July 29, 1958 J. B. BENYAK 2,844,835

TUFTED BRUSH CONSTRUCTION

Filed May 23, 1955 2 Sheets-Sheet 1

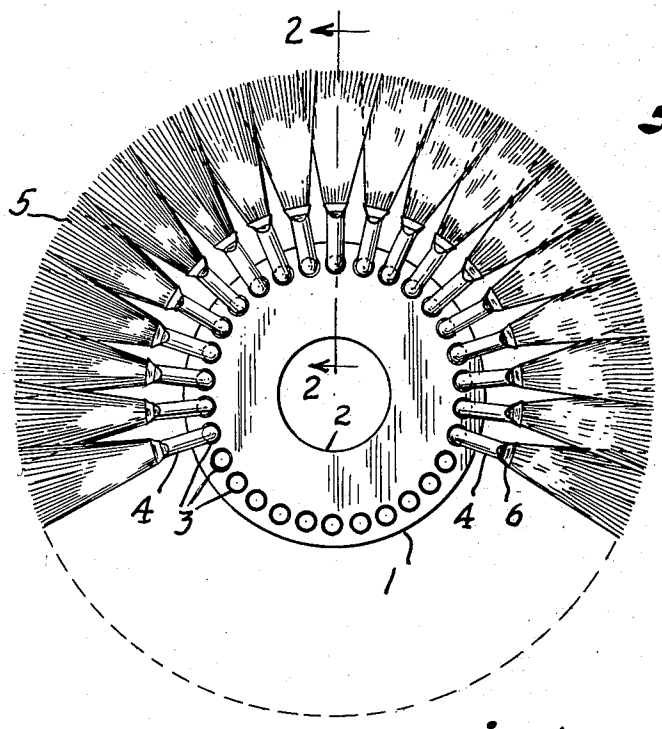

Fig. 1

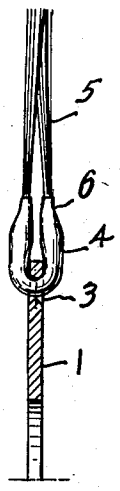

Fig. 2

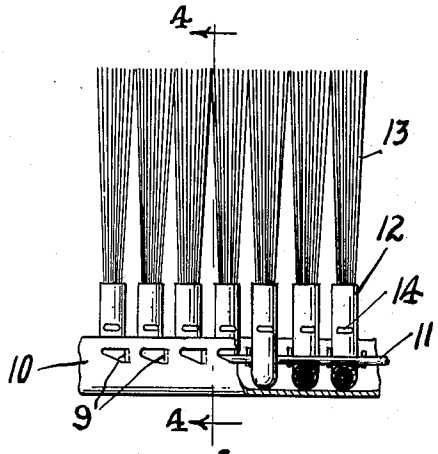

Fig. 3

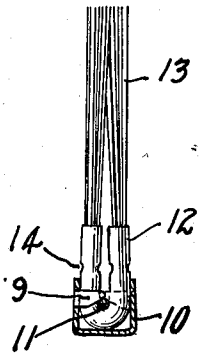

Fig. 4

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TUFTED BRUSH CONSTRUCTION

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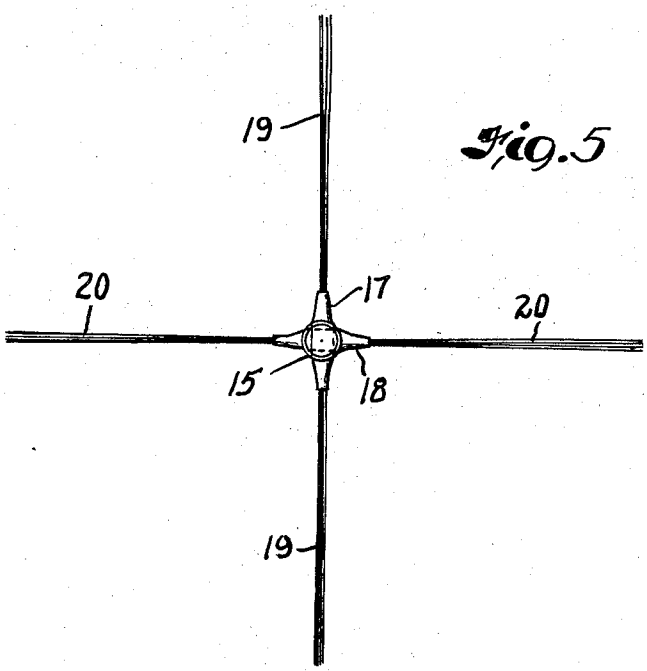

Fig. 5

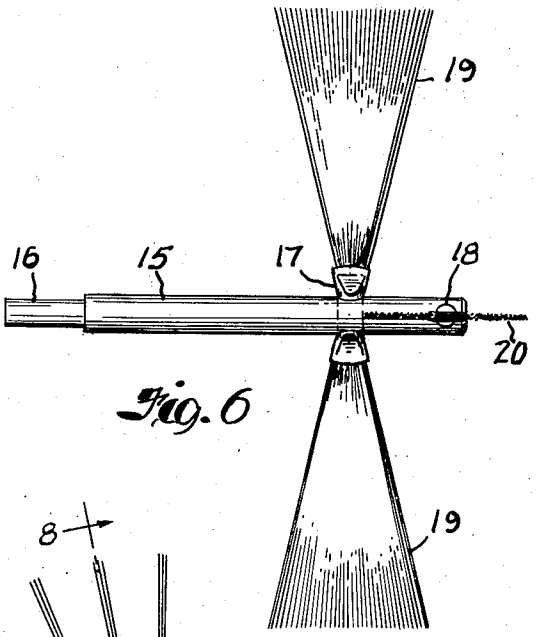

Fig. 6

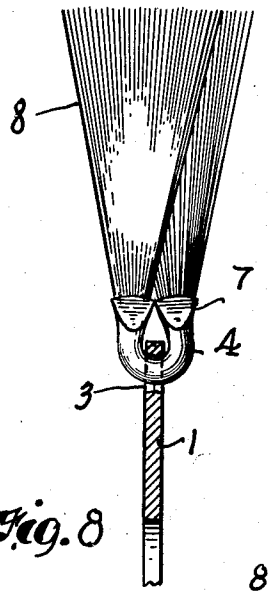

Fig. 8

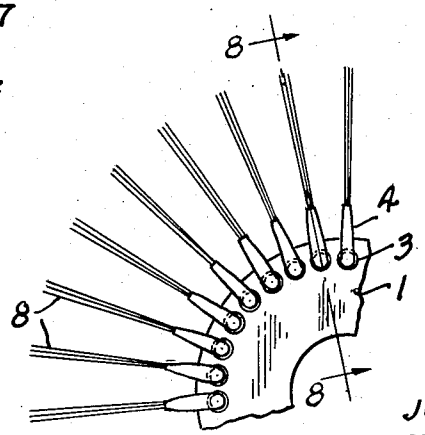

Fig. 7

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TUFTED BRUSH CONSTRUCTION

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Application May 23, 1955, Serial No. 510,283

8 Claims. (Cl. 15—179)

This invention relates as indicated to tufted brush construction, and more particularly to power driven rotary brushes of various types in which individual tufts of brush bristle material are secured in a manner which not only ensures longer brush life and bristle action but also permits the tufts to be formed in desired shapes to achieve selected types of brush faces.

For many types of brushing operations, the twisted tuft form of brush has been found most suitable, particularly satisfactory forms being shown and described in Peterson Patent 2,480,877. In twisted tuft brushes, however, only the portions of the bristles extending beyond the last twist in a tuft are free to flex upon engagement with the work, and it is necessary that the bristle material be relatively tough to avoid premature breakage. It is accordingly an object of the present invention to provide a tufted rotary brush having many of the advantages of twisted tuft rotary brushes known in the art, but utilizing straight bristle material which may be of greatly increased hardness, such bristle material being so mounted and secured as to minimize breakage and shedding of the bristles.

It is also often desired to produce brush strip in continuous lengths as taught in Peterson Patent 2,303,386, for example, but with the bristles extending in individual tufts therefrom. The provision of such novel brush strip is another object of this invention.

There is an increasing demand for power driven rotary brushes having very open brush facessuitable for cleaning the interiors of tubes and other cylindrical openings, brushes of this general class being known as "duster" brushes in the art, and it is a further object of my invention to provide novel brushes of this type wherein the individual tufts may be widely spaced circumferentially of the brush and the bristles of the individual tufts may be arranged in the most effective manner for the purpose intended.

Still another object is to provide power driven rotary brushes having wide, thin, generally fan shaped tufts of bristles.

Other objects of the 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 drawings:

Fig. 1 is an axial view of a rotary brush showing a large number of individual tufts secured to a central disc-like hub in accordance with my invention;

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

Fig. 3 is a side view of a short length of brush strip generally similar to that disclosed in the aforesaid Peterson Patent 2,303,386 but utilizing my new tufted brush material;

Fig. 4 is a transverse section taken on the line 4—4 on Fig. 3;

Fig. 5 is an axial or end view of a rotary duster brush of novel construction in accordance with my invention;

Fig. 6 is a side view of the brush of Fig. 5;

Fig. 7 is a fragmentary view of a rotary brush of a construction generally similar to that of Fig. 1 but with the tufts of brush bristle material arranged in a different manner; and

Fig. 8 is a transverse section taken on the line 8—8 on Fig. 7.

Referring now more particularly to Figs. 1 and 2 of the drawing, the embodiment of my invention there illustrated may comprise a central steel disc 1 adapted to serve as a hub and having a central aperture 2 which may be mounted on a brush arbor or mandrel. A number of small apertures 3 are circumferentially disposed closely within the outer periphery of disc 1, their edges being beveled or rounded. Through each of such apertures is inserted a tubular sleeve 4 having brush bristle material 5 extending therethrough and protruding therefrom in the form of individual tufts. Such bundles of bristles substantially fill the tubes 4 which are rebent after insertion through apertures 3 so that the two tufts protruding from each tube extend generally radially outwardly from the disc-shaped hub 1. The outer ends of the tubes may be crimped or compressed together as at 6 both to assist in securing the bristle material therewithin and also to form the tufts into relatively thin, flat, fan-shaped form, as best shown in Fig. 1. When arranged as illustrated, such tufts obviously afford a relatively dense but very narrow brush face in substantially the same plane as that of disc 1. Brushes of this sort are very useful when it is desired to enter narrow slits and the like.

It will be appreciated that the individual bristles are relatively straight in contrast to the usual twisted tuft brush (although they may be slightly crimped on occasion, if desired) and will ordinarily be fairly long in their extent from the ends of tube 4 to the outer working face of the brush. This means that such bristles are enabled to bend in an arcuate fashion over substantially their entire length when engaging the work and are very much less likely to be broken. The bristles are, moreover, protected where they pass through the disc, being in effect enclosed within a hinge member guarding them against all wear and abrasion at this point. For the two reasons above indicated, it is feasible to employ relatively hard brush bristle material, even including steel wire having a Knoop hardness of 600 or more without danger of an excessive amount of long fracture in use. Such brushes naturally have a much enhanced cutting action.

As shown in Figs. 7 and 8, the tube end portions may be crimped or compressed as at 7 transversely of disc 1 so that the tufts 8 of brush bristle material lie in planes generally normal to the axis of the disc. When a brush of this latter type is rotated at high speed, centrifugal force of course operates to hold the bristle tufts extending radially although they may be momentarily deflected when engaging the work. When thus engaging the work, the bristles are not only free to bend over the larger portion of the length, but also their tubular supports 4 will swivel somewhat in apertures 3. It will, of course, be obvious that the ends of tubes 4 may be compressed to any desired angle to the plane of disc 1 intermediate the forms shown in Figs. 1 and 7.

While various types of brush strip construction are well known in the art and may be utilized in accordance with my invention, I prefer that disclosed in Peterson Patent 2,303,386 and illustrated in modified form in Figs. 3 and 4 herein. Teeth **9** are punched in from the respective sides of a sheet metal channelform back **10** for the purpose of securing an elongated retaining element such as wire **11** therebeneath. As best shown in Fig. 4, the bundles of brush material are inserted within tubular member **12** and protrude from both ends of the latter to form individual tufts **13** which may be of generally circular cross-section. Tubular members **12** are bent to general U-shape about retaining wire **11** which serves to secure such members within the channel brush back. Such tubular members may be slightly crimped as at **14** to assist in preventing shifting of the bristles therewithin although the bending of such member and the enclosed bristle bundle about retaining element **11** will ordinarily suffice for this purpose. The teeth **9** will, of course, protrude inwardly over wire **11** intermediate the tufts, such teeth preferably being arranged in substantially opposed, slightly overlapping pairs as taught in such Peterson Patent 2,303,386. Brush strip produced in the manner described herein may thus comprise a long series of dense individual bristle tufts and obviously when such brush strip is circularized, such tufts may extend generally radially outwardly with the outer ends of the tufts being consequently somewhat spaced apart. As in the case of the Fig. 1 and Fig. 7 embodiments of the invention, the tubular socket members may be shaped to provide any desired form of bristle tuft.

Referring now to Figs. 5 and 6 of the drawing, the embodiment there illustrated is particularly suitable for use as a "duster" brush for cleaning the interiors of cylinders and the like. It comprises a metal rod **15** having having a reduced stem portion **16** adapted to be secured in an appropriate power tool with two short lengths of metal tubing **17** and **18** inserted through diametric apertures in rod **15** arranged at right angles to each other and spaced axially of such rod. Bundles of brush bristle material are inserted in each tube and protrude from the respective ends thereof to form the tufts **19** and **20**. By compressing the slightly protruding end portions of the two tubes as best shown in Fig. 6, these are caused to flare to secure the same in place in rod **15** and also to form the tufts to fan shape as illustrated.

It will be noted that in most of the embodiments of my invention illustrated and described above, the double bristle tufts are secured to the brush back or equivalent support by what amounts to a bearing permitting a degree of oscillating or swiveling action, ordinarily in but a single plane.

Brushes of the type shown in Fig. 1 have many special uses such as the removal of electrical insulation from copper wires secured in slots in the rotors of small electric motors. Obviously, as previously explained, I am enabled to adjust the width of the brush face provided by suitably selecting the angles at which the ends of the tubular members are crimped or compressed, all without affecting the bearing action of such members where secured in their support. Because my new brush construction enables the employment of straight brush bristle material instead of twisted tufts, for example, it is possible to maintain a precise brush diameter, this sometimes being of importance in high precision brushing operations. Moreover, in the past such twisted tufts have naturally been made of wire, but the individual tufts of my new brushes, while likewise frequently of wire, may also be of animal, vegetable or synthetic fibers such as horsehair, Tampico fiber and nylon. While steel wire is undoubtedly the most common form of metal wire employed, there are occasions when copper wire, stainless steel or aluminum, for example, may be preferred. The tubular members in which the bundles of bristles are inserted will ordinarily be of metal such as steel, brass, copper or aluminum. While the discs in the Fig. 1 and Fig. 8 embodiments will ordinarily be flat as shown, they may also be cupped in the general manner shown and described in Peterson Patent 2,480,877, it being appreciated that the U-shaped tubular members carrying the tufts of brush material will still be mounted for swivelling about axes transversely of the direction of brush face movement. Crimped wire or plastic coated wire, for example, may be utilized as the brush bristle material and the prior insertion of bundles of such material in the short tubular elements greatly facilitates the handling of such bundles thereafter. It has been common practice in the past to assemble bundles of brush bristle material and then temporarily to bind such bundles together with rubber bands and the like to permit convenient handling during the subsequent assembly operation. Double tuft units such as shown in Figs. 2 and 8 may be embedded in a plastic base if desired. It will also be appreciated that tufts of the type shown and described herein may be secured in strip having notches or holes therein as disclosed in Nelson et al. application Serial No. 134,904, filed December 24, 1949, for "Brush and Method of Making Same."

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:

1. A rotary brush comprising a metal disc having a central opening for mounting on a mandrel or the like and a large number of small circular apertures uniformly circumferentially located adjacent the outer periphery of said disc, the edges of such apertures being beveled, a U-shaped metal tubular member of circular cross-section pivotally mounted in each such aperture with the respective ends thereof extending generally radially outwardly of said disc on each side thereof, and a bundle of wire brush bristle material inserted through each said tubular member with the respective ends of said bundles extending generally radially outwardly to form a circular brush face, the end portions of said tubular members being compressed to spread the emergent bristle material into generally flat fan-shaped layers lying substantially in the plane of said disc.

2. A rotary brush comprising a metal disc having a central opening for mounting on a mandrel or the like and a large number of small circular apertures uniformly circumferentially located adjacent the outer periphery of said disc, the edges of such apertures being beveled, a U-shaped metal tubular member inserted in each such aperture with the respective ends thereof extending generally radially outwardly of said disc on each side thereof, and a bundle of wire brush bristle material inserted through each said tubular member with the respective ends of said bundles extending generally radially outwardly to form a circular brush face, the end portions of said tubular members being compressed to spread the emergent bristle material into generally flat fan-shaped layers lying substantially normal to the plane of said disc.

3. A rotary brush comprising a disc-shaped hub member having a large number of circular apertures uniformly circumferentially located adjacent the outer periphery of said disc, a U-shaped tubular member of circular cross-section inserted in each such aperture with the respective ends thereof extending generally radially outwardly of said disc on each side thereof, and a bundle of brush bristle material inserted through each said tubular member with the respective ends of said bundles providing pairs of tufts extending generally radially outwardly to form a circular brush face.

4. The brush of claim 3, wherein said tubular members are adapted to swivel in such apertures about axes normal to the plane of said disc only.

5. The brush of claim 3, wherein said tubular members are locally compressed in their respective end portions more firmly to grip and secure said respective bundles of brush bristle material therein.

6. The brush of claim 3, wherein said tubular members are locally compressed in their respective end portions more firmly to grip and secure said respective bundles of brush bristle material therein and to spread the emergent bristle material into generally flat fan-shaped layers lying substantially in the plane of said disc.

7. The brush of claim 3, wherein said tubular members are locally compressed more firmly to grip and secure said respective bundles of brush bristle material therein and to spread the emergent bristle material into generally flat fan-shaped layers lying in planes transversely of said disc.

8. A rotary brush having a rotatable support, tubular socket members projecting radially therefrom, and brush material secured in said socket members, the outer portions of said socket members being compressed to spread said brush material into generally flat fan-shaped layers lying in substantially the same narrow plane transversely of the axis of rotation of said support.

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