

July 18, 1961

C. WEISS

2,992,648

CIGARETTE FILTERS

Filed June 10, 1959

FIG. 1

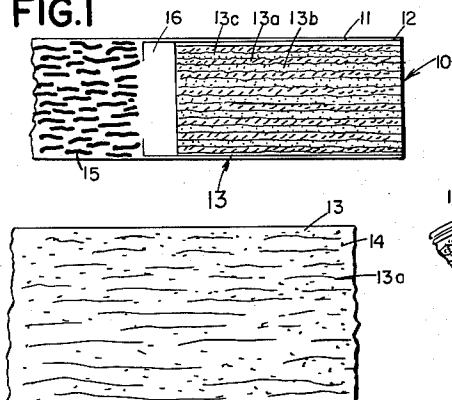


FIG. 2

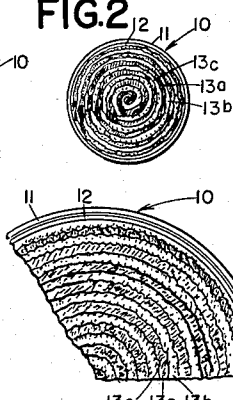


FIG. 5

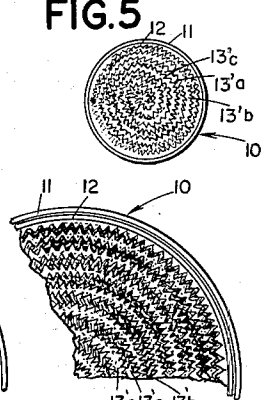


FIG. 3

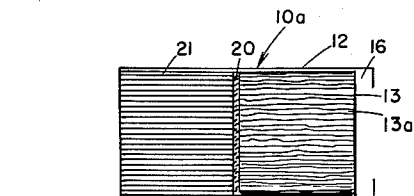


FIG. 4

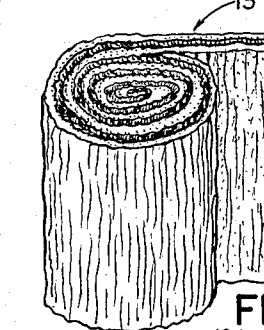


FIG. 6

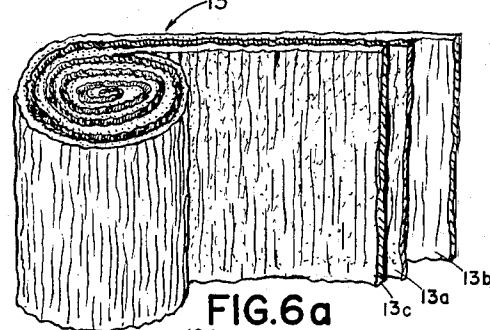


FIG. 7

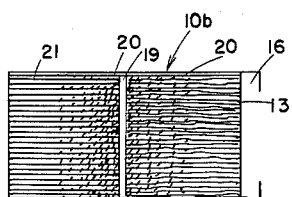


FIG. 8

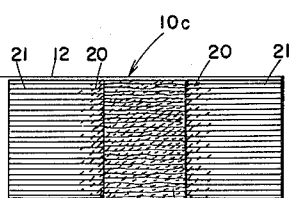


FIG. 9

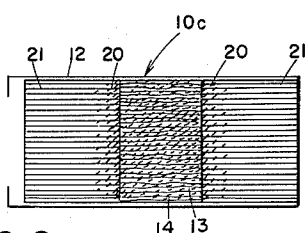


FIG. 10

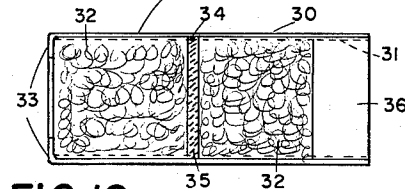
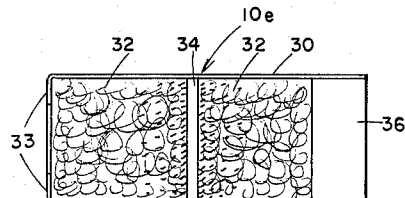


FIG. 11



INVENTOR:
Charles Weiss

BY
Maxwell E. Sparrow.

ATTORNEY.

1

2,992,648

CIGARETTE FILTERS

Charles Weiss, 1295 Sheridan Ave., Bronx, N.Y., assignor of one-third to Maxwell E. Sparrow and one-third to Sigurd Scholle, both of New York, N.Y.

Filed June 10, 1959, Ser. No. 819,479

7 Claims. (Cl. 131-10)

This invention relates generally to improvements in filters for smoking tobacco products, and more particularly to filters made to condition tobacco smoke emanating from a lighted cigarette for inhalation by the smoker.

It is generally known that in smoking of tobacco, such as in a cigarette or the like, products of combustion are formed or released among which tar and its constituents have been found to affect the health of the smoker.

Since the advent of tobacco smoking it has been generally accepted that tars formed upon combustion of the tobacco leaf were an irritant to the human respiratory system and a nuisance in that they stained the smoker's teeth and hands. Medical science was well aware at all times of the causative relationship of nicotine (found among the alkaloid components of tar in the tobacco smoke), and cardiovascular diseases.

However, it was only during the early years of the second half of this century that clinical and pathological studies have established enough evidence to link cancer of the lung, oral cavity and larynx to tobacco smoking. Statements reportedly made by Surgeon General Leroy E. Burney of the U.S. Public Health Service on July 12, 1957, and by the Medical Research Council of Great Britain (B. Med. Journal of June 29, 1957) leave no doubt that the highest government levels consider the causative connection between lung cancer and smoking proved.

Indeed, it is a safe assumption that a carcinogenic substance occurring in the condensate of tobacco smoke and recognized to be responsible for cancer induced in a variety of animal species is also responsible for cancer formation in man.

Animal experimentation in the field of tobacco carcinogenesis has permitted identification of specific carcinogenic substances in the tobacco tar condensate. They are known as "higher aromatic polycyclics" and are formed in the process of tobacco combustion. Carcinogenic substances so identified and isolated include the following: benzo(e)pyrene, benzo(a)pyrene, dibenz(a,h)anthracene, chrysens, 3,4-benz-fluoranthene. (From Journal of the National Cancer Institute October 1958). More recently two new carcinogenic substances: 3,4-benz-fluoranthene and 10,11-benz-fluoranthene have been isolated and identified as causing skin cancer to mice. (Dr. Ernest Wynder and Dr. Dietrich Hoffman of the Sloane Kettering Institute at the April 1959 Convention of the American Association for Cancer Research.)

Findings, either expressed or endorsed by leading research organizations of the United States indicate that no cigarette filter has yet been found capable of selectively removing carcinogenic substances contained in the tar, but that the "cancer risk reduction could be significantly affected if the filter were able to reduce the amount of tar to a point where the dose-response relationship established for cigarette tar" will be significantly affected.

In approaching the objective, the concept was developed that, since one of the authentic explanations for lung cancer is the direct carcinogenic action of components of tobacco smoke on the human bronchial epithelium, this membrane is evidently an excellent medium of adsorbing and absorbing the tar condensate of the smoke containing the carcinogenic substances.

Hence, to possess tar-preemptive properties, a filter-conditioner should be built on the same principles or better

2

as the epithelium, the mucous lining of the human throat and the respiratory system.

Considerable research conducted towards finding a low-priced material suitable to reproduce or simulate the adsorptive conditions prevailing on the surface of the epithelium of the human respiratory tract (caused by action of the mucous producing epithelial glands), led to petroleum jelly, also known as petrolatum or Vaseline, a mucilaginous substance tenacious enough to stick to a surface and sticky, glutinous and viscid enough to act as an adsorbent.

It is well known that petrolatum, petroleum jelly or Vaseline is a semi-solid mixture of hydro-carbons, a by-product of petroleum refining, derived from the dewaxing of paraffin-base lubricating oils. It is, when pure, color- and odor-less, translucent and amorphous. Under the trade name of Vaseline it is largely employed in pharmacy, both alone as well as a vehicle for the application of medicinal agents. It is known to be soothing and to supply relief of nasal and throat irritations. It does not readily oxidize on exposure to air and is not readily acted upon by chemical reagents. It can be conveniently used as carrier of chemical agents which can thus be suspended in the stream of the tobacco smoke and act as chemical adsorbents of the injurious ingredients of the tobacco smoke in addition to the physical adsorptive properties of the carrier medium itself. It can also be conveniently used as carrier of a catalyst which, so placed in the stream of the tobacco smoke, would promote and accelerate chemical reaction of reagents placed in the filter body for the purpose of destroying or neutralizing carcinogenic substances.

To be assured of the full advantage and benefit of the adsorptive properties (the faculty of attracting molecules of gases or of solutions to its surface) of petrolatum, petroleum jelly or Vaseline, it is intended to use it in exclusively its unadulterated, undiluted state or composition.

In prior art where Vaseline is mentioned as being used in a filtering agent for tobacco smoke, a very small amount dissolved in solvents is specified. It is evident that the semi-solid state of the Vaseline is thus destroyed, that is, the semi-solid substance is turned into a liquid which when applied soaks the filter material with the effect that all advantages and benefits of the tenacious, glutinous, viscid and sticky nature of petrolatum, petroleum jelly or Vaseline are destroyed and the very purpose of using a semi-solid substance is defeated.

It was unknown in the prior art how to spread a uniform coat of Vaseline, petrolatum or petroleum jelly on the surface of filter material or to apply such substance by impregnation to filter material in such amount as not to retard the passage of the smoke therethrough yet sufficient to act as an adsorbent trap for the tar substances in the smoke.

A thin coat of petrolatum, petroleum jelly or Vaseline is preferable, as a thick layer might cancel out or obstruct the permeability of the filter material or air passages therein which must be maintained to permit the "easy draw" of the cigarette. Methods of liquifying petrolatum, petroleum jelly or Vaseline have been tested, melting in first place.

To carry out a purpose of the invention it is not desired or intended to pass the tobacco smoke through the semi-solid medium of petroleum jelly, petrolatum or Vaseline, but to lead the smoke through air passages or conduits the walls of which are coated with petrolatum, petroleum jelly or Vaseline, preferably so constructed as to cause eddy currents to form in order to promote intimacy of contact between the smoke and the coated surfaces of such conduits. A convenient way to con-

struct a body of a cigarette filter tip so that it is honey-combed with tortuous air passages the walls of which are coated with Vaseline or petrolatum, is to roll spirally or accordion pleat previously coated crepe paper so that the corrugations of the crepe paper run parallel with the axis of the roll or accordion pleats. It is desired that the filter material be packed by rolling, accordion pleating or any other convenient method that will keep the air channels formed by the corrugations open. Corrugations in the crepe paper are particularly suitable to form tortuous conduits by virtue of their irregular configuration. Helped by the turbulence of the eddy currents forming in the tortuous conduits, greater intimacy of contact of the smoke with the coated walls of the conduits is attained and thereby a higher measure of adsorption.

According to the invention, petrolatum, petroleum jelly, or Vaseline is employed as conditioning material in undiluted composition in combination with paper, cellulose or other suitable material. The cellulose material may be coated or impregnated with the undiluted petrolatum or Vaseline; or a thin layer of petrolatum or Vaseline may be interposed at the interface between two adjacent cellulosic filter portions. Within a relatively short time, the petrolatum or Vaseline will travel along the fine filaments or strands of the cellulosic filter portions, leaving a fine coat upon them and leaving an air space which was formerly occupied by said layer of petrolatum or Vaseline, a process believed to be caused by capillary attraction and the phenomena of surface tension.

Impregnating a cellulose body of soft fibrous substance with petrolatum or Vaseline causing the fine strands or filaments to acquire a filmy coat of mucilaginous nature, creates a very large surface area of petrolatum or Vaseline coating on the outside of the strands or filaments, much as in the instance of the inside coating of the walls of tortuous conduits formed by packing coated crepe paper into filter bodies. In both cases, the smoke is forced against the coated walls along which particles of tar condensate of the tobacco smoke is deposited probably by adsorptive attraction thus minimizing to a very considerable extent the amount of tar condensate reaching the respiratory system of the smoker.

For mass production of filter tips fit to be fed in the modern high speed cigarette machines for attachment to the cigarettes, it is preferable to use as the petrolatum or Vaseline carrier a suitable corrugated or crepe paper which by virtue of the creases or corrugations is resilient or elastic, although plain paper may be used if creases or corrugations can be forced into it prior to the process of coating. This petrolatum-treated crepe paper is preferably interposed between two layers of untreated crepe paper, making a three-ply unit which goes into the rolling, accordion pleating process to be made into a filter tip or a rod of three or more filter tips depending on the construction of the cigarette machine.

The filter unit may be a separate filter attachable to an end of a cigarette or it may be an integral part of the cigarette connected thereto during manufacture of the cigarette. The filter unit may comprise a cylindrical body of cellulosic or other suitable filter material impregnated with petrolatum, petroleum jelly or Vaseline in such limited amount as to permit passage of smoke through the air passages when the cigarette is lit and drawn upon by the smoker; or the unit may comprise a pair of members or portions arranged in tandem in the casing, each of the portions having an impregnation of petrolatum or the like in the aforesaid limited amount; or the unit may comprise a plurality of members or portions, at least one of the portions having an impregnation of petrolatum or the like in the aforesaid limited amount. Where two or more members or portions are employed, it is preferable to separate the portions, thereby providing air spaces for passage therebetween.

The aforementioned treated cylindrical or rolled mem-

bers are preferably encased in a sleeve or housing resistant to the said impregnating material, either by the use of oil repellant or by providing an oil-repellant coating.

In the embodiment of the invention wherein the filter body consists of two petrolatum impregnated cellulosic sections which are separated from each other thereby creating an air space therebetween, as well as in the embodiment of the invention where the filter body consists of one single crepe paper portion and is recessed or separated from the tobacco portion of the cigarette thereby providing an air-space therebetween, it is believed that in both instances the airspace acts as a condensor-precipitator causing the tarry components of the smoke to take on a semi-solid form (at the earliest moment and before the smoke reaches the smoker's respiratory tract) in which state the tar condensate is adsorbed by the coated walls of the tortuous conduits or the coated walls of the strands and filaments and there trapped and arrested.

It is to be understood that where the word petrolatum is used in the specification and claims it is intended that it also embraces and includes Vaseline and petroleum jelly, and that where the words impregnate, impregnating and impregnated are used they also embrace and include permeate, permeating, premeated; penetrate, penetrating, penetrated, and similar terms. Further, where the words undiluted or unadulterated state or composition are used they are understood to mean that the petrolatum or Vaseline has not been altered or changed in composition or effectiveness, during, after, or at the time of its application, by the vehicle or instrumentality used to propel or otherwise apply the substance to the filter body.

It is a primary object of the present invention to provide a smoke condition unit which traps the tar condensates in the smoke of a cigarette; and eliminates or reduces the deleterious effects of the smoke upon the organism of a smoker by thus removing impurities inherent in cigarette or other tobacco smoke which otherwise would be inhaled.

A further object of the present invention is to provide an efficient and effective smoke conditioner which can be easily and cheaply produced.

A still further object of the present invention is to produce a smoke condition unit for a cigarette containing petrolatum, petroleum jelly or Vaseline in such limited amount as to permit passage of smoke through the smoke passages when the cigarette is lit and drawn upon by the smoker, said petrolatum being undiluted and in its unaltered state.

It is a further object of the present invention to provide a smoke conditioning unit which may be readily adapted for use as a separate device for attachment to a cigarette or which may be incorporated as an integral unit in a cigarette during the manufacture thereof.

The foregoing and other objects, features and advantages of the invention will be apparent in the following detailed description and the accompanying drawings of embodiments of the invention which, it is to be understood, are merely exemplary and are not to be construed as limitations of the invention.

This application is a continuation-in-part of my co-pending application Serial No. 672,519, filed July 17, 1957, now abandoned.

In the drawing:

FIG. 1 is a sectional view (on an enlarged scale) of the filter tip end of a cigarette, according to the invention;

FIG. 2 is a cross-sectional view of the filter-tip seen in FIG. 1;

FIG. 3 is a portion of the center or intermediate filter layer (on an enlarged scale) with a film or coating and adsorption of petrolatum, embodied in the filter of the filter-tip shown in FIGS. 1 and 2;

FIG. 4 is a partial end view of FIG. 3 (on an enlarged scale);

5

FIG. 5 is an end view of a filter-tip in modified form; FIG. 6 is an end view of FIG. 5 (on an enlarged scale);

FIG. 6a is a perspective view of a filter unit filter partly unrolled to show the conduits or smoke passages;

FIGS. 7 and 8 are sectional views of a filter-tip according to the invention in a further modified form;

FIG. 9 is a sectional view of a filter-tip according to the invention in a further modified form; and

FIGS. 10 and 11 are sectional views of a filter unit embodying the invention in a still further modified form.

Referring now more in detail to the drawings which show some examples of realizing the invention, in FIG. 1 there is seen a filter-tip 10 forming part of a cigarette and encased in the cigarette paper 11. The filter-tip 10 preferably has a housing or casing 12 which is impervious to petrolatum or Vaseline and which contains the filter body 13. Casing 12 preferably has its end adjacent the tobacco 15 turned providing a space or recess 16 between filter-tip 10 and the tobacco 15.

The layer 13a of body 13 of the filter-tip or unit 10 is coated with petroleum, petroleum jelly or Vaseline in its unadulterated or undiluted condition or composition, which substance (indicated by the numeral 14) acts as a tar-adsorbing or tar-trapping or tar-reducing agent for the tar condensates of the tobacco smoke. Layer 13a may form the intermediate layer of a tree-layer filter roll or accordion, the outer and inner layers of the roll being indicated by the references 13b and 13c, respectively (FIGS. 2 and 4), and the outer and inner layers of the accordion pleated unit being indicated by the references 13'b and 13'c respectively (FIGS. 5 and 6). The intermediate layer in FIGS. 5 and 6 is indicated by the reference 13'a.

This tar-trapping or tar-retaining agent 14 is very effective when applied to a filter body which may be plain, corrugated or crepe paper, cotton or other cellulose, fibrous filter material.

It is preferable to apply the petrolatum as a coating before the filter paper is rolled or accordion pleated into cylindrical shape. However, the petrolatum may be applied after the forming of the filter body in which case the petrolatum will be absorbed and will impregnate the material of the filter body coating the walls of the small smoke passages formed by the corrugations or pleats in the roll. The petrolatum or Vaseline is applied in such limited amount as to permit or not retard passage of smoke through the filter body 13 when the cigarette is lit and drawn upon by the smoker.

In FIGS. 1 to 6a, inclusive, body 13 is indicated as comprising creased crinkled or crepe paper layers rolled, pressed and/or accordion-pleated into cylindrical shape. Either one or more of the layers comprising body 13 may be initially coated with the petrolatum or Vaseline.

The body of the filter-tip or unit may comprise a single portion or member 13, as seen in FIG. 1, or may comprise a plurality of like or unlike portions or members, examples of which are shown in FIGS. 7 to 11, inclusive.

As heretofore stated, the petrolatum is used in its undiluted or substantially undiluted state or composition, or in a composition where the petrolatum predominates in amount.

FIG. 7 illustrates a filter-tip or unit 10a which comprises the filter body portion or member 13 which may be of a type similar to that disclosed in FIGS. 1 to 6a, inclusive, and the filter body portion or member 21 which may be made of paper similar to 13 or of cotton or other suitable cellulose or fibrous material. Interposed between body portions 13 and 21 is a layer of undiluted petrolatum or Vaseline 20 which, as indicated in FIG. 7 by capillary action, absorption or similar process will impregnate the body portions or members 13 and 21 leaving a void or space 19 therebetween. The filter-tip

6

or unit in this condition is indicated in FIG. 8 by the reference 10b. Thus, the tar-trapping agent, namely petrolatum or Vaseline, temporarily acts as a spacer separating the absorbent or adsorbent members 13, 21; these members will eventually transfer or absorb said filtering agent 20, that is, said members will become impregnated with the petrolatum, and an air chamber will be formed between members or portions 13, 21. The petrolatum is applied in such limited amount as to permit passage of the tobacco smoke through the members 13, 21.

FIG. 9 discloses a filter-tip or unit 10c which comprises the outer members or portions 12 and 21, and the intermediate previously petrolatum-treated body, member or portion 13, the petrolatum or Vaseline being indicated by the numeral 14. It will be noted that when the filter-tip or unit is assembled, the impregnation 14 in filter portion 13 will spread to the portions 12 and 21.

FIG. 10 illustrates a separate filter unit 10d adapted to be attached by the smoker to the end of a cigarette. It has a casing 30 which may be coated with or which may be made of a material resistant to petrolatum or Vaseline, or which may be an adhesively treated strip of plastic, such as cellophane. The internal adhesive coating is indicated by the numeral 31. Casing 30 preferably has the intumed flange 33. The spaced cotton or other cellulosic portions or members are indicated by numeral 32 between which is disposed the layer of petrolatum or Vaseline 35. After an end of the cigarette is inserted in the space 36 of casing 10d, a slight pressure applied thereto will unite the cigarette and filter unit. In this case, after smoking the cigarette, the filter unit will be discarded along with the remaining cigarette butt. However, it is possible to reuse the filter unit, for which purpose the adhesive coating 31 may be eliminated as seen in FIG. 11, where this modified filter unit is generally indicated by the reference 10e and the space devoid of the petrolatum 35 (which has now impregnated the portions or members 32 by transfer, adsorption or absorption or otherwise) is indicated by the numeral 34.

Thus, a filter unit or tip contemplated by the invention may be provided by impregnating or otherwise treating the cylindrical portions or members of the filter body 10, 10b 10c, 10e, with undiluted petrolatum or Vaseline in its unaltered state, condition or composition in such limited amount as to permit or not unduly retard the passage of the tobacco smoke through the filter unit when the cigarette is lit and drawn upon. As heretofore mentioned the casing or covering for the petrolatum-impregnated members or portions should comprise a suitable material resistant to the petrolatum or petroleum jelly.

The filter unit according to the invention may constitute a filter which is utilizable as a mouthpiece or holder for a cigarette or an integral part of the cigarette; or it may be made applicable for use as a filter for a cigar holder or pipe.

The following laboratory test analyses were made in connection with filter-tips made according to the invention described herein, analysis No. 1 testing filter tips made from already petrolatum-coated crepe paper and analysis No. 2 testing filter tips impregnated therewith after completion of the untreated filter body.

TEST ANALYSIS NO. 1

Eight filter tips made from crepe paper and eight filter tips made in the same way and from the same crepe paper but treated with petrolatum according to the invention were attached to the tobacco portion of a popular brand of king size cigarettes of which the original filter tips had been removed; subsequently, the two groups of eight cigarettes each were tested for tar content in the smoke in one of the usual robot testing machines which smoke each cigarette for a length of 62 mm., taking one 35 cc.

puff of smoke of a two-second duration once every minute. The result of this test showed as follows:

	Mg.
Tar content in the smoke of each cigarette with the petrolatum treated filter tip -----	9.3
Tar content in the smoke of each cigarette with the plain untreated filter tip -----	23.5

TEST ANALYSIS NO. 2

The filters of eight king size cigarettes of the same popular brand mentioned above were removed from the tip of each cigarette, cut in half transversely and a thin layer of petrolatum was interposed between the two sections which were then replaced within the respective cigarette tips.

These eight cigarettes together with eight original king size filter tip cigarettes (untreated) were then tested for tar content in the smoke in the manner described above. The result of the test was recorded as follows:

	Mg.
The tar content in the smoke of each cigarette with the petrolatum-treated filter tip -----	3.5
The tar content in the smoke of each cigarette with the original (untreated) filter tip -----	18

TEST ANALYSIS NO. 3

Draw (pressure-drop) test

From ten king size cigarettes of a popular brand, the original filter tips were cut off and filter tips according to the invention were substituted.

The aforementioned ten cigarettes and ten original cigarettes of the same brand with their original filter tips were then tested for ease of draw (pressure drop test) with suction apparatus using 3 inches of water-displacement through a 4 mm. tube. The result of this test showed the following:

	Cc.
Average draw of the cigarettes with petrolatum impregnated filter tip attached -----	15
Average draw of cigarettes with their original (untreated) filter tips -----	10

The above analysis indicates that the draw of the cigarettes fitted with the petrolatum treated filter tips is 50% easier than the draw of the cigarettes with the original untreated filter tips.

Although illustrative embodiments have been described in detail and shown in the accompanying drawings, it is to be understood that the invention is not limited to those embodiments, and that various changes and modifications may be effected therein without departing from the scope or spirit of the invention as defined in the appended claims.

I claim:

1. A cigarette comprising a tobacco-filled portion and a filter-tip portion connected to and serving as smoke

conditioner for said tobacco-filled portion when the cigarette is lit and drawn upon, said filter-tip portion comprising a body formed with a plurality of conduits running substantially parallel to the axis of said body allowing passage of the tobacco smoke, the walls of said conduits having a coating of semi-solid petrolatum whereby condensates of tar products formed by combustion of the tobacco in the cigarette will be deposited and collected on said coated walls.

2. A cigarette comprising a tobacco-filled portion and a filter-tip connecting to and serving as smoke conditioner for said tobacco-filled portion when the cigarette is lit and drawn upon, said filter-tip comprising a pair of filter portions arranged in tandem, each of said portions having an impregnation of semi-solid petrolatum in such limited amount as to permit passage of smoke through said filter portions when the cigarette is lit and drawn upon by the smoker.

3. A cigarette comprising a tobacco-filled portion and a filter-tip connected to and serving as smoke conditioner for said tobacco-filled portion when the cigarette is lit and drawn upon, said filter-tip comprising a plurality of filter portions, at least one of said portions having an impregnation of semi-solid petrolatum in such limited amount as to permit passage of smoke through said filter portions when the cigarette is lit and drawn upon by the smoker.

4. A cigarette comprising a tobacco-filled portion and a filter-tip portion connected to and serving as smoke conditioner for said tobacco-filled portion when the cigarette is lit and drawn upon, said filter portion comprising cellulose material and semi-solid petrolatum, impregnating said material in such limited amount as to permit passage of smoke through said material when the cigarette is lit and drawn upon by the smoker.

5. A cigarette, according to claim 1, wherein said body comprises a plurality of portions, the last one of which contains petrolatum.

6. A cigarette, according to claim 2, wherein the said filter portions are separate from each other.

7. A cigarette, according to claim 3, wherein said petrolatum-impregnated portions are separate from the remaining filter portions.

References Cited in the file of this patent

UNITED STATES PATENTS

1,543,043	Allen -----	June 23, 1925
1,561,229	Haon -----	Nov. 10, 1925
2,120,120	Wells -----	June 7, 1938
2,815,761	Shearer -----	Dec. 10, 1957
2,818,073	Taylor -----	Dec. 31, 1957
2,819,720	Burbig -----	Jan. 14, 1958
2,832,351	Hale -----	Apr. 29, 1958
2,904,050	Kiefer et al. -----	Sept. 15, 1959

FOREIGN PATENTS

518,331	Belgium -----	Mar. 31, 1953
---------	---------------	---------------