United States Patent

Hunt

[15] **3,649,985**

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[54] **DISPOSABLE ROTARY BRUSH CORE AND FILAMENT ASSEMBLY FOR POWER SWEEPERS**

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[52] **U.S. Cl.** **15/179,** 29/117

[51] **Int. Cl.** **A46b 1/00**

[58] **Field of Search** 15/179–183; 29/117

[56] **References Cited**

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[57] **ABSTRACT**

A disposable cylindrical brush assembly for use in power sweeping machines such as street sweepers. The cylindrical brush is attached to a drive shaft for the machine through use of expansible elastic coupling elements which are carried by the drive shaft and which frictionally engage the inner surface of a cylindrical core which carries the brush filaments.

4 Claims, 9 Drawing Figures

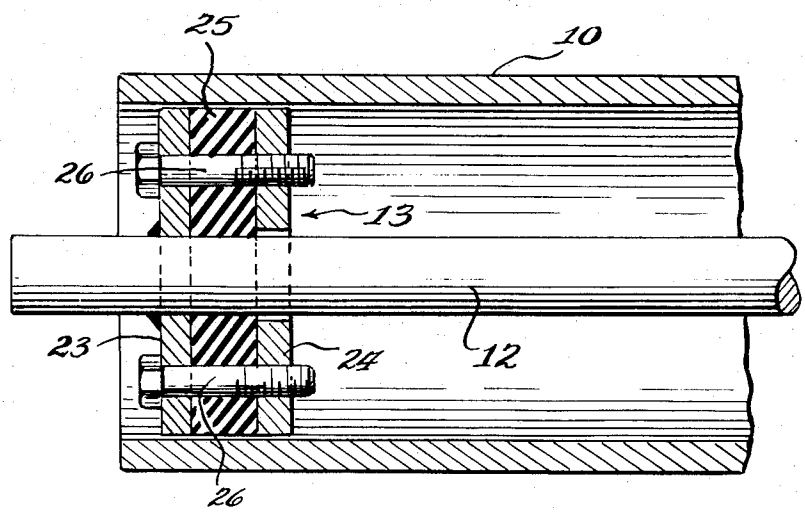


Fig. 1.

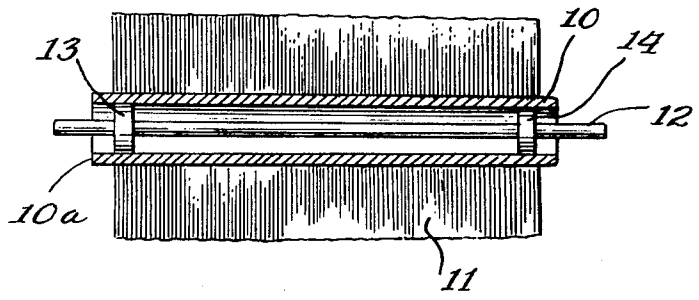
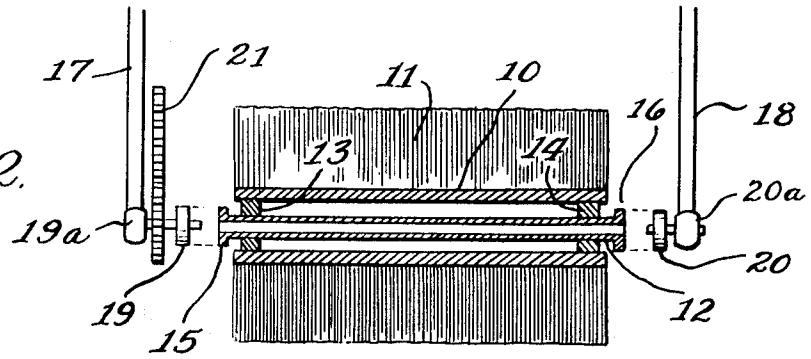


Fig. 2.



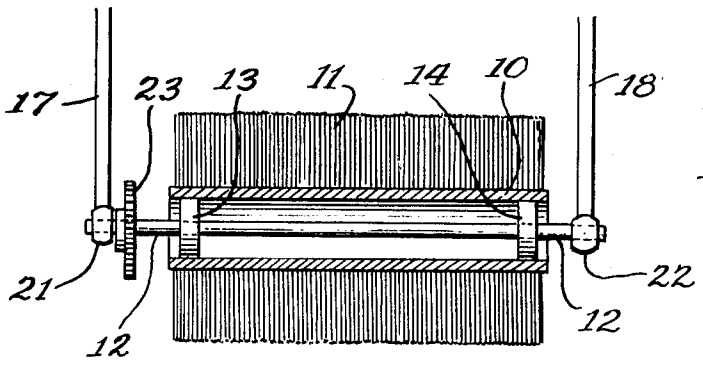


Fig. 3.

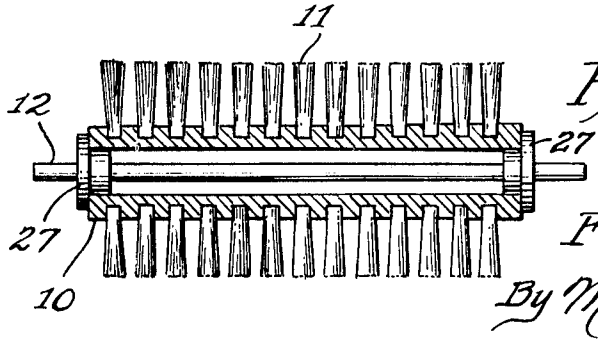


Fig. 9.

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Fig. 4.

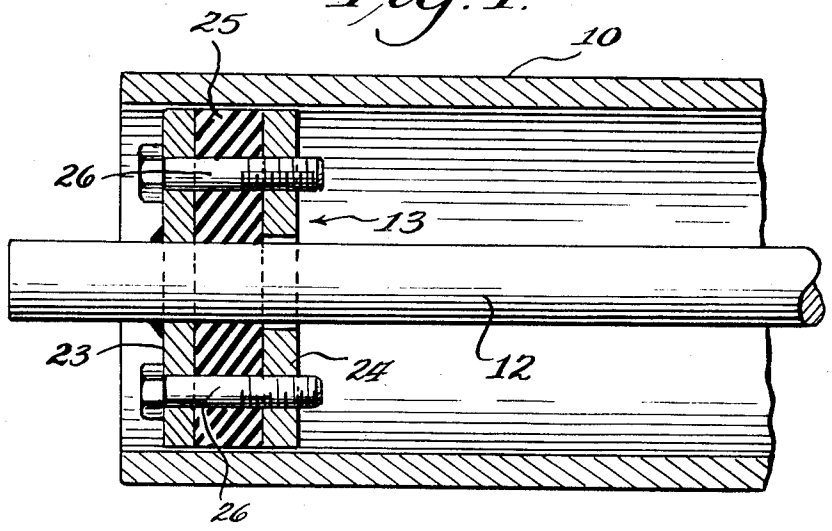

Fig. 5.

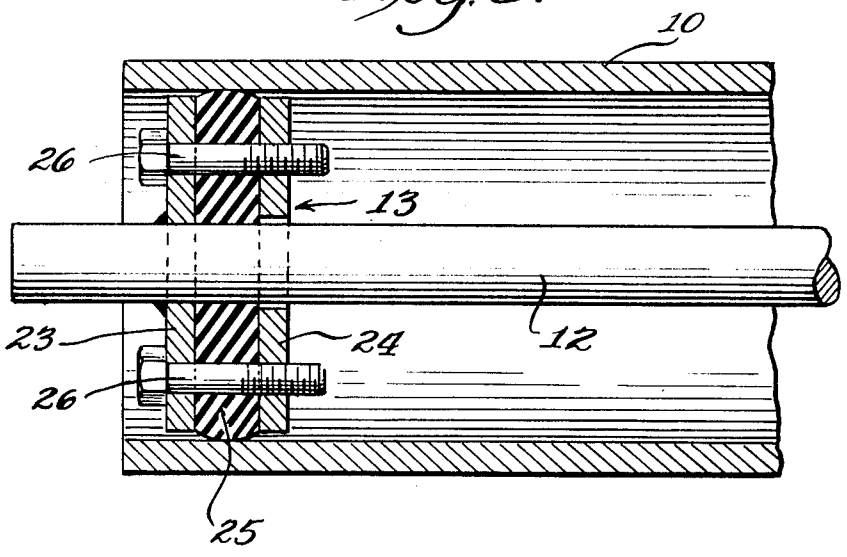

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Fig. 6.

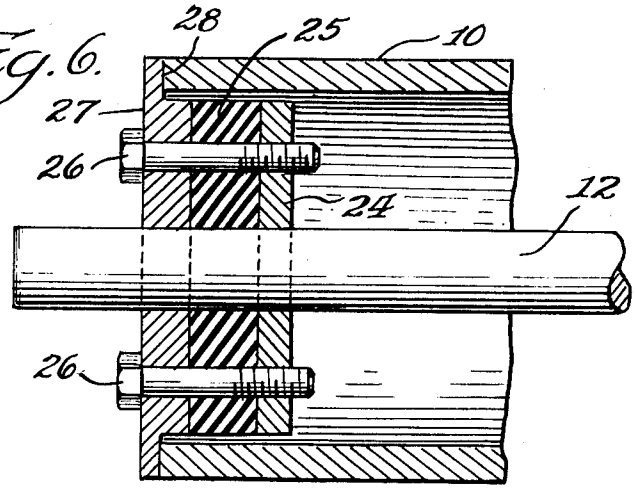

Fig. 8.

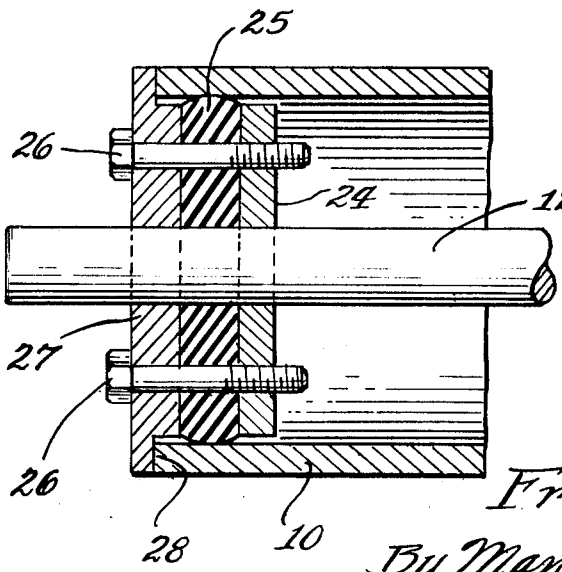

Fig. 7.

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DISPOSABLE ROTARY BRUSH CORE AND FILAMENT ASSEMBLY FOR POWER SWEEPERS

The present invention is directed to new and useful improvements in rotary brooms of the type used in street sweepers.

In the past rotary brooms of this type have usually been of a spiral channel type or a type in which a plurality of circular "wafer-like" filament assemblies consisting of circular supports with filaments held thereon are slipped over a supporting core in the broom. The spiral wound type may be of a type in which a spiral groove is machined in the core or a type wherein a separate channel is wound about a core with filaments held in the channel by means of a cord positioned in the channel and/or by means of clamping pressure from the sides of the channel. In some spiral wound brushes, a spiral channel and filament assembly is removably fitted over a core. In both classes of such brooms it has been customary to provide special driving attachments on the core itself. Sometimes the drive shaft for the broom is formed integrally with the core. When the drive shaft is formed integrally with the brush core, the cost of replacing a worn brush is usually more expensive than is the case where the drive shaft is removable from the brush core and filament assembly. In the case of brush cores which are removable from the drive shaft, the attaching facilities are relatively expensive and cumbersome. The "wafer-like" brush constructions which are removably fitted on a core are relatively expensive and require a relatively large amount of time for removal from and replacement on a core.

With the foregoing in mind, the principal purposes of the present invention are to form a brush filament assembly on a cylindrical core without any special drive attaching facilities on the core and in such a manner that the replacement channel and filament assembly is in the normal operating position when received by the purchaser thereof so that the purchaser may quickly and easily remove a similarly formed unit from his sweeping machine and replace it with a new filament and core assembly. A related purpose of the invention is to provide simple and effective means to enable a quick attachment of and detachment of a replaceable filament assembly with drive shaft means of a street sweeping machine. Another related purpose of the invention is to provide a rotary broom in which the cost of material, time and labor in replacing worn-out filaments is less than in prior machines. These and other purposes of the invention will become more apparent in the course of the ensuing specification and claims when taken with the accompanying drawings, in which:

FIG. 1 is a diagrammatic view of a broom of a power sweeping machine incorporating the principles of the present invention;

FIG. 2 is another diagrammatic view of the broom shown in FIG. 1 while illustrating machine driving and supporting means for the broom;

FIG. 3 is another diagrammatic view of a broom as shown in FIG. 1 but illustrating a different driving and supporting means for the broom;

FIG. 4 is a sectional view of the broom or brush core together with a new and improved coupling for coupling the broom drive shaft to the brush core;

FIG. 5 is a view of the same elements shown in FIG. 4 while illustrating a different operative condition of the elements;

FIG. 6 is a sectional view of a modified form of coupling between the drive shaft and the brush core;

FIG. 7 is a sectional view of the brush core, coupling and drive shaft shown in FIG. 6 but illustrating a different operative position of the elements illustrated in FIG. 6;

FIG. 8 is a perspective view illustrating the method of assembling brooms or brushes formed in accordance with the present invention with the couplings and drive shaft herein illustrated; and

FIG. 9 is a diagrammatic sectional view of a broom using the couplings of FIGS. 6 and 7.

Like elements are designated by like characters throughout the specification and drawings.

With specific reference to the drawings, and in the first instance to FIG. 1, the numeral **10** designates a brush or broom core having brush filaments **11** fixed thereto and extending radially outwardly therefrom. The filaments **11** as illustrated in FIG. 1 and as used in the invention may be fixed to the core through use of a spiral channel wound about the core and with a cord holding portions of the filaments within the channel and/or with the channel clamping the filaments, Both in a manner known to the art. In lieu of a separate channel member, a channel may be machined in the exterior surface of the core while using a holding cord to hold the filaments in the channel in a manner known to the art. The filaments may also be positioned on the core through use of a plurality of "wafer-like" filaments and supports positioned side by side on the core. In this latter case, relatively short supporting sleeves each carry brush filaments extending radially outwardly therefrom and a plurality of the "wafer-like" brush elements are positioned side by side along the length of the core **11**.

In accordance with the invention, the core **10** is hollow and generally cylindrical in form. The core may be made from steel, wood, plastic or may be fabricated from a plurality of spirally wound laminations of paper which are bonded together. The core **10** must be such as to provide a substantially smooth inner surface from one end **10***a* of the core to the other end **10***b*, while providing approximately the same cross-sectional area from one end to the other. While the inner surface is smooth, it should be understood that the material of the core should provide good friction with materials such as rubber and resilient polyurethane plastics. The material used for the core **10** should be sufficiently rigid as to maintain its concentricity and cylindrical shape during subsequent sweeping operations in power sweepers or brooms. In one example, the core may be approximately eight inches in internal diameter, approximately one-half inch thick and approximately five feet long. The core may be formed with other lengths, thicknesses and diameters.

A drive shaft **12** extends through the hollow interior of the core and is fixed to the core through use of spaced couplings **13** and **14** which will be described hereinafter.

Brooms or brushes as thus described are customarily used with power sweepers of the type having movable or stationary supporting arms for the drive shaft **12** as illustrated in the alternative drive systems shown in FIGS. **2** and **3**. A typical power sweeper is a street sweeping machine. In FIG. **2**, for example, the drive shaft **12** is shown as hollow and is provided with flanges **15** and **16** on the opposite ends thereof. The drive shaft may be solid. The broom supporting arms **17** and **18** may be pivotally mounted on the frame of power sweeping machines so as to enable lowering of the broom to an operative position and raising the broom to an inoperative position in a manner known to the art. In some power sweepers, the supporting arms **17** and **18** may be fixed in the operative position. The broom supporting arms carry machine stub shafts **19** and **20** which can be coupled with the end flanges **15** and **16** of the drive shaft **12**. The stub shafts are rotatably mounted in the bearings **19***a* and **20***a* which are carried by the arms **17** and **18**. One stub shaft, as for example stub shaft **19**, may carry a drive sprocket which is keyed on stub shaft **19** and driven through a chain or belt drive **21** from a suitable prime mover on the machine. FIG. **3** illustrates another driving arrangement in which the broom or brush supporting arms **17** and **18** carry bearings **21** and **22** in which the drive shaft **12** is removably journaled. In the arrangement of FIG. **2**, a drive sprocket **23** is keyed to the main drive shaft **12** and driven from the prime mover of the machine. In both FIGS. **2** and **3** the sprockets may be inside or outside of the supporting arms.

It should be understood that the invention described herein is applicable to a number of different drive shaft supporting and driving means. The two different supporting arm and drive arrangements in FIGS. **2** and **3** should be taken as illustrative of brush shaft supporting and driving means known to the art to which the present invention may be applied.

In accordance with the invention, the brush core with the assembled brush filaments thereon is removably fixed to the drive shaft through use of couplings as illustrated in FIGS. 4–7. In FIG. 4, for example, a first generally circular clamping plate 23 is positioned around and fixed to the drive shaft as by means of welding or the like. A movable clamping plate 24 surrounds the drive shaft 12 and a disc of rubber or rubberlike material 25 is positioned between the two plates 23 and 24. Disc 24 also surrounds the shaft. The disc 25 may be formed from resilient natural rubber or synthetic types of neoprene or polyurethane plastic, possessing good memory characteristics.

THe fixed plate 23, movable plate 24, and rubber element 25 have normal diameters providing a clearance with the internal cylindrical surface of the brush core 10. This diametral clearance may be on the order of 1/8 to 1/1000 inch so that the brush core is easily slipped over these elements. The inner diameter of the fixed plate 23 should be such that it makes a rather snug fit with the drive shaft 12. The inner diameter of the rubber disc 25 preferably should also be such that it makes a relatively snug fit with the external surface of the drive shaft 12, although a small clearance such as several thousandths of an inch may be used between the disc 25 and shaft 12. The internal diameter of the movable plate 24 may be such as to provide a clearance space of approximately 1/16 to 1/100 of an inch between the plate 24 and the external diameter of the shaft 12. Greater and lesser clearances may be used.

The plates 23 and 24 together with the rubber element 25 are held in an assembled position by bolts 26 which are passed through the stationary plate 23 and threaded into the movable plate 24. A plurality of these bolts 26 are equally spaced around the shaft. Tightening of the bolts causes the movable plate 24 to move towards the stationary plate 23 and cause the rubber disc 25 to flow outwardly into a tight binding frictional engagement with the inner surface of the core. This compressive force exerted by the plates 23 and 24 also causes the rubberlike element 25 to press inwardly against the external surface of the drive shaft 12. The inward and outward flow tendency of the rubber tends to insure concentricity of the brush core 10 with respect to the axis of the drive shaft 12, because the pressure exerted on the rubber disc 25 develops radial forces within this element acting both inwardly and outwardly with respect to the axis of the drive shaft. If the clearance between shaft 12 and disc 25 is such that the disc 25 does not contact shaft 12 in the expanded or distorted condition of disc 25, concentricity is then established from the fixed position of the bolts 26. Such a structure can be used with the removable brush cores described herein, but it is preferred to use a close fit between the shaft and disc to provide the radial forces against the shaft. It should be understood that both couplings 13 and 14 are formed in a manner identical to the coupling illustrated in FIGS. 4 and 5.

The rubberlike disc 25 may be made in one piece. To facilitate removal and replacement of the disc, the disc may be made in identical half sections or have a radial slit therein so that it may be removed without endwise movement over the shaft.

While it is preferable to fix the stationary plate to the drive shaft 12, in some cases it may be advantageous to mount the plate 23 for sliding movement along drive shaft 12 while precluding rotation thereon through use of a key or keyway. The particular formation of the core enables selective positioning of the coupling elements at various positions along the drive shaft. This latter type of arrangement may be advantageous in circumstances wherein different lengths of brush core assemblies are desired for use on the same drive shaft. After adjustment of the coupling assemblies at a particular position by sliding movement along the shaft, the position may be fixed through use of suitable pins or the like which are passed through the plates and shaft.

FIGS. 6 and 7 illustrate a modified form of coupling which is similar in all respects to the coupling illustrated in FIGS. 4 and 5 except for the fixed plate which is designated at 27 in these figures. In these figures the fixed plate is formed with an annular shoulder 28 which abuts against the end of the brush core 10. A similar abutting fixed plate is used at each end of the assembly. Again, the fixed plate 27 may be fixed to the drive shaft 12 as by welding or the like, or may be mounted for a slidable adjustment along the length of the drive shaft 12. In FIGS. 6 and 7 tightening of the bolts 26 serves to cause the rubberlike element to flow outwardly into a tight frictional driving engagement with the inner surface of the core 10. The form of the invention illustrated in FIGS. 6 and 7 may be used with the form illustrated in FIGS. 4 and 5 with a coupling of FIGS. 6 and 7 at one end of the core and a coupling of FIGS. 4 and 5 at the other end to permit endwise removal and replacement of the brush core over the couplings. A coupling as illustrated in FIGS. 6 and 7 may be used at each end of the core if the couplings are removably fixed to the drive shaft to permit removal and replacement of the core.

In each form of the invention use is made of a brush element in the form of a cylindrical core with brush filaments mounted thereon in a normal operative position. The assembled core and filaments are easily placed into a power machine simply by sliding the core over the coupling elements as diagrammatically indicated in FIG. 8, whereupon the bolts 26 are tightened to bring about the driving engagement between the shaft 12 and the core 10. If the couplings are slidably mounted on the shaft and one or more is removable from the shaft, the coupling or couplings may be removed from the shaft before the core is removed. Then a new core unit is placed over the shaft and the removable coupling or couplings are placed in their normal operative positions. A worn brush unit is easily replaced simply by loosening the coupling elements whereby the memory of the rubber will cause it to return toward its normal condition (providing clearance between it and the internal surface of the core) whereupon the worn assembled core and filaments are removed from the shaft and couplings by a simple endwise sliding movement. A new disposable core and filament unit may then be inserted endwise over the couplings and fixed in position.

The invention makes use of disposable filament and core assemblies practical and economical.

The brush core when removed may, if desired, be provided with new filaments as, for example, by removing the filament holding facilities from the core and then adding new filament holding facilities and filaments to the core whereupon the core and filament assembly is ready for reuse in the sweeping machine. A core may be provided with new filaments in the case of a spiral channel filament holding assembly as described in U.S. Pat. to George B. Hunt, No. 3,343,884, by removing the old channel and filaments from the core and thereafter winding a new channel and group of filament on the core.

In each form of the invention, the inner cylindrical, frictional surface of the brush core is the sole drive shaft attaching facility on the core.

I claim:

1. A heavy duty replaceable rotary brush and drive assembly for power street sweeping machines and the like including an elongated, hollow, rigid, cylindrical core, said core having a substantially smooth inner surface from end to end thereof and providing an unobstructed passageway of approximately the same cross-sectional area from end to end of the core, filament holding means on the exterior surface of the core, brush filaments carried by said means and extending outwardly from the core, a drive shaft positioned within said core and extending from one end of said core to the other, said drive shaft carrying means providing a connection with a power source and means providing a connection for supporting arms of a power sweeping machine, and spaced couplings carried by said shaft within said core for fixing said core to said drive shaft for rotation therewith, each coupling including expansible rubberlike elements extending around said shaft and platelike elements embracing each rubberlike element, each coupling having means for moving said platelike elements toward one another to cause said rubberlike elements

to bulge outwardly and grip the internal wall of said core in a frictional driving engagement, each coupling including means for holding it on said shaft for rotation therewith, one platelike element of each coupling having an outer annular portion engaging one end face of said core.

2. A heavy duty replaceable rotary brush and drive assembly for power street sweeping machines and the like including an elongated, hollow, rigid, cylindrical core, said core having a substantially smooth inner surface from end to end thereof and providing an unobstructed passageway of approximately the same cross-sectional area from end to end of the core, filament holding means on the exterior surface of the core, brush filaments carried by said means and extending outwardly from the core, a drive shaft positioned within said core and extending from one end of said core to the other, said drive shaft carrying means providing a connection with a power source and means providing a connection for supporting arms of a power sweeping machine, and spaced couplings carried by said shaft within said core for fixing core to said drive shaft for rotation therewith, each coupling including expansible rubberlike elements extending around said shaft and platelike elements embracing each rubberlike element, each coupling having means for moving said platelike elements toward one another to cause said rubberlike elements to bulge outwardly and grip the internal wall of said core in a frictional driving engagement, each rubberlike element having a normal, undistorted shape providing a clearance with the internal wall of said core and each rubberlike element having an internal aperture with a diameter providing a snug fit with said shaft in the undistorted shape of the element, whereby, upon movement of said platelike elements toward one another to cause distortion and outward expansion of said element into a frictional engagement with the internal wall of said core, said element exerts inward pressure against said shaft, each coupling including means for holding it on said shaft for rotation therewith.

3. The structure of claim 2 characterized by and including means for fixing at least one platelike element of each coupling to said shaft.

4. The structure of claim 2 characterized by and including means for holding each coupling against rotation relative to said shaft.

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