May 24, 1966 J. VOS 3,253,247

ELECTRICAL CONNECTOR

Filed Dec. 5, 1963

FIG. 1

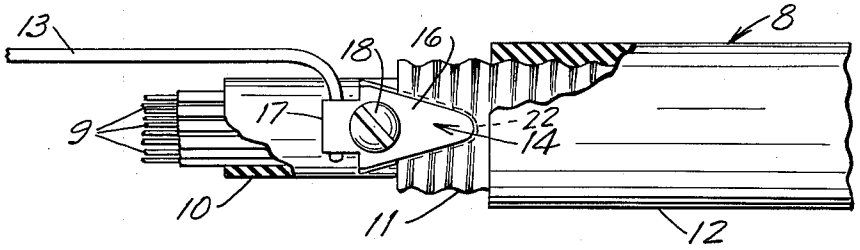


FIG. 2

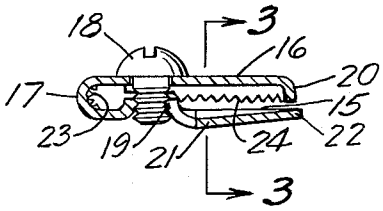


FIG. 3

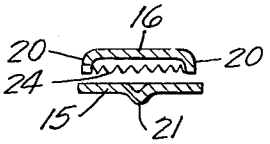


FIG. 4

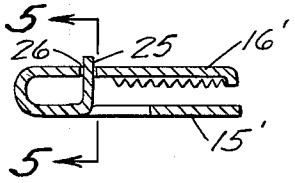


FIG. 5

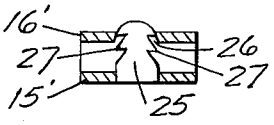


FIG. 6

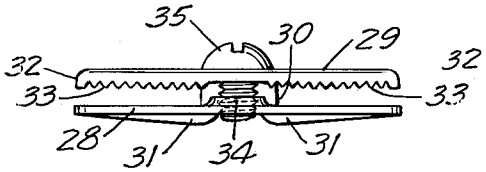
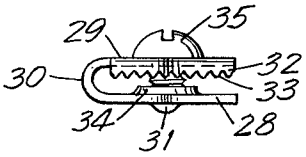


FIG. 7



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ELECTRICAL CONNECTOR

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This invention relates to electrical connectors and is especially useful for electrically connecting the conductive shielding of two communication cables when the cables are spliced together.

Communication cables commonly comprise a number of communication wires bound together within an inner covering consisting of an insulating sheath, a second covering comprising an electrically conductive sleeve-like shielding and an outer protective jacket. The purpose of the shielding is to intercept currents from extraneous fields and particularly from lightning and to conduct the currents to a ground. Thus when two communication cables are spliced together, it is desirable to electrically connect the shielding to allow conduction of the unwanted currents across the splice to the point of grounding.

When splicing of the inner communication wires is completed, there normally remains only a small portion of the cable that is not protected by the shielding. Therefore, in areas where there is minimal danger from outside electrical fields, it is generally acceptable to make the connection between the shielding with a jumper wire. Heretofore, the connection between the ends of the jumper wire and the respective shielding was commonly accomplished by the tedious process of soldering which requires the use of special equipment that must be handled in a skillful manner. The need for a simple mechanically attachable connector has long been recognized and yet the present invention is the first to teach such a device.

A suitable mechanical connector is required to be cheaply constructed, easily placed in operative position, easily and quickly connected to both shielding and jumper wire, operative without endangering the inner communication wires, and of course capable of secure and effective electrical contact. The present invention teaches a solderless mechanical connector whereby all of these features may be present. A brief description of a preferred device is as follows:

A metal strip is folded on itself to provide upper and lower jaws and a connecting web. The lower jaw has a free end that is flat and tapered which allows it to be easily inserted between the shielding and sheath of a communication cable. A simple screw extends between the jaws at a point adjacent the connecting web and is threadably engaged with the lower jaw so that a common screwdriver operates to draw the jaws together. The screw and connecting web define a spacing suitable for receiving the free end of a jumper wire, and as the screw is tightened to clamp the shielding between the jaws, the web is drawn tightly around the jumper wire.

The electrical contacts between the connector and the respective shield and jumper wire are securely established by providing serrations on the upper jaw and knurls on the inner face of the connecting web. Thus when the screw is tightened, the jaws and web actually bite into the respective shielding and wire. It is of course important that the screw does not penetrate the sheath. To safeguard against this possibility, the portion of the lower jaw that threadably engages the screw should be offset to allow the screw to extend through the lower jaw without engaging the sheath.

The above-described connector comprises only two parts, e.g., a common machine screw and a metal strip which may be stamped from a metal sheet and formed

in essentially a single operation. Thus, the present device is capable of very economical construction.

These and additional features will be more fully understood by reference to the accompanying drawings in which:

FIGURE 1 is a top plan view of one form of the improved connector as applied between a cable shielding sleeve and a jumper wire.

FIGURE 2 is a sectional side elevation view of the connector illustrated in FIGURE 1.

FIGURE 3 is a sectional view of the connector as taken along lines 3—3 of FIGURE 2.

FIGURE 4 is a side elevation view of a second form of the improved connector.

FIGURE 5 is a sectional view of the second form as taken along lines 5—5 of FIGURE 4.

FIGURE 6 is a side elevation view of a third form of the improved connector.

FIGURE 7 is an end view of the third form.

FIGURE 1 illustrates generally a cable **8** having communication wires **9**, an insulating sheath **10** surrounding the wires, a shielding sleeve **11** and an outer jacket **12**. A jumper wire **13** is connected to the shielding sleeve by means of a connector **14**. Said connector comprises a lower jaw **15**, an upper jaw **16**, a web **17** and tightening means consisting of a male screw **18** engaged with female threads **19** in a portion of lower jaw **15** that is offset towards the upper jaw.

The lower jaw **15**, upper jaw **16** and web **17** are integral, having been stamped and formed from a sheet of metal, preferably a copper alloy such as annealed beryllium copper which is then heat treated in a known manner to provide good tensile strength and resiliency. The upper jaw **16** is provided with a peripheral flange **20** for reinforcement and the lower jaw **15** is provided with a central ribbing **21** for reinforcement to make said jaw members stiff as related to the web **17**. The end portion **22** of the lower jaw **15** is thin, flat and pointed to facilitate insertion of said lower jaw between shielding sleeve **11** and sheath **10**.

In operation, lower jaw member **15** is inserted between sheath **10** and shielding sleeve **11**, and wire **13** is inserted between the web **17** and the offset at female screw threads **19**. The male screw **18** is engaged with the female screw threads **19**, and when the screw **18** is turned, the jaw members are forced toward one another. The inner wall of the web is provided with knurls **23** and the flange **20** of the upper jaw terminates in serrations **24**. Thus, as the jaws are forced together to clamp the jaws to the shielding **11** and draw the web around the wire **13**, the said knurls and serrations respectively bite into the wire and shielding to provide secure electrical connection.

In addition to providing a guide for the insertion of the jumper wire, the offset at female screw threads **19** provides a clearance for extension of the male screw beyond the female screw threads. This feature is important in that the male screw can cause material damage if it penetrates the insulating sheath during tightening of the jaws. Once the screw is tightened, the resilient jaws provide continual clamping pressure to the shielding regardless of expansion, contraction or flexing of the shielding sleeve.

FIGURES 4 and 5 illustrate a modified form of the connector wherein a portion of the lower jaw **15'** is cut out and bent upwardly to form a male locking member **25** provided with teeth-like projections having inclined upper edges and lateral lower edges. The upper jaw **16'** is provided with a slot aligned with the male locking member and adapted to admit entry of the male locking member when sprung open by the inclined edges of the projections. It will be understood that the lateral lower edges of the projections prevent withdrawal of the male lock-

ing member. This modified form is a single piece construction, does not endanger the insulating sheath and is operative without any tools.

FIGURES 6 and 7 illustrate another form of the connector which is suitable for direct connection to the shielding of both cables, i.e., no jumper wire need be used. The elongated lower jaw **28** has two opposed end portions each of which is flat, tapered and reinforced by central ribs **31**. The upper jaw **29** has a configuration similar to the lower jaw **28** and is provided with a peripheral flange **32** that terminates in serrations **33**. A web **30** connects the two jaws intermediate their end portions, and a male screw **35** extends through an opening in the upper jaw and is engaged with female screw threads **34** located in an offset portion of the lower jaw adjacent the web.

Although preferred embodiments of the present invention have been described herein, it will be understood that various modifications and changes may be made in the construction shown as for example the metal strip instead of being made of beryllium copper, can be made of such materials as Phosphor bronze, alloys of copper and nickel, or even laminates of copper and spring steel. As a further example, because the lower jaw portion receives support due to its being sandwiched between the sheath and the shielding, it may be desirable to only heat treat the upper jaw portion. Still further, such physical changes may be made as for instance providing serrations on the lower jaws to enhance the biting action at the expense of ease of insertion.

What is claimed is:

1. A connector suitable for making electrical connection to communication cable shielding comprising:

(A) a length of annealed copper alloy formed into

(1) an upper jaw portion having a peripheral, downwardly extended flange terminating in teeth-like serrations,

(2) a lower jaw portion having a tapered flat free end and upwardly offset female screw threads,

(3) a web portion joining said jaw portions and having knurls on its inner wall,

said offset female screw threads positioned at the end of said web portion at the point of connection with the lower jaw portion, and said formed alloy being heat treated to provide good tensile strength and resiliency;

(B) a male screw having

(1) a threaded shank extending between the ends of the web portion and engaged with said female screw threads, and

(2) a head affording means for the male screw to draw the ends of the web together, and by means of the resiliency of the upper jaw portion, to impart continuous spring pressure clamping action to the jaw portions when the connector is applied to a communication cable shielding.

2. A connector suitable for making electrical connection to communication cable shielding comprising:

(1) a resilient upper jaw portion having a reinforcing, downwardly extended flange terminating in teeth-like serrations,

(2) a lower jaw portion having a flat free end for insertion under the cable shielding,

(3) a web portion joining said jaw portions and having knurls on its inner wall,

(4) said lower jaw portion having inset female screw threads adjacent said web portion,

(5) a male screw extending through said upper jaw portion at a point adjacent to the web portion and threadably engaged with the female screw threads of said lower jaw portion,

said web portion and male screw defining an opening for receiving a wire conductor therebetween and to tightly grip the wire within said web portion for secure electrical connection when said male screw is drawn into the female screw for simultaneously imparting spring pressure clamping action of the jaw portions to the shielding.

3. A connector suitable for making electrical connection to communication cable shielding comprising:

(1) an upper jaw portion having a reinforcing, downwardly extended flange terminating in teeth-like serrations, said jaw portion having good tensile strength and resiliency,

(2) a lower jaw portion having a flat free end for insertion under the cable shielding,

(3) a web portion relatively more flexible than the reinforced upper jaw portion joining said upper and lower jaw portions,

(4) said lower jaw portion having female screw threads adjacent said web portion,

(5) a male screw extending through said upper jaw portion at a point adjacent to the web portion and threadably engaged with the female screw threads of said lower jaw portion,

(6) said female screw threads having sufficient depth from the outer surface of the lower jaw portion for substantial insertion of the male screw into the female screw before said male screw protrudes beyond the outer surface of the lower jaw portion,

said web portion and male screw defining an opening for receiving a wire conductor therebetween and for tightly gripping said wire conductor for secure electrical connection when said male screw is drawn into the female screw to simultaneously clamp the jaw portions to the shielding.

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