June 2, 1959 B. A. SMITH, SR 2,888,726

LEAD-IN WIRE CONNECTORS

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FIG. 1.

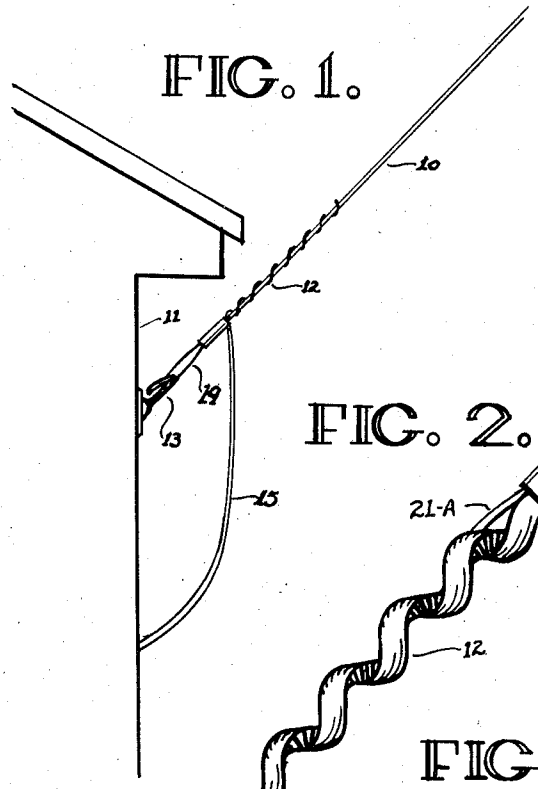

FIG. 2.

FIG. 3.

FIG. 4.

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FIG. 5.

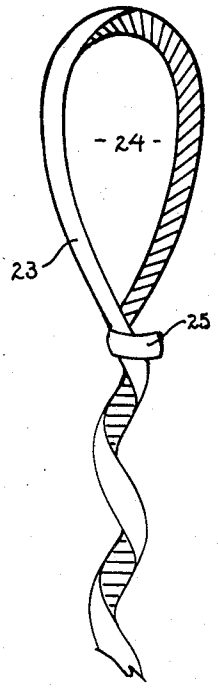


FIG. 6.

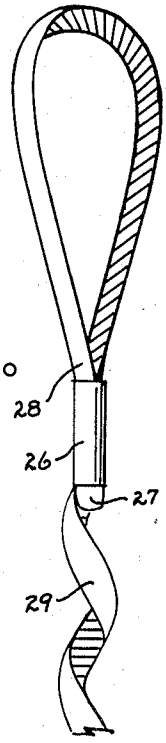


FIG. 7.

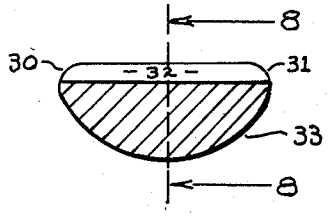


FIG. 8.

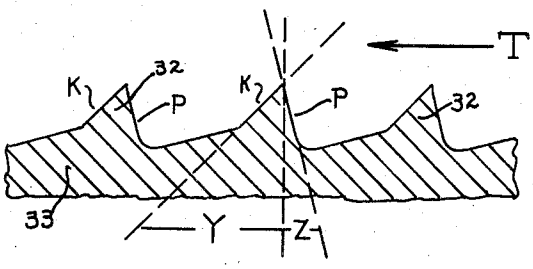
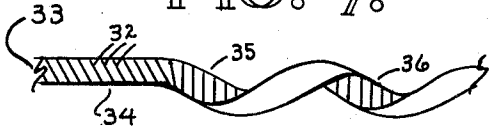


FIG. 9.



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United States Patent Office

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LEAD-IN WIRE CONNECTORS

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Application May 4, 1956, Serial No. 582,682

11 Claims. (Cl. 24—123)

This invention relates to connectors such as those customarily used to secure transmission lead-in wires to cables, buildings and other stationary objects, and more particularly to an improved one-piece dead ending connector for use in the installation of communication lead-in wires and drop lines. The invention can be said to have a plurality of important objectives.

The present invention, therefore, has been made with the foregoing considerations in mind, and it can be said to have a plurality of important objectives.

One important object of my invention is the provision of a device adapted for supporting and connecting lead-in wires to cables, poles, buildings and other stationary objects, which will be lower in cost yet stronger than presently available devices generally used for that purpose.

Another important object of my invention is the provision of a device of the character described which is adapted for one-piece construction or, at least, will be completely assembled into a single piece as compared with some connectors which comprise two interfitting sections in which the wires must be aligned and clamped together.

A further important object of the present invention is the provision of a device of the character described adapted in construction to be lighter in weight and less bulky to ship and carry than presently available devices.

A still further important object of my invention is the provision of a lead-in wire connecting device adapted in conformation so as to be faster to apply and install.

An additional and highly important object of my invention is the provision of a device of the character described from which the wire may be manually removed without the use of tools or special equipment.

In brief, my invention includes a convolute strap of high tensile strength material, one side of which is provided with a continuous pattern of transverse ridges, the strap being conformed in the generally helical form of a corkscrew with the ridged side of the strap disposed inwardly of the convolutions. In one embodiment, a bail member, by means of which the device is attached to a stationary object, consists of a loop of lighter, generally flexible, corrosion resistant wire fixedly attached to one end of the helically formed strap by a compression ferrule which holds the ends of the bail wire tightly superposed against the ridged side of the strap. In use, the loop of the bail is secured over a hook or around an insulator attached to a stationary object, and the convolute strap section is wound around and into continuous contact with the transmission wire. One of the ends of the loop of bail wire is extended through and outwardly of the ferrule, and is bent over the upper shank end of the transmission wire to hold it in the upper end of the helical form from which it drops loosely to the point of next connection on the conduit, building or other stationary object.

Other important objects of the present invention will become apparent to persons acquainted with the general

art upon inspection of the following detailed specification and the references therein to the accompanying drawings, in which:

Figure 1 is a schematic diagram showing a device constructed according to my invention in use in a typical installation;

Figure 2 is a schematic diagrammatic perspective view of a preferred embodiment of the device;

Figure 3 is a perspective diagrammatic view similar to that of Figure 2, showing the same device with a section of communication lead-in wire positioned therein;

Figure 4 is a diagrammatic sectional view taken along the line and in the direction indicated by the arrows 4 in Figure 3, and is substantially enlarged to reveal the manner in which the transverse ridges of the strap serve to engage the ends of the bail wire under pressure of the ferrule;

Figure 5 is a fragmentary plan view, somewhat enlarged compared to Figures 2 and 3, showing a modified form of the device;

Figure 6 is a view similar to that of Figure 5 showing a variation of the form of the device illustrated in Figure 5.

Figure 7 is a diagrammatic cross sectional view of the strap material used in the grip portion of the connector;

Figure 8 is a schematic diagram showing a longitudinal sectional profile of the strap material to illustrate the disposition of the ridges therein, and

Figure 9 is a fragmentary plan view of a length of the strap material showing the relative transverse positioning of the ridges thereon.

Reference is again made to Figure 1 in which the numeral 10 designates a lead-in line which is attached to the side of a building 11 by means of a connector device 12 constructed according to my invention. The helical portion 12 of the device is attached to a bail member 14 which is looped over the hook 13 attached to the building 11. This permits the drop wire to hang in a loose loop between the connector 12 and its next point of attachment.

The figure is mainly intended to show the purpose and function of connectors of this general type, and the particular arrangement of components, although typical, is subject to innumerable variations according to the character and location of the installation being made.

A preferred form of a connector constructed according to my invention is clearly shown in Figure 2 in which the numeral 12 designates the helically wound portion of the strap that serves to grip the lead-in wire. The strap section 12 is conformed in a continuous helix or spiral of constant diameter with evenly spaced convolutions from its point at 16 to its shank end 17 which is enclosed in the ferrule 18 and compressed thereby against the ends of the bail member 19.

The wire of which the bail member 19 is conformed is generally flexible since it is intended to conform readily to the diameter and shape of the hook or insulator by which it is attached to a building or the overhead cable of the communication system.

The manner in which the ends of the bail wire 20 and 21 are compressed within the ferrule 18 against the straight shank end 17 of the connector strap 12 is clearly shown in Figure 4 which is a cross section taken through the ferrule along the line and in the direction indicated by the arrows 4 in Figure 3. The relatively soft wire of the bail is pressed into the ridges of the shank 17 to form a permanent bond.

During tests made with the connector device under actual service conditions the installation method comprised passing the lead-in wire 10 through the hook 13 to hold it against the tension and weight of the lead-in line, then slipping the bail member 19 over the hook 13 and winding the helical strap 12, starting at the point 17,

around the lead-in wire to completely enclose it as shown in Figure 3. Then the line was removed from the hook and permitted to drop down as indicated at **15** in Figure 1 to the next point of connection.

As can be understood, this installation method does not require the introduction of slack into the line when the connector is attached or during the tightening of the wire within the connector when placed under tension. To keep the untensioned drop line portion **15** of the lead-in wire **10** from working loose at the upper part **17** of the grip portion **12**, a short length of the bail end **21** is carried outwardly of the ferrule **18** as shown at **21**–A and is bent downwardly over the lead-in wire as seen in Figure 3.

The helical conformation of the strap portion **12** as seen in Figure 2 is dimensioned in diameter to provide a clear axial opening substantially less than the thickness of the lead-in wire **10**, and as a consequence, the wire **10** is uniformly displaced laterally along its point of contact with the band **12** from true axial alignment within the length of the strap **12**, shown in Figure 3. Thus, as can readily be seen, the tighter a wire is drawn through the center of the helical strap, the straighter it becomes and the more tightly its surface is pressed against the inner ridges of the strap.

Also contributing importantly to the holding power of the device is the particular conformation and positioning of the inner ridges which are shown greatly enlarged for purposes of illustration in the schematic longitudinal section of Figure 8 which is taken along the line and in the direction indicated by the arrows **8**—**8** in Figure 7. The ridges **32**, as shown in Figure 8, are triangular in sectional profile, and their sides are differently pitched as indicated relatively at Y and Z. The sides P, which are much steeper than the sides K, are disposed oppositely to the direction of lineal tension indicated by the arrow T existing in a wire being tightened within the connector. This angular form and positioning of the ridges makes it comparatively easy to pull a line or wire through the connector in the direction effective to remove slack from the line, but virtually impossible to pull it in the other direction wherein its surface becomes engaged by the steep sides P of the ridges **32**.

With further reference to the holding power of the connector, attention is also directed to the fragmentary plan view of Figure 9 which illustrates the manner in which the ridges such as **32** are impressed into the body material **33** at an angle as shown at **34** so that they become perpendicular, as at **35** and **36**, to the longitudinal axis of the helix into which the strap is wound. In this way, the frictional restraint of the inner ridges of the strap is squarely opposed to the direction of tension and is distributed over a considerable length of wire, thereby precluding damage or deformation of any portion of the lead-in wire **10**.

Attention is also directed to the particular conformation of the strap material as clearly shown at **33** in the cross sectional view of Figure 7. It will be noticed that the corners **30** and **31** of the ridge **32** are rounded to avoid sharp edges which might damage the insulation of a wire disposed within the connector. With this feature in mind, a preferred method of construction is to roll the ridges into tough, strong, corrosion resistant material such as stainless steel wire to effect a sectional profile substantially that of a flat half-oval, as seen in Figure 7, the strap material being shaped into its convolute form after the ridges have been impressed.

The lineal twist in the lead-in wire **10**, as shown in Figure 3, from the point at which it enters the helically formed grip portion at **16** to its point of egress at **21**-A, is arbitrary in the drawing and is not necessarily typical of the lineal twist normally encountered.

A modification of the device is shown in Figure 5 in which the ridged strap **23** is extended longitudinally and

formed to provide a bail loop **24** secured by a hook portion as shown at **25**. The form shown in Figure 6 is similar to that of Figure 5 except that a sleeve **26** is employed to hold the end **27** adjacent the shank portion **28** of the ridged strap **29**.

Although in order to comply with the statute the present invention has been shown and described in rather considerable detail in the form of one preferred embodiment, together with two rather obvious variations thereof, it is to be understood that the details are subject to modification and change, and that the invention itself is amenable to modification into a number of embodiments, and that the invention, therefore, is not to be restricted to the embodiment shown herein nor limited in any respect except as may be indicated by the scope of the following claims:

What I claim as my invention is:

1. A lead-in line connecting device, comprising: a longitudinally extended strap of generally rigid material, said strap having an arcuate side and a flat side, and having transverse ridges extended outwardly from the flat side thereof; a main portion of said strap being disposed in the generally helical form of a corkscrew with said flat side of said strap being disposed inwardly adjacent the longitudinal axis of said helical form, and being terminated at one end in a rounded tip extended outwardly at right angles to said axis, and at the other end in a straight nonconvolute end portion; said helical form having a clear axial opening therethrough of lesser diameter than that of a wire engageable therein; and bail means including a loop of wire being fixedly attached to and extended axially from said straight end portion for attaching said connector to a stationary object.

2. The invention in accordance with claim 1 being further characterized by said ridges extended outwardly from said flat side being transversely disposed at a predetermined angle relative to said straight end portion whereby they are substantially perpendicular throughout said helical form to said longitudinal axis thereof.

3. The invention in accordance with claim 2 and being additionally characterized by said ridges being triangular in cross section and being spaced on said strap with generally flat interspaces therebetween, the two outwardly extended sides of each of said triangular ridges being of unequal width and the narrower of said sides being disposed toward said bail means.

4. The invention in accordance with claim 3 in which said bail means comprise: a loop of generally malleable and flexible wire, the ends thereof being juxtaposed against said ridges in said flat side of said straight end portion of said strap adjacent said helical form therein; a generally tubular ferrule member being compressed around said loop ends and said straight end portion in such a manner as to hold them in fixed attachment, and one of said loop ends being extended through said ferrule member and beyond the first convolution of said helical form of said strap.

5. The invention in accordance with claim 3, being further characterized by alternate bail means comprising: said straight nonconvolute end portion being extended longitudinally and conformed in an ellipsoidal loop, said loop being terminated in a straight end section longitudinally disposed with its ridged surface juxtaposed against that of said strap adjacent said helical form therein, and ferrule means adapted to hold said end section of said loop and said strap in fixed attachment.

6. A lead-in wire connecting device, comprising: a longitudinally extended strap of generally rigid material, said strap having a smooth arcuate side and a flat side having transverse ridges extended outwardly therefrom; a main portion of said strap being disposed in the generally helical coil form of a corkscrew having therethrough a straight axial opening of substantially constant diameter, and with said ridges extended therefrom being disposed adjacent the longitudinal axis of said helical coil

form; said main portion being terminated at one end in a rounded tip extended outwardly from said longitudinal axis and at the other end in a nonconvolute end portion; and bail means defining a closed loop extended axially from said nonconvolute end portion for attaching said connecting device to a stationary object.

7. A lead-in line connecting device, comprising: a longitudinally extended strap of generally rigid material having an arcuate side and a flat side, a main portion of said strap being disposed in the generally helical coil form of a corkscrew and having a clear axial opening therethrough adapted to receive a conventional transmission wire longitudinally therein; said flat side of said strap being disposed inwardly adjacent said longitudinal axis of said helical coil form, and having a continuous pattern of transverse ridges extended therefrom toward and generally perpendicular to said axis, said ridges being adapted to engage the surface of a transmission wire entered axially of said coil form and to oppose axial movement of said wire through said coil form; said main portion of said strap being terminated at one end in a rounded tip extended outwardly substantially at right angles to said axis, and at the other end in a straight nonconvolute end portion; and bail means defining a closed loop being fixedly attached to and extended axially from said nonconvolute end portion for attaching said connector to a stationary object.

8. The invention in accordance with claim 7 in which said bail means comprises: a loop of generally malleable wire, the ends thereof being juxtaposed against the rigid side of said nonconvolute end portion of said strap adjacent said helical coil form therein, and a generally tubular ferrule being compressed around said loop ends and said nonconvolute end portion and effective to hold them in fixed attachment.

9. The invention in accordance with claim 8 and being further characterized by one of said loop ends being extended through said ferrule and beyond the first adjacent convolution of said helical coil form of said main portion of said strap.

10. In a lead-in wire connecting device, the combination comprising: a longitudinally extended strap of generally rigid material, said strap having a smooth arcuate side and a flat side having transverse ridges extended outwardly therefrom; a main portion of said strap being disposed in the generally helical coil form of a corkscrew and having therethrough a straight axial opening of substantially constant diameter, and with said ridges extended therefrom being disposed adjacent the longitudinal axis of said helical coil form; said main portion being terminated at one end in a rounded tip extended outwardly from said longitudinal axis and at the other end in a nonconvolute end portion being extended longitudinally and conformed in an ellipsoidal loop; said loop being terminated in a rounded end bent backwardly around said strap adjacent said helical coil therein, said rounded end defining a hook member effective to maintain said loop when attached to a stationary object.

11. In a transmission line connecting device, the combination comprising: a longitudinally extended strap of generally rigid material, said strap having a smooth arcuate side and a flat side having a continuous pattern of transverse ridges extended therefrom; a main portion of said strap being disposed in the generally helical coil form of a corkscrew and having therethrough a straight axial opening of substantially constant diameter, and with said ridges extended therefrom being disposed adjacent the longitudinal axis of said helical coil form; said main portion being terminated at one end in a round tip extended outwardly from said longitudinal axis and at the other end in a straight nonconvolute end portion being extended longitudinally and conformed in an ellipsoidal loop, said loop being terminated in a straight end section longitudinally disposed with its ridged surface juxtaposed against the ridged side of said strap adjacent said helical form therein, and ferrule means adapted to hold said end section of said loop and said strap in fixed attachment.

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