CONNECTOR FOR COUPLING A GROUND CONDUCTOR TO THE SHEILD OF A SHIELDED CONDUCTOR

14 Claims, 12 Drawing Figs.

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Field of Search 174/75.2, 78, 84.1, 90, 94; 339/223, 276, 95, 96, 97

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ABSTRACT: The disclosure is directed to a connector for coupling the sheath of a shielded cable to a ground point. In a first embodiment of the invention, the connector comprises a central portion having strengthening ribs thereon and two out-rigging members to provide strain relief to the insulating jacket of the conductor adjacent the central portion of the connector. The entire connector is generally C-shaped having a first curved portion with a smaller radius than the second curved portion so that the ends thereof are free to move in overlapping, wrapping relationship as the connector is coupled about the conductor. The central portion further includes an aperture, and a tab entering into said aperture, said tab being curved inwardly of the area generally defined by the C-shape, in such a manner that the bared portion of a grounding conductor can be inserted therein and trapped by the collapsing of the tab as the connector is attached to the conductor. The connector may be provided in uninsulated, or insulated, versions. A second form of the connector provides a grounding tab extending from an out-rigging member thereof which may be directly plugged into a grounding connector. A further version of the device provides the central portion of the connector with insulation piercing teeth for contact with the conductor sheath without the requirement for prestripping of the insulating outer jacket.
CONNECTOR FOR COUPLING A GROUND CONDUCTOR TO THE SHIELD OF A SHIELDED CONDUCTOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention is directed to the field of grounding the sheath of shielded conductors.

2. Description of the Prior Art

Prior to the present invention, the grounding of the sheath of a shielded conductor was accomplished by means of two sleeves crimped together with a ground lead trapped between the sleeves. For instance, it was necessary to strip the end of the cable free of its outer insulating jacket, then to stretch the sheath such that the inner sleeve could be inserted between the central conductor insulation and the sheath. The grounding conductor was then inserted atop the sheath and the outer sleeve inserted thereover. The entire assembly was then crimped, or otherwise deformed, to seize the sheath between the inner and outer sleeves as well as trapping the ground conductor therebetween. If a plurality of shielded conductors were to be grounded, it was necessary to provide separate inner and outer sleeves and ground leads for each of the conductors and then the ground leads might be commoned together to permit the removal of one ground lead from all of the shielded conductors. Because of the wide variety of sizes of shielded conductors it was necessary to provide a large number of inner and outer sleeves to accommodate these various sized conductors. Each of the grounding connections thus accomplished by prior art devices was bulky and generally weakened the sheath of the conductor and also resulted in gaps between the sheath and the central conductor portion.

Further, it was not possible with prior art devices to ground a plurality of shielded conductors employing the same connector in that each one of the shields required its own individual connector composed of two sleeves.

SUMMARY OF THE INVENTION

The present invention overcomes the difficulties noted above with respect to prior art devices by providing a simple, rapidly installed connector for attaching a ground point to one or more shielded conductors. This is accomplished by means of a connector which is generally in a C-shaped configuration having a first end curved in a smaller radius than the second end such that as the connector is wrapped around the conductor the portion having the smaller radius will move within the portion having the larger radius while the other moves to the outer portion of that portion having the smaller radius. Because of the manner of overlapping wrapped relationship of the connector to the conductor itself, a single connector can be employed with a variety of sizes of conductors while providing satisfactory grounding. In a first embodiment of the connector, the connector is applied over the exposed portion of the sheath of the shielded conductor. In this embodiment the connector is constructed of a central portion having two strengthening ribs running its length and having in its central portion thereof an aperture with a tab extending therefrom. The tab is fabricated to have a generally curved form and extends within the area generally defined by the C-shaped connector. The introduction of a ground lead between the connector body and the tab, at the central portion and the subsequent application of the connector to the conductor will cause the tab to be deformed or flattened in the direction of the connector body thereby providing a rigid mechanical connection between the connector and the ground lead. Extending from the central portion of the connector are two strain relief members which will engage the insulation adjacent the stripped portion of the shielded conductor to minimize the strain applied to the portion of the conductor from which the insulation has been removed. In a second embodiment of the device, a tab is provided depending from one of the strain relief members and omitting the central aperture and tab whereby the depending tab may then be inserted into a grounding connector without the requirement for additional grounding conductors. In a further embodiment, insulation piercing teeth are placed upon the central portion of the connector whereby it is unnecessary to preexpose the sheath of the shielded conductor in that the teeth are permitted to pass through the outer insulating jacket and make contact with the sheath of the shielded conductor. In each of the embodiments the connector may be provided in bare or preinsulated form. In the preinsulated form, a layer of insulation is placed upon the outer surface, that is away from the surface from which the tab extends, having portions of the insulation extending beyond the boundaries of the connector itself. At the top and the bottom edges of the connector, those edges which will overlap one another when the connector is wrapped about a conductor, the insulating material is folded back upon itself and bonded directly to the material of the connector along the connector length and bonded to itself in the portions adjacent the connector whereby the connector is prevented from moving laterally with respect to the insulation and separating therefrom. Temperature setting, or unctuous materials may be employed about the peripheral edges of the connector so that when the connector is placed about a conductor a moisture seal is provided. It is therefore an object of the invention to provide an improved connector for coupling a ground point to the sheath of a shielded conductor.

It is yet another object of this invention to provide an improved connector for coupling a grounding point to the sheath of a shielded conductor which does not require the distortion of the sheath of the shielded cable but which may be simply applied at the ends of the conductor or midspan without disruption to the conductor. It is still another object of this invention to provide an improved connector with positive retaining means for retaining a grounding lead to the assembled connector to provide the necessary grounding for the sheath of a shielded conductor.

It is yet another object of this invention to provide an improved connector for the grounding of the sheath of a shielded conductor which permits grounding of the sheath without the use of ancillary ground conductors. It is yet another object of this invention to provide an improved connector for grounding the sheath of a shielded conductor without requiring the removal of the outer insulating jacket.

It is still another object of this invention to provide a grounding connector for use with a wide range of shielded conductor sizes.

It is yet another object of this invention to provide a grounding connector which can ground the sheaths of a plurality of shielded conductors.

Other objects and features of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings which disclose, by way of example, the principles of the invention and the best modes which have been contemplated for carrying them out.

BRIEF DESCRIPTION OF THE DRAWINGS

In the Drawings:

FIG. 1 is a front elevation of a first embodiment of a connector constructed in accordance with the concepts of the invention;

FIG. 2 is a side elevation of the connector of FIG. 1;

FIG. 3 is a front elevation of the second embodiment of a connector constructed in accordance with the concepts of the invention and showing the connector of FIG. 1 with an insulating layer applied thereto;

FIG. 4 is a side elevation of the connector of FIG. 3;

FIG. 5 is a front elevation of a further embodiment of a connector constructed in accordance with the concepts of the invention;

FIG. 6 is a front elevation of a further embodiment of a connector constructed in accordance with the concepts of the invention;
FIG. 7 is a side elevation of a shielded conductor having a portion of its outer insulating jacket removed to expose the sheath thereof.

FIG. 8 is a side elevation of the connector of FIG. 1 having installed therein the stripped portion of an insulated ground leader.

FIG. 9 is a side elevation illustrating the exposed sheath portion of a shielded conductor engaged by the connector of FIG. 1 and having a ground lead inserted therein;

FIG. 10 is a perspective view of a shielded conductor with the connector of FIG. 1 installed thereto;

FIG. 11 is a side elevation of a shielded conductor having a portion of the sheath exposed for a midspan grounding of the sheath;

FIG. 12 is a side elevation of the conductor of FIG. 11 having attached thereto the connector of FIG. 1 having a ground lead positioned therein;

Similar elements will be given similar reference characters in each of the respective FIGS.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Turning now to FIGS. 1 and 2 there is shown a connector 20 constructed in accordance with the concepts of the invention. Connector 20 has a central portion 22 having formed thereon strengthening ribs 24. Outrigged from the central portion 22 are a pair of strain relief shoulder 26 held to the central portion 22 by means of the members 28 and separated by apertures 29. Formed in the central portion 22 is an aperture 30 and a tab 32 which extends within the aperture 30. The tab 32, as can be better appreciated from FIG. 2, is preformed in a curved manner to permit the insertion between the central portion 22 and the tab 32 of the bare portion of an insulated ground conductor or a bare ground conductor (not shown).

The entire connector 20 is formed in a generally C-shaped, as is better seen in FIG. 2, such that the upper portion, terminating in the upper edge 34, has a smaller radius of curvature than the lower curved portion terminating in the edge 36. As will be apparent from the description below, the edge 34 will be permitted to trace a path along the inner surface of the lower curved portion while the edge 36 traverses the outer portion of the upper curved portion, as the connector 20 is tightly wrapped about the exposed sheath of the shielded conductor. Both of the edges 34 and 36 are rounded in order to provide interference and assurance that one edge 34 and 36 move with respect to one another. As will also be apparent, tab 32 will be flattened in the direction generally towards the central portion 22 as the overall connector 20 is tightly fastened about the sheath of the shielded conductor. The tip 38 of the tab 32 will be permitted, under certain conditions of size of the ground conductor and the shielded conductor, to enter the aperture 30 and anchor itself at the back surface of the connector 20. In other instances the tip 38 of the tab 32 may ride along the inner surface of the connector 20, or take any position intermediate. As a result of the conductor 20 being applied to the sheath of a shielded conductor a grounding connector placed within the tab 32 is urged towards the point of joisture of the tab 32 with the connector 20 thus increasing the mechanical holding and locking action of the connector 20 with respect to a grounding conductor. Further, depending upon the direction of passage of the grounding conductor to the tab 32, either of the strain relief members 26 will also act as a strain relief and further provide holding for the ground conductor as is passed under connector 20, that is between the body of the connector 20 and the sheath of the shielded conductor. The strain relief members 26 engage the outer jacket portion of the sheath of the exposed sheath to provide additional strain relief for the connection and also to prevent unwanted separation of the insulation from the sheath of the cable as a result of the breaching of a portion of the insulating jacket.

Referring now to FIGS. 3 and 4 there is shown a second embodiment of a connector 50 constructed in accordance with the concepts of the invention. The connector blank 51 is, in all mechanical detail, the same as connector 20 of FIGS. 1 and through 3 with the addition of an insulating layer 52 thereof thereafter. Insulating layer 52 is larger than the connector blank 51 having overlapping tabs 54 and 56. The overlapping tab portions are folded back to cover the opposite sides of the connector blank 51 to which the layer 52 is applied. Layer 52 will then be bonded at the overlapping portions 54 to connector blank 51 material where an insulation to material contact exists and to itself beyond the connector blank 51 as at 58. The bonding achieved between the material of the connector blank 51 and the insulating material 52, as well as the bonding of the insulating material 52 to the overlapping tabs 54 and 56 will prevent separation of the insulating layer 52 from the connector blank 51 and will prevent the connector blank 51 from being displaced laterally with respect to the insulating layer 52.

As can be seen from FIG. 5 there is shown a further embodiment of a connector 70 constructed in accordance with the concepts of the invention omitting the necessity for the introduction of a grounding conductor and providing a grounding tab 72 formed as an integral portion of the connector 70. Central portion 72 of the connector 70 is shown to be without an aperture equivalent to aperture 30 of FIG. 1 and omits the tab 32, also shown in FIG. 1. In addition, the outrigging strain relief member 76, to the left of FIG. 5, is extended to provide a grounding tab 72. It should be noted that the grounding tab 72 may be placed at either one of the outrigging strain relief members 26, 26' or there may be such grounding tabs extending from both of the strain relief members 26, 26'. The grounding tab 72 will be made of sufficient length so that it may be plugged into an appropriate grounding terminal (not shown).

Turning now to FIG. 6, a further embodiment of a connector 80 constructed in accordance with the concepts of the invention is shown. The connector 80 of FIG. 6 is similar to connector 20 of FIG. 1 with the exception of the addition of insulating piercing teeth 82 placed upon the central portion 22'. In this arrangement it will not be necessary to prestrip, or expose, the sheath of the shielded conductor; instead the connector 80 will be attached over the outer insulating jacket of the shielded conductor and pulled tight so that the teeth 82 may pierce the outer insulating jacket and contact the sheath below. The teeth 82 will be of sufficient size and strength to permit piercing of the outer insulating jacket of sufficient length to contact the sheath. Thereafter the sufficient length to cut through the sheath and enter the insulation extending between the central conductor and the sheath.

Referring now to FIG. 7 through 10 the assembly of connector 20 of FIG. 1 to the sheath 102 of the shielded conductor 100 is shown. As is shown in FIG. 7, outer insulating jacket 104 has been stripped back to expose the sheath 102. Further, the sheath 102 has been cut so as to expose the insulator 106 of the central conductor. The arrangement shown in FIG. 7 is termed an end type of termination. As is shown in FIG. 8 the ground conductor 110 has its insulated outer jacket 112 stripped back to expose the grounding conductor 114. The bare portion of the conductor 114 is then inserted under the tab 32 of the connector 20. Connector 20, with the grounding conductor 110 in place, is then placed about the shielded connector 100 such that a first of the strain relief members 26 extends over the outer insulating jacket 104. It should be noted at this time that the position of the grounding conductor 110 is such that as it extends from the tab 32 out from the connector 20 it will also be placed under the strain relief member 104 engaging the outer insulating jacket 104 of the shielded conductor 100. The central conductor insulated by insulating jacket 106 extends to the right hand portion of FIG. 9. Now a suitable tool (not shown) is applied to tighten the connector 20 about the shielded conductor 100. As a result of the wrapping overlapping action tightening the connector 20 upon the conductor 100, tab 32 as described with reference to FIGS. 1 and 2 will be flattened against the central portion 22 of the con-
nector 20 trapping ground conductor 110 bare end 114. The strain relief member 26, to the left hand portion of FIG. 9 engaging the insulating outer jacket 104, will provide strain relief to prevent pull-back of the insulated outer jacket 104 as a result of any forces applied to the conductor 100 as well as protecting the grounding conductor 110 from being dislodged from the connector 20. The final assembly of the connector 20, the ground lead 110 and the shielded conductor 100 is shown in FIG. 10. The strain relief member 26, extending closest to the central conductor insulation 106 of the conductor 100, will not be in contact with either the sheath or the central conductor insulator 106. If a connection was to be made, for example, to a plastic terminating pin, the strain relief member 26 would engage the terminal pin and provide strain relief to prevent separation of the terminal pin from the conductor 100.

In FIG. 11 there is shown the preparation of a shielded conductor 100 wherein the insulated outer jacket 104 is stripped midspan to expose a portion of the sheath 120 therebetween. This arrangement is generally what is referred to as a midspan tap termination in that the ground connection is to be made at other than the end portions of the conductor 100. The ground lead 110 is attached as illustrated in FIG. 4 and the entire connector 20 is then wrapped about the midspan exposed sheath portion 120. The connector 20 will then be tightened about the conductor 100 to provide the necessary contact and grounding. The only difference in this instance will be that both the strain relief members 26 will engage the outer jacket 104 of the conductor 100 and will thus provide strain relief to both sides of the conductor 120 adjacent the exposed sheath.

It should be noted that although the instant connector has been described in terms of a shielded conductor, it may also be employed as a tap for a ground lead or any other type of conductor where a simply installed connector is desired.

While there have been shown and described and pointed out the fundamental novel features novel of the invention as applied to the preferred embodiments, it will be understood that various omissions and substitution and changes of the form and details of the devices illustrated and in their operation may be made by those skilled in the art, without departing from the spirit of the invention.

I claim

1. A connector for grounding the exposed sheath of a jacketed shielded conductor from which a portion of the jacket has been removed to expose the sheath comprising: a central portion for overlapping wrapped engagement with the exposed sheath of a shielded conductor; said central portion being preformed in a generally C-shaped configuration having a first curved end portion of a first predetermined radius of curvature and a second curved end portion of a second predetermined radius of curvature larger than said first predetermined radius of curvature; said first curved end portion moving within said second curved end portion when said central portion is wrapped about the exposed sheath of a shielded conductor; a pair of strain relief members coupled to said central portion, one disposed to each side thereof; said members adapted to engage the outer jacket of the shielded conductor to either side of the exposed sheath and means coupled to said connector for coupling said conductor to a grounding point.

2. A connector, as defined in claim 1, wherein said means is a tab extending from one of said shoulders whereby said tab may be inserted into a grounding connector.

3. A connector, as defined in claim 1, wherein said central portion further comprises a pair of ribs extending in a direction parallel with said members.

4. A connector, as defined in claim 1, further comprising an insulating layer positioned over the outer surface of said connector.

5. A connector for grounding the exposed sheath of a jacketed shielded conductor from which a portion of a jacket has been removed to expose the sheath comprising: a central portion for overlapping wrapped engagement with the exposed sheath of a shielded conductor: a pair of strain relief members coupled to said central portion, one disposed to each side thereof; said members adapted to engage the jacket of the shielded conductor to either side of the exposed sheath; means coupled to said conductor for coupling said connector to a grounding point; an insulating layer positioned over the outer surface of said connector, said layer extending beyond the edges of said connector, said extending portions adjacent the overlapping edges of said connector being folded over the inner surface of said connector and bonded to the connector where the insulating layer overlaps the connector and bonded to itself beyond the connector, whereby the insulating layer is bonded to the connector and the connector is restrained from lateral movement.

6. A connector, as defined in claim 5, further comprising a high temperature melting material disposed along the edges of said connector whereby upon the application of heat to the assembled connector said material melts to provide a moisture tight seal upon resetting.

7. A connector, as defined in claim 5, further comprising an insulating material disposed along the edges of said connector whereby a moisture seal is formed about said connector when said connector is assembled to said conductor.

8. A connector for grounding the exposed sheath of a jacketed shielded conductor from which a portion of the jacket has been removed to expose the sheath comprising: a central portion for overlapping wrapped engagement with the exposed sheath of a shielded conductor; an aperture in said central portion; a pair of strain relief members coupled to said central portion, one disposed to each side thereof; said members adapted to engage the jacket of the shielded conductor to either side of the exposed sheath; a tab means extending into said aperture to permit a ground lead to be introduced within said tab means and held to the assembled connector when said connector is wrapped about said conductor; said central portion further comprises a pair of ribs extending in a direction parallel with said members, one of said ribs disposed to either side of said aperture.

9. A connector for grounding the exposed sheath of a jacketed shielded conductor from which a portion of the jacket has been removed to expose the sheath comprising: a central portion for overlapping wrapped engagement with the exposed sheath of a shielded conductor; an aperture in said central portion; a pair of strain relief members coupled to said central portion, one disposed to each side thereof; said members adapted to engage the jacket of the shielded conductor to either side of the exposed sheath; said tab extending into said aperture to permit a ground lead to be introduced within said tab means and said connector and held to the assembled connector when said connector is wrapped about a conductor; said central portion is preformed in a generally C-shape, one of the curved portions having a smaller radius than the other to permit the ends of said connector to move in an overlapping relationship when tightened about a conductor; and said tab extending into the partially closed area defined by said C-shape; said tab being flattened against said conductor connector to retain a ground conductor as said connector is tightened about a shielded conductor.

10. A connector, as defined in claim 9, further comprising an insulating layer positioned over the outer surface of said connector.

11. A connector for grounding the exposed sheath of a jacketed shielded conductor from which the portion of the jacket has been removed to expose the sheath comprising: a central portion for overlapping wrapped engagement with the exposed sheath a pair of strain relief members coupled to said central portion, one disposed to each side thereof; said members adapted to engage the jacket of the shielded conductor to either side of the exposed sheath; said tab extending into said aperture to permit a ground lead to be introduced within said tab means and held to the assembled connector when said connector is wrapped about a conductor; and an insulating
layer positioned over the outer surface of said connector, said layer extending beyond the edges of said connector, said extending portions adjacent the overlapping edges of said connector being folded over the inner surface of said connector and bonded to the connector where the insulating layer overlaps the connector and bonded to itself by beyond the connector, whereby the insulating layer is bonded to the connector and the connector is restrained from lateral movement.

12. A connector, as defined claim 11, further comprising a high temperature melting material disposed along the edges of said connector whereby upon the application of heat to the assembled connector said material melts to provide a moisture tight seal upon resetting.

13. A connector, as defined in claim 11, further comprising an unctuous material disposed along the edges of said connector whereby a moisture seal is formed about said conductor when said connector is assembled to said conductor.

14. A connector for grounding the sheath of a jacketed shielded conductor comprising: a central portion for overlapping wrapped engagement with the jacket of a shielded conductor; said central portion being preformed in a generally C-shaped configuration having a first curved end portion of a first predetermined radius of curvature and a second curved end portion of a second predetermined radius of curvature larger than said first predetermined radius of curvature; said first curved end portion moving within said second curved end portion when said central portion is wrapped about the jacket of a shielded conductor; a plurality of teeth on said central portion; said teeth arranged to pierce the jacket of a jacketed shielded conductor and engage the sheath thereof when said connector is wrapped about a conductor; a pair of strain relief members coupled to said central portion, one disposed to each side thereof; said members adapted to engage the jacket; and means coupled to said connector for coupling said connector to a grounding point.
UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,549,787 Dated March 16, 1971

Inventor(s) John J. Churla, Jr.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 6, line 59, after "against" delete -- a --;
before "con-" delete -- conductor --.

Column 6, line 69, after "sheath" insert -- of a
shielded conductor; an aperture in said central
portion; --

Signed and sealed this 25th day of May 1971.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR. WILLIAM E. SCHUYLER, JR.
Attesting Officer Commissioner of Patents