ANNULAR BRUSH ELEMENT

Brooks E. Nelson, Chagrin Falls, Ohio, assignor to The Osborn Manufacturing Company, Cleveland, Ohio, a corporation of Ohio

Application May 21, 1954, Serial No. 431,483

10 Claims. (Cl. 15—181)

This invention relates as indicated to an annular brush element, and more particularly to a strong and rigid but lightweight annular brush element utilizing circularized lengths of brush strip.

In Patent No. 2,303,386 to Ruben O. Peterson, there is disclosed a form of brush strip which has proven particularly satisfactory for circularization as by winding on a mandrel or the like to form annular brush elements which may comprise, for example, but a single turn of the brush strip or a plurality of helically wound turns supported on an appropriate hub or arbor and usually held between end flanges or clamping plates. While brush strip as thus disclosed in such patent is considered to be particularly suitable for use in accordance with my invention, there are, of course, a number of other forms of commercially available brush strip which may likewise be employed.

There is a considerable demand for relatively narrow brush sections, and particularly brush sections of a size which may be formed of a single turn of brush strip with the two ends of the turn directly opposed. It is, of course, necessary to support and mount such turn very securely so that it will retain its exact circular conformation even when rotated at high speeds, and there has accordingly been a tendency to employ relatively heavy and bulky hub structures and the like for this purpose. Such mounting means have been not only relatively expensive but clumsy to handle, ship and install, and have enforced certain limitations in the use and arrangement of the brushes on power driven arbors and in machines.

It is accordingly a principal object of my invention to provide a novel annular brush element which may be relatively narrow in width, comprising for example but a single turn of brush strip, and in which such brush strip will be very securely and accurately retained.

Another object is to provide brush strip retaining means which is very light and thin, and inexpensive of manufacture, but which when assembled with the brush strip will afford a rigid unitary structure.

Still another object is to provide an annular brush element in which circularized brush strip is employed and securely retained without employment of welding or otherwise specially securing the extreme ends of the strip.

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 drawings forming part of this disclosure 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 a side view of an annular rotary brush embodying my invention, broken away in part better to disclose the internal construction of the same;

Fig. 2 is a plan view of a strip of sheet material in process of being formed for employment as the brush strip mounting means;

Fig. 3 is a transverse section taken on the line 3—3 on Fig. 2;

Fig. 4 is a view similar to Fig. 2 but showing a somewhat modified construction;

Fig. 5 is a fragmentary side view of an annular brush element similar to that of Fig. 1 but utilizing the strip material of Fig. 4;

Fig. 6 is a transverse section taken through an annular brush element in accordance with my invention utilizing two turns of circularized brush strip such as is shown in Figs. 4 and 5;

Fig. 7 is a transverse section through an annular brush element in accordance with my invention utilizing the retaining means of Figs. 4 and 5 but a somewhat different form of brush strip;

Fig. 8 corresponds to Fig. 7 but illustrates the employment of still another form of brush strip;

Fig. 9 is a transverse section taken on the line 9—9 on Fig. 1; and

Fig. 10 is a section taken on the line 10—10 on Fig. 1.

Referring now more particularly to the drawing, I may continuously longitudinally advance a thin flat strip or ribbon 1 of sheet metal through a punch press by means of which a series of circular notches 2 may be punched in the respective edges of the strip, such notches in the respective edges being opposite one another as shown in Fig. 2. In other words, openings are punched in the strip so close to the respective edges of the latter that they break through such edges, leaving opposed pointed portions 3 where the circular openings thus break through. In a subsequent operation, such pointed portions are turned up in the same direction to form upstanding teeth 4, at the same time opening out the notches so that they are now of general U-shape conformation.

As shown in Fig. 1, a length of brush strip, preferably of the type disclosed in Peterson Patent 2,303,386, may be circularized to form a single turn, such brush strip comprising a sheet metal channel form back 5 with the brush material 6 retained therein by means of a wire 7 or like elongated retaining element. Such wire is secured in place by means of teeth 8 punched in from the respective channel sides in the manner taught in such Patent 2,303,386 (see also Fig. 6). The sheet metal sides of the channelform back 5 may be somewhat pinched together at the abutting ends 9 and 10 to prevent the escape of adjacent bristles.

A length of metal strip punched and deformed as described above is now likewise circularized and the opposed ends welded together as at 11 to form a cylindrical annulus adapted to seat the inner periphery of the turn of brush strip with the latter mounted centrally of the transverse dimension of the strip 1. Such strip 1 is of considerably greater width than the transverse dimension of the channelform back 5 of the turned brush strip, and the side portions of strip 1 are now turned up and radially outwardly as illustrated in Fig. 1 so that the teeth 4 closely overlie and engage the radially outer edges 12 of the sheet metal channelform back 5 of the brush strip. The under-edges of such teeth 4 are, of course, curved, and this assists their action in camming down the brush strip back into snugly fitting engagement of its inner periphery with the central portion of the circularized mounting strip 1. If desired, such teeth 4 may be dimensioned slightly to indent the outer edges 12 of the brush strip back.

It will be noted that the notches 2 may extend quite deeply radially of the finished assembly, this having several advantages. Such deep notches greatly reduce the stretching required of the metal of strip 1 when forming the latter to embrace the turn of brush strip, and there is consequently no tearing. The curved U-shape of such
notches further assists in distributing forming stresses, and there is accordingly no danger of tearing when the strip is deformed. The deep notches 2 additionally assist in facilitating the radial flow of cooling air during high speed rotation of the brush. As seen in Figs. 1 and 5, the circularized mounting strip 1 in its initial form comprises an annulus seating the inner periphery of the brush strip back and having integral radially extending end portions circumferentially continuously embracing the sides of the brush strip back in a region spaced radially inwardly from the outer edges of the brush strip back, thereby forming a relatively shallow annular channel. Now referring more particularly to Figs. 4 and 5 of the drawing, a sheet metal strip 13 similar to strip or ribbon 1 is here shown with apertures or notches 14 punched therein similarly to notches 2 but arranged in staggered or offset relationship instead of diametrically opposite each other. The opposed pointed edge portions 15 are turned up to form teeth 16 corresponding to teeth 4, and when such strip is circularized to form an annulus, the side portions of the strip may be turned in with such teeth engaging the edges 12 of the brush strip back 5 (Fig. 5). The teeth 16 are, of course, staggered relative to each other rather than opposed, and this arrangement is sometimes preferred wherein the teeth are relatively elongated to the transverse dimension of the brush strip being held.

Figure 6 illustrates an assembly similar to that of Fig. 1 but with two separate circular turns of brush strip mounted side-by-side on the annulus with the axially outer edges of the brush strip backs 5 secured beneath the teeth 4. A flat sheet metal annulus 47 will desirably be interposed between the two lengths of brush strip and closely fitting the annular supporting strip 1 with teeth 18 projecting in both directions to overlie the adjacent inner side edges of the two turns of brush strip.

In Fig. 7 I show an assembly similar to that of Fig. 5 but one wherein the wire 7 securing the bristle material 6 within the brush back 19 is held in place by opposed dimples 20 formed in the brush strip channel sides. The modification of Fig. 8 is likewise similar to that of Fig. 5, but in this case the retaining wire 7 is held in place by means of a constricted pressure neck 21 of the channel-form brush back. Figure 9 is a transverse section on the line 9—9 on Fig. 1 and shows the opposed teeth 4 closely overlying the edges of the channel-form sheet metal back 5. It is, of course, readily apparent that a variety of different brush materials may be employed such as Tampico fiber, metal wire, cord, horsehair, synthetic plastic strands and filaments, plastic coated wire, plastic coated glass fiber strands, and the like. Similarly, the mounting strips 1 and 13 may be of a variety of different metals such as steel, copper, brass, and aluminum, and in some cases even of certain synthetic plastics, the thermostetting plastics being preferred. While the brush construction will ordinarily be as shown with the bristle material 6 extending substantially radially outwardly, it will likewise be appreciated that the assembly may be somewhat copped if desired, in well-known fashion. It is very much preferred that the opposed ends of the strips 1 and 13 defining the inner annulus be firmly joined together as by welding, but it is possible to produce an operative assembly with such opposed ends of the inner strip unjoined, particularly if their point of assembly is substantially diametrically opposite to the point where the opposed ends of the brush strip about.

It will be seen that the stamping can be made from a single length of metal ribbon of suitable thickness and width. Two main operations, one of blanking and forming the edge details and the other of circularizing and joining the edges of the ribbon to form an annulus, prepare the parts for assembly. The single turn of brush strip is then placed over the cylindrical annulus and the latter flared and flat pressed to embrace such turn as above described. Of course, various known types of annular brush elements may be similarly mounted and such elements need not necessarily be formed of a length of brush.

strip although there are special advantages when such is the case. The portions of the mounting strip intermediate the notches are in effect radially extending arms with fingers at their ends gripping the brush strip and firmly holding the latter. The completed annular brush secures the brush unit, one or more of which may be mounted between the usual clamping plates, as desired. Both principal components lend themselves readily to automatic high speed production.

While the notches 2 might extend the entire depth of the annulus sides, the fact that the latter form a continuous although relatively shallow channel adds considerably to the strength and rigidity of the assembly. The teeth on the side extensions in between the notches readily penetrate the brush material to overlie and engage the outer periphery of the brush strip back portion. The exact shapes of the notches and teeth may obviously be varied considerably as desired. For some annular brushes, it is desirable to extend these teeth to three-fourths the radial extent of the brush strip back portion 5 (see Fig. 1) so that such back is well seated but excessive stretching of the notches also avoided.

While the principle of my invention is particularly adapted to the manufacture of relatively narrow brush units utilizing, for example, a single turn of brush strip, an annular brush element may be employed comprising two or more helical turns of brush strip and a supporting sheet metal annulus of appropriate width.

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. As a new article of manufacture, an annular brush element comprising a single circular turn of a length of brush strip having a continuous elongated channel back portion with brush material retained therein and extending generally radially outwardly of such turn, the two ends of such length of brush strip being directly opposed to each other; and a sheet metal annulus seating the inner periphery of said turn of brush strip, said annulus being of shallow channel form rigidly the sides of such channel embracing the sides of said brush strip back portion, circumferentially spaced extensions of said channel-form annulus extending radially beyond said back portion of said turn of brush strip, and inwardly directed teeth on said ends penetrates said brush material and closely overlying and engaging the channel edge portions of said back portion of said brush strip.

2. As a new article of manufacture, an annular brush element comprising a single circular turn of a length of brush strip having a continuous elongated channel back portion with brush material retained therein and extending generally radially outwardly of such turn, the two ends of such length of brush strip being directly opposed to each other; and a sheet metal annulus seating the inner periphery of said turn of brush strip, said annulus having radially outwardly extending end portions embracing the sides of said brush strip back portion and extending radially therefrom, and inwardly directed teeth on said end portions penetrating said brush material and closely overlying and engaging the channel edge portions of said back portion of said brush strip, said end portions of said annulus having a series of circumferentially spaced notches in their radially outer edge portions, such notches extending part way only toward the inner periphery of said annulus.
3. As a new article of manufacture, an annular brush element comprising a single circular turn of a length of brush strip having a continuous elongated channel back portion with brush material retained therein and extending generally radially outwardly of such turn, the two ends of such length of brush strip being directly opposed to each other; and a sheet metal annulus seating the inner periphery of said turn of brush strip, said annulus having radially outwardly extending end portions embracing the sides of said brush strip back portion and extending radially therefrom, and inwardly directed teeth on said end portions penetrating said brush material and closely overlying and engaging the channel edge portion of said back portion of said brush strip, said end portions of said annulus having a series of circumferentially spaced notches in their radially outer edge portions, such notches extending part way only toward the inner periphery of said annulus but extending radially inwardly of the outer periphery of said brush strip back portion and being of arcuate contour at their inner ends.

4. As a new article of manufacture, an annular brush element comprising a brush member having an annular outer channel back with brush material extending generally radially outwardly therefrom; and a sheet metal annulus seating the inner periphery of said back, integral radially extending end portions on said annulus circumferentially continuously embracing the sides of said channel back, and teeth on said end portions projecting into said brush material and closely overlying the outer periphery of said back.

5. As a new article of manufacture, an annular sheet metal brush element comprising a brush member having a split annular back of U-shape cross-section with brush material extending generally radially outwardly therefrom; and a sheet metal annulus seating the inner periphery of said back, integral radially extending end portions on said annulus circumferentially continuously embracing the sides of said back, and teeth on said end portions projecting into said brush material and closely overlying the outer periphery of said back.

6. As a new article of manufacture, an annular brush element comprising a brush member having an annular back with brush material extending generally radially outwardly therefrom; and a sheet metal annulus forming a unitary continuous radially outwardly opening channel seating the radially inner portion of said back, arms extending radially from the sides of said channel embracing the sides of said back, and teeth on said arms projecting into said brush material and closely overlying the outer periphery of said back, said teeth lying in radial planes parallel to the brush axis for rigidly and bodily penetration of the brush material.

7. As a new article of manufacture, an annular brush element comprising a plurality of axially aligned brush members having annular backs of the same diameter with brush material extending generally radially outwardly therefrom; and a sheet metal annulus seating the inner peripheries of said backs, integral radially extending end portions on said annulus continuously embracing the endmost sides of said backs, teeth on said end portions projecting into said brush material and closely overlying the outer peripheries of the endmost said backs, a flat sheet metal annulus interposed between adjacent said backs and fitting said first sheet metal annulus, and teeth on said flat annulus projecting laterally closely over the outer peripheries of the adjacent brush backs.

8. As a new article of manufacture, an annular brush element comprising a plurality of turns of a length of brush strip having a continuous elongated back portion with brush material retained therein and extending generally radially outwardly of such turns; and a sheet metal annulus seating the inner peripheries of said turns of brush strip, said annulus being of unitary shallow channel form with the sides of such channel embracing the radially inner portions only of the sides of said brush strip back portion, circumferentially spaced extensions of said channelform annulus extending radially beyond said back portion of said turn of brush strip, and inwardly directed teeth on said extensions penetrating said brush material and closely overlying and engaging said back portion of said brush strip.

9. As a new article of manufacture, an annular brush element comprising a plurality of turns of an elongated brush back with brush material extending generally radially outwardly therefrom; and a sheet metal annulus seating the inner periphery of said back, integral radially extending end portions on said annulus circumferentially continuously embracing the sides of said back, and teeth on said end portions projecting into said brush material and closely overlying the outer periphery of said back.

10. As a new article of manufacture, an annular brush element comprising a brush member having an annular outer channel back with brush material extending generally radially outwardly therefrom; and a sheet metal annulus seating the inner periphery of said back, integral radially extending end portions on said annulus circumferentially continuously embracing the sides of said channel back in a region spaced radially inwardly from the radially outer edges of said channel back only, thereby forming a relatively shallow annular channel receiving said annular brush element, a plurality of circumferential spaced radially extending arms on said respective end portions, and projections on said arms overlying the outer peripheral edges of said channel back.

References Cited in the file of this patent

UNITED STATES PATENTS

1,339,894 Johnson May 11, 1920
1,922,752 Volger Aug. 15, 1933
1,960,487 Frost May 29, 1934
2,349,643 Wesemeyer May 23, 1944
2,525,947 Rose Oct. 17, 1950