June 15, 1965 D. H. SCOFIELD 3,189,679

JOINT AND COVER ASSEMBLY FOR TROLLEY ELECTRIFICATION SYSTEM

Filed March 12, 1963 2 Sheets-Sheet 1

Fig. 1.

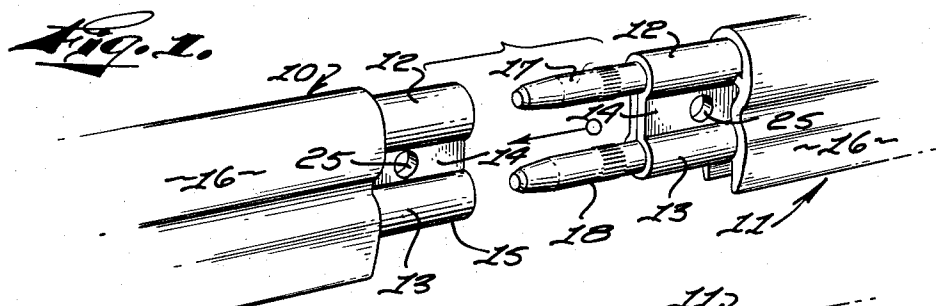


Fig. 2.

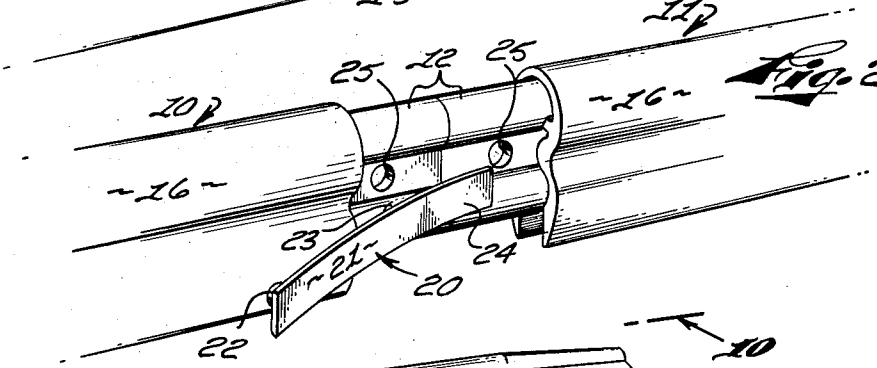
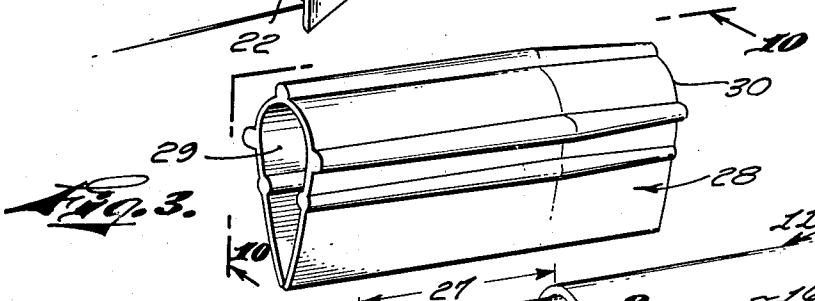


Fig. 3.



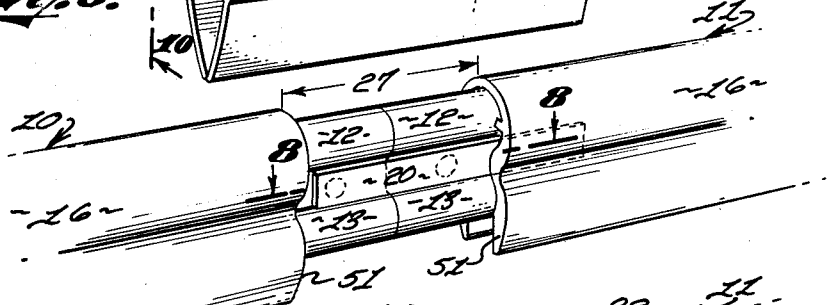
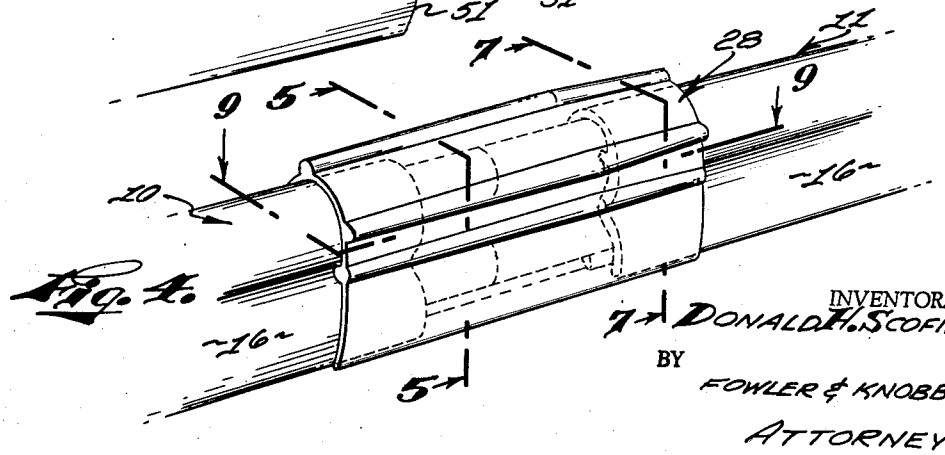


Fig. 4.



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Fig. 5.

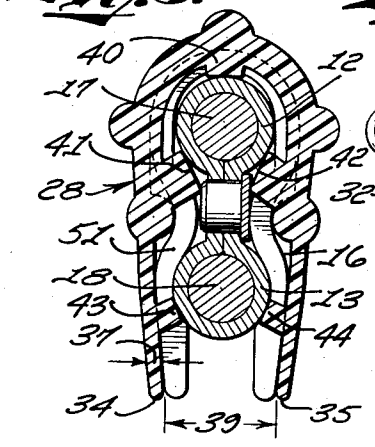


Fig. 6.

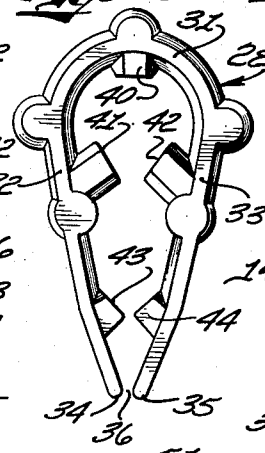


Fig. 7.

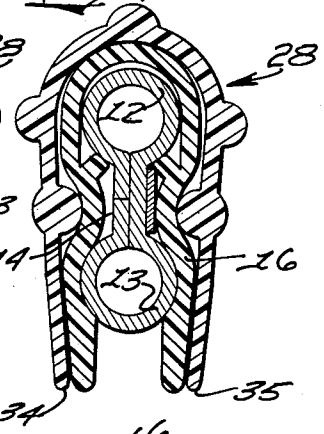


Fig. 8.

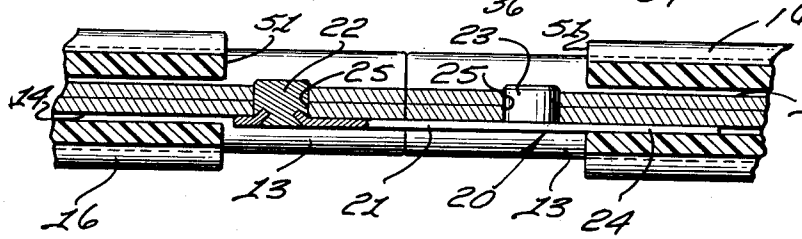
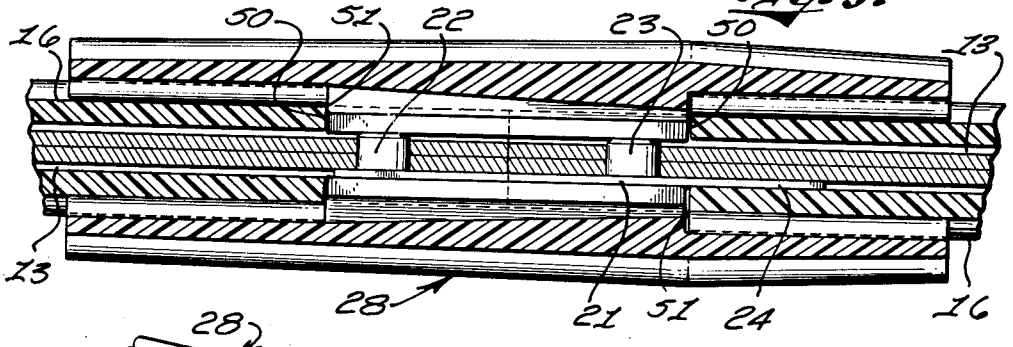


Fig. 9.



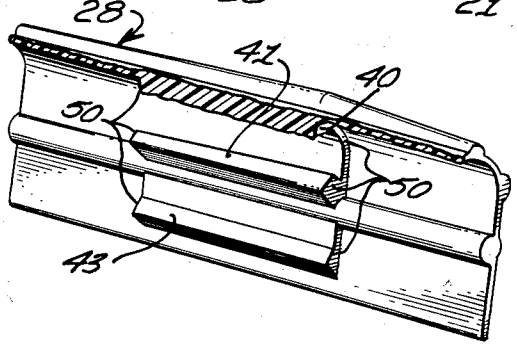


Fig. 10.

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JOINT AND COVER ASSEMBLY FOR TROLLEY ELECTRIFICATION SYSTEM

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Filed Mar. 12, 1963, Ser. No. 266,132
5 Claims. (Cl. 174—84)

The present invention relates to an improved joint assembly for trolley electrification systems wherein electrical power is supplied to mobile machinery such as a traveling crane or hoist.

A mobile electrical hoist and like machine is usually mounted upon a carriage suspended on wheels which roll along a supporting track or rail. Usually, one or more conductor bars are supported from and extend along the rail, and a corresponding number of electrical collectors are mounted on the carriage and held in engagement with the conductor bars as the carriage moves along the rail.

The electrical conductor bars to which the present invention relates are formed as elongated pieces or sections, each of which is provided with a separate insulating sheath extending throughout substantially the entire length of the bar. These sheaths are formed of an electrically insulating material and closely surround substantially the entire periphery of the bar, leaving only a small exposed surface of the bar for engagement by the sliding collector shoe. A preferred configuration for the conductor bar is one having a figure 8 in cross-section wherein two lobes of circular cross-section are connected by a flat integral web. This configuration provides substantial bending resistance without excess weight in the conductor bar. Furthermore, a smooth outwardly directed convex surface is provided for engagement by the sliding electrical shoe.

It is often necessary to position these conductor bars in end-to-end relation in order to provide electrical power to a track of longer length than the usual commercial length of conductor bar. In such installations, the insulating sheath associated with each conductor bar is terminated short of the bar in order to leave an uncovered end section of each bar which may be used in connecting two bars by forcing their aligned circular parts onto connecting pins. After the ends of the two aligned bars have been connected in this manner, a gap is left between the ends of the insulating sheaths associated with the two bars. It has been the practice heretofore to cover this gap with a joint cover, a preferred joint cover of the prior art being described in U.S. Patent No. 2,994,734, entitled "Connecting Sheath for Conductor Bar Assemblies," and assigned to Insul-8 Corp., assignee of the present invention. One problem, however, associated with this cover in the past is that it is sometimes inadvertently removed or displaced from its proper position by the conductor shoe or other moving structure striking the cover member.

Another problem connected with certain joint assemblies of the prior art is that the connecting pins are not always adequate to properly retain the bars fixed together. This problem is especially acute with conductor bars constructed of copper which, because of this metal's relatively low modulus of elasticity, tend to loosen from the connecting pins.

It is the object of the present invention to provide an improved joint assembly for trolley electrification systems which successfully overcomes the problems described hereinabove.

In accordance with a preferred form of the present invention, there is provided a joint cover molded from a resilient plastic material having open ends and a cross-sectional configuration comprising a closed, generally circular end portion connected to converging side portions whose ends are separated by a narrow gap. This member

includes a first pair of inwardly extending bosses formed at an angle with respect to the side portions and inclined toward the closed end portion. An additional boss is located at the center of the closed circular end portion and extends downwardly, generally perpendicular to the interior surface of the cover member at this point. A second pair of bosses, also inclined upwardly from the side portions, are located approximately halfway between the first pair of bosses and the cover ends. In use, the open ends of the cover member are forced over opposite sides of the adjacent ends of two aligned connector bars, thereby causing these side portions to spread apart and form a generally U-shaped cover. The resilience of the plastic material causes the joint cover member to tightly grip the sides of the conductor bar. Also, the first inwardly extending bosses and the single boss exert opposing forces upon the upper lobe of the figure 8 shaped bar, thereby locking the cover member on the bar and preventing its inadvertent removal or displacement if struck by the sliding collector shoe or other moving structure. The second pair of bosses engage the bottom lobe of the figure 8 conductor bar and maintain a predetermined gap between the ends thereof for avoiding any interference with the sliding collector shoe mechanism.

The invention also relates to a joint keeper member for holding conductor bar sections together, this member comprising a flat steel strip having two protruding buttons riveted thereto. In use, one end of this flat strip is inserted underneath the end of the insulating sheath of one of the conductor bar sections, and the buttons inserted in respective holes formed in the conductor bar ends. The keeper member is so temporarily retained until the joint cover member is clamped over the exposed joint. The first pair of inwardly extending bosses of the joint cover member described hereinabove are preferably formed so as to also engage this joint keeper member, thereby locking this member in position.

A more thorough understanding of the invention may be obtained by a study of the following detailed description taken in connection with the accompanying drawings in which:

FIGS. 1 through 4 are perspective views showing successive steps in the construction of a joint assembly according to the invention;

FIG. 5 is a cross-sectional view taken along line 5—5 of FIG. 4;

FIG. 6 is an end elevation view of the joint cover of the present invention; and

FIGS. 7 through 10 are respectively cross-sectional views taken along lines 7—7, 8—8, 9—9 and 10—10 of FIGS. 3 and 4.

Referring now to FIGS. 1 through 4, there is shown therein successive steps in the construction of a joint assembly in accordance with the present invention. In FIG. 1, there is shown adjacent ends of electrical bars **10**, **11** each comprising in cross-section a pair of generally circular lobe portions **12**, **13** which are spaced apart and joined by an integral web **14**. As noted heretofore, this generally "figure 8" configuration is preferred for trolley electrification systems since it has substantial bending resistance without excessive weight. Furthermore, a smooth outwardly directed convex surface **15** is provided for engagement by a sliding electrical contact (not shown). A preferred electrical collector assembly is described and claimed in the copending application by John W. Roney, Serial No. 240,841, Patent No. 3,142,368 entitled "Electrical Collector Assembly," filed November 29, 1962, and assigned to Insul-8 Corp. Each conductor bar section is covered overall except for a small end portion by a plastic insulating sheath **16**. Each sheath is substantially U-shaped in cross-section and surrounds and covers substantially the entire exterior surface of its associated conduc-

tor bar, leaving exposed only the one surface 15 of the circular lobe 13 which may be engaged by the sliding collector shoe of a movable trolley. The insulating sheath associated with each conductor bar does not extend to the end of the bar with which it is associated, but, as shown in the drawings, stops short of such end in order to permit the adjacent exposed ends of the two conductor bars to be engaged by a tool (not shown) in order to force the end parts of the circular lobes 12, 13 onto connecting pins 17, 18, thereby forming the configuration shown in FIG. 2.

Means are provided by the present invention for insuring that the joined conductor bar sections do not become disconnected. This occurrence is especially common when the conductor bars are formed of copper which, because of its relatively low modulus of elasticity, does not provide a sufficiently tight grip about the connecting pins 17, 18. In order to lock together adjacent sections, a joint keeper member 20 is provided, comprising a thin strip of metal 21 having riveted to one surface thereof a pair of spaced protruding buttons 22, 23 (FIGS. 2, 8 and 9). Member 20 is formed so as to have an end segment 24 of the strip 21 extend beyond the button 23. In use, this end segment is inserted underneath the insulating sheath 16 of one of the connector bar sections as shown in FIG. 3. The buttons 22, 23 engage respective holes 25 of the conductor bar sections so as to lock these sections in place. In this manner, the joint keeper member is temporarily retained as shown in FIG. 3 until the joint cover member 28 is snapped in position.

The joint cover member 28 described in detail hereinafter, is an elongated member open at both ends 29, 30 and of such length that at each of its ends it extends over and covers an end of one of the insulating sheaths 16, thereby not only bridging the space 27 between the ends of the two sheaths and covering the exposed ends of the two conductor bars but also covering the spaced end parts of the two sheaths.

Referring now to FIG. 6, the joint cover is shown in detail. This member is preferably molded of a resilient plastic material and comprises an unstressed cross-sectional configuration having a closed, generally circular end portion 31 connected to and integral with tangential, general planar side portions 32, 33 whose ends 34, 35 converge to form a narrow gap 36 substantially smaller than the diameter of the circular closed end portion. The joint cover member includes a plurality of inwardly extending bosses 40, 41, 42, 43 and 44. Each of these bosses comprises an elongated polyhedron, each having a slight taper to facilitate removal from the plastic forming mold. These bosses are spaced intermediate from the outer open ends 29, 30 of the cover and have a length slightly less than the total exposed surface 27 of the conductor bar (best illustrated in FIGS. 4, 9 and 10).

Boss 40 is formed at the center of the closed circular end portion and extends downwardly, generally perpendicular to the interior surface of the cover member at this point. Bosses 41, 42 are located near the junction between the circular end portion 31 and the tangential side portions 32, 33 and are formed at an angle with respect to the side portions and inclined upwardly toward the closed end portion 31. Bosses 43, 44 are formed approximately halfway between the bosses 32, 33 and the cover ends 34, 35. These bosses are also inclined upwardly. The exact position and form of each of these bosses is dependent upon the particular conductor bar with which the cover member is associated, as described below.

In use, the joint cover is applied over the top of the exposed conductor bar to thereby force the side portions 32, 33 whereby the cover member assumes a stressed generally U-shaped cross-sectional configuration (FIG. 5). The plastic material used to form the cover member is sufficiently flexible to permit the cover member to be formed in this manner so long as a predetermined thickness of material is not exceeded for the closed end portion. By way of example, the thickness 37 of this material will usually be of the order of .05 inch with a maximum thickness in the circular portion of .10 inch for a cover having an overall height of approximately 1.5 inches and a width of approximately 1 inch. When the cover member is snapped into the position shown in FIG. 5, the uppermost boss 40 rests upon the upper surface of circular lobe 12. The first pair of upwardly inclined bosses 41, 42 provide a means for engaging the underside of this same lobe thereby exerting opposing forces on the lobe 12 and locking the joint cover in position. Boss 42 also engages the joint keeper member 20 thereby permanently securing this member in position.

The second pair of bosses, 43, 44, are also inclined upwardly to provide a retaining force upon the lower conductor bar lobe 13. In addition, these bosses space the edges 34, 35 of the joint cover member a predetermined distance 39 apart to avoid interference with the sliding collector shoe mechanism.

Longitudinal movement of the joint cover with respect to the conductor bar sections 10, 11 is prevented by the bosses 40 through 45 since they each include a perpendicular face 50 at their opposite end which engages a juxtaposed perpendicular end face 51 of the conductor bar insulating sheath 16 (FIGS. 3, 8 and 9).

Although an exemplary embodiment of this invention has been disclosed and discussed, it will be understood that other applications of the invention are possible and that the embodiments disclosed may be subjected to various changes, modifications, and substitutions without necessarily departing from the spirit of the invention.

I claim:

1. A member for covering the exposed ends of aligned sections of conductor bar joined in end-to-end relation comprising

an elongated member molded from resilient plastic and having open ends, said member having a cross-sectional configuration comprising a closed, generally circular end portion integral with tangential, generally planar side portions, said side portions converging towards one another to form a narrow gap,

said member including

a first pair of inwardly extending integral bosses respectively located near the juncture of said side portions with said generally circular end portion, said bosses being formed at an angle with respect to said side portions and inclined toward said closed, generally circular end portion,

an integral boss located proximately at the center of said closed, generally circular end portion and extending downwardly, generally perpendicular to the interior surface of the cover member at this point, and

a second pair of inwardly extending integral bosses inclined with respect to said side portions toward said closed end and respectively located approximately half way between said first pair of bosses and the ends of said converging sides;

each of the said bosses comprising generally an elongated polyhedron.

2. In a joint assembly for trolley electrification systems including insulated conductor bar sections joined in end-to-end relation, said conductor bars substantially covered with an insulating sheath but having exposed end portions with respective holes therethrough, the combination comprising

a joint keeper comprising a strip of metal having spaced protuberances inserted into respective holes of the exposed conductor bar end portions, said joint keeper including an end segment extending beyond one of said protuberances and disposed underneath the insulating sheath of one of said conductor bars for temporarily retaining said joint keeper in position, and

an elongated joint cover member formed of a resilient insulating material and having a cross-sectional configuration comprising a closed, generally circular end portion integral with side portions whose ends converge to form a narrow gap substantially smaller than the diameter of said circular end portion,

said joint cover member including an inwardly extending boss formed integral with the wall of said member and inclined toward said circular end portion, said boss engaging said conductor bar and said joint keeper for fixedly retaining both said cover and said keeper in position.

3. A joint cover member for trolley electrification systems wherein said member covers the exposed ends of aligned insulated conductor bar sections jointed in end-to-end relation comprising

an elongated member having a cross-sectional configuration comprising a closed, generally circular end portion integral with generally planar side portions, said side portions converging towards one another to form a narrow gap between their respective juxtaposed ends, said gap being substantially smaller than the diameter of the circular closed end portion so that said side portions are spread apart when said cover member is forced over the exposed ends of the conductor bar ends and constrained in a generally U-shaped configuration, said cover member being formed of a resilient material so that said member is biased towards its original narrow gap cross-sectional configuration from the stressed U-shaped configuration, causing said side portions to tightly grip the sides of said conductor bar sections, and

means for (i) inhibiting removal of said cover member from said conductor bar sections and (ii) maintaining the ends of said converging side portions a predetermined distance apart to avoid interference with the movable collector mechanism of said trolley electrification system, said means comprising a pair of inwardly extending bosses formed integral with said generally planar side portions and inclined toward said closed, generally circular end portion, said bosses being located so as to engage a portion of the surface of said conductor bar sections directed outwardly from the closed, generally circular end portion of said cover member.

4. A joint cover member for trolley electrification systems wherein said member covers the exposed ends of aligned insulated conductor bar sections joined in end-to-end relation comprising

an elongated member having a cross-sectional configuration comprising a closed, generally circular end portion integral with generally planar side portions, said side portions converging towards one another to form a narrow gap between their respective juxtaposed ends, said gap being substantially smaller than the diameter of the circular closed end portions so that said side portions are spread apart when said cover member is forced over the exposed ends of the conductor bar ends and constrained in a generally U-shaped configuration, said cover member being formed of a resilient material so that said member is biased toward its original common narrow gap cross-sectional configuration from the stressed U-shaped configuration causing said side portions to tightly grip the sides of said conductor bar sections, and

means for locking said joint cover member to conductor bar sections having a cross-sectional configuration including a pair of circular lobe portions separated by an integral web, said means including

a first pair of inwardly extending bosses formed integral with the inside wall of said member and inclined toward said closed, generally circular end portion,

another boss integral with the inside wall of said cover member,

said another boss and said pair of bosses being so located as to exert opposing forces upon the upper circular lobe portion of said respective conductor bar sections,

means for maintaining said converging ends of the side positions of said joint cover member a predetermined distance apart to avoid interference with the movable collector mechanism of said trolley electrification system, said means comprising

a second pair of inwardly extending bosses formed integral with the inside wall of said member, said bosses being so located as to engage the lower circular lobe portion of said respective conductor bar sections.

5. In a joint assembly for trolley electrification systems including insulated conductor bar sections having a longitudinal axis joined in end-to-end relation, said conductor bars substantially covered with an insulating sheath but having exposed end portions with respective holes therethrough, transverse to said longitudinal axis, the combination comprising

a joint keeper comprising a strip of metal having spaced protuberances inserted into respective holes of the exposed conductor bar end portions,

said joint keeper including an end segment extending beyond one of said protuberances and disposed underneath the insulating sheath of one of said conductor bars temporarily retaining said joint keeper in position,

an elongated joint cover member formed of a resilient insulating material and having a cross-sectional configuration comprising a closed end portion integral with side portions whose ends converge to form a narrow gap substantially smaller than the width of said end portion, said cover mounted on said conductor bar sheath overlying said exposed end sections with said side portions biased against the sides of said sheath, and

said joint cover member including an intermediate inwardly extending projection formed integral with the side portions of said member which engages said conductor bars to fixedly retain said cover and keeper in position.

References Cited by the Examiner

UNITED STATES PATENTS

2,945,081	7/60	Bogese et al.	174—45
2,994,734	8/61	Scofield et al.	174—5 X

FOREIGN PATENTS

859,635	1/61	Great Britain.
886,781	1/62	Great Britain.

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