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FILTER ELEMENTS AND ADDITIVE THEREFOR

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ABSTRACT OF THE DISCLOSURE

A selective tobacco smoke filter element containing a particulate additive coated with a water-soluble, weak-basic inorganic salt which is capable of chemically reacting with and rendering harmless substantially all hydrogen cyanide vapors contained in the tobacco smoke passing through the filter elements. The organic salt is selected from the group consisting of phosphates, phosphites, and carbonates of sodium and potassium.

This invention relates to tobacco smoke filter elements. More particularly it concerns specially coated powdered additives for tobacco smoke filter elements and filter elements containing same.

In our U.S. patent application Ser. No. 425,920, filed Jan. 15, 1965, now U.S. Patent No. 3,297,705 issued Aug. 20, 1968, we disclose use of certain water-soluble inorganic salts for removal of substantial amounts of hydrogen cyanide from tobacco smoke by addition to filter elements. While such salts have proved highly successful in cyanide removal we have noticed in some instances a tendency of these additives to dust off and to be not distributed over the filter filaments in as uniform a manner as might be desired. Also, such salts in powder form tend to have particles which are sometimes too large to be completely dissolved by the moisture from the smoke passing through the filter element. Thus, in such instances optimum filtration efficiency is not attained. Therefore development of a filter element with improved hydrogen cyanide filtration efficiency and an improved water-soluble inorganic salt additive therefor represent a highly desirable result. After extended investigation we have developed an additive which removes an increased amount of hydrogen cyanide from tobacco smoke when contained in continuous filament cellulose acetate filament filter elements. We have also found that this additive may be used in a highly efficient manner in conjunction with known tobacco smoke filter element additives.

One object of this invention is to provide a new and improved type of tobacco smoke filter element. Another object is to provide a treated powder which may be applied to cellulose acetate tow to improve particulate matter removal and to selectively remove hydrogen cyanide (HCN) from the vapor of tobacco smoke. A further object is to provide a method for constructing an improved tobacco smoke filter. Still another object is to provide an improved additive for cellulose acetate filter tow.

In its broader aspects our invention involves adding to cellulose acetate tow powders which have water-soluble inorganic salts coated on the surface thereof, especially the salts of Group I*a* elements. The coated powders may be applied by vibrating onto the tow.

Inorganic salts which we have found particularly useful according to our invention include the sodium and potassium carbonates and phosphites or mixtures of these. Powders (or powders in flake form) which may be coated with these water-soluble inorganic salts to dampen their static properties and enhance their application by a vibration technique include cellulose acetate, cellulose, methyl cellulose, starch, and the like. The amount of inorganic

salt that may be added according to our invention is from 1 to 50%, the preferred amount being between 2 and 10%, based on the weight of the final filter. The amount of additive coated with salt that may be added to the tow according to our invention is between 1 and 75%, the preferred amount being between 5 and 50%, based on the weight of the final filter.

According to one embodiment of the instant invention a crimped tow may be spread out to a width of approximately 15 inches as it moves through a cigarette plug-making machine. A vibrating pan 15 inches in width is placed directly above and parallel to the tow. In the pan is placed a flake or powder which has been ground to pass through a 50-mesh screen and coated on its surface from a water solution with sodium carbonate or the like inorganic water-soluble salt amounting to 25% by weight of the flake or powder. The vibrator pan is adjusted to apply the desired amount of additive, and the additive is vibrated onto the filter tow as it moves through the filter plug-making equipment. As the tow containing the additive moves through the equipment, the tow is recompacted and wrapped with a paper tape to form a cylindrical-shaped section. This section may be cut into any desired length and used either alone as a filter or in combination with other filters to make a dual or multiple filter.

For a further understanding of our invention, following are several illustrative examples.

Example I

A 10-ft. length of 8 denier/filament (d./f.) crimped cellulose acetate filter tow having 8,000 filaments and weighing approximately 20 grams is spread out to a width of 15 inches. Glyceryl triacetate (triglycerin) in the amount of 8% by weight of the tow is applied to the tow by rollers. A dry cellulose acetate powder containing 0.5 g., 50% by weight, sodium carbonate coated on its surface is applied to the tow from a vibrating pan until 1 g., 5% total additive, based on the weight of the tow, is added. The tow is then recompacted and wrapped with a paper tape. The cylindrical section thus formed is then cut into 20 mm. segments. The 20 mm. segments are attached to king-size cigarettes by means of a cellophane tape. The cigarettes are smoked with an automatic smoking device, and the amounts of total particulate matter (tar) and hydrogen cyanide are determined respectively by the method of McConnell, et al., in Tobacco Science 4, 55–61 (1960), and substantially the method described by Aldridge et al., in the Analyst 69, 262 (1944). The amounts of total particulate matter and hydrogen cyanide obtained from the same type filter element containing no additive, and a filter element containing only powdered sodium carbonate as an additive are substantially higher than those obtained with the filters containing cellulose acetate powder coated with sodium carbonate.

Example II

A 10-ft. length of 8 d./f. crimped cellulose acetate filter tow having 8,000 filaments and weighing approximately 20 grams is spread out to a width of 15 inches. Glyceryl triacetate in the amount of 8% (1.6 g.) by weight of the tow is rolled onto the tow. A dry methyl cellulose powder containing 0.8 g., 50% by weight, sodium carbonate coated on its surface is applied to the tow from a vibrating pan until 8% total additive (1.6 g.), based on the weight of the tow, is added. The tow is then recompacted and wrapped with a paper tape to form a rod. The rod is then cut into 20 mm. segments. The 20 mm. segments are attached to king-size cigarettes by means of a cellophane tape, and the cigarettes smoked with an automatic smoking device. The amount of total particulate matter (tar) delivered by the cigarette is determined by the method of

McConnell et al., in Tobacco Science 4, 55–61 and the amount of hydrogen cyanide is determined as substantially described by Aldridge et al., in Analyst 69, 262 (1944). The amounts of total particulate matter and hydrogen cyanide which are obtained from the same type filter elements containing no additive and a filter element containing only powdered sodium carbonate as an additive are substantially higher than those obtained with the filters containing cellulose acetate powder coated with sodium carbonate.

Example III

A 10-ft. length of 8 d./f. crimped cellulose acetate filter tow having 8,000 filaments and weighing approximately 20 grams is spread out to a width of 15 inches. Glyceryl triacetate in the amount of 1.6 g., 8% by weight of the tow, is rolled onto the tow. A dry cellulose powder containing 50% by weight (0.45 g.) potassium carbonate coated on its surface is applied to the tow from a vibrating pan until 45% (9.g.) of the additive, based on the weight of the tow, is added. The tow is then recompacted and wrapped with a paper tape to form a rod. The rods are then cut into 20 mm. segments. The 20 mm. segments (filter elements) are attached to king-size cigarettes by means of a cellophane tape, and the cigarettes smoked with an automatic smoking device. The amounts of tar and hydrogen cyanide delivered by the filter cigarettes are determined by the methods described in Examples I and II. The amounts of total particulate matter and hydrogen cyanide obtained from the same type filter element containing no additive and a filter element containing only powdered potassium carbonate as an additive are substantially higher than those obtained with the filters containing cellulose acetate powder coated with potassium carbonate.

From the foregoing description and examples it may be seen that we have provided a cellulose acetate filter element of increased selectivity for removal of hydrogen cyanide from tobacco smoke.

Although the invention has been described in considerable detail with particular reference to certain preferred embodiments thereof, variations and modifications can be

effected within the spirit and scope of the invention as described hereinabove.

We claim:

1. A rod-shaped filter element adapted for selective removal of hydrogen cyanide from tobacco smoke which comprises compacted cellulose acetate filaments enveloped in an encircling wrapper and having as a particulate additive thereon particles selected from the group consisting of cellulose acetate, cellulose, methyl cellulose, and starch, which particles are coated with a water-soluble inorganic salt selected from the group consisting of sodium carbonate, potassium carbonate, sodium phosphite, and potassium phosphite.

2. The tobacco smoke filter element of claim 1 in which the coated particulate additive comprises 5% to 50% of the weight of said element and the inorganic salt comprises 2% to 10% by weight of said element.

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