June 24, 1941. L. G. WALTERS 2,246,557

BUS CONNECTOR

Filed Feb. 18, 1939 4 Sheets-Sheet 1

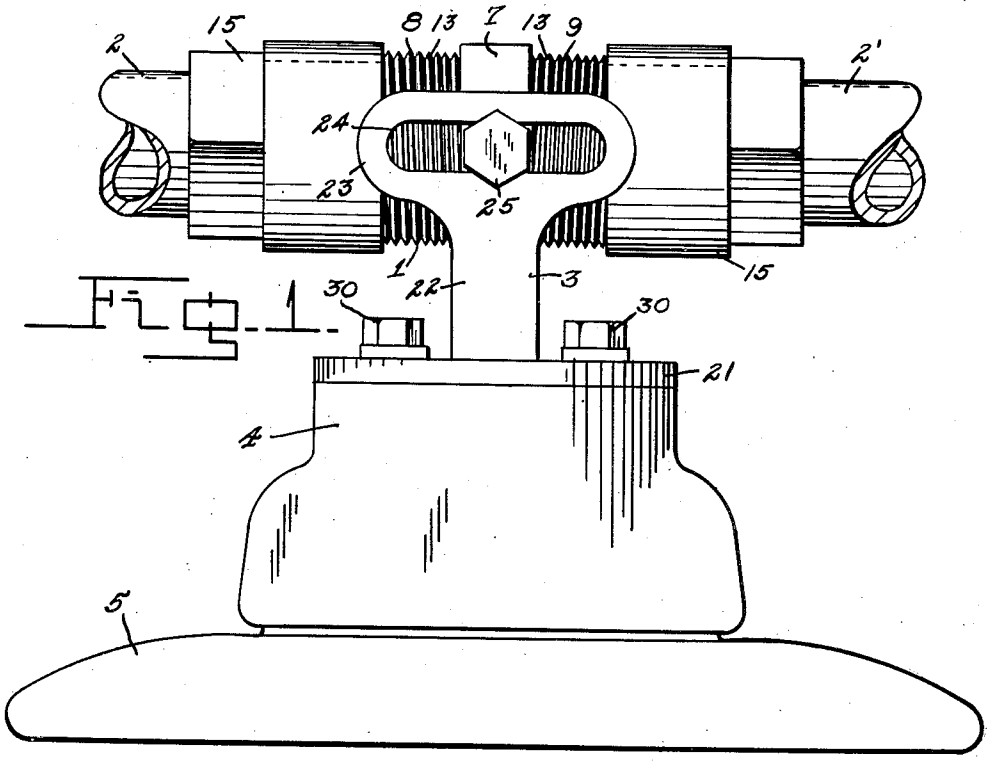


Fig. 1

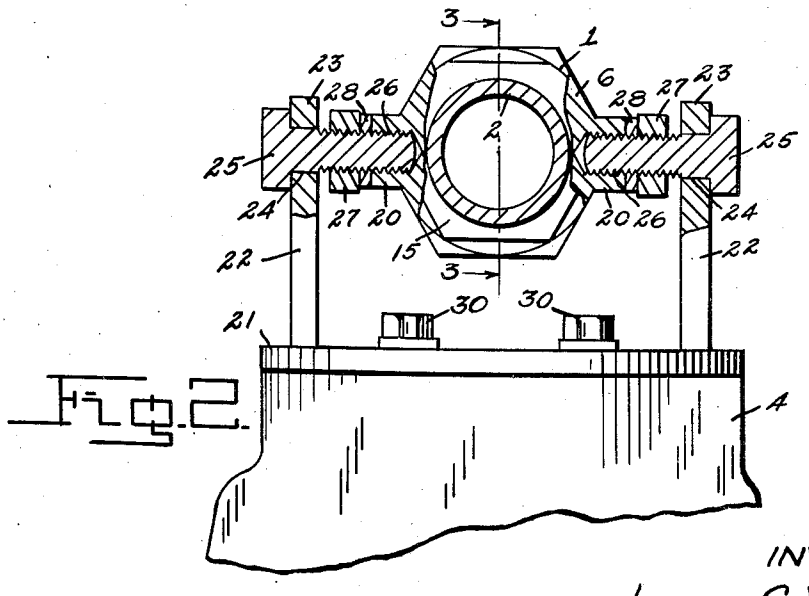


Fig. 2

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BUS CONNECTOR

Filed Feb. 18, 1939 4 Sheets-Sheet 2

Fig. 3.

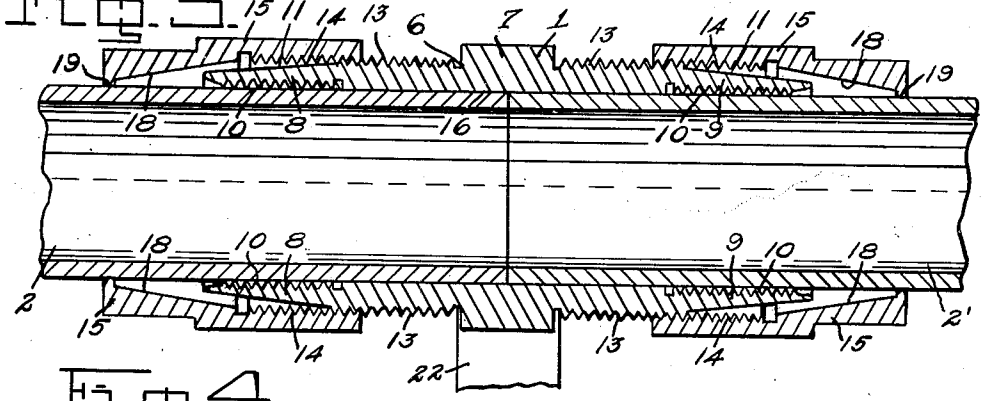


Fig. 4.

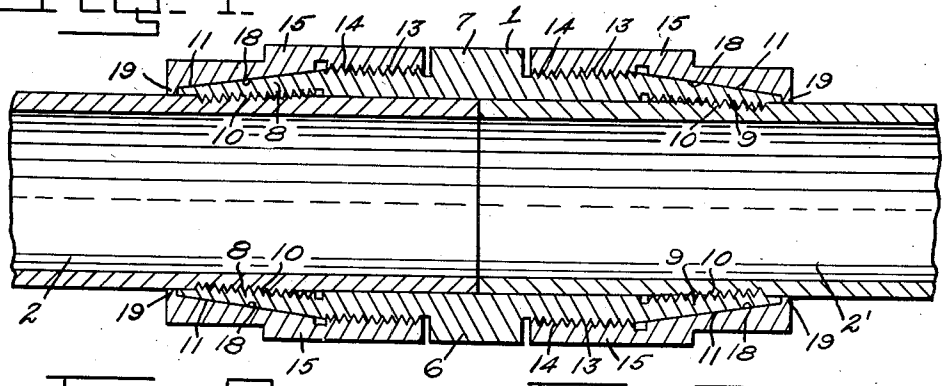


Fig. 5.

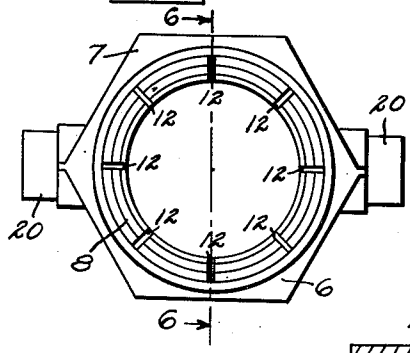


Fig. 6.

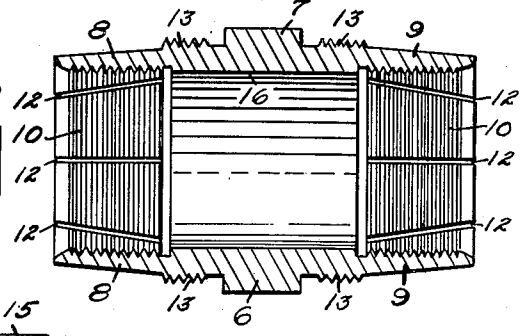
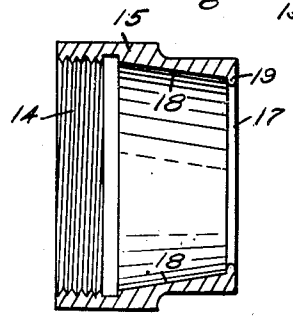


Fig. 7.

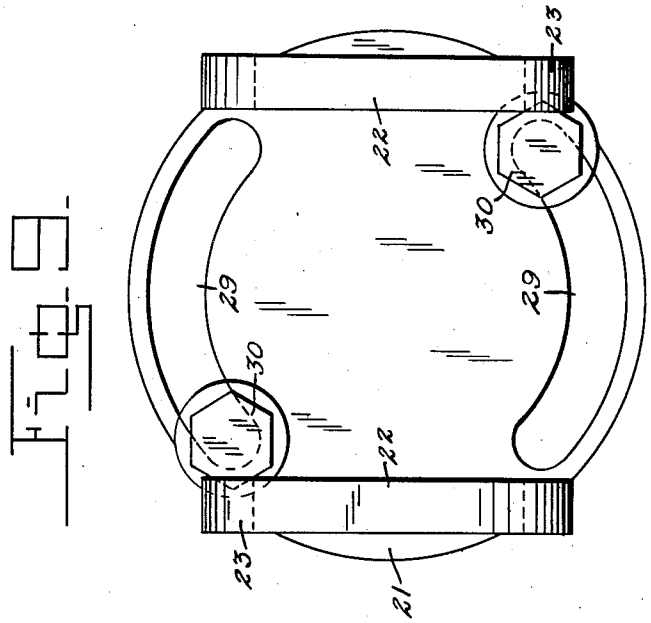


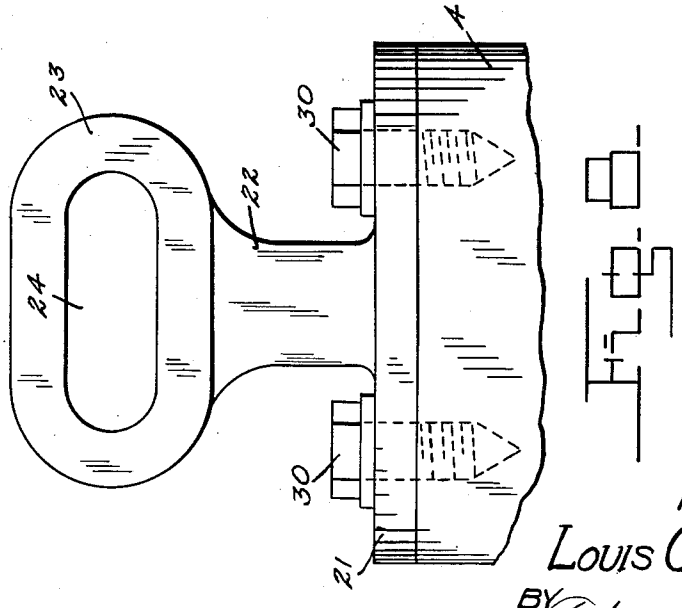
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BUS CONNECTOR

Filed Feb. 18, 1939 4 Sheets-Sheet 3





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BUS CONNECTOR

Filed Feb. 18, 1939 4 Sheets-Sheet 4

Fig. 10.

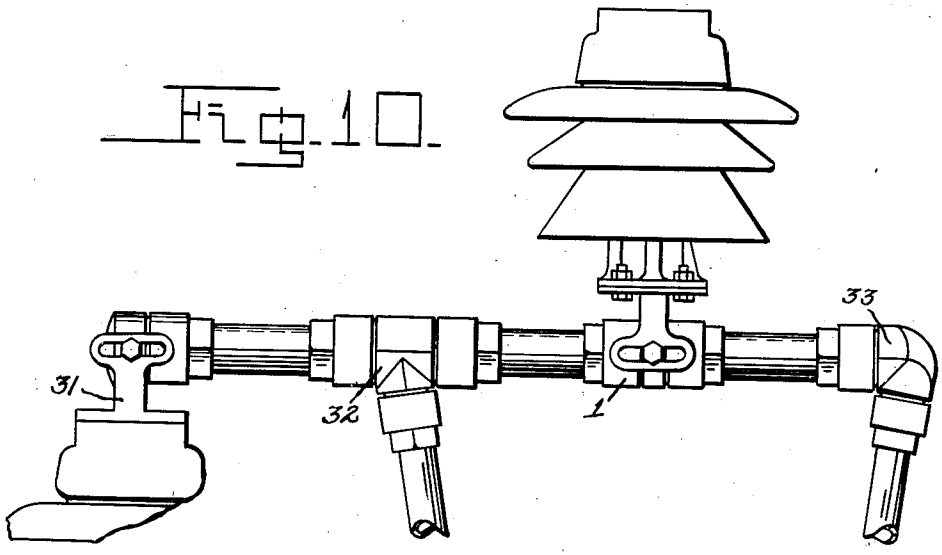
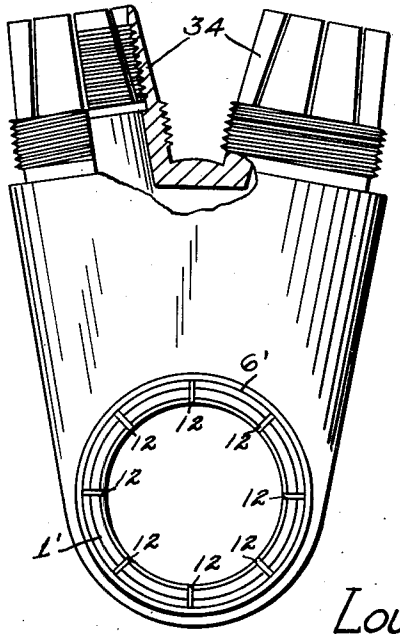


Fig. 11.



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UNITED STATES PATENT OFFICE

2,246,557

BUS CONNECTOR

Louis G. Walters, Portland, Oreg.

Application February 18, 1939, Serial No. 257,055

6 Claims. (Cl. 285—123)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

This invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates to connecting devices, particularly devices of this character for joining together electrical conductors, conduits and the like.

Some of the objects of the invention are to provide a connecting device which will enable good and secure electrical and mechanical connections to be made between conductors forming parts of an electrical circuit; which provides a low resistance electrical contact between the conductors and forms a moisture and dirt proof seal at the joint or connection and minimizes corona discharge and radio interference.

Another object of the invention is to provide in combination a support and a connector for electrical conductors pivotally mounted on the support in such a manner that the connected conductors may expand without injury, permits lateral alignment of the conductors and allows the connector to be moved in elevation, the said support being adapted to be mounted rotatably on an insulator for moving the connector in azimuth.

Another object of the invention is to provide a connector for electrical conductors which is simple in construction, easy to apply and remove from the conductors, inexpensive to manufacture and which is not liable to come loose from the conductors under vibration and repeated cycles of temperature change.

The conventional type of bus connectors at present in use depend upon bolts or split tapered threaded sleeves, drawn tight by means of compression nuts, to secure an electrical contact between busses and the clamping action of the connector is obtained by compressing split threaded portions of the sleeves and to relieve the tightness in the inner engaged sleeve and nut threads, smooth tapered surfaces are employed which are similar and conform to each other, and no means are provided for mounting the connector on a support so as to allow the connected conductors to be moved in elevation, or to expand, or to permit lateral alignment of the conductors, nor is the support for the connectors adapted to be rotated for changing the direction in azimuth of the connector as proposed by this invention.

It is therefore the aim and purpose of this invention to provide a connector for electrical conductors which forms a high pressure, low resistance electrical contact by causing serrations or teeth provided on a body of the connector to bite into the conductors when a tapered surface on the body member of the connector and a tapered surface on compression nuts coact as the nuts are screwed on the connector body, the said tapered surfaces of the body member and nuts extending at different angles; to so mount the connector on a support as to permit it to be moved in elevation; to permit the conductors to expand without injury and to remedy any lateral misalignment of the conductors, also to mount the support on an insulator or the like in such a manner that the support may be rotated for changing the direction in azimuth of the connector.

With the above and other objects and advantages in view, the invention consists of certain features of construction and operation of parts which will hereinafter appear and in which—

Fig. 1 is a side elevation of the connector and support mounted on an insulator;

Fig. 2 is an end view thereof, partly in section with a part of the insulator broken away;

Fig. 3 is a longitudinal sectional view taken on the line 3—3 of Fig. 2, showing the connector in an untightened condition.

Fig. 4 is a longitudinal sectional view thereof showing the connector tightened on the conductors, conduits or the like;

Fig. 5 is an end view of the body member of the connector;

Fig. 6 is a longitudinal sectional view thereof taken on the line 6—6 of Fig. 5;

Fig. 7 is a longitudinal sectional view of a coupler nut used in carrying out the invention;

Fig. 8 is a side elevation of the support mounted on an insulator, with parts of the insulator broken away;

Fig. 9 is a top plan view of the support;

Fig. 10 is a plan view of a part of a conductor system embodying various forms of the invention; and

Fig. 11 is an end view partly in section of a combined V-shaped connector and straight connector embodying the invention.

In the illustrated embodiment characterizing the invention, 1 indicates generally the improved bus connector shown in Fig. 1 for joining the ends 2 and 2' of two conductors together, which in the present illustration are shown as being tubular, but any other conduit, rod, wire or cable may be joined together by the connector.

The connector 1 is pivotally and adjustably mounted on a supporting member 3 which is in turn adjustably mounted on an insulating cap 4

of an insulator including a lower end member 5, the said insulator being of the type employed in securing high voltage conductors or lines to poles, cross arms and towers, or other places where the connector is exposed to considerable mechanical strain. The supporting member 3 constitutes one end section and the insulator constitutes another end section of a complete supporting unit for the connector.

Referring more particularly to Figs. 3 to 7 inclusive, the improved connector 1 comprises a sleeve 6, containing a central flange or main body portion 7 having opposite end portions 8 and 9, each internally provided with annular sharp serrations or teeth 10 and with an external tapered surface 11. In order that the end portions 8 and 9 of the sleeve 6 may yield and be gradually contracted until the ends are forced into engagement with the ends 2 and 2' of the conductors, there is provided a series of longitudinal slots 12 on each of the end portions 8 and 9 which permit the ends to be compressed or contracted within their elastic limits and to expand to their original form when the pressure is released. The sleeve 6 is screw-threaded on a straight cylindrical external surface thereof, as shown at 13, and these threads 13 are designed to cooperate with threads 14 provided internally in one end of a coupling nut 15, carried at each end of the sleeve. The inner surface 16 of the sleeve 6 is smooth and extends to adjacent the opposite inner ends of the expansible end portions 8 and 9 of the sleeve. The inner diameter of the end portions 8 and of the sleeve being the same as the smooth inner surface 16 thereof.

Each coupler nut 15 is formed with an opening 17 and with an internal tapered surface 18 which extend from a flange 19 on the ends of the coupler nuts adjacent the opening 17 to closely adjacent the internal threads 14 of the coupler nut. The two cooperating tapers 11 and 18 of the sleeve and nuts respectively, increase in size from the outer ends thereof but are not the same, as the taper 18 of the coupling nuts is tapered to a slightly different or greater angle from the taper 11 provided on the outer surface of the expansible and contractible ends 8 and 9 of the sleeve. In this case the smaller end of the nuts 15 containing the opening 17 is called the outer end of the nuts which means that the ends of the nuts containing the internal threads 14 are the inner ends of the nuts.

With the parts of the connector 1 in position, as shown in Fig. 3, the ends 2 and 2' of the conductors are inserted in opposite directions in the opening 17 of the coupler nuts 15 and into the sleeve 6, the coupler nuts 15 being screwed outwardly on the external threads 13 of the sleeve so as to leave the slotted ends 8 and 9 of the sleeve in expanded condition. With the parts in this position the coupler nuts are turned to screw them inward on the slotted ends 8 and 9 of the sleeve. Having started the internal threads 14 of the nuts 15 onto the external threads 13 of the sleeve, it follows that the tapered surface 18 of the coupler nuts and the tapered surface 11 of the sleeve are brought together whereby as the coupler nuts advance along the sleeve threads 13 the tapered surface 18 of the nuts coacting with the surface 11 of the sleeve results in a wedging action which causes the outer ends 8 and 9 of the sleeve to gradually collapse or contract by reason of the slots 12 formed therein as the coupling nuts screw toward the center of the body portion 7 of the sleeve. Since the internal surface 18 of the coupling nuts is tapered at greater of an angle than the tapered surface 11 on the sleeve it follows that the collapsing action of the sleeve ends 8 and 9 brings together the annular serrations or teeth 10 of the sleeve which gradually diminish the difference in the angular relation of the tapered surfaces 11 and 18 with the result that the tapered surfaces 11 and 18 coact and wedge one against the other causing the sleeve ends 8 and 9 to collapse, thereby reducing their diameter and tending to close the slots 12 of the sleeve ends. In this way the ends 8 and 9 of the sleeve close upon the conductors or the like received therein, the flange 19 on the outer ends of the sleeves preventing the nuts from being screwed on the sleeve beyond the limits of their threaded travel. By the time the coupling nuts reach the ends of their threaded travel the serrations or teeth 10 on the sleeve ends attain full contact throughout with the conductor ends. A maximum gripping and seating action is therefore attained between the sleeve 6 and the conductors which positively hold the conductors in the bus connector 1. In order to withdraw the conductors their entire end portions 2 and 2' would have to be stripped through the serrations 10 of the sleeve.

The connector 1 is mounted on the supporting member 3 by means of trunnions 20 which extend from diametrically opposite sides of the sleeve 6 of the connector. The supporting member 3 is in the form of a yoke or forked U-shaped member comprising a base plate 21 having vertically extending side portions 22, which terminate at their upper ends in mutilated eyes 23 having elongated slots 24 provided therein through each of which a bolt 25 is adapted to pass, said bolt being threaded into a socket 26 provided in each of the trunnions 20. A lock nut 27 and washer 28 may be provided on each of the bolts 25 in locking the bolts in position and preventing inadvertent loosening thereof. By this construction the connector 1 may be laterally adjusted as desired for placing the connecting conductors in alignment by loosening up on one end of the bolts and tightening the other, also the connector may be moved horizontally in one direction or the other to engage the conductor ends within the limits of the slots 24 of the support and by its pivoted connection the connector may be turned in elevation for engaging conductors extending to the connector from different elevations.

The base plate 21 of the supporting member 3 is provided with arcuate slots 29, as illustrated in Fig. 9, through each of which a bolt 30 is adapted to pass, said bolts 26 being threaded into the upper surface of the insulating cap 4. By this construction the supporting member 3 may be rotated as desired within the limits of the arcuate slots 29, thus carrying the connector with it, whereby the connector may be moved to engage conductors regardless of which direction they may extend. After the supporting member 3 has been adjustably rotated as desired, it is clamped in place by the bolts 30.

The bus connector 1 may take various forms for adapting it to use with any size, number or type of conductors, tubing, pipe, rod, wire or cable in any combination, as illustrated in Figs. 10 and 11.

Referring to Fig. 10, there is illustrated different forms which the connectors may take, wherein 31 indicates generally a connector and support applied to the end of a conductor; 32 a T-connector for joining three conductors together, the

conductors being of a different size; 1 the improved connector mounted on a suspension support and 33 an elbow type of connector.

In Fig. 11 is illustrated the combination of a V-shaped connector 34 and a horizontally extending connector 1' embodying the invention, the said V-shaped connector 34 being made integral with the sleeve 6' of the connector 1', and extending at right angles thereto. The V-shaped connector 34 may be used for tapping various size conductors extending from different directions onto other conductors which are joined by the connector 1'.

It will thus be seen that there is provided a highly novel and useful form of bus connector and support which are well adapted for all the purposes indicated. Even though there has been herein described certain features of construction and operation of parts, it is nevertheless to be understood that various changes may be made therein without departing from the spirit or scope of the invention.

Having described my invention, what I claim as new and wish to secure by Letters Patent is:

1. In combination, a support including side portions, a connector for electrical conductors, means for mounting said connector on the support, said means including trunnions on said connector, an elongated slot provided in each of the sides of said support, a bolt extending through each of the slots in the side portions of the support, each of said bolts adapted to engage threadably a trunnion on said connector to thereby hold the connector in a position adjustable radially, longitudinally and in elevation with respect to said support and a holding device on each of said bolts.

2. In combination, a support comprising end sections, one of said end sections comprising a supporting member including side portions and a base plate, a connector for electrical conductors, means for mounting said connector on said supporting member and additional means for mounting said supporting member on another of said end sections of said support, said first mentioned means including trunnions on said connector, an elongated slot in each of the side portions of said supporting member, a bolt extending through each of said slots and adapted to engage threadably a trunnion on the connector to thereby hold said connector in a position adjustable radially, longitudinally and in elevation with respect to said support, a holding device on each of the bolts and said second mentioned means including arcuate slots and a bolt extending through each of the arcuate slots into said second mentioned end section of said support and adapted to thereby hold the supporting member of the first mentioned end section of said support on the said second mentioned end section of said support in a position adjustable rotatably within the limits of the arcuate slots of said supporting member whereby the connector may be turned in azimuth with the supporting member of the first mentioned end section of said support.

3. In a connecting device for electrical conductors, the combination a conductor, a sleeve surrounding the conductor, said sleeve having an externally threaded portion and a contractible extension thereon, said extension having an externally tapered surface and internal serrations thereon, a nut mounted on said sleeve, said nut having an internally threaded portion engaging with said threaded portion of the sleeve and having an internal tapered surface adapted to engage the tapered surface of said extension upon the advancement of said nut on the threaded portion of said sleeve whereby said extension is collapsed and the serrations on said extension are projected into said conductor, said tapered surface of said nut being at a greater angle to the axis than the tapered surface on said extension and a flange on said nut adapted to abut against said extension to prevent said nut from being screwed beyond its threaded travel on the threaded portion of said sleeve.

4. In a connecting device for electrical conductors, the combination of a conductor, a sleeve surrounding the conductor, said sleeve having a rectilinear external threaded portion and a contractible slitted extension thereon, said extension having a smooth externally tapered surface and internal serrations thereon, a nut mounted on said sleeve, said nut having a rectilinear internal threaded portion engaging with said rectilinear external threaded portion of said sleeve and having an internal smooth tapered surface adapted to engage the smooth tapered surface of said extension upon the advancement of said nut on the threaded portion of said sleeve whereby the extension on said sleeve is collapsed and the serrations on the extension are projected into said conductor, said tapered surface of said nut being at a greater angle to the axis than the tapered surface on the extension, and a flange on an outer end of said nut, said flange adapted to abut against an outer end of the extension to prevent said nut from being screwed beyond its threaded travel on the threaded portion of said sleeve.

5. In a connecting device for electrical conductors, the combination of a conductor, a sleeve surrounding the conductor, said sleeve including a central flange portion and oppositely projecting slitted extensions, rectilinear external threaded portions provided on said sleeve, one of each of said threaded portions provided on opposite sides of said central flange portion, each of said extensions having a smooth externally tapered surface and internal serrations thereon, a nut on each of the extensions, said nut having a rectilinear internal threaded portion engaging with a threaded portion of said sleeve and adapted to travel thereon toward said central flange portion, an internal smooth tapered surface on said nut adapted to engage a tapered surface of an extension upon the advancement of said nut on said sleeve toward said central flange portion, whereby the extension is contracted to force the serrations thereon into gripping relation with said conductor, said tapered surfaces of said nuts being at a greater angle to the axis than the tapered surfaces of said extensions, and a flange on an outer end of each of said nuts, said flange adapted to abut against an outer end of an extension to prevent said nut from being screwed beyond its threaded travel on a threaded portion of said sleeve.

6. In combination, a support including side portions, a connector for electrical conductors or conduits, means for mounting said connector on the support, said means including trunnnions on said connector, an elongated slot provided in each of the sides of said support and a bolt extending through each of said slots, each of said bolts adapted to engage threadably a trunnion on said connector to thereby hold the connector in a position adjustable radially, longitudinally and in elevation with respect to said support.

LOUIS G. WALTERS.