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ARTIFICIAL FILAMENT

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Fig. 1

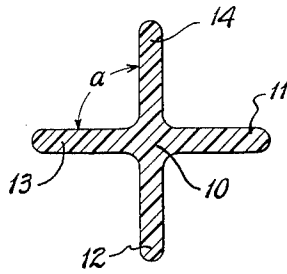
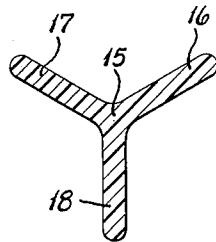


Fig. 2



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1 Claim. (Cl. 28—82)

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The present invention relates to improved filaments utilizable, for instance, as bristles in the manufacture of push brooms, whisks, brushes, and related articles. The invention relates more particularly to a filament which is artificially prepared, as contrasted with naturally occurring filaments such as vegetable fibres or animal hairs and bristles, said filaments of the invention being made of long chain, linear thermoplastic polymers the molecules of which have been oriented, or made to lie generally in the direction of the length of the filament.

Objects and advantages of the invention will be set forth in part hereinafter and in part will be obvious herefrom, or may be learned by practice with the invention, the same being realized and attained by means of the instrumentalities and combinations pointed out in the appended claim.

The invention consists in the novel parts, constructions, arrangements, combinations and improvements herein shown and described.

The accompanying drawings, referred to herein and constituting a part hereof, illustrate an embodiment of the invention, and together with the description, serve to explain the principles of the invention.

The invention has for an object the provision of an artificial filament having high qualities of stiffness, resiliency and durability making it particularly useful for use as bristles in brooms, brushes, and the like. The invention further provides a filament having increased surface area over conventional filaments of either natural or synthetic origin making it particularly useful for paint brushes and similar uses, for instance. Another object is the provision of a filament wherein the strength characteristics are retained but a substantially smaller mass of material is utilized than in conventional filaments, giving rise to savings in materials and a lighter weight in objects fabricated from the filaments.

Figs. 1 and 2 of the drawings illustrate two preferred cross sectional shapes which may be adapted for the synthetic filaments of the invention.

With the above stated and other objects in view the filament of the invention is made of a long chain linear polymer or copolymer such as, for instance, vinyl chloride-acetate or nylon, the molecules of which have been oriented, that is, made to lie generally in the direction of the length of the filament, in order to provide a filament of high modulus of elasticity and tensile strength. The filament is extruded from a suitable die so that the finished form of the filament provides

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a central filament portion and a plurality of filament web portions extending radially outwardly from the central portion. The web portions so provided are preferably of considerable radial extent, extending for at least several times the thickness of the central filament portion, so that the construction of the filament is essentially that of several intersecting continuous web portions, the central portion of the filament being merely the intersection of the several webs and having a cross sectional dimension of about the order of the width of such webs. In preferred forms of the filament all of the angles formed between adjacent surfaces of the webs by their intersection are equal, that is, the web portions are regularly positioned as radii in the body of the filament, and such web portions are preferably of substantially equal thickness and said thickness for each web portion is continuous. It will be apparent that filaments so fabricated will have maximum strength, stiffness and area characteristics for a minimum mass of material, and their use in brushes and brooms will provide maximum possible material economy.

It will be understood that the foregoing general description and the following detailed description as well are exemplary and explanatory of the invention but are not restrictive thereof.

Referring now in detail to the invention, Figs. 1 and 2 illustrate preferred cross sectional forms to be imparted to filaments in accordance with the invention, although such forms are given by way of example only, and other forms may be used. As shown in Fig. 1, a cruciform cross sectional shape may be adopted for the filament wherein a central filament portion 10 is formed by the intersection of the radially extending web portions 11, 12, 13 and 14. The web portions extend radially for distances which are several times the greatest thickness of the central portion 10, thus providing high strength in the filament with a minimum of material, and likewise providing a large total external surface. The angles α internally of the filament formed between the adjacent faces of the several web portions are preferably, though not necessarily, equal, and the several web portions are also preferably of the same thickness and of substantially uniform thickness throughout their lengths, providing uniformity in the construction and functioning of the filament.

As shown in Fig. 2 of the drawings, the filament may within the scope of the invention take a form having a Y cross section, wherein the central portion 15 is formed by the intersection of the three

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web portions 16, 17 and 18, and the arrangement and proportion of the elements is similar in principle to the embodiment of Fig. 1 just described.

In the formation of filaments of the invention any long chain linear thermoplastic polymer capable of being subsequently oriented may be used as the material for the filament depending upon the various properties which are desired in the finished product, and such polymer is extruded in accordance with known practices through spinnerets having shapes to impart the desired final form to the filament. In the case of filaments of the forms shown in Figs. 1 and 2, for example, the bores or apertures of the spinnerets would have the forms of the cross sectional shapes of the finished filaments there shown.

After the filament is extruded and solidified it is then stretched in accordance with the method best suited to the particular material being used in order to orient the molecules of the polymer so that they all lie in the direction of the length of the filament, giving a high modulus of elasticity and tensile strength to them. The conditions under which such stretching takes place will vary in accordance with the particular material being used, as, for instance, nylon filaments will be stretched to four to seven times their original length at controlled temperature which in some instances may be as high as 230° F., while filaments of polyvinyl chloride-acetate copolymer are stretched at a time when they are heated as, for instance, by passage through an atmospheric steam bath chamber. After the filaments are oriented, they may in accordance with known practice be reheated as for instance by passage through a steam bath in order to anneal and shrink them to a stable form.

The finished filament made of materials and in the form described may have an over all cross-sectional dimension from about 0.006 to 0.100 of an inch, and the thickness of the web portions may be of the order of about 0.001 to 0.005 of an inch.

The invention in its broader aspects is not

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limited to the specific embodiments shown and described but departures may be made therefrom, within the scope of the accompanying claims, without departing from the principles of the invention and without sacrificing its chief advantages.

What I claim is:

A filament of substantially uniform cross-section throughout its length which is particularly adapted for use as a brush bristle, said filament being formed from a long chain linear oriented stable thermoplastic polymer, said cross-section comprising at least three flat, thin, erect webs radiating at about equal angles from each other from a small center portion having a cross-sectional dimension of about the order of the thickness of such webs, whereby a high degree of stiffness and a great amount of surface is obtained with a minimum of polymer.

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