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G. JACOBSON
CIGARETTE FILTERS
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3,087,500

FIG. 1

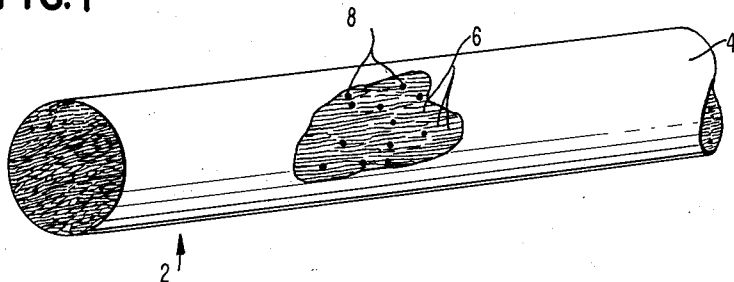


FIG. 2

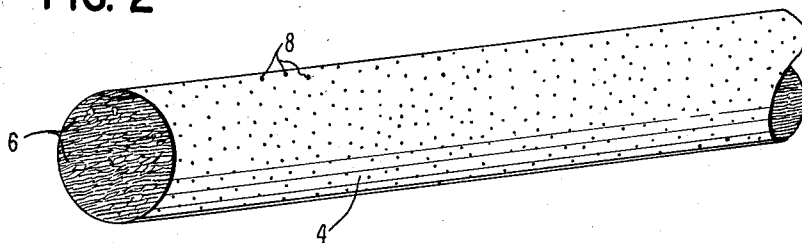


FIG. 3

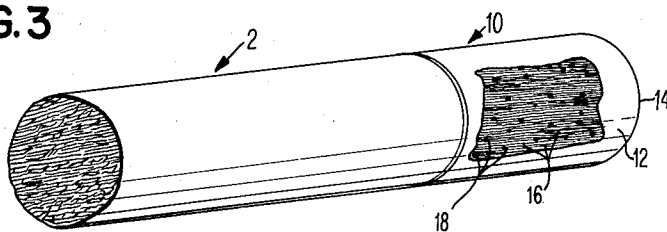
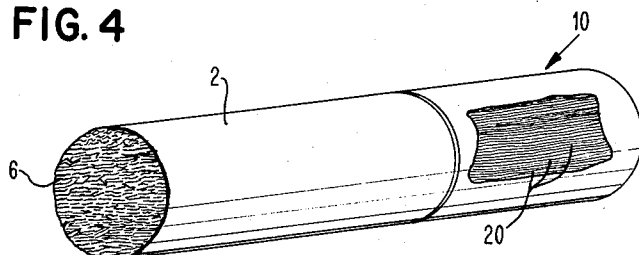


FIG. 4



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CIGARETTE FILTERS

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2 Claims. (Cl. 131-10)

This invention relates to filters in general, but more particularly to filters that are to be employed with cigarettes and cigars.

That there is a high correlation between the smoking of tobacco and the increased incidence of cancer has appeared in the literature. One such paper that treats of such correlation is entitled, "Towards a Solution of the Tobacco-Cancer Problem" by E. L. Wynder which appeared in the January 5, 1957 issue of the "British Medical Journal," pp. 5009, 5010, 5011. The carcinogenic agents in tobacco, such as tars and nicotine, have been instrumental in producing cancer of the throat, particularly among moderate to heavy smokers.

It is also known, however, that the smoking of tobacco affords many such immeasurable pleasure that the habit of tobacco-smoking persists despite the ever-present danger of the carcinogenic agents in tobacco. Consequently, it would be a boon to smokers of tobacco, particularly to cigarette smokers, if means were made available to eliminate the carcinogenic agents of tobacco during the actual enjoyment of the cigarette.

Major efforts to eliminate the carcinogenic agents during actual smoking have relied on mechanical filters that are attached to the cigarette itself or to a cigarette-holder, such filters serving to trap some of the tars and nicotine that are found in most tobaccos. Such filters are inefficient in that a good deal of the carcinogenic agents are combusted with the tobacco and are carried along with the smoke that is passed through the mechanical filter. Consequently, the actual burning of the cigarette leaves a residue of tars in the smoke carried along the length of the cigarette, which residue penetrates such mechanical filters mentioned above.

The present invention accomplishes the filtering action by breaking up the smoke particles that carry the combusted tars and nicotines into ionized particles and then providing an electrostatic potential at the cigarette end as a means for precipitating out such ionized particles, as well as a means for increasing the flow of ionized smoke through the length of the cigarette so as to provide less residue to cling to the unburnt tobacco. There are many techniques for ionizing particles such as the use of radioactive substances that emit alpha and beta particles for ionizing materials that came in contact with such particles; the use of a very high potential created at a point to obtain a corona discharge that exceeds the dielectric constant of air so as to ionize the latter; or one may use friction to mechanically tear away electrons from a surface. All such techniques are not feasible for ionizing the harmful substances in a cigarette during the enjoyment of the latter. The method relied upon in the practice of the present invention is referred to as "thermionic ionization." Thermionic ionization occurs when certain materials are heated to a point at which electrons escape from the electrostatic gravitational force of the material. The average velocity of the escaping electrons increases with an increase in heat. At a critical temperature, electrons overcome the electrostatic force existing at the surface of the heated material and escape from the surface. In general the electronic flow is related to temperature by the Formula

$$I = AT^2 E \frac{-b}{T}$$

where I is the current in amperes cm.², T is the temperature in absolute ° K., A is a constant=120.4 amperes/cm.²

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deg.², b is a constant equal to 11,600 E_w in degrees Kelvin and E_w is the work function of the material in electron volts.

In order to obtain high electron emission, I have incorporated in the tobacco and in the cigarette paper housing the tobacco a substance that has a high thermionic electron emission yet is not toxic to the human body. Such substance should, at the temperature at which a cigarette burns, generate sufficient electrons so as to ionize the tars and nicotine immediately adjacent thereto so that means, to be described in detail hereinafter, can be provided to precipitate the ionized particles before they are inhaled by the smoker. Such precipitating means is a substance which is light in weight and one that can be attached to the cigarette during its enjoyment. Such precipitating means would comprise materials that are electrically polarized when their temperatures become elevated. At such elevated temperatures the material will become electrostatically polarized with one end of the heated material (should the material be crystalline in form) polarized positively and the other end negatively, such polarized material serving to precipitate out the ionized particles created by the non-toxic, high thermionic emissive material incorporated with the tobacco.

Thus, it is an object of this invention to provide improved filters for cigarettes and the like.

It is another object to provide a light-weight filter that will electrostatically precipitate out deleterious particles by ionizing such particles.

It is yet another object to provide such light-weight filter during the actual enjoyment of the cigarette.

Still another object is to provide a novel means for producing ionization of deleterious agents in the tobacco that comprises the cigarette so that such novel filtering means will be effective in carrying out its filtering action.

These and other objects and features of the invention will be more fully understood from the following detailed description when read in conjunction with the drawings, in which:

FIG. 1 shows that aspect of the invention that does not include the filter but includes the means for ionizing the products of burning tobacco.

FIG. 2 shows the ionizing material incorporated in the paper in which the tobacco is housed.

FIG. 3 shows an embodiment of the invention showing the novel electrostatic precipitator attached to one end of applicant's novel ionizing means.

FIG. 4 is another embodiment of the electrostatic filter invention shown in FIG. 3.

Turning to FIG. 1, there is shown a cigarette 2 having the conventional paper covering 4 and the shredded tobacco 6. Incorporated with and intimately commingled with the shredded tobacco 6 are particles 8 of a substance that is non-toxic and has a high thermionic ionization. One such substance is tantalum, which is relatively inexpensive. Other elements that have high thermionic electron emission may be used, even if slightly toxic, so long as the cigarette is used with a filter that traps the toxic or harmful products. Such particles of tantalum would be pellets of the order of one micron in diameter. Using the relationship of

$$I = AT^2 E \frac{-b}{T}$$

and assuming that a lighted cigarette burns at 880° C., a one micron diameter sphere of tantalum at such temperature will emit approximately 2.25 10¹³ electrons more than enough available electrons for ionizing most of the residue products that arise when the tobacco is burned. Other substances that could be used would be gallium,

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molybdenum, and tungsten. Compounds of such elements may be used where such compounds are non-toxic.

If desired, the one micron pellets 8 of tantalum, gallium, tungsten, molybdenum, or compounds thereof, or other non-toxic thermionically ionizable substance may be incorporated, as shown in FIG. 2, in the cigarette paper 4 that houses the compacted shreds of tobacco and non-toxic ionizable pellets so that the nicotine and tars that exist in such paper 4 may also be ionized during the smoking of the cigarette.

FIG. 3 shows a filter section 10 that is attached to the cigarette portion 2 during the manufacture of the cigarette, though what follows is meant to describe a filter that can be contained in an independent holder to accommodate any cigarette of the type described in FIGS. 1 and 2. Filter section 10 consists of stiff paper 12 having the usual opening 14 at the end of the cigarette that is held in the mouth during smoking. Confined within the stiff paper 12 is a suitable filler material 16, such as, though not limited to, the honeycombed, spongy, and cork-like substance used in mechanical filters already in existence in use with cigarettes. Incorporated in such mechanical filters are pellets 18 of tourmaline. Tourmaline is a mineral containing aluminum, boron, sodium, iron, magnesium, fluorine, and silicon as its principal ingredients. The commonest forms are six-sided prisms capped by obtuse pyramids. The desirable feature of tourmaline is that it is pyroelectric and becomes polarized when heated. Tourmaline is black and occurs as grains, fibrous masses or as radiate aggregates. The tourmaline 18, when ground into fine pellets, will be distributed among the filler material 16 that is confined within the paper cylinder 12. The heated smoke, as it is drawn through the filter section, will polarize the tourmaline, so that the positive crystals of tourmaline will attract the negatively charged residue that has been created in the cigarette portion 2 during the smoking of the cigarette. Such filter 10 is in effect a light weight electrostatic precipitator that permits the electrostatic deposition of the harmful elements in a cigarette, such harmful elements having been ionized by the non-toxic ionizable substance that was incorporated in the tobacco.

FIG. 4 is another technique for obtaining a light-weight electrostatic precipitator. In this embodiment, the filter section 10 will contain a porous vinyl plastic 20 in the form of thin sheets or in the form of delicately spun fibres. Vinyl plastic develops an electrostatic charge when rubbed.

The filter tip 10 that is made of such material, as shown in FIG. 4 and which serves as an electrostatic precipitator, can be rubbed with the fingers during smoking so that the vinyl plastic may become electrically polarized, permitting the latter to serve as a collector of ionized smoke particles being passed through the length of the cigarette during the actual smoking of such cigarette. The vinyl plastic is sufficiently yieldable to finger

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pressure or mouth pressure so as to be more susceptible to being charged by the frictional rubbing of the vinyl plastic by such finger or mouth pressure. The vinyl plastic also becomes charged due to air, during smoking, that is drawn over the vinyl plastic.

A novel cigarette and cigarette filter have been described which permits one to ionize the harmful ingredients in tobacco and produce ionized smoke particles by using the temperature of the burning cigarette to produce a copious supply of electrons from a non-toxic, highly ionizable substance incorporated in the tobacco, and relying on a lightweight substance to act as an electrostatic precipitator of such ionized smoke. The aforementioned invention serves to filter out harmful ingredients in tobacco that cannot be eliminated by conventional mechanical filters.

While there has been shown and described and pointed out the fundamental novel features of the invention as applied to a preferred embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. A tobacco smoke filter formed of a mass of randomly arranged particles of tourmaline dispersed in a non-toxic carrier.

2. An improved cigarette comprising a mixture of tobacco having commingled therewith a substance having a high thermionic emission, and filter means at one end of said cigarette comprising a dispersion of tourmaline crystals.

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