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(54) TOBACCO SMOKE FILTER

(71) We, HOECHST AKTIENGESELLSCHAFT, a body corporate organised according to the laws of the Federal Republic of Germany, of 6230 Frankfurt/Main 80, Postfach 80 03 20, Federal Republic of Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a tobacco smoke filter, especially a cigarette filter, containing cellulosic material.

Such filters are used, for example in cigarettes, to retain to a greater or lesser extent various constituents of the cigarette smoke, such as tar and nicotine, as well as other harmful substances.

Cellulosic material is used in the manufacture of cigarette filters. In particular, cellulose acetate is widely used because filters made of this material are inexpensive and their production is simple. However, they do not significantly reduce the content of tar, nicotine and other harmful substances in cigarette smoke.

In order to remedy this disadvantage, German Offenlegungsschrift No. 2 512 511 proposes a cigarette filter with a cellulosic material which contains at least some modified cellulose or cellulose ether.

Although this filter is selectively highly effective, in particular against tar and nicotine, its manufacture is not particularly advantageous technologically because the active material, modified cellulose or modified cellulose ether, has to be added to the filter carrier material in the form of fine fibres or powder.

The present invention provides a tobacco smoke filter, especially a cigarette filter, comprising a modified cellulose ether applied to paper, the modified cellulose ether being predominantly or completely insoluble in water while retaining the ability to absorb water.

The modified cellulose ether is advantageously applied to only one surface of the paper, or to part only of one or both surfaces.

There is advantageously used a creped tissue paper with a weight per unit area of approximately 22 to 45 g/m².

In one process for the manufacture of the filter according to the invention, paper, especially tissue paper, is modified by bringing its surface to the desired moisture content by brief immersion of the paper in water and subsequently wiping it, and subsequently applying to one or both surfaces a modified cellulose ether, for example in a centrifugal chamber or by scattering the ether in powder form onto the moist surface. Any modified ether that may be obtained in finely divided, pourable form, it being irrelevant whether the particles are fibrous irregularly crumbly or finely divided in some other manner, is suitable. There are preferably used cellulose ethers which are modified by cross-linking according to the process described in British Patent Application No. 49154/74 (Serial No. 1487938) or modified as described in British Patent Application No. 50331/74 (Serial No. 1492039). They are distinguished by a high capacity to absorb and retain water. Other modified cellulose ethers which can be used are, for example, the ammonium salts, modified by heat action according to the process described in German Patent Specification 839 492, of cellulose glycolic acid or the gel-forming cellulose ether modifications obtainable according to the process described in United States Patent Specification No. 2,639,239, by heating celluloseglycolic acid alkali metal salts. This conversion of finely-divided water-swellable, cellulose ethers into a material convenient for further processing is described in detail in German Offenlegungsschrift No. P 25 34 358.2, and British Patent Application No. 31922/76 (Serial No.).

Among the special advantages of the filter, especially as a cigarette filter, according to the invention is its selective filter action for phenol and also for other relatively hydrophilic substances, such for example as methanol, lower aldehydes, ketones and nitriles. The retention capacity for nicotine and tar lies, in addition to the mentioned selective filter action, within the scope of the

values determined for untreated papers. When smoking cigarettes with the filters according to the invention, there is no untoward increase in the draw resistance for the smoker; the draw resistance of the cigarette remains constant during smoking.

The following examples, in which the percentages are by weight, illustrate the invention:

EXAMPLE 1

A cigarette filter consisting of a paper of which the surface is covered on one side by a carboxymethyl cellulose cross-linked by dichloroacetic acid is produced as follows.

A web of tissue 120 mm wide and having a weight per unit area of 25.7 g/m² is drawn through water and, after wiping off the adhering water, is conveyed through a laboratory vibrating sieve. The carboxymethyl cellulose cross-linked with 11.25% dichloroacetic acid calculated on the weight of the original cellulose, is dusted onto one side of the paper through a 0.2 mm sieve so that, after drying, the paper has increased in weight by approximately 100%.

The cross-linked carboxymethyl cellulose used is produced as follows:

At approximately 20°C, 20 kg of cellulose in 60 kg of aqueous isopropanol (87% strength) is alkalisied, while stirring intensively in a stirrer vessel, with 12.8 kg of aqueous NaOH solution (49.5% strength) for 45 minutes; there is added to this a mixture of 10.8 kg of sodium monochloroacetate and 2.25 kg of dichloroacetic acid. The mixture is heated to 85°C and is stirred for one hour at this temperature; after cooling to approximately 20° to 25°C the mixture is neutralised against phenolphthalein by acetic acid, filtered, the powder washed free of salt with 80% aqueous methanol and dried at 60°.

EXAMPLE 2

A cigarette filter consisting of a paper of which the surface has been coated on both sides with a carboxymethyl cellulose cross-linked by dimethylolmethylene bisacrylamide is produced as follows.

A web of tissue 120 mm wide and having a weight per unit area of 25.7 g/m² is drawn through water and, after wiping off the adhering water, is conveyed through a laboratory vibrating sieve. Carboxymethyl cellulose, cross-linked with 17% dimethylol-

methylene bisacrylamide based on the original material is dusted through a 0.2 mm sieve on to both sides of the paper so that after drying the paper has increased in weight by approximately 100%.

The cross-linked carboxymethyl cellulose is produced as follows: At approximately 20°C, 100 g of cellulose in 300 g of aqueous isopropanol (87% strength) is alkalisied for 45 minutes while kneading with 65 g of aqueous NaOH solution (50% strength). The etherification of the alkali cellulose is carried out by the addition of 82 g of sodium monochloroacetate and further kneading at 70°C for one hour. The mixture is cooled to approximately 50°C and the cross-linking is carried out at this temperature for one hour with 50 g of aqueous dimethylolmethylene bisacrylamide solution (30% strength). After cooling to approximately 20°C to 25°C, the mixture is neutralised against phenolphthalein with acetic acid, filtered, and the powder obtained washed salt free with 80% aqueous methanol and dried at 60°C.

WHAT WE CLAIM IS:—

1. A tobacco smoke filter comprising a modified cellulose ether applied to paper, the modified cellulose ether being predominantly or completely insoluble in water while retaining the ability to absorb water.

2. A filter as claimed in claim 1, which is a cigarette filter.

3. A filter as claimed in claim 1 or claim 2, wherein the ether covers one surface of the paper only.

4. A filter as claimed in claim 1 or claim 2, wherein the ether only partially covers at least one surface.

5. A filter as claimed in any one of claims 1 to 4, which comprises paper having applied thereto a cellulose ether cross-linked by dichloroacetic acid or dimethylolmethylene bisacrylamide.

6. A filter as claimed in claim 1, substantially as described in any one of the Examples herein.

7. A cigarette, having a filter as claimed in any one of claims 2 to 6.

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