

[54] **METHOD OF MAKING A BRUSH STRUCTURE**

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[58] Field of Search..... 15/179, 180, 181,
15/182, 198, 200; 300/2, 4, 12, 14, 21;
29/463, 148.4 D

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Primary Examiner—Peter Feldman

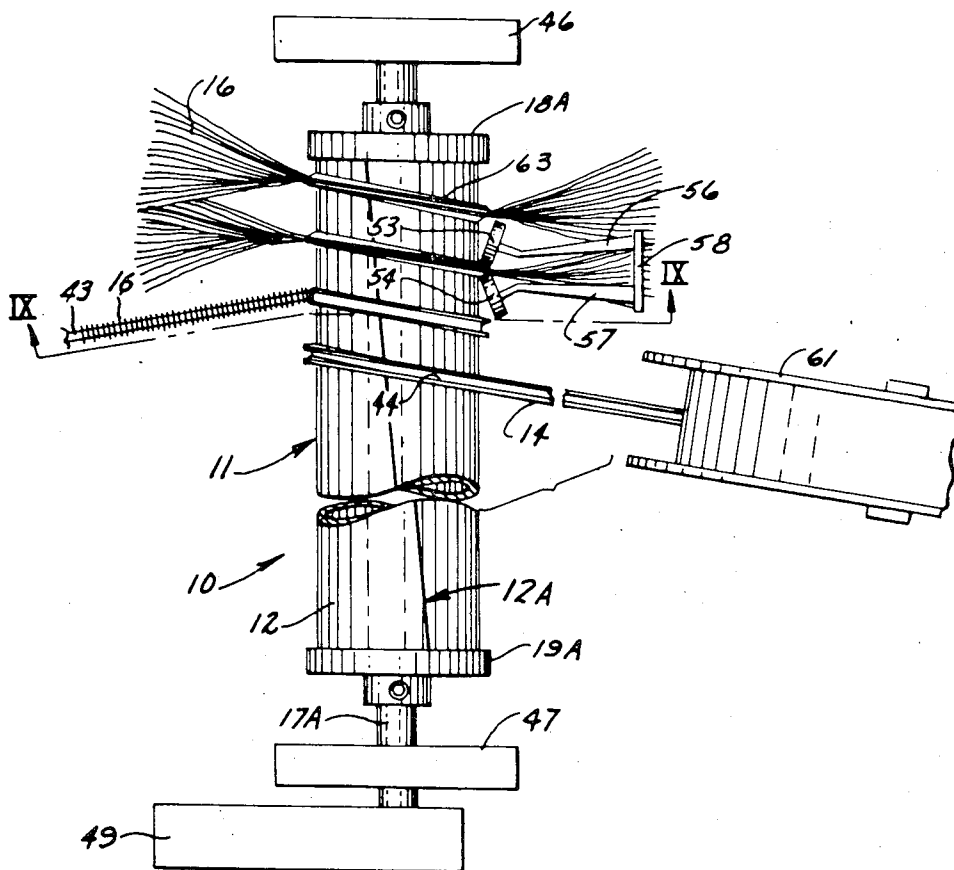
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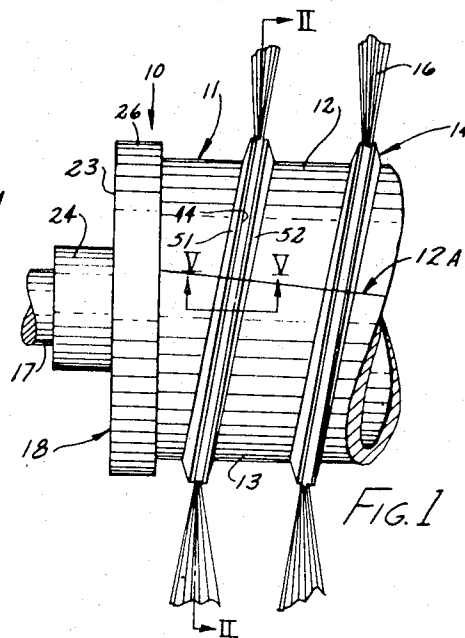
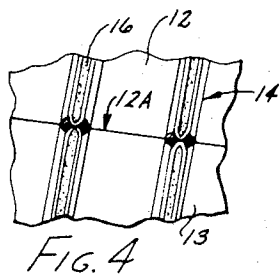
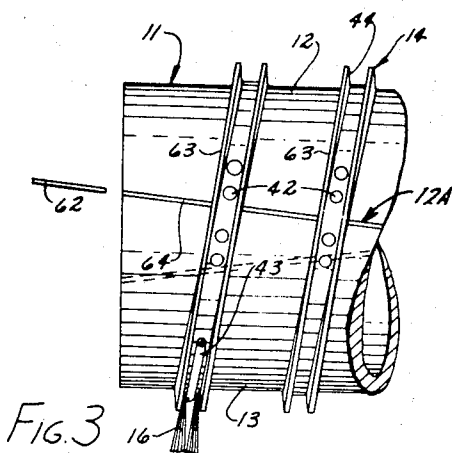
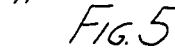
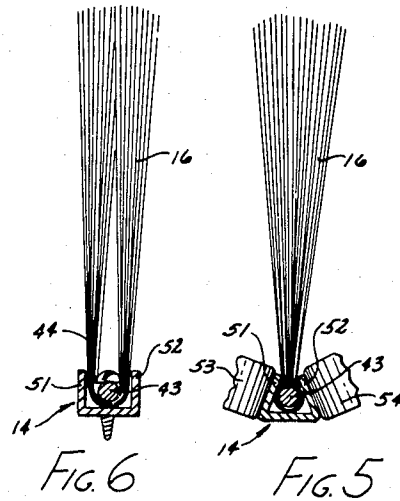
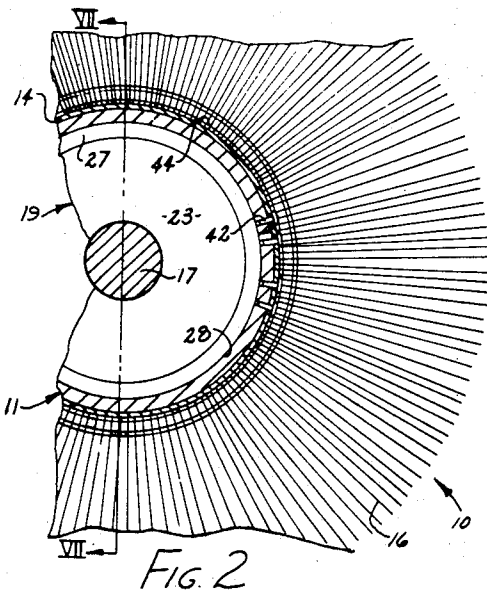
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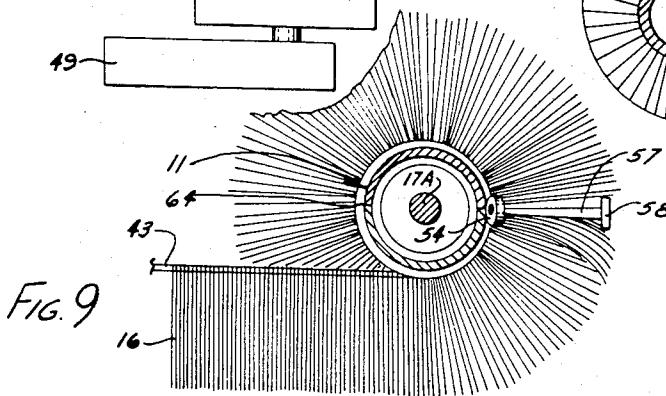
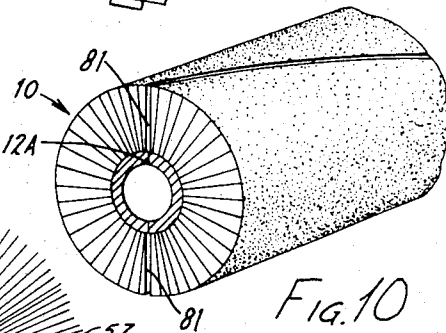
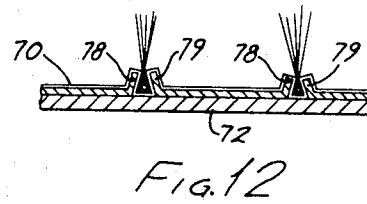
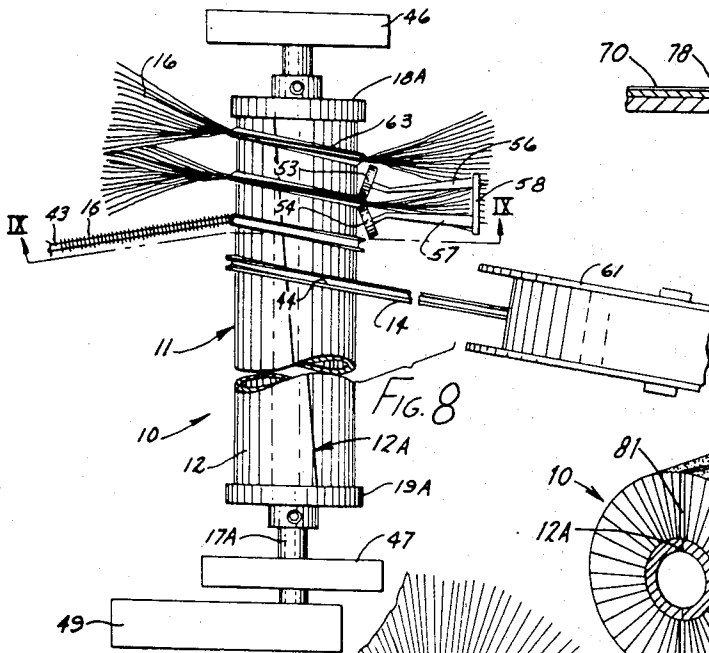
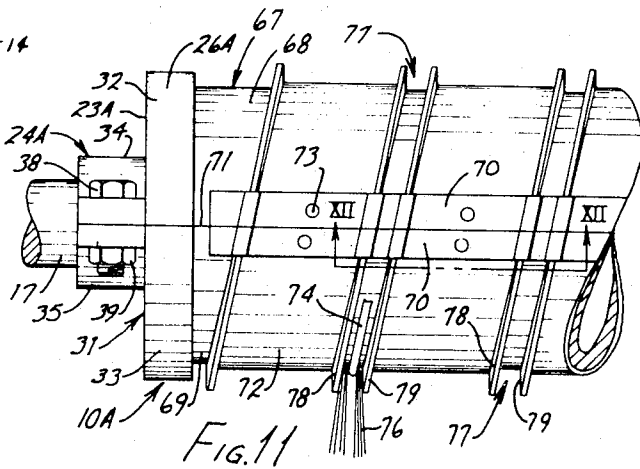
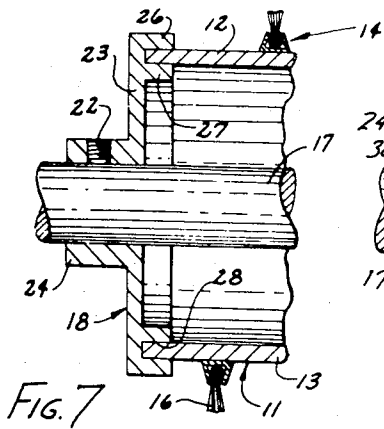
ABSTRACT

A rotary brush construction comprised of an elongated, channel-shaped member wrapped around a cylindrical core and rigidly secured thereto to form a plurality of closely spaced, spiral flights by which the brush elements are firmly secured to the core. The method is carried out by cutting the core substantially lengthwise thereof into two or more segments, either before or after the flights of the channel-shaped member are secured thereto, and mounting the channel-shaped member upon the core with the brush elements rigidly seated in said channel-shaped member. The parting surfaces between the core segments are not parallel with the axis of the core. Alternatively, the brush elements may be rigidly seated between the flights of the channel-shaped elements by bending the adjacent flanges on a pair of adjacent, spaced flights of the channel-shaped member toward each other to clamp the brush bristle to the cylindrical core.

6 Claims, 12 Drawing Figures







METHOD OF MAKING A BRUSH STRUCTURE

This is a division, of application Ser. No. 120,138, filed Mar. 2, 1971 now U.S. Pat. No. 3,688,335.

FIELD OF THE INVENTION

The invention relates in general to an improved method of fabricating a rotary brush and, more particularly, to a type thereof designed for use in a car washing operation.

BACKGROUND OF THE INVENTION

The sizes and shapes of automobiles and the types and locations of parts projecting therefrom, such as bumpers and the like, are constantly changing so that rotary brushes used in automatic devices for washing vehicles are frequently and seriously damaged under circumstances which cannot be adequately anticipated. Thus, it is of great importance to provide brush constructions which can be quickly and easily, hence inexpensively, replaced and repaired in order to minimize losses of money and time, thereby increasing the efficiency in, and profit from, such car-washing operations.

It is equally important that such rotary brushes be capable of quick and easy removal and replacement where such is necessitated by the wear and tear of the brush bristles resulting from ordinary use.

Many attempts have been made to produce brushes meeting the foregoing qualifications and one such brush construction is disclosed in my Pat. Nos. 3,355,758; 3,439,373; and 3,553,760. However, in a continuing effort to improve upon, and reduce the cost of, the procedure for replacing worn or damaged brushes or brush bristles, I found that much time could be saved by attaching the bristles to the core with a single spiral member by which the brush bristles are anchored.

I have also discovered that where the cylindrical core and the bristle anchoring member thereon are cut along a diametrical plane including the rotational axis of the core, space is often created in the bristle arrangement where the saw cuts the bristle anchoring member along the parting line. Thus, when the brush structure is in operation and the brush bristles are sweeping a surface, the ends of the brush bristles on the trailing side of the space remain against such surface for a longer period than average, after the preceding bristles leave said surface, and thereby tend to cause a "thumping" or "slapping" of said trailing brush bristles when they are moved against another, nearby surface. The sound produced by the slapping of said trailing brush bristles is clearly audible and said slapping creates a vibration which can be detrimental to the continued successful operation of the rotary brush construction.

Accordingly, a primary object of this invention is the provision of an improved method for making a rotary brush construction in which the brush bristles are mounted in an elongated bristle-anchoring member which is in turn wrapped in a spiral around a cylindrical brush core after which the core and anchoring member may be cut substantially lengthwise of the core into two or more core segments, preferably of similar size and shape so that the core segments can be quickly and easily replaced between the end bells which are attached to a supporting shaft.

A further object of this invention is the provision of an improved method for making a rotary brush construction wherein the bristle-anchoring member comprises an elongated channel-shaped member which is wrapped in an outwardly opening spiral having spaced flights around a cylindrical brush core, the channel-shaped member having a bottom wall anchored to the brush core, the space between the adjacent flanges of two adjacent flights defining a zone for receiving the brush bristles so that movement of said spaced flanges of adjacent flights toward each other will clamp the brush bristles therebetween.

Other objects and purposes of the invention will become apparent to persons familiar with rotary brush constructions upon reading the following descriptive material and examining the accompanying drawings, in which:

FIG. 1 is a fragment of a rotary brush construction embodying the invention;

FIG. 2 is a fragmentary, sectional view taken along the line II—II in FIG. 1;

FIG. 3 is a fragment of said rotary brush construction when it is partially fabricated;

FIG. 4 is a fragment of FIG. 1 showing a further step in the fabrication of said brush construction;

FIG. 5 is a sectional view of the channel-shaped member taken long the line V—V in FIG. 1;

FIG. 6 is a sectional view of said channel-shaped member before it is completed;

FIG. 7 is a sectional view taken along the line VII—VII in FIG. 2;

FIG. 8 is a broken, plan view of a rotary brush construction embodying the invention and the apparatus with which it is being fabricated;

FIG. 9 is a sectional view taken along the line IX—IX in FIG. 8;

FIG. 10 is a fragmentary perspective view of the brush construction embodying the invention;

FIG. 11 is a fragment of a modified rotary brush construction; and

FIG. 12 is a sectional view taken along the line XII—XII in FIG. 11.

For convenience in description, the terms "inner," "outer" and words of similar import will have reference to the central axis of the rotary brush construction.

SUMMARY OF THE INVENTION

The objects and purposes of the invention, including those set forth above, have been met by providing a rotary brush having a cylindrical core comprised of two or more core segments having parting surfaces which do not define a diametrical plane, said cylindrical core being encircled by plural spiral flights of a channel-shaped anchor member by which brush elements are secured to the core. The flights of the anchor member are preferably cut along spaced lines, usually two lines located approximately on opposite sides of the core, so that the segments can be separated for quick removal from the shaft upon which they are mounted by a pair of end bells. Said cutting lines are not parallel with the axis. The method of fabricating the brush structure comprises the attachment of an elongated, channel-shaped member upon the assembled core in a single spiral, either during or after which the brush bristles are anchored in the channel member, and then cutting said channel-shaped member along the separation lines of the core segments. Alternatively, the core and channel

member are cut simultaneously after they are assembled. In a further alternate form of the invention, the channel member is anchored to the cylindrical core so that bristles are held between the adjacent flanges on a pair of adjacent flights.

DETAILED DESCRIPTION

The rotary brush construction of the invention, one preferred embodiment of which is illustrated at 10 in FIG. 1, is comprised of a cylindrical, preferably hollow core 11 cut into two segments or sections 12 and 13 along a surface 12A skewed or nonparallel with the axis of rotation of the core. A channel member 14 is wrapped around the core 11 for the purpose of anchoring a plurality of radially outwardly extending brush elements or bristles 16. The lines created on opposite sides of the core by the cutting surface 12A may be parallel to each other or nonparallel as long as both lines are not parallel with the axis of rotation of the core. The segments are preferably identical so that they are interchangeable.

The core 11 is mounted upon a shaft 17 by means of a pair of end bells, similar to the end bell 18, which are firmly held against axial movement with respect to said shaft by set screws 22. The end bell 18, by way of example and as shown in FIG. 7, has a diametrically disposed wall 23 which is integral at its inner end with a hub 24 through which the set screw 22 extends. A pair of spaced and concentric flanges 26 and 27 are integral with and extend axially inwardly from the diametrical wall 23 near its outer edge to define a groove 28 into which the axial end edges of the core sections 12 and 13 are snugly but removably received. A preferably identical end bell 19 (FIG. 2) is provided at the other end of the core 11.

If desired, the end bells 18 and 19 may be replaced by a split end bell 31 (FIG. 11) having upper and lower halves 32 and 33. The hub of end bell 31 is also split to provide upper and lower halves 34 and 35 having sidewardly extending flanges 36 and 37, respectively, on both sides thereof. The flanges 36 and 37 have aligned openings through which bolts 38 are received for engagement by nuts 39, whereby the two halves of the bell 31 are held firmly together and against movement with respect to shaft 17.

The core sections 12 and 13 may be fabricated from any suitable material such as wood, plastic or metal, and they are preferably hollow and relatively thin walled in order to minimize weight. The end bells 18, 19 and 31 may be fabricated from metal, such as aluminum, or a suitable plastic material, for example.

The channel member 14 (FIG. 8) is wrapped around the core 11, either before or after the core is split (as appearing in FIGS. 1 and 3), to provide a plurality of closely spaced spiral flights, each of which encircles the core 11. As the channel member 14 is thus wrapped around the core 11, it is rigidly secured to the core by means, such as the rivets 42 (FIG. 3), which are preferably located adjacent the parting line between the core sections 12 and 13. Additional rivets may be used if desired. It will be recognized that the core 11 can be one-piece or comprised of three or more segments, instead of two and held together by the end bells 18 and 19, for example.

An elongated cord or cable 43 (FIGS. 5 and 6) is anchored at one end thereof preferably within the initial end of the channel member 14 by any convenient fas-

tening device, such as a screw (FIG. 6), which may also be used to secure the end of the channel member upon the core 11. A plurality of brush elements 16 (FIG. 9) are draped over the cable 43 which is then fed into the groove 44 defined by the channel member 14. During this assembling operation, the core 11 will normally be mounted upon a shaft 17 which is supported by bearings 46 and 47 so that one end of the shaft 17 can be engaged and rotated by an appropriated drive means 49.

Following insertion of the cable 43 and brush elements 16 into the groove 44, the flanges 51 and 52 (FIG. 6) of the channel member 14 are engaged by a pair of rollers 53 and 54 (FIG. 8) which bend the flanges 51 and 52 toward each other, as shown in FIG. 5. The rollers 53 and 54 may be driven or may be freely rotatably mounted upon the spindles 56 and 57, which are held by the support 58.

As shown in FIG. 8 and 9, the brush elements 16 may be draped over the cable 43 by automatic machinery in a uniform pattern as the cable approaches the channel member. Moreover, the channel member can be applied to the core 11 from a large spool 61 of such material located adjacent the core and positioned to feed the channel member onto the core in a predetermined spiral. Furthermore, it may be desirable to mount plural pairs of core segments upon a splined shaft along which said segments, and their supporting end bells, can be moved axially as the shaft is rotated while the cable 43 and channel member 14 are fed from a relatively stationary source. In such case, the channel member and cable can move in an unbroken path from one pair of core segments to the next without material interruption in the assembling operation. Small end portions of the channel member can be trimmed automatically from the axial ends of the core segments to permit their reception by the end bells.

If desired, the end bells can be recessed within the core, especially if it is in one piece, so that the end of the brush appears about as shown in FIG. 3.

After the channel member 14, cable 43 and brush elements 16 have been applied to and mounted upon the core 11, the flights 63 of the channel member 14 may be cut, by means such as a circular saw 62 (FIG. 3), along the parting line between the two core segments 12 and 13. However, since this cutting operation will normally remove a small portion of each flight, it is advantageous to place a thin spacer 64, approximately the thickness of the cut made by the saw 62, between the core segments prior to commencement of the assembly operation. Thus, after the flights 63 are cut, the spacer 64 can be removed and the cylindrical shape of the overall brush structure will be preserved.

The cut ends of the flanges 51 and 52 may be pinched tightly together as shown in FIG. 4 to prevent accidental dislodgement of the brush elements 16 from within the groove 44 adjacent the cut ends of the member 14 when the core segments are in their unassembled positions.

It will be recognized that the channel member 14 can be secured to the outer surface of the core 11 by the use of a strong cement or other adhesive, in place of the rivets. Moreover, it will also be recognized that the cable 43 and/or the inner ends of the brush elements 16 can be firmly held within the channel member 14 by other means, such as a cement or adhesive. The channel member 14 may be welded to the core 11, where

both are metallic. Also, the bristles may be secured within a second channel which is held in channel 14 as disclosed in U.S. Pat. No. 3,439,373.

It will also be seen that the channel member 14 can be wrapped around and secured to the core 11 before it is split into the core segments 12 and 13. Thus, the cutting of the flights 63 can be combined with the cutting of the core 11 to provide the core segments at the same time.

As an alternate construction, the core 67 of FIG. 11 is cut into core segments 68 and 69 along a parting surface 71 which may or may not be diametrical of the cylindrical core 67. End bells, such as the bells 31 described above, are connected to the core segments 68 and 69. A channel member 72 is wrapped around the core 67 and secured thereto by strips 70 which are contoured to the channel member and core. The strips are located adjacent the opposite sides of the parting surface 71 and secured to the core by means such as the rivets 63. The channel member 72, which is substantially wider than the channel member 14 in this embodiment, is wrapped around the core 67, either before or after the core is split (as described above), to provide a plurality of spaced, spiral flights, each of which encircles the core 67.

An elongated cord or cable 74 is anchored at one end thereof, preferably adjacent the initial end of the channel member 72, by any convenient fastening device such as a screw. A plurality of brush elements 76 are draped over the cable 74 which is then fed into the groove 77 defined by the adjacent flanges 78 and 79 on a pair of adjacent flights of the channel member 72. During this assembling operation, the core 67 will normally be mounted upon a shaft, similar to the shaft 17 described above, which is supported by bearings so that one end of the shaft can be engaged and rotated by an appropriate driving means, such as the driving means 49 illustrated in FIG. 8.

Following insertion of the cable 74 and brush elements 76 into groove 77, the adjacent flanges 78 and 79 (FIG. 12) of the channel member 72 are engaged by an convenient means, such as rollers, not shown, which bend the flanges 78 and 79 toward each other to the position illustrated in FIG. 12, wherein they grip the cable and bristles between them.

OPERATION

Although the operation of the brush construction and the carrying out of the method described above will be apparent to persons skilled in the art from a reading of the foregoing description, a summary thereof will now be set forth.

The core 11, is mounted upon structure for rotation around its central axis. In one preferred embodiment, the core will first be cut into a plurality of segments along a surface or surfaces which is skewed with respect to the axis of rotation of the core. A suitable spacer 64 is placed between the parting faces of the core segments as they are mounted on an assembly shaft 17A between a pair of assembly end bells 18A and 19A in preparation for wrapping the channel member 14 around the core. The channel member 14, the cable 43 and the brush elements 16 will then be applied to the core segments, as described above, following which the flights of the channel member 14 are cut along the edges of the parting faces of the core seg-

ments and the cut ends of the flights are pinched together as shown in FIG. 4.

All of the foregoing operations can be performed on the channel member while it is mounted upon and between the end bells 18A and 19A. In order to allow for the gap between the core segments provided by the spacer 64, the end bells 18A and 19A, used during the assembling operation, are oversized. Thus, the core segments will be held tightly together at their parting line when they are engaged by the standard end bells 28 and 19 with which they are actually used. Where split end bells 31 (FIG. 11) are used, the spacer can extend between the halves 32 and 33 during the assembly operation so that special assembly end bells will not be required.

When the cut ends of the flights are pinched together as shown in FIG. 4, the absence of bristles creates a space 81 as shown in FIG. 10. Since the core is cut into segments having parting surfaces 12A, which are skewed with respect to the axis of rotation of the core, the space 81 does not extend parallel to the axis of rotation of the core. Instead, the space 81 extends in a direction which is not parallel to the axis of rotation of the core. Thus, when the brush construction is in use and the brush bristles are rotating and moving from one surface to another, the brush bristles on the trailing side of the space 81 tend to slide smoothly onto the other surface without causing an undesirable sound or vibration.

The core segments and end bells will be mounted upon a shaft 17 during normal operation in substantially the same manner as they are mounted upon shaft 17A when the rotary brush 10 is being formed. Thus, damaged or worn core segments can be quickly and easily replaced merely by loosening the set screw on one of the end bells and moving it away from the core segments. A new core segment or pair of core segments can then be quickly replaced between the end bells after which the loosened end bell is returned to its normal core-engaging position and its set screw is tightened upon the shaft. The repaired rotary brush is then ready for operation with a minimum loss of time and without removing the shaft from its bearings. The damaged or worn core segments can be returned to the factory for repair.

Although a particular preferred embodiment of the invention has been disclosed in detail for illustrative purposes, it will be recognized that variations or modifications of the disclosed apparatus, including the rearrangement of parts, lie within the scope of the present invention.

The embodiments of the invention in which I claim an exclusive property or privilege are defined as follows:

1. A method of fabricating the segments of a rotary brush, comprising the steps of:
 - dividing a hollow cylindrical brush core into a plurality of segments having at least two pair of parting surfaces not parallel with the central axis of said core and extending lengthwise of the core;
 - supporting said plural cylindrical brush core segments together
 - securing an elongated channel-shaped member to an external, circumferential surface of said core near one axial end thereof;
 - causing said channel-shaped member to be wrapped around said core in a spiral having plural,

substantially uniformly spaced flights, said channel-shaped member opening radially outwardly from said core;
securing said channel-shaped member to said core;
feeding into a groove defined by said channel-shaped member, after it is engaged with said core, a plurality of brush elements;
securing the radially inner ends of said brush elements within said groove and
dividing each flight of said channel-shaped member along the radial edges of said parting surfaces. 10
2. A method according to claim 1, wherein said radially inner ends of said brush elements are secured in a groove defined by the flanges of each flight.
3. A method according to claim 1, wherein said radially inner ends of said brush elements are secured in a groove defined between the adjacent flights. 15
4. A method according to claim 1, wherein each flight is secured to said core in at least two places on both sides of and adjacent to said parting surfaces as said channel-shaped member is wrapped on said core and before said brush elements are fed into said groove. 20
5. A method according to claim 1, wherein the radial edges of said parting surfaces are straight.

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6. A method of fabricating a rotary brush, comprising the steps of:
providing a hollow cylindrical brush core;
securing an elongated channel-shaped member to the external circumferential surface of said core near one axial end thereof;
causing said channel-shaped member to be wrapped around said core in a spiral having plural, substantially uniformly spaced flights, said channel-shaped member opening radially outwardly from said core;
securing said channel-shaped member to said core;
feeding into a groove defined by said channel-shaped member, after it is engaged with said core, a plurality of brush elements;
securing the radially inner ends of said brush element within said groove; and
dividing said core and said flights into a plurality of segments with said core having at least two pair of parting surfaces not parallel with the central axis of said core and extending lengthwise of the core, said flights being divided along the radial edges of said parting surfaces.

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