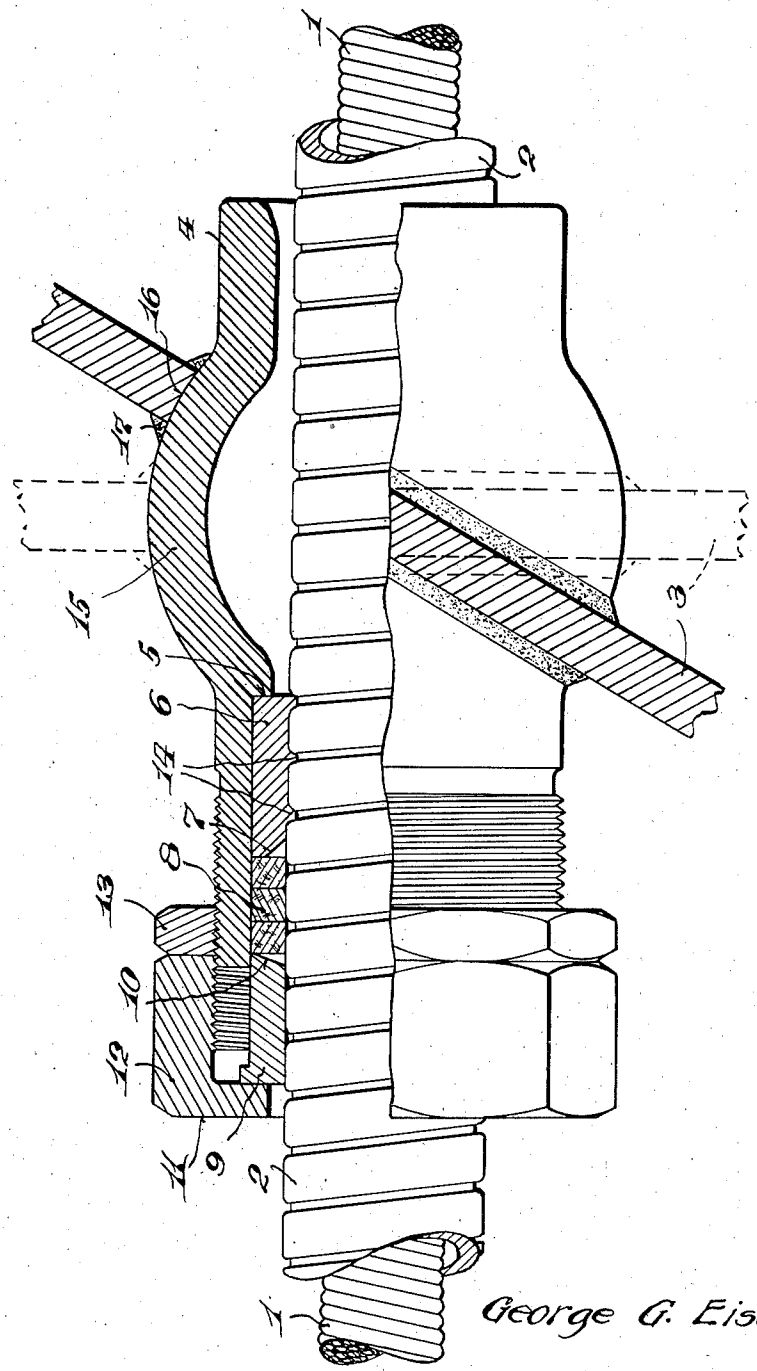
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FLEXIBLE SHAFTING

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FLEXIBLE SHAFTING

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This invention relates to improvements in flexible shafting, and more particularly to a piercing sleeve assembly for carrying flexible shafting through a deck, bulkhead or like wall.

Flexible shafting has come into wide usage on shipboard for the transmission of power and for the remote control of mechanisms operated from a distance, installation requirements frequently making it necessary to carry the shafting through decks, bulkheads, and like walls, which in some cases are open to the weather. The present invention contemplates and aims to provide an improved and practical piercing sleeve assembly for carrying the shafting through deck plates or bulkheads, while at the same time providing for the fixed securement of the shafting casing relative thereto. To prevent leakage of water through the opening provided for the passage of the shafting, the invention further combines in a piercing sleeve assembly as aforesaid an effective waterproof seal between the sleeve and the shafting casing. It is a further aim of the invention to provide a sleeve assembly of the stated character which can be installed at a given angle with the deck plate or bulkhead required for a particular installation, without the necessity of providing irregularly shaped or elliptical deck or wall openings heretofore employed in mounting a piercing sleeve in other than right angular relationship with respect to the deck plate or like wall.

Other objects will be in part obvious and in part hereinafter pointed out in connection with the following analysis of this invention wherein is illustrated an embodiment of the invention in detail.

In the drawing—

The figure is a longitudinal part section of the piercing sleeve assembly according to the invention.

Referring to the drawing, reference character 1 indicates a conventional flexible shaft core comprising, for example, a plurality of superimposed layers of wire helically wound on a central wire, and being enclosed within a flexible metal-sheathed casing 2 of known construction in which the shafting is free to rotate. As shown, the casing sheathing is of the interlocked type having a helical groove formed in its outer surface by the convolutions of the sheathing.

To carry the shaft core 1 and its casing through a deck, bulkhead or equivalent wall generally indicated at 3, as required in numerous remote control flexible shaft installations, the present invention contemplates a piercing sleeve assembly providing for the passage of the shafting through an opening in the deck plate or wall at the required location. Such a sleeve assembly according to the invention comprises a sleeve-form body member 4 having a through bore for the passage of the shaft casing and the core enclosed thereby, the sleeve extending through the deck plate opening and being secured intermediate its ends to the plate in any desired angular position relative thereto as by welding. The sleeve bore is provided along its length with an angled shoulder surface 5 formed as by machining one end of the sleeve to have greater internal diameter than the other end thereof. Disposed within the larger diameter bore portion of the sleeve is a ferrule 6 of split or sectional construction whose inner end face is adapted to abut against the sleeve shoulder 5. Hence, with the sections of the ferrule arranged on the casing 2 to extend about the circumference thereof, the ferrule is axially located in one direction within the sleeve through the engagement of its inner end face with the sleeve shoulder.

The outer end face of the ferrule is chamfered as at 7 to engage packing contained within the sleeve and disposed about the casing 2 as shown. Preferably, the packing comprises a plurality of packing rings 8 formed from a compressible packing material such as braided asbestos.

To compress the packing and thereby effect a water-tight seal between the sleeve 4 and the casing 2, a follower ring 9, which may also be of split or sectional construction, is disposed about the casing with its inner end extending within the sleeve 4 into engagement with the outer packing ring 8. It will be understood that the ring proper has internal and external diameters such as to provide the necessary clearance for the follower to move axially into the space between the sleeve 4 and casing 2.

As shown, the inner end face of the follower ring 9 which engages the packing is beveled as at 10 for the purpose to be described. The end face of the outer end of the follower which projects beyond the sleeve is formed straight and is adapted to be engaged by a radial end flange 11 formed on a clamp nut 12 threaded onto the clamping end of the sleeve which is exteriorly threaded as shown. A lock nut 13 also threaded onto the end of the sleeve functions to lock the clamp nut 12 in final position.

Due to the inclination of the adjacent end faces of the ferrule 6 and the follower 9, endwise movement of the follower into the sleeve 4 consequent to the screwing down of the clamping

nut 12 causes the packing rings 8 to be compressed axially and also to be constricted radially inwardly into tight engagement with the casing 2 and the helical groove thereof, thus to provide a water-tight packing between the sleeve 4 and the casing and also to effect a clamping and securing of the casing relative to the sleeve. Endwise movement of the follower as aforesaid also exerts pressure against the outer chamfered end of the ferrule 6 through the packing 8, and hence urges the ferrule 6 against the sleeve shoulder 5 thereby to axially locate the same within the sleeve from both directions.

According to another feature of the invention, the sleeve 4 may be further clamped or interlocked with the shaft casing 2 by means which, as herein shown, comprises coarse spirally arranged ribs or teeth 14 formed on the inner diameter or surface of the ferrule 6, the pitch of which corresponds to the pitch or lead of the helical groove formed in the exterior of the casing. Hence, with the teeth 14 interlocking with the helical casing groove, and with the ferrule fixed axially relative to the sleeve 4 upon tightening of the clamp nut 12, the sleeve 4 is effectively locked or clamped to the casing 2. Accordingly, in final assembly, the shaft casing is fixedly secured against axial displacement relative to the sleeve by the simple expedient of tightening of nut 12 to compress the packing.

To provide for the installation of a piercing sleeve assembly as aforesaid at a given angle relative to the deck plate or wall 3 required for a particular installation, without the necessity of providing irregularly shaped or elliptical plate or wall openings, the sleeve body 4 intermediate its ends is provided with a part-spherical enlargement 15, whereby upon locating the enlarged portion 15 of the sleeve in a circularly formed opening 16 of required diameter provided in the plate or wall, the sleeve may be angularly adjusted relative to the latter in the manner of a ball joint. Hence, the plate and sleeve may have the angular relationship shown in the drawing, or the sleeve may have any other angular relationship, within the limitations of such a sleeve to plate mounting, as required for a particular installation. Upon the sleeve being inserted through the opening 16 and adjusted to the required angular relationship, it is fixedly secured within the opening as by welding 17.

The piercing sleeve assembly as described may be assembled complete on the job, or, when desired, it may be loosely assembled on the casing 2 at the factory, as by threading the casing through the sleeve 4, with the ferrule 6, packing 8 and follower 9 arranged in the large diameter end of the sleeve substantially as shown and loosely secured as by threading the nut 12 a few turns onto the threaded end of the sleeve. The sectional construction of both ferrule and follower expedites this assembly as the sections thereof may be readily arranged about the casing, and the sleeve slid thereover to hold the sections in place. To install, the sleeve and its contained parts are moved in the approximate position axially of the casing required for the particular installation, and the sleeve is thereupon projected through the preformed circular aperture 16 provided in the deck or bulkhead 3. Upon adjusting the assembly to the required angle relative to the deck or bulkhead, the sleeve is thereupon secured in place within the opening as by welding 17. Finally, the securing nut 12 is screwed down on the sleeve to actuate the split follower into the latter, this movement compressing the packing both axially and radially and locating the ferrule against the sleeve shoulder 5. Such axial or endwise movement of the follower also results in the teeth 14 of the ferrule assuming their final position in which they interlock with the helical casing groove, and accordingly the shaft casing is securely interlocked with the sleeve and in effect fixed against axial displacement relative to the deck or bulkhead. if not already assembled with the casing, the flexible shaft core is thereupon fed through the casing and its terminals secured in accordance with the requirements of the particular installation.

It will be seen from the above that the invention provides a simple and effective sleeve assembly for carrying flexible shafting through a deck, bulkhead or like wall and for securing the casing to the latter. Moreover, a sleeve assembly according to the invention may be inexpensively manufactured and thereupon installed with a minimum of time and effort. Upon installation, the sleeve assembly as aforesaid functions not only to permit passage of the flexible shafting through a deck or bulkhead, but also effectively secures the shaft casing against axial displacement relative thereto, and at the same time provides an effective water-tight joint precluding the passage of water through the wall or plate opening in which the assembly is mounted.

As many changes could be made in carrying out the above construction without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A piercing sleeve assembly for carrying flexible shafting consisting of a rotary core and a stationary enclosing casing having a helical groove in its outer surface through a wall or plate aperture, comprising a sleeve adapted to extend through said aperture and to be secured to the wall or plate within said aperture, the sleeve having an internal stop shoulder formed therein, a sectional ferrule positioned within the sleeve by said shoulder and having teeth on its inner surface meshing with the groove of the casing and being thereby operative to secure the casing within and to the sleeve, and means providing a water-tight joint between the sleeve and casing comprising a follower extending into said sleeve in spaced relation to the ferrule, packing in the space between ferrule and follower, and an end nut threaded on to the outer surface of the sleeve for actuating the follower toward the ferrule to compress the packing against the ferrule and into the casing groove.

2. A piercing sleeve assembly for carrying flexible shafting consisting of a rotary core and a stationary enclosing casing having a helical groove in its outer surface through a wall or plate and being adapted for mounting at a given inclination relative to the wall or plate as required for a particular installation, comprising a sleeve adapted to extend through a circular aperture of the wall or plate, the sleeve being provided intermediate its ends with an enlarged part-spherical portion of diameter determining that of said aperture and which provides for initial angular adjustment of the sleeve to its required inclination relative to the wall or plate, means contained in the sleeve and having interlocking engagement with the casing groove for

fixedly securing the casing within the sleeve, and means providing a water-tight joint between sleeve and casing.

3. A piercing sleeve assembly for carrying flexible shafting consisting of a rotary core and a stationary enclosing casing having a helical groove in its outer surface through a wall or plate and being adapted for mounting at a given inclination relative to the wall or plate as required for a particular installation, comprising a sleeve adapted to extend through a circular aperture of the wall or plate, the sleeve being provided intermediate its ends with an enlarged part-spherical portion of diameter determining that of said aperture and which provides for initial angular adjustment of the sleeve to its required inclination relative to the wall or plate, the sleeve having an internal stop shoulder formed therein, a sectional ferrule positioned within the sleeve by the shoulder and having teeth on its inner surface interlocking with the groove of the casing, packing contained in the sleeve, and a follower nut for compressing the packing against the ferrule and into the casing groove.

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