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(54) Brush manufacture

(57) A method of fixing bristles into ferrules of brush heads, comprises providing a composition comprising an epoxy resin, applying the composition to end portions of the bristles, locating the end portions of a bunch of the bristles within a ferrule with the resin in contact with the ferrule, and effecting curing of the resin to adhere the bristles to the ferrule. The resin composition is such that the curing is effected in no more than 60 minutes and the resin on curing adheres within and to the ferrule and does not undergo excessive shrinkage during curing or subsequent cooling such that its adhesion to the bristles and the ferrule is not lost.

Further, a method of fixing bristles into a ferrule of a brush head, comprises providing a composition comprising an epoxy resin and including a curing agent based upon a fatty acid and an aliphatic amine, the method comprising applying the composition to end portions of the bristles, locating the end portions of a bunch of the bristles in a ferrule with the resin in contact with the ferrule, and effecting curing of the resin to adhere the bristles within and to the ferrule.

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Description

[0001] The present invention relates to the manufacture of brushes and in particular to the fixing of bristles into ferrules of brush heads.

[0002] It is known to fix bristles into ferrules of brush heads by use of polyurethane resin systems, polyester resin systems and epoxy resin compositions comprising a Mannich base.

[0003] Such known methods are all attended by disadvantages.

[0004] Polyurethane resin systems have hitherto provided far too costly. Polyester resin systems give excessive shrinkage and thus the adhesion of the bristles to the ferrule fails.

[0005] With use of known epoxy resin systems, comprising a Mannich base, post operations cannot be carried out for at least four hours, which is the time the resin takes to cure at an acceptable temperature, and it is necessary to rely on the weight and viscosity of the resin to penetrate and wet out the bristles to ensure that the bristles are adhered within the cured resin.

[0006] The present invention aims to provide an improved method of fixing bristles into ferrules of brush heads.

[0007] There has now been discovered an epoxy resin composition which will adhere to bristles and ferrules and can be cured in an acceptably short period of time and will not shrink and loose its adhesion to the ferrules on cooling.

[0008] In accordance with a broad aspect of the invention there is provided a method of fixing bristles into ferrules of brush heads, comprising providing a composition comprising an epoxy resin, applying the composition to end portions of the bristles, locating the end portions of a bunch of the bristles within a ferrule with the resin in contact with the ferrule, and effecting curing of the resin to adhere the bristles to the ferrule, the resin composition being such that the curing is effected in no more than 60 minutes, preferably no more than 30 minutes, and the resin on curing adheres within and to the ferrule and does not undergo excessive shrinkage during curing or subsequent cooling such that its adhesion to the bristles and the ferrule is not lost.

[0009] In accordance with a further aspect of the invention there is provided a method of fixing bristles into a ferrule of a brush head, comprising providing a composition comprising an epoxy resin and a curing agent based upon a fatty acid and an aliphatic amine, such as an aliphatic triamine, the method comprising applying the composition to end portions of the bristles, locating the end portions of a bunch of the bristles in a ferrule with the resin in contact with the ferrule, and effecting curing of the resin to adhere the bristles within and to the ferrule.

[0010] The exceptional bonding property of the epoxy resin composition incorporating the curing agent is a function of the polarity of the amide group derived from reaction of the fatty acid and the aliphatic amine. Specifically, the carbonyl component of the amide group brings about a particularly strong withdrawal of electrons, thus enhancing the possibility of forming polar bonds.

[0011] It will be appreciated that the curing agent, based upon a fatty acid and an aliphatic triamine, is a modified epoxy curing agent. A suitable commercially available curing agent is that available under the trade name EX 1080 from Acene Limited of Bradley Hall Trading Estate, Standish, near Wigan, Lancashire, WN6 0XQ, England.

[0012] Preferably the epoxy resin and the curing agent are mixed in a ratio of 3.5:1 to 4.5:1 by weight to formulate the composition for use in the invention.

[0013] The epoxy resin may comprise bis phenol A epichlorohydrin epoxy resin.

[0014] Normally the epoxy resin includes inert filler depending on viscosity required.

[0015] Curing of the epoxy resin may be effected at 50 to 200°C.

[0016] The curing time is typically 30 minutes or less. After curing the brush head may be subjected to subsequent operations.

[0017] The method of the invention may be used for manufacturing paint brushes and varnish brushes (e.g. ½ to 7" in size), paper hanging brushes, dusting brushes and pegknots, shaving brushes and cosmetic brushes.

[0018] The brush filling, constituted by the bristles, may be of natural bristle, animal hair, solid or hollow polyester filaments, solid or hollow nylon filaments, tapered or level polyester filaments, tapered or level nylon filaments or a mixture of any of the aforementioned materials.

[0019] The invention affords the following advantages.

[0020] Due to the structure of the amide group (formed by reaction of the fatty acid and the aliphatic amine) the resin on curing has much improved and very strong adhesion to copper, stainless steel and to plated steel (e.g. brass-, tin- or nickel-plated steel), materials of which the ferrule may be made.

[0021] The bonding characteristics of the curing resin allow brush heads to be set (i.e. the bristles to be affixed within the ferrule) at high temperatures without the resin coming away from the inside of the ferrule.

[0022] Fast cure times may be achieved, enabling post operations to be carried out only 15 minutes after curing has been started.

[0023] By processing at elevated temperatures the range of viscosity of resin can be reduced from 5 to 1 as compared with the use of resins comprising Mannich bases. This enables cost savings and reduction in lines.

[0024] The resin is stable for up to two hours, i.e. does not start to cure for up to two hours after incorporation of the curing agent, if stored at a sufficiently low temperature. Below 15°C is recommended.

[0025] The resin composition has excellent wetting

properties and gives reproducible even penetration in brush heads containing natural bristle, animal hair, polyester filament bristles, nylon filament bristles or a mixture of such bristles.

[0026] The resin composition may be of such a viscosity at the processing temperature that it will penetrate natural bristle of varying quality.

[0027] The resin improves brush head security without the use of additional aids. This is material-saving and labour-saving.

[0028] Initial and ongoing bristle loss is reduced and the brush heads have greater durability. Brush head shape retention is improved, which is desirable to the end user.

[0029] The invention is illustrated by the following example.

Example

[0030] A resin composition comprising four parts by weight of an epoxy resin comprising bis phenol A epichlorohydrin epoxy resin and inert filler and one part by weight of curing agent (EX 1080) was prepared. The curing agent had a viscosity of 160 poise at 25°C. The resin had a viscosity of 53 poise at 25°C.

[0031] The resin composition was prepared by mixing the curing agent with the epoxy resin by pumping through a static mixer at ambient temperature (21°C).

[0032] Brush heads were prepared using the resin to adhere bristles into stainless steel ferrules of brush heads, curing being carried out in circulating hot air at 85°C.

[0033] The resin composition penetrated to the edges of the ferrules. The resulting brush heads had cured resin/bristle matrices firmly bonded to the insides of the stainless steel ferrules.

[0034] The curing time was 20 minutes. The brush heads were then ready for subsequent operations.

Claims

1. A method of fixing bristles into a ferrule of a brush head, comprising providing a composition comprising an epoxy resin, applying the composition to end portions of the bristles, locating the end portions of a bunch of the bristles within a ferrule with the resin in contact with the ferrule, and effecting curing of the resin to adhere the bristles to the ferrule, the resin composition being such that the curing is effected in no more than 60 minute and the resin on curing adheres within and to the ferrule and does not undergo excessive shrinkage during curing or subsequent cooling such that its adhesion to the bristles and the ferrule is not lost.

2. A method of fixing bristles into a ferrule of a brush head, comprising providing a composition comprising an epoxy resin and including a curing agent based upon a fatty acid and an aliphatic amine, the method comprising applying the composition to end portions of the bristles, locating the end portions of a bunch of the bristles in a ferrule with the resin in contact with the ferrule, and effecting curing of the resin to adhere the bristles within and to the ferrule.

3. A method according to claim 2, wherein the epoxy resin and the curing agent are mixed in a ratio of 3.5:1 to 4.5:1 by weight to formulate the composition.

4. A method according to any preceding claim, wherein the epoxy resin comprises bis phenol A epichlorohydrin epoxy resin.

5. A method according to any preceding claim, wherein the epoxy resin includes inert filler.

6. A method according to any preceding claim, wherein curing of the epoxy resin is effected at 50 to 200°C.

7. A method according to any preceding claim, wherein after curing the brush head is subjected to subsequent operations.

8. A method according to either preceding claim, wherein the curing is effected in a no more than 30 minutes.

9. A method of fixing bristles into a ferrule of a brush head, substantially as described herein in the Example.