

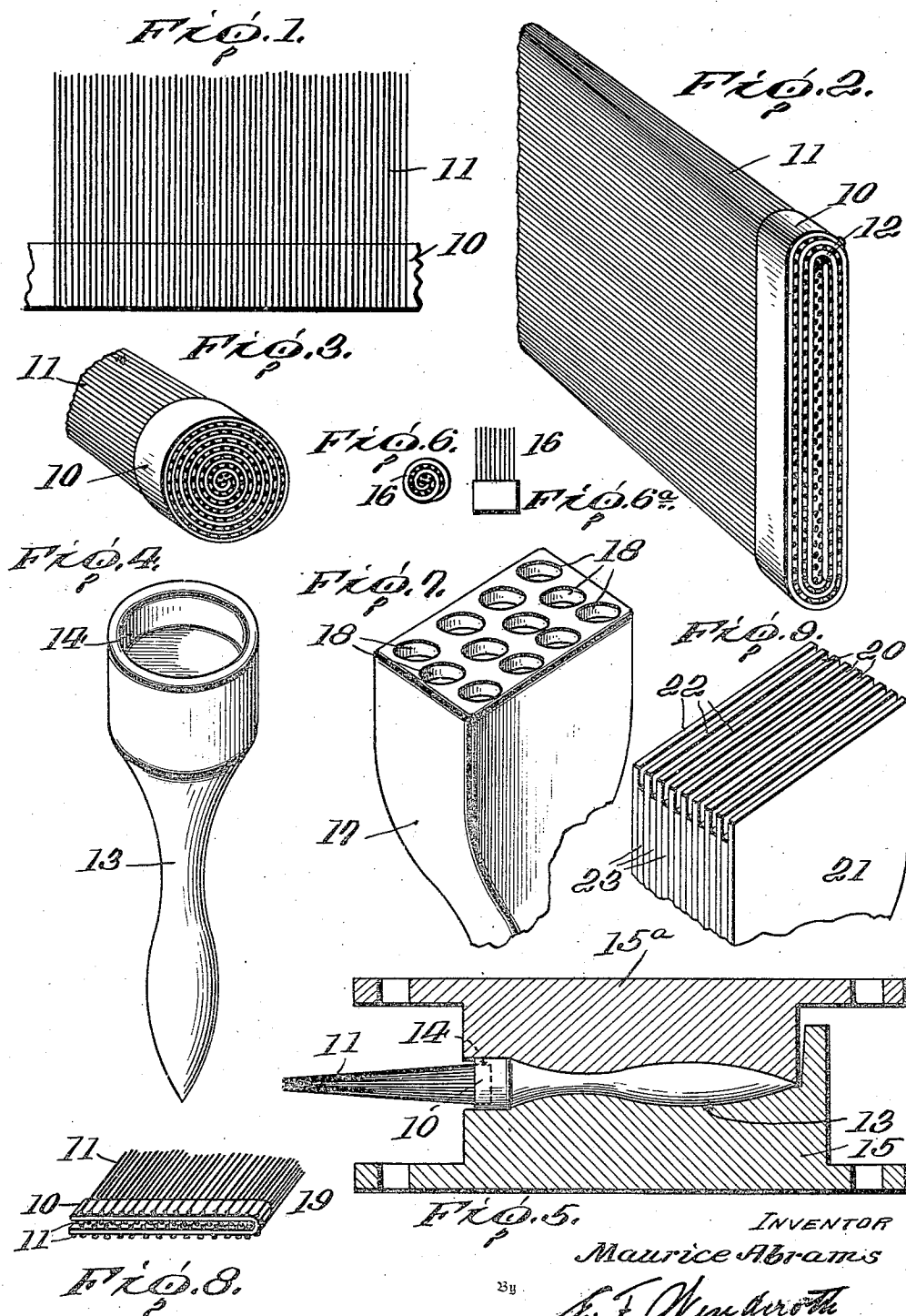
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BRUSH

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BRUSH

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The present invention relates to a new process for the manufacture of brushes, such as paint brushes, tooth brushes, personal brushes, artist's brushes and the like, as well as to the products of the said process.

It is, of course, a desideratum in this art to provide a relationship of parts which will provide assurance against the ready detachment of hair and bristles, and which result in products which are economical in their manufacture and are resistant to wear as well as to chemical, thermal and mechanical influences.

Brushes of the character here involved which, in general, comprise a handle and a hair or bristle portion attached thereto, have hitherto been manufactured according to the following process: The hair or bristles are retained by a metallic ring, are then submerged in a bath of glue, rubber or the like, and are finally fixed on a handle. These several operations are quite time-consuming and, moreover, the products are not at all resistant to the action of solvents, temperature influences, mechanical influence, etc., so that these readily effect the detachment of the hairs or bristles from the handle.

Now, the present invention has for its object the elimination of the above difficulties by providing a process which is of general application to all kinds of brushes and which will assuredly result in products which are resistant to physical and chemical influences so that detachment of bristles will be obviated, the new process being moreover simple and economical so that brushes may be manufactured according to the present invention at low cost.

The new process consists essentially in associating hairs or bristles with a strip or ribbon of cellulosic material which has preliminarily been impregnated with a synthetic resinous composition, capable of conversion to heat-hardened or petrified state by the action of heat and pressure, then rolling, folding or otherwise converting the hair-and-strip assembly into desired shape, and finally subjecting the product to a hot-pressing treatment. It is incidentally possible, according to the invention, to provide the assembly with a handle during the latter treatment. In this connection, the handle is also preferably of resin-impregnated cellulosic material. The resin of bristle-retaining strip or ribbon becomes integrated during the assembly process with the resin of the handle material thus, in effect, converting these parts into a unitary whole.

The present invention will be more readily understood in the light of the following detailed

description of presently preferred exemplary embodiments thereof, reference being had in this regard to the accompanying sheet of corresponding, somewhat diagrammatic, illustrative drawing. On the said sheet of drawing—

Figure 1 is a plan view of a portion of a resin-impregnated strip of paper or the like, with the bristle-forming hairs associated therewith;

Figure 2 is a perspective view of the strip-and-bristle assembly of Fig. 1, after a rolling operation;

Figure 3 is a view corresponding to that of Fig. 2 but illustrating the rolling to form a brush of different cross-section;

Figure 4 is a perspective showing of one form of brush handle, according to the present invention;

Figure 5 is a somewhat diagrammatic cross-sectional representation of a finishing pressure mold with the brush parts shown in position therein;

Figure 6 is an end view of a third form of strip-and-bristle assembly;

Figure 6a is an elevation of the assembly of Fig. 6;

Figure 7 is a perspective view of a portion of handle particularly adapted for association with the bristle units of Fig. 6;

Figure 8 is a perspective view of still another embodiment of strip-and-bristle assembly; and

Figure 9 is a perspective view of a portion of a handle particularly adapted for association with the bristle units according to Fig. 8.

Corresponding parts are designated by corresponding reference characters throughout the several figures of drawing.

Reference numeral 10 represents a strip or ribbon, preferably of cellulosic fibrous material such as paper, cardboard or the like, which forms the securing means proper for the hairs or bristles which form the bristle portion of the brush. The strip 10 is of any suitable or desired length, preferably a length such that coiling or rolling up of the strip as hereinafter described will result in a product corresponding essentially to the shape and size of the desired brush portion of the final brushing implement. In subsequently-described embodiments (Figs. 6 and 8), the strip 10 is shorter—of a length sufficient only to form a bristle unit, a plurality of the latter being employed to constitute the entire brush portion of the implement.

The first step in the manufacture of the brushes in accordance with this invention is the preparation of an impregnating bath wherein the

strip or ribbon 10 may be impregnated with the requisite synthetic resinous composition.

To this end, use may be made of any one of a number of suitable compositions. A presently preferred resinous composition may be made up as follows:

	Parts
o-Cresol, $\text{CH}_3\text{C}_6\text{H}_4\text{OH}$ -----	52
α -Trioxymethylene, $(\text{CH}_2\text{O})_3$ -----	42
Lead nitrate, $\text{Pb}(\text{NO}_3)_2$ -----	1.5
Zinc chloride, ZnCl_2 -----	0.5

The o-cresol and α -trioxymethylene react or condense to give a resinous product of the so-called petrifying or hardening type, while the lead nitrate and zinc chloride catalyze this reaction or condensation.

The several above-enumerated ingredients are placed in a concentrator or other similar receptacle and the temperature of the mixture is then raised to about 95° C. until the catalytic reaction is completed. Completion of the condensation is indicated by the conversion of the reaction mass from its initial state of relatively thin fluidity into a state of thick consistency.

The resultant material is then diluted by the addition of 6 parts of ethyl alcohol, 3 parts of benzol, 0.5 part of terpinol and 0.5 part of zinc chloride. The resultant bath, which preferably is of a viscosity of about 14–20° Bé. at about 18° C., is then ready for use in impregnating the strip or ribbon of paper, cardboard or other cellulosic material.

After impregnated strip 10 is partly dry but while it is still sufficiently tacky so that the hair or bristles 11 will readily adhere thereto, the strip is spread out, essentially as indicated in Fig. 1 of the drawing, and the hair or bristles 11, which are to form the applicator end of the brush, are spread thereon as shown, i. e. with the individual hairs in more or less close adjacency and with one end thereof in substantial coincidence with one edge of the strip.

Secure retention of the contacting portions of hair and impregnated strip in the relationship of Fig. 1, may be assured, if necessary or desired, for instance by passing a pressure roller thereover whereby the hairs are caused to adhere securely to the coating on the strip. The remaining portion of each hair projects freely beyond the strip as shown.

It is also possible to proceed, alternatively, by first arranging a layer of hairs, superposing the impregnated strip thereon, and placing another layer of hairs on the upper side of the strip, care being taken that an edge of the strip 10 coincides substantially with an edge of each layer of hair or bristles.

The resultant hair-and-strip assembly, prepared in either of the foregoing ways, is then preferably rolled up into the desired shape. Illustrative of the results of the rolling-up step are the showings in Figs. 2, 3, 6 and 8. The first of these shows a rolled-up assembly to give a so-called "flat" brush, while the assembly of Fig. 3 is for the "round" brush type. The assemblies of Figs. 6 and 8 are for the type built up from small bristle units. It is evident that the particular configuration may be altered as desired and that folding or the like may be substituted for rolling.

If desired, use may be made of retaining tacks or pins 12 or the like to retain the assembly in rolled-up or folded form, pending further manipulation.

The rolled material is then introduced into an autoclave wherein it may be subjected to the action of a temperature of about 120° C. and a vacuum of the order of about 29 mm. of Hg for a period of about 20 minutes or until the material is completely dehydrated. The dehydrated, i. e. dried, material is then ready for the final pressure molding treatment.

Referring now more particularly to Fig. 4 of the drawing, it is within the purview of the present invention to form a handle which may be associated with the rolled-up bristle-forming portion of the brush during the said pressure molding treatment.

As shown, the handle 13 may conveniently be made from suitably shaped soft wood, such as pine or the like, which, prior to association with the bristle assembly, is thoroughly impregnated with a petrifying resinous composition, preferably the identical composition above disclosed for use in impregnating the strips 10, and then dried.

If desired, the handle 13 may also be made up from a plurality of suitably configured laminations of paper, cardboard, soft wood, or molded cellulose pulp which, prior to superposition to form the handle, are also impregnated, for example, with the composition used in connection with the strips 10. Superposition may be maintained by pressing the laminations onto each other while tacky, or by the use of retaining pins or the like, whereupon drying is effected.

Figure 9 of the drawing specifically illustrates a handle of laminated construction, but it is to be understood that any of the handle embodiments may be either of the solid wood or laminated construction.

The end of the handle member may be provided with a countersunk recess 14 which is substantially of the size and configuration of the end of the bristle portion which fits thereinto for association therewith.

The handle and bristle portions, thus prepared and associated, are then placed in a steel mold 15, 15a, the interior of which is of a configuration corresponding to that of the final product being made. Conventional means (not shown) are associated with the mold sections whereby the brush handle and bristle portions positioned therein may be subjected to heat and pressure. The mold sections are also preferably provided with conventional means (not shown), such for example as conduits through which a cooling medium such as water may be passed, whereby the sections may be cooled. If necessary, fragments of previously impregnated paper or cardboard may be added to the mold to completely fill the same.

The material in the mold may then be subjected to pressure, for example, of the order of about 250–280 kg. per sq. cm. and a temperature of about, but not in excess of, 160° C. for a period of about 15 to 20 minutes. This treatment effects a coalescence and a thermosetting or petrification of the resinous composition, resulting in an integration of the resin-impregnated materials and of the resinous impregnant therein so as to produce a unitary structure.

Finally, the molded implement is subjected to a tempering treatment at about 2–6° C., while still under pressure in the mold, for a period of from 3 to 8 minutes. With this last operation the brush is finished and will possess very high mechanical strength. Moreover, the hair will be firmly attached to the handle and detachment thereof by mechanical and/or ordinary chemi-

cal influences will be rendered substantially impossible, whereby the objects of the invention will be realized.

It is not at all necessary that the molding operation (Fig. 5) also include the production and attachment of the handle. It is within the purview of the present invention to subject a structure such as that of Fig. 2 or Fig. 3 to the molding step, and to associate the resultant product with a more or less conventional handle through the medium of the usual ferrule type of connection, or in any other suitable and desirable conventional way.

Referring now more particularly to Figs. 6, 6a and 7 of the drawing, the parts here illustrated comprise small bristle-and-strip assemblies or units 16 which, except for size, are more or less counterparts of the assembly of Fig. 3. These units are particularly adapted for cooperation with a handle 17 of the type shown in Fig. 7. This handle is preferably of resin-impregnated wood, molded cellulose pulp or the like (i. e. of material treated essentially like handle 13 of Fig. 4), the end of which is provided with a plurality of more or less closely arranged sockets or countersunk recesses 18 for the reception, severally, of units 16. Integration of a plurality of units by treatment in a mold 15, 15a, substantially in the manner hereinbefore set forth, results in an implement, the brush or applicator end of which closely resembles that obtained with the unit shown in Fig. 2. As hereinbefore suggested, the handle 17 may be a laminated structure, if desired.

Figs. 8 and 9, finally, illustrate still further embodiments of strip-and-bristle assemblies and handle member. In this case, the bristle unit 19 is made up of a resin-impregnated strip 10 which is merely folded over on itself in U-shaped fashion. The strip 10, according to this modification, is preferably covered with a hair layer 11 on each side thereof. The assembly 19 is made and dried essentially in the manner described in connection with Fig. 2 except, of course, that rolling-up is not involved. The dried units 19 are then inserted in slots or grooves 20 of laminated handle member 21.

The latter may, if desired, be built up of a plurality of suitably shaped laminations 22 which may be of paper, cardboard, molded cellulose pulp, wood or the like which are first impregnated with a suitable heat-hardenable resin composition, for instance that used in impregnating strips 10, and which are then superposed, while still tacky, onto each other, and then dried. Superposition may be retained by pressing the laminae sharply together or by the use of retaining pins or the like. The laminations are, of course, so configured as to finally produce a handle of the desired shape.

In the illustrated embodiment (Fig. 9) alternate laminae 23 are shorter than the rest 22, thereby defining alternate grooves 20 into which units 19 of corresponding dimensions may be inserted.

The resultant assembly of handle 21 and bristle units 19 is then subjected to a heat-pressure treatment in a corresponding mold 15, 15a, whereupon coalescence of the resin impregnant in the several parts takes place, uniting the same into an integral whole.

If desired, all the laminations may be of the same length and grooves 20 may be cut therein,

preferably transversely of the laminations, after superposition and drying of the latter.

In every case, treatment in the mold 15, 15a is followed by cold tempering, as hereinbefore described.

It should be understood that the present invention is by no means limited to the specific foregoing disclosure or to the materials, pressures and temperatures mentioned therein, as numerous minor changes may be resorted to without departing from the scope of the invention as more particularly defined by the appended claims.

What is claimed is:

1. In the manufacture of brushes, the steps of superposing brush bristles on a supporting strip of cellulosic material previously impregnated with a heat-hardenable phenol-formaldehyde resinous composition, laminating the resultant mat up into substantially the desired ultimate configuration, and subjecting the rolled mat to heat and pressure to effect hardening of the said resinous composition, and then subjecting the heat treated product to a cooling treatment under pressure at about 2-6° C. for about 3 to 8 minutes, whereby the said bristles are substantially inseparably associated with said supporting strip and high mechanical strength is imparted to the assembly.

2. In the manufacture of brushes, the steps of superposing brush bristles on a tacky supporting strip of cellulosic material previously impregnated with a heat-hardenable phenol-formaldehyde resinous composition, rolling the resultant mat up into substantially the desired ultimate configuration, drying the rolled mat, building up a handle member from compressible cellulosic material impregnated with the said resinous composition, juxtaposing the said handle member and rolled mat, and subjecting said juxtaposed rolled mat and handle member to heat and pressure to effect hardening of the said composition, whereby the said bristles are substantially inseparably associated with said supporting strip and whereby said mat and handle member are integrated.

3. In the manufacture of brushes, the steps of superposing brush bristles on a tacky supporting strip of cellulosic material previously impregnated with a heat-hardenable phenol-formaldehyde resinous composition, rolling the resultant mat up into substantially the desired ultimate configuration, drying the rolled mat, building up a handle member from compressible cellulosic material impregnated with the said resinous composition, juxtaposing the said handle member and rolled mat, and subjecting said juxtaposed rolled mat and handle member to heat and pressure to effect hardening of the said composition, and then subjecting the heat treated product to a cooling treatment under pressure at about 2-6° C. for about 3 to 8 minutes, whereby the said bristles are substantially inseparably associated with said supporting strip and whereby said mat and handle member are integrated.

4. A method for the manufacture of brushes comprising subjecting an assembly of a handle and at least one bristle unit, abutting portions of which are impregnated with a heat-hardenable phenol-formaldehyde resinous composition, to a heat-and-pressure treatment to coalesce, integrate and harden the latter, and then subjecting the resultant integrated assembly to a cooling treatment under pressure at about 2-6° C. for about 3 to 8 minutes.

5. A method for the manufacture of brushes comprising uniting and integrating hardenable-

phenol-formaldehyde resin-impregnated handle and bristle portions by subjecting the same in assembled condition to pressure at elevated temperature, and then subjecting the integrated assembly to a cooling treatment under pressure at about 2-6° C. for about 3 to 8 minutes.

6. A method for the manufacture of brushes comprising uniting and integrating hardenable-phenol-formaldehyde-resin-impregnated handle and bristle portions by subjecting the same in assembled condition to pressure of the order of about 250-280 kg./sq. cm. at elevated temperature

not in excess of about 160° C., and then subjecting the integrated assembly to a cooling treatment at reduced temperature of about 2-6° C.

7. In a method for the manufacture of brushes from hardenable-resin-impregnated brush parts, the said resin being a phenol-formaldehyde-resin, the steps of first subjecting the assembled parts to a heat treatment under pressure and then subjecting the heat treated product to a cooling treatment under pressure at a temperature of about 2-6° C. for about 3 to 8 minutes.

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