United States Patent

Wernsing

[15] **3,705,444**

[45] **Dec. 12, 1972**

[54] **SWAGABLE WIRE ROPE FERRULE**

[72] Inventor: **Kenneth L. Wernsing,** 1931 N. E. 72nd Avenue, Portland, Oreg. 97213

[22] Filed: **March 24, 1971**

[21] Appl. No.: **127,652**

[52] **U.S. Cl.**.....**24/114.5,** 24/115 A, 24/123 W

[51] **Int. Cl.**.....**F16g 11/02**

[58] **Field of Search**.....24/115 A, 123 W, 114.5; 287/80

[56] **References Cited**

UNITED STATES PATENTS

2,209,673	7/1940	Bratz	24/123 W
650,862	6/1900	McTighe	24/115 A
2,832,118	4/1958	Ehmann	24/123 W
463,443	11/1891	Davidson	24/123 W
556,649	3/1896	Smith	24/123 W

FOREIGN PATENTS OR APPLICATIONS

405,784	2/1934	Great Britain	24/115 A
694,772	9/1964	Canada	24/123 W
859,368	12/1970	Canada	24/123 W

Primary Examiner—Bernard A. Gelak
Attorney—Eugene D. Farley

[57] **ABSTRACT**

A ferrule for use on the end of a wire rope comprises a swageable metal body having a forward nose section and a rearward open terminal section interconnected by a longitudinally extending bore. The bore has a plurality of circumferentially formed ridges defined by leading and trailing surfaces meeting at an angle of not more than about 90°. When a wire rope is inserted into the bore and the ferrule swaged, the metal is displaced from the rope into the recesses present between the ridges. The leading surface of each ridge thereupon provides a buttress, backing up the metal displaced into the recesses, and opposing withdrawal of the rop when a pulling stress is applied to it.

4 Claims, 6 Drawing Figures

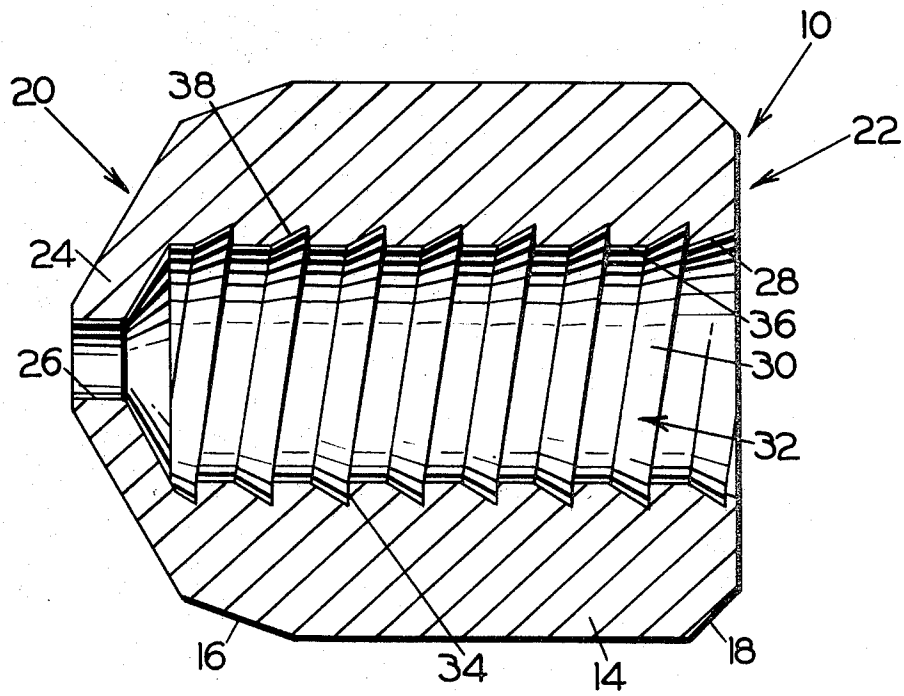


FIG. 2

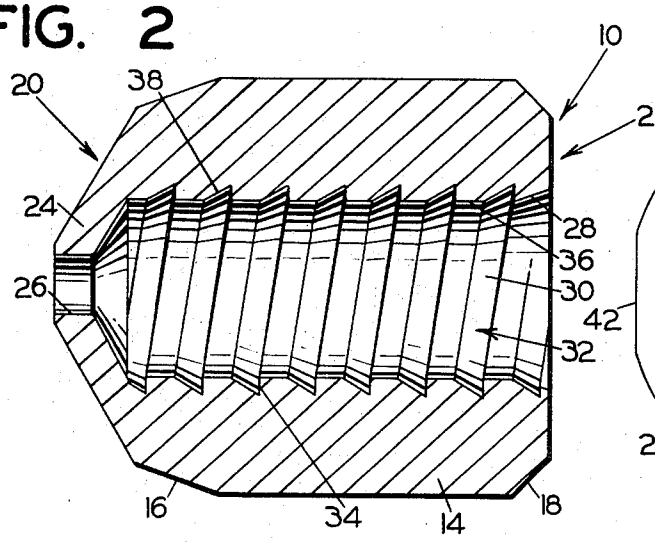


FIG. 3

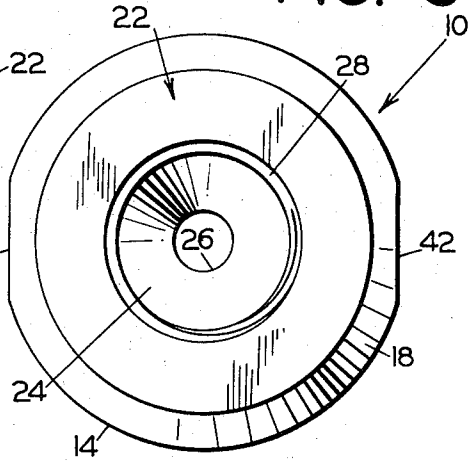


FIG. 4

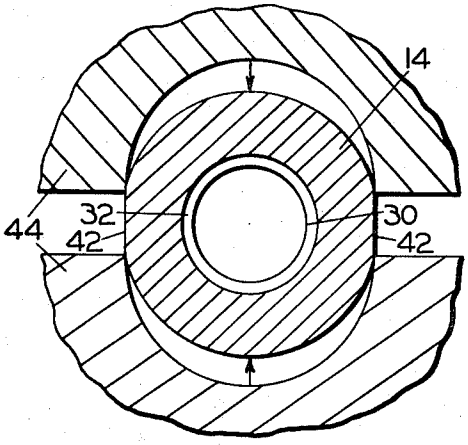
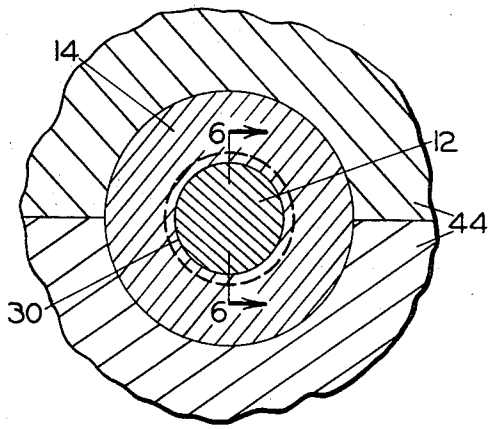


FIG. 5



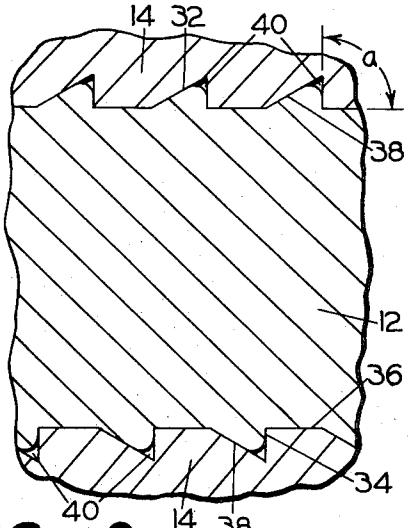


FIG. 6

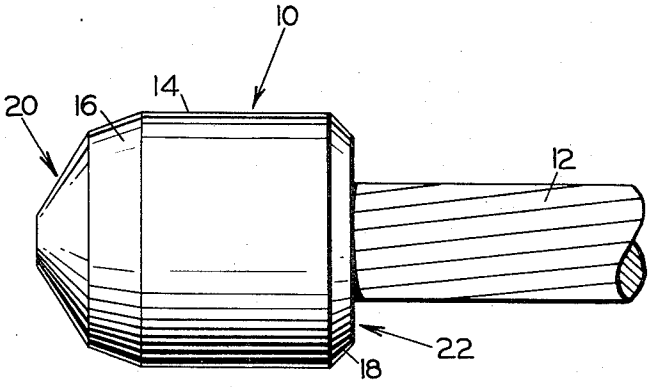


FIG. 1

KENNETH L. WERNSING
INVENTOR.

BY Eugene D. Farley
ATTY.

SWAGABLE WIRE ROPE FERRULE

This invention relates to ferrules of the class secured by swaging to the end of a wire rope.

Ferrules of the class to which that of the present invention belongs are widely applied to the ends of wire ropes employed in conjunction with choker hooks used in logging and similar operations. In such uses, the ferruled end of the rope is run through the choker hook, threaded around the log, and then fastened to the choker hook. The assembly then is used to drag the log to the loading station.

In one conventional method of applying ferrules, the ferrule is slipped over the end of the rope and pressed under heavy pressure until the ferrule metal flows into the rope. This anchors the rope in the ferrule. It is the purpose of the present invention to provide a ferrule of the indicated class having significant advantages over the ferrules of the prior art. Among these are the following:

The rope is guided smoothly into the ferrule and may be advanced easily clear to its end, thereby seating the rope securely within the ferrule preliminary to swaging.

The wire rope is held inside the ferrule during loading of the swaging dies by self-threading the rope into the ferrule bore.

During swaging, metal from the wire rope is displaced into buttressed recesses in the ferrule which resist withdrawal of the rope. This lends great strength to the assembly.

Reliefs are provided on the outside of the ferrule for accommodating metal displaced during swaging. This prevents the formation of flashings during the swaging operation, eliminates a subsequent machining operation and utilizes all of the metal content of the ferrule.

The ferrule is sealed so that the choker setter or other operator is protected from getting wire rope jaggers in his hands.

The ferrule is provided with a pointed nose so that it may be threaded under and around logs more easily when setting the choker.

The ferrule may be applied to wire ropes of various sizes and types.

The manner in which the foregoing and other objects of this invention are accomplished will be apparent from the accompanying specification and claims considered together with the drawings, wherein:

FIG. 1 is a plan view of the herein described ferrule illustrated in its use condition, swaged onto the end of a wire rope;

FIG. 2 is a longitudinal section of the ferrule;

FIG. 3 is a view in elevation of the trailing end of the ferrule;

FIG. 4 is a transverse sectional view of the ferrule positioned between dies preliminary to swaging;

FIG. 5 is a transverse sectional view similar to FIG. 4, but illustrating the ferrule and wire rope after swaging; and

FIG. 6 is an enlarged, fragmentary, longitudinal sectional view taken along line 6—6 of FIG. 5; and illustrating the integration of the wire rope into the ferrule upon swaging.

As noted, the ferrule of my invention is adapted for use on the end of a wire rope. In its broad aspect it comprises a swagable metal body having a forward nose section and a rearward, open terminal section interconnected by a longitudinal bore. The bore has a plurality of circumferential ridges. The ridges are defined by leading and trailing surfaces meeting at an angle of not more than about 90°.

When a wire rope is inserted into the bore and the ferrule swaged, the metal is displaced from the rope into the recesses provided between the ridges. The leading surface of each ridge thereupon forms a buttress, backing up the metal displaced from the rope into the recesses and opposing withdrawal of the rope upon application of a pulling stress.

Considering the foregoing in greater detail and with particular reference to the drawings:

As shown in FIG. 1, the ferrule of my invention, indicated generally at 10, is adapted for use in conjunction with a wire rope, indicated at 12. The wire rope may be of various sizes and categories, but in the illustrated form comprises a twisted strand wire rope of conventional construction manufactured by conventional methods.

The ferrule 10 basically comprises a body 14 formed integrally from a swagable metal such as iron or steel. Its contour preferably is that of a cylinder having a forward, beveled surface 16 and a rearward beveled surface 18. The bevel at both ends prevents hangups on logs and other obstructions in the use of the ferruled rope.

Ferrule body 14 further is formed with a forward nose section 20 and a rearward, open terminal section 22.

Nose section 20 preferably comprises a tapered abutment wall 24 having a central opening 26. Abutment wall 24 has for its function locating the wire rope in its fully inserted position preliminary to swaging. It also contains the wire rope, so that jagged ends of the rope strands do not project outwardly, creating a hazard for the choker setter.

Opening 26 has for its function enabling the operator to ascertain with certainty when the wire rope has been fully inserted in the ferrule preliminary to swaging. This insures development of maximum strength in the fitting. Rearward terminal section 22 opens to the exterior with an outwardly flared opening 28. This facilitates threading the rope into the interior of the ferrule.

Body 14 further is provided with a central bore 30 which extends the full length of the ferrule body. At its leading end, bore 30 communicates with sight opening 26. At its trailing end it communicates with the exterior through flared opening 28.

The periphery of bore 30 is formed with a plurality of circumferentially arranged ridges. These may comprise separate annular ridges alternating with annular grooves arranged concentrically in parallel planes. Preferably, however, for ease of manufacture and ease of insertion of the rope into the ferrule, the ridges comprise a continuous thread indicated at 32.

The pitch of thread 32 preferably is "slow" to provide maximum engagement with the rope. The internal diameter of the thread preferably is a trifle less than the exterior diameter of wire rope 12. This makes possible self threading the ferrule onto the rope end. Thereupon the ferrule becomes temporarily secured to the rope as it is fitted into the swaging die. This materially facilitates loading the dies.

As is particularly evident in the enlarged view of FIG. 6, the thread is defined by a leading surface 34 and a trailing surface 36. The latter preferably may include a sloping section 38 which merges in the trailing direction with leading surface 34.

The contour of the thread is significant in determining the performance of the ferrule.

The angle formed at the junction point of leading surface 34 and trailing surface 36, angle *a* of FIG. 6, should be not more than about 90°, preferably from about 50° to about 90°. In the illustration, it is substantially exactly 90°.

This arrangement provides a cutting edge at the point of juncture between the two surfaces and makes possible self-threading the ferrule onto the rope. It also makes of leading segment 34 a buttress or support which, as will appear more fully hereinafter, backs up the rope and prevents it from being withdrawn from the ferrule during use.

The sloping portion 38 of the trailing surface serves a guiding function. Its angle is such that when the wire rope is inserted into the ferrule, its end successively engages the various areas of sloping portion 38. These guide the rope toward its fully seated position in the ferrule.

The arrangement thus provides a continuous, spiral recess 40 defined on one side by sloping portion 38 of the trailing surface and on the other side by leading surface 34 of the thread.

As a further feature of the invention, generally cylindrical body 14 of the ferrule is provided with diametrically opposite flats 42. These are dimensioned and spaced as indicated to accommodate the leading margins of the oppositely-acting die sections 44 which are undersized with respect to the outside diameter of the ferrule.

After the ferrule has been fully threaded onto the wire rope with its leading end abutting against nose closure 24, it is ready for swaging. The swaging operation may be carried out in any one of the commercially available swaging machines.

When closing the swaging dies in the direction indicated by the arrows of FIG. 4, sufficient pressure is applied to cause the metal of the rope to flow into recesses 40 of the ferrule thread. This is particularly evident in FIG. 6.

The ferrule and rope thus are integrated into an assembly of great strength. Any attempt to withdraw the rope from the ferrule by applying heavy pulling stresses is resisted by surfaces 34 of the thread which, as noted above, serve as buttresses backing up the portions of the wire rope which have been displaced into recesses 40.

As an additional but important advantage, the flat portions 42 of the ferrule exterior surface serve as reliefs which accommodate excess metal during swaging. This metal normally would be extruded as flashings along the side walls of the ferrule. The necessity of grinding off the flashings thus is eliminated and maximum use of all of the metal content of the ferrule is assured.

Having thus described my invention in preferred embodiments, I claim:

1. A ferrule for use on the end of a wire rope, the ferrule comprising

a. a swageable metal body having a forward nose section and a rearward, open terminal section,

b. the body having longitudinally therethrough a bore communicating with the rearward terminal section,

c. the bore being provided with a plurality of circumferentially arranged ridges,

d. the ridges being defined by leading and trailing surfaces meeting at an angle of not more than about 90°,

e. the ridges providing intermediate recesses adapted to receive metal displaced from the rope upon swaging of the metal body,

f. the leading surface of each ridge thereupon forming a buttress, backing up the metal displaced from the rope into the associated recess, and opposing withdrawal of the rope upon applying a pulling stress thereto,

g. the exterior surface of the body being substantially cylindrical in outline for swaging by a two-part cylindrical cavity die, the cylindrical exterior surface of the body having parallel relief flats on diametrically opposed portions arranged opposite the meeting surfaces of the die parts, the distance between the flats being substantially the same as the closed diameter of the die.

2. A ferrule for use on the end of a wire rope, the ferrule comprising

a. a swagable metal body having a forward nose section and a rearward open terminal section,

b. the body having longitudinally therethrough a bore communicating with the rearward terminal section,

c. the bore being provided with a continuous thread the inner diameter of which is less than the diameter of the rope by an amount predetermined to enable self-threading of the rope into the ferrule.

d. the thread being defined by leading and trailing surfaces meeting at an angle of not more than about 90°,

e. the surfaces providing intermediate recesses adapted to receive metal displaced from the rope upon swaging of the metal body,

f. the leading surface of the thread thereupon forming a buttress, backing up the metal displaced from the rope into the associated recess and opposing withdrawal of the rope upon applying a pulling stress thereto.

3. A ferrule for use on the end of a wire rope, the ferrule comprising

a. a swagable metal body having a forward nose section and a rearward, open terminal section,

b. the body having longitudinally therethrough a bore communicating with the rearward terminal section,

c. the bore being provided with a plurality of circumferentially arranged ridges,

d. each ridge being defined by a leading surface disposed substantially perpendicular to the axis of the bore, and a trailing surface having a leading section meeting with the leading surface at an angle of not more than about 90° and a trailing section sloping from the leading section to the base of the next trailing leading surface,

e. the trailing sections providing intermediate recesses adapted to receive metal displaced from the rope upon swaging of the metal body,

f. the leading surface of each ridge thereupon forming a buttress, backing up the metal displaced from the rope into the associated recess and opposing withdrawal of the rope upon applying a pulling stress thereto.

4. A ferrule for use on the end of a wire rope, the ferrule comprising

a. a swagable metal body having a forward nose section and a rearward, open terminal section,

b. the body having longitudinally therethrough a bore communicating with the rearward terminal section,

c. the bore being provided with a continuous thread the inner diameter of which is less than the diameter of the rope by an amount predetermined to enable self-threading the rope into the ferrule,

d. the thread being defined by a leading surface disposed substantially perpendicular to the axis of the bore, and a trailing surface having a leading section meeting with the leading surface at an angle of not more than about 90° and a trailing section sloping from the leading section to the base of the next trailing leading surface,

e. the trailing sections providing intermediate recesses adapted to receive metal displaced from the rope upon swaging of the metal body,

f. the leading surface thereupon forming a buttress, backing up the metal displaced from the rope into the associated recess and opposing withdrawal of the rope upon applying a pulling stress thereto,

g. the exterior surface of the body being substantially cylindrical in outline for swaging by a two-part cylindrical cavity die, the cylindrical exterior surface of the body having parallel relief flats on diametrically opposed portions arranged opposite the meeting surface of the die parts, the distance between the flats being substantially the same as the closed diameter of the die.

* * * * *