April 22, 1969 G. J. CLARK 3,439,373

BRUSH STRUCTURE

Filed Dec. 26, 1967 Sheet 1 of 2

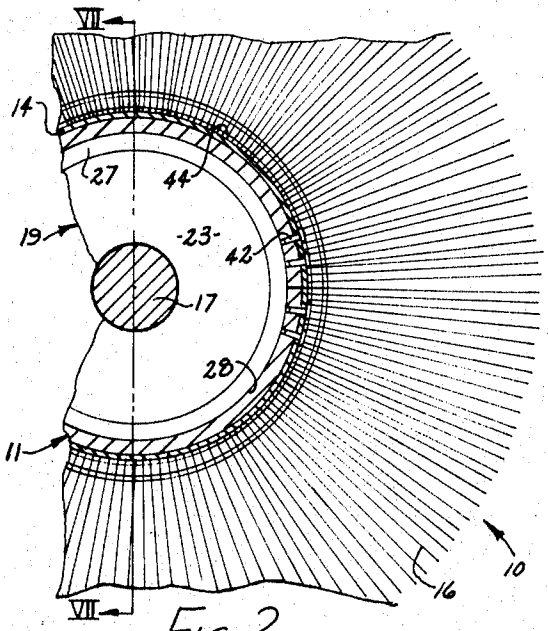


FIG. 2

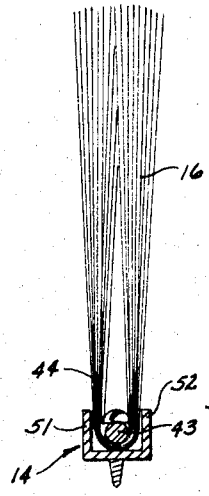


FIG. 6

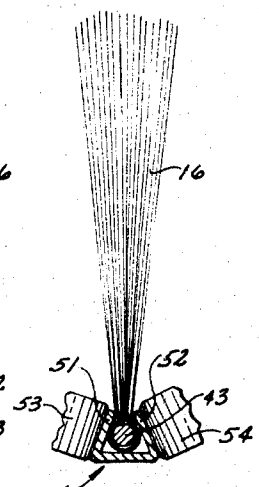


FIG. 5

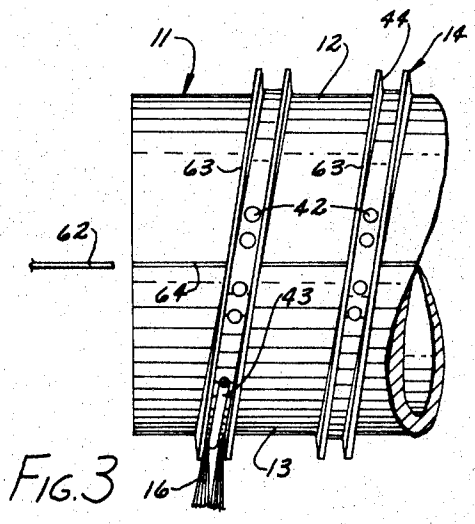


FIG. 3

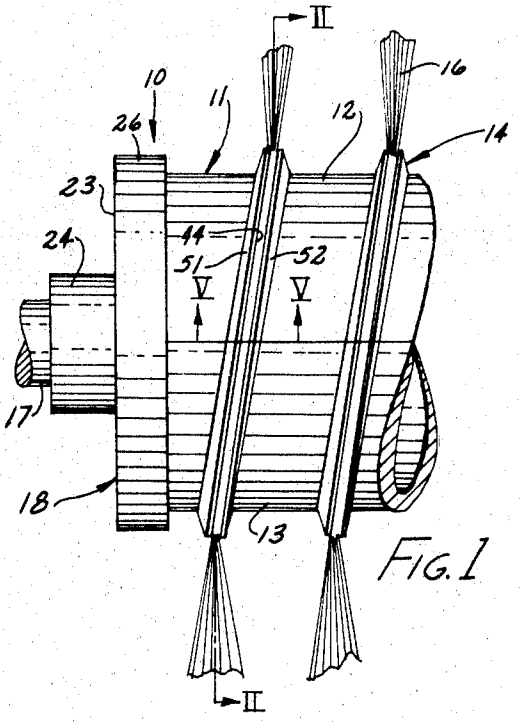


FIG. 1

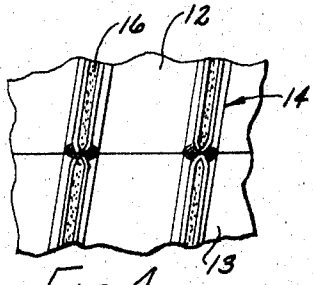


FIG. 4

INVENTOR.
GAYLORD J. CLARK
BY
Woodham, Blanchard & Flynn
ATTORNEYS

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BRUSH STRUCTURE

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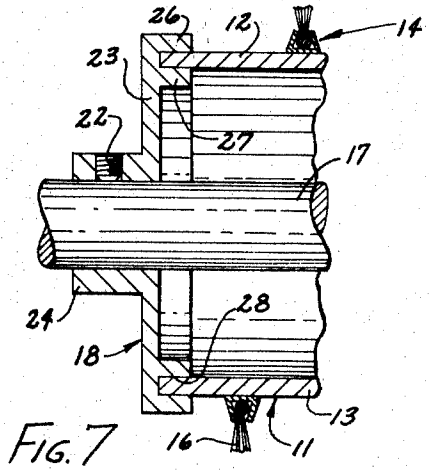


FIG. 7

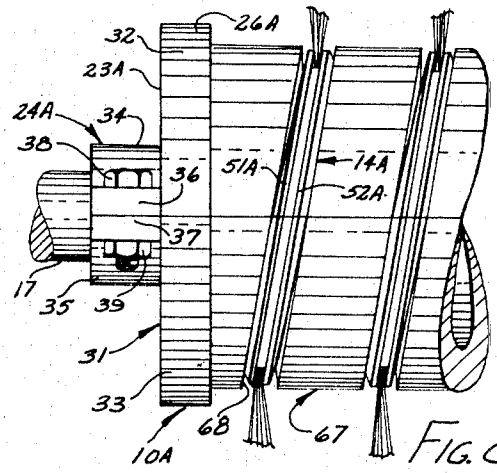


FIG. 8

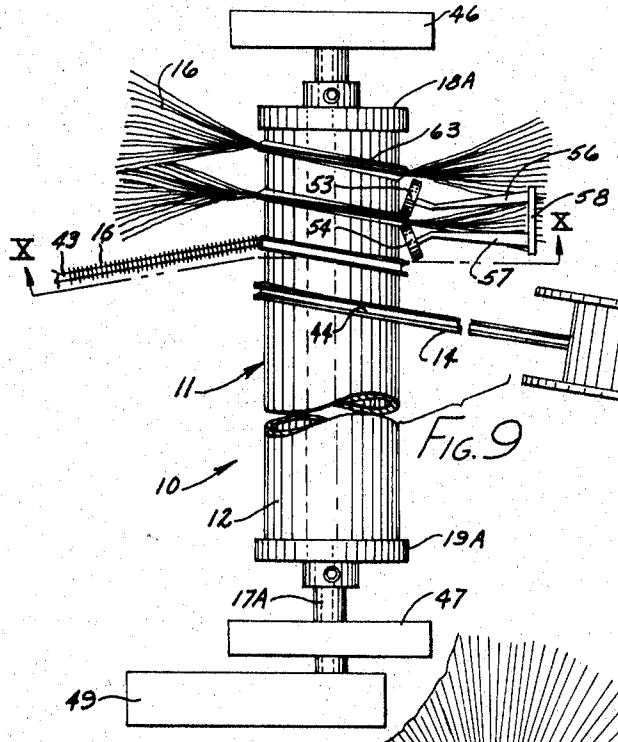


FIG. 9

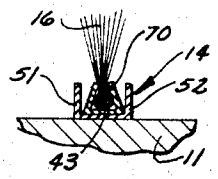


FIG. 12

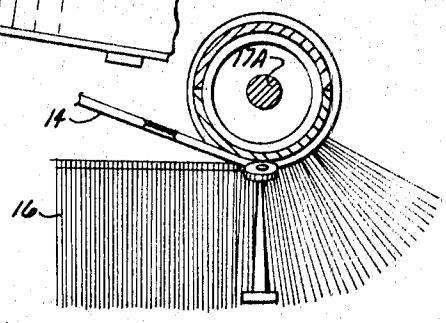


FIG. 11

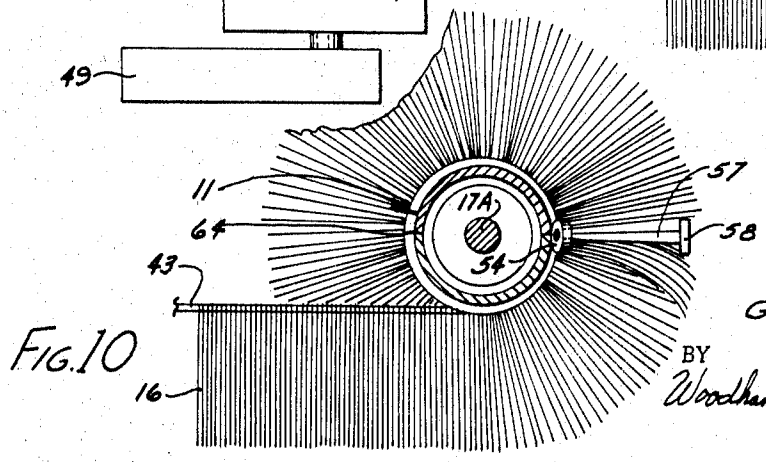


FIG. 10

INVENTOR.
GAYLORD J. CLARK

BY
Woodham, Blanchard & Flynn
ATTORNEYS

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3,439,373

BRUSH STRUCTURE

Gaylord J. Clark, P.O. Box 216, Coloma, Mich. 49038

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Int. Cl. A46b 7/10; A46d 1/00
U.S. Cl. 15—182 4 Claims

ABSTRACT OF THE DISCLOSURE

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 in which the brush elements are firmly seated. The core and the flights of the channel-shaped member are cut along a diametrical plane including the central axis of the core, so that the core halves can be separated for quick removal from a shaft upon which they are mounted by a pair of end bells.

Background of the invention

This invention relates in general to a rotary brush and, more particularly, to a type thereof designed for use in a car-washing operation.

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 carwashing 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 Patent No. 3,355,758. However, in a continuing effort to improve upon, and reduce the cost of, the procedure of 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 to which the brush bristles are anchored.

Accordingly, a primary object of this invention is the provision of an improved 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 are cut along a diametrical plane including the rotational axis of the core so that the two core halves can be quickly and easily mounted upon and between the end bells which are attached to the brush shaft.

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:

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

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

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

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

FIGURE 5 is a sectional view of the channel-shaped member taken along the line V—V in FIGURE 1.

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

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

FIGURE 8 is a fragment of a modified construction embodying the invention.

FIGURE 9 is a broken, plan view of a rotary brush construction embodying the invention and the apparatus with which it is being fabricated.

FIGURE 10 is a sectional view taken along the line X—X in FIGURE 9.

FIGURE 11 is a transverse, sectional view of FIGURE 9 showing a modified apparatus for assembling the brushes.

FIGURE 12 is a sectional view similar to FIGURE 5 and showing a modified holder for the brush elements.

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 pair of core halves defining a cylindrical core encircled by plural spiral flights of an anchor member to which brush elements are secured and from which they preferably extend radially. The flights of the anchor member are also cut on both sides of the core along the plane between the halves thereof so that the core halves can be separated for quick removal from the shaft upon which they are mounted by a pair of end bells. The method of fabricating the brush structure comprises the attachment of an elongated, channel-shaped member upon the core halves 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 parting plane of the core halves. In an alternate form of the invention, the core is a solid cylinder and is cut into halves simultaneously with the cutting of the channel-shaped member.

Detailed Description

The rotary brush construction of the invention, a preferred embodiment of which is illustrated at **10** in FIGURE 1, is comprised of a cylindrical, preferably hollow core **11** having a pair of preferably identical core halves **12** and **13** around which the channel member **14** is wrapped for the purpose of anchoring a plurality of radially outwardly extending brush elements or bristles **16**. The core **11** is mounted upon a shaft **17** by means of a pair of end bells similar to the end bell which are supported upon the shaft **17** and firmly held against axial movement with respect thereto by set screws **22**.

The end bell **18**, by way of example and as shown in FIGURE 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 parallel 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 halves **12** and **13** are snugly but removably received. A preferably identical end bell is provided at the other end of the core **11**.

If desired, the end bell **18** may be replaced by a split end bell **31** (FIGURE 8) 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 halves **12** and **13** may be fabricated from any suitable material such as wood, plastic or metal, and they are preferably hollow and reatively thin walled in order to minimize weight. The end bells **18** and **31** may be fabricated from metal, such as aluminum, or a suitable plastic material, for example.

The channel member **14** (FIGURE 9) is wrapped around the core **11**, either before or after the core is split (as appearing in FIGURES 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** (FIGURE 3), which are preferably located adjacent the parting plane between the core halves **12** and **13**. Additional rivets may be used if desired. It will be recognized that the core **11** can be comprised of three or more segments, instead of two, which are preferably joined along radial planes and held together by the end bells **18**, for example.

An elongated cord or cable **43** (FIGURES 5 and 6) is anchored at one end thereof preferably within the initial end of the channel member **14** by any convenient fastening device, such as a screw (FIGURE 3), which may also be used to secure the end of the channel member upon the core **11**. A plurality of brush elements **16** (FIGURE 10) 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 appropriate drive means **49**.

Following insertion of the cable **43** and brush elements **16** into the groove **44**, the flanges **51** and **52** (FIGURE 6) of the channel member **14** are engaged by a pair of rollers **53** and **54** (FIGURE 9) which bend the flanges **51** and **52** toward each other, as shown in FIGURE 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 the channel member **14** is wrapped around the core **11**, the flanges **51** and **52** thereof may tend to bend toward each other because of the tension applied thereto in the bending action. Under such circumstances, it will be desirable to have the cable **43** fed into the groove **44** (as appearing in FIGURE 11) just as the bending of the channel member is about to occur. Thus, this induced bending of the flanges will not interfere with the feeding of the cable and brush elements into the groove **44**.

As shown in FIGURES 9 and 10, 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 halves upon a splined shaft along which said halves, 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 halves 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 halves to permit their reception by the end bells.

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** are cut, by means such as a circular saw **62** (FIGURE 3), along the parting line between the two core halves **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 saw **62**, between the core halves 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** are pinched together as shown in FIGURE 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 halves 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 means other than rivets, for example, by the use of a strong cement or other adhesive. 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.

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 halves **12** and **13**. Thus, the cutting of the flights **63** can be combined with the cutting of the core **11** to provide the core halves at the same time.

As an alternate construction, the core **67** of FIGURE 8 is provided with a spiral groove **68** into which the channel member **14A** is received during the assembly operation and held by any convenient means such as the rivets shown in FIGURE 3 or a suitable cement. Since it would be difficult to perform the bending operation upon the flanges **51A** and **52A** after the channel member **14A** is disposed within the groove **68**, such flange bending would advantageously be performed before the insertion of the channel member within the groove. In all other respects, the structure and the method of assembly for the rotary brush **10A** (FIGURE 8) would be the same as described above with respect to the rotary brush **10** (FIGURE 1).

It would also be possible to use a core **11** which is substantially solid, rather than substantially hollow, as shown. In such case, the shaft could extend through a relatively small axial opening through the core, and the anchor bolts could extend through the core halves instead of the end bells, which would not be required.

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**, which may be in a single piece or several segments, is mounted upon structure for rotation around its central axis. In the preferred embodiment, the core will first be cut into halves. A suitable spacer **64** is placed between the core halves 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 element **16** will then be applied to the core halves, as described above, following which the flights of the channel member **14** are cut along the parting line of the core halves and the cut ends of the flights are pinched together as shown in FIGURE 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 halves provided by the spacer **64**, the end bells **18A** and **19A** used during the assembling operation are oversized. Thus, the core halves will be held tightly together at their parting line when they are engaged by the standard end bells **18** with which they are actually used. Where split end bells **31** (FIGURE 8)

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.

The core halves 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 halves 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 halves. A new core half or pair of core halves 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. The damaged or worn core halves can be returned to the factory for repair.

As shown by the modified structure of FIGURE 12, the brush elements **16** may be preassembled in a small channel member **70** which is then inserted into the larger channel member **14** during the assembly of the complete brush. The elements **16** may be held in the channel member **70** by the cable **43** and by crimping the flanges of the channel member **70** against the cable.

The modified structure of FIGURE 12 can be assembled by winding the channel member **14** onto the core **11** and thereafter securing the member **14** to the core, as described above. Thereafter, the channel member **70** is fed into the channel member **14** and the side flanges **51** and **52** are crimped toward each other. The core **11**, whether one piece or precut in segments, is then cut, whereby the channel members **14** and **70** are cut, to form the core segments. Pinching of the cut ends of said channel members may be desired to obstruct further the escape of the brush elements from the channel members.

Although particular preferred embodiments of the invention have been described above for illustrative purposes, it will be understood that variations or modifications of such disclosure, which come within the scope of the appended claims, are fully contemplated.

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

1. A rotary brush construction adapted for mounting upon a shaft means and comprising:

cylindrical core means divided into a pair of core halves located on opposite sides of a parting plane defined by the axis at a diameter of said core means;

end bell means adapted to engage the opposite axial ends of said core means and said shaft means for holding said core means rigidly and concentrically upon said shaft means;

channel-shaped means wrapped around said core means to provide uniformly spaced plural flights, each flight being cut along said plane on diametrically opposite sides of said core means;

holding means rigidly securing each of said flights to both of said core halves on opposite sides of and adjacent to said plane; and

a plurality of elongated brush elements extending into and firmly gripped within the outwardly opening groove defined by said channel-shaped means.

2. A rotary brush construction according to claim **1**, including an elongated locking element disposed within said groove and extending transversely of said brush elements approximately midway between the ends of each;

wherein said channel member has side flange means bent toward each other to grip said locking element therebetween; and

wherein the ends of said flanges adjacent said plane are pinched together to prevent dislodgement of said brush elements from the cut ends of said flights.

3. A rotary brush construction according to claim **2**, wherein said core means is hollow;

wherein said end bell means are split diametrically; and

wherein each end bell means has axially opening annular groove means into which the axial ends of said core halves are removably received.

4. A rotary brush construction adapted for mounting upon a shaft means and comprising:

an elongated, cylindrical and hollow core means adapted to be mounted on said shaft means;

end mounting means adapted to engage said shaft means at spaced points and the opposite axial ends of said core means for holding said core means rigidly and concentrically upon said shaft means;

an elongated, channel-shaped member wrapped around said core means to provide a plurality of uniformly spaced, spiral flights encircling said core means, said member having spaced side flanges;

holding means rigidly securing said channel-shaped member to said core means;

a plurality of elongated brush elements extending into and firmly gripped within the outwardly opening groove defined by said channel-shaped member; and

an elongated locking element disposed within said groove and extending substantially transversely of said brush elements between the ends thereof, said flanges being adapted to be bent toward each other to grip said locking element therebetween and thereby hold said elongated brush elements within said groove.

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PETER FELDMAN, *Primary Examiner.*

U.S. Cl. X.R.

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