United States Patent [19]

Merrill

[11] **3,774,623**

[45] **Nov. 27, 1973**

[54] **COMPOSITION FOR REMOVING POLYNUCLEAR AROMATIC HYDROCARBONS FROM BURNING TOBACCO GAS-SMOKE**

[75] Inventor: **Edward W. Merrill,** Cambridge, Mass.

[73] Assignee: **Hans H. Estin; Leonard W. Cronkhite, Jr., and William W. Wolback, Trustees of the Charles River Foundation**

[22] Filed: **Mar. 13, 1972**

[21] Appl. No.: **233,935**

Related U.S. Application Data

[62] Division of Ser. No. 888,505, Dec. 29, 1969, Pat. No. 3,679,625.

[52] **U.S. Cl.** ..... **131/17 R,** 131/265, 131/269

[51] **Int. Cl.** **A24b 15/02,** A24b 15/04

[58] **Field of Search** 131/17, 9, 2, 140–144, 131/261–269

[56] **References Cited**

UNITED STATES PATENTS

3,662,765	11/1970	Clark	131/265
1,985,840	12/1934	Sadtler	131/10.9 X
2,108,860	2/1938	Kauffman	131/267 X

Primary Examiner—Melvin D. Rein

Attorney—Kenway, Jenney & Hildreth

[57] **ABSTRACT**

Polynuclear Aromatic Hydrocarbons (PAH) can be absorbed and thereby removed from tobacco gas-smoke by polysiloxane compositions. The polysiloxane may be present in the tobacco to absorb the PAH at or near the combustion zone. Endothermic fillers in the polysiloxane and high polysiloxane to tobacco ratios are effective to reduce the combustion temperature and minimize desorption of previously absorbed PAH.

8 Claims, 7 Drawing Figures

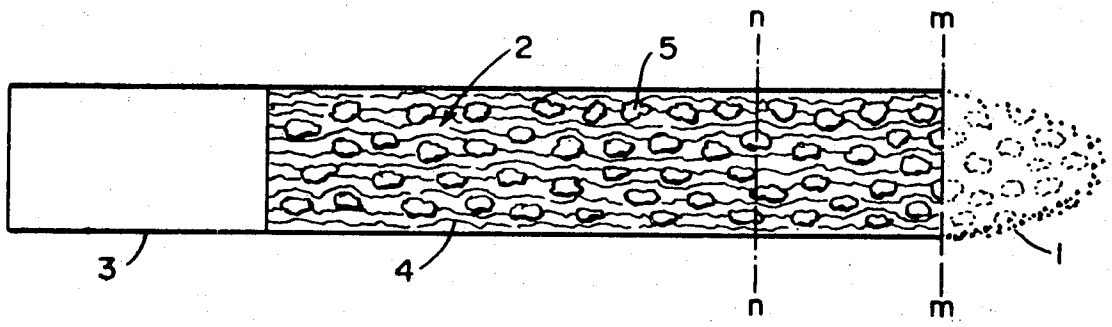
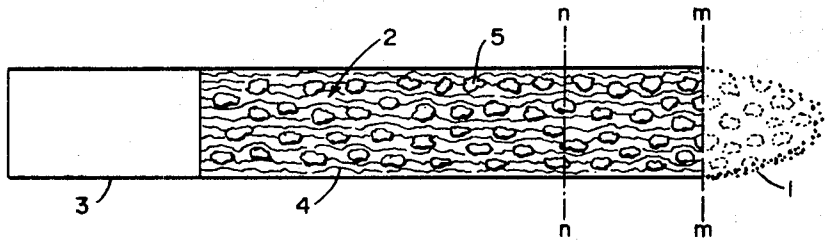


FIG. 1



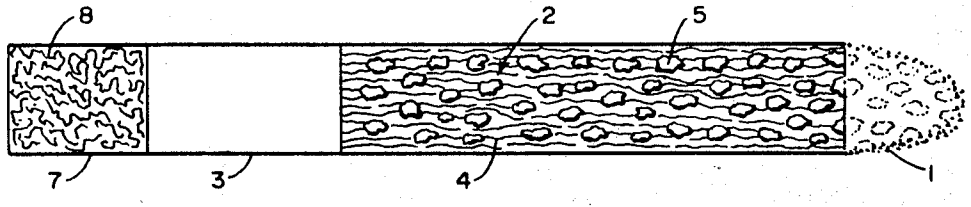


FIG. 2

FIG. 3

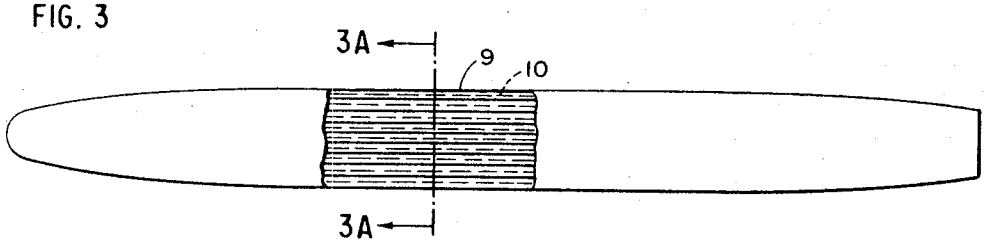


FIG. 4

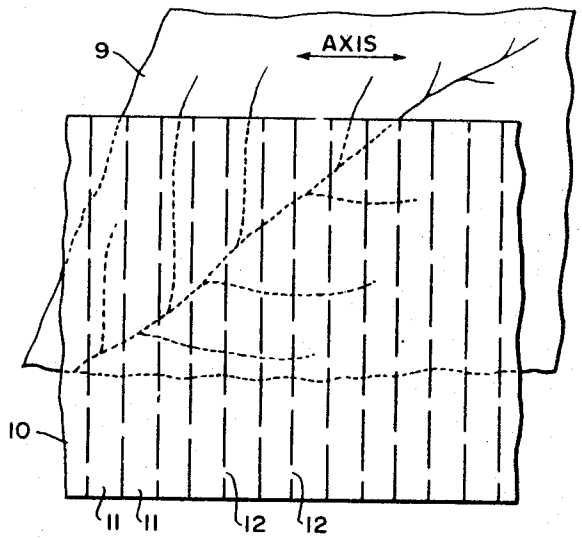


FIG. 3A

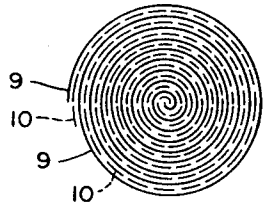
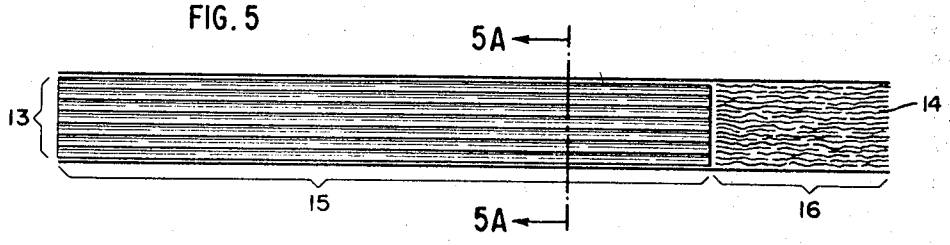


FIG. 5



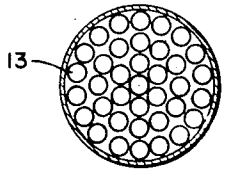


FIG. 5A

COMPOSITION FOR REMOVING POLYNUCLEAR AROMATIC HYDROCARBONS FROM BURNING TOBACCO GAS-SMOKE

This application is a divisional application of Ser. No. 888,505, filed Dec. 29, 1969, now U.S. Pat. No. 3,679,625.

This invention relates composition for removing polynuclear aromatic hydrocarbons (PAH) from tobacco gas-smoke.

It is generally thought that the carcinogens in the gas-smoke produced from burning tobacco are found primarily among the polynuclear aromatic hydrocarbons (PAH) of which benz [a] pyrene and benz [a] anthracene are particularly recognized examples. PAH are generated by the destructive distillation of more complicated chemical compounds in the burning tobacco. The quantity of PAH formed increases with the combusion temperature of tobacco.

Presently available cigarette filters are aimed at reducing the hazard of carcinogenic matter from cigarettes. However, because of the material used in these filters, their placement relative to the tobacco and other factors, they serve primarily to condense moisture and some of the water soluble materials in the gas-smoke and to precipitate, by impaction, a small fraction of the colloidal particles generated as the gasses moving from the combustion zone of the burning tobacco are cooled by passage through the downstream bed of tobacco.

the PAH are generated as a molecular dispersion but because of their low vapor pressures they tend to adsorb and condense on any surfaces with which they contact including unburned tobacco leaves, cigarette wrapping paper or colloidal particles being generated in the gas-smoke. The PAH that have recondensed on unburned tobacco or paper later will be revolatilized as they are heated and burned, whereas the PAH that are captured by adsorption and condensation on colloidal smoke particles will travel with them through the cigarette and follow them to their ultimate destination, whether it be captured by impaction on a cigarette filter or the deepest reaches of the smoker's lung. Presently employed filter techniques are relatively ineffectual for removing PAH either in vaporous form or when captured by colloidal particles not impacting the filter.

Carbon black and granulated charcoal in their various forms have been used in the filter portions of cigarettes, but these materials suffer the disadvantage that they are far more active toward polar materials such as nicotine than they are toward PAH and thus even if PAH are adsorped on these surfaces they later may be re-evolved into the gas phase by preferential adsorption of nicotine. Furthermore the efficacy of any surface in the filter end of a conventional cigarette is fundamentally limited by the well-known principles of impaction of colloidal particles.

It would be highly desirable to provide a means for removing or substantially reducing the amount of PAH in tobacco gas-smoke especially by means that could be incorporated easily in cigarettes, cigar or pipe tobacco. In addition it would be desirable that the means for removing PAH be selective so that the physiologically satisfying material is retained in the tobacco gas-smoke. In contradistinction to the prior art, this invention provides for the capture of PAH upon liberation from burning tobacco in predominantly molecular

forms by absorption onto materials having high solubility for the PAH and negligible or low solubility for the polar components such as nicotine and other alkaloids.

This invention provides a novel composition removing or substantially reducing the PAH in tobacco gas-smoke. A particulate polysiloxane absorbent composition capable of absorbing PAH is mixed with tobacco and/or employed in a filtering means adjacent burning tobacco. The temperature on the absorbent surface is maintained at a substantially lower temperature than adjacent burning tobacco during absorption of PAH to prevent desorption of PAH by effecting an endothermic chemical reaction or desorption of a filler material in the particles to liberate a physiologically harmless by-product such as carbon-dioxide or water. The polysiloxane itself does not decompose at the temperature generated by the burning tobacco. The PAH, such as benz [a] pyrene are absorbed and having been absorbed are so highly diluted by solvation of the polymer that subsequent reheating as the combustion zone passes the material does not cause significant desorption of them.

When the polysiloxane composition is incorporated in the tobacco, it is conveniently removed with the ash of the burning tobacco so that the carcinogenic compounds, instead of progressively accumulating in even higher concentrations by condensation on yet unburned tobacco, are instead mostly removed as the ash is flicked off leaving a smoke-gas mixture that is physiologically satisfying because of its nicotine content but having a significantly lowered concentration of PAH.

Because of the factors noted above, it will be understood that as the gas-smoke mixture passes through a conventional cigarette filter a certain amount of PAH may yet be in a molecular form and therefore susceptible of capture by absorption, in contradistinction to colloidal particles susceptible of capture primarily by impaction or electrostatic mechanisms rather than diffusion. Therefore, to render the cigarette, cigar or other product of this form even safer it is preferred to replace the conventional filter with or add to the conventional filter an extension containing PAH absorbing polymer in finely divided form with high surface area such as shredded polysiloxane rubber. There need not be present in the polysiloxane composition in the filter a material capable of undergoing an endothermic reaction since the low surface temperature sufficient to substantially reduce desorption is maintained by virtue of its remoteness from the combustion zone. However, it is preferred that the primary site for capture of PAH and similar carcinogens be the adsorbent materials admixed with the tobacco flake.

A more detailed understanding of this invention can be obtained by reference to the attached figures and the discussion below:

FIG. 1 is a cross-sectional view of a cigarette, the tobacco portion of which contains the polysiloxane composition of the invention.

FIG. 2 is a cross-sectional view of the cigarette of FIG. 1 having in addition, a filter containing a polysiloxane.

FIG. 3 is an axial cross section view of a cigar and FIG. 3a is a transverse cross section at *3a—3a* of FIG. 3.

FIG. 4 is a plan view showing a perforated polysiloxane film and a tobacco leaf to be layered together.

FIG. 5 is a longitudinal and FIG. 5*a* is a transverse cross section of the filter portion of a cigarette.

Referring to FIG. 1, 1 represents the solid residue, or ash, from the combustion of the tobacco 4, in mixture 2, 3 is the filter, or end of the cigarette in the mouth of the smoker, 4 is tobacco flake shredded leaf or other conventional form of tobacco and 5 is the absorbent in flake, fiber or other particulate form. As the combustion zone midplane moves from position mm to position nn in FIG. 1, the evolved PAH are absorbed by immediately adjacent absorbent particles 5, while carbon dioxide, water, and the more polar material such as nicotine pass through the cigarette. The ash 1 is tapped off of the cigar or cigarette from time to time carrying with it the polysiloxane having the absorbed PAH.

Referring to FIG. 2, the tobacco-absorbent mixture 2, is followed by a conventional filter 3, that removes the major part of the aqueous condensate and an extension 7, comprising finely divided silicone polymer 8, as for example, in a fibrous configuration, not necessarily containing any filler component, which serves to absorb the now very small content of PAH and other lipophilic molecules that may have escaped prior adsorbtion in the adsorbent tobacco mixture 2. Referring to FIG. 3, a cigar is formed by wrapping spirally alternating layers of tobacco leaf 9 and of sheeted polysiloxane material 10. The sheeted polysiloxane material is prepared in thicknesses comparable to the thickness of tobacco leaf and is scored or perforated so as to form narrow ribbons 11 (approximately one-fourth inch wide) which are held together by a limited number of junction points 12.

When the cigar of FIG. 3 is formed, the polysiloxane material with absorbed PAH 10 becomes part of the incombustible ash and is detached by tapping the cigar.

Referring to FIG. 4, the major axis of the cigar is shown relative to the tobacco leaf and to the perforated or scored polysiloxane sheeted material, prior to spiral wrapping. It will be understood that, depending on the grade of leaf, thickness of leaf, thickness of polysiloxane material and so on, the alteration of one leaf with one polysiloxane sheet shown in FIGS. 3 and 4 is only one embodiment, and that two or more leaves of tobacco may be rolled with one sheet of polysiloxane material.

Referring to FIG. 5, which shows the cross section of a cigarette cut along the major axis, silicone absorbent in the form of parallel lengths of round tubing, 13, of small diameters are assembled as a bundle containing 20 or more individual tubes, of which the end section is shown corresponding to section 5*a*–5*a* from the side section. Conventional shredded cigarette-grade tobacco 14 is packed beyond the filter section 15 and is enclosed with the filter section by a common cigarette paper wrapping.

The polysiloxanes employed in this invention have sufficient thermal stability to undergo negligible or no degradation at temperatures encountered in the combustion of tobacco when appropriate amounts of fillers, to be specified below are used. While linear siloxanes of high molecular weight may be used without cross-linking, for example gum stock, it is more satisfactory in general to cross-link the polymer to render it rubbery and more stable against thermal degradation, as well as non-flowing with respect to admixed tobacco flake. Cross-linking in effect forms a polymeric network of infinite molecular weight and zero vapor pressure which can be destroyed only by scission of the silicone-oxygen backbone and oxidation of the side groups. The conventional silicone oils of low molecular weight are not useful in this invention, because they are too readily volatilized under the combustion conditions of tobacco and furthermore they are not as convenient to admix with the fillers used in this invention as are the silicone polymers set forth below that may be subsequently cross-linked.

Among the polymers that may be used in the adsorbent material to be co-mixed with tobacco are poly (dimethyl) siloxane, poly (co-phenylmethyl dimethyl) siloxane, poly (co-vinylmethyl-phenylmethyl-dimethyl) siloxane and the classes of these polymers conventionally terminated with silanol groups or polymers of the RTV class that are prepared with acetoxy termination for the purpose of cross-linking by hydrolysis of the acetate groups and subsequent cross-linking of the silanol groups generated by hydrolysis; provided that in their final state, the polymer be of high molecular weight, exceeding 100,000, or preferably that it have been cross-linked.

The surface temperature of the polysiloxane is regulated during combustion by incorporating an endothermically reactive filler in the polysiloxane. The filler is dispersed throughout the polymer but the permeability of the polymer to CO_2 and water vapor is so that the reaction products are easily diffused through the absorbent to its surface. The filler absorbs heat from the surface by virtue of the endothermic reaction or endothermic evolution of vaporous material. Furthermore, as the vapors evolved from the filler pass through the particle surface, they absorb heat from the surface. In this manner, the surface temperature of the absorbent particles is maintained sufficiently low to prevent substantial desorption of PAH. Among the fillers that may be used are those capable of releasing water vapor carbon dioxide or both endothermically regardless of whether the vapor evolved is generated by chemical reaction or physical desorption.

The preferred fillers are those which, per gram, absorb the most heat from the surrounding combustion zone while liberating the harmless gaseous product at a temperature low enough to prevent destruction of the polysiloxane absorbent. At the same time, the filler must not spontaneously decompose under conditions of storage with the tobacco product prior to use.

Preferred fillers are listed in Table 1, which also tabulates the nature of the vapor evolved, the endothermic heat in cal./gram of filler and the approximate temperature at which the endothermic heat absorption occurs.

TABLE I

	Heat cal/g	Temp.	Vapor
Milk of magnesia (magnesium hydroxide)	350	350°C	Water
Epsom salt (mag. sulfate heptahydrate)	356	150°–200°C	Water
Sodium metasilicate nonahydrate	412	45°–300°C	Water
Artinite, natural (basic mag. carbonate trihydrate)	400	100°–350°C 350°C	Water Carbon dioxide
Nesguehonite, nat. (mag. carbonate trihydrate)	400	165°C 350°C	Water Carbon dioxide
Sodium bicarbonate	181	270 °C	Carbon dioxide

Gypsum (calcium sulfate dihydrate)	158	128° 163°C	Water Water

Any of the fillers mentioned above may be milled into poly dimethyl siloxane silicone gum stock on a cool mill without significant loss of water of other gaseous product and the silicone rubber may then be cross-linked at essentially room temperature by ionizing radiation. The cured material has only the endothermic filler and no toxic components such as found in products cured by free radical initiators. Alternatively, one can easily admix Gypsum or Glauber's salt or porous water-containing material with RTV silicone and allow room temperature vulcanization to occur by hydrolysis of terminal acetoxy groups, or by other means with the use of trivial amounts of water according to the type of RTV silicone used. When sodium bicarbonate is to be used for evolution of carbon dioxide and water it is impractical to use the acidic RTV rubbers containing acetoxy terminal groups because of partial conversion of the sodium bicarbonate to sodium acetate. On the other hand it is completely practical and indeed desirable to admix the bicarbonate with pure silicone gum stock, especially pure polydimethyl siloxane and then to effect cross-linking by ionizing radiation, such as by a Van der Graaf generator. It will be understood that mechanical strength is irrelevant to the properties of the silicone adsorbent material admixed with the tobacco. Thus, it is not necessary to use silica filler of the fume type or other inert fillers customarily used for reinforcement, but these inert fillers if present in the silicone gum stock will not interfere with the action of the decomposing fillers recited above.

The filler is used to maintain the temperature of the silicone polymer absorbent below its decomposition point and at the same time allow more effective absorption of the PAH molecules liberated from the tobaccos since the PAH are the more soluble in the polymer, the lower is the temperature.

The temperature of tobacco in the combustion zone of a cigarette can exceed about 800°C. depending on moisture content, tightness of packing, rate of smoking by the user and so on. Thus, the amount and type of filler in each polymer particle and the concentration of polymer particles in the tobacco are control-led to obtain the desired results set forth above in relation to the moisture content of the tobacco and to the tightness of packing. At least 50 phr (parts of filler per 100 parts of rubber) are to be used while 100 phr to 150 phr are preferred. The maximum amount of filler that may be incorporated depends on a variety of factors such as filler density, asymetery of the particles, particle size distribution, particle porosity and other factors, and the practical upper limit may be as high as 300 phr. This can be easily ascertained taking care to account for these factors for each filler material. Small amounts of a filler can be directly exposed on the particle surface but it should not be sufficient to adversely effect the absorbent property of the particles nor permit excessively high temperatures on the surface. At the same time the filler particles must be sufficiently near the surface, (within less than about 10 microns) so that by their decomposition they will maintain the surface at the desired temperature and because of their distribution throughout the mass at the same time they will maintain the mass essentially isothermal.

The physical shape and form of the silicone absorbent to be admixed with the tobacco is not critical provided that the maximum surface to volume ratio consistent with practical admixture with the tobacco is realized. In general, the thickness of the absorbent should be comparable to that of the tobacco flake or leaf. The absorbent may take the form of discontinuous flake as in FIGS. 1, 2 or as continuous ribbon as in FIG. 5, or in any other form, provided that after combustion of the intervening tobacco, the ash and spent absorbent can be easily tapped off together, and provided that the absorbent material can be so disposed relative to the tobacco that local "hot" spots are avoided.

When the silicone polymer is cross-linked by thermal decomposition of a free-radical initiator such as dichlorbenzoyl peroxide, it is necessary to remove the potentially harmful by-products resulting from the cross-linking step that might escape by subsequent heating of the silicone rubber, such as phenyl benzoate. This can be effected, for instance, by extraction with acetone and acetone-ether mixtures. For this reason the RTV acetoxy terminated siloxanes and dimethyl silicone gum stocks cured by ionizing radiation (x-ray, Van der Graaf, cobalt 60, etc.) are preferred because no molecular fragments remain after cross-linking that can escape subsequently during heating in the combustion zone of a burning cigarette, cigar or pipe tobacco.

In admixing the silicone absorbent with the tobacco no restriction is placed on the weight ratio of absorbent to tobacco except that the upper limit cannot exceed approximately 6 because otherwise it would be difficult to propagate the combustion front and thus maintain the tobacco lit. Up to this ratio, increased absorption is obtained with increased concentration of absorbent. Therefore, for maximum protection it is preferred to use at least 60 parts of adsorbent to 40 parts of tobacco. The weight of the tobacco is measured after equilibration under one atmosphere pressure at 60 plus or minus 2% relative humidity, at 22 plus or minus 2°C. This can be obtained by placing a mixture containing 74 volumes of glycerin and 26 volumes of water or other dessicant on a suitable covered dessicator.

It is obvious from the foregoing statement that the admixture of silicone rubber adsorbent will result in significantly lower mean combustion zone temperature than would occur if the same quality of tobacco at the same relative humidity were used without admixture with the adsorbent. The presence of the adsorbent reduces the total effective area of combustion in the combustion zone relative to the amount of air being drawn through the cigarette, thus leading to a much higher ratio of oxygen to fuel than is stociometrically required. By itself, this has the well known effect of reducing the temperature of the combustion zone in a calcuable way, and in addition decreasing the small but finite content of carbon monoxide found in the smoke-gas mixture from burning tobacco. It is well known carbon monoxide represents a special health hazard. In addition, the liberation of water or carbon dioxide or other harmless gaseous element from the filler contained within the silicone absorbent demands latent heat of dessication or of evaporation or of desorption and thereby further reduces the temperature of the combustion zone. Consequently the production of PAH is significantly reduced and with the extensive absorptive area immediately adjacent to the zone of production the total PAH passing out of the tobacco mixture into

the filter of the cigarette is very substantially reduced compared to a cigarette without admixed absorbent.

As an alternative embodiment in the filter section **3** of FIG. **1** or FIG. **2**, the clean-up absorbent in section **8** may be of any inert lipophilic polymer including butyl rubber, butadiene rubber, ethylene-propylene copolymers etc. Among the various polymers that may be used, the silicone polymers broadly are preferred because of their very high capacity for the PAH. However, since the cigarette filter will never operate a temperature in excess of 50°C., the exceptional thermal resistance of the silicones is not specifically required in the filter section **8.**

From the foregoing disclosure, it will be understood that there is no practical limit on the length of the lipophilic filter of section **8.** Indeed, it could be greater than half the length of the entire cigarette. It will also be understood that a cigarette consisting of a filter composed of silicone polymers extending over eighty per cent of the cigarette would be of significant value in removing substantially all of the PAH from the small amount of tobacco in such a cigarette, constituting 20 per cent of the total length. In this case the length of the tobacco that may be burned is so short and the distance from the combustion zone to the nearest silicone surface is so short that most of the effects obtainable with the admixture of silicone absorbent would be obtained in a cigarette with an 80 to 20 ratio of filter to tobacco section. It will be understood that in such a cigarette, because the combustion zone could approach and come in contact with the filter medium, it would be manditory to have silicone polymers with high heat resistance of the classes specified above, and containing some gas releasing filler to prevent over-heating of the end nearest the tobacco.

It will be understood therefore, that this invention includes the use of silicone polymers either in admixture with gas releasing, temperature moderating fillers, as absorbent matter to cigarette, and preferably for maximum elimination of PAH from the gas-smoke mixture inhaled by the smoker the cigarette consists of an admixture of tobacco with a silicone absorbent in the combustion section. Additionally a filter section containing a lipophilic polymer, preferably silicone, to absorb final traces of PAH may be provided.

The following examples illustrate the present invention and are not intended to limit the same.

EXAMPLE I

The following mixture is prepared in a laboratory Brabender mixer or on a laboratory rubber mill (cool rolls) until uniformity of color is achieved:

Dow Corning Medical Grade Silastic (devoid at catalyst, but containing 25phr silica)	100.0g
Magnesium hydroxide, CP powder	100.0g
Red iron oxide	4.0g
Ground activated charcoal	0.5g

This raw stock is extruded through a laboratory extruder containing a die with 100 holes of 20 mils diameter, there being a continuous light dusting of sodium bicarbonate powder on the 100 emerging filaments to prevent blocking. The filaments are lightly twisted into a cord and the cord is coiled loosely in piles about 4 inches high. The coils are then transformed to a Van der Graaf or equivalent generator of ionizing radiation and are exposed to a dose of about 10 megarads, whereby the silicone polymer is effectively cross-linked.

Final preparation consists of drawing the cured cord through a water bath to remove superficial bicarbonate, drying in high velocity warm air (120°F max), and then passing continuously through a flying-knife chopper that produces bundles not over 200 mils long. The bundles are passed between closely adjusted knurled rolls the upper running 10 percent faster than the lower at about 100rpm set to a clearance of about 50 mils as determined by feeler gauge. This effects the separation of the individual filaments in the bundles and randomizes them. The randomized chopped filament is comixed with shredded cigarette tobacco (previously conditioned at 60 percent RH at 22°C.)over 74% glycerol **26%** water in a weight ratio of **2** parts filament to **1** part tobacco and is packed into cigarette paper to form cigarettes.

EXAMPLE II

100 grams of Dow Corning Silastic ™ RTV-732, a semi-liquid is mixed with 140 grams finely ground Epsom salt in a laboratory Brabender mixer and 1 gram red iron oxide (to provide color indication of thoroughness of mixing).

The paste after mixing is extruded through the laboratory extruder described in example **1,** and the issuing filaments are sprayed with a fine water fog to hasten superficial hydrolysis and gel formation. The filament thus moistened is stored in chambers held at 95% RH at 25°C. for 48 hours, and is then air dried at 90°F. for 2 hours.

This filamentory material is then chopped as in example I and is mixed with cigarette tobacco, previously conditioned at 22°C. over 74% glycerol, in a weight ratio of 3 to 1.

EXAMPLE III

Union Carbide silicone gum stock W **96,** predominantly polydimethyl siloxane devoid of any peroxide catalysts, is diluted with diethyl ether to form a solution containing 15% polymer. To this is added with effective mixing finely powdered sodium metasilicate nonahydrate (1.4 grams/gram dry rubber), ground activated charcoal (0.02 grams/gram dry rubber) and red iron oxide (0.04 grams/gram dry rubber). When uniform red-brown color is achieved the paste is knife spread onto a polished stainless steel belt which passes through a solvent recovery chamber wherein the ether is evolved by infra red heating to a surface temperature of 120°F. The knife is adjusted to produce a sheet which, after ether evolution, is 15 mils thick.

This sheet is, because of its high filler content, relatively non-blocking. It is loosely folded in layers up to 50 deep. The layered material is transferred to a Van der Graaf generator and irradiated with 10 megarods, whereby it is cured. The folded sheeted stock is then unfolded and passed under a rotary perforator whereby it is slit into nearly detached ribbons three-sixteenths inch wide connected at one-half intervals by an uncut length about 25 mils long.

This sheet stock, thus slit, is co-wrapped with whole leaves of tobacco in a 1/1 ratio, so as to form cigars, in which the nearly separated ribbons of absorbent are at right angles to the axis of the cigar.

From the foregoing description it will be seen that the absorptivity of polysiloxanes to PAH may be utilized to

remove PAH from tobacco gas-smoke. The polysiloxane may be placed in the tobacco mixture or in the gas-smoke-stream, but should be presented to maintain a relatively low maximum temperature to minimize the regeneration of PAH vapors. Siloxane polymers situated close to burning tobacco in the combustion zone may include endothermic fillers that generate physiologically harmless vapors such as water, carbon dioxide or they may be present in relatively high proportions, to keep down the temperature in the combustion zone and minimize regeneration of previously absorbed PAH.

The foregoing description sets forth several preferred and representative examples of the embodiments of this invention. It is, however, contemplated that the principles herein set forth will lead others to employ various modifications from the present disclosure, which will still be within the skill of the art and not beyond the spirit of this invention.

In particular the formulations of tobacco and silicone are aimed at presenting the silicone in form and arrangement to be adsorptive of PAH from the gas-smoke and to prevent subsequent desorption of PAH. The maintenance of low temperatures in the silicone polymers is important, and is provided for by incorporating endothermic fillers or by the presence of relatively large proportions of silicone in the combustion zone. In either case the objective is to present the siloxane in absorptive relationship to the tobacco gas-smoke, and to prevent subsequent over-heating sufficient to regenerate previously absorbed PAH. When the silicone polymer is mixed with the tobacco, low temperatures may be maintained through the presence of relatively large amounts of silicone, or by incorporating large amounts of physiologically harmless absorptive fillers in the siloxane polymer. When the "filler" is situated downstream of the filler, in the gas-smoke stream, but not consumed, lipophilic solids other than silicone also are effective to remove PAH.

I claim:

1. A smoking composition comprising tobacco and a lipophilic absorbent comprising an organic polysiloxane having a molecular weight greater than 100,000, said polysiloxane being capable of absorbing hydrocarbon constituents without evolving toxic materials when heated and containing admixed therewith from about 50 to about 300 parts a filler per 100 parts polysiloxane, said filler being selected from the group consisting of hydrates and carbonates endothermically dissociable to release water or carbon dioxide at a temperature less than about 350°C to limit the temperature rise of absorbent during normal combustion of the tobacco to prevent substantial desorption of absorbed hydrocarbons when the tobacco is burned.

2. The composition of claim **1** wherein the lipophilic absorbent is mixed with the tobacco in an amount between 0.5 and 3.0 times the weight of tobacco.

3. The composition of claim **1** wherein the filler endothermically liberates water vapor when the tobacco is burned.

4. The composition of claim **2** wherein the filler endothermically liberates water vapor when the tobacco is burned.

5. The composition of claim **1** wherein the filler endothermically liberates carbon dioxide when the tobacco is burned.

6. The composition of claim **2** wherein the filler endothermically liberates carbon dioxide when the tobacco is burned.

7. In a smoking device wherein tobacco is arranged to be smoked with a passage of tobacco gas-smoke therethrough, tobacco, a lipophilic absorbent mixed with said tobacco comprising an organic polysiloxane in the stream of said gas-smoke, said polysiloxane having a molecular weight greater than 100,000 and being capable of absorbing hydrocarbon constituents without evolving toxic materials when heated and containing admixed therewith from about 50 to about 300 parts of filler per 100 parts polysiloxane, said filler being selected from the group consisting of hydrates and carbonates endothermically dissociable to release water or carbon dioxide at a temperature less than about 350°C to limit the temperature rise of the absorbent during smoking to prevent substanial desorption of hydrocarbons absorbed by said polysiloxane.

8. The device of claim **7** wherein the absorbent comprises particles having a major dimension less than about one quarter inch.

* * * * *