July 1, 1958 F. C. MAXWELL 2,840,841

PAINT BRUSH AND METHOD OF MAKING THE SAME

Filed Oct. 21, 1954

FIG. 1.

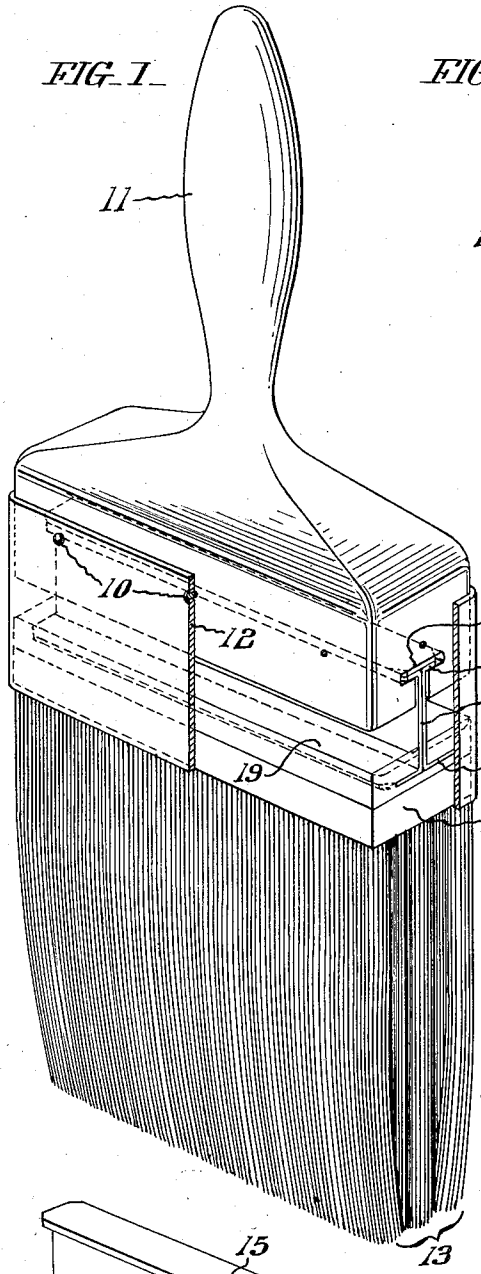


FIG. 2.

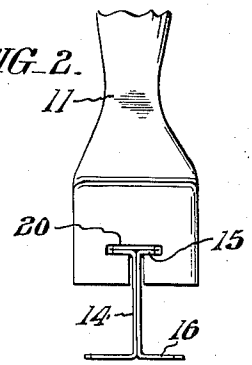


FIG. 3.

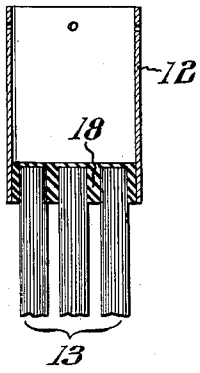


FIG. 4.

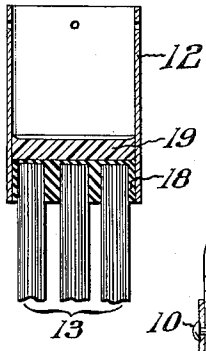


FIG. 5.

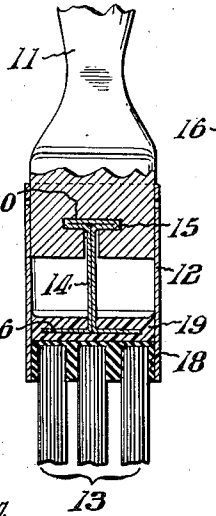


FIG. 6.

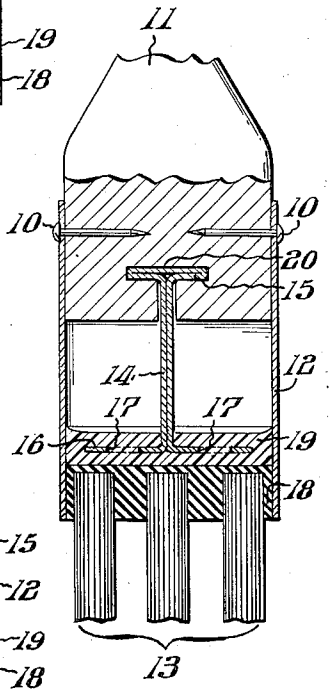
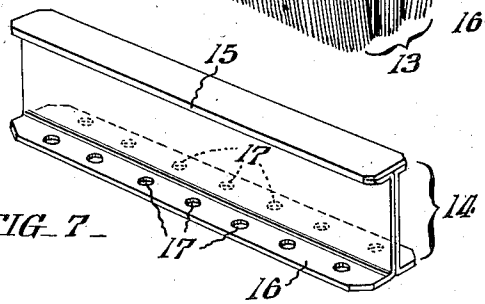


FIG. 7.



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PAINT BRUSH AND METHOD OF MAKING THE SAME

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3 Claims. (Cl. 15—193)

This invention relates generally to paint brush assemblies and more particularly to a paint brush structure which provides positive retention of the filaments in the direction of the brush handle.

Paint brushes in common use normally comprise filaments bonded together by a glutinous substance at one end, a tubular ferrule in which the filaments are inserted and a handle inserted in the ferrule at the end opposite to the filaments. The filaments in such brushes are held in place by the gripping action of the ferrule which is usually metallic, and this grip is augmented by rivets or pins driven through the ferrule and the bonded filaments. Brushes so constructed have a tendency to loosen where the ferrule grips the filaments or to break away in the bonding material because of the action of the rivets or pins.

Accordingly it is a principal object of this invention to provide a paint brush in which the filaments are positively held in the deriction of the handle without damage to the bonding material which holds the filaments together.

It is another object of this invention to provide a paint brush in which the bonded filaments are connected directly to the handle by a substantially rigid retaining membrane.

It is another object of this invention to provide a method of marking paint brushes in which the brush is made up of independent units which are assembled without need of further treatment of the bonding material which holds the bonded filaments in the ferrule.

A paint brush in accordance with this invention includes a handle **11**, a ferrule **12**, a retaining element **14**, a resinous capping layer **19**, the filaments **13**, and the filament bonding material **18**.

Fig. 1 is a perspective view partially cut away of a brush made according to the invention.

Fig. 2 is a fragmentary side elevation of the handle and retaining element of a brush made according to the invention.

Figs. 3–6 are sectional side elevations showing the consecutive stages in the manufacture of a brush in accordance with the invention.

Fig. 7 is a perspective view of the retaining element made in accordance with the invention.

The term "filament" as hereinafter used includes natural pig bristle, nylon, horse hair and any other material normally used in the working portion of a brush.

The filaments **13** may be any one of the types normally used in paint brush manufacture including natural and synthetic materials. They are gathered together and are then bonded together at one end by a suitable bonding material **18**. Such material may be a natural rubber or synthetic resin or a mixture of both. Where natural pig bristles are used, the bonding material will preferably be pure crude rubber; where nylon filaments are employed a suitable mixture of natural rubber and synthetic resin is preferred since the synthetic resin provides a better bond to the nylon filaments, whereas the pure rubber adheres better to the metal ferrule. Pure crude rubber is

used with horse hair filaments. Broadly, however, the bonding material may be any glutinous substance adhesively compatible with the filaments and is normally a substance which is not subject to attack by the painting materials to be employed with the brush or to boiling water.

The bonding material **18** is applied to the filaments **13** when the filaments **13** are inserted in the ferrule **12** as shown in Fig. 3. The quantity of bonding material applied is determined by the depth of penetration around the filaments desired and by the viscosity of the bonding material itself. When natural rubber is used the bonding material is vulcanized directly in the ferrule; otherwise it is permitted to harden in place.

When the bonded filaments **13** are in place in the ferrule **12** a layer of capping material **19** is poured into the ferrule **12** over the ends of the bonded filaments **13**. This material **19** is characterized by its capacity to harden without the application of further heat or pressure. When the capping material **19** is poured into the ferrule **12** there is a limited mechanical combination with the bonding material **18** used to bind the filaments **13**, and also a certain adhesion to the ferrule **12**. The capping material **19** thus becomes a separate layer attached both to the filament bonding material **18** and the ferrule **12**.

The handle of the brush **11**, according to this invention, is of the normal type except that a T-shaped slot **20** is formed in the bottom end thereof, as shown in the drawings. This slot **20** continues across the full width of the handle **11** and is shaped to accommodate the upper flange **15** of the retaining element **14**. The retaining element **14** is a substantially rigid structure having an I-beam cross-section in which the upper flange **15** is somewhat narrower than the lower flange **16**. The lower flange **16** is provided with a plurality of perforations **17**. The upper flange **15** of the retaining element **14** is inserted in the T-slot **20** in the handle **11** as shown in Fig. 2. The handle **11** is then inserted in the ferrule **12** sufficiently far to place the lower flange **16** in the fluid capping material. Due to the self-hardening nature of the capping material **19** no further action is needed to complete the construction of the brush other than to nail the ferrule **12** to the handle **11** by means of the nails **10**. When the capping material **19** is hardened it will be seen that a positive directional pull is maintained on the filaments **13** through the bonding material **18**, the hardened capping material **19**, the metallic retaining element **14** and the handle **11**. Thus the nails **10** may be eliminated.

It will be appreciated that many different types of slot designs may be used to accommodate the upper portion of the retaining element **14**, and that a corresponding number of different shapes may be employed in the retaining element itself. The preferred embodiment shown in the drawings has been found satisfactory in that the T-slot **20** is easily formed and the I-beam structure can be simply made from a single sheet of flat material. It is essential that the retaining element be firmly held by the handle and that the lower portion be sufficiently broad to provide low stress concentration in the capping material **19**. As shown in Fig. 7 the lower flange **16** is provided with a number of holes **17** which allow the capping material **19** to flow around the flange **16**.

It has been pointed out above that any self-hardening glutinous substance may satisfactorily serve as the capping material **19** in this invention. It is preferred, however, in the manufacture of a brush according to this invention, that the capping material **19** be capable of self-hardening at a relatively rapid rate without being an instant-setting material which would prevent the pouring of the capping material during continuous manufacturing operations. It has been found desirable for man-

ufacturing purposes to employ a capping material which will completely harden within two hours after application but which will retain working fluidity for a minimum period of about thirty-five minutes. It has been determined that the preferred materials for this purpose are the two-part, self-setting reactive resins. In practice the epoxy resins having viscosities in the range between 100 and 100,000 centipoises have been found to be satisfactory when used with a suitable propriety amine catalyst such as 8% by weight of diethylene triamine. Also satisfactory is a resorcinol resin base with a suitable aldehyde catalyst such as 25% by weight of commercial 37% formaldehyde solution. A third material is based upon the well-known phenolic resinoids. The preferred catalyst in this case is 7% by weight of hypophosphorus acid. It should be noted that the base resin employed in the latter capping material is not stable alone at room temperature. It is of course essential that the catalyst employed in each case be well distributed throughout the base material to insure proper setting.

An important feature of my invention is the method of making the brush. The handle unit, Fig. 2, is assembled as one function; the upper flange **15** of the retaining element **14** is inserted in the T-slot **20**. Since the T-slot **20** runs the full length of the bottom of the handle **11**, the retaining element **14** is simply slid longitudinally along the slot into the position shown in Fig. 1. The assembled filaments **13** are inserted in the bottom of the ferrule **12** and the desired bonding material **18** is poured is as shown in Fig. 3. Where the bonding material **18** is natural rubber, it is vulcanized directly in the ferrule **12**. The capping material is then poured into the ferrule **12** over the filaments **13** and bonding material **18** to form a capping layer **19** of sufficient depth to encompass the lower flange **16** of the retaining element **14**. The handle **11** and the connected retaining element **14** are then inserted in the ferrule **12**. The height of the retaining element **14**, the height of the ferrule **12** and the depth of the capping layer **19** are predetermined to place the lower flange **16** of the retaining element **14** in the capping material **19** substantially as shown in Fig. 5. Due to the self-hardening characteristics of the capping material **19** no further operation is needed on it to complete the brush other than to nail the ferrule **12** to the handle **11** where necessary. The ferrule **12** may be designed to grip the handle **11** in any known manner.

Many alternative forms and materials will be apparent as substitutes for those shown. Thus it is of course not intended to limit the invention to brushes which are hand operated. Any type of head element may be employed for the handle **11**. Likewise the invention could be entirely operative without the presence of the ferrule **12** as a structural element, since directional strength is obtained from the retaining element **14**.

It will be appreciated that the above description covers only a preferred embodiment of the invention and that one skilled in the art may readily make various changes and modification therein without detracting from the invention as hereinafter claimed.

Having thus described my invention I claim:

1. A brush comprising a handle having a slot recessed along the bottom face thereof, a plurality of painting filaments grouped together at one end, a resinous bonding material disposed about and above the said end of said filaments, a separate layer of self-hardenable resinous plastic material disposed across said bonding material and mechanically attached thereto, and retaining means having one end inserted in said recessed slot and held in position by said handle, and the other end horizontally inserted in said separate layer of self-hardenable resinous material.

2. A method of making a brush comprising inserting a plurality of filaments in one open end of a ferrule, applying a glutinous bonding material to the ends of the filaments in said ferrule, setting the bonding material, recessing a T-shaped slot in the lower part of a handle member and inserting therein the upper flange of an I-shaped elongated retaining member, placing a mass of self-hardening resin in said ferrule across and above said filaments, and inserting the handle and retaining element in said ferrule while said self-hardening resin is still plastic and immersing the lower flange of said retaining member in the self-hardening resin.

3. A paint brush comprising a handle having a T-shaped slot recessed along the bottom face thereof, a plurality of painting filaments bonded together at one end by a mixture of synthetic resin and natural rubber, a separate capping layer of a two-part self-setting reactive resin disposed across said bonding material and above the ends of the filaments, an elongated retaining element of I-shaped cross section having a narrow upper flange inserted in said T-slot and having a broad lower flange substantially perforate disposed in said separate capping layer, and rigidly retained therein when said two-part resin has hardened.

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