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BRUSH EMBODYING SYNTHETIC BRISTLES

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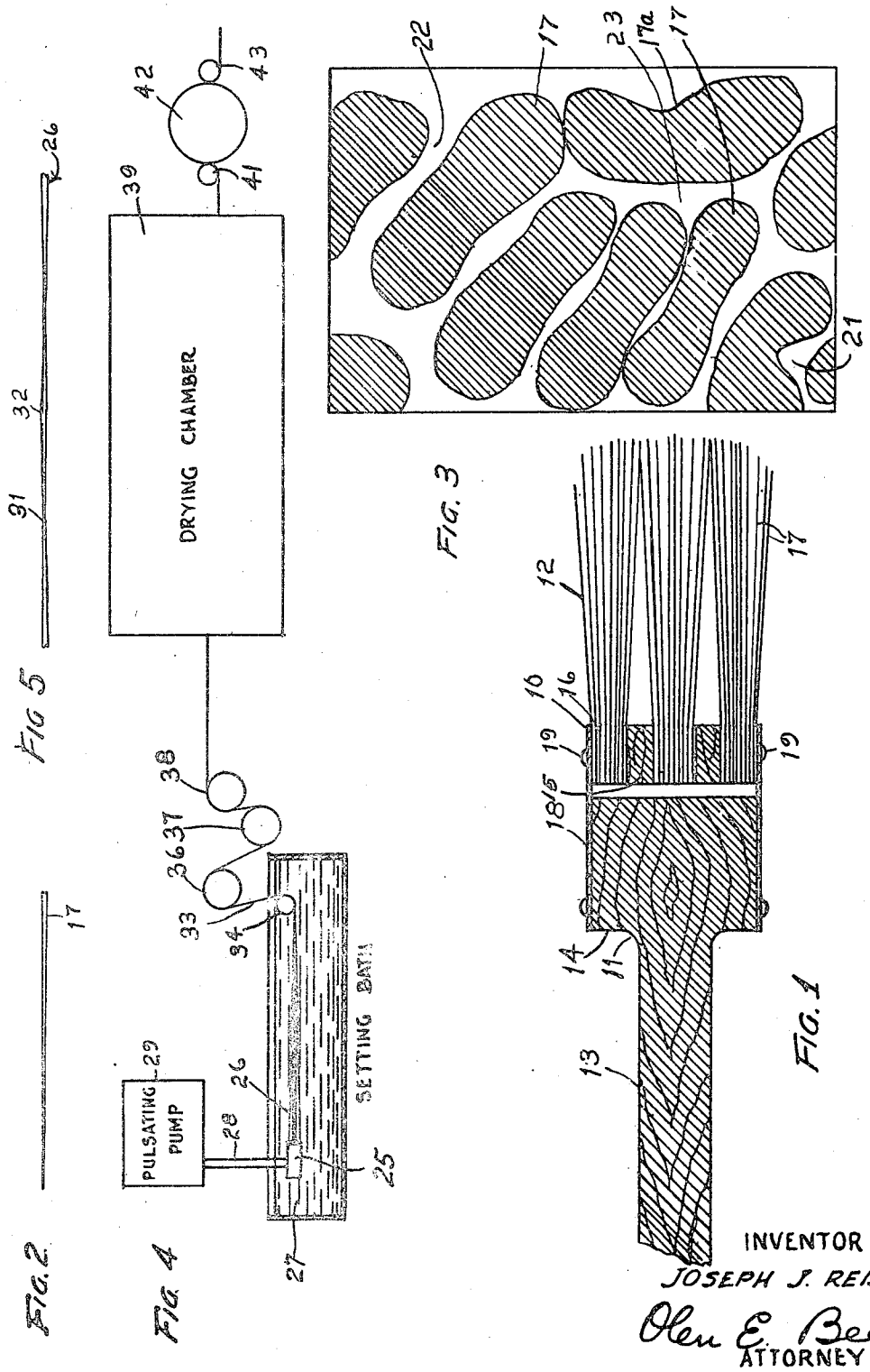

FIG. 1

FIG. 2

FIG. 3

FIG. 4

FIG. 5

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BRUSH EMBODYING SYNTHETIC BRISTLES

Joseph J. Reis, Jr., Baltimore, Md., assignor to Pittsburgh Plate Glass Company, Allegheny County, Pa., a corporation of Pennsylvania

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3 Claims. (Cl. 15—159)

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The present invention relates to brushes for the application of coating compositions and it has particular relation to brushes embodying bristles formed of a synthetic plastic as a substitute or replacement for natural animal bristles.

An object of the invention is to provide a brush containing synthetic bristles, which will retain satisfactory quantities of paints and other coating materials when dipped into the latter.

A second object of the invention is to provide a paint brush comprising synthetic bristles, which brush is relatively free from spattering and which can be handled without undue tendency of the contents of the brush to drip or flow down the handle when the brush is tipped upwardly.

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

The bristle or brush portion of a good paint brush should have such properties as flexibility with a reasonable degree of springiness; it must hold a good quantity of paint or other coating material without an undue tendency to spatter, drip, or to flow down the handle when the brush is tipped up; at the same time paint should feed out smoothly and uniformly during the working stroke.

Heretofore animal hairs and bristles have been employed almost exclusively in the manufacture of paint brushes. The better grades of these animal bristles, such as pig bristles when examined under the microscope are found to be characterized by such features as flagged or frayed end portions and scaly surfaces. These properties of the bristles seem to promote the desired paint holding and distributing properties. During the present war-time conditions and for several years prior, it has been very difficult to obtain a satisfactory grade of animal bristles for the manufacture of the paint brushes required. It has been proposed to manufacture synthetic bristles by spinning out filaments of a synthetic plastic, such as cellulose acetate, linear polymers of dibasic acids and diamines known as nylon, or the like, into filaments of appropriate diameter.

Synthetic bristles, such as are obtained by spinning or extruding organic plastics commonly are round and smooth. Some of them in their original state will not hold paint at all or will only hold it to an indifferent degree. In order to improve these characteristics it has been customary to expose the bristles to buffing with an abrasive wheel or other abrading element in order to roughen them up.

The present invention contemplates the provision of an improved bristle for paint brushes, which bristles in section are of an outline roughly corresponding to that of a human foot print or perhaps an animal kidney. They will be designated herein as being of dumb-bell shape in cross section. These bristles when combined to form a brush provide capillary channels between the bristles which are excellently adapted to take up paint and to distribute it upon a surface to be coated.

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

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

Fig. 2 is an elevational view of a bristle employed in or practicing the invention;

Fig. 3 is a fragmentary sectional view showing on an enlarged scale the sectional configuration of the bristles and their arrangement in the brush:

Fig. 4 is a diagrammatical view of an embodiment of apparatus suitable for forming films corresponding in section to the finished bristles employed in practicing the invention;

Fig. 5 is a view of a piece of a filament from which the bristles are to be cut.

In the drawings like numerals refer to like parts throughout.

In the practice of the invention a brush 10 embodying the improvements constituting the main features of this invention may be constructed in any convenient manner. The one shown in the drawings comprises a handle 11 and a bristle portion 12. The handle includes a shaft portion 13 adapted to fit the grasp of the user and a head portion 14. Spacer bars 15 separate the tufts or knots 16 of bristles of the brush. Individual bristles of these knots are indicated at 17.

At least a substantial part of the bristles are of a synthetic plastic, e. g., cellulose tri-acetate and have the features which give the brush its distinctive characteristics. These will be further commented upon. The butt ends of the bristles before assembly with the spacers are adhered together in suitable manner to provide the knots. One convenient method involves dipping in a cement, such as a solution of rubber or a natural or synthetic plastic. A second method involves merely dipping the butts of bunches of bristles of appropriate size in a solvent, such as acetone designed partially to dissolve or soften the plastic to such extent as to obtain cohesion of the dipped portions of the bristles. The knots or tufts 16

and spacers 15 are held together and upon the head 14 by means of a ferrule or band 18 of metal secured in place by means of nails 19 or other convenient fastening devices.

A highly important feature of the invention resides in the sectional shape of the bristles and their arrangement with respect to each other in the brush. Typical sections of a group of bristles magnified about 200 diameters are shown in Fig. 3. It is to be observed that the bristles in section are usually about 2½ to 3 times as wide as they are thick at their greatest dimensions and that upon at least one side and sometimes upon both they are substantially depressed to provide channels running the entire length of the bristles. Usually the bristles will be of such section as to obtain a denier within the range of 20 to 2000. The bristles are substantially tapered from butt to tip, usually so that the diameters are of a ratio of about 1 to 1.75. It is to be understood that the tips can be further pointed by subjecting them to a buffing operation with an abrasive wheel or other grinding device.

As previously indicated, the mid portion of each bristle section is substantially constricted, thus giving to the bristle a section roughly resembling a human foot print, a dumb-bell or kidney. By reason of the high ratio of the width of the bristle sections to the thickness, the bristles in a brush tend to become leafed. That is they are oriented with their wide faces lying adjacent to each other so that the grooves provide capillary channels 22, or in some cases some of the bristles, e. g., the ones designated 17*a* in Fig. 3, are oriented directly across the ends of a group of bristles disposed in leafed relation to provide channels 23. Channels 22 and 23 retain an adequate supply of paint when a brush is dipped and they feed it out smoothly and evenly during the working stroke. When the brushes are handled properly there is also no undue tendency for spattering, dripping or running. The action of the bristles is very much like that of a pen point, which by reason of its curvilinear section readily holds and feeds out ink during a writing operation.

The preparation of bristles of the foregoing type is illustrated by Fig. 4. The mechanism employed may be that illustrated in greater detail in the application for patent by John J. Gregory, Serial No. 459,251, filed September 22, 1942, now Patent No. 2,374,744, issued May 1, 1945.

The apparatus shown diagrammatically in Fig. 4 comprises a spinning cell 25 discharging a plurality of filaments 26 of a solution of plastic, e. g., cellulose tri-acetate into a coagulating bath 27. The solution is fed to the spinning cell by conduit 28, which in turn communicates with a pumping mechanism 29, designed to produce a pulsating pressure in the cell 25. This pumping mechanism is described in detail in the foregoing Gregory application. As a result of the pulsating pressure, the diameters of the filaments vary periodically to provide alternate thickened portions 31 and restricted portions 32 approximately illustrated in Fig. 5 of the drawings.

The filaments are hardened or set in bath 27 and are then collected into a strand 33 and passed upwardly about a pulley 34 to a system of tensioning pulleys 36, 37 and 38, that operate at constant speed. The strand passes to a drying chamber 39 where the solvent and coagulant associated therewith are evaporated and may be recovered by appropriate apparatus (not shown). The strand as it leaves the chamber is trained about constantly driven pulleys 41, 42 and 43.

After leaving the pulleys, the filaments are cut first at the thickened portions 31 and subsequently at the restricted portions 32 to provide bristle lengths 17 illustrated in Fig. 2. These inherently are in bunches containing as many bristles as there were strands. Several bunches can be combined to make bigger bunches.

In the spinning operation, the filaments when initially discharged into the bath 27 are round. The dumb-bell section is obtained during the steps of coagulating and drying the films. In order to obtain a satisfactory section the following procedure may be followed:

A solution of plastic, such as a 20% solution of cellulose tri-acetate (60.7% acetyl), in a mixture of about 90% methylene chloride and 10% of ethyl or methyl alcohol is prepared. This solution when extruded to form the filaments 26 may be coagulated in a bath of toluene, xylene or kerosene. Mixtures of any two or three of the coagulants may be employed. Filaments may be dried in the chamber 29 at a temperature of about 93° C.

It is to be recognized that the filaments are spun out from cells 25 in groups usually of about 200 to 400. The resultant strand or bundle of filaments when cut into bristle lengths provide small bunches that can be collected in bundles, combed, spread in layers and otherwise treated in the same manner as ordinary bristles. They can also be mixed with natural bristles or bristle material or with other synthetic bristles. The assembly of the bristles into brushes follows conventional procedure. The brushes may take substantially any convenient form, that shown in the drawings being merely representative. The sectional shapes of the bristles are such that the bristles naturally arrange in the pattern shown in Fig. 3. The embodiments of the invention herein shown are to be regarded merely as representative. It will be understood by those skilled in the art that numerous modifications may be made therein without departure from the spirit of the invention or the scope of the appended claims.

What I claim is:

1. A paint brush comprising a handle having a bristle portion secured to one end thereof, said portion comprising bristles of a synthetic plastic, each bristle being approximately of dumb-bell cross section and 2½ to 3 times as wide as it is thick, many of the bristles being disposed in face to face relationship, providing channels of capillary size holding paint during a painting operation.

2. A paint brush comprising a handle having a bristle portion secured to one end thereof, the bristle portion comprising bristles of spun cellulose triacetate tapered from butt to tip and being approximately of dumbbell cross section, which section is approximately 2½ to 3 times as wide as it is thick, many of the bristles being arranged in groups in which contiguous bristles are disposed in face to face relationship providing capillary channels retaining paint during a painting operation.

3. A paint brush comprising a handle having a bristle portion secured to one end thereof, the bristle portion comprising bristles of spun cellulose triacetate tapered from butt to tip and being approximately of dumbbell cross section, which section is approximately 2½ to 3 times as wide as it is thick, many of the bristles being arranged in groups in which contiguous bristles are disposed in face to face relationship providing cap-

illary channels retaining paint during a painting operation, the tips of the bristles further having buffed surfaces.

JOSEPH J. REIS, JR.

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