ROTARY BRUSH CONSTRUCTION FOR VACUUM CLEANER

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ABSTRACT
A brush structure for use in a vacuum cleaner including a dowel carrying an elongated brush for rotation about the longitudinal axis of the dowel. The dowel is formed of a multiplicity of segments and includes drive means for effecting rotation of the brush structure about the axis of the dowel. The dowel is further arranged to carry a beater bar in cooperation with the brush.

14 Claims, 5 Drawing Figures
ROTARY BRUSH CONSTRUCTION FOR VACUUM CLEANER

BACKGROUND OF THE INVENTION

1. Field of the Invention
This invention relates to vacuum cleaners, and in particular to brush structures for use in vacuum cleaners such as in the nozzle of an upright vacuum cleaner.

2. Description of the Prior Art
In one form of beater brush structure for use in the nozzle of a vacuum cleaner, the beater and beater bar are carried on a dowel which is rotated about the longitudinal axis thereof. A number of different beater brush structures of this type have been developed for use in such vacuum cleaner applications. The conventional beater-brush structure utilizes a cylindrical dowel having a grooved outer surface adapted to receive the brush back and beater bar back. Such cylindrical dowels are conventionally formed of metal and are relatively heavy and expensive.

In another form of rotary brush structure, the brush back is carried on a plurality of spaced discs providing a relatively open brush assembly.

In other forms of rotary brushes, cylindrical dowel elements have been provided with recesses adapted to receive tufts of bristles, with the overall brush structure being comprised of a plurality of such individual brush structures disposed in coaxial end-to-end association.

SUMMARY OF THE INVENTION

The present invention comprehends an improved brush structure for use in vacuum cleaners and the like which is extremely simple and economical of construction while yet providing a number of highly desirable features not obtained in the structures of the prior art as discussed above.

Thus, the present invention comprehends a brush structure such as for use in a vacuum cleaner or the like including a plurality of dowel segments, means for retaining the segments in end-to-end coaxial alignment to define an elongated, substantially continuous cylindrical brush dowel, means for journalling the brush dowel for rotation about the longitudinal axis thereof, and means on the dowel segments defining a substantially continuous helical channel for holding an elongated brush insert in a helical disposition coaxially about the brush dowel. The brush insert may define means for locking the dowel segments against movement relative to each other about the axis of the dowel, and the individual dowel segments may be provided with interlocking elements for preventing such relative rotation.

The means for retaining the segments in end-to-end association may comprise a tie rod extending coaxially through the dowels and being provided at opposite ends of the tie rod for retaining the segments against rotation about the axis of the tie rod and against movement axially of the tie rod. The means at one end of the tie rod may further define a drive pulley for use in effecting rotation of the brush structure about the axis of the tie rod. The retaining means may further define bearing means for journauling the tie rod including means for effectively preventing deposition of foreign matter on the bearing surfaces during the use of the apparatus. The helical channel means may comprise a projection on the cylindrical dowel structure. Each of the individual dowel segments may be provided with a segmental helical channel means which, when the dowels are ranged in aligned end-to-end association, defines a substantially continuous helical channel means. The individual dowel segments may comprise tubular elements having transversely extending webs for mounting the tubular dowel elements on the axial tie rod support means.

The dowel segments may be formed of low cost, lightweight material, such as a synthetic plastic, and may comprise substantially identical elements for effectively minimum cost.

BRIEF DESCRIPTION OF THE DRAWING

Other features and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawing wherein:

FIG. 1 is a fragmentary perspective view of an upright vacuum cleaner provided with a brush structure embodying the invention;
FIG. 2 is a transverse section of the brush structure;
FIG. 3 is a fragmentary perspective view of the brush structure;
FIG. 4 is a fragmentary enlarged diametric section thereof taken substantially along the line 4—4 of FIG. 3; and
FIG. 5 is a fragmentary diametric section of a brush dowel embodying the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the exemplary embodiment of the invention as disclosed in FIGS. 1–5 of the drawing, a brush structure generally designated 10 is shown to comprise a brush structure suitable for use in vacuum cleaners and illustratively, adapted for use in an upright vacuum cleaner generally designated 11. As shown in FIG. 1, the vacuum cleaner structure may include a nozzle portion 12 carried on suitable wheels 13 for movement over a floor surface to pick up dust and dirt from the floor surface as a result of suction applied thereto through the nozzle and upwardly through a tubular body portion 14 of the vacuum cleaner. To facilitate removal of dirt from the floor surface, the brush structure 10 is provided in the nozzle 12 and is arranged to be driven by a suitable driven belt 15 for rotation about the longitudinal axis thereof to cause a brushing-beating action by means of a brush generally designated 16 and a beater bar generally designated 17 of suitable material, for example, polyethylene plastic, provided in the brush structure 10. The present invention comprehends an improved brush structure of this type wherein the dowel generally designated 18 adapted to carry the brush 16 and beater bar 17 is composed of a plurality of segments 19.

More specifically, as shown in FIGS. 3 and 4, the brush structure 10 includes a tie rod 20 on which the individual segments 19 are carried for rotation about the axis 21 of the tie rod. The individual segments 19 effectively comprise tubular elements having a cylindrical outer surface 22 carrying, at diametrically opposite portions, projecting channel elements 23 each defining a segmentally helical channel portion 24 having a radially outer opening 25. Each segment is provided at approximately its axial mid-portion with a transverse web 26 having a central opening 27 through which tie rod 20 extends, as shown in FIG. 4. Thus, the segments are effectively carried coaxially on the tie rod.
Each segment is defined at its opposite ends by shoulder elements generally designated 28 for connecting the individual segments in end-to-end association, as shown in FIG. 4. The shoulder elements 28 define overlapping inner shoulder surfaces 29 and outer shoulder surfaces 30 cooperating to retain the respective segments in aligned association parallel to the axis 21 of the tie rod.

As shown in FIGS. 4 and 5, the segments 19 include a female shoulder portion 31 and a male shoulder portion 32 at the opposite ends thereof for interconnection with correspondingly opposite male and female portions of adjacent segments for effecting the desired aligned association of the respective segments as well as defining means for preventing rotation of the segments relative to each other about the axis 21. The thickness of the female shoulder portion 31 and the male shoulder portion 32, respectively, are less than the thickness of the segments 19 as indicated in FIG. 4 and at 31 in FIG. 5. When the segments 19 are assembled, the interfitting male and female shoulder portions 31 and 32 (see FIG. 5) are not visible from the exterior of the dowel structure 18 as viewed in FIG. 3.

It will be appreciated that the interfitting shoulder portions 31 and 32 provide a form of tongue and groove arrangement which constitutes means for registering or indexing the adjacent segments so that the helical channel portions are in proper continuous alignment.

The end-to-end association of the individual segments 19 defines the overall brush dowel 18. As the individual segments are thus aligned with each other, the channel segments 24 cooperatively define a substantially continuous helical channel extending end-to-end of the dowel structure 18. One such channel structure 33 is adapted to receive the brush back 34 of the brush 16 which may have a cross-section substantially complementary to the cross-section of the channel segments 24. The brush back 34 may be relatively rigid and thus may define means for preventing rotation of the individual segments relative to each other about the tie rod axis 21 when the brush back is inserted in the channel 33 to extend from end-to-end of the dowel structure 18.

The beater bar 17 may similarly define means received in the opposite channel defined by the diametrically opposite channel portions 23', 24' and 25', and may similarly comprise a relatively rigid element adapted to prevent rotation of the individual dowel segments relative to each other when the beater bar is inserted in the diametrically opposite channel.

Dowel segments 19 may be retained against axial separation by means at opposite ends of the tie rod 20, herein comprising a drive means 35 at the lefthand end thereof and a brush hub assembly means 36 at the righthand end thereof, as seen in FIG. 4. The drive means 35 herein comprises a pulley 37 carried on a hub 38 locked to tie rod end 39 by suitable means, such as serrations 40 on the tie rod end. Pulley 37 includes a recess at 37a (FIG. 4) which receives the segment shoulder portion 32 to effectively prevent rotation of the segments relative to axis 21. The drive belt 15 may be trained over the pulley 37, as shown in FIG. 4, to effect the drive connection of the brush structure to the power supply (not shown). Drive means 35 may further include an axially inturned annular support portion 41 coaxially received within the end 42 of the lefthand dowel segment 19. A steel washer 43 may be fixedly mounted on the hub 38 of the drive means 35.

At the other end 44 of the tie rod 20, an annular retainer 45 is fixedly secured by means of serrations 46 to bear against the transverse web 26 of the righthand segment and retain the segments against axial movement relative to the tie rod 20 between retainer 45 and drive means 35. A dust seal element 47 is carried on the retainer 45 by a split end portion 47a to extend outwardly of the righthand end of the dowel 18. An end cap 48 is mounted on the distal end of the tie rod adjacent a washer 49, and the tie rod 20 is received in a bearing 50 carried on a bearing support 51 for journaling the tie rod 20 at the righthand end. A similar bearing journaling the lefthand end of the tie rod 20. Thus, the tie rod 20 also functions as a bearing shaft.

Brush structure 10 is extremely simple and economical of construction while providing an improved brush assembly for use in a vacuum cleaner providing for facilitated manufacture and long life. The assembly of brush structure 10 is extremely simple. The segments are installed relative to the brush back and beater bar base by relative movement of the individual segments with the brush back and beater base received in the channels 24 and 24' therefor to arrange the dowel, brush and beater bar as shown in FIG. 3. The drive means 35 and the brush hub assembly means 36 are then installed at the opposite ends of the tie rod to lock the assembly on the tie rod, as shown in FIG. 4. The brush back and beater bar base effectively lock the individual segments against rotation relative to each other for rotation with the tie rod as effected by the drive belt 15 acting through pulley 37.

As indicated above, the dowel segments may be formed of molded plastic. The hub structure 36 may comprise a die cast metal element for long life and strength, and the retainer 45 may similarly be cast of powdered iron. The dust cap 48 may be formed of molded plastic. The tie rod 20 may be formed of a strong material, such as steel. The distal ends of the tie rod are preferably maintained smooth so as to provide minimum wear in the bearings 50.

The foregoing disclosure of specific embodiments is illustrative of the broad inventive concepts comprehended by the invention.

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

1. A brush structure for use in a nozzle of a vacuum cleaner, comprising: a plurality of dowel segments; means for retaining said segments in end-to-end coaxial alignment to define an elongated substantially continuous cylindrical brush dowel; means for journaling said brush dowel for rotation about the longitudinal axis thereof; segmentally helical means on said segments; and means integral with said segments for cooperatively indexed indexing said segments sequentially in said end-to-end relationship to cause said segmentally helical means to define a substantially continuous helical channel for holding an elongated brush insert in a helical disposition coaxially about said brush dowel.

2. The brush dowel of claim 1 wherein said brush insert defines means for precluding movement of the dowel segments relative to each other about the axis of the brush dowel.
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3. The brush dowel of claim 1 wherein said indexing means defines interlocking male and female means on said dowel segments for precluding movement of the dowel segments relative to each other about the axis of the brush dowel.

4. The brush dowel of claim 1 wherein said brush insert and indexing means cooperatively define means for precluding movement of the dowel segments relative to each other about the axis of the brush dowel.

5. The brush dowel of claim 1 wherein said means on said segments for holding the brush insert comprises a segmentally helical, outwardly opening groove in said dowel segments disposed in end-to-end continuity to define said helical channel extending substantially the length of said brush insert and cooperating means on said brush insert for locking said brush insert to said dowel segments in said helical channel.

6. The brush dowel of claim 5 wherein said grooves comprise an undercut channel.

7. The brush dowel of claim 1 wherein said dowel segments have a substantially cylindrical outer surface and said means on said segments for holding the brush insert comprise means projecting radially outwardly from said cylindrical outer surface.

8. The brush dowel of claim 1 wherein said dowel segments are tubular and include a transverse web.

9. The brush dowel of claim 1 wherein said dowel segments are tubular and include a transverse web, and said means for retaining said segments in end-to-end coaxial alignment comprises a tie rod extending coaxially through said webs for effectively mounting the segments thereon in said coaxial alignment.

10. The brush dowel of claim 1 wherein said dowel segments are tubular and include a transverse web, said means for retaining said segments in end-to-end coaxial alignment comprises a tie rod extending coaxially through said webs for effectively mounting the segments thereon in said coaxial alignment, and means at the ends of said tie rod for retaining said segments against rotation about the axis of said tie rod and against movement axially of said tie rod.

11. The brush dowel of claim 1 wherein said dowel segments are tubular and include a transverse web, said means for retaining said segments in end-to-end coaxial alignment comprises a tie rod extending coaxially through said webs for effectively mounting the segments thereon in said coaxial alignment, and means at the ends of said tie rod for retaining said segments against rotation about the axis of said tie rod and against movement axially of said tie rod.

12. The brush dowel of claim 1 wherein said dowel segments are tubular and include a transverse web, said means for retaining said segments in end-to-end coaxial alignment comprises a tie rod extending coaxially through said webs for effectively mounting the segments thereon in said coaxial alignment, and means at the ends of said tie rod for retaining said segments against rotation about the axis of said tie rod and further defining a drive pulley adapted to be belt driven for rotating said brush structure about the axis of said tie rod.

13. The brush dowel of claim 1 wherein said dowel segments are tubular and include a transverse web, said means for retaining said segments in end-to-end coaxial alignment comprises a tie rod extending coaxially through said webs for effectively mounting the segments thereon in said coaxial alignment, and means at the ends of said tie rod for retaining said segments against rotation about the axis of said tie rod and further defining bearing means rotatably journaling the tie rod, and including dust seal means for preventing deposition of foreign matter on the bearing means.

14. The brush dowel of claim 1 wherein said dowel segments include interfitting opposite end portions for registering channel portions of adjacent segments to provide a substantially continuous helical channel.

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