We, BRITISH-AMERICAN TOBACCO COMPANY LIMITED, a British Company of Westminster House, 7 Millbank, London SW1P 3JE, United Kingdom, hereby apply for the grant of a Standard Patent for an invention entitled:

"IMPROVEMENTS RELATING TO THE MANUFACTURE OF TOBACCO SMOKE FILTERS"

which is described in the accompanying Complete Specification.

Details of basic application:

- Number: 8712617
- Country: United Kingdom
- Date: 28th May, 1987

Our address for service is:

SHELSTON WATERS
55 Clarence Street
SYDNEY, N.S.W. 2000.

DATED this 24th Day of May, 1988

BRITISH-AMERICAN TOBACCO COMPANY LIMITED

by P. Heathcote

Fellow Institute of Patent Attorneys of Australia
of SHELSTON WATERS

To: The Commissioner of Patents

WODEN A.C.T. 2606

File: 17J

Fee: $145.00
CONVENTION APPLICATION BY A COMPANY
FORM 8 - REGULATION 12 (2)
AUSTRALIA PATENTS ACT 1952
DECLARATION IN SUPPORT OF A CONVENTION APPLICATION FOR A PATENT

In support of the Convention Application made by British-American Tobacco Company Limited, Westminster House, 7 Millbank, London SW1, England

(hereinafter referred to as "Applicant") for a patent for an invention entitled:

Improvements relating to the Manufacture of Tobacco Smoke Filters

...

and do solemnly and sincerely declare as follows:

1. I am authorised by Applicant to make this declaration on its behalf.

2. The basic Application(s) as defined by section 141 of the Act was / were made in the United Kingdom on the 21st day of May 1987 by British-American Tobacco Company Limited, Westminster House, 7 Millbank, London SW1, England


...is/are the actual Inventor(s) of the Invention and the facts upon which Applicant is entitled to make the Application are as follows:

By virtue of Contract of Employment

4. The basic Application(s) referred to in paragraph 2 of this Declaration was/were the first Application(s) made in a Convention country in respect of the Invention, the subject of the Application.

DECLARED at London, England

1,271,274; 1,341,400; 1,442,631, 1,456,908 and
Claim

1. A method of making foamed filtration material, wherein a particulate plastics material, a polysaccharide and water are fed to an extruder, the extruder being operated under such heat and pressure conditions that upon emergence of the extrudate from the extruder die the extrudate assumes a cross-section greater than that of the exit orifice of said extruder die.
Name of Applicant: BRITISH-AMERICAN TOBACCO COMPANY LIMITED

Address of Applicant: Westminster House, 7 Millbank, London SW1P 3JE, United Kingdom

Actual Inventor: John Anthony Luke

Address for Service: S"ELSTON WATERS, 55 Clarence Street, Sydney

Complete Specification for the Invention entitled:
"IMPROVEMENTS RELATING TO THE MANUFACTURE OF TOBACCO SMOKE FILTERS"

The following statement is a full description of this invention, including the best method of performing it known to me/us:-

-1-
IMPROVEMENTS RELATING TO THE MANUFACTURE OF TOBACCO SMOKE FILTERS

The invention the subject of the present application relates to the manufacture of tobacco smoke filter elements.

The most widely established method of manufacture of cigarette filter elements comprises the continuous feeding of plasticizer treated cellulose acetate tow and a web of wrapper paper to a garniture unit of a rod making machine. A driven endless band extends through the garniture unit and serves to convey the tow and wrapper paper web through the unit, wherein the wrapper paper is wrapped about the tow and lap seamed, thereby being continuously produced a rod of circular cross-section. Downstream of the garniture unit the rod is cut into lengths a multiple, commonly six, of a unit element. Subsequent cutting of the rod lengths during the making of filter tipped cigarettes provides discrete filter elements. A similar method is used, although to a lesser extent, for the manufacture of paper filter elements, a web of crimped filter paper rather than cellulose acetate tow being fed to the garniture unit.

There have also been proposed methods of making filter rod by the extrusion of foamed thermoplastics materials. Such proposals have been disclosed in

1,271,274; 1,341,400; 1,442,631, 1,456,908 and 1,482,216 (Monsanto Chemicals Limited or Monsanto Limited) and in United States Patent Specification No. 4,180,536 (Celanese Corporation).

Mention is made in United Kingdom Patent Specification No. 694,436 (Mayer-Neville) of a cigarette filter element formed by rolling into cylindrical form a strip of porous latex foam. Similar filter elements are disclosed in United Kingdom Patent Specification No. 799,781 (Cogea).

United Kingdom Patent Specifications Nos. 1,122,661 and 1,279,803 (Monsanto Chemicals Limited) relate to cigarette filter elements made from an extruded, foamed thermoplastic material which has been drawn, to impart unidirectional orientation to the material, and then worked in order to break down the foam structure and to produce a three dimensional structure of interconnected fibre elements.

United Kingdom Patent Specification No. 993,602 (Du Pont) teaches a method of making cigarette filter rod wherein a polyoxymethylene is extruded as a foamed structure ribbon, the ribbon is shredded under the action of a wire brush and the shreds are wrapped in a paper web. United Kingdom Patent Specification No. 1,183,498, in the name of the present applicants, teaches the comminution of synthetic foam materials, as for example in a hammer mill, and the wrapping of
the resultant particulate material in paper to provide filter rod. A class of foam materials disclosed in United Kingdom Patent Specification No. 1,205,766 (National Patent Development Corporation) is said to provide a suitable tobacco smoke filter medium, especially when the materials are in particulate form. According to United Kingdom Patent Specification No. 1,194,492 (Strickman Foundation), a tobacco smoke filtration material is provided by granulating a rigid polyurethane foam.

It is proposed in United States Patent Specification No. 3,800,808 (Brown & Williamson Tobacco Corporation) to make cigarette filter material by encasing a starch with a cellulose ester, cellulose acetate for example, swelling the starch and then removing the starch by enzymation and/or chemical hydrolysis or by solubilising the starch. The resultant foamed product is cut into shreds, which shreds are used as filter material for filter rod.

Although numerous proposals have been made in the patents literature for the use of foamed materials in or as cigarette filters, these proposals have failed to find practical application in the tobacco industry.

It is an object of the present invention to provide a method of making commercially acceptable filter rod, which method is practical and simple. It is another object of the present invention to provide a method in
which readily available and inexpensive materials can be used to make commercially acceptable filter rod.

The subject invention provides a method of making filtration material, wherein a foamed extrudate is produced by providing to an extruder a particulate plastics material, a polysaccharide expansion agent and water, the conditions of heat and pressure in said extruder being such that upon emergence of the extrudate from the extruder die the extrudate assumes a cross-section greater than that of the exit orifice of said extruder die.

The plastics material is suitably polypropylene, cellulose acetate, or polyethylene. The plastics material may also be a polyester, viscose or nylon. If cellulose acetate is used, it may be derived from waste cigarette filters. Two or more plastics materials may be fed together to the extruder.

The polysaccharide used as an expansion agent may be a natural starch such, for example, as corn starch, or a modified starch. As an alternative the polysaccharide may be a cellulose, which term includes food grade cellulose, or a modified cellulose, methyl cellulose for example.

Other materials, chalk for example, may be fed to the extruder with the plastics material and the starch. The materials fed to the extruder may include a binder, the inclusion level of which typically does not
exceed 5%. Cellulosic binders, hydroxypropyl cellulose, carboxymethyl cellulose or sodium carboxymethyl cellulose for example, are especially useful. Alternatively, or in addition, a natural, or modified natural, binder may be used, examples being pectin, or pectin salts, and guar.

The materials fed to the extruder may include one or more of a nucleating agent, such, for example, as calcium carbonate or calcium acetate, a humectant such, for example, as glycerol, propylene glycol or sorbitol, and a lubricant such, for example, as pharmaceutical grade mineral oil.

The purpose of introducing water to the extruder is to produce the foamed structure of the extrudate. In the extruder the materials fed thereto are subjected to conditions of heat, 100°C to 250°C for example, and pressure such that immediately upon emergence from the exit die of the extruder, the water, or at least a portion thereof, flashes into steam, thereby creating cells within the extrudate and a consequent swelling of the extrudate. The water may be injected into the extruder through ports in the extruder barrel and/or be fed to the extruder via the feed hopper thereof.

Advantageously, the plastics material and the polysaccharide, plus other materials if utilised, are blended before being fed to the extruder.

The inclusion levels on a dry weight basis of the
materials fed to the extruder are 5% to 95% for the plastics material and 95% to 5% for the polysaccharide. The water may account, on a weight basis, for 1% to 20% of the materials plus water fed to the extruder.

The density of the extrudate may be in a range of 20 mg/cc to 500 mg/cc.

The extruder used in carrying out the inventive process is suitably a twin-shaft cooker extruder. Advantageously, the die of the extruder comprises a slit-form exit orifice, whereby the extrudate takes the form of a flat web or ribbon. Alternatively, the exit orifice of the die is such that the extrudate upon first issuing from the die is of tubular or near-tubular cross-section, the extrudate being then opened to provide a flat web or ribbon. The die may according to further alternatives be configured for the extrusion of a strand or for the coextrusion of a plurality of strands.

Advantageously, the extrudate when in web or ribbon form is subjected to a draw down step, so effecting an increase in the machine direction dimension of the extrudate and a decrease in the thickness thereof.

When the extrudate takes the form, for example, of a web or ribbon or a plurality of strands, it may be fed continuously to the garniture of a filter making machine, wherein it is gathered into rod form and wrapped in a plugwrap, the process being similar to
that commonly adopted in the making of paper filters
for cigarettes. Alternatively, a web, ribbon or strand(s)
may be shredded to provide pieces approximating in
size to cut cigarette filler, the so provided particulate
material being then fed to a cigarette making machine,
wherein it is wrapped in plugwrap thus to provide
filter rod rather than cigarette rod. Advantageously,
before the extrudate passes to either of these rod
forming stages it is subjected to the cooling action of
cooling means.

The material fed to the filter or cigarette
making machine may be treated with a bonding agent.
Thus, for example, if the plastics material fed to the
extruder comprises cellulose acetate, a triacetin
bonding agent may be used. Again, for example, if
the plastics material comprises polypropylene, the
bonding agent may be a copolymer of ethylene and vinyl
acetate.

If the extrudate is of an open cellular interior
structure, the extrudate may take the form of a continuous
rod of the required filter rod circumference. In such
case the extrudate may be passed through sizing means,
tubular sizing means for example, in order to ensure a
consistent and accurate rod circumference. After
formation to size the rod is cut into, for example,
lengths six times unit filter element length.

Examples of the subject invention are as follows:
EXAMPLE I

A 50%:50% dry blend of polypropylene granules and Pfizer dietary fibre was fed to a Baker Perkins twin-shaft cooker extruder at a feed rate of 9.5 Kg/hr. The extruder was operated at a shaft speed of 110 r.p.m. and with an outlet die temperature of 126°C. Water was fed to the barrel of the extruder at a feed rate of one litre per hour.

The resultant extrudate was a white, fluffy, soft but self-sustaining rod of a density of 0.032 g/cc.

EXAMPLE II

A 50%:50% dry blend of polypropylene granules and methyl cellulose granules manufactured by Celanese Corporation under designation M450 was fed to the extruder used in Example I at a feed rate of 16.0 Kg/hr. The operating conditions were: shaft speed - 130 r.p.m.; outlet die temperature - 140°C; and water feed rate - two litres per hour.

The resultant extrudate was a white, bubbly, firm, self-sustaining rod of a density of 0.053 g/cc.

The rods extruded in Examples I and II were suitable for being shredded to provide pieces of cigarette filler size for feeding to a cigarette making machine for the manufacture of wrapped filter rod.
CLAIMS
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method of making foamed filtration material, wherein a particulate plastics material, a polysaccharide and water are fed to an extruder, the extruder being operated under such heat and pressure conditions that upon emergence of the extrudate from the extruder die the extrudate assumes a cross-section greater than that of the exit orifice of said extruder die.

2. A method according to Claim 1, wherein said plastics material comprises one or more of polypropylene, cellulose acetate and polyethylene.

3. A method according to Claim 1, wherein said plastics material comprises one or more of polyester, viscose and nylon.

4. A method according to Claim 1, 2 or 3, wherein said polysaccharide comprises starch or modified starch.

5. A method according to any one of the preceding claims, wherein said polysaccharide comprises cellulose or modified cellulose.

6. A method according to any one of the preceding claims, wherein there is additionally fed to said extruder a binder.

7. A method according to any one of the preceding claims, wherein there is additionally fed to said extruder one or more of a nucleating agent, a humectant and a lubricant.
8. A method according to any one of the preceding claims, wherein said extrudate is subjected to a drawdown step to effect an increase in the machine direction dimension of the extrudate and a decrease in the thickness thereof.

9. A method according to any one of the preceding claims, wherein said extrudate is fed continuously to the garniture of a filter making machine.

10. A method according to any one of Claims 1 to 9, wherein said extrudate is shredded and the thus produced particulate material is fed to a cigarette making machine.

11. A method according to Claim 10, wherein said particulate material is treated with a bonding agent.

12. A method according to any one of Claims 1 to 8, wherein said extrudate takes the form of a continuous rod of open cellular structure, said rod being cut into lengths a multiple of unit filter element length.

DATED this 24th Day of May, 1988

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