

April 11, 1967

P. P. NOZNICK ETAL

3,313,305

CIGARETTE FILTER

Filed Aug. 11, 1965

Fig. 1

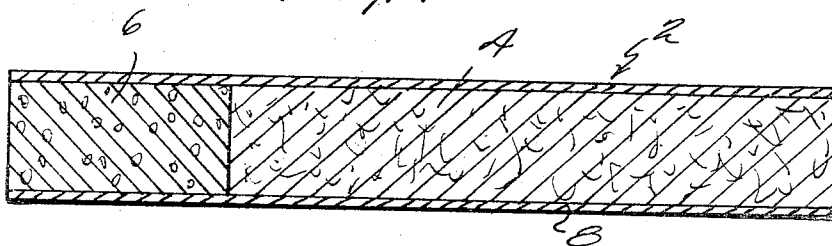


Fig. 2

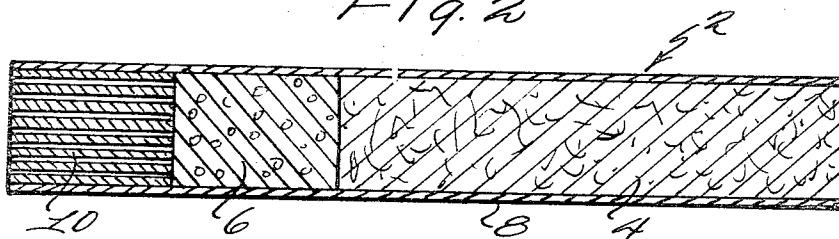


Fig. 3

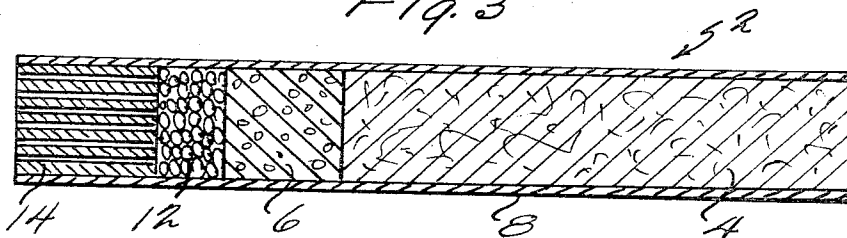


Fig. 4

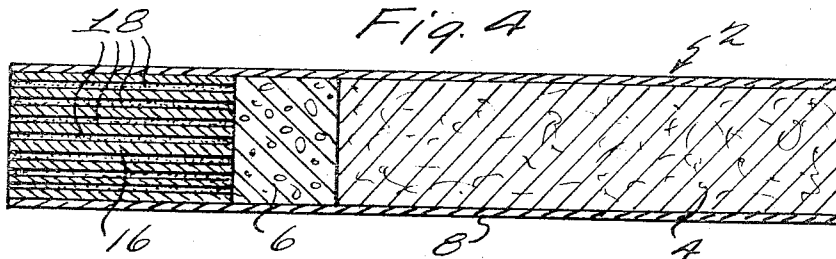
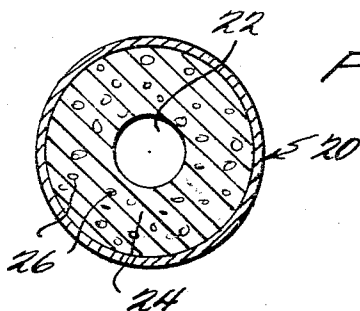


Fig. 5



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3,313,305

CIGARETTE FILTER

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Filed Aug. 11, 1965, Ser. No. 478,854

10 Claims. (Cl. 131-10.7)

This invention relates to a novel smoker's filter article. This application is a continuation-in-part of our application Ser. No. 360,383, filed Apr. 16, 1964, now Patent No. 3,279,476.

One of the objections to many of the cigarette filters employed today is that the smoke loses the tobacco taste during filtration. In addition, tars and nicotine are not always removed to a sufficient extent.

Accordingly, it is an object of the present invention to develop a novel tobacco filter.

Another object is to develop a tobacco filter which retains the tobacco taste and flavor.

An additional object is to develop a tobacco filter which has a high efficiency for removing tars and nicotine.

Still further objects and the entire scope of applicability of the present invention will become apparent from the detailed description given hereinafter; it should be understood, however, that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

It has now been found that these objects can be attained by the use of certain novel filters as hereinafter set forth.

While the following disclosure is primarily directed to the use of the novel filters in cigarettes, it is to be understood that the filters can also be employed as filters for other smokers' articles, such as cigars and pipes.

In one aspect of the invention a tobacco flavor regenerator is employed which is impregnated with a solvent extract of tobacco.

The solvent is preferably water although there can also be employed other solvents such as methyl, ethyl, propyl or isopropyl alcohol or aqueous alcohol, e.g. 80% ethyl alcohol by weight, to prepare the extract. The tobacco is extracted with water and the aqueous solution is then concentrated, e.g. to $\frac{1}{2}$ - $\frac{1}{4}$ of its original volume. Preferably, a mild saline solution is employed for the extraction. In a specific example, tobacco was soaked with a 1% aqueous salt solution. The aqueous solution drained off and evaporated to $\frac{1}{3}$ its original volume.

The aqueous extract solution used in extracting tobacco may also include the following: A dilute aqueous solution of glycerine or sorbitol ranging from 2-10%, preferably 5%, or a dilute aqueous solution of organic acid such as gluconic, lactic, tartaric or saccharic in the range from .5-5%, preferably 1%, where the aqueous extract is at a pH no greater than pH 6.

The concentrated tobacco extract thus prepared can then be used to impregnate filter paper, cellulosic fibers, e.g. alpha cellulose or cotton, cellulose ester fibers, e.g. cellulose acetate and cellulose acetatebutyrate, asbestos fibers, viscose rayon, polypyrrolidone fibers, etc. The impregnated fibers are then dried. Most preferably, the tobacco impregnated filter, i.e., cigarette flavor regenerator, is placed on the afterside of another filter so that the filtered smoke volatilizes the tobacco containing filter flavor so that the smoker can detect the aromatic flavor of the tobacco with the smoke.

Instead of impregnating the filter fibers with the aqueous concentrate of the tobacco extract there can be added

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to the aqueous concentrate an adhesive gum such as gum acacia (gum arabic), gum tragacanth, inulin, larch gum, guar gum, gum karaya, locust bean gum, or other carbohydrate gums, pectin, e.g. low methoxy pectin, methyl cellulose, carboxymethyl cellulose and the mixture spray dried to a powder. This powder is then incorporated on the surface of filter paper, or any of the other fibers set forth supra, in the presence of moisture. As a result a substantial amount of powder adheres to the filter paper and on subsequent drying the powder adheres to the paper due to the mucilaginous character of the gum or the like. The preferred mucilaginous gum is gum acacia. In a specific example 50% of gum acacia was added to a water extract of tobacco which had previously been evaporated to $\frac{1}{2}$ its original volume. This mixture was spray dried. The powder was sprinkled on the surface of damp alpha cellulose fibers and these were then dried prior to being used as a cigarette flavor regenerator.

When employing alcohol to extract the tobacco, the concentrate can be air dried rather than spray dried.

In another alternative the aqueous tobacco extract is added to cigarette paper pulp in the pulping operation. In this manner the end paper contains the tobacco flavor distributed throughout the paper.

There can be employed any of the conventional filtering fibers with the tobacco extract.

There can also be added conventional granular or pulverulent filtering agents such as activated carbon used as filters, for example in Lark and Tareyton brands of cigarettes. A granular activated carbon filter of the type employed in Lark cigarettes is disclosed in Portuguese Patent 40,999. There can also be used granular adsorbents such as silica gel and ion exchange resins, e.g. cation exchange resins such as sulfonated styrene-divinyl benzene copolymer (available commercially as Dowex 50), sulfonated phenol-formaldehyde and ethylene glycol dimethacrylate-methacrylic acid copolymer and anion exchange resins such as phenol-tetraethylene pentamine-formaldehyde resin and quaternary ammonium resins prepared by reacting a tertiary amine with a haloalkylated cross-linked copolymer of a monovinyl hydrocarbon and a polyvinyl hydrocarbon, e.g. the reaction product of trimethyl amine with a chloromethylated cross-linked copolymer of 92% styrene and 8% divinyl benzene by weight (Amberlite IRA-400).

The novel filter of the present invention comprises a carbohydrate or proteinaceous material and at least one chemical agent selected from the group of beeswax, cholesterol, paraffin and hydrogenated methyl ester of rosin. This novel filter can be used as the sole filter or it can be employed with the tobacco flavor regenerator and with or without conventional filters such as those previously set forth, e.g. fibrous filters such as alpha cellulose fibers, cotton fibers, cellulose acetate fibers, viscose rayon fibers or granular filters, e.g. activated carbon, activated alumina, silica gel, cation exchange resins and anion exchange resins.

As the carbohydrate material there can be employed modified starches, dextrin, lactose, corn syrup solids or carbohydrate gums, etc. Proteinaceous materials such as sodium caseinate and gelatin can also be used for this purpose. Dextrin gum is the preferred carbohydrate material because it has the best enzymatic stability.

The novel filtering material is preferably prepared in the powdered form. The powder can be prepared by first dissolving the carrier, such as dextrin gum, in water. This aqueous mixture is preferably slightly heated, usually to about 100-160° F., and then the chemical agent is added along with an emulsifying agent. This mixture may then be pasteurized at about 160°-200° F. and homogenized

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at about 500–1000 p.s.i. The resultant mixture may be spray dried to form the desired powder.

The emulsifying agent to be used depends on the nature of the chemical agent to be emulsified. Examples of suitable emulsifiers are decaglycerol tristearate, hydrogenated lecithin, diacetyl tartaric ester monoglyceride, sorbitan monostearate, decaglycerol monostearate, propylene glycol monostearate, glycerol lactopalmitate, triglycerol monostearate, decaglycerol decastearate, propylene glycol monooleate, sorbitan monooleate, sorbitan sesquioleate, decaglycerol trioleate, glycerol lactooleate, glycerol lactostearate.

The powdered filtering material of the present invention may be employed as a powder plug in a cigarette or as a paper filter with the powder impregnated thereon. In addition, the powdered filter material of the present invention can be used in combination with the fat encapsulated filter described in our parent application, Ser. No. 360,383, either as a mixture of powders or as separate filters in tandem.

The invention is further illustrated by the following specific examples. In each of these examples, the carrier employed was dextrin gum. The procedure employed to prepare the powdered product was the same in each example: The carrier was first dissolved in water. The solution was then heated to 100–160° F. and then the chemical agent and the emulsifier added. The mixture was then pasteurized, homogenized and spray dried to a powder. Pasteurization can be carried out at conventional temperatures, e.g. 140–165° F. for 20–40 minutes or at higher temperatures for shorter periods of time.

In each of the examples, 900 g. of chemical agent was employed to 2100 g. of dextrin gum. The amount of emulsifier added was 4.5 g. About 7000 g. of water was added to make a 30% solids solution. All parts and percentages used herein are by weight.

Example No.	Chemical Agent	Emulsifier	Pasteurization and Homogenization Temp., ° F.	Homogenization Pressure, p.s.i.
1.	Beeswax	Decaglycerol tristearate	190	500
2.	Cholesterol	Hydrogenated lecithin	190	1,000
3.	do	Diacetyl tartaric ester monoglyceride	184	1,000
4.	Paraffin	Decaglycerol tristearate	190	500
5.	do	Sorbitan monostearate	190	600
6.	Hydrogenated methyl ester of rosin.	Decaglycerol monostearate	192	500

The spray dried powdered product of each example was found to be a very good filter for trapping tar from cigarettes when used as plugs ¼" to ½" long. Each of these plugs successfully removed additional tar and nicotine when placed on the after side of a cigarette having a conventional filter.

The individual particles of the spray dried powdered product of the present invention are more or less spherical in shape having a continuous phase of carbohydrate material, e.g., dextrin gum, and a discontinuous phase of the chemical agent or agents. The carbohydrate shell of these particles is not completely impervious and the smoke can get to the chemical agent within the particles. It is believed that the tars from the smoke are dissolved in the chemical agent.

Humectants are frequently added to the flavor section of the filter. Suitable humectants include glycerol, sorbitol, propylene glycol, ethylene glycol, mannitol, xylitol and the like. The humectant is added to the aqueous tobacco extract in an amount of 0.1–5% by weight prior to concentration. In a specific example 0.5% of glycerol was added to the aqueous tobacco extract prior to concentration. The aqueous mixture was concentrated to ½ its volume and then used to impregnate cellulose acetate fibers which were then dried and used as a cigarette filter.

The invention will be further described by the drawings wherein:

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FIGURE 1 is a sectional view of a cigarette having a filter according to the invention;

FIGURE 2 is a sectional view of another cigarette having a modified filter according to the invention;

FIGURE 3 is a sectional view of a cigarette illustrating another embodiment of the invention;

FIGURE 4 is a sectional view of a cigarette illustrating an alternative embodiment of the invention; and

FIGURE 5 is a sectional view of a particle of the powdered product used in the novel feature of the invention.

Referring more specifically to FIGURE 1, there is provided a cigarette 2 comprising tobacco 4 and a filter 6 encased in an over-all outer paper wrapper 8. The filter 6 is made of spray dried powder prepared in accordance with any one of Examples 1 to 6.

In FIGURE 2 the cigarette 2 comprises a rod of tobacco 4 and a filter 6 made in a manner similar to the filter shown in FIGURE 1. There is also an after filter 10 made of cellulose acetate fibers. The cigarette is encased in an over-all outer paper wrapper 8. In FIGURE 3 the cigarette 2 comprises tobacco 4 and filter 6 made of the same type of materials as shown in FIGURE 1. There is also provided a granular activated carbon filter 12 and a final filter 14 of alpha cellulose fibers. The alpha cellulose fibers were impregnated with an aqueous extract of tobacco and dried prior to use in the cigarette. Tobacco 4 and the three filters 6, 12, and 14 are encased in an over-all outer paper wrapper 8.

In FIGURE 4 the cigarette 2 comprises tobacco 4 and filters 6 and 16. Filter 6 has the same composition as the filters in the previous figures carry the same identification number. Filter 16 was prepared by incorporating particles of a spray dried mixture of 50% gum acacia, 50% concentrated aqueous tobacco extract of filter paper fibers in the presence of moisture to incorporate the

powder as particles 18 on the surface of the filter paper fibers and then drying the filter. An over-all paper wrapper 8 was then employed to encase the tobacco 4 and filters 6 and 16.

FIGURE 5 shows a particle 20 of the powdered product used in preparing filter 6 of FIGURES 1 through 4. The particle 20 is hollow at the center 22 and is of generally spherical shape. It has a continuous phase of carbohydrate material 24 and a discontinuous phase of chemical agent 26 encased therein.

The relative amount of chemical agent to be used in the novel filter of the present invention can be varied within wide limits. Usually the chemical agent is 2.0 to 70.0%, preferably 5.0 to 40.0% of the total weight of the chemical agent and carbohydrate material. By varying the ratio of chemical agent to carbohydrate material there can be varied the amount of nicotine, etc, pulled out from the cigarette, cigar or pipe tobacco smoke.

The amount of emulsifier to be used in preparing the filter is not critical. Usually the emulsifier is about 0.5% by weight of the chemical agent employed but care should be taken to use enough emulsifier to emulsify the chemical agent in the liquid mixture containing the carbohydrate material. The use of excessive amounts of emulsifier will bring added advantage to the resultant filter.

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What is claimed is:

1. The combination with a smoker's article having therein a smoke passage of substantial cross-section of a filter section having dispersed therethrough a chemical agent selected from the group consisting of beeswax, cholesterol, paraffin and hydrogenated methyl ester of rosin, said chemical agent being encased in a member of the group consisting of carbohydrates and proteinaceous materials, said chemical agent serving to reduce the amount of tar and nicotine in the smoke.
2. The combination according to claim 1 wherein the chemical agent is encased in dextrin gum.
3. The combination according to claim 1 further including a filter impregnated with a solvent extract of tobacco to impart aroma to the smoke.
4. A cigarette comprising tobacco and a filter section having dispersed therethrough a chemical agent encased in dextrin gum, said chemical agent being selected from the group consisting of beeswax, cholesterol, paraffin and hydrogenated methyl ester of rosin, said chemical agent serving to reduce the amount of tar and nicotine in the smoke.
5. A cigarette according to claim 4 further including a filter impregnated with an aqueous extract of tobacco to impart aroma to the smoke.
6. A cigarette according to claim 4 wherein said chemical agent is beeswax.
7. A cigarette according to claim 4 wherein said chemical agent is cholesterol.
8. A cigarette according to claim 4 wherein said chemical agent is paraffin.

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9. A cigarette according to claim 4 wherein said chemical agent is hydrogenated methyl ester of rosin.

10. A cigarette comprising a rod of tobacco at the end thereof and a plurality of filter sections, the first of said filter sections being at the opposite end of the cigarette from the tobacco and comprising filter fibers impregnated with an aqueous extract of tobacco and a second filter section being between said first filter section and the tobacco, said second filter section having dispersed therethrough a chemical agent encased in dextrin gum, said chemical agent being selected from the group consisting of beeswax, cholesterol, paraffin and hydrogenated methyl ester of rosin, said chemical agent serving to reduce the amount of tar and nicotine in the smoke.

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