

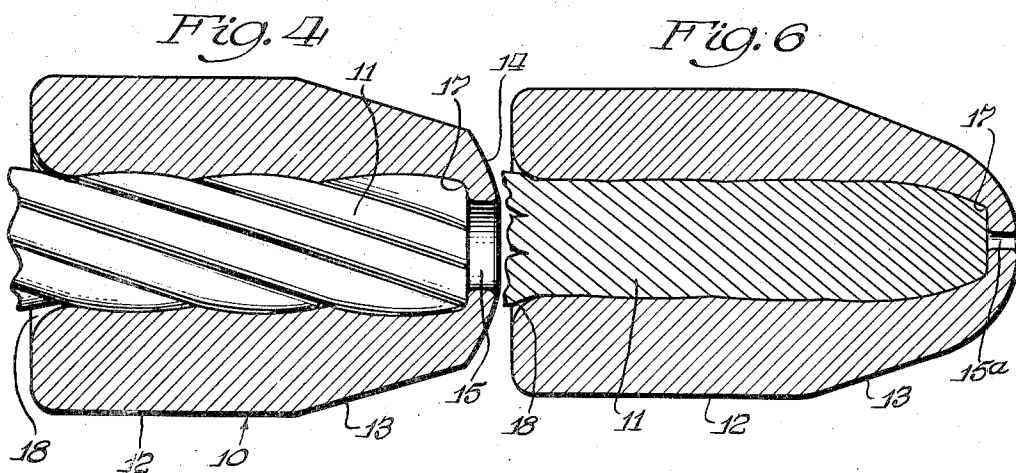
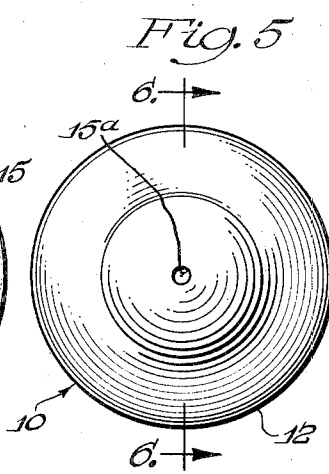
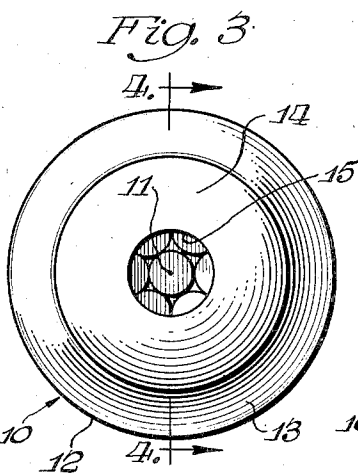
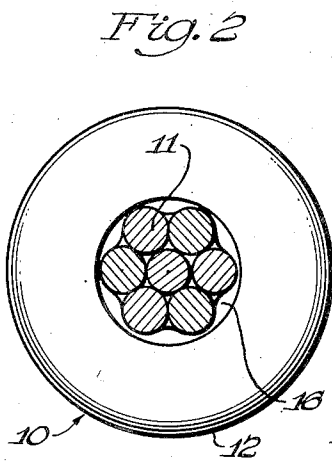
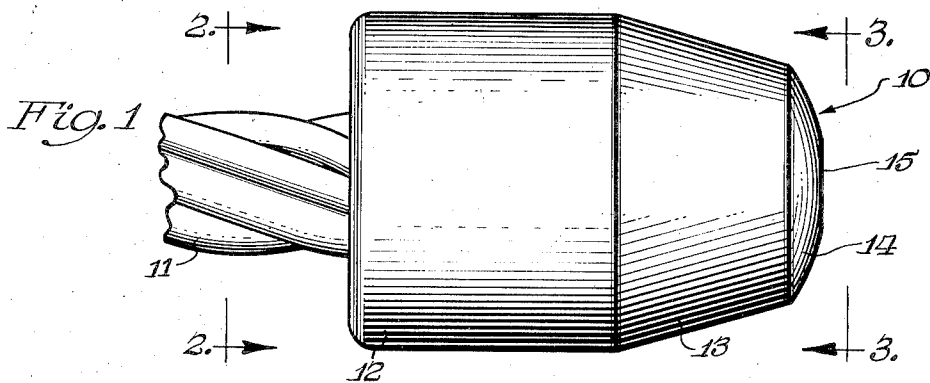
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FERRULE

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This invention relates to a ferrule useful in enclosing the end of a wire rope. Ferrules embodying the invention have particular utility in connection with choker or butt hook assemblies, and which are adapted to be rigidly anchored to the end of the wire rope of such assemblies in a swaging operation.

In a choker or butt hook assembly, a wire rope is provided with a special type of hook intermediate the ends thereof, and the end of the rope is equipped with an enlargement adapted to be received within the hook and to be gripped thereby. Such assemblies are useful, for example, in the lifting and dragging of logs etc., and when so used the end portion of the rope must be pushed under the log or logs before the rope end can be secured within the hook.

In order that the rope end can be readily threaded under logs and similar structures, the rope end is preferably free of obstructions that might cause the rope to hang up on the log. Further, the enlargement at the end of the rope, and that is secured by the hook, must be firmly secured to the rope end so that it can withstand the rough usage and impact forces applied thereto in use of the butt hook assembly.

An object of this invention is to provide a ferrule useful in enclosing the end of a wire rope, and being characterized by permitting greater pressure to be available in a swaging operation for compressing the ferrule about the rope portion received therein to better and more securely anchor the ferrule to the rope. Still another object is in the provision of a ferrule of the character described that receives the end portion of a wire rope therein and that, following a swaging operation, provides a closure about the end of the rope, such closure forming a smooth end portion for the rope and permits it to be readily threaded under logs and similar structures without hanging up, etc. A further object of the invention is in the provision of a ferrule having a bore extending longitudinally therethrough adapted to receive a wire rope therein, the ferrule at the outer end thereof being adapted to be substantially closed in a swaging operation to completely enclose the rope end. Yet a further object is that of providing a ferrule having a wire rope profile cast therein, whereby a greater gripping force is provided with the rope following a swaging operation. Additional objects and advantages will become evident as the specification proceeds.

An embodiment of the invention is illustrated in the accompanying drawing, in which—

Figure 1 is a side view in elevation of a rope structure equipped with a ferrule embodying the invention; Figure 2 is a transverse sectional view taken on the line 2—2 of Figure 1; Figure 3 is an end view in elevation as viewed along the line 3—3 of Figure 1; Figure 4 is a longitudinal sectional view taken along the line 4—4 of Figure 3; Figure 5 is an end view in elevation similar to that of Figure 3, but showing the ferrule after the swaging operation;

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tion; and Figure 6 is a longitudinal sectional view taken along the line 6—6 of Figure 5.

The ferrule, which is designated with the numeral 10 in the drawing, may be used as an end closure for ropes having varied characteristics. A typical rope is shown in Figure 1 and is designated with the numeral 11. The rope 11 is a wire rope formed by spirally winding together a plurality of individual strands. The rope can be formed of any number of strands, and the strands may have any desired diameter, and the rope itself may be of varied diameters.

The ferrule 10 has a generally cylindrical body portion 12 that merges forwardly into a frusto-conical section 13 having a partial end closure 14 provided with an opening 15 centrally therethrough. The ferrule has a longitudinally extending bore or opening 16 therein that at its forward end communicates with the opening 15. As is seen most clearly in Figure 4, the annular shoulder 17 is provided at the juncture of the bore 16 and opening 15.

Preferably, the inner end of the bore 16 is flared outwardly, as is shown at 18 in Figure 4, to permit the rope 11 to be readily inserted into the bore. It is desired that the ferrule, and particularly the bore 16 thereof, have the profile of the rope 11 cast therein. Thus, the rope 11 is snugly received within the bore 16.

In using the ferrule 10, it is threaded onto the end portion of the rope 11 and the end of the rope is brought into abutting relation with the annular shoulders 17. This position of the rope within the ferrule may be determined by inspection through the opening 15 in the end wall 14. As is clear from Figure 4, the rope 11 substantially fills the bore 16, and the rope preferably substantially touches the walls of the bore which are cast with the rope profile therein.

After the rope and ferrule have been assembled as is shown in Figure 4, the ferrule is placed between the jaws of a swaging die, and pressure is applied between those jaws to compress the ferrule and thereby rigidly anchor it to the rope 11. In such a swaging operation, the ferrule 10 is distorted and particularly the end wall 14 thereof which flows so as to substantially close the opening 15, as is seen in Figures 5 and 6. For purposes of identification, the opening 15 after swaging of the ferrule is designated with the numeral 15a. After such a swaging operation, it is found that the ferrule is firmly anchored upon the rope and is capable of resisting any tendency of the rope to be withdrawn therefrom even when considerable forces tending to separate the rope and ferrule are applied therebetween.

As shown in Fig. 6, the swaging operation is effective to lengthen the ferrule slightly, reduce the diameter thereof, and substantially mold the wire into a homogeneous mass although it does retain its longitudinal profile. Where a wire rope of three-quarter inch diameter is used and a corresponding ferrule, the ferrule diameter is reduced about three-sixteenths of an inch, the length is increased about one-quarter inch, and the wire diameter reduced about one-eighth inch.

The opening 15 in the ferrule allows more pressure to be available in a swaging operation for tightly compressing the ferrule about the rope received therein. Further, upon substantially complete closing of the opening 15, it is found that the end of the ferrule is smooth and may readily be threaded through relatively tight passages without hanging up.

In reforming the bore of the ferrule so as to conform to the profile of the wire rope, the bore 16 has alternating ridges and grooves, as shown best in Fig. 2, with the ridges extending between the spirally-wound wires or strands of the rope so that the bore thus snugly receives the end of the rope when it is threaded into the ferrule.

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Since the ridge portions of the contoured bore stick in between the wires or strands of the rope, the ensuing swaging operation requires very little flow of the metal in filling the voids between the rope strands, and the ridge portions of the contour further act to maintain the wire strands in their original spiral position during the swaging action. Why the rope end is held with such firmness within the ferrule after the swaging operation, I am not able to explain with complete scientific certainty. It is possible that the preformed ridges of the contoured bore which stick between the spiral wires of the rope maintain these wires in their original spiral position without allowing them to straighten or partially straighten under the pressures of the swaging operation and that this accounts for the firm anchor obtained. It may be that the explanation lies largely in the fact that the metal has less distance to flow between the rope wires and thus reduces the tensile strength of the ferrule steel less, while at the same time filling up more of the voids than would otherwise be filled. In any event, it is found, as already stated herein, that an extremely firm anchor is obtained, and the assembly operation is accomplished with a minimum of time and expense.

While in the foregoing specification, an embodiment of the invention has been set forth in considerable detail for purposes of adequately disclosing the invention, it will be apparent that those skilled in the art may vary those details considerably without departing from the spirit and principles of the invention.

I claim:

1. In a method for anchoring a one piece ferrule upon the end of a spirally-wound wire rope, the steps of forming the ferrule with a bore having spiral ridges and grooves conforming to the spiral ridges and grooves forming the profile of the rope end, rotating the ferrule to thread the wire rope end into the ferrule and into snug engagement with the bore thereof so that the ridges of said bore extend inwardly between the spiral wires of said rope, and then swaging the ferrule about said wire end portion.

2. In a method for anchoring a single swagable metal ferrule upon the end of a spirally-wound wire rope, the steps of forming the ferrule with an internal bore having spiral ridges and grooves conforming to the spiral ridges and grooves of said rope end, rotating the ferrule with respect to said rope and to thread the rope end into the ferrule in snug engagement with the bore thereof so that the ridges of said ferrule bore extend inwardly between

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the spiral wires of said rope to anchor said wires against straightening, and then swaging the ferrule about said wire rope end.

3. In a method for anchoring a single swagable metal ferrule upon the end of a spirally-wound rope, the steps of forming the ferrule with an inwardly-extending end wall and with an internal longitudinal bore having spiral ridges and grooves conforming to the spiral ridges and grooves of said rope end, rotating the ferrule with respect to said rope to thread the rope end into the ferrule in snug engagement with the bore thereof and with the ridges of the ferrule extending inwardly between the strands of said rope and to bring a portion of said rope end into abutting relation with said end wall, and then swaging the ferrule about said rope end.

4. In combination with a spirally-wound end portion of a wire rope in which the exterior wires provide alternating ridges and grooves, a one-piece ferrule member adapted to be swaged about said rope end portion and comprising a swagable metal body having a longitudinally-extending bore preformed to provide integral alternate spiral ridges and grooves conforming to the ridges and grooves of said rope end portion, the inner portions of the ferrule ridges lying within a circle of substantially less diameter than an imaginary circle enclosing the outermost portions of the rope wires whereby, prior to swaging, said inner ferrule ridge portions lie within the grooves of said rope and are adapted to anchor said rope wires against straightening.

5. The structure of claim 4, in which the ferrule is provided with an annular shoulder portion at the outer end thereof substantially abutting an end portion of said rope.

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