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3,418,187

FILTER ELEMENTS

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2 Claims. (Cl. 156—180)

ABSTRACT OF THE DISCLOSURE

A process for the production of filter elements comprises forming a band or web of filaments or fibres, applying to the band a bonding agent in the form of a fusible powder consisting of a polyethylene glycol of molecular weight greater than 100,000, condensing the band into a cylindrical shape of the required dimensions and subjecting the formed cylindrical elements to heat in order to fuse the bonding agent.

This invention relates to the production of filter elements and in particular to filter elements in cylindrical form suitable for use as filter tips in cigarettes.

It has previously been proposed to produce filter tips for cigarettes from filamentary material such as cellulose acetate by forming a band of the filaments by opening a tow spraying a plasticiser for the polymeric material on to the bands and condensing the bands into cylindrical form of the shape and size required. The present invention is concerned with the manufacture of filter elements and it will be understood that cylindrical filter elements referred to in this specification include elements having a cross-section in the form of a curve other than a circle, such as, for example, elliptical cross-section.

According to the invention the process for the production of filter elements comprises forming a band or web of filaments or fibres, applying to the band a bonding agent in the form of a fusible powder, condensing the band into a cylindrical shape of the required dimensions and subjecting the formed cylindrical elements to heat in order to fuse the bonding agent.

The filamentary or fibrous material may be composed of continuous filaments or of staple fibres and should possess some degree of crimp. In applying the fusible powder to continuous filament material, it is preferred to open a tow of continuous filament material until substantially all the fibres are in parallel formation and to apply the powdered material by spraying or by other known methods of powder feeding, such as by the use of gravity applicators. Staple fibre material may be similarly sprayed in the form of a carded web or under certain circumstances in the form of a sliver. The powder may also be applied by passing a band or sliver of filaments or fibres through a fluidised bed of powdered material. Preferably from 5 percent to 30 percent by weight of powder is employed, based upon the weight of the filaments or fibres.

The band or web of filaments or fibres may be condensed into cylindrical form by conventional methods, for example in the condensing tube of a conventional cigarette making machine. The heat treatment may be applied after condensing or after the application of a wrapper, but may also be applied substantially at the same time as the condensing is taking place. When the heating takes place after condensing or wrapping the formed elements may be placed in an oven, or passed through a heating zone as desired. The condensing tube may itself be heated so that the fusible powder is melted simultaneously with the condensing operation. The temperature of heating will be dependent upon the particular filaments or fibres being treated and upon the nature of the fusible powder. This

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temperature requires to be higher than the melting point of the fusible powder and it is preferred to employ a powder which melts at a temperature which is less than the melting point or softening temperature of the filaments or fibres. When the polymer of the filaments or fibres is cellulose acetate it is preferred to use a fusible powder having a melting temperature not more than about 160° C. Under these circumstances, it will not normally be necessary to heat the filter elements at a temperature higher than 200° C. It is also possible to apply techniques of infrared or high frequency heating to the fusion of the powders.

Substantially any known filamentary or fibrous material suitable for the production of filter elements of the type described may be used in the process of the invention including, for example, filaments or fibres produced from cellulose acetate, viscose, polyesters, polyamides, polyolefines, acrylonitrile polymers, regenerated proteins or natural material such as cotton. Of the above materials cellulose acetate in continuous filamentary form or in the form of staple fibres is preferred.

The fusible powder material may be of any suitable kind of consistent with the requirement of obtaining satisfactory bonding, and with the need to obtain substantially no undesirable flavour on the passage of smoke through the filter; it is necessary that the powder should melt without decomposition at a temperature within the required range. Examples of materials which are suitable include polyvinyl butyral, cellulose acetate, polyethylene, acrylonitrile styrene copolymers, nylon and any other suitable polymers whose melting point is in the required range or may be brought into the required range by the incorporation of plasticisers. Certain adhesives, such as powdered polyethylene glycols, are known to have favourable absorption properties for components of cigarette smoke, and their use in the process of the invention may be particularly advantageous. Especially preferred are polyethylene glycols having molecular weights greater than 100,000.

If desired, charcoal, activated clay or other aid to efficient filtration and absorption may be added as well as the bonding material, for example in an amount within the range from 10 percent to 60 percent by weight based on the weight of filaments or fibres, when it will be firmly incorporated within the finished filter rod.

In the process of the invention the powder is applied in a substantially random manner, and the individual filaments or fibres are bonded together at various points distributed at random throughout the filter element by the application of heat. Some powder material may fail to adhere and may be recovered from the apparatus and returned for re-use.

The invention is illustrated by the following examples. In the examples, the various powders were applied as evenly as possible to the tow, the tow was condensed into a cylinder in a tube, and the bonding agents were set by heating in an oven for one hour at the appropriate temperature. The properties of the resulting filter rods were compared with those of a standard cellulose acetate filter tip made by conventional methods.

EXAMPLE 1

Filter rods were made by the method described above from cellulose acetate tow and from 6 percent to 15 percent by weight of each of the following bonding powders.

	Melting point, ° C.	Heating temperature, ° C.
(1).....	55-70	85
(2).....	110-140	150
(3).....	130-150	150
(4).....	85-110	150
(5).....	100-110	150
(6).....	140-165	180

The rods were paper wrapped and their properties were as shown in Table 1.

which comprises forming an opened band of continuous filaments or of carded staple fibres applying to the opened

TABLE I

Bonding Powder used.	None (reference)	1	2	3	4	5	6
Average weight of tip (grams)-----	0.174	0.168	0.152	0.152	0.161	0.161	0.155
Average pressure drop (cm.)-----	4.8	4.4	3.9	3.3	2.9	4.4	2.9
Percent tar retention-----	37.6	54.6	42.3	31.5	35.2	25.0	31.9

EXAMPLE 2

Filter rods were made in the same way but charcoal of 18-60 mesh size (British Standard Screen) was added together with the powdered bonding agents. The rods were paper wrapped and their properties were as shown in Table 2 in which the reference numbers relate to the list of bonding agents in Example 1.

band a bonding agent in the form of a fusible powder consisting of a polyethylene glycol of molecular weight greater than 100,000, condensing the treated band into a cylindrical shape of the required dimensions and subjecting the formed cylindrical elements to heat in order to fuse the polyethylene glycol.

2. The process as claimed in claim 1 in which the

TABLE 2

Bonding Powder used.	None (reference)	1	3	4	5	6
Percent adhesive-----		6	16	20	17	14
Percent charcoal-----		120	110	20	100	115
Average pressure drop (cm.)-----	4.9	3.9	4.6	2.7	4.3	3.7
Percent tar retention-----	42	54	52	42	45	53

We claim:

1. The process for the production of filter elements

filter elements are made from a tow of crimped continuous filament cellulose acetate.

References Cited

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,418,187 Dated December 24, 1968

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It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 23 of the patent, delete "of" from the phrase "kind of consistent"; line 67, after "(1)" insert --Polyethylene glycol--; line 68, after "(2)" insert --Nylon copolymer--; line 69, after "(3)" insert --Polyethylene--; line after "(4)" insert --Polyvinyl butyral--; line 71, after "(5)" insert --Cellulose acetate powder--; line 72, after "(6)" insert --Acrylonitrile/styrene copolymer--.

SIGNED AND
SEALED

DEC 23 1969

(SEAL)

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