

Oct. 9, 1962

J. C. BONGIOVANNI ET AL
REINFORCED BRUSH CONSTRUCTION

3,056,986

Filed July 18, 1958

2 Sheets-Sheet 1

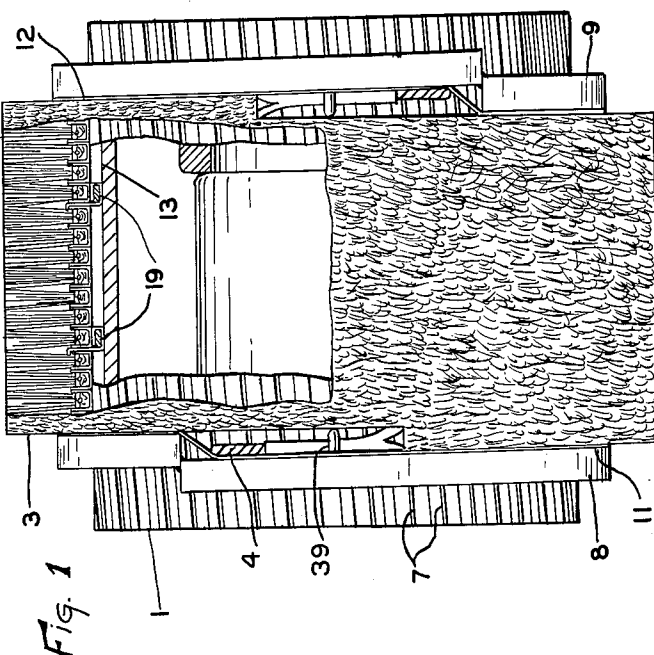


Fig. 1

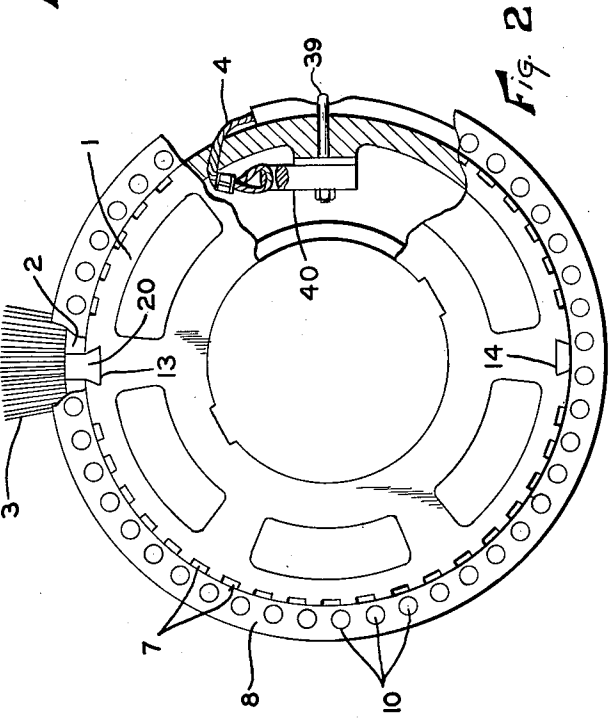


Fig. 2

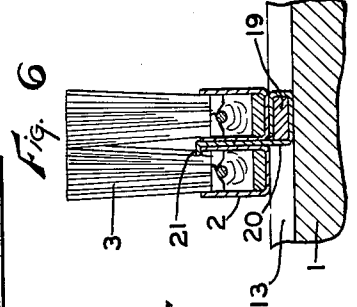


Fig. 3

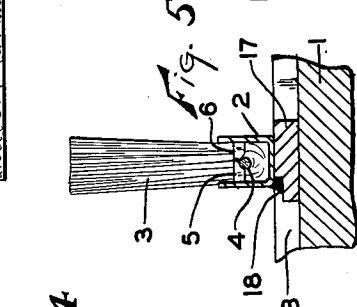


Fig. 4

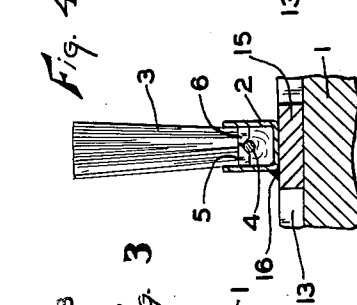


Fig. 5

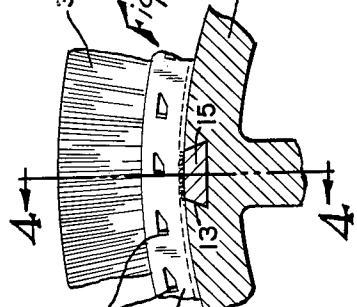


Fig. 6

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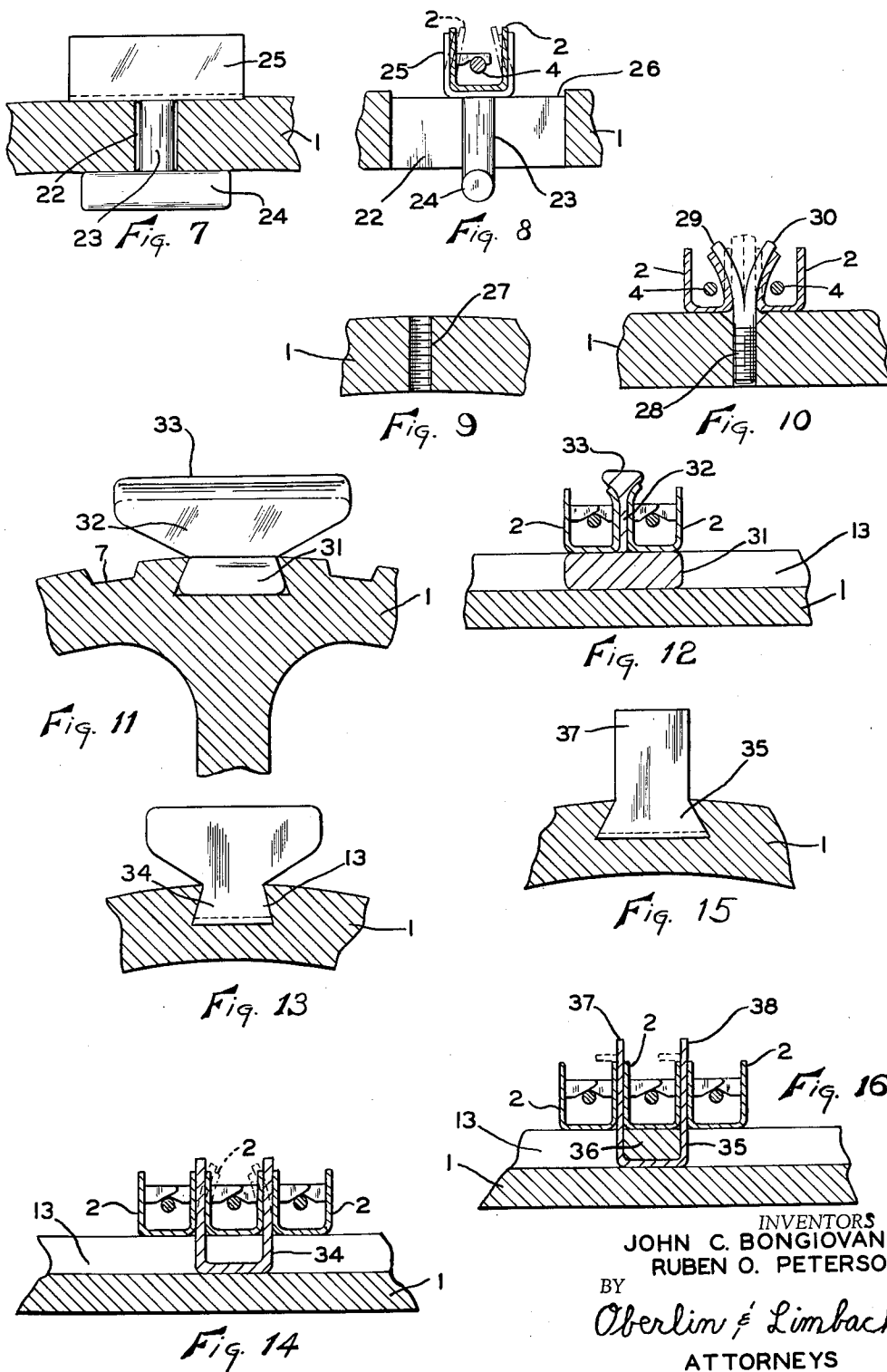
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REINFORCED BRUSH CONSTRUCTION

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5 Claims. (Cl. 15—182)

This invention relates as indicated to a reinforced brush construction, and more particularly to a power driven rotary brush adapted to be operated at high speed and to perform heavy work on continuously traveling metal strip and the like.

Cylindrical power driven rotary brushes have been developed for the purpose of brushing traveling metal strip such as steel and aluminum strip, for example, to remove scale and other oxides and materials therefrom and otherwise to benefitate the surface of the work, an improved form of brush for such purpose being disclosed in the co-pending patent application Serial No. 525,224 of John C. Bongiovanni, now Patent No. 2,921,328, filed July 29, 1955, for "Rotary Brush With Fluid Passages." Certain means for strengthening the brush construction are disclosed in the co-pending patent application of Brooks E. Nelson and Ruben O. Peterson, "Reinforced Rotary Brush," Serial No. 741,125, now Patent No. 2,977,622, filed June 10, 1958, and the reinforcing means of the present invention may be employed in conjunction with the devices and construction of such prior co-pending application. Rotary brushes of the type with which this invention is principally concerned may be some feet in length and also of quite large diameter so that when operated at high speeds of from, for example, 5,000 to 10,000 surface feet per minute the brush material is strongly subjected to the action of centrifugal force. We prefer to employ helically wound brush strip which may be of the general type described and shown in Peterson Patent 2,303,386 wound upon a cylindrical hub, and there may accordingly be a great many helical turns of brush strip between the respective ends of the latter where the strip is secured to the hub. Even though the brush strip may have been wound under considerable tension, there is nevertheless a pronounced tendency for the strip to bulge away from the supporting hub under the influence of centrifugal force when the brush is operated at high speeds and this, of course, results in uneven brushing pressures against the work, the brush strip is not directly supported by the hub in such bulged regions, and the carefully ground cylindrical brush face is no longer cylindrical. It is accordingly an important object of this invention to provide means for anchoring the turns of brush strip to the hub at points intermediate its ends in a manner to resist the effect of centrifugal force thereon.

Another object is to provide such anchoring means which will not appreciably affect the uniformity of the brush face.

Still another object is to provide such anchoring means which will be relatively inexpensive and adapted quickly to be put in place.

A further object is to provide anchoring means of a type and disposition which will not cause imbalance of the brush about its axis of rotation.

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.

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In said annexed drawing:

FIG. 1 is a side view of a cylindrical power driven rotary brush reinforced in accordance with our invention, a portion being broken away better to disclose the internal construction thereof;

FIG. 2 is an end view of the brush of FIG. 1 likewise partly broken away better to disclose the internal construction thereof;

FIG. 3 is a fragmentary transverse section through the cylindrical shell of the brush hub showing one means of anchoring a turn of brush strip to the hub.

FIG. 4 is a section through the brush strip and anchoring means taken on the line 4—4 on FIG. 3;

FIG. 5 is a view similar to FIG. 4 but showing a somewhat modified form of anchoring means with special provision for welding the brush strip back thereto;

FIG. 6 is a fragmentary detail view showing a preferred form of anchoring means (as in FIGS. 1 and 2 but on a larger scale) in accordance with our invention;

FIG. 7 illustrates another embodiment utilizing a slot through the hub shell rather than a keyway therein;

FIG. 8 is a view longitudinally through such slot taken at right angles to FIG. 7;

FIGS. 9 and 10 illustrate yet another means for anchoring two adjacent turns of brush strip to the hub;

FIG. 11 shows a further anchoring means adapted to engage and secure two adjacent turns of brush strip, such anchoring means being fitted in a keyway;

FIG. 12 is a section transversely of FIG. 11 showing the manner in which such anchoring means engages the brush strip channel back;

FIG. 13 shows yet another form of anchoring means of heavy sheet metal secured in a keyway in accordance with our invention;

FIG. 14 is a view transversely of FIG. 13 showing how such anchoring means is adapted to secure a single turn of brush strip;

FIG. 15 shows another form of anchoring means held in a keyway slot in accordance with our invention, such anchoring means being somewhat similar to that of FIG. 6 comprising a composite assembly of a sheet metal element and a reinforcing metal block; and

FIG. 16 is a view taken at right angles to FIG. 15 and showing the manner in which the sheet metal component of the assembly is adapted to engage and anchor two adjacent turns of brush strip.

Referring now more particularly to such drawing, the rotary brush of FIGS. 1 and 2 may comprise a cylindrical hub 1 of the general type disclosed in Bongiovanni application Serial No. 525,224 on which brush strip of the general type disclosed in Peterson Patent 2,303,386 may be helically wound, such brush strip having a sheet metal channel back 2 within which a layer of brush material 3 is retained by doubling such material beneath an elongated retaining element such as wire or cable 4 which in turn is held in place within the brush back by means of teeth 5 and 6 punched in from the respective sides of the back. Adjacent turns of the brush strip may be slightly spaced apart by protuberances projecting outwardly from one side of the channel back as shown and described in the aforesaid application of B. E. Nelson and R. O. Peterson Serial No. 741,125.

The surface of the cylindrical hub 1 which may, for example, be of aluminum may desirably be provided with a plurality of long lead helical grooves such as 7 to assist in conducting cooling air to the brush strip from the interior of the hub which is connected with such grooves by a plurality of passages (not shown). Annular end plates or rings 8 and 9 may be mounted on the hub in close lateral engagement with the respective end turns of the helically wound brush strip, such rings being provided with offsets to conform to the helical disposition of the

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brush strip. The rings may be secured to the hub by means of setscrews, for example, and their outer side faces may be drilled as at 10 when subsequently balancing the finished brush on a balancing machine, this being a conventional procedure. Supplementing such rings are inner sheet metal rings 11 and 12 abutting against and conforming to the respective inner faces of heavy end plate rings 8 and 9. Such sheet metal rings 11 and 12 are provided with inwardly projecting teeth (not shown) lying in radial planes adapted to penetrate the brush bristle material 3 and closely overlie the adjacent lip of the end turn of the brush strip back. Such end plates and toothed brush strip retaining rings are not per se novel and do not themselves constitute a part of this invention.

Before winding the brush strip on the cylindrical hub, the surface of the hub may be coated with adhesive such as a thin layer of epoxy resin composition which may be heated and cured after the brush strip has been mounted thereon. Such adhesive affords a very strong bond between the channel back of the brush strip and the cylindrical surface of the hub supplementing the other reinforcing means employed. Such adhesive, of course, does not block the ventilating grooves 7 nor prevent outward flow of air between the turns of brush strip in the regions where the brush strip back bridges such grooves.

Referring now also to FIGS. 4-5 of the drawing, the embodiments there illustrated utilize a pair of diametrically opposite keyways 13 and 14 milled in the outer surface of cylindrical hub 1 parallel to the axis thereof and of greater depth than the helical ventilating grooves 7. As shown in FIGS. 3 and 4, solid metal keys such as 15 may be inserted in such keyways and slid therealong to pre-selected positions lengthwise of the brush where they are welded to the sheet metal brush strip back 2 as at 16, the winding of the brush strip on the hub being stopped briefly for performance of such welding operations. The FIG. 5 embodiment closely resembles that of FIGS. 3 and 4, but the key 17 is provided with a step or recess 18 to receive the weld metal in a manner avoiding undue spacing of the next adjacent turn of brush strip when such is subsequently wound upon the hub.

The FIG. 6 form of the invention is the same as that also shown on a smaller scale in FIGS. 1 and 2. It comprises a key portion formed of the solid metal member 19 having a sheet metal strip 20 wrapped thereabout to bring the outer surface of the key portion proper substantially flush with the outer peripheral surface of hub 1. Such sheet metal strip 20, however, also extends outwardly between adjacent turns of brush strip, and its outer end portion 21 is upset and bent over the outer edge of the sheet metal channel back 2 of an adjacent turn of brush strip wound upon the hub. As shown in FIG. 1, a plurality of such anchoring members may be secured in keyways 13 and 14 as appropriate intervals therealong.

Instead of utilizing a keyway for the anchoring means as above described, a plurality of elongated slots such as 22 may be formed in the cylindrical shell of hub 1 through which brush strip anchoring means may be inserted and secured rather in the manner of cuff links. Such anchoring means comprise a shank portion 23 having a crossbar 24 at one end. To the other end is welded a sheet metal channel 25 adapted closely to receive and embrace the sheet metal channel form brush strip back 2 as indicated in FIG. 8. The outer surface of hub 1 will be slightly recessed as at 26 to compensate for the thickness of the bottom portion of channel 25 so that brush strip back 2 will not be raised from the outer surface of hub 1. The crossbar 24 and shank 23 are, of course, inserted through slot 22 with such crossbar in alignment therewith, and the device is then turned 90° into the position shown in FIGS. 7 and 8. In such position, the device firmly engages the inner and outer surfaces of the cylindrical shell of the hub 1 but is nevertheless adapted to be adjustably positioned longitudinally of slot 22 in order properly to engage a selected turn of the brush strip back. With the brush

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strip back closely fitted within channel portion 25, the sides of the latter are indented or pinched in as indicated in dotted line in FIG. 8 firmly to grip the brush strip back in this region and anchor the same against outward movement.

In FIGS. 9 and 10, a somewhat different form of anchoring means is illustrated. Holes such as 27 are drilled and tapped in cylindrical shell 1 at desired intervals and a threaded pin such as 28 is secured in each such hole intermediate adjacent turns of brush strip. The outer end of pin 28 is split as shown and the split end portions 29 and 30 may be spread apart by appropriate wedge means to indent and overlie the adjacent side edges of sheet metal channel backs 4 of the two adjacent turns of brush strip.

In FIGS. 11 and 12, there is shown a solid metal key 31 adapted to be fitted and adjustably located in the keyways 13 and 14, such key having a radially outwardly extending web portion 32 and an outer laterally flaring head portion 33 (somewhat like a railroad rail) adapted to flange over and overlie the outer edge portions of sheet metal channel back 2 of adjacent turns of the brush strip, thereby holding such turns against outward movement under the influence of centrifugal force.

The form of the invention illustrated in FIGS. 13 and 14 likewise comprises a key member adapted to fit within a keyway such as 13 and 14, such key comprising a U-shaped element 34 of relatively heavy gauge sheet metal which is necked to fit the keyway but then flares as shown in FIG. 13 to embrace a turn of the brush strip back 2 along a substantial longitudinal portion of the latter. The outwardly extending side portions of U-shape member 34 may then be indented or pinched in similarly to deform the respective sides of sheet metal channel back 2 as shown in FIG. 14 to secure the latter against outward movement (and incidentally against shifting circumferentially of the hub).

The form of the invention shown in FIGS. 15 and 16 is somewhat similar to that of FIGS. 13 and 14, the U-shape member 35, however, being reinforced by a solid inner metal key portion 36. While the outwardly extending side portions 37 and 38 of member 35 may be pinched together in the same general manner as that shown in FIG. 14, they may alternatively be upset as shown in FIG. 16 to overlie side edge portions of two adjacent turns of the sheet metal brush strip back 2. Also, side portions 37 and 38 may, if desired, be upset in opposite directions away from each other thus to engage and secure the channel backs of brush strip turns spaced apart by the intervening turn embraced by member 35.

It will be understood, of course, that the anchoring means of this invention will ordinarily be supplemental to various other means utilized to secure the extreme end turns of the helically wound brush strip to the hub. Thus, as shown in FIGS. 1 and 2, the extreme end portion of the brush strip back may be devoid of brush material and firmly clamped to the hub by means of U-bolt 39. Additionally, the ends of cable 4 may be passed through apertures in the hub and secured to anchors such as 40 internally thereof.

The anchoring means of this invention are particularly useful when incorporated in cylindrical power driven rotary brushes adapted to be driven at high speed and which brushes are of considerable length, the brush material being mounted on the long cylindrical hub in the form of brush strip helically wound thereon. Certain advantages of the invention may, however, also be obtained when single annular turns or rings of brush strip, or annular brush sections are mounted on the hub with or without spacer means intermediate adjacent sections.

A wide variety of brush material may, of course, be employed, including crimped steel wire, nylon coated wire, nylon coated glass fiber, Tampico fiber, and buff fabrics and the like. As many of our new anchoring elements as are required for the particular conditions of use may be

employed, and such devices may be spaced as close together or as far apart as is found advisable under such circumstances. The number of keyways and the arrangement of the anchoring means may be varied as desired, but it is desirable that they be arranged in a manner substantially to balance one another for smooth vibrationless rotation of the brush at high speeds in use. The mass of the elements is, however, small in relation to the rest of the brush, and precise balancing is not required as this may be done when drilling the holes 10 in balancing rings 8 and 9.

By utilizing anchoring means keyed in the dovetail keyways, such anchoring means may be positioned therealong exactly where required to engage and hold an adjacent turn of the brush strip back. In some cases, it may be desired to utilize only one such anchoring means substantially midway of the length of the brush, and on other occasions it may be desired to employ a number of such anchoring means at intervals along the keyway, even adjacent the respective ends of the helically wound brush strip. As will be apparent from the foregoing description, a single anchoring means may be employed to engage one side of an adjacent turn of the brush strip back, or both sides of such back, or one side of each of two adjacent turns of the brush element back. It will be noted that the various types of anchoring means disclosed are adapted to be removed from the brush hub without damaging the latter so that the hub may be repeatedly reused with new brush strip mounted thereon.

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.

We therefore particularly point out and distinctly claim as our invention:

1. In a power driven cylindrical rotary brush having a cylindrical hub adapted to be mounted on a drive shaft or the like, and a plurality of helical turns of a brush element back seated on said cylindrical hub with brush material secured therein and extending generally radially outwardly therefrom; a dovetail keyway extending longitudinally in the outer cylindrical surface of said hub, and local anchoring means for said brush element interengaged in said keyway and at least partially overlying said back of said element in the same local region to prevent the latter from bulging away from the supporting surface of said hub under the influence of centrifugal force, said anchoring means comprising a key portion formed of a solid metal member and a sheet metal strip wrapped thereabout and extending outwardly between adjacent turns of said brush element back, its outer end portion being upset and bent over an adjoining outer edge of said back.

2. In a power driven cylindrical rotary brush having a cylindrical hub adapted to be mounted on a drive shaft or the like, and a plurality of helical turns of a brush element back seated on said cylindrical hub with brush material secured therein and extending generally radially outwardly therefrom; a dovetail keyway extending longitudinally in the outer cylindrical surface of said hub, and local anchoring means for said brush element interengaged in said keyway and at least partially overlying said back of said element in the same local region to prevent the latter from bulging away from the supporting surface of said hub under the influence of centrifugal force, said anchoring means comprising a key portion formed of a solid metal member and a sheet metal strip wrapped thereabout with its two end portions extending outwardly from said keyway on the respective sides of a turn of said brush element, the extreme outer

ends of said outwardly extending portions being over outer edges of said brush element back.

3. In a power driven cylindrical rotary brush having a cylindrical hub adapted to be mounted on a drive shaft or the like, and a plurality of helical turns of a brush element back seated on said cylindrical hub with brush material secured therein and extending generally radially outwardly therefrom; a dovetail keyway extending longitudinally in the outer cylindrical surface of said hub, and local anchoring means for said brush element interengaged in said keyway and at least partially overlying said back of said element in the same local region to prevent the latter from bulging away from the supporting surface of said hub under the influence of centrifugal force, said anchoring means comprising a key portion formed of a solid metal member and a sheet metal strip wrapped thereabout with its two end portions extending outwardly from said keyway on the respective sides of a turn of said brush element, the extreme outer ends of said outwardly extending portions being bent over outer edges of different turns of said brush element back.

4. In a power driven cylindrical rotary brush having a cylindrical hub adapted to be mounted on a drive shaft or the like, and a plurality of helical turns of a brush element back seated on said cylindrical hub with brush material secured therein and extending generally radially outwardly therefrom; a dovetail keyway extending longitudinally in the outer cylindrical surface of said hub, and local anchoring means for said brush element interengaged in said keyway and at least partially overlying said back of said element in the same local region to prevent the latter from bulging away from the supporting surface of said hub under the influence of centrifugal force, said anchoring means comprising a key portion formed of a U-shape sheet metal member fitting in said keyway with the two arms of such U extending radially outwardly therefrom and embracing a turn of said brush element back, the end portions of said arms gripping and holding said back.

5. In a power driven cylindrical rotary brush having a cylindrical hub adapted to be mounted on a drive shaft or the like, and a plurality of helical turns of a brush element back seated on said cylindrical hub with brush material secured therein and extending generally radially outwardly therefrom; a dovetail keyway extending longitudinally in the outer cylindrical surface of said hub, and local anchoring means for said brush element interengaged in said keyway and at least partially overlying said back of said element in the same local region to prevent the latter from bulging away from the supporting surface of said hub under the influence of centrifugal force, said anchoring means comprising a key portion formed of a U-shape sheet metal member fitting in said keyway with the two arms of such U extending radially outwardly therefrom and embracing a turn of said brush element back, the end portions of said arms gripping and holding said back, and said arms being of greater extent circumferentially of said hub than the width of said keyway.

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