

Aug. 5, 1958

R. O. PETERSON

2,845,648

BRUSH AND BRUSH MATERIAL

Filed March 18, 1954

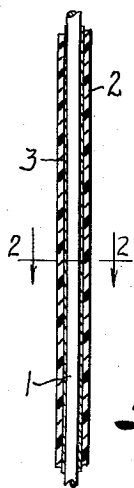


Fig. 1

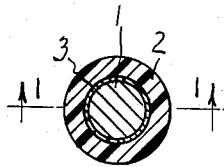


Fig. 2

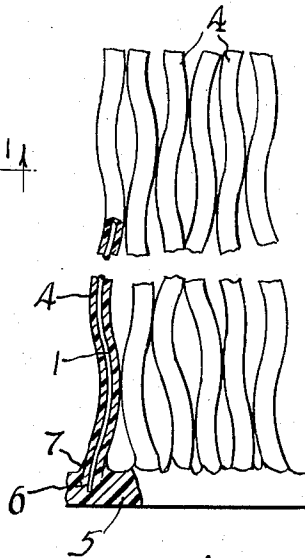


Fig. 3

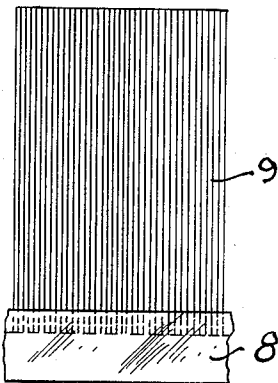


Fig. 4

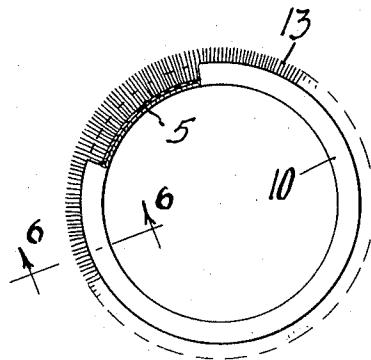


Fig. 5

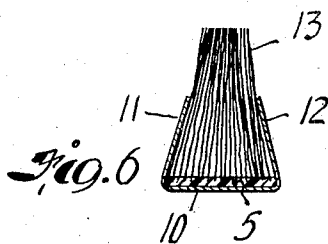


Fig. 6

INVENTOR.  
RUBEN O. PETERSON  
BY  
Oberlin & Limbach  
ATTORNEYS.

1

2,845,648

## BRUSH AND BRUSH MATERIAL

Ruben O. Peterson, University Heights, Ohio, assignor to The Osborn Manufacturing Corporation, Cleveland, Ohio, a corporation of Ohio

Application March 18, 1954, Serial No. 416,989

12 Claims. (Cl. 15—159)

This invention relates as indicated to a novel brush and brush material, and more particularly to plastic coated wire brush bristle material mounted in a back portion or sheet or strip of plastic material unitary with the plastic material coating such wires.

In the co-pending application of Ruben O. Peterson and Fletcher C. Miles, Serial No. 595,422, filed May 23, 1945, now Patent No. 2,672,640, there are disclosed certain methods for the manufacture of brushes and the like wherein plastic brush bristle material is joined to a plastic base portion, ordinarily preferably a relatively thin flexible sheet or strip. In one preferred embodiment, a bundle of such plastic bristles is tightly held while compatible molten plastic is intruded into one end of such bundle to interfuse the ends of the plastic strands therewith and thereby form a unitary continuous base in which they merge. The present invention is concerned with a special form of brush and brush material which may be produced and utilized in a generally similar manner.

It is a principal object of this invention to provide wire brush bristle material and brushes utilizing the same wherein the wires are coated and protected by individual sheaths or coatings of plastic material.

It is another object to provide such brush material wherein the wire core portions may be of exceptional hardness, having a Knoop hardness of 700 or more, and yet be suitable for relatively hard usage without an excessive tendency toward long fracture.

A further object is to provide brushes and the like utilizing such brush bristle material having plastic back or base portions merging with the plastic sheaths of the individual bristles and with the core portions penetrating an appreciable distance into such base or back.

Other objects of my invention will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, said invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawing:

Fig. 1 is a diagrammatic longitudinal section through one of my new brush bristles showing the internal construction of the same;

Fig. 2 is a transverse section taken on the line 2—2 on Fig. 1;

Fig. 3 is a diagrammatic elevational view of a portion of a brush element or the like having a thin flexible plastic base with crimped spaced brush material secured therein and extending therefrom in accordance with my invention;

Fig. 4 is a side elevational view of another form of brush element having a back comprising a rigid block

2

of plastic with straight densely packed brush material merged therewith and extending therefrom;

Fig. 5 shows a rotary brush element utilizing a strip brush element according to my invention mounted within a sheet metal channel form back; and

Fig. 6 is a transverse cross-section taken on the line 6—6 on Fig. 5.

Referring now more particularly to said drawing, the brush material employed in accordance with my invention may be of the general type disclosed in my co-pending application Serial No. 58,670, filed November 6, 1948. The wire core 1 may, for example, be hard steel wire (severe quench and a minimum draw back), beryllium copper wire, stainless steel wire, "Z" nickel wire (hard drawn, heat treated, relatively pure nickel) and also for certain purposes a number of softer wires such as copper, brass, bronze and aluminum alloy. Such wire core is ordinarily a monofilament.

The plastic coating material employed on such filamentous element should ordinarily be able to withstand reasonably high operating temperatures without softening or smearing the work. Preferred examples include nylon (polyamide resins), vinyl plastics (vinyl polymers and copolymers), and trifluorochloroethylene polymer. Other plastics such as neoprene (polychloroprene) and Hycar (modified copolymers of butadiene and acrylonitrile) as well as rubber and melamine resins (melamine-formaldehyde reaction products) may be employed in some cases, particularly when compounded to exhibit properties similar to nylon.

It will be understood that in employing such plastics the same will commonly have included therewith suitable fillers as well as the usual vulcanizing agents or the like to produce the resilient plastic composition for my purpose.

The thin plastic coating may be applied to the stranded material by extrusion or any other suitable method. When employing wire brush material, plastic compounds such as those having a neoprene base may, if desired, have their bond to such brush material improved by first applying a cement to the material, such cement preferably comprising a synthetic rubber and resin composition such as is commercially available under the name of "Ty-Ply-S" (Vanderbilt). The material should then be properly dried before applying the plastic coating material.

When nylon is employed as the coating material 2, it will ordinarily be preferred first to coat the wire 1 with a thin film of an Epon resin 3 which serves to bond the nylon much more effectively to the wire. Such resin is a condensation polymer containing the epoxide group and is compatible with the nylon, bonding therewith when the nylon is applied at 510° F. and setting without frothing since no volatiles are involved. It is commercially available from Shell Chemical Company (see booklet "Epon Resins").

For many purposes, it is preferred that my brush bristle material be crimped, both to minimize local concentrations of stress in use and also to afford a somewhat less dense and solid working face to the brush element. As diagrammatically shown in Fig. 3, crimped strands or bristles 4 having wire cores 1 in accordance with my invention may be assembled and joined to an integral flexible plastic sheet base 5 preferably formed by application of molten plastic to the ends of a bundle of crimped bristle material so that such molten plastic forms a portion of the sheet base, the remainder being formed by the plastic coatings of the end portions of the strands or bristles. Consequently, the ends 6 of wire cores 1 are firmly embedded in the base sheet 5 and the plastic coatings 4 of the wire gradually merge and blend into

## 3

grally with such sheet base as shown in the broken portion of Fig. 3, ordinarily with a slight rim or meniscus 7 of the intruded plastic extending a short distance around the adjacent basal portion of the strand to form in effect a supporting socket therefor.

When thus employing crimped brush material, the ends of the strands in even a firmly compacted bundle will be somewhat spaced as shown, facilitating the intrusion of molten plastic therebetween. The plastic of base portion 5 will, of course, ordinarily be the same as that of the coating 4.

When desired, a somewhat different form of brush may be produced utilizing a relatively large amount of plastic to form a rigid base 8 (Fig. 4) with the plastic coated wire brush bristles 9 extending therefrom, the ends of such bristles being embedded in and merged with back 8 in a manner similar to that illustrated in Fig. 3. Crimped brush bristle material may be utilized in the Fig. 4 embodiment, but in this view the coated bristles are shown as being straight and densely packed together. Even when thus densely packed, there will ordinarily be a degree of capillary action therebetween to cause the liquid plastic which is to solidify and form the bulk of back 8 to enter between the ends of the coated bristles to form sockets supporting the latter with the extreme end portions of the bristle coatings integrally merged with the plastic of the back.

When the back or base portion 5 is in the form of a relatively narrow elongated flexible strip, for example, it may be mounted within a sheet metal channelform back 10 and circularized (either helically or to form a single turn) with such plastic base portion 5 gripped or clamped between the sides 11 and 12 of the sheet metal back and with the bristle material 13 extending generally radially therefrom. In this arrangement, the base strip 5 may be relatively rigid transversely due to the narrowness of the strip while yet being flexible enough to permit such circularization. When thus circularized, the brush bristle material 13 will, of course, be somewhat less dense at the outer periphery or working face of the tool and may be laterally compacted by the intumed channel sides 11 and 12 which embrace and support the same. It will often be desirable to cement the strip 5 to the supporting back and Epon resins may be used for this purpose. Brush strip of this general type may likewise be circularized with the strands or bristles projecting generally radially inwardly, if desired.

In addition to use in the form of relatively narrow strips, my new material may also be employed in wider sheets adapted to be used as golf tees, for example, or cemented on flat supports to serve as a blanking table, as when blanking out cardboard. It may also be mounted on rotary discs for brushing or polishing purposes.

While particularly desirable and effective with wire centered plastic coated strands, which afford increased rigidity and cutting action, various other core materials such as glass fiber may be employed. By my method I join together a plurality of wire or equivalent bristles which are interconnected and retained by a flexible plastic sheet material base unitary with the coatings on such wires. By crimping the wire the effectiveness of such method is much enhanced, as explained above.

The brush or brush-like element thus produced is useful for a wide variety of purposes, including seals. Certain subject-matter disclosed but not claimed herein is disclosed and claimed in my co-pending application "Brush Seal and the Like," Serial No. 417,130, filed March 18, 1954.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims or the equivalent of such be employed.

I therefore particularly point out and distinctly claim as my invention:

## 4

1. A brush element comprising a thin flexible nylon sheet base and crimped brush bristle material secured thereto and extending therefrom generally normal to such sheet, the individual crimped strands of said brush material each comprising a single wire having a thin coating of an epoxide resin and an outer coating of nylon, the end of said wire being substantially embedded in said sheet and the end portion of said nylon coating merging in unitary manner with such sheet, with a portion of the nylon of such sheet surrounding and embedding the basal portion of the strand but not integrally merged therewith.

2. A brush element comprising a thin flexible sheet base and crimped brush bristle material joined thereto and extending therefrom generally normal to such sheet, the individual crimped bristles each comprising a wire core having a thin outer coating of protective plastic, one end of said wire core extending into said sheet with the corresponding end portion of said plastic coating physically merging in an integral manner with the material of said sheet, and with the surface portion of said sheet surrounding and bonding the coated bristle further to secure and support the same without integrally merging with said coating in this region.

3. A filamentous element comprising a plastic base portion, and a plurality of crimped plastic strands secured thereto and extending in generally side-by-side relationship therefrom, said plastic strands integrally merging at their ends with the material of said base, and such material of said base also extending a short distance further along said strands without integrally merging therewith better to support the same.

4. A filamentous element in accordance with claim 3 wherein said plastic base is secured within a sheet metal channelform back with the sides of said back closely embracing said strands.

5. A filamentous element comprising a plastic base portion, and a plurality of plastic strands secured thereto and extending in generally side-by-side relationship therefrom, said plastic strands integrally merging at their ends with the material of said base, and such material of said base also extending a short distance further along said strands without integrally merging therewith better to support the same.

6. A filamentous element comprising a plastic base portion, and a plurality of plastic strands secured thereto and extending in generally side-by-side relationship therefrom, the inner ends of said strands being slightly spaced and integrally merging with the material of said base, and such material of said base also extending a short distance further along said strands without integrally merging therewith better to support the same.

7. A filamentous element comprising a plastic base portion, and a plurality of composite strands secured thereto and extending in generally side-by-side relationship therefrom, said strands having inner cores of reinforcing material extending into said base portion and plastic sheaths individually surrounding said cores and integrally merged with said base portion.

8. A filamentous element comprising a plastic base portion, and a plurality of crimped wire strands secured thereto and extending in generally side-by-side relationship therefrom, said wire strands being individually provided with plastic sheaths integrally merging at their inner ends with the material of said base, and such material of said base also extending a short distance further along said strands without integrally merging therewith better to support the same.

9. A brush element comprising a thin flexible sheet base and crimped brush bristle material secured thereto and extending therefrom generally normal to such sheet, the individual crimped strands of said brush material comprising a wire core having an outer coating of plastic, the end of said wire being embedded in said sheet and the end portion of said plastic coating merging in unitary manner with such sheet, with a portion of said

5

sheet being of plastic and a portion of such plastic of said sheet further surrounding and embedding the basal portion of the composite strand but not integrally merged therewith.

10. A filamentous element comprising a base portion including a plastic layer, and a plurality of wavy filaments secured thereto and extending therefrom generally normal to said base, said individual wavy filaments comprising a hard core having a thin coating of an epoxide resin adhered thereon and an outer coating of nylon adhered over said resin coating, the inner ends of said wavy filaments being embedded in said plastic layer of said base with a portion of said plastic layer surrounding, embedding, and adhesively gripping the basal portions of said filaments.

11. A brush-like filamentous element comprising a support portion and filamentous material secured thereto and extending individually therefrom, said filamentous material comprising a large number of generally parallel filaments having hard filamentous cores, a thin adhesive epoxide resin coating on said cores, and outer plastic coatings adhered to said resin coatings.

6

12. A brush-like filamentous element comprising a support portion and filamentous material secured thereto and extending individually therefrom, said filamentous material comprising a large number of generally parallel filaments having hard filamentous cores, thin adhesive coatings on said cores, and outer plastic coatings adhered to said adhesive coatings.

## References Cited in the file of this patent

## UNITED STATES PATENTS

|           |          |                |
|-----------|----------|----------------|
| 376,800   | Frisbie  | Jan. 24, 1888  |
| 1,408,951 | Kern     | Mar. 7, 1922   |
| 1,482,415 | Seaboyer | Feb. 5, 1924   |
| 1,674,236 | Bauer    | June 19, 1928  |
| 2,027,884 | Schwab   | Jan. 14, 1936  |
| 2,100,138 | Heldt    | Nov. 23, 1937  |
| 2,207,158 | Neville  | July 19, 1940  |
| 2,511,004 | Peterson | June 13, 1950  |
| 2,607,064 | Sullivan | Aug. 19, 1952  |
| 2,648,084 | Swart    | Aug. 11, 1953  |
| 2,718,024 | Maynard  | Sept. 20, 1955 |