July 7, 1964 B. E. NELSON ETAL 3,139,642

TWISTED TUFT ROTARY BRUSH

Filed May 3, 1961

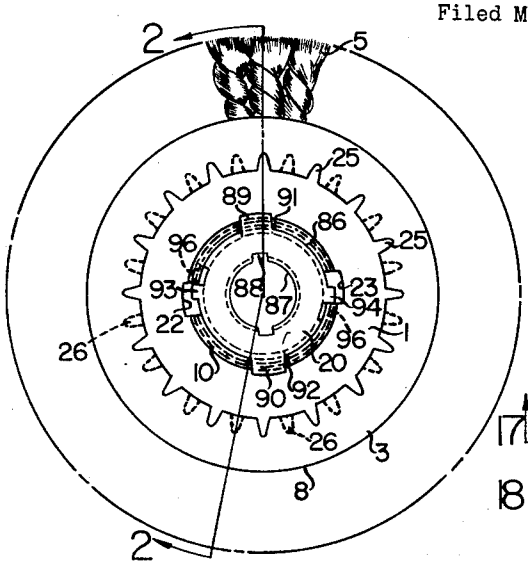


FIG 1

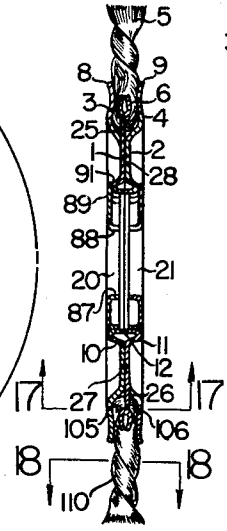


FIG 2

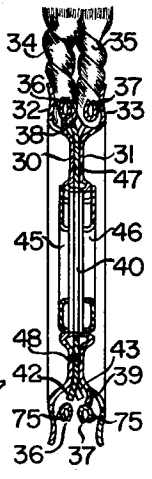


FIG 3

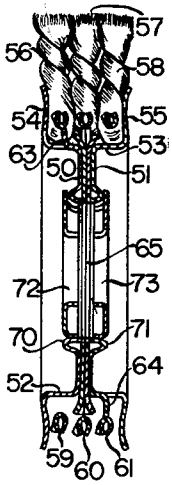


FIG 4

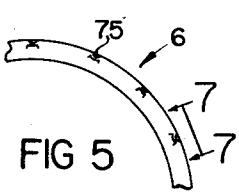


FIG 5

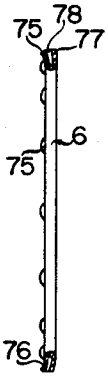


FIG 6

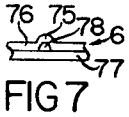


FIG 7



FIG 18

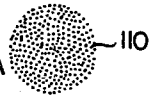


FIG 18A

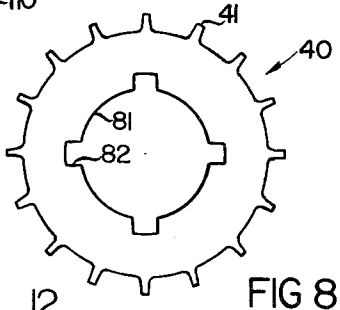


FIG 8

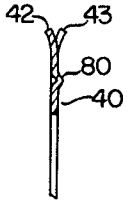


FIG 9

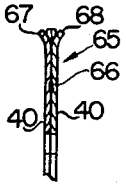


FIG 10

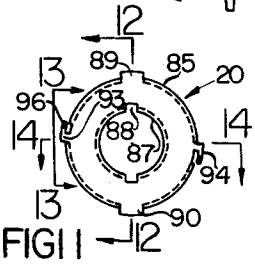


FIG 11

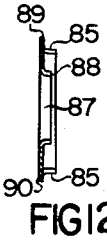


FIG 12

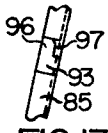


FIG 13

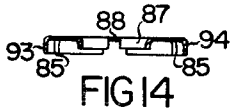


FIG 14

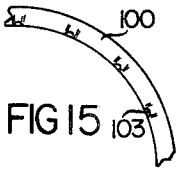


FIG 15

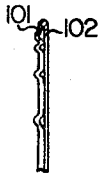


FIG 16

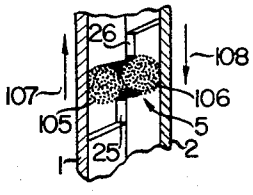


FIG 17

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Oberlin, Maky & Donnelly

ATTORNEYS

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3,139,642

TWISTED TUFT ROTARY BRUSH

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Filed May 3, 1961, Ser. No. 107,442
28 Claims. (Cl. 15—198)

This invention relates generally, as indicated, to a twisted tuft rotary brush and more particularly to a novel brush construction employing a twisted tuft and method of assembly thereof.

It is difficult to manufacture and assemble twisted tuft rotary brushes in that the bases of the knots cannot generally be held compressed into a solid equally distributed uniformly oriented mass of wire loops. For example, if the base loops of fill wires are restricted within a retaining hole or aperture, they are not readily distributed by mass compression so that each wire loop absorbs an equal portion of the total load. Base loops that are restricted within a hole must absorb the total compression as a bundle of wires through a limited area of contact at the center disk and the center support. Accordingly, wire loops held by a U-shape retaining ring without the loops passing through holes or apertures have been found to provide a much improved brush construction.

However, it is difficult to ensure that the knot bases be equally spaced radially as well as circumferentially of the brush and that they be clamped in the face plates of the brush so that the pressure exerted by the plates will tend to open the knot rather than to close it. The compactness, density and uniformity of the bristle material are, of course, factors which govern the life and performance of a brush. Laboratory and field tests show superior performance ratios with the brushes of the present invention cutting much faster, perhaps at the rate of 4 to 1 over ordinary brushes and on difficult jobs the subject brushes require substantially less pressure than otherwise needed. This reduction in pressure increases the fatigue life of the brush.

It is accordingly a principal object of the present invention to provide a novel brush construction providing a brush of superior performance and life characteristics.

It is another main object to provide a novel brush construction and method of assembly producing such superior brushes.

It is another main object to provide a rotary brush which can readily be employed on different size arbors in fast start and stop operations.

It is a further object to provide a rotary brush adapter which permits fast start or stop operations in either direction of rotation.

It is still another object to provide a unique brush retaining ring, face plate, and a brush supporting plate in a rotary brush construction.

Other objects and advantages of the present invention will become apparent as the following description proceeds.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawings 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 principles of the invention may be employed.

In said annexed drawing:

FIG. 1 is an end elevation of a brush in accordance with the present invention;

FIG. 2 is a diametrical section of the brush of FIG. 1 taken substantially on the line 2—2 of FIG. 1;

FIG. 3 is a modified form of the brush of FIG. 1 employing two brush sections;

FIG. 4 is a further modification of such brush employing three brush sections;

FIG. 5 is a fragmentary view of one form of tuft retaining ring that may be employed with the present invention;

FIG. 6 is a diametrical section of the retaining ring of FIG. 5;

FIG. 7 is an enlarged fragmentary view of such retaining ring taken substantially on the line 7—7 of FIG. 5;

FIG. 8 is an end view of a spacing plate that may be employed with the present invention;

FIG. 9 is a fragmentary transverse section of such spacing plate;

FIG. 10 is a fragmentary transverse section of another form of such spacing plate in which two may be joined and deformed for employment, for example, with the brush embodiment of FIG. 4;

FIG. 11 is an end elevation of an adapter in accordance with the present invention;

FIG. 12 is a diametrical transverse section of such adapter taken on the line 12—12 of FIG. 11;

FIG. 13 is a detail view of such adapter taken substantially on the line 13—13 of FIG. 11;

FIG. 14 is a diametrical section of such adapter taken on the line 14—14 of FIG. 11;

FIG. 15 is a fragmentary view of another form of bristle retaining ring in accordance with the present invention;

FIG. 16 is a fragmentary transverse section of such ring;

FIG. 17 is a fragmentary detail sectional view taken substantially on the line 17—17 of FIG. 2 illustrating how rotation of the face plates in opposite directions tends to close the base or loop of the knot of the bristle tufts during the assembly of the brush of the present invention;

FIG. 18 is a similar sectional view of the knot of a tuft taken substantially on the line 18—18 of FIG. 2 showing the knot prior to rotation of the face plates; and

FIG. 18A is a sectional view of the same knot showing how the knot is opened by rotation of the face plates.

Referring now more particularly to the brush illustrated in FIGS. 1 and 2, it will be seen that the brush therein illustrated comprises face plates **1** and **2** which bulge outwardly as shown at **3** and **4** to enclose a series of bristle knots **5** of the twisted tuft type, the bases of which are wrapped around a retaining ring **6** within the enlarged portion provided by the bulges **3** and **4** of the face plates **1** and **2**. The peripheral edges of the face plates **1** and **2** are rebent slightly outwardly as shown at **8** and **9** to avoid presenting any sharp edges to the bristle fill material which might cause nicks or scratches which could result in wire bristle fill material fracture.

The inner annular edges of the face plates **1** and **2** are rebent as shown at **10** and **11** and abut as shown at **12** in a cylindrical surface extending axially of the axis of rotation of the brush. Each of the face plates is provided with an adapter **20** and **21** respectively which may be inserted into or removed from the arbor hole formed by the inner edges of the face plates. Key slots **22** and **23** may be cut through the rebent or bead portions **10** and **11** of the inner edge of the face plates so that the brush may readily be keyed on the arbor of a brush lathe or the like.

The bases of the outwardly bulging portions **3** and **4** of the face plates **1** and **2** which enclose the knots of

the bristle tufts are each provided with an annular series of indentations or teeth as shown at 25 and 26 respectively. The teeth even though punched inwardly of the face plates still project substantially radially outwardly. This series of teeth 25 and 26 engage certain of the knots 5 and prevent them from rotating about the retaining ring 6 within the U-shape retainer provided by the face plates. Additionally, the teeth 25 and 26 may project through the fill material and engage the bottom or inner periphery of the retaining ring 6 which thus ensures that the retaining ring will be properly centered in the assembled brush construction. This likewise ensures that each bristle knot will be equally radially spaced. It is noted that the teeth on each of the face plates are offset so that about the periphery of the brush, the teeth alternate from one face plate to the other. These offset or staggered teeth not only centrally support the retaining ring 6 in the assembled brush and thus ensure the proper radial positioning of the bristle knots, but they also assist in preventing the migration of the fill material circumferentially about the brush while in operation. When the brush is assembled as will hereinafter be more clearly described, the face plates may be firmly secured together as, for example, by spot welding as shown at 27 and 28.

In the double section brush shown in FIG. 3, the face plates 30 and 31 bulge outwardly substantially more than the bulges 3 and 4 in the FIG. 1 embodiment as shown at 32 and 33 to accommodate two side-by-side brush sections, each composed of bristle knots 34 and 35 and respective retaining rings 36 and 37.

The bases of the bulging portions 32 and 33 are each provided with a series of indentations or inwardly projecting teeth which are circumferentially offset from similar indentations in the opposed face plate. The teeth 39 in plate 31 may engage and center the retaining ring 37 and the teeth 38 in plate 30 may engage and center the retaining ring 36. The teeth 38 and 39 of the double section brush of FIG. 3 serve substantially the same purpose as the teeth in the FIG. 1 embodiment, i.e., to assist in the proper centering of the brush retaining rings 36 and 37 and to prevent migration of the fill material circumferentially about such rings and the brush during operation. To assist in this function there is provided a support ring 40 interposed between the plates 30 and 31 and provided with a series of equally circumferentially spaced radially outwardly projecting teeth 41 (see the detail view of FIG. 8). In the double section embodiment of FIG. 3, the teeth may be axially bent to be alternately offset in opposite axial directions so that adjacent teeth 42 and 43 will project in opposite directions (note the detail view of FIG. 9).

The laterally outwardly projecting teeth of the support ring of the double section embodiment provide a center support base for the two brush sections and it can readily be seen that the support ring when properly in position serves to center the brush section as well as to prevent the migration of the bristle material. Whereas the teeth 41 of the ring 40 may not directly engage the support rings in the FIG. 3 embodiment, they will cooperate with the series of teeth 38 and 39 in the face plates properly to support and engage the brush sections. Adapter plates 45 and 46 of a slightly larger transverse dimension than the plates 20 and 21 may be provided and the face plates 30, 31 and the support ring 40 may be welded together as shown at 47 and 48 to provide a unitary construction.

In the three brush section embodiment shown in FIG. 4, the face plates 50 and 51 are provided with axially extending portions 52 and 53 which are bent relatively sharply to form the radially extending side wall portions 54 and 55 which cooperate with the axially extending or base portions 52 and 53 to form a substantially U-shaped annular channel to receive the brush sections, each composed of an annular series of knots of twisted tuft bristle material 56, 57 and 58 which are twisted about respective retaining rings 59, 60 and 61. A series of circumferentially spaced teeth 63 are punched in from the axially extending portion 52 of the plate 50 and similarly a series of circumferentially spaced teeth 64 are punched inwardly from the axially extending portion 53 of the plate 51. Such teeth on the opposed plates are arranged to be circumferentially offset from each other and the teeth 64 may engage and center the retaining ring 61 while the teeth 63 may engage and center the retaining ring 59. Such teeth also prevent the migration of fill material circumferentially about the brush while in operation. In order properly to center and support the central brush section retaining ring 60, there is provided a supporting ring assembly shown generally at 65 and in detail in FIG. 10. Such supporting ring assembly may be comprised of two support rings 40 spot welded together as shown at 66 and having the teeth 41 thereof axially opposed. Alternate pairs of opposed teeth about the assembly 65 may then be bent outwardly as shown at 67 and 68 to approximately the same degree that the teeth 42 and 43 are bent outwardly in the FIG. 3 embodiment. The supporting ring assembly 65 serves to center the middle brush section including the retaining ring 60 and the teeth projections 67 and 68 will engage the fill material not only of the central brush section, but of the two outer brush sections to assist in preventing migration of the fill material. The supporting ring assembly 65 and the face plates 60 and 61 may then be welded together in the usual manner to form a unitary brush construction. The face plates 50 and 51 like the face plates 1, 2 and 30, 31 will be provided with the inner annular bead portions 70 and 71 which will accommodate adapter plates 72 and 73 as hereinafter described.

The bristle knot retaining ring for the brush sections in the three embodiments illustrated in FIGS. 2, 3 and 4 may be identical in form and such brush retaining ring is shown in detail in FIGS. 5, 6 and 7. Referring now to such FIGS. 5, 6 and 7, it will be seen that the retaining ring 6 is comprised of a longitudinally folded metallic ring of U-shaped cross-section with the folded or bight portion of the ring being inwardly directed. One side or leg only of the U-shape retaining ring is provided with a series of outwardly extending projections 75 with the maximum extent of such projections being on the outside diameter of the ring. The projections may be spaced so that a number of knots will fit therebetween. The ring 6 may be made by folding the strip of metallic material longitudinally and pressing the legs 76 and 77 thereof tightly together. The projections 75 may then be made by inserting a tool such as a pointed punch as shown at 78 while supporting the outside of the leg 77. The projections 75 on one side only of the retaining ring hold the knots in place circumferentially of the ring during manufacture as will hereinafter be described and also, in the finished brush, assist in preventing migration of the fill.

As seen in the detail views 8, 9 and 10, the supporting ring 40 may be provided with dimples 80 to assist in the proper assembly of the device and to locate the position for the weld joints between the supporting rings and the face plates. The inside diameter 81 of the supporting ring 40 will fit between the axially inwardly directed inner edges of the face plates to provide a continuous inside diameter or arbor hole for the assembled brushes. Keyways 82 may also be provided in the inside diameter which may be aligned with the keyways 22 and 23 when the brush is assembled.

Many of the brushes of the present type are employed in a reversing service where the brush is started in one direction, stopped quickly, and then started in reverse direction etc. Also, such brushes are generally arranged with an adapter system to preclude the necessity of stocking many arbor hole sizes. Adapters 20 and 21 of the

present invention (see FIG. 2) permit the use, for example, of a 2 inch basic arbor hole brush having a keyway on an arbor of a smaller size where keyways are required for the service involved. The adapters 20 and 21, as are the adapters 45, 46 and 72, 73, identical in form and only one such adapter plate is shown in detail in FIGS. 11, 12, 13 and 14. The adapter plate 20 includes an outer cylindrical surface 85 which conforms quite closely to the inside diameter of the arbor hole 86 (see FIG. 1) formed by the face plates 1 and 2. An inner cylindrical surface 87 provides a reduced diameter arbor hole and keyways 88 may be provided therein. Diametrically oppositely extending tabs 89 and 90 extend beyond the peripheral surface 85 to interengage with dimples or notches 91 and 92 in the annular bead or rebent portion 10 of the face plate 1. These tabs 89 and 90 are in the same plane as the face of the adapter plate and interengage the dimpled portions 91 and 92 of the bead 10 to hold the adapter plate in the proper position once latched in place by the circumferentially extending outwardly projecting tangs 93 and 94 which extend diametrically normal to the tabs 89 and 90. As seen in FIG. 14, such tangs extend beyond the outer peripheral surface 85 of the adapter plate and include circumferentially projecting portions 96 which are axially cut away and beveled as shown at 97. (Note particularly the detail view of FIG. 13.) The tangs 93 and 94 fit within the keyways 22 and 23 in the inside diameter of the face plates 1 and 2 and rotation of the adapter plate in a clockwise direction as viewed in FIG. 1 will cause the projections 96 on each of the tangs 93 and 94 to underlie the bead or rebent portion 10 of the inner edge of the face plate. The beveled surface 97 will assist in forcing the projections 96 within the rebent or beaded portion 10 of the face plate. Clockwise rotation as shown in FIG. 1 will lock the adapter in place. Such clockwise rotation will continue until the tangs 93 and 94 abut or enage the edges of the keyways 22 and 23. At this time, the tabs 89 and 90 will be within the dimples 91 and 92.

The adapter plates 20 and 21 may be identical in form and both will be assembled in the same manner on each of the face plates 1 and 2. However, it is readily understood that the adapter on one side of the brush or on the face plate 1 is locked in position which will permit the fast start clockwise operation of the brush whereas the adapter 21 on the face plate 2 will be locked in position to permit the fast stop counterclockwise operation as viewed in FIG. 1. Since the face plates will be firmly secured together by the spot welds or the like and the adapters held by a key or the like, this means, then, that a fast start or stop in either direction is permissible since at least one adapter is always locked against the movement which otherwise would be induced by inertia. This can easily be visualized since it will be realized that a clockwise direction when viewing the end of face plate 1 is opposite to a clockwise direction when viewing the end of face plate 2, i.e., counterclockwise to the clockwise of face plate 1.

In FIGS. 15 and 16, there is illustrated a slightly modified form of retaining ring 100 of a U-shaped cross-section wherein the legs 101 and 102 extend radailly inwardly rather than radially outwardly as in the FIG. 6 embodiment. Again projections or dimples 103 are formed but here they are adjacent the inner periphery of the ring 100 instead of adjacent the outer periphery of the ring as in FIG. 6. These projections 103 may be formed in the manner as that disclosed in FIG. 7. The inversion of the U-shape retaining ring will serve to strengthen the same since the circularization of the U-shaped ring in FIG. 6 will cause a compression in the bight portion of the ring and a stretching in the outer ends of the legs, and vice versa in the FIG. 15 embodiment, there will be a stretching in the bight portion and a compression at the outer ends of the legs. However, in either case the deformations will not rupture the ring.

It has been found that knots of bristle material of straight or nearly straight wire in place of normally employed crimped wire obtains a better balance of fill density as related to support from adjacent fill materials. A faster cutting action and finer finish is obtained with the straight wire which is of the straight line type rather than the familiar "orange peel" finish.

Referring now to FIG. 17, it will be seen that the knot bases, as exemplified by the two clusters of bristles 105 and 106 of one tuft or knot of bristles 5, are slightly circumferentially offset due to the manner in which the twisted tufts are formed. It is, of course, desirable that the knot bases be equally spaced radially and circumferentially and that they be clamped in the face plates 1 and 2 so that the pressure exerted by the plates will tend to close the loop rather than to open it. To accomplish this orientation, it has been found that if the face plates are rotated in opposite directions as indicated by the arrows 107 and 108 as they are being assembled, this rotation being 5–10° depending upon the brush inside diameter, the bristle loop will tend to be closed rather than opened. This, of course, will be accomplished by the teeth 25 and 26 on the respective plates 1 and 2 engaging and moving the loop bundles to a position directly opposite each other instead of the skewed position shown thus tending to close the loop rather than opening it. The teeth also maintain the correct circumferential spacing of each individual knot. At the same time, this method of "ringing" the face plates by contra-rotating them into position permits the retaining ring 6 to find its mean location equidistant between the two side face plates. It is this twisting or slight rotation of the separate bundles of the loop by the ringing of the face plates which accounts for the preference that the teeth or projections on the retaining rings as shown in FIGS. 5 and 15 be on one side only thereof. This then permits the bundles of bristles on the opposite side to move slightly with respect to the retaining ring when the loop is closed by this ringing action of the face plates. The projections on the retaining rings, however, still prevent the loop from slipping around and losing their radial position while in service. The contra-rotation of the face plates then actually increases the pressure on the bristle loop by bringing the separate bundles thereof substantially directly opposite each other by thus slightly rotating the base or loop of each tuft and as soon as they are in the proper position, the face plates are secured together by the weldments or other suitable means and a finished brush is produced. By bringing the axis of the loop substantially in line with the retaining member, the wire loops will uniformly be positioned between the face plates and the density of the wires is then uniform throughout the circumference of the U-shaped channel established by the face plates.

As seen in FIG. 18, before rotation of the plates, the knot 110 will be extremely compact with all the wire fill material touching and contacting other fill material. However, as seen in FIG. 18A, the closing of the loop bundles 105 and 106 will tend to open and generally uniformly distribute the fill material in the knot 110. This loosening of the normally extremely tight knot remarkably increases the life of the brush in that the individual bristles can now independently flex and the fracture produced by inter-bristle contact is substantially reduced. Thus the fill material of each knot will tend to be spread evenly over the alloted space for each knot and be interlocked with the base loops of adjacent knots.

The rotation of the face plates thus tends to release the interlocking strains of the knot twist and substantially opens the total knot. Accordingly, the flexibility of each bristle within the knot is extended at least to the periphery of the face plates. Also this permits the pressure exerted by the U-shaped cross section radially to-

ward the peripheral edges of the face plates, as shown at 8 and 9, to function at maximum effectiveness. This in addition to the aforementioned maximum precision in the radial and circumferential location of the tufts is then obtained by rotation of the plates.

It can now be seen that there is provided a rotary brush of a simplified construction which is easy to manufacture and assemble. The brush construction affords a method of assembly which ensures that the tufts will be properly positioned and securely held and such brush readily may be employed in fast start and stop operations on various size arbors.

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. A brush section for a rotary brush and the like comprising a series of self-sustaining twisted knot type bristle tufts, a retaining member passing through each said bristle tuft, and lateral projections on one side only of said retaining member whereby relatively small rotational movements of portions of each said tuft about the longitudinal axis thereof may be obtained while bodily movement of said tuft along said retaining member is precluded.

2. A brush section as set forth in claim 1 wherein said retaining member comprises an elongated metallic element of U-shaped cross-section with the legs of the U abutting each other, and said projections comprise laterally deformed portions of one of said legs.

3. A brush section as set forth in claim 2 wherein said retaining member is an annular ring, and the legs thereof extend radially outwardly, said deformed portions being at the outer periphery of the ring.

4. A brush section as set forth in claim 2 wherein said retaining member is an annular ring and the legs thereof extend radially inwardly, said deformed portions being at the inner periphery of said ring.

5. A rotary brush assembly comprising a pair of face plates having shoulders forming an annular hub portion, and an assembly of a metallic retaining ring, and a large number of self-sustaining tufts of brush material doubled thereabout in close side-by-side relationship extending outwardly therefrom very tightly fitted in the outer periphery of said hub portion, said metallic ring being of a U-shaped cross-section with the legs of the U abutting each other, and said ring having a plurality of equally spaced lateral projections defined by protuberances deformed in one leg thereof, said ring being unruptured by such projections, and teeth inwardly projecting from said face plates adapted radially to engage and center said retaining ring within said hub.

6. A brush assembly as set forth in claim 5 wherein said teeth inwardly project from both said face plates, said teeth being equally circumferentially spaced on each said face plate but circumferentially offset from the teeth on the opposed face plate.

7. A brush assembly as set forth in claim 6 including a supporting plate positioned between said face plates having radially projecting teeth thereon adapted to engage said brush material to preclude migration of the bristle tufts when the brush is in use.

8. A brush assembly as set forth in claim 7 wherein said supporting ring teeth are axially bent.

9. A brush assembly as set forth in claim 8 wherein said supporting ring comprises a pair of supporting rings secured together having opposed teeth thereof oppositely axially bent.

10. A brush assembly comprising opposed face plates forming a generally U-shape outwardly extending channel, a brush section in said channel comprising a plurality of self-sustaining bristle knots looped about a sheet metal retaining ring, a plurality of inwardly yet radially projecting teeth in said face plates adapted to engage and center said brush section, said retaining element comprising a U-shaped sheet metal ring with the legs thereof extending radially outwardly, and equally spaced lateral projections on one leg only of said ring.

11. A brush as set forth in claim 10 wherein said teeth in said face plates are equally circumferentially spaced but circumferentially offset from the teeth in the opposed face plate.

12. A brush as set forth in claim 11 including two brush sections side-by-side within said face plates, and a supporting ring assembly positioned between said face plates having radially extending teeth thereon adapted to engage and position said brush sections.

13. A brush assembly comprising opposed face plates forming a generally U-shape outwardly extending channel, three brush sections in said channel each comprising a plurality of self-sustaining bristle knots looped about a sheet metal retaining ring, a center supporting plate assembly between said face plates having radially projecting teeth thereon adapted to engage said brush sections, and a plurality of inwardly yet radially projecting teeth in said face plates adapted to engage and center said brush sections.

14. The method of forming a rotary brush assembly which comprises the sequential steps of forming a sheet metal ring having uniformly spaced laterally projecting protuberances along one side thereof only, and doubling a large number of individual tufts of bristle material about such ring in close side-by-side radially outwardly extending circumferential alignment, clamping the thus formed annular brush section between opposed face plates having inwardly directed teeth adapted to engage such tufts, oppositely circumferentially rotating such face plates, and securing said face plates together.

15. The method of forming a rotary brush assembly which comprises the sequential steps of forming a sheet metal ring having a large number of uniformly spaced laterally projecting protuberances along one side thereof only, doubling a large number of individual tufts of brush material about such ring in close side-by-side radially outwardly extending circumferential alignment, axially press-fitting the thus formed brush section between opposed circular face plates while simultaneously contra-rotating said face plates more uniformly to distribute such brush material.

16. The method of claim 15 wherein said face plates are rotated approximately 5–10° in opposite directions.

17. The method of forming a rotary brush assembly which comprises the sequential steps of assembling a large number of individual tufts of brush material on a retaining ring in close side-by-side radially outwardly extending circumferential alignment, securing the thus formed brush section between opposed face plates having inwardly projecting teeth adapted to engage and center such brush section, and oppositely rotating while axially compressing such face plates more uniformly to distribute such brush material, and securing said face plates together.

18. A brush assembly comprising opposed face plates forming a generally U-shape outwardly extending channel, a brush section in said channel comprising a plurality of self-sustaining bristle knots looped about a sheet metal retaining ring, and a plurality of axially inwardly projecting teeth in said face plates adapted to engage and center said brush section, an aligned arbor hole through each said face plate, adapters secured in each said aligned arbor holes, said adapters having aligned apertures therein, and keyways in such apertures, each said adapter on the respective face plate being positively stopped in opposite directions of rotation.

19. An adapter for a rotary brush or the like having an arbor hole comprising an outer peripheral cylindrical portion adapted to fit closely in the arbor hole of such

brush, radially outward and circumferentially projecting means on said adapter adapted to latch said adapter to such brush, said means being operative to provide a positive stop for high-speed stops and starts respectively of such brush in opposite directions of rotation.

20. In combination, a rotary brush having an arbor hole therethrough, an inner peripheral beaded portion adjacent said arbor hole, a keyway extending through said inner peripheral beaded portion, an adapter secured in said arbor hole and having a radially and axially projecting tang adapted circumferentially to fit within said beaded portion through said keyway, and latch means adapted to hold said adapter with said tang within said beaded portion.

21. In combination, a rotary brush having radially projecting bristles extending from a hub portion, an arbor hole axially through said hub portion, said hub portion being provided with an inner hollow beaded portion adjacent said arbor hole, a keyway extending axially through said beaded portion, an adapter secured within said arbor hole and having a radially and circumferentially extending projection adapted to fit within said hollow beaded portion, and latch means adapted to hold said adapter in the circumferentially adjusted position with said projection fitting within said bead.

22. The combination set forth in claim 21 wherein said latch means comprises a radially extending tab on said adapter adapted to mate with a dimpled portion of said bead portion of said hub.

23. The method of forming a looped twisted tuft brush which includes the step of compressing the lateral edges of the loop of such tuft to loosen the twisted portion thereof.

24. The method of forming a looped twisted tuft brush which comprises the steps of assembling a number of individual tufts on a retaining member in close side-by-side relation, and compressing the lateral edges of the loops of such tufts to loosen the twisted portions thereof.

25. The method of forming a looped twisted tuft rotary brush which comprises the steps of assembling a large number of individual tufts on a retaining ring in close side-by-side radially outwardly extending circumferential alignment, aligning the loops of such tufts and laterally squeezing such loops to loosen the twisted portions of such tufts, and locking together such tufts thus formed.

26. The method of forming a twisted tuft rotary brush comprising the steps of looping and twisting bundles of wire tightly to form such tufts, threading the loops of the thus formed tufts on a ring, rotating the loops of such tufts under pressure to loosen the twisted portions thereof, and clamping such tufts on such ring.

27. A twisted tuft rotary brush comprising a ring, a series of looped twisted tufts threaded on said ring, and means laterally to compress the loops of said tufts to loosen the twisted portions thereof.

28. A twisted tuft rotary brush as set forth in claim 27 wherein said last mentioned means includes means slightly to rotate each tuft about its axis.

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