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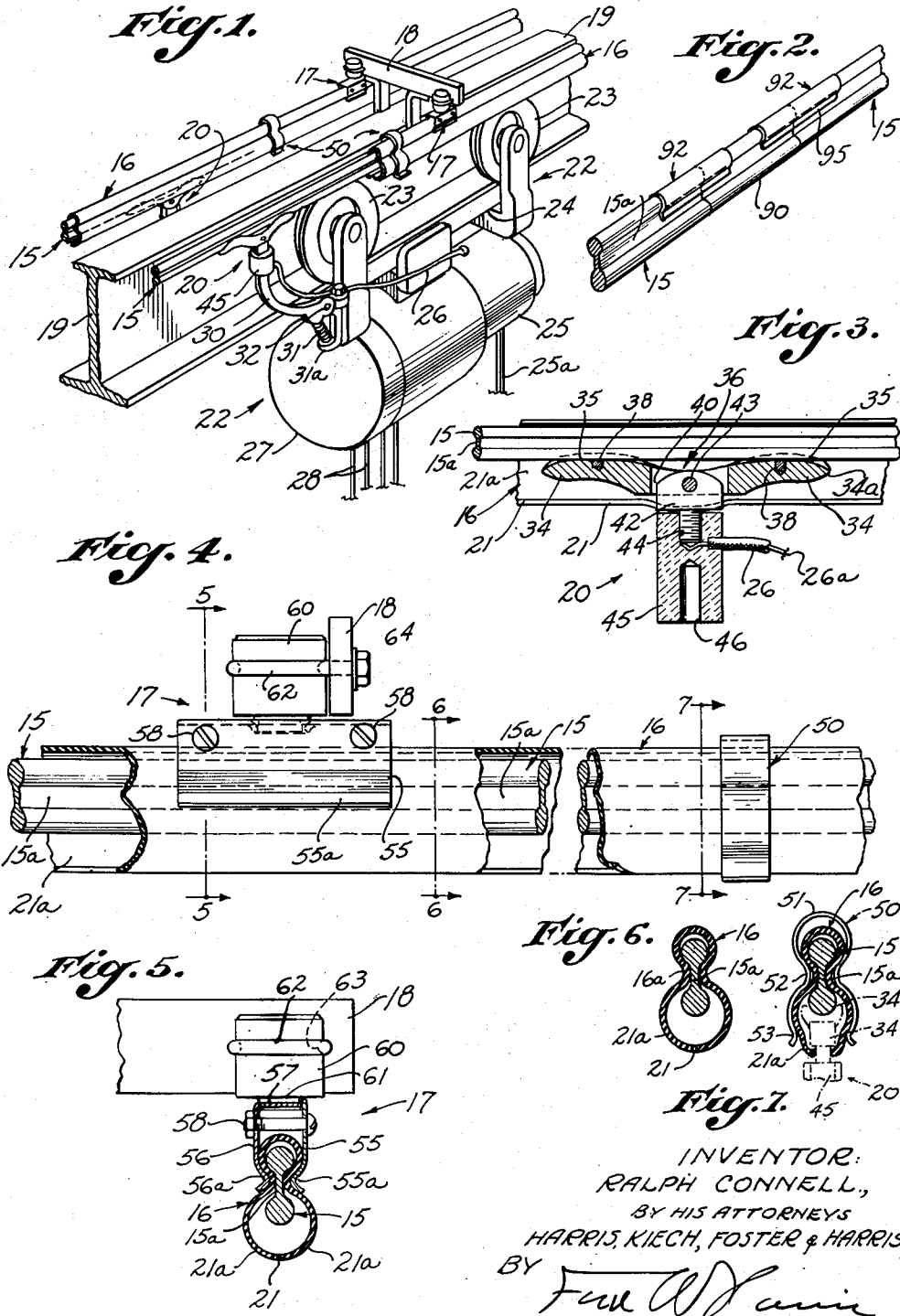
R. CONNELL

2,668,199

CONDUCTOR SYSTEM FOR ELECTRIFIED RAILS

Filed Sept. 2, 1947

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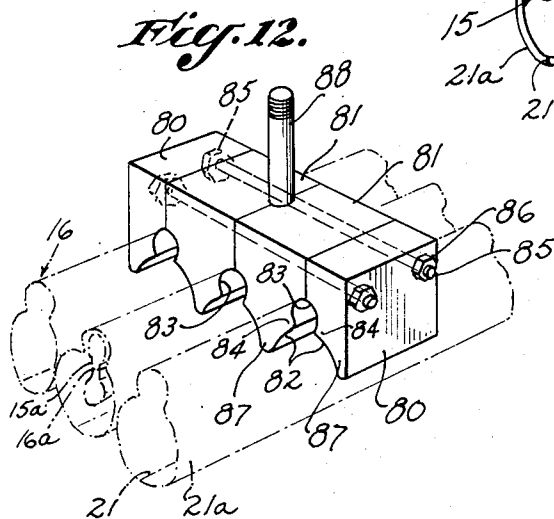
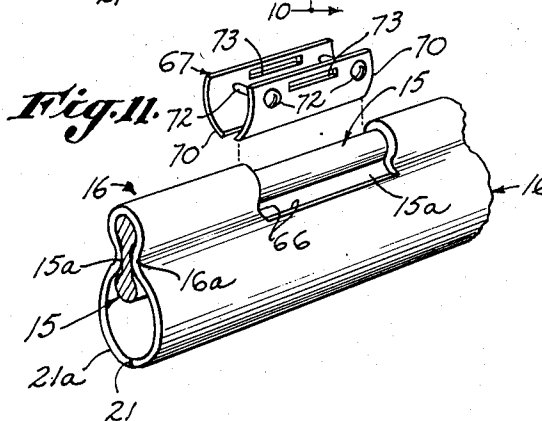
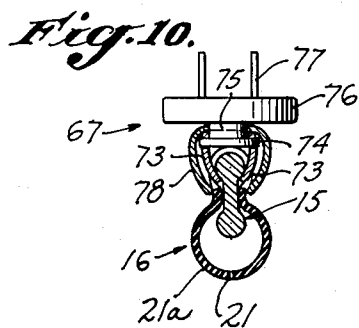
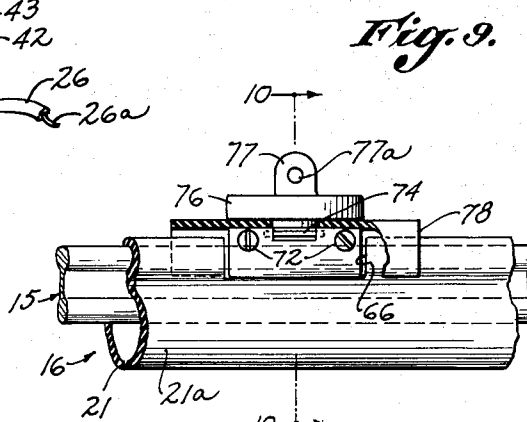
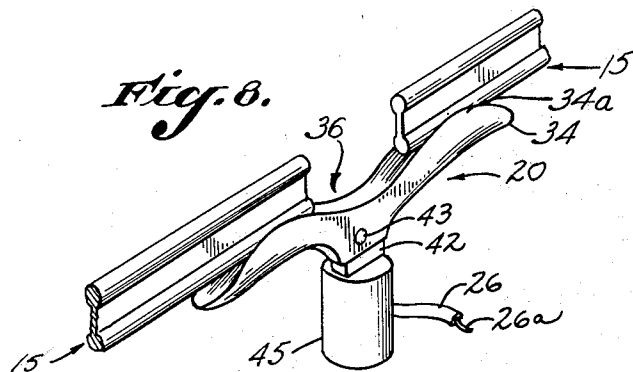
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CONDUCTOR SYSTEM FOR ELECTRIFIED RAILS

Filed Sept. 2, 1947

2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,668,199

CONDUCTOR SYSTEM FOR ELECTRIFIED
RAILS

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Application September 2, 1947, Serial No. 771,738

10 Claims. (Cl. 191—25)

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This invention relates to overhead conveyor systems, and more especially is concerned with means by which the so-called monorail or crane systems are electrified.

In conventional electrified systems employing overhead rails, overhead conductor bars are employed for supplying electric current to hoisting means and the like mounted upon the conveyors being used, and such conductor bars, together with current collecting means, such as rollers and roller-carrying frames are exposed, no protective insulation being employed upon or about them. As a consequence, serious danger lurks in these exposed parts, and they constitute a menace to repair men or other persons who must work near them or who come in contact with them.

The principal object of this invention is, therefore, to provide an overhead monorail or crane system wherein the conductor bars or other kindred means supplying electric current are appropriately insulated in order that workmen may be protected.

Another object of the invention is to provide, in conjunction with insulated conductor bars and the like, current collecting means so constructed that when it is in operative position with respect to a conductor bar it also will be insulated whereby to protect workmen and others.

It is still another object of the invention to provide insulating means which enshrouds conductor bars being employed to transmit electric energy, and which at the same time houses the current collecting means being employed in conjunction therewith.

Another object of the invention is to employ insulating means for such conductor bars which will permit the passage of the current collecting means during ordinary operation of the conveyor system while at the same time housing such current collecting means.

A further object of the invention is to provide insulating means for conductor bars which will entirely enclose the conductor bars when no current collecting means is passing therealong, which will spread to admit the passage of such current collecting means, and will again close completely concealing the bars after the current collecting means has passed during advancement of the conveyor means.

It is an additional object of the invention to provide novel current conducting means for connecting sections of conductor bars, novel clamp means, and novel supporting means for the conductor bars.

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Other objects, and various features of the invention, will become apparent to those skilled in this art upon reference to the following specification and the accompanying drawings wherein certain embodiments of the invention are illustrated for the purpose of exemplification.

In the drawings:

Fig. 1 is a perspective view showing my invention disposed in operative relationship with an overhead or monorail conveyor system;

Fig. 2 is a perspective view showing means for forming appropriate insulated joints in conductor bar sections;

Fig. 3 is a vertical longitudinal section showing an electric current collector of this invention and its relationship to a conductor bar and insulating means therefor in accordance with this invention;

Fig. 4 is a side elevation on an enlarged scale, portions being broken away, and showing the assembled relation of a conductor bar and its insulating shroud, together with means for clamping the shroud in place upon the conductor bar whereby to admit passage of the current collector, means also being shown for supporting the shrouded conductor bar;

Figs. 5, 6, and 7 are vertical cross-sections taken respectively on the lines 5—5, 6—6, and 7—7 of Fig. 4;

Fig. 8 is a perspective view indicating how the current collector of this invention will readily span a gap between adjacent sections of the conductor bar;

Fig. 9 is a side elevation illustrating a modified form of supporting clamp for the conductor bar, portions being broken away to facilitate illustration;

Fig. 10 is a cross section taken on the line 10—10 of Fig. 9;

Fig. 11 is an exploded perspective view which further illustrates the relationship of the clamp of Figs. 9 and 10; and

Fig. 12 is a perspective view of a further modification of clamp which is adapted for supporting a plurality of conductor bars in close parallel relationship.

The construction illustrated in the drawings includes a conventional elongated conductor bar 15 for carrying electric current, this bar being of the conventional so-called figure 8 construction having a connecting web 15a integrally joining the upper and lower lobes of the figure 8 bar. The lobes are approximately circular as illustrated, and the web 15a is relatively thin in order to provide an elongated recession or channel on

each side of the bar 15. Bars of other appropriate or conventional shape also may be used.

Mounted upon the conductor bar 15 so as to cover and enclose the same is an elongated shroud 16 of flexible insulating material, such as rubber. The shroud 16 is roughly also of figure 8 shape, its upper portion being in the form of a lobe shaped to provide an upper elongated channel which receives the upper lobe of the conductor bar 15, intermediate portions of the opposite sides of the shroud 16 being provided with elongated recessions 16a (Fig. 6) to engage the sides of the web 15a of the conductor bar. The lower lobe of the shroud 16 is much enlarged with respect to the lower lobe of the conductor bar 15 so that the corresponding sides of the shroud 16 lie well beyond such lower lobe of the conductor bar 15 for a purpose presently to be described.

The conductor bar 15 and its insulating shroud 16 may be supported in operative position by various appropriate means, one of which, illustrated in Figs. 1, 4, and 5 comprises a suspending and supporting clamp 17 carried upon a projecting portion of overhead bracket means 18 carried by a conventional overhead monorail 19 which may be of I-beam construction as illustrated, or other preferred form. When required, one or more conductor bars 15 may be carried at each side of the monorail 19 through the medium of clamps 17 disposed at both ends of the bracket means 18.

The under edge of the lower lobe of the conductor bar 15 is adapted to be slidably engaged by an elongated current collecting shoe 20 which thus constitutes a current collector to gather electric energy for actuation of hoisting means or the like carried by the monorail 19. The shoe 20 is adapted to be inserted into the bottom of the shroud 16, and to move along the conductor bar 15 while being housed within the shroud 16. This is accomplished by providing a continuous slit 21 in the lowermost portion of the shroud 16, that is, in the lowest part of the larger lobe lying around and below the lower lobe of the conductor bar 15. Thus, the lower lobe of the shroud 16 is in the form of two separable sides 21a (Figs. 5 and 6) which, due to the flexible and resilient character of the rubber or similar material of which the shroud 16 is composed, are adapted to close against each other at the slit 21 as seen in Figs. 5 and 6, or to be spread by the shoe 20, as seen in Fig. 7, so that the shoe 20 may enter the shroud 16 to engage the conductor bar 15 and to pass therealong.

The shoe is carried by an overhead truck or trolley of a crane or monorail construction which is supported as shown by wheels 23 travelling upon the lower flanges of the I-beam type track or rail 19 and supporting the framework 24 of a trolley or crane which in turn supports an electric motor 25 which is energized by electric current collected by the shoe 20 and fed to the motor 25 by an electric conduit 26. The electric motor, which may be controlled in any approved manner such as by a switch on a drop cord 25a, actuates a hoist drum 27 carrying hoisting cables 28, or the like. A portion of the framework 24 has mounted thereupon a supporting arm 30 which carries the shoe 20 at its upper end. The arm 30 may be mounted in a conventional manner in which case it is urged upward to maintain the shoe 20 in contact with the conductor bar 15 through the medium of a spring 31 whose lower end is rested upon an appropriate bracket 31a on

the framework 24, an adjacent portion of the arm 30 being mounted upon a pivot 32 also carried by the framework 24.

The collector shoe 20 is elongated, as best seen in Fig. 3, and has two end portions 34 which are upwardly arched to provide corresponding engaging arms to contact the conductor bar 15 at spaced contact points 35. The spacing of the contact points 35 is effected by depressing the intermediate portion of the shoe 20 lying between the end portions 34 so as to provide a separating space 36 throughout which no contact occurs between the shoe 20 and the conductor bar 15. As also indicated, the extremities of the end portions 34 are downwardly turned whereby to provide an efficient sliding contact, even in the event that the lower edge of the conductor bar 15 presents irregularities, such as due to minor misalignment or slight spacing between the ends of the adjacent sections of the conductor bar. For the purpose of further facilitating good sliding contact on the shoe 20 with the conductor bar 15, the longitudinally arched end portions 34 are at the same time transversely concaved so as to provide upstanding longitudinally extending lips 34a which also are upwardly arched, as seen in dotted lines in Fig. 3, and thus serve as guides.

In order that good sliding movement of the shoe 20, which in effect serves as a trolley shoe, may be assured, lubricating inserts 38 are set in the inward portions of the end portions 34 of the shoe 20, the tops of these inserts extending into sliding engagement with the under edge of the conductor bar 15. These inserts 38 may be of any appropriate known form of lubricating inserts including graphited bodies.

For the purpose of properly mounting the shoe 20 upon the upper end of its supporting arm 30, the middle portion of the shoe 20 is provided with an opening 40 elongated in the direction of the length of the shoe and this opening receives a metal stud 42 which is flat transversely of the shoe 20, the stud 42 being mounted upon a metal pin 43 having its ends fixed in the side walls of the opening 40 of the shoe 20, which also is of metal, these metal parts being good conductors of electricity. The lower portion of the flat stud 42 lies below the body of the shoe 20 in such position that it is slidably engaged by the edges of the lower side portions 21a of the shroud 16 adjacent the slit 21. The advancing ends of the stud 42 may be tapered or beveled to facilitate their advance along the slit. The lower end of the stud 42 is provided with a threaded extension 44 adapted to be received in a correspondingly threaded opening in the upper end of an insulation block 45 having an appropriate bore 46 provided in its lower end to receive a corresponding supporting pin or the like positioned upon the upper end of the shoe supporting arm 30. As indicated in Fig. 3, one end of the conduit 26 is inserted into a corresponding seat in the upper end of the insulating block 45, and the conductor wire 26a of such conduit 26 is passed into the bottom of the opening receiving the threaded extension 44, the end of the wire 26a being bound thereby in position and in electrical contact with the lower extremity of the extension 44. By these means the shoe 20 is properly carried upon the upper end of its supporting arm 30, and appropriate electrical connection is made between the shoe 20 and the motor 25. Thus, as the truck 22 is moved along the monorail 19, electrical energy is appropriately and continuously

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supplied from the conductor bar 15 to the motor 25 for actuation of the hoisting mechanism, 27, 28, or other crane apparatus to be operated.

In order that the insulating shroud 16 may be properly bound to the conductor bar 15 at suitable intervals between the supporting clamps 17, and also in order that the lower edges of the shroud 16 adjacent the split 21 may be positively closed after the shoe 20 and its stud 42 have passed any given point, a plurality of spring clips 50 is employed. Each clip 50 is a strip of spring metal formed to have in general a U-shape, the middle thereof providing a bight 51 of roughly circular formation, the opposite legs being contracted as illustrated to form recessions 52 corresponding with the recessions 15a of the shroud 16 and serving to bind the recessions 15a against the web 15a of the conductor bar 15, as best illustrated in Fig. 7. Preferably, the bight 51 loosely engages around the upper lobe of the shroud 16 approximately as illustrated, but it may hug such upper lobe when found desirable. The lower portions of each clip 50 are flared outward from the recessions 52 on its opposite sides to accommodate, in general, the lower portions 21a of the shroud lying at opposite sides of the slit 21. With this construction, as the shoe 20 passes through the slit 21 adjacent each clip 50, the lower portions of the two legs expand as the side portions 21a of the shroud 16 expand, whereby to pass the shoe 20. The tips at the lower extremities of the legs of the clips 50 are curved outwardly as indicated to provide suitably rounded bearing terminals 53 against which the lowermost edge portions of the shroud 16 are forced by passage of the stud 42 as the shoe 20 progresses along the bar 15.

The form of suspending and supporting clamp 17 illustrated in Figs. 1, 4, and 5 comprises a pair of spaced clamping jaws 55 and 56 adapted to be disposed at opposite sides of the conductor bar 15 and the shroud 16. The lower ends of the jaws 55 and 56 are directed inward toward each other, their tips being directed then outward to provide rounded recessions 55a and 56a, respectively, such recessions being adapted to engage in the recessions 15a of the shroud 16 opposite the web 15a of the conductor bar 15. The jaw 56 is shown as having an integrally formed laterally directed spacer arm 57 which engages the jaw 55 near its top. Bolts 58 passing through the two jaws 55 and 56 serve to bind the end of the arm 57 against the upper portion of the jaw 55 and also to bind the recessions 55a and 56a in the operative position illustrated in Fig. 5. For the purpose of suspension of the clamp 17 from the bracket means 18, the spacer arm 57 has secured thereto a block 60, as through the medium of an intervening neck 61 attached to the spacer arm 57 in any appropriate manner, and a U-bolt 62 seated in a corresponding annular groove 63 in the block 60 serves to bind the block to the bracket means 18, the legs of the U-bolt 62 passing through the bracket means 18 and receiving clamping nuts 64 on their ends as illustrated in Fig. 4.

Where it is not desired to risk deformation and damage of the shroud 16 which might result from the employment of the clamp 17, other clamping means may be employed. Thus, as illustrated in Figs. 9, 10, and 11, an opening 66 is formed in a corresponding upper portion of the shroud 16 to expose a portion of the upper lobe of the conductor bar 15 and an upper portion of the web 15a thereof, whereby to receive a clamp 67 to be bound directly upon the bar 15. This

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clamp 67 includes two opposed clamp jaws 70 bound upon the upper portion of the bar 15 by a pair of screws or bolts 72. The upper middle portion of each jaw 70 is provided with an elongated slot 73, the slots 73 receiving opposite portions of an annular head 74 provided upon the lower end of a neck 75 embedded in or integral with a disk 76 from which appropriate upstanding attachment ears 77 extend. Preferably, the disk 76 and its neck 75, as well as the annular head 74, are of insulating material such as fiber. The attachment ears 77 are adapted to be bound to the bracket means 18 as required, for example, by a bolt received in openings 77a in the ears 77.

In order to provide proper insulation for the clamping jaws 70, especially where the latter are metallic and become electrified, an insulating hood 78 is employed to enclose the clamp jaws 70 and the opening 66 in the shroud 16. As illustrated, this hood 78, which constitutes an auxiliary shroud, is long enough and wide enough to completely hide the electrified portions of the clamp, and it is so molded and shaped from rubber or other insulating material as to assume the operative relationship indicated in Fig. 10. It is held by being fitted around the neck 75 above the annular head 74, and when formed of soft rubber it may be easily installed by being stretched over the head 74.

Where the form of clamp employed in Figs. 9, 10 and 11 is used, a series of spring clips 50 is resorted to as the only means to maintain the shroud 16 in position upon the conductor bar 15, as illustrated in Figs. 1 and 4.

It is sometimes necessary to position a plurality of conductor bars 15 and their shrouds 16 in a close parallel relationship such as illustrated in Fig. 12. For this purpose a multiple type of clamp is employed. This comprises end clamp blocks 80 and intermediate clamp blocks 81. Each of these blocks has a flared, outwardly curved surface 82 adapted to extend longitudinally of the respective shroud 16 and to depend at the sides of the lower portion of the respective shroud 16. Each block 80 and 81 also has an upper curved portion 83 formed on a smaller radius than the respective curved portion 82 whereby to engage over the upper curved lobe portion of each shroud 16 and corresponding upper lobe portion of the contained conductor bar 15. To effect the required clamping engagement, an inwardly directed rib 84 is provided on each block between the curved portions 82 and 83, so that opposing ribs 84 of adjacent blocks 80 and 81 engage in the recessions 16a of the respective shroud 16 and press them against the adjacent web portion 15a of the conductor bar 15. The blocks 80 and 81 are bound in clamping position to hold the conductor bars 15 and their shrouds 16 by means of long bolts 85 extending through the series and secured by means of nuts 86. The depending portions 87 of the blocks 80 and 81 are sufficiently flared to permit ready expansion of the side portions 21a adjacent the slit 21 in the respective shroud 16 as the collector shoe 20 slides through the lower portion of the respective shroud 16 in contact with the under edge of the respective conductor bar 15. For the purpose of suspension of this form of clamp, any form of support may be used such as an upstanding screw or bolt 88 bound between the middle blocks 81 through the action of the bolts 85 and their nuts 86.

The functioning of this apparatus has been in general described in conjunction with the explanation of its construction. Briefly, as an

overhead trolley or truck 22 or other crane or monorail device is moved in either direction along the rail 19, the collector shoe 20 slides along the underside of the connector bar 15, in each instance, and occupies the space formed within the lower side portions of the shroud 16 as indicated in Fig. 7. The edges of such portions provided by the slit 21 thus expand and slide along the lower side portions of the stud 42 which supports the shoe 20, such edges lying just above the insulation block 45 whereby to enclose all metallic parts of the collecting shoe structure. Thus, transmission of electric current through the electric motor 25 is readily effected without exposure of any of the electrified metallic parts, the conductor bar 15 and its shroud 16 being supported in each instance by the overhead bracket means 18 through the medium of the clamp 17 of Fig. 1, or the clamp 67 of Fig. 11, or the clamp means of Fig. 12.

In view of the upwardly arched configuration of the portions 34 of the collector shoe 20, as seen in Fig. 3, together with the spacing of these portions and the concave cross-sectional construction as seen in Fig. 7, the shoe 20 readily slides along the under side of the conductor bar 15 passing from section to section thereof, even though adjacent end portions of the sections of the conductor bar may be somewhat misaligned. Also, ready passage from one section to another, as indicated in Fig. 8, will be assured even though the ends of the adjacent sections be somewhat spaced. Automatic lubrication is effected by means of the lubricating inserts 38 shown in Fig. 3. Where it is desired to avoid actual spacing as indicated in Fig. 8, and in those instances where direct contact of adjacent sections of the conductor bar 15 is not desired, a section of insulation 90 may be employed as shown in Fig. 2, the cross section of this element corresponding with the cross section of the conductor bar 15. In order that the insulation 90 may be properly retained, spring clamps 92 are employed to bridge each joint. These clamps have the cross-sectional outline of half of a figure 8, thereby providing an upper lobe portion 94 to fit over the upper lobe of the conductor bar 15 and depending inset portions 95 which engage the opposite upper portions of the web 15a of the conductor bar 15 in firm clamping relationship. When desired, such spring clamps 92 may be also employed to join abutting ends of the adjacent sections of the conductor bar 15.

Other modifications of the generic invention herein disclosed will no doubt occur to those skilled in the art, and it is therefore intended to protect all modifications which fall within the scope of the claims.

I claim as my invention:

1. In combination in an overhead electrified system: a conductor bar having a cross section approximating a figure 8 shape; and a split integral insulating shroud completely enclosing and fully insulating said bar circumferentially and having a channel fitting over and retained on one lobe of said figure 8, the lower portion of said shroud being split and depending below and spaced from the other lobe of said figure to form at the sides of said other lobe and below it a channel for reception of a current collector movable therethrough and through the split and along said other lobe, said shroud being normally closed at the line of split, said shroud being flexible and yieldable to expand to pass said collector

and to contract to close at the line of split after said collector has passed therebeyond.

2. A combination as in claim 1 including a collector shoe for engagement with said other lobe of said conductor bar, said shoe having upstanding side portions to lie at the sides of said other lobe and occupy the spaces of said channel provided at said sides of said other lobe by said spacing of said side portions of said shroud from said sides of said other lobe.

3. A combination as in claim 1 including means for binding said shroud in fitted relation upon said bar and having yielding portions depending outside lower portions of said shroud to close the latter yieldingly at said line of split.

4. A combination as in claim 1 including clamp means disposed about the channel portion of said shroud fitting over said one lobe and binding said shroud upon said one lobe of said conductor bar.

5. In combination in an overhead electrified system: a conductor bar having a cross section approximating a figure 8 shape; a split integral insulating shroud completely enclosing and fully insulating said bar circumferentially and having a channel fitting over and retained on one lobe of said figure 8, the lower portion of said shroud being split and depending below and spaced from the other lobe of said figure to form a channel for reception of a current collector movable therethrough and through the split and along said other lobe, said shroud being normally closed at the line of split, said shroud being flexible and yieldable to expand to pass said collector and to contract to close at the line of split in the absence of said collector; and means about said shroud at a plurality of positions and binding said shroud in fitted relation upon said bar, said means having yielding portions depending outside said lower portions of said shroud for positively closing said lower portions of said shroud at said line of split.

6. In combination in an electrified overhead rail system: a conductor bar; an insulating shroud covering said bar and split along its length; and a current collector shoe movable along said bar and adapted to be received within and insulated by said shroud and to be moved between the portions of said shroud along the line of split, said shroud depending below and enclosing said bar and shoe, and said shoe having an insulating attachment on the lower side thereof and projecting below said shroud, said attachment having means for connection to a supporting carrier and having means for receiving an electric conduit.

7. In combination in an electrified rail system: a conductor bar formed of elongated supported sections disposed in end-to-end relationship; and an elongated collector shoe having spaced bar-engaging portions slidable along said bar and adapted to span a space between adjacent ends of said sections whereby continuously to receive electric current from said bar, each bar-engaging portion having upstanding side portions providing a channel to receive said conductor bar, said shoe having shoe-supporting means positioned midway between said bar-engaging portions on the side of the shoe opposite from said channels.

8. In combination in an overhead electrified rail system: a conductor bar provided with an upper portion and a lower portion connected by an intermediate portion of thickness less than said upper portion, said lower portion being adapted to be engaged by a movable collector shoe; an integral insulating flexible shroud com-

pletely enclosing said conductor bar and having an upper portion generally corresponding in cross section with the cross section of the upper portion of said conductor bar and said intermediate portion, said shroud having integral lower side portions spaced from the sides of said lower portion of said bar and depending below said lower portion of said bar and providing a channel around said lower portion of said bar and within the shroud for passage of said shoe, the lowest parts of said shroud side portions being divided by a split and being normally in contact with each other at said split but adapted to yield to pass a member carrying said shoe; yielding clamp means disposed about the upper portion of said shroud and binding said upper portion of said shroud against the upper portion of said conductor bar, said yielding clamp means having depending yielding side portions engaging said lower portions of said shroud to yield to pass a current collector moving through said split and to return said shroud side portions to close said split upon passage of said collector; and supporting clamp means disposed about said upper portion of said shroud and binding the latter against said intermediate portion of said bar and adapted to support said bar.

9. A combination as in claim 8 wherein said shroud is formed of resilient rubber.

10. In a collector device for an electrified rail system which includes a flexible insulating shroud enclosing a conductor bar structure to be engaged by a sliding collector shoe and comprising abutting bar portions forming joints, the shroud being split to provide engaging edge por-

tions yieldable to pass said shoe: an elongated collector shoe having spaced bar-engaging portions to engage simultaneously bar portions at opposite sides of a joint, the bar-engaging portions of said shoe being concaved transversely to form upstanding side portions providing channels accommodating said conductor bar structure, said side portions being cut away between said bar-engaging portions to clear a joint when in position intermediate such spaced bar-engaging portions; and an insulating attachment connected to the middle of said shoe opposite said upstanding side portions and between said bar-engaging portions and projecting from said shoe, said attachment having means for mounting the shoe on a supporting carrier and means for receiving an electric conduit.

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