

PATENT SPECIFICATION

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(54) ROTARY ABRASIVE HONE

(71) I, STEVE ALBERT RANDS, a citizen of the United States of America, of 4353—4355 East Floral Drive, Los Angeles, California 90022, United States of America, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a rotary abrasive brush of the type comprising elastic bristles which project outwards from a support which can be rotated around an axis, the free ends of the bristles being disposed substantially in a circular cylindrical array, and each bearing a globule in the form of an abrading body, these globules comprising abrasive particles bound together by a binder.

Such a brush is known, see for example the applicant's U.S. Patent No. 3,384,915. But in use of the known brush the problem has arisen of fixing the globule securely on the end of a bristle. A binder material which is suitable for carrying abrasive particles distributed within its mass has not been found to be suitable for fastening the globule securely to the bristle end. It is therefore an object of this invention to solve the above-mentioned problem and to provide a rotary abrasive brush which has globules on the bristle ends, which globules not only provide for efficient abrasive action, but which also remain firmly in place on the ends of the bristles. According to this invention a rotary abrasive brush of the above type is characterised in that each globule is adhered to a respective bristle end by means of a two-component synthetic resin adhesive, preferably a resorcinol-formaldehyde synthetic resin adhesive.

It has been found that the two-component synthetic resin provides a junction material which is of such strength and affinity for both the material of the bristle end and the binder material comprising the inner surface of each abrasive globule, as to render the junction substantially inseparable.

Several embodiments of the invention will now be described by way of example, with reference to the drawings, in which:—

Figure 1 is a side elevation partly in section on the plane 1—1 of Figure 2, of one embodiment;

Figure 2 is an end elevation as seen from the plane 2—2 of Figure 1;

Figure 3 is a perspective view;

Figure 4 is a detail side elevation of the end of a bristle;

Figure 5 is a detail section showing the bristle end of Figure 4, but coated ready to receive an abrasive globule;

Figure 5A is a view similar to Figure 5, showing one exemplary step in producing the coated end shown in Figure 5;

Figure 5B is a view similar to Figure 5A, but showing another exemplary step in producing the coated end shown in Figure 5;

Figure 6 is a fragmentary cross-section showing the bristle end with an attached abrasive globule;

Figure 7 is a view similar to Figure 6, but showing another embodiment;

Figure 8 is also a view similar to Figure 6, but showing another embodiment;

Figure 9 is also a view similar to Figure 6, but showing another embodiment;

Figure 10 is a diagrammatic side view, partly in elevation and partly in section, showing the brush prior to insertion into a bore which is of smaller diameter than the initial diameter of the brush; and

Figure 11 is similar to Figure 10, but showing the brush after forcible insertion thereof into the bore; a rotary power driving tool is also shown in this view.

Referring to the drawings, a rotary abrasive brush 20 has a plurality of bristles 22 and a bristle-mounting support 24 in the form of a twisted wire 26 with the inner end portions 28 of each bristle (or the middle portions of double-ended bristles) captured therein. Each bristle 22 includes a shaft portion 22S and an outer end 22T (Fig. 4) and is made of an elastic thermoplastics material, for example Nylon. Each bristle 22

extends radially outwardly from the wire 26.

An abrasive globule 30 is fixed on the end 22T of each of the bristles 22. Since the brush is intended primarily for power-rotation, to abrade a bore or other cylindrical recess, the plurality of abrasive globules 30 mounted by the radially outwardly extending bristles 22 defines a circular cylindrical array or surface. The globules can be easily inwardly deflected when the brush is inserted into a smaller-diameter workpiece surface, as shown in Figure 11.

Each globule 30 is mounted on the bristle end 22T so that the major portion of the shaft 22S is free of any outer coating. Each globule 30 includes binder material 34 and particulate abrasive particles 36. In forming the abrasive globule 30, each bristle end 22T is first provided with a junction-facilitating bonding coating by the application of a two-component synthetic resin adhesive 35 (Fig. 5) followed by curing thereof. Then the cured adhesive 35 is dipped into initially-liquid adhesive binder material 34, which may be carried in a shallow tray for convenient application to the end 22T carrying the adhesive 35, so as to produce bristle ends coated with the binder material 34, with an intervening bridge of the adhesive 35. Then, and before hardening or curing of the binder material 34, the coated ends 22T may be immersed in finely divided abrasive particles 36, thus producing the abrasive globules 30 (Fig. 6) which are then cured in place so as to mount each globule 30 on a respective bristle end 22T. The adhesive 35 acts as a mechanical bridge between the end 22T and the binder material 34 of the globule 30. The binder material 34 may be an epoxy resin air-cured at approximately 77°F for 24 hours.

The binder material 34 can be cured at a temperature of between 200 and 250 degrees F. for approximately four hours.

The abrading particles may be tungsten carbide, carborundum, or other very hard material suitable for the purpose.

The adhesive 35 is a two-component resorcinol-formaldehyde resin including a first component, capable of being applied in liquid form at room temperature to the bristle ends, and a second hardener component comprising an additive to be applied to the first component for curing and hardening in place. This is illustrated in Figures 5A and 5B. In Figure 5A, the first component 37', comprising a partially condensed resorcinol-formaldehyde resin in an alcohol-water solution, has been applied to the end 22T, after which the second component, comprising a hardener in the form of a powder of paraformaldehyde and a cellulosic filler, is added to the first

component 37': this second step is shown in Figure 5B, where the hardener is somewhat distorted and is diagrammatically indicated by numeral 37". After application of the second component 37", hardening and curing of the composite resorcinol-formaldehyde resin adhesive occurs and forms the two-component adhesive 35, which strongly adheres to the end 22T and also strongly adheres to the subsequently applied and subsequently cured epoxy resin binder material 34 of the outer coating 32 which forms the globule 30. The affinity of the two-component adhesive 35 for the Nylon of the bristle end and also for the binder material 34 of the globule is such as to prevent breaking away or flaking away of any substantial portion of the abrasive globule 30 despite hard usage of the brush as illustrated in Figure 11. The binder material 34 is wear-attributable by being softer than the workpiece, so that the abrasive particles 36 will project sufficiently to be effective throughout the working life of the brush 20, and yet the mounting of each globule 30 by the adhesive 35 is such as to retain unaltered the elastic character of the bristle shafts 22S.

Experiment has shown that the flexibility of each uncoated Nylon shaft 22S is at least twice that which would be obtained if the coating of adhesive 35 extended along the shaft portion.

Figure 7 shows another embodiment. The two-component adhesive 35a is the same as that of the embodiment described above. However, the coating making up the abrasive globule 30a comprises multiple layers 32a, each of which includes binder material 34a and abrasive particles 36a bonded to at least one interface as at 38. This arrangement produces a laminated, abrasive globule 30a, usually made of the same binder materials and abrasive particles as in the first embodiment, and with each layer interface making possible the production of a larger composite abrasive globule than would otherwise be the case.

Figure 8 shows another embodiment in which the coating 32b of the abrasive globule 30b is different from that of Figure 6, in that binder material 34b and abrasive particles 36b are mixed before being applied to the two-component adhesive 35b. The coating 32b may be provided by mixing the binder material 34b and the particles 36b in a container immediately before application to the bristle end 22Tb which has the adhesive 35b thereon.

Figure 9 shows another embodiment in which the main difference is that part of the globule 30c is provided by enlargement of the bristle end 22E. Thus a greater surface area is provided for the adhesive 35c, and a

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smaller quantity of the binder material 34c is required to produce an enlarged globule 40c of a size comparable to that of Figure 6.

5 Figures 10 and 11 illustrate the self-centering and self-sizing actions of the rotary abrasive brush. A workpiece 40 is shown in cross-section and comprising a bore with a cylindrical surface 42 to be worked. The diameter of the brush 20 is greater than the diameter of the bore surface 42 so that when the brush is forcibly inserted into the bore surface 42, this is accomplished by reason of the elasticity of the bristle shafts 22S, which remain uncoated and unaltered from their original form and can thus retain their elasticity.

WHAT I CLAIM IS:—

20 1. A rotary abrasive brush with elastically bendable bristles which project outwards from a support which can be rotated around an axis, the free ends of the bristles being disposed substantially in a circular cylindrical array, and each bearing a globule in the form of an abrading body, the globules comprising abrading particles bound together by a binder, characterised in that each globule is adhered to a respective bristle end by means of a two-component synthetic resin adhesive.

30 2. A brush according to claim 1 characterised in that the adhesive is a resorcinol-formaldehyde synthetic resin adhesive.

35 3. A brush according to claim 1 or claim 2 characterised in that each bristle is of plastics material and has an uncoated shaft portion.

40 4. A brush according to any preceding claim characterised in that the bonding material of each globule is a hardenable and curable plastics material.

5. A brush according to claim 2 characterised in that the resorcinol-formaldehyde resin is of initially liquid form and can be cured and hardened in place on a bristle end. 45

6. A brush according to claim 2 characterised in that the first component of the adhesive is of initially liquid form adapted to be cured and hardened in place on a bristle end in the presence of the second component to provide the adhesive. 50

7. A brush according to claim 6 characterised in that the first component is a partially condensed resorcinol-formaldehyde resin in an alcohol-water solution, and the second component is a hardener in the form of a powder of paraformaldehyde and a cellulosic filler. 55

8. A brush according to claim 3 characterised in that each bristle is of flexible Nylon. 60

9. A brush according to claim 4 characterised in that the bonding material is an epoxy resin. 65

10. A brush according to any preceding claim characterised in that each globule comprises at least two layers of bonding material with abrasive particles mixed therein. 70

11. A brush according to any preceding claim characterised in that the bristle end is enlarged.

12. A rotary adhesive brush constructed and arranged substantially as herein described and shown in the drawings. 75

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smaller quantity of the binder material 34c is required to produce an enlarged globule 30c of a size comparable to that of Figure 6.

- Figures 10 and 11 illustrate the self-centering and self-sizing actions of the rotary abrasive brush. A workpiece 40 is shown in cross-section and comprising a bore with a cylindrical surface 42 to be worked. The diameter of the brush 20 is greater than the diameter of the bore surface 42 so that when the brush is forcibly inserted into the bore surface 42, this is accomplished by reason of the elasticity of the bristle shafts 22S, which remain uncoated and unaltered from their original form and can thus retain their elasticity.

WHAT I CLAIM IS:—

1. A rotary abrasive brush with elastically bendable bristles which project outwards from a support which can be rotated around an axis, the free ends of the bristles being disposed substantially in a circular cylindrical array, and each bearing a globule in the form of an abrading body, the globules comprising abrading particles bound together by a binder, characterised in that each globule is adhered to a respective bristle end by means of a two-component synthetic resin adhesive.
2. A brush according to claim 1 characterised in that the adhesive is a resorcinol-formaldehyde synthetic resin adhesive.
3. A brush according to claim 1 or claim 2 characterised in that each bristle is of plastics material and has an uncoated shaft portion.
4. A brush according to any preceding claim characterised in that the bonding material of each globule is a hardenable and curable plastics material.

5. A brush according to claim 2 characterised in that the resorcinol-formaldehyde resin is of initially liquid form and can be cured and hardened in place on a bristle end.

6. A brush according to claim 2 characterised in that the first component of the adhesive is of initially liquid form adapted to be cured and hardened in place on a bristle end in the presence of the second component to provide the adhesive.

7. A brush according to claim 6 characterised in that the first component is a partially condensed resorcinol-formaldehyde resin in an alcohol-water solution, and the second component is a hardener in the form of a powder of paraformaldehyde and a cellulosic filler.

8. A brush according to claim 3 characterised in that each bristle is of flexible Nylon.

9. A brush according to claim 4 characterised in that the bonding material is an epoxy resin.

10. A brush according to any preceding claim characterised in that each globule comprises at least two layers of bonding material with abrasive particles mixed therein.

11. A brush according to any preceding claim characterised in that the bristle end is enlarged.

12. A rotary adhesive brush constructed and arranged substantially as herein described and shown in the drawings.

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