Aug. 27, 1935. J. B. WHITTED 2,012,842

FLEXIBLE SHAFT

Filed March 28, 1934

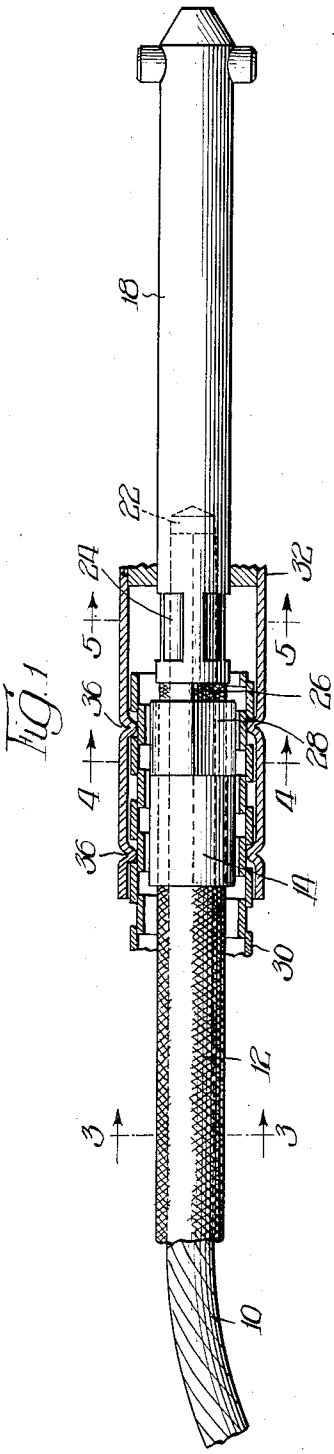


Fig. 1

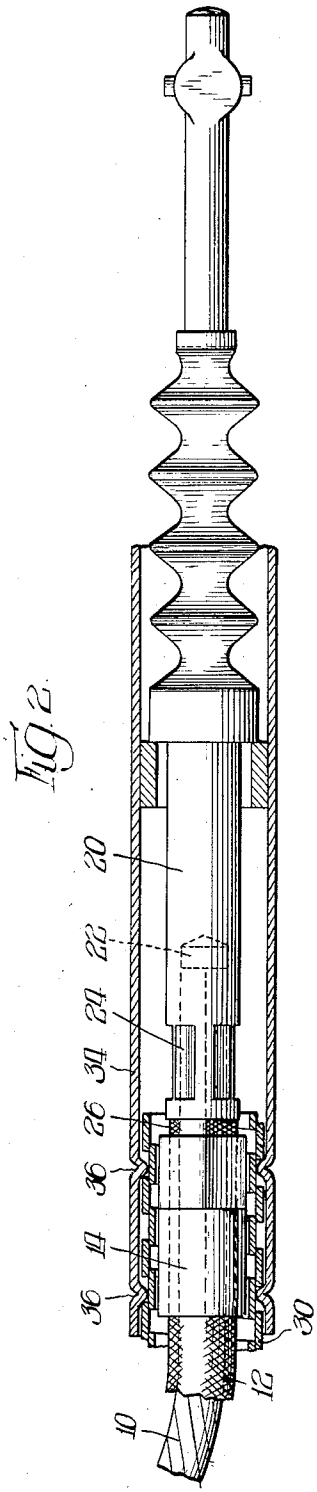


Fig. 2

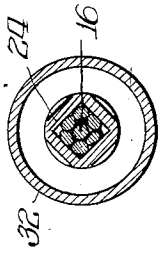


Fig. 5

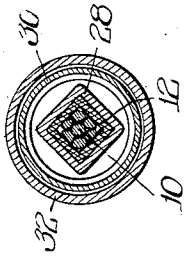


Fig. 4

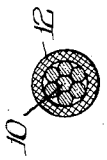


Fig. 3

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FLEXIBLE SHAFT

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Application March 28, 1934, Serial No. 717,714

6 Claims. (Cl. 64—30)

This invention relates to improvements in flexible shafts of the type which may be used, for example, as a flexible drive shaft for a windshield wiper.

My invention is an improvement over the flexible drive shaft for windshield wipers shown in my prior application Serial No. 692,911, filed October 9, 1933.

It is an object of my invention to provide a flexible shaft in which the rotatable core will run silently within the flexible sheath thereof.

It is further an object of my invention to provide a rotatable core for a flexible shaft comprising an inner core of tightly twisted strands of steel wire enclosed within a fabric covering and to provide a flexible metallic sheath for housing the rotatable core.

A still further object of my invention is to provide a flexible shaft which is lubricated within its sheath by utilizing as a rotatable core a metallic driving member having a lubricant-impregnated fabric covering therefor.

A still further object of my invention is to provide improved means for attaching the driving and driven means to the ends of the flexible shaft in such a manner that the fabric covering of the shaft will be secured against unraveling, slippage or tangling during operation of the shaft.

Further objects and advantages of my improvements will be more readily apparent from the following description taken in connection with the attached drawing, in which

Figure 1 is an elevation of one end of the rotatable core and the drive tip therefor, showing, in section, a portion of the flexible sheath and a connected ferrule;

Figure 2 is a similar view of the other end of the flexible shaft;

Figure 3 is a section on the plane indicated 3—3 in Figure 1;

Figure 4 is a section on the plane indicated 4—4 in Figure 1;

Figure 5 is a section on the plane indicated 5—5 in Figure 1.

The flexible inner core 10 is made up in the conventional manner of tightly twisted strands of steel wire. Over this metal core 10 is tightly woven a fabric covering or jacket 12, composed of strands of cotton thread. This jacket 12 may be woven in any well-known manner by the use of a looming machine. Although this fabric covering or jacket 12 is woven very tightly about the steel core 10, it would nevertheless tend to ravel and come loose if suitable steps were not taken to hold the fabric in place. I provide brass sleeves 14, one at each end of the flexible shaft. The sleeves 14 are first slipped over the ends of the fabric covered rotatable core. The fabric covering 12 is then pushed back to expose the ends of the steel core 10. Each end of the steel core is then placed in a die and pressed to a square section, as indicated at 16 in Figure 5. A drive tip or driving member 18 is connected to one end of the steel core and a driven member 20 is attached to the other end of the steel core. Each of these drive tips or members 18 and 20 is provided with a socket 22 to receive the squared end 16 of the metal core 10. Each of the drive tips is rigidly secured to the metal core 10 by being crimped in place as indicated by the crimped squared section 24 and as clearly shown in Figure 5. The fabric covering 12, which has been pushed back, is now returned to place and the excess material cut off so that each end 26 of the fabric covering 12 is adjacent to the end of the corresponding drive tip 18 or 20. Each of the brass sleeves 14 is then moved until it is close to the drive tip. The brass sleeves 14 may then be crimped tightly to the fabric covered metallic core, as shown by the crimped squared section 28. As shown, the brass sleeves 14 are crimped in place in such a manner as to conform to the shape of the steel core, the ends of which have been previously pressed in a die to a squared section. Thus, portions of the sleeves 14 surround the cylindrical portion of the core 10 and may retain the cylindrical shape, as clearly shown in the drawing. This may assist in maintaining the core concentric with respect to the sheath. By this method of construction the drive tips are tightly secured to the metaillic core and the fabric covering is tightly held in place against unraveling.

The rotatable core is enclosed within a flexible metallic sheath 30 which, at its ends, is connected to ferrules 32 and 34. Each of the ferrules may be crimped in place as indicated at 36. The provision of the fabric covering for the metallic core enables lubrication of the core, since before the placing of the core within the sheath it is soaked in some suitable lubricant, for example, white oil of the type frequently used in refrigerating machinery, has been found very satisfactory but it will be understood that graphite oil or any other form of lubricant would be suitable. The fabric covering will absorb the lubricant and therefore the shaft will be properly lubricated without using excessive amounts of grease and oil which may ooze through the sheath or joints therein. When the lubricated

core rotates within the sheath for a period of time, the fabric impregnated with lubricant becomes glazed and presents a very smooth surface to the interior of the sheath, thus friction losses are very low. Moreover, the fabric effectively prevents a whirring or rattling noise which is frequently present in flexible shafts of this type in which a fabric jacket is not provided for the metallic core.

The use of a flexible shaft as specifically disclosed herein is described in more detail in my prior application, Serial No. 692,911, filed October 9, 1933, wherein the core not only rotates within the sheath but is adapted for slidable movement to control a clutch at one end of the flexible shaft.

I claim:

1. A flexible shaft assembly comprising a rotatable flexible shaft and a non-rotatable flexible metallic sheath, said rotatable flexible shaft comprising a metallic core with a lubricant-impregnated fabric covering thereon and rotatable therewith.

2. A flexible shaft assembly comprising a rotatable flexible shaft and a non-rotatable flexible metallic sheath, said rotatable flexible shaft comprising a core composed of tightly twisted strands of steel wire and a tightly woven lubricant-impregnated fabric covering on said metal core and rotatable therewith.

3. A flexible shaft assembly comprising a non-rotatable flexible metallic sheath and a flexible rotatable shaft, said flexible shaft comprising a steel core and a tightly woven lubricant-impregnated fabric covering, drive tips fixed to the ends of said steel core, the fabric covering on said steel core extending adjacent to said drive tips, a pair of metallic sleeves, each of which is rigidly secured to the fabric covered metal core adjacent each of said drive tips.

4. A flexible shaft assembly comprising a non-rotatable flexible metallic sheath and a rotatable flexible shaft, the rotatable shaft comprising a flexible steel core and a lubricant-impregnated fabric covering on said steel core, the ends of the core pressed to square shape in cross section, drive and driven tips having sockets to receive the square ends of said core and clamped thereto, a pair of sleeves through which the ends of said fabric covered core extend, said sleeves being fixed in position to hold the fabric in place by being clamped to the square sections of said core adjacent the tips.

5. A flexible shaft assembly comprising a non-rotatable flexible metallic sheath and a rotatable flexible shaft, the rotatable flexible shaft comprising a steel core and a lubricant impregnated fabric cover woven on said steel core, drive and driven tips fixed directly to the ends of said steel core, the fabric covering being previously cut away to permit connection with the core and sleeve members receiving the fabric covered core and fixed thereto to hold the fabric covering in place at its ends and prevent unraveling.

6. A flexible shaft assembly comprising a flexible rotatable shaft composed of a core of tightly twisted strands of steel wire for transmitting the driving torque and a tightly woven lubricant-impregnated fabric covering about said tightly twisted strands and rotatable therewith and a non-rotatable flexible metallic sheath for housing the lubricant-impregnated fabric covered metallic shaft.

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