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ROTARY BRUSH WITH FLUID PASSAGES

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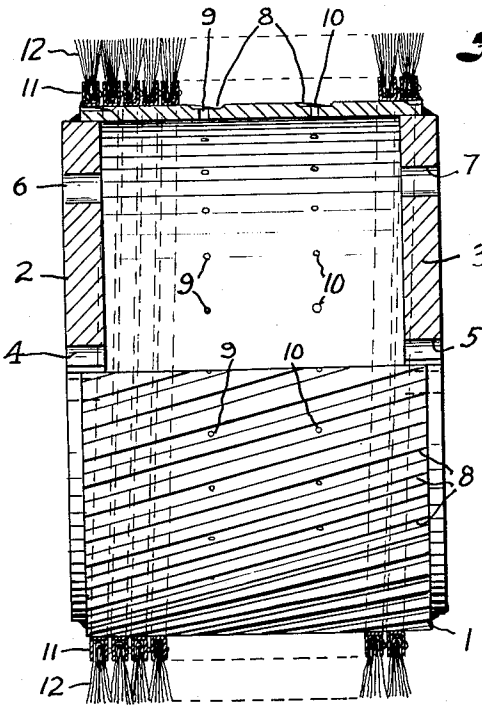


Fig. 2

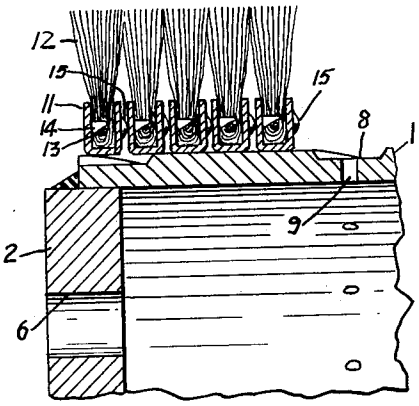


Fig. 3

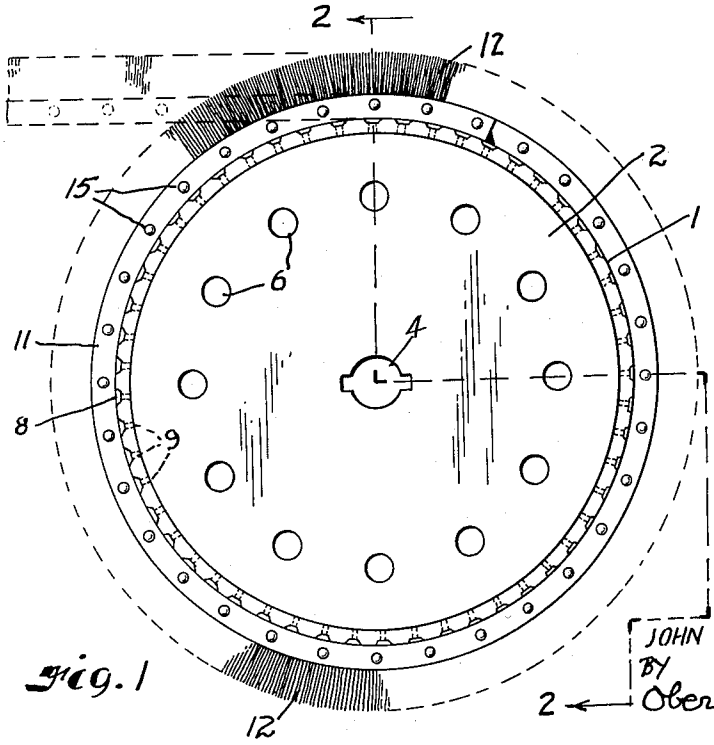


Fig. 1

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ROTARY BRUSH WITH FLUID PASSAGES

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12 Claims. (Cl. 15—182)

This invention relates as indicated to a novel brush provided with fluid passages for ventilating purposes and optionally, introduction of other fluids for distribution to the brush material.

Patent No. 2,409,309 to Ruben O. Peterson discloses and claims several forms of power driven rotary brushes having provision for ventilation, one such form being shown in Figs. 11 and 12 of such patent having circumferentially arranged longitudinally extending bars 40 defining the outer periphery of the hub upon which the annular brush elements are mounted. Brushes of this type have proven quite successful commercially and represent a considerable advance in the art, but their manufacture nevertheless involves certain problems.

It is often desired to produce cylindrical or so-called "roller" brushes in which continuous lengths of brush strip such as that disclosed in Peterson Patent 2,303,386 are wound directly upon a hub element under considerable back tension, thereby simultaneously circularizing the back of the brush strip, mounting the latter upon the hub, and very firmly and securely seating the brush element upon the hub. The end portions of the helical brush strip may be tacked to the hub by arc welding or otherwise secured in well-known manner, as by employment of appropriate end clamping plates or discs. Such rotary brushes are subsequently trimmed and sometimes ground to provide perfectly circular symmetrical uniform brush faces in order that they may not be off balance when driven at high speeds and also to ensure uniform brushing characteristics when engaging the work. It has been found, however, that when brush strip is very tightly wound upon a hub having longitudinally extending recesses in its outer periphery parallel to the axis of rotation, that the portions of the brush strip back bridging such recesses under high tension do not conform to the true arc desired, but instead follow chords, forming flats. It will accordingly be apparent that when the resultant brush is trimmed, while it will appear perfectly symmetrical superficially, nevertheless there will be a series of longitudinally extending areas of the brush face parallel to the brush axis where the bristles are of slightly greater length than the bristles intervening therebetween. This variation in bristle length, following a symmetrical pattern circumferentially of the brush, has been found to be responsible for slight differences in surface finish produced by such brushes on metal sheets and the like passed therebeneath. Such faint differences, often referred to as "ghosting," while slight, are nevertheless very apparent to the eye due to their symmetrical appearance on the work and are considered objectionable in many cases.

It is accordingly a principal object of my invention to provide a power driven rotary brush having a hub with ventilating grooves or recesses in its outer periphery arranged to afford a high degree of fluid flow through the brush but without causing symmetrical differences in brush bristle length of brush strip wound thereon under heavy tension.

Another object of my invention is to provide a novel rotary brush which will be exceptionally cool-running in operation, well balanced, and adapted for introduction of fluids thereto both internally and externally of the hub element.

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 drawing:

Fig. 1 is an end elevational view of one embodiment of my invention illustrating the manner in which brush strip may be wound upon my new hub member under back tension;

Fig. 2 is an elevational view partly in section taken on the line 2—2 on Fig. 1; and

Fig. 3 is an enlarged fragmentary detail view showing the manner of mounting the helical brush element upon the hub member.

Referring now more particularly to said drawing, the embodiment of my invention there illustrated comprises a hub member having a cylindrical shell portion 1 welded on two circular end plates or discs 2 and 3 having aligned central apertures 4 and 5 to facilitate mounting on an appropriate arbor or mandrel. A plurality of circumferentially spaced apertures such as 6 and 7 are provided in such respective discs radially outwardly of the central apertures to permit the influx of cooling air or the introduction of such other fluids as may be desired to the interior of the hub.

The external cylindrical surface of shell 1 is provided with a large number of relatively narrow grooves 8 therein extending helically of such cylindrical surface. One or more rows of holes such as 9 and 10 may be drilled through such shell to connect such helical grooves with the interior of the latter. Such holes are very desirable for supplemental ventilating purposes when the hub is of considerable length (e.g. 3 feet or more long) and such holes will generally then be disposed in circumferential rows adjacent the longitudinal mid-point of the hub. When the hub is of relatively short length, however, it will ordinarily be unnecessary to go to the added expense of drilling such holes, the peripheral helical grooves 8 affording ample ventilation in a manner explained below.

A variety of different types of brush strip, well known in the art, may be employed in accordance with my invention, but such brush strip will ordinarily comprise an elongated sheet metal channelform back with brush material secured therein by an elongated retaining element extending longitudinally within the channel. A very satisfactory form of brush strip for employment in accordance with my invention is that disclosed in Peterson Patent 2,303,386. A superior form of brush strip for employment in accordance with my invention, however, is the form disclosed and claimed in application Serial No. 452,320 of Brooks E. Nelson, "Brush Element" filed August 26, 1954, and now abandoned. Such latter form of brush strip includes provision for maintaining successive turns thereof slightly spaced to facilitate outward flow of ventilating air.

As best shown in Fig. 3 of the drawing, the brush strip preferably employed may comprise a sheet metal channelform back 11 of generally U-shape cross-section within which brush bristle material 12 is retained by being doubled about an elongated retaining element such as wire 13 extending longitudinally within the channel

and held therein by means of teeth 14 punched inwardly from the channel side and overlying the wire. As explained in greater detail in the aforesaid Nelson application Serial No. 452,320, the helical turns of the channel brush back 11 may be slightly spaced apart by means of outwardly laterally projecting protuberances or dimples 15 so that a narrow space is afforded between the adjacent turns for outward flow of ventilating air.

When my new brush is rotated at high speed, the effect of centrifugal force is such as to draw air into the helical grooves 8 for passage radially outwardly between the turns of brush strip, thereby ventilating and cooling the brush material. As above explained, this effect may be accentuated by the optional provision of holes such as 9 and 10 whereby air entering through apertures 6 and 7 to the interior of the hub then passes radially outwardly through holes 9 and 10 to grooves 8 to supplement the air drawn into the ends of such latter grooves. If desired, grooves 8 may be provided of opposite hand describing helices which meet one another in a herringbone effect. Other modifications will be apparent to those skilled in the art wherein the grooves extend at angles to the axis of rotation of the hub rather than parallel thereto, but the relatively simple helical form illustrated and described is preferred.

The brush strip may be wound directly upon such hub under back tension required to deform the metal channel back of the strip as shown in Fig. 1 of the drawing, but obviously no symmetrical pattern of brush material length differentials will appear when the brush is subsequently trimmed. While portions of the brush strip back may nevertheless still be somewhat flattened where bridging grooves 8, the effect upon the work-piece is not nearly so noticeable and has not been found objectionable. Moreover, due to the angle at which the ends of the grooves 8 extend to the respective hub ends, one end of each groove will always be inclined in the direction of rotation of the brush regardless of which direction the brush may turn and accordingly cooling air will be scooped therein and forced more rapidly along such grooves.

Even when holes such as 9 and 10 are provided, it is usually desirable that any end plates employed in conjunction with my new brush should not obstruct the ends of grooves 8. The brush material may be of any desired type, including tampico fiber, cord, horsehair, wire, buff fabric, synthetic plastic filaments, and wire and glass fiber filaments coated with plastic.

While my new construction is of particular advantage when utilizing brush strip tightly wound on the cylindrical hub surface in a short lead helix, it will be readily apparent that annular brush sections such as that shown and described in Whittle Patent No. 2,288,337 may likewise be employed. Although grooves 8 are at a substantial angle to the axis of the hub, they are nevertheless of rather long lead, the angle being sufficient to afford much enhanced support to the portions of the brush strip bridging the grooves. In effect, the brush strip back crosses the grooves at a substantial angle thereto.

Drive screws may be employed initially to secure the ends of the brush strip to the hub, subsequently reinforced by tack welding as shown. End clamping members of the general type shown and described in Peterson Patent 2,609,559 are also suitable for use with my new brush assembly.

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. In a rotary brush having a hub in the form of a cylindrical shell and brush strip mounted thereon, end plates welded to said shell and centrally apertured for mounting the hub on an arbor or the like, said end plates having additional holes therethrough to place the interior of the hub in communication with the outer atmosphere, said cylindrical shell having a plurality of unobstructed long lead helical grooves in its outer peripheral surface extending to the respective ends of said shell, and brush strip tightly helically wound and secured in a short lead helix on the outer cylindrical surface of said shell, thereby bridging said grooves, adjacent turns of said helically wound brush strip being slightly spaced apart by lateral protuberances on the brush strip back, the ends of said helical grooves being in communication with the outer atmosphere and said shell having a plurality of holes therethrough extending from the inner hub cavity to said grooves.

2. In a rotary brush having a hub comprising a cylindrical shell of uniform diameter and means mounting said shell for rotation about its axis; said shell having unobstructed grooves in its outer peripheral surface extending longitudinally of said hub and at an angle to the axis thereof, and brush strip tightly helically wound and secured on such surface with the turns thereof bridging said grooves diagonally and with the brush material of said brush strip extending outwardly therefrom.

3. A rotary brush comprising a hub having an outer cylindrical surface and a plurality of narrow grooves in said surface extending longitudinally of said hub at an angle to the axis thereof in a circumferential direction, and an annular brush element tightly seated and secured on such cylindrical surface bridging said grooves and with brush material extending generally outwardly from said brush element, said grooves being open for flow of air therethrough when said brush is rotated in use.

4. The rotary brush of claim 3, wherein said brush element comprises helically wound brush strip.

5. The rotary brush of claim 3, wherein the ends of said grooves are exposed for inflow of cooling air.

6. The rotary brush of claim 3, wherein said grooves are helical.

7. The rotary brush of claim 3, wherein said brush element comprises adjacent turns of brush strip secured in slightly spaced apart relationship to facilitate outward flow of air therebetween.

8. The rotary brush of claim 3 wherein said brush element comprises helically wound brush strip, adjacent turns of which are slightly spaced apart by outwardly projecting protuberances on the sides of the brush strip back.

9. The rotary brush of claim 3, wherein said hub is hollow and open to the exterior at at least one end thereof, said hub having holes therethrough leading from its hollow interior to said grooves.

10. The rotary brush of claim 3, wherein said hub is hollow and open to the exterior at at least one end thereof, said hub having holes therethrough leading from its hollow interior to said grooves, such holes being located substantially midway of the length of said hub.

11. A rotary brush comprising a hub having a cylindrical outer surface with a plurality of generally longitudinally disposed grooves therein, said grooves extending at an angle to the axis of said hub in a circumferential direction, said hub being hollow and having passages extending from the interior thereof to said grooves, and an annular brush element tightly seated on said cylindrical surface bridging said grooves and having brush material extending generally outwardly therefrom.

12. In the manufacture of a rotary brush, the step of winding brush strip under tension in a short lead helix on a cylindrical hub having long lead helical grooves in its outer surface, such brush strip comprising a sheet metal channelform back with brush material secured

therein and extending therefrom, whereby such strip back portions bridging such grooves lie only slightly closer to the axis of such hub than those portions engaging the arcuate periphery of such hub and a ventilated cylindrical rotary brush is produced in which the working brush face is free of regions of different brushing effectiveness extending longitudinally directly parallel to the axis of rotation.

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