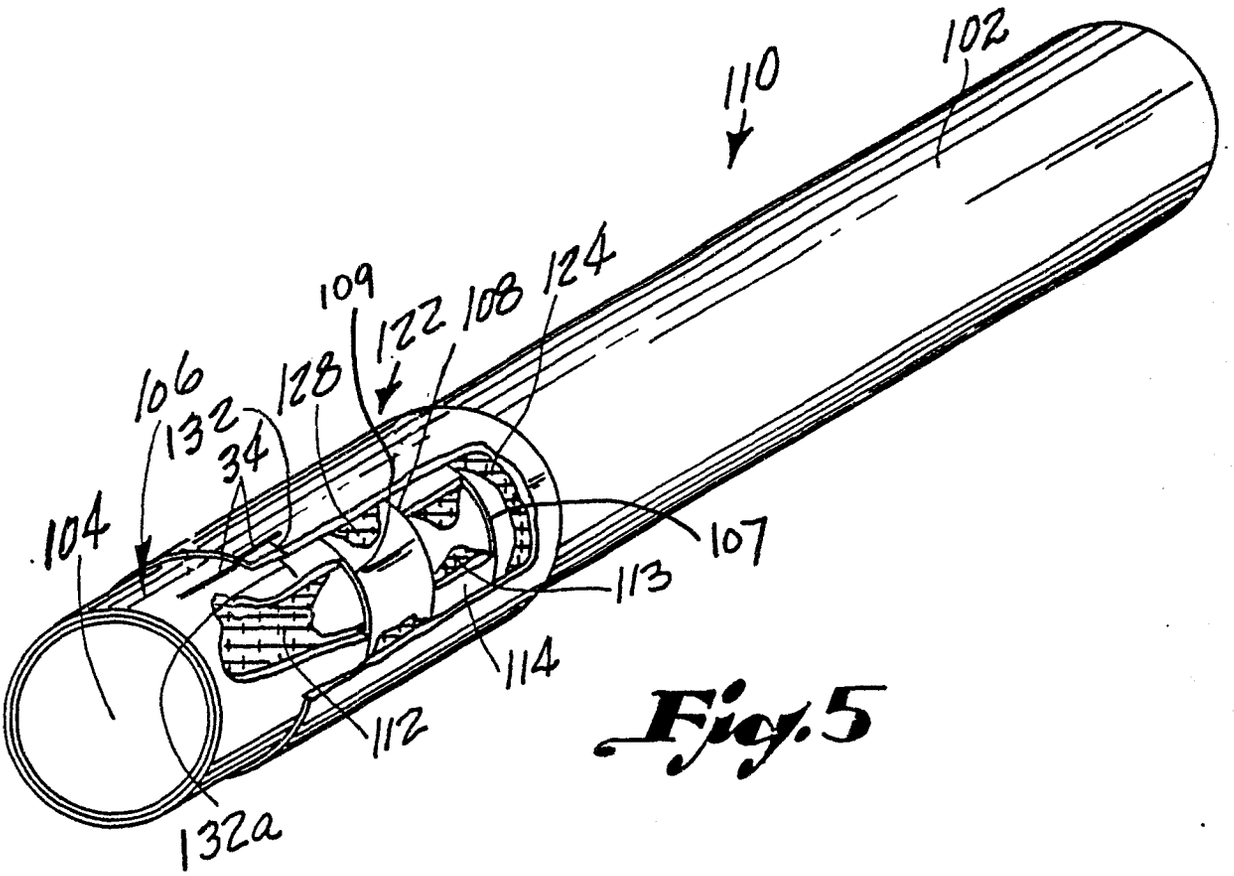

Fig.5

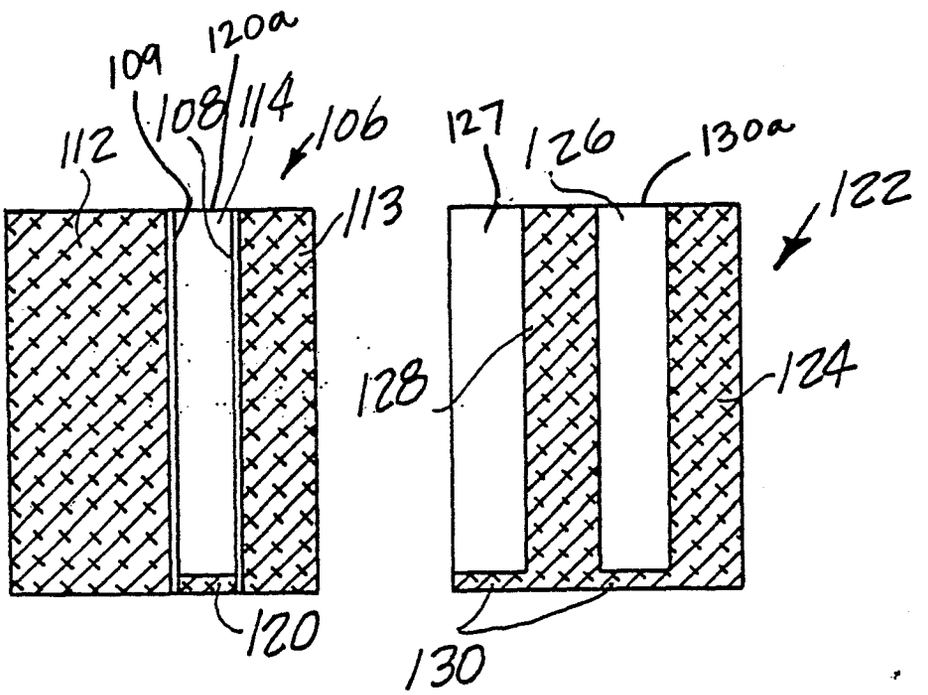

Fig.6

Fig.7

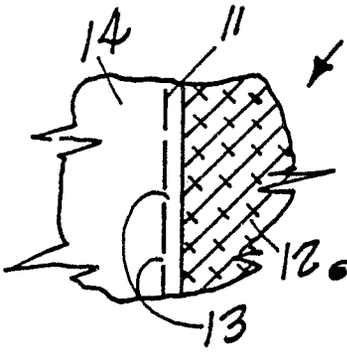

Fig.11

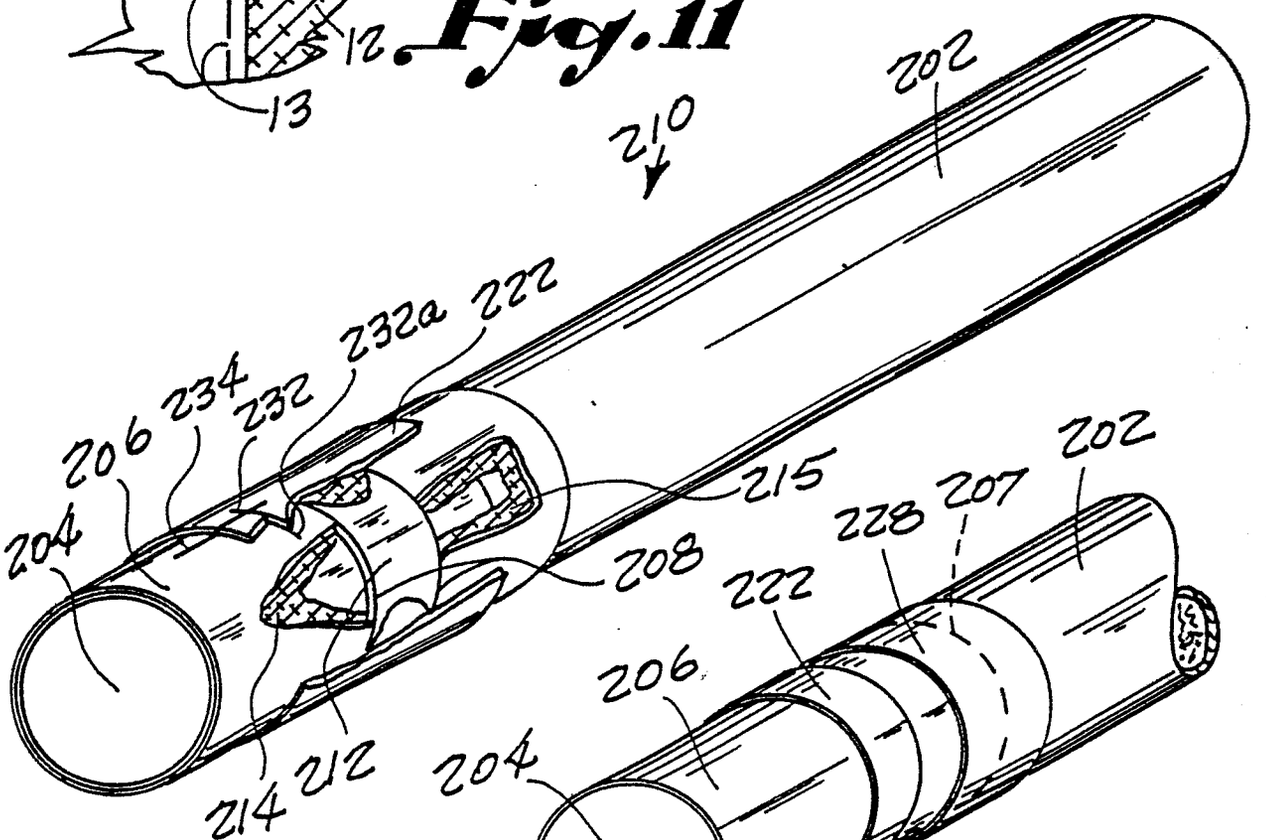

Fig.8

Fig.12

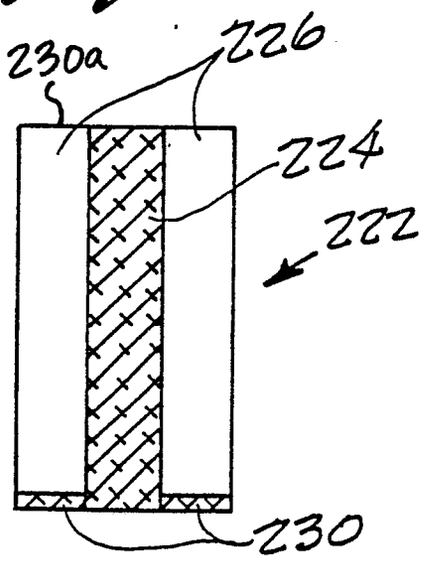

Fig.10

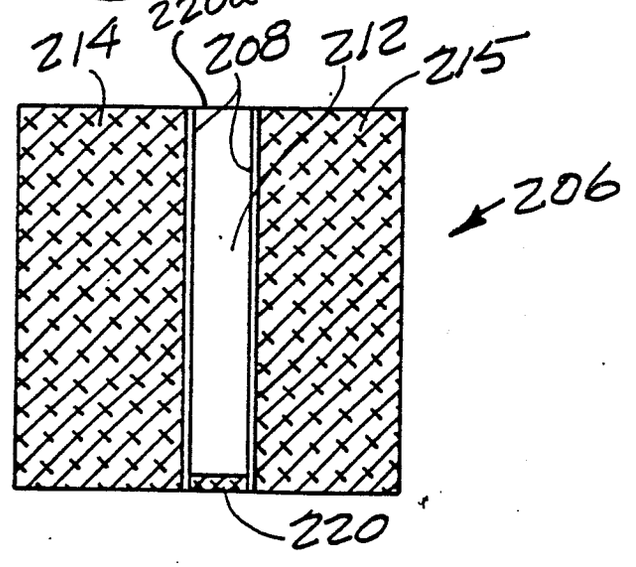

Fig.9

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EUROPEAN SEARCH REPORT

Application number

DOCUMENTS CONSIDERED TO BE RELEVANT

EP 83306494.2

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
A,D	US - A - 3 359 988 (THOMSON) * Totality *	1,7	A 24 D 3/04 A 24 D 3/02
A,D	US - A - 3 486 508 (SIPOS) * Claim 1; fig. 1,2 *	1,7	
A,D	US - A - 3 503 406 (RIEGEL et al.) * Claim 1; fig. 1,3 *	1,7	

TECHNICAL FIELDS SEARCHED (Int. Cl. ³)

A 24 D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	30-12-1983	WOLF

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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