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2,408,718

HIGH CAPILLARITY BRISTLE

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Fig. 1.

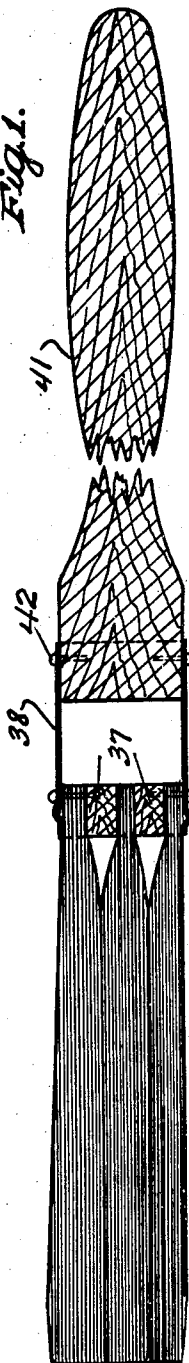


Fig. 2.

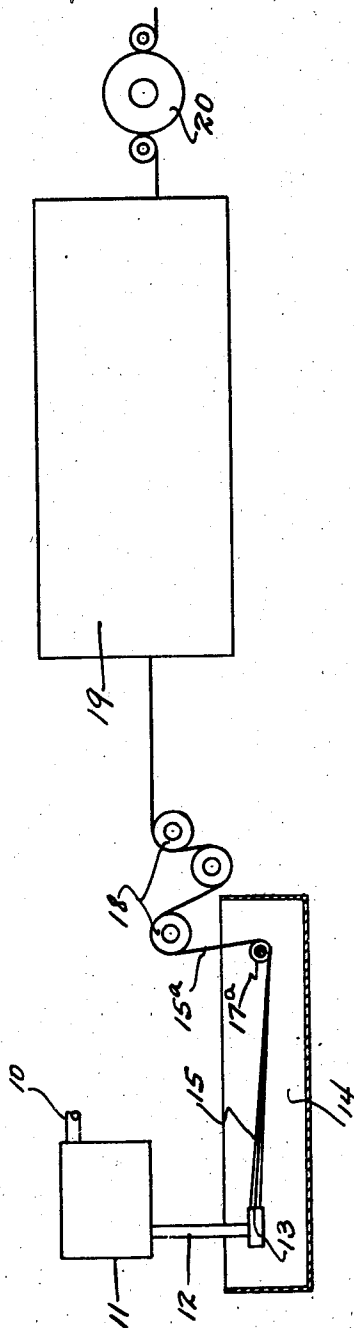


Fig. 3.

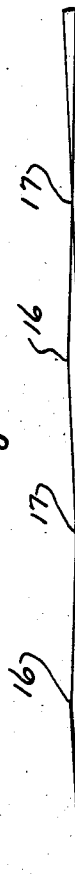


Fig. 4.



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HIGH CAPILLARITY BRISTLE

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7 Claims. (Cl. 15—159)

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The present invention relates to bristles for use in the manufacture of brushes such as are employed as means for applying paints, varnishes and the like to surfaces which are to be coated, and it has particular relation to the preparation of bristles of the foregoing type from a synthetic plastic material.

One object of the invention is to provide a synthetic bristle which is adapted to retain paints, varnishes and such like liquids without undue tendency to run or spatter when a brush embodying the bristles is dipped into the liquids.

A second object of the invention is to provide a simple and convenient method of forming such bristles.

These and other objects of the invention will be apparent from consideration of the following specification and the appended claims.

Heretofore, in the manufacture of such brushes as are employed in painting or other coating operations, hairs or bristles of animals have been employed in order to form a brush element. The better grades of bristles have been obtained from geographical regions which are now largely inaccessible owing to war conditions. In order to supply the need of bristles, it has therefore been proposed to spin monofilaments from a synthetic plastic material and then to cut the filaments into suitable lengths for bristles. The synthetic bristles, as heretofore obtained, do not entirely duplicate the characteristics of the animal bristles because the latter usually are more or less frayed at the tips, and also the surfaces thereof usually are coated with or formed of overlapping scales. These features are highly desirable inasmuch as they increase capillarity and thus greatly assist in retaining or holding the paint or other liquid into which a brush embodying the bristles may be dipped. Accordingly, brushes embodying a good grade of natural bristles are relatively free from tendency of the liquids in the brush to spatter and to run back down the handle when the brush is tipped upwardly. Of course, the synthetic bristles inherently are quite smooth and in many instances, do not readily retain paint.

In order to improve the paint-retaining characteristics of synthetic bristles, it has heretofore been proposed to subject them either before or after introduction into a brush, to a buffing action by means of an abrasive body, such as a conventional grinding wheel, driven at relatively high speed. This operation, of course, is relatively expensive.

In order to provide inexpensively synthetic bristles having high capillarity and good paint retaining characteristics, it is now proposed to incorporate into the stock from which the synthetic bristles are spun, a filler material preferably of a fibrous or porous nature designed to

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provide a roughened paint-retaining surface in the product.

For a better understanding of the invention, reference may now be had to the accompanying drawing, in which:

Fig. 1 is a sectional view of a brush embodying the features of the invention;

Fig. 2 illustrates diagrammatically a convenient method of forming the filaments from which the bristles are to be made;

Fig. 3 illustrates a portion of a filament including several sections adapted to be severed to provide bristle lengths; and

Fig. 4 is an elevational view of one of the bristles embodying the invention.

In the drawing, like numerals refer to like parts throughout.

A bristle 8 as shown in Fig. 4, embodying the principles of the present invention, preferably is substantially tapered from butt to tip, which effect conveniently can be obtained by spinning a solution of synthetic plastic containing a fibrous or porous filler material by means of the apparatus shown in Fig. 2. In accordance with this showing, a solution of plastic and filler is supplied through a conduit 10 from any convenient source to a pumping mechanism 11. Preferably, the latter is of the type illustrated in the applications of John J. Gregory, Serial Nos. 459,251, Patent No. 2,374,744, patented May 1, 1945, and 459,252, filed September 22, 1942. This mechanism is designed to deliver the solution through a conduit 12 to a spinner head 13 disposed in a coagulating bath 14 containing a liquid agent adapted to set the fluid plastic. It is to be understood that in accordance with the provisions of the inventions disclosed in the foregoing applications, the plastic is delivered to the spinning head under pulsating pressure. The head is provided with a suitable plate having spinnert openings formed therein through which the monofilaments 15 are drawn out into the setting bath. By reason of the pulsating pressure generated by pump 11, the filaments as shown in Fig. 3 have alternating thickened portions 16 and constricted portions 17 corresponding respectively to the butts and tips of the bristles when the filaments are cut up into sections of bristle lengths.

The filaments after they have been set in the bath, are collected into a cable or bunch 15a about pulley 17 and are then drawn upwardly and about a series of take-up pulleys 18 which conveniently may be driven at a constant speed in order to maintain a desired degree of tension upon the filaments in the setting bath. The filaments, still in a bunch or cable, pass into a drying chamber 19 of any convenient design in which the setting agent together with any residual solvent associated with the filaments are evaporated.

The dried filaments are delivered from chamber 19 to a suitable drum 20 designed to maintain a predetermined delivery rate of the filaments. This drum may also be associated with a convenient cutting mechanism designed to cut the filaments through their thickened portions, thus providing bunches comprising units each of which includes two bristle lengths. A suitable cutting apparatus is shown in the John J. Gregory application Serial No. 499,264 (Patent No. 2,356,841, patented August 29, 1944), filed August 19, 1943. Subsequently, the bunches are cut into single bristle lengths and are then ready for transmission to the brush maker.

Various types of plastic may be employed for spinning the synthetic bristles in accordance with the provisions of the present invention. Apparatus, as shown, is designed for spinning monofilaments suitable for use as bristle stock from solutions of plastic such as cellulose diacetate, cellulose triacetate, cellulose acetobutyrate, or the like. In this operation, the solution of plastic is simply admixed with the desired filler in appropriate amount prior to delivery to the spinning apparatus. It is desirable that the filler be inert and it be of a fibrous or at least a porous nature. Wood flour is particularly satisfactory for the purpose, but may be replaced by ground asbestos, cotton flock, sisal or the like. Silica gel in powdered form or diatomaceous earth, bone char in powdered form might be employed as embodiment of a porous, absorbent material. The filler must be sufficiently finely ground to pass through the spinnerets without any undue tendency to clog the latter, approximately 200 mesh material seems to be satisfactory, but other sizes, so long as the spinnerets do not clog or the material become so fine as to lose its capacity to induce high capillarity in the surface of the filaments, may be employed. The proportion of filler material employed may vary over a relatively broad range, but preferably should be approximately within the limits of 1 to 50 percent based upon the solids content of the plastic composition. These seem to be approximately the extreme ranges and in most cases a composition of intermediate filler content is to be preferred—for example, 10 to 40 percent.

The following is illustrative of a composition which may be employed in forming bristle stock in accordance with the provisions of the present invention:

	Parts
Cellulose triacetate	150
Wood flour	50
Tetrachlorethane	720
Methyl alcohol	160

In the foregoing example, parts are by weight. The tetrachlorethane and methyl alcohol constitute convenient examples of a solvent system for the plastic. Mineral spirits, kerosene, xylol or other hydrocarbon of fairly high boiling point and which is a non-solvent for the plastic but is a solvent for the true solvent agent may be employed as a setting bath in container 14. It is to be understood that cellulose triacetate can be substituted by cellulose diacetate which when spun provides filaments of higher tensile strength than the triacetate. Similarly, cellulose triacetate can be replaced by cellulose acetobutyrate.

It is to be understood that monofilaments of "nylon," the resinous polymer of a dibasic acid

and a diamine, polymerized vinylidene chloride or polymerized vinyl chloride may be employed in place of the cellulose esters. These latter are relatively insoluble but fusible materials which are best spun into filaments by fusing them down into fluid state prior to the spinning operation. The filaments set into solid state upon cooling. Of course, the fibrous or porous filler is incorporated into the plastic prior to a spinning operation and may be in a ratio of 1 to 50 percent as above described. Central filamentary cores of nylon, polymerized vinylidene chloride or the like can, also, be drawn through the spinnerets to receive coatings of a solution of cellulose triacetate or other soluble plastic and a fine fibrous filler. The coated filaments can then be cut into bristle lengths.

The formation of the bristles into brushes, after they have been cut from the spun filaments, follows conventional procedure. For example, the bristles are merely inserted in a ferrule 32 and the spacer bars 37 are inserted in the body portions by well-known technique. Subsequently, the butts are dipped into rubber or other adhesive material in liquid state and subjected to a cure in order to bond the brush. The brush is secured in place in the ferrule by means of nails 39 which may conveniently be driven through the metal constituting the ferrule. The brush is completed by inserting a handle 41 and securing it in place by means of nails 42.

The bristles embodying the present invention have a high degree of capillarity and readily hold an ample supply of paint or other coating material and the brush, when so charged, will withstand the usual brushing operations without any undue tendency of the paint to run or spatter.

It is to be understood that the forms of the invention herein disclosed are to be considered merely exemplary. Numerous modifications may be made therein without departure from the spirit of the invention and the scope of the following claims.

What I claim is:

1. A brush comprising tapered synthetic bristles of plastic having surfaces roughened by means of a comminuted fibrous filler embedded in the plastic.

2. A brush comprising tapered bristles of "nylon" containing a finely-divided fibrous filler imparting roughness to the bristles.

3. A paint brush comprising tapered bristles of plastic containing 1 to 50 percent of a finely-divided fibrous filler imparting roughened surfaces of high capillarity to the bristles.

4. A paint brush comprising tapered synthetic bristles of plastic containing 1 to 50 percent of wood flour.

5. A brush comprising tapered synthetic bristles of cellulose diacetate containing a finely-divided fibrous filler adapted to impart high capillarity to the bristles.

6. A brush comprising tapered synthetic bristles of cellulose acetobutyrate containing 1 to 50 percent of an inert fibrous filler imparting high capillarity to the surface of the bristles.

7. A bristle suitable for brushes and being tapered from butt to tip and being formed of plastic containing a plastic and 1 to 50 percent of an inert fibrous filler imparting high capillarity to the bristle.

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