Nov. 28, 1967 S. G. SHANNON 3,355,202

TERMINATING DEVICE FOR LINEAR BODIES

Filed Oct. 1, 1965 2 Sheets-Sheet 1

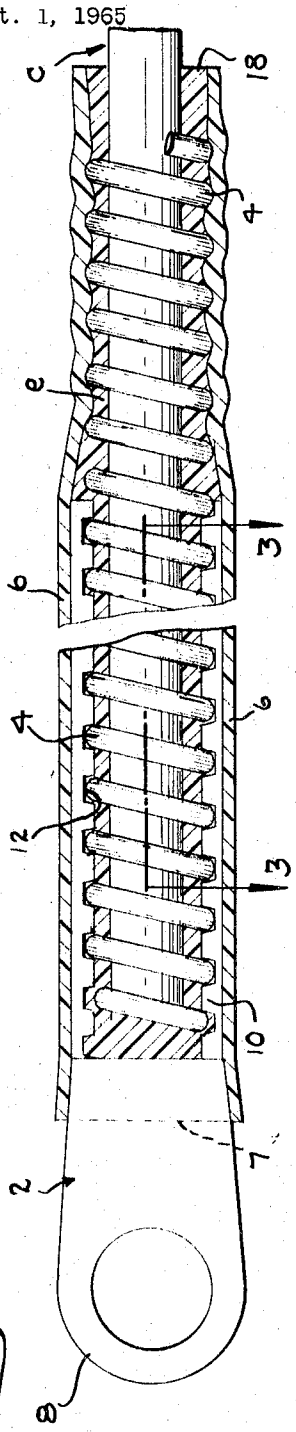


Fig. 1

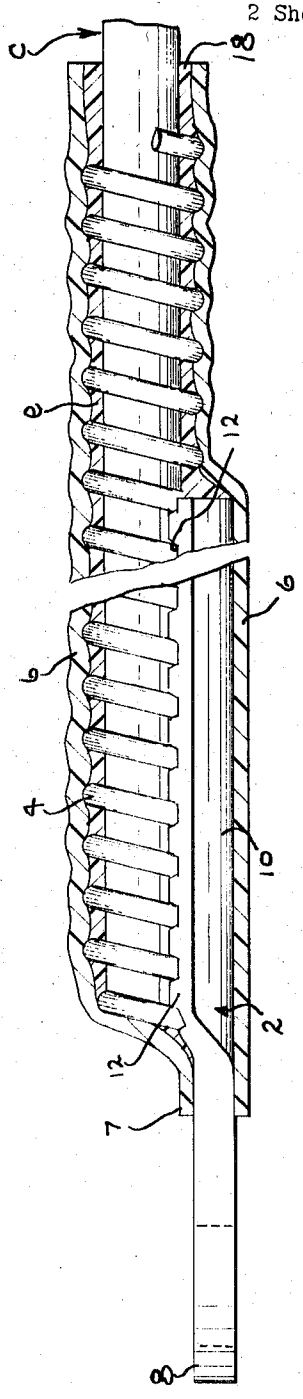


Fig. 2

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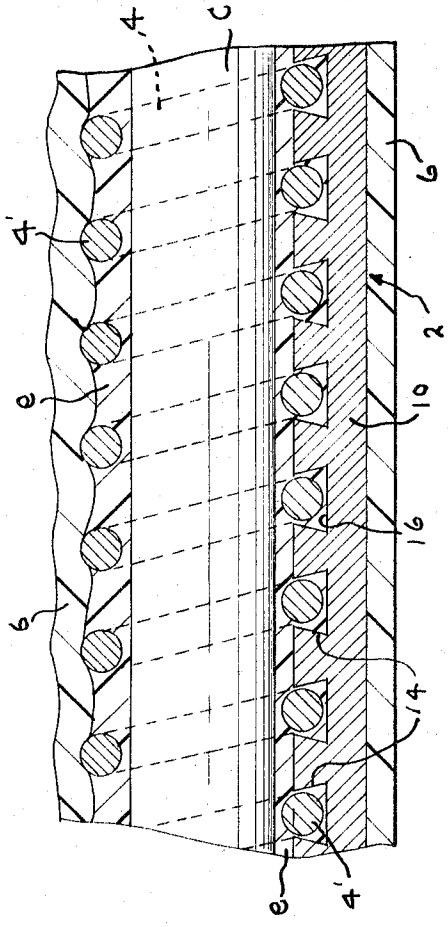


Fig. 3

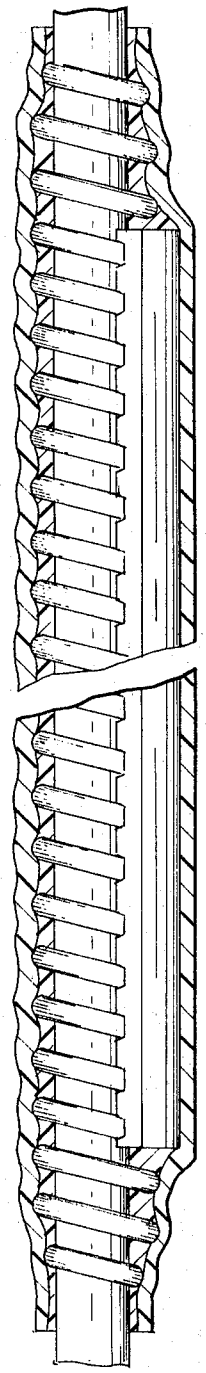


Fig. 4

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TERMINATING DEVICE FOR LINEAR BODIES

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ABSTRACT OF THE DISCLOSURE

The invention constitutes a terminating means for linear bodies such as fibrous glass cable. The device comprises a terminal lug member having a U-shaped body with a coil spring member secured therein. One end of the coil spring member extends beyond the terminal body. A sleeve of suitable plastic is heat-shrunk onto the terminal to complete the assembly. Epoxy resin is used in the terminal body to bind a linear body to the device.

This invention generally relates to terminating devices for linear bodies such as guy wires, and particularly relates to means for anchoring cables to support structures.

Fibrous glass cable is being used in industry to anchor marine buoys and to connect mechanical parts in general. This cable is flexible, light in weight, and has the longitudinal tension characteristics of steel. The cable comprises many fibrous glass strands in longitudinal orientation. The fibers are subsequently impregnated with epoxy resin. This arrangement contains the fibers and provides a rigid outer cover for the cable. One major problem in using this type of cable is that it cannot be terminated by conventional compression devices because of its basic fibrous glass makeup. Compression forces onto this cable fracture the epoxy resin and glass and weaken the cable causing tensile failure.

It is therefore an object of the present invention to provide terminating means for linear bodies such as fibrous glass cable.

Another object is to provide a terminating device which may be used with other linear bodies such as steel cables or rods.

Another object is to provide binding means in a linear body termination whereby a terminating device is held in binding engagement with the linear body by molecular adhesion.

Another object is that of providing a terminating device as described above which is constructed of several basic parts, a simple alteration of which results in an in-line splice means for joining two like bodies.

A further object is the provision of a terminating device which has a long useful life, is simple and economical in construction, and may be easily assembled, but which is sufficiently rugged to withstand even careless use.

These and other objects of this invention will become apparent when the description is read in conjunction with the accompanying drawings wherein:

FIGURES 1 and 2 are respectively face and side views of a terminating appliance in accordance with this invention;

FIGURE 3 is an enlarged fragmentary sectional view taken through the lines 3—3 of FIGURE 1; and

FIGURE 4 is a side view of splice appliance in accordance with this invention.

Referring now to FIGURES 1 and 2, the terminating device includes a terminal lug member 2 which is formed from a flat stamping of suitable metal such as steel, a coil spring 4, and an outer plastic sleeve 6. Sleeve 6 is preferably formed from a length of transparent or translucent plastic of the type comprising fluorocarbon resins, e.g., Teflon, but may also be formed from other plastics such as polyvinylchloride. Sleeve 6 is expanded radially

so that it can be ultimately shrunk onto spring 4 and lug member 2 after the device is assembled. Sleeve 6 holds the spring 4 in place on body 10 and confines a binding agent E, epoxy resin, during the terminating procedure.

Lug member 2 has a tongue 8 on one end thereof for engagement with a support structure, and a generally U-shaped body 10 coextensive with tongue 8 for engagement with a cable C. Body 10 has a series of equidistantly spaced diagonal slots 12 thereacross adapted to receive portions of the helically wound coils 4' of spring 4. Slots 12 have sidewalls 14 which extend convergently from the floor 16, FIGURE 3.

The spring 4 fits into the body 10 with the individual coils of the spring fitting into the slots 12. The spring provides a plurality of irregular surfaces to which the binding agent E binds itself.

The smallest area across slots 12 is greater than the cross sectional area of the coils 4' of spring 4. This arrangement provides suitable spaces between slots 12 and coils 4' wherein a binding agent such as epoxy resin E will flow during the terminating procedure.

The device is assembled by placing spring 4 in slots 12 of U-shaped body 10. Spring 4 overhangs the body 10 and provides means to relieve undue bending stresses on cable C where it joins the device. Sleeve 6 in its expanded state is placed around body 10 and spring 4. Sleeve 6 overhangs spring 4 to aid in the above strain relief means. Sleeve 6 is then shrunk onto the appliance by heat to constitute an assembled terminating device. During the above heating operation, sleeve 6 shrinks sufficiently to snugly grip the coils 4' of spring 4 and body 10 of the device. The forward end 7 of sleeve 6 shrinks tightly onto tongue 8 to close the forward end of the appliance. This prevents the liquid binding agent E from flowing from the forward end of the appliance, to be described hereinafter.

Operation

A pre-determined amount of liquid epoxy resin E which comprises a suitable mixture of liquid resin, liquid catalyst and filler material, e.g., glass flake is injected into the device from the open end 18 of sleeve 6. The glass flake filler material increases the strength of epoxy resin after it hardens to a solid state. One end of cable C is then inserted into the appliance through open end 18. During this insertion, cable C pushes the liquid epoxy resin by piston action into slots 12 and around coils 4', FIGURE 3. The epoxy resin is also forced back along cable C to fill the sleeve 6. Closed end 7 of sleeve 6 contains the epoxy and prevents it from flowing from the forward end of the appliance during the above insertion.

During a suitable hardening period which is determined by the catalyst agent, the epoxy resin E binds itself by molecular adhesion to cable C, spring 4 and sleeve 6, and changes to a hardened state.

Withdrawal forces on cable C are resisted by a combination of bonds. One bond is between the surface of the cable and the hardened epoxy resin E. The other bond is between the epoxy resin mass E and the spring 4 and body 10. Keystone shaped slots 12 with divergent walls 14 and spring 4 provide many irregular surfaces to which the epoxy resin mass E bonds itself. Divergent walls 14 provide an additional locking means to hold the epoxy resin mass E into engagement with body 10. This arrangement adds to the tensile characteristics of the termination.

The transparency of sleeve 6 allows the operator to inspect the device for proper cable positioning during the terminating operation. It also allows him to inspect for proper epoxy resin displacement during and after the terminating operation. The result is a terminating device secured to a fibrous glass cable by molecular adhesion. No compression forces are exerted onto the cable

or the device, therefore no danger of accidental cable fracture exists. Undue bending stresses on the cable are relieved where it joins the device by virtue of the overhanging spring 4 and sleeve 6.

The above-described device, however, can easily be adapted so as to be a splice appliance for joining two linear bodies, FIGURE 4. This is accomplished by using the same assembled device without a tongue member 8. Both ends of a splice appliance will be identical to the open end of the embodiment shown in FIGURES 1 and 2. The terminating procedure will differ in that one cable will be joined to the appliance and the binding agent E allowed to harden before the other cable is joined to the other end of the appliance.

It will therefore be understood that the terminating device of the present invention may be used equally well with steel cable, rope or solid state linear bodies such as steel rod. It will also be understood that more than one linear body may be joined to a terminating appliance of the type shown and described herein.

It will, therefore, be appreciated that the aforementioned and other desirable objects have been achieved; however it should be emphasized that the particular embodiment of the invention, which is shown and described herein, is intended as merely illustrative and not as restrictive of the invention.

I claim:

1. A device for terminating fibrous glass cable to a structure, said device having a tubular section including sleeve means on one end thereof for receiving said cable, binding means comprising, epoxy resin in said tubular section for binding said device to said cable, spring means in said tubular section adapted to provide irregular gripping surfaces between said bond, and tongue means on the other end of said device for fastening said device to said structure.

2. A terminating device for fibrous glass cable comprising the combination of a lug member having a tongue on one end thereof and a U-shaped body with diagonal slots on the other end thereof, a helically wound coil spring member adapted so that its coils are disposed in said slots, sleeve means surrounding said body and said spring member, said sleeve means adapted to hold said spring member in axial position in said body, binding means in said body to secure said cable to said device.

3. A terminating device for fibrous glass cable comprising the combination of a lug member having a tongue on one end thereof for securing said device to a structure and a U-shaped body with diagonal slots on the other end thereof, a helically wound coil spring member disposed in said slots, said spring member adapted to overhang the end of said body to provide strain relief means for the cable where said cable leaves said body, said spring member providing irregular inner surfaces in said body, shrinkable plastic sleeve means around said body and said spring member adapted to be shrunk onto said device to hold said spring member in axial position on said body, binding means in said body adapted to adhere said cable and said device together.

4. A terminating device for fibrous glass cable comprising the combination of a lug member having tongue on one end thereof and a U-shaped body with diagonal slots on the other end thereof, a helically wound spring member disposed in said slots and adapted to overhang the end of said body, said spring providing irregular inner surfaces in said body, shrinkable plastic sleeve means shrunk around said body and adapted to hold said spring in coaxial relationship therewith, binding means comprising a suitable mixture of liquid epoxy resin disposed in said body prior to cable insertion for adhering said cable to said device after cable insertion.

5. A terminating device according to claim 4 wherein said diagonal slots have sidewalls extending convergently from the floor thereof.

6. A terminating device according to claim 4 wherein said epoxy resin fuses to the outer cover of said cable.

7. A connector device for joining two fibrous glass cables comprising the combination of a lug member having a generally U-shaped body with diagonal slots therein, a helically wound spring member disposed in said slots and adapted to overhang the ends of said body to provide strain relief means where said cables join said connector, sleeve means around said body adapted to hold said spring in coaxial relationship with said body, binding means comprising a suitable mixture of liquid epoxy resin disposed in said body prior to cable insertion for adhering said cables to said connector after cable insertion.

8. A connection between a terminating device and a fibrous glass cable comprising a terminal lug member including a U-shaped body with a series of diagonal slots therein and a coil spring member disposed in said slots, one end of said cable disposed in said body, binding means comprising epoxy resin in said body, said slots and around said spring member and said cable whereby said device and said cable are adhered to each other.

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