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[56]

References Cited

UNITED STATES PATENTS

2,965,699	12/1960	Bollmeier	174/84
3,201,744	8/1965	Dean	339/97 P
3,388,369	6/1968	Zalmans	339/95

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[54] **IN-LINE CONNECTOR FOR ELECTRICAL CONDUCTORS OR THE LIKE**
3 Claims, 5 Drawing Figs.

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[51] Int. Cl. H01r 11/20
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97—99, 223

ABSTRACT: A connector for making an in-line electrical connection between two or more insulated electrical wires or conductors in which a pair of spaced teeth on an upper jaw member cooperate with a tooth positioned on a lower jaw member such that meshing of the teeth cause the conductors to be bent around the lower tooth and the insulation to be stripped therefrom along planes parallel to the planes of movement of the teeth.

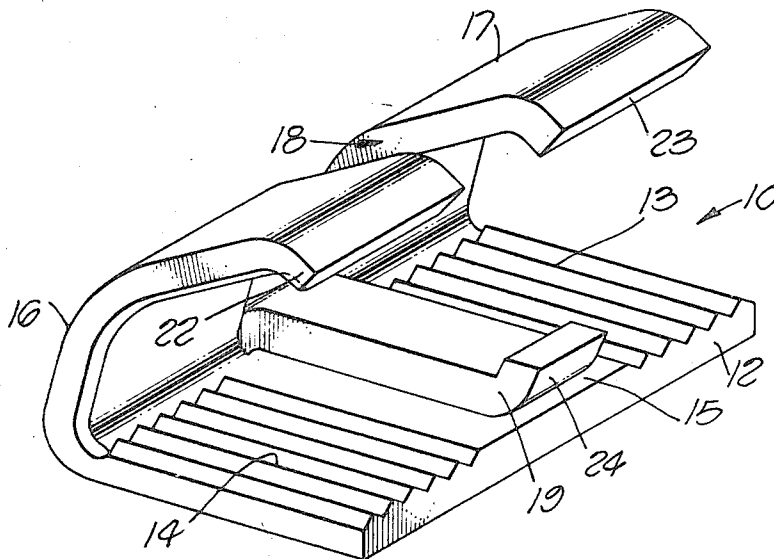


FIG. 1.

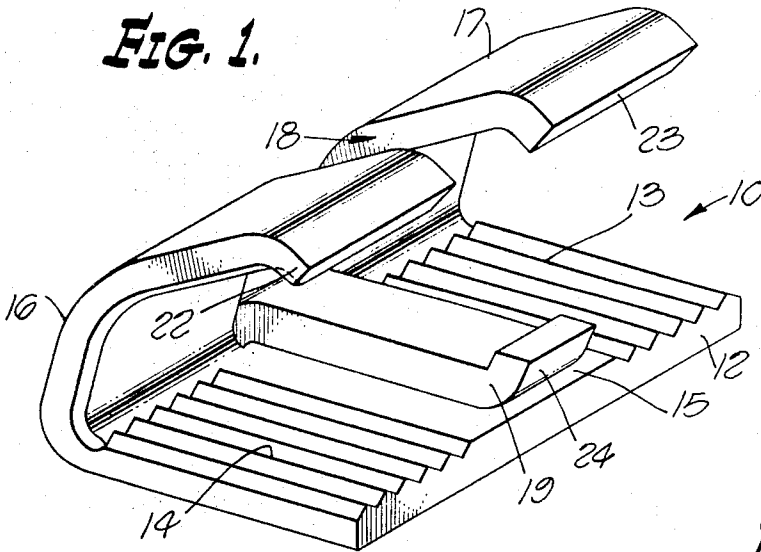


FIG. 2.

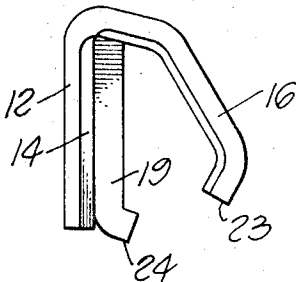


FIG. 3.

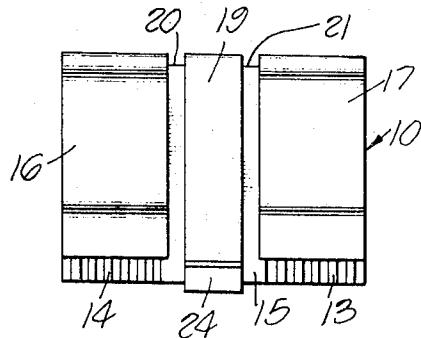


FIG. 5.

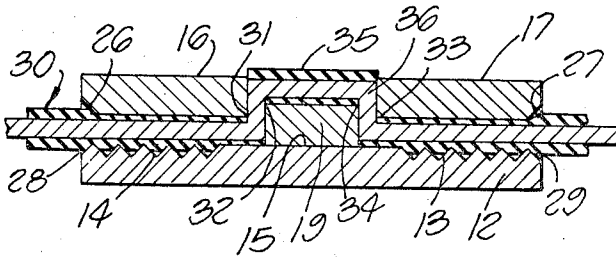
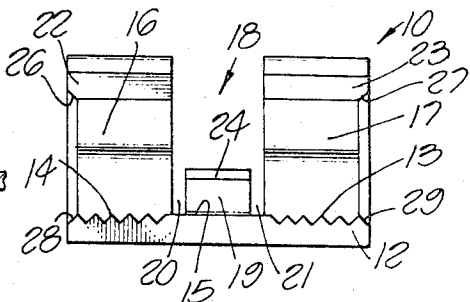


FIG. 4.



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IN-LINE CONNECTOR FOR ELECTRICAL CONDUCTORS OR THE LIKE

BACKGROUND OF THE INVENTION

The need for devices capable of connecting two or more electrical conductors is of long standing and consequently many connectors have been proposed and used for this purpose. Of particular desirability in many applications is a connector which can be installed in line, that is, at some point intermediate the ends of the conductors and without the necessity of either sliding the connector over the wires from their ends or stripping the insulation off of the wires back to a point where the connection will be made. An example of an application where such a device would be particularly useful is in the interconnection or splicing of several wires in a telephone cable of the type which typically may contain several thousand of such insulated conductors.

The devices which have been most commonly proposed for this purpose are crimped onto the wires, that is, the connector is provided in some fashion with teeth or other objects suitable for piercing the insulation, and the connector is deformed over the wires to cause the teeth to pierce the insulation and make electrical contact with the conductors themselves. A typical example of such a crimped device is disclosed in the U.S. Pat. No. 2,783,447 to Watts.

As shown in the Watts patent, a generally U-shaped metal member is provided with slots and corresponding shear blocks which are caused to shear the conductors in a direction perpendicular to the axis of the conductor, that is, the shear planes are so arranged that a portion of the wire is actually laterally displaced, the remaining exposed portions of the conductor making electrical contact with the connector to form the electrical connection. As disclosed in Watts, the connector is installed on the wires by use of a special crimping tool which causes the arms of a U-shaped member to be bent inwardly and over, and the connector to be deformed so that the shear blocks enter their associated slots and cause the lateral displacement of a portion of the conductor. While such connectors are generally satisfactory, they have several disadvantages. First, a special crimping tool is required for their installation and these tools are relatively expensive. Moreover, since different size connectors are needed for different size wires, different size crimping tools are also often needed, requiring an extensive inventory of both connectors and tools. In addition, the connectors themselves are relatively large and consequently expensive. Perhaps more seriously, the operation of this type connector often causes the wires to be completely severed or at least so weakened by the shearing action which takes place that they no longer have the desired mechanical stability and may in time separate at the shearing planes to the detriment of both the mechanical and electrical connection.

Another typical connector used for somewhat the same purpose is shown in the U.S. Pat. No. 2,965,699, to Bollmeier. In the Bollmeier patent there is disclosed a generally tubular connector in which a first plurality of bars cooperate with a second plurality of bars to bend the wires into a serpentine shape and sever them. The spacing between the bars is progressively greater and this spacing is maintained by widened tips provided on the ends of the bars of the second plurality. The construction of the Bollmeier device requires that it be passed over the ends of the wires. However, this is no particular disadvantage for his purposes as he wishes to sever the ends of the wires in any event. As in the Watts patent, the Bollmeier structure provides no means for limiting the movement of the cooperating bars of the conductor so that an excess force can cause these bars to move sufficiently relative to each other to sever the wires. However, as already noted, this is one of the purposes of the device and thus prevents no overwhelming obstacle to the use of the device. However, for these reasons, the device would be less than satisfactory as an in-line device. The device is also rather large and expensive to construct.

SUMMARY OF THE INVENTION

According to the present invention, a connector is provided which can be installed in-line with a simple tool such as a pair of pliers without fear of severing the wires to be connected. This is accomplished by providing the connectors with jaws formed to bend the conductors and scrape off the insulation in a direction parallel to the axis of the wires. In this manner the wires themselves are not subjected to any substantial shearing forces and their cross-sectional areas are not significantly reduced. In addition, the shearing of the insulation in this manner causes the jaws to make a wiping contact with the conductive portions of the wires it being recognized in the art that a wiping contact of this type is most desirable from an electrical standpoint. The connector is formed so that the jaws are integral and one jaw has a base which acts as a stop for the cooperating jaw, that is, it prevents relative movement of the jaws to a point where the wires could be severed. The connector is very simple and inexpensive to manufacture, is quite small, and can be quickly and easily installed with a simple tool thereby obviating the necessity for a number of expensive special tools.

It is therefore an object of the present invention to provide a connector for electrical wires or the like which is relatively inexpensive and which can easily be installed intermediate the ends of the wires without substantial danger to the mechanical integrity of the wires.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the connector of the present invention;

FIG. 2 is an end view of the connector of the present invention;

FIG. 3 is a top plan view of the connector of the present invention;

FIG. 4 is a front elevation view of the connector of the present invention; and

FIG. 5 is a cross-sectional view of the connector of the present invention showing it installed on a pair of electrical wires.

DESCRIPTION OF THE INVENTION

As shown in the several FIGS. the connector 10 of the present invention includes a base 12 having serrated portions 13 and 14 on its upper surface, the serrated portions 13 and 14 being separated by a flat portion 15. Extending upwardly from the base 12, and integral therewith, are jaw portions 16 and 17 which extend outwardly over the base 12, generally overlying the serrated portions 13 and 14, so that the connector 10 is generally C-shaped in cross section.

Intermediate the jaw portions 16 and 17 is a slot 18 formed by punching out a lower jaw portion 19 which is bent over to engage the flat region 15 of the base 12. If desired, the jaw portion 19 can be bonded to the flat region 15 but such is not generally necessary. As can best be seen in FIGS. 3 and 4, strips of material are removed from the sheet of metal from which the connector is formed to leave slots 20 and 21 between the jaw portions 16 and 17 and the lower jaw portion 19. These strips are preferably removed as part of the same punching operation which forms the jaw portions, and are of a width consistent with the wire size to be used as explained more fully hereinafter. Preferably, the outer ends 22 and 23 of the upper jaw portions 16 and 17 are bent downwardly and the outer end 24 of the lower jaw portion 19 is bent upwardly so that upon closure of connector the wires held therein cannot escape through the open side of the connector. Preferably, the ends of the upper jaw pieces and the base are chamfered as shown at 26, 27, 28 and 29 to prevent sharp bending or nicking of the conductor.

To install the connector 10, the wires to be connected are positioned over the lower jaw portion 19 within the upturned end 24 thereof. A pair of pliers or another suitable tool is then used to force the upper jaw portions 16 and 27 down toward

the base 12 and lower jaw portion 19. When the upper jaw portion 16 and 17 engage the wires or conductors 30 (only one of which can be seen in FIG. 5) positioned within the connector, they cause the conductors to be bent around the lower jaw portion 19 with the wires fitting into the slots 20 and 21 as shown in FIG. 5. At the same time, and as downward pressure of the upper jaw portions 16 and 17 continues, the scissorlike action of the jaw edges 31 and 32 and 33 and 34 will scrape or shear the insulation 35 from the wires 30 exposing the conductive portions 36. Movement of these edges will also cause the continued deformation of the conductors into the slots 20 and 21. The width of the slots 20 and 21 is made slightly smaller than the diameter of the conductive portion 36 so that the action of the jaw edges causes the exposure of fresh unoxidized metal on the conductor as well as the removal of the insulation therefrom, thereby providing the desired sliding contact. It should be understood that one or more conductors may be inserted into each end of the connector, the heretofore described operation of the connector making good electrical connection between all of them.

As can be seen, the base 12 acts as a stop which limits the relative movement of the upper and lower jaw portions and prevents an appreciable shearing force to be exerted on the wires in a direction normal to their axis. Consequently, the wires are not subjected to a substantial reduction of their cross-sectional area nor any other attack on their mechanical integrity. The serrations of the portions 13 and 14 serve the purpose of locating the conductors securely between the closed jaw surfaces and prevent the conductors from flexing at their weakest points, that is, the areas of deformation or bending. In addition, the clamping force of the jaws acts as a strain and tension relief on the conductors.

I claim:

1. A connector for electrical wires or the like having an external sheath of insulating material comprising:
 - a base, said base having a lower jaw member positioned thereon and protruding above the surface thereof;
 - first and second upper jaw members formed integrally with said base and extending above said base to form a generally C-shaped article for receiving said wires between said upper and lower jaw members, said upper jaw members being deformable to permit movement thereof toward said base;
 - said first and second upper jaw members being laterally displaced from said lower jaw member by a distance slightly less than the diameter of said wires less said external sheath so that each of said upper jaw members form with said lower jaw member a pair of laterally displaced parallel shear planes;
 - movement of said upper jaw members toward said base causing said wires to be deformed about said lower jaw member to position said wires such that portions of the external sheath of each wire is parallel to said shear planes whereby said jaw members remove said sheath from said portions of said wires in a direction parallel to the axes of said wires, said base limiting the relative movement of said jaw members and preventing shearing of said wires in a direction normal to their axes.
2. The connector of claim 1 wherein said jaw members have inwardly extending ends.
3. The connector of claim 1 wherein said base is provided with serrations on either side of said lower jaw member.

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