July 31, 1951 L. R. B. HERVEY 2,562,716

BRUSHES AND METHOD OF MAKING SAME

Filed Aug. 9, 1945

Fig. 1.

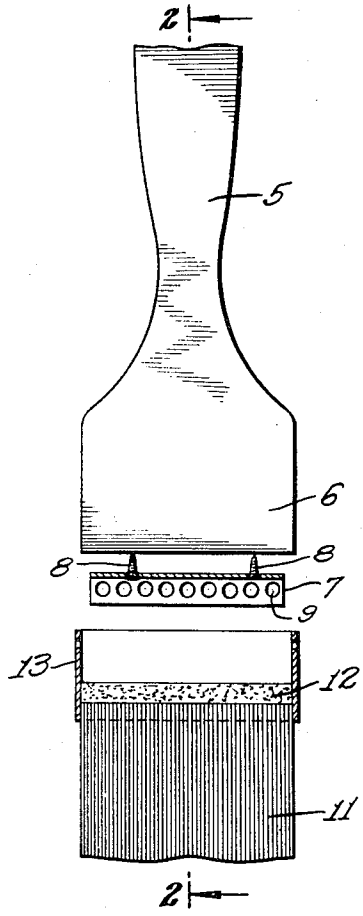


Fig. 2.

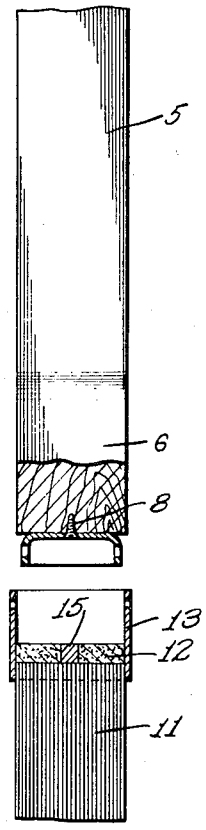


Fig. 4.

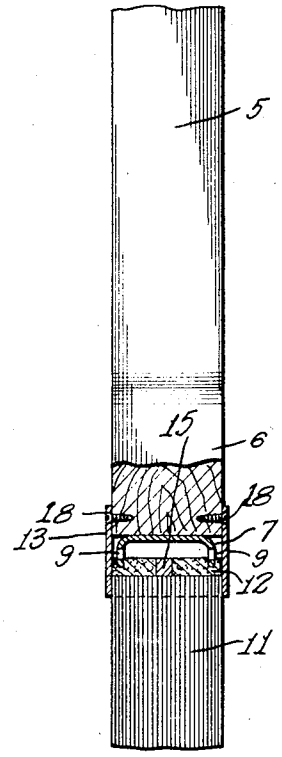
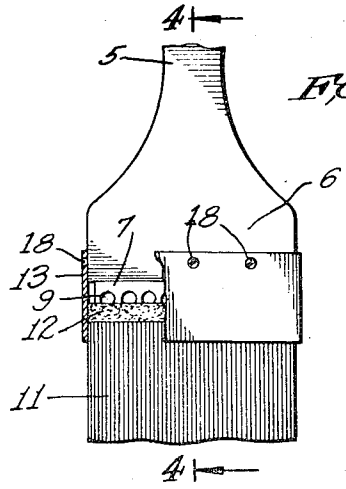


Fig. 3.



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BRUSH AND METHOD OF MAKING SAME

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5 Claims. (Cl. 300—21)

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This invention relates to the manufacture of brushes. More particularly, it relates to a new and improved method for securing the bristle tufts to the brush handle. It relates also to the resulting product.

My invention is especially directed to the manufacture of brushes of that type wherein the bristles are formed of nylon or other thermoplastic or fusible synthetic material. It is especially concerned with an improved method by which the tufts of bristles are firmly bonded together and are secured at their butt or root ends to the handle or similar supporting member in such manner that loosening or detachment of the individual bristles or bristle layers is prevented.

My method is particularly suitable for use in securing together and to a brush handle tufts formed of a synthetic thermoplastic material such as nylon in filamentary form. This is accomplished in a way to secure a degree of adhesion never previously obtainable with synthetic bristles. The firm bond, which reduces the danger of the bristles becoming loosened and falling out, thereby greatly increasing the life of the brush, is largely secured even without utilizing the usual metallic ferrule surrounding the lower end of the handle and bristle knot. Generally, however, it is preferred to retain the conventional ferrule.

The proper bonding and setting of bristles of nylon and similar synthetic thermoplastic bristle materials during the manufacture of brushes has heretofore been a very difficult manufacturing operation. This is especially the case in making brushes of the paint brush type wherein the bristle knot is secured to a handle or supporting member of wood or other material.

Usually in this type of brush a ferrule is employed to unite the bristle body with the handle, the ferrule being arranged to surround portions of each and being secured by nails, or the like, to both. Because of the fusible character of the synthetic thermoplastic bristles attempts have been made to rely upon their fusing for bonding purposes. However, satisfactory adhesion of the bristles in this manner and their union with a handle or other supporting member by means of a ferrule has not generally been secured. As a result the bristles have loosened and fallen out of the brush, and the life of brushes utilizing synthetic bristles has consequently been unduly shortened.

In setting bristles of nylon or other thermoplastic synthetic material it has been suggested to fuse the butt ends of the bristles together by

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means of heat while the bristle tufts are secured at their butt ends in the usual metal band or ferrule. In utilizing this type of bond reliance has been placed on the bristle knot becoming fused to not only hold the bristle together but also to cause them to adhere to the metal ferrule. Nails or screws have sometimes been passed through the ferrule into the bristle knot to assist in maintaining the assembly.

The foregoing method of securing the bristle body to the handle is, however, objectionable for a number of reasons. The high temperatures required maintained over a sufficient period to effect the desired fusion, tend to cause some disintegration of the nylon or other synthetic thermoplastic material, with consequent weakening of the bond between the individual bristles. Unless nails are driven through the ferrule into the bristle knot the adherence of the fused thermoplastic material to the metal of the ferrule is not sufficient to provide a very satisfactory bond. And if nails are driven into the bristle knot through the ferrule the depth of fused plastic is generally insufficient to permit such nailing without breaking the knot and causing separation of the individual bristles at a point opposite that where the nails penetrate the brush. The methods for setting bristles of synthetic thermoplastic material in brushes that are now available have generally not been very satisfactory, and the resulting brushes have been characterized by weak bonding between the individual bristles and between the bristle body and the brush handle or other bristle supporting member.

It is the primary object of this invention to provide an improved method and means for securing bristles of a synthetic material such as nylon, or other thermoplastic synthetic bristle material, together and to the brush handle or other supporting member used to retain the bristles.

Another object of my invention involves the securing of the desired improved adhesion between the bristle tufts and brush handle by a procedure and means through which damage or disintegration of the synthetic bristles is avoided. The bristles are bonded to the handle without the necessity for driving nails or screws into the fused bristle knot, thus avoiding separation of individual fibers usually resulting from the use of such attachment elements.

It is another object of this invention to provide a method and means for attaching synthetic thermoplastic bristles to a brush handle or other supporting member which is simple and effective, and which can be readily practiced or applied in-

expensively in existing brush manufacturing establishments without the necessity for providing additional equipment.

A further object of this invention is to provide a method and means for the attachment of bristles of the character described to brush handles which will result in a bond that is permanent and secure, regardless of whether or not the brush includes the usual metal ferrule now customary in brushes. These and still further objects of my invention will be apparent from the ensuing disclosure of certain illustrative, preferred embodiments thereof.

My improved method and means for setting synthetic thermoplastic bristles in the bristle knot, and for securing that bristle knot to the brush handle in a tight bond, may best be described with reference to the annexed drawing wherein:

Fig. 1 is a view partly in side elevation and partly in section, which illustrates the method of assembling the various parts of a brush in accordance with my method. The view shows the various elements comprising the brush separated somewhat, so that the method of bonding the bristle knot to the brush handle will be more readily apparent;

Fig. 2 is a cross-sectional view taken on the line 2—2 of Fig. 1 and looking in the direction of the arrows;

Fig. 3 is a side elevational view, some parts being broken away for clearness of illustration, of a completed brush incorporating my improved bond; and

Fig. 4 is a cross-sectional view taken on the line 4—4 of Fig. 3, looking in the direction of the arrows.

While my invention may be conveniently described with reference to the manufacture of a paint brush, it is obvious that it is not restricted to the manufacture of such brushes but is of general application wherever the problem is encountered of securing bristles of a synthetic thermoplastic material such as nylon to a handle or supporting member.

Referring more particularly to the drawing, the brush includes the usual handle 5, which may be of wood or any other suitable material, and which may be formed with the enlarged lower portion 6 to which the bristles are to be attached. The securement member 7, which may be a metal plate, is first secured to the lower portion 6 of handle 5, by nails or screws 8, or in some other suitable manner. As shown, the plate 7 may be set in a slight distance from each edge of the lower end section of lower portion 6. The metal plate 7 may be channel-shaped in cross-section, and may be provided with a series of perforations 9 in each depending leg of the channel. The screws or nails 8, securing the metal plate to the lower end 6 of the handle 5, may rest against the inner flat surface of the top or back of the channeled metal plate member. While a metal plate 7 of channel cross-section is illustrated in the drawing and for some purposes will be found superior for securing the bristles to the handle 5, the metal plate may be constructed to have cross-sections of various other forms. It may, if desired, be formed as a complete cup.

The bristles 11, formed of nylon or some other synthetic thermoplastic material suitable for use in forming brush bristles, after being assembled in any suitable manner to form the desired bristle bunch, may be fused together at the butt ends of the bristles to provide the bristle knot 12. If

desired, this may be done while the tuft or tufts of bristles are held together in the ferrule 13, which may be of metal, so as to secure the benefit of any adhesion between the bristle knot and the metallic ferrule resulting from the fusion. In fusing the bristles at their root or butt ends to form the bristle knot 12, heat is applied to the bristle ends in any suitable manner and at a high enough temperature to fuse the ends of the bristles and cause them to adhere together in the form of a solid bristle knot. In order to accomplish this it may be necessary to heat the butt ends of the tuft or tufts of bristles to a temperature above the melting point of the thermoplastic bristle material which, in the case of nylon, is about 450° F. (230° C.) For many purposes, however, heating to the fusion temperature is not necessary, as a synthetic thermoplastic material may soften under the influence of heat at a temperature below its melting point to a sufficient extent to permit the root ends of the bristles to adhere together to form the desired bristle knot.

As shown most clearly in Fig. 4, in the manufacture of paint brushes, particularly the larger sizes, it is frequently desirable to provide a dividing member or plug 15, which may be a block of wood or other suitable material, this being arranged in the bristle knot to provide a centrally-disposed space serving to render the bunch more pliable during forward and backward strokes of the brush while painting or brushing. In some instances, particularly in smaller brushes, the plug may be omitted, and my invention may be practiced either with or without this element. If used, the plug should be properly positioned before heating the butt ends of the bristle tufts to secure the bristle knot 12, although it may, if desired, be pressed into the bristle knot after the root ends of the bristles have been heated and are in a soft or plastic condition. Several of such plugs may be utilized if desired.

The metal plate 7 may be heated, as by means of a torch, by induction heating, or by any other suitable means. The metal plate is preferably heated to a temperature of between 300° C. and 400° C., although some variation from this range may be desirable depending on the nature of the thermoplastic bristle material used. The handle 5 is quickly inserted into the ferrule 13 containing the bristle knot 12 after the heated metal of the plate 7 has caused softening or melting of the synthetic thermoplastic material to an extent sufficient to permit the metal plate to be embedded in the fused area of the bristle knot 12. As a practical matter it is usually desirable to embed the heated metal plate 7 in the bristle knot 12 while the latter is held in the ferrule 13 and in a plastic or fused condition. The embedding of the heated metal plate 7 in the bristle knot 12 may advantageously take place as a step immediately following that of forming the bristle knot 12 in the ferrule 13 by the application of heat.

The assembly is now permitted to cool and the bristles 11 are tightly secured to the handle 5 by means of the metal plate 7 which is fastened to the handle and is embedded in the bristle knot 12. The bond between the handle 5 and the bristles 11 thus produced is far superior to that obtainable by other previously available methods for securing bristles of synthetic thermoplastic material to brush handles or other supporting members. This bond is secured without causing disintegration of the nylon or other synthetic thermoplastic bristle material. Moreover, when

the bristle knot is so formed the danger of shedding or loosening of individual bristles, such as in the outer layers of the bristles, is reduced to a minimum.

After the metal plate 7 is embedded in the bristle knot 12, the ferrule 13 may, if desired, be removed as it does not play an important role in bonding the bristles 11 to the handle 5. For many purposes, however, it is desirable to retain the ferrule as a part of the permanent assembly, thus from the appearance standpoint it is a desirable element in a commercial brush structure of this type. When so used it may be nailed, held by screws, or otherwise secured to the brush handle 5 and, in that event does strengthen the entire assembly somewhat by firmly embracing and holding together the handle 6 and bristle body 11. It assists to some extent also in preventing loosening and detachment of the outer layers of the bristles which are generally less firmly bonded to the bristle body. However, as indicated, my invention may be practiced without retaining the ferrule in the final assembly, should this be considered desirable in any particular instances.

Various modifications of or variations in the preferred and illustrative embodiments of the invention, which have been described, may be adopted. Thus the metal plate 7 might be first embedded in the bristle knot 12, and then secured, by nails or screws, or any suitable, special means, to the brush handle 5. Also, the extent to which the metal plate is embedded in the bristle knot may be varied, depending on the degree of bond desired and the nature of the synthetic thermoplastic bristle material. While it is ordinarily not desirable, nailing or the insertion of screws through the ferrule into the bristle knot may also be utilized as an additional securement means. While my invention is particularly adapted for paint brush construction, my method is of value in the manufacture of brushes of other types.

It is intended that the foregoing modifications, as well as other changes in my process and brush construction as described, shall be considered as falling within the scope of my invention, to the extent that they are comprehended within the appended claims.

I claim:

1. A brush comprising a bristle body of synthetic thermoplastic bristles, one end of said bristle body being fused and resolidified to form an integral knot of the thermoplastic material of which said bristles are formed, a handle having one end adjacent said knot, and a metallic member having a portion secured directly to said end of the handle and a portion embedded in the outer end of said knot for securing said bristle body and handle together, said second mentioned portion having recesses extending transversely of the axis of the bristle body and arranged to interlock with the material of said knot.

2. The method of manufacturing brushes having bristles formed of a synthetic thermoplastic material which comprises assembling a bunch of bristles with their butt ends encircled and held firmly together, applying heat to the butt ends of the bristles while so held to fuse the same into an integral fused bristle knot, heating a metallic securement member to a temperature substantially above the melting point of the thermoplastic material, embedding a portion of said heated securement member directly in the outer end of said bristle knot, and in the course of forming the brush providing a direct and firm connection between said securement member and a handle, whereby said bristle body is secured to said handle in a firm bond independently of an encircling ferrule.

3. The method of manufacturing brushes having bristles formed of synthetic thermoplastic material which comprises assembling a bunch of bristles with their butt ends encircled and held firmly together, applying heat to the butt ends of the bristles while so held to fuse the same into an integral fused bristle knot, providing a metallic securement member with surfaces extending transversely to its axis, heating said member to a temperature substantially above the melting point of the thermoplastic material, embedding a portion of said heated securement member provided with said surfaces directly in the outer end of said bristle knot by forcing the member in an axial direction into said knot, and in the course of forming the brush providing a direct and firm connection between said securement member and a handle whereby said bristle body is secured to said handle in a firm bond independently of an encircling ferrule.

4. The method of manufacturing brushes having bristles formed of a synthetic thermoplastic material which comprises assembling a bunch of bristles with their butt ends encircled and held firmly together, applying heat to the butt ends of the bristles while so held to fuse the same into an integral fused bristle knot, providing a metallic securement member with surfaces extending transversely to its axis, heating said member to a temperature substantially above the melting point of the thermoplastic material, embedding a portion of said heated securement member provided with said surfaces directly in the outer end of said bristle knot by forcing the member in an axial direction into said knot while the latter is still hot and soft, and in the course of forming the brush providing a direct and firm connection between said securement member and a handle, whereby said bristle body is secured to said handle in a firm bond independently of an encircling ferrule.

5. A brush comprising a bristle body of synthetic thermoplastic bristles, one end of said bristle body being fused and resolidified to form an integral knot of the thermoplastic material of which said bristles are formed, a handle having one end adjacent said knot, and a metallic member having a portion secured directly to said end of the handle and a portion embedded in the outer end of said knot for securing said bristle body and handle together, said second mentioned portion having walls parallel to the general direction of the bristle body, and said walls having interlocking means extending in a direction transverse to the general direction in which said bristle body extends and arranged to interlock with the material of said knot to prevent endwise separation of the handle and knot.

LAURENCE R. B. HERVEY.

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