July 22, 1952 B. E. SUGERMAN ET AL 2,604,362

PROCESS OF MAKING BRUSHES

Filed Dec. 1, 1947

Fig. 1.

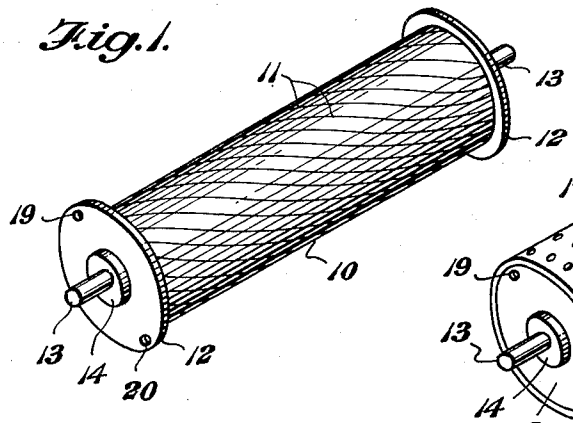


Fig. 2.

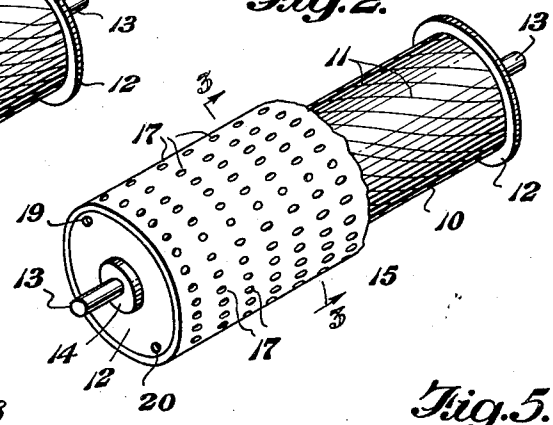
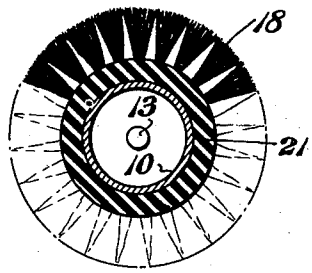


Fig. 5.



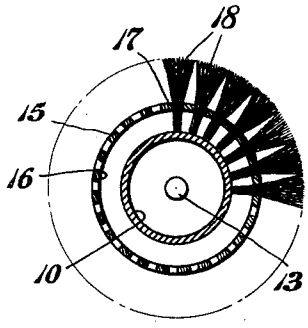


Fig. 3.

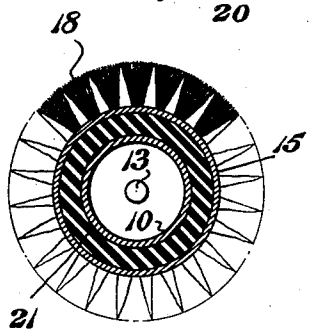


Fig. 4.

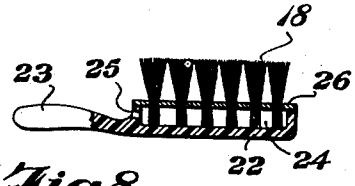


Fig. 8.

Fig. 6.

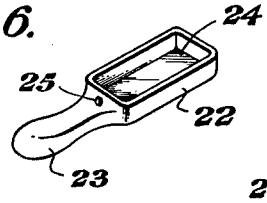
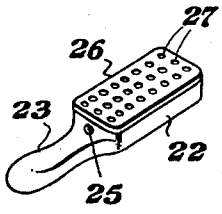


Fig. 7.



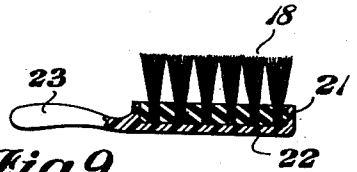


Fig. 9.

Inventors

Bernard E. Sugerman

and Jerome L. Been.

By

Sol B Wiczyl

Attorneys.

Patented July 22, 1952

2,604,362

UNITED STATES PATENT OFFICE

2,604,362

PROCESS OF MAKING BRUSHES

Bernard E. Sugerman, Gladstone, N. J., and Jerome L. Been, Brooklyn, N. Y., assignors to Rubber and Asbestos Corp., Jersey City, N. J., a corporation of New Jersey

Application December 1, 1947, Serial No. 789,050

4 Claims. (Cl. 300—21)

1

The present invention relates to a method of forming brushes and particularly to fixing bristles by embedding the bristle ends in an adhesive substance. It is known in the art to mold brushes by casting a resin in a mold which also supports bristles, but such practice has the disadvantage of using costly machinery which is slow and difficult to operate particularly since the resin may exude around the bristle perforations in the mold and removal from the mold is difficult if not impossible, particularly in the case of round or rotary brushes.

As a primary feature of this invention, the adhesive is cast and in a preferred form is thermoset as by vulcanizing using a frangible form as part of the mold which temporarily supports the bristles or tufts thereof in position in the mold, the frangible member being subsequently destroyed as it is removed from the completely formed brush after the adhesive has set.

The invention overcomes the difficulty of adhesively setting by molding, brushes of odd shape, particularly round or rotary type brushes, but the principle of the invention will obviously be applicable to other types of brushes.

It is accordingly a primary object of this invention to provide a method of casting a resinous binder for brush bristles.

It is a further object to mold the resinous binder with a temporary, frangible mold body capable of supporting the bristles for adhesion to the brush body of any desired shape, but particularly round or rotary brushes.

It is a further object to provide a temporary frangible mold body which will not adhere to the resinous binder and may be easily removed.

The invention is explained in further detail by reference to the drawings which are illustrative of application to two types of brushes, but it will be understood that other types of brushes may be made according to principles set forth herein.

The several figures of the drawing illustrate the several stages of construction according to the present process.

Fig. 1 shows a core member of a rotary or round type of brush prior to setting the bristles thereon.

Fig. 2 shows the core member with part of the frangible mold mounted thereon prior to adding the bristles and adhesive.

Fig. 3 is a transverse section on the line 3—3 of Fig. 2 with bristles mounted in the frangible mold element prior to filling the mold with adhesive.

Fig. 4 is the same as Fig. 3 after the mold is filled with adhesive.

2

Fig. 5 is the same as Fig. 4 after the adhesive is set and the frangible mold element is removed to produce the completed rotary brush.

Fig. 6 is a hollow brush back of a flat brush to which bristles are to be adhered.

Fig. 7 shows the mounting on the back of Fig. 6 of a frangible mold element.

Fig. 8 shows the next step of inserting the bristles or tufts prior to casting adhesive.

Fig. 9 shows the completed brush after casting, setting and removing the frangible mold element.

The core element of Fig. 1 is a round metal, wood or plastic body or back, preferably a metallic bar or tube 10 which has a desirably roughened surface 11 formed by knurling, indenting, corrugating, or otherwise for securing firmer adhesion of the plastic thereto. At each end is a flange 12 lending strength and forming the ends of a mold. The core is further fitted with spindles 13 which are attached to the flanges 12 through hubs 14 when the brush is to be mounted for rotation.

As shown in Fig. 2 a frangible element 15 is closely fitted over the core extending from flange to flange to complete the molding space between the core tube 10 and frangible element 15 and bounded at each end by flanges 12. The frangible element 15 is generally composed of easily destructible material such as heavy laminated paper or cardboard. It may be made of light wood or plastic or combinations thereof, preferably some material to be disposed of after molding without great cost.

The frangible material will be of variable thickness depending on the nature of the material to firmly support the bristles and provide an outer mold surface during casting of the adhesive against possibly some, but not considerable pressure.

The frangible material is desirably of a nature to which the bristle adhesive will not adhere, but for this purpose the frangible material may be given a coating of adhesive repellent on the inner mold surface 16 such as with conventional mold lubricant like zinc stearate, silicone grease, or regenerated cellulose.

Alternatively for this purpose, the frangible material may be composed of non-adherent material like regenerated cellulose or may be of laminated construction to provide a thin film of laminate on the adhesive resin contacting surface.

The frangible mold element 15 is perforated at 17 in any desired pattern to provide holes through which the bristles are firmly but tem-

porarily mounted for adhesion to the core by subsequent casting.

After emplacing the frangible element on the core to form the mold as shown in Fig. 2, the bristles 18 are firmly packed into each perforation 17 so that the holes are completely filled and to prevent exudation of fluid adhesive. The bristles 17 are inserted until the inner ends contact the tube 10 which forms a backing element therefor. The bristles may be individual as shown or may be inserted as bent tufts (not shown) as is conventional in the art. The assembly prior to casting the adhesive resin is shown in Fig. 3.

The resin may be any liquid, liquefiable resin, liquid resin forming substance which is thermoplastic or thermo setting. That is the resin is normally liquid and is set after casting by heating to moderate temperatures, or the resin is naturaly solid but is liquefied prior to casting by heating to obtain sufficient fluidity for pouring or extruding into the mold.

In the thermosetting category are Bakelite intermediates and urea aldehydes, and natural and synthetic rubbers or blends thereof, but particularly preferred is depolymerized rubber which may be produced in any desired practical degree of normal temperature fluidity and set or cured with sulphur by the usual methods.

Suitable thermo-plastics are the polystyrenes, polyvinyl halides, esters, acetals and mixtures, chloro-rubbers, alkyds and linear polyamides. Some of these resins may be applied in the unpolymerized or partially polymerized state and polymerization completed by curing in the mold.

For purposes of introducing the fluid resin into the mold, one of the flanges 12 of the core is bored at 19 and 20. The liquid resin is then introduced into the mold through one of the openings as 19 while the other opening as 20 serves as a vent to allow the air to be displaced from the mold by the liquid resin.

The hot or cold liquid resin is then poured or otherwise injected into the mold. If desired, the mold may be vibrated to displace air bubbles. In the case of thermosetting resins and rubbers the cast resin is heated to the optimum temperature for curing or setting which will vary depending upon the nature of the resin.

After the resin is cast, set and cooled, the frangible mold element 15 is removed by tearing, breaking and stripping from the finished brush. Fig. 4 shows the cast resin 21 in the mold and Fig. 5 shows the completed brush after breaking away the frangible mold element 15.

Similar treatment may be applied to other types of brushes as illustrated for a flat brush in Figs. 6, 7, 8 and 9.

Thus Fig. 6 shows the back 22 of a typical flat brush having a handle 23 and hollowed out portion 24 forming the mold space, one wall of the brush back being bored at 25 for introduction of resin 21. Fig. 7 shows the next stage of completing the mold by application of a frangible mold element 26 perforated at 27 in desired pattern for reception of bristles 18. The bristles are packed into the perforations as shown in Fig. 8 and the resin is introduced through the opening 25. After setting, the frangible element 26 is stripped off as shown in Fig. 9 to give the completed brush.

While the bristles fill the perforations and prevent exudation of liquid resin, when the resin is a dry powder or not very fluid, it may sometimes be preferred to fill the mold first with resin and then insert the bristles.

The following examples show typical operations with specific resins:

Example 1

The rotary type brush mold assembled as shown in Fig. 3 with a frangible mold element consisting of medium heavy gauge cardboard laminate having thin cellophane film adhered to its inner mold surface is filled with a liquid resin of the following composition:

	Parts by weight
Depolymerized rubber	100
Sulfur	40
Naftolen R–100	10
Diphenyl guanidine	2

The filled mold is then vulcanized and cured by heating at 130° C. for 18 hours. Thereafter the frangible cardboard is torn off to give the completed brush a highly desirable bristle setting of superior adhesion, high impact strength and abrasion resistance.

Example 2

In this case a cardboard element having its inner mold surface treated with plasticized silicone, a resin repellant available commercially as Dow-Corning Silicone Grease #DC–7 is used as the frangible element. The following resin composition is introduced into the mold:

	Parts by weight
2–5 dichlorostyrene	33
Polydichlorostyrene	21.5
Styrene	21
Polystyrene	11
Halogenated terphenyl	13
Solution containing 60% divinyl benzene	0.5
Benzoyl peroxide	0.15

The filled mold is then cured by heating at 60° C. for eight hours. Thereafter the frangible mold element is torn off to give a strongly set brush.

Considerable variation of the materials of the brush core or back is possible as well as the materials comprising the bristles. The bristles may be natural hair, nylon, wynene tampico or other known types.

In certain cases it may be feasible to introduce the resin as a powder and cure similarly by heat, but such procedure does not give the excellent bristle binding set forth according to the preferred procedure above.

Various modifications are possible within the applicable scope of the inventive principles herein set forth, and it is intended accordingly that the examples be deemed illustrative and not limiting except as set forth in the claims.

What is claimed is:

1. The method of forming brushes comprising temporarily assembling a preformed brush back, having flanges extending from the edges thereof to define a hollow portion therewith, with a frangible perforated closure member extending across said flanges and thereby form an enclosed molding cavity in the brush back, said frangible closure member being coated with an adhesive repellent substance, said perforated closure member having inserted a tuft of bristles in each of said perforations to a point whereby the inner ends of the bristles within said molding cavity substantially contact the opposite surface of said hollow back portion of said brush, each tuft con-

taining sufficient bristles to firmly pack each perforation and thereby support each tuft within the perforation and seal the perforation in fluid-tight manner, introducing into said molding cavity a normally liquid elastomeric composition settable to a solid by application of heat thereto, whereby the inner ends of each tuft within the molding cavity become embedded within the liquid composition filling the same, heating the brush and heat settable liquid within the molding cavity therein to set said composition to a solid in bristle supporting and bonding relationship within the brush back, and destructively removing said frangible mold element from the finished brush.

2. The method of forming brushes comprising temporarily assembling a preformed brush back, having flanges extending from the edges thereof to define a hollow portion therewith, with a frangible perforated closure member extending across said flanges and thereby form an enclosed molding cavity in the brush back, said frangible closure member being coated with an adhesive repellent substance, said perforated closure member having inserted a tuft of bristles in each of said perforations to a point whereby the inner ends of the bristles within said molding cavity substantially contact the opposite surface of said hollow back portion of said brush, each tuft containing sufficient bristles to firmly pack each perforation and thereby support each tuft within the perforation and seal the perforation in fluid-tight manner, introducing into said molding cavity a normally liquid heat settable depolymerized rubber containing a vulcanizing agent, whereby the inner ends of each tuft within the molding cavity become embedded within the liquid composition filling the same, heating the brush and heat settable liquid within the molding cavity therein to vulcanize and set said composition to a solid in bristle supporting and bonding relationship within the brush back, and destructively removing said frangible mold element from the finished brush.

3. The method of forming a rotary type brush comprising temporarily assembling a preformed brush back, comprising a metallic cylindrical brush back member having its surface roughened to enhance adhesion to a composition molded thereto, and having circular flanges mounted near the outer ends thereof coaxial therewith, together with a cylindrical frangible perforated closure member having a larger diameter than the first cylindrical member and mounted between said flanges and coaxial with said first cylindrical member to form an enclosed molding cavity with said flanges and said first cylindrical brush back member, said frangible closure

member being coated with an adhesive repellent substance, said perforated closure member having inserted a tuft of bristles in each of said perforations to a point whereby the inner ends of the bristles within said molding cavity substantially contact the opposite surface of said hollow back portion of said brush, each tuft containing sufficient bristles to firmly pack each perforation and thereby support each tuft within the perforation and seal the perforation in fluid-tight manner, introducing into said molding cavity a normally liquid elastomeric composition settable to a solid by application of heat thereto, whereby the inner ends of each tuft within the molding cavity become embedded within the liquid composition filling the same, heating the brush and heat settable liquid within the molding cavity therein to set said composition to a solid in bristle supporting and bonding relationship within the brush back, and destructively removing said frangible mold element from the finished brush.

4. A rotary-type brush comprising a cylindrical metal core having a roughened surface and a pair of circular flanges mounted near the outer ends thereof coaxial therewith, a plurality of tufts disposed normal to said cylindrical surface with the inner ends contacting the same for radial support and disposed in a pattern over substantially the entire cylindrical surface, said tufts being embedded within a solid vulcanized normally liquid depolymerized rubber composition disposed as a cylindrical layer between and substantially filling the cylindrical volume from flange to flange and firmly supporting and elastomerically compressing each tuft at the cylindrical surface juncture therewith, whereby said brush comprises a smooth cylindrical vulcanized rubber body containing bristle tufts disposed thereabout and resiliently embedded therein.

BERNARD E. SUGERMAN.
JEROME L. BEEN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
717,014	Morrison	Dec. 30, 1902
737,970	Schwartz	Sept. 1, 1903
1,394,255	Davis	Oct. 18, 1921
1,402,990	Adams	Jan. 10, 1922
1,556,298	Morck	Oct. 6, 1925
1,595,006	Kelly	Aug. 3, 1926
1,886,759	Taylor	Nov. 8, 1932
2,094,008	Freedlander	Sept. 28, 1937
2,427,137	Hall	Sept. 9, 1947