Dec. 13, 1960 N. L. NILSSON ET AL 2,964,585

PARALLEL TAP CONNECTOR

Filed June 5, 1958 2 Sheets-Sheet 1

Fig. 1.

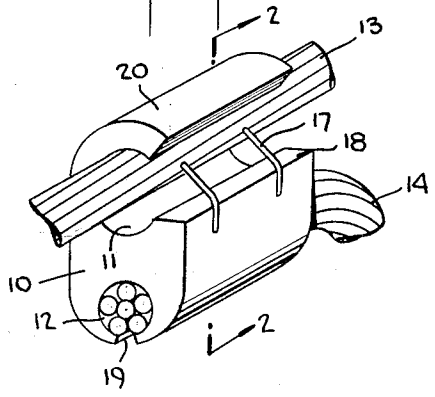


Fig. 2.

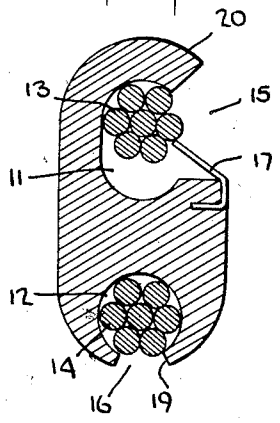


Fig. 3.

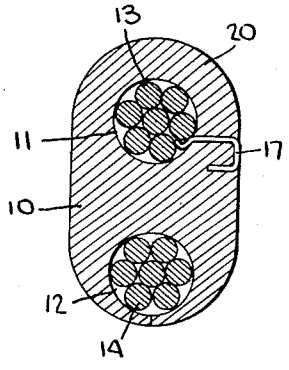


Fig. 4.

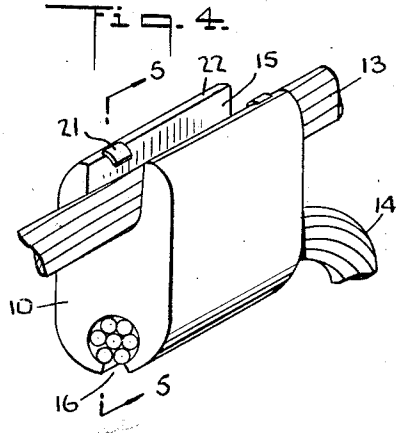


Fig. 5.

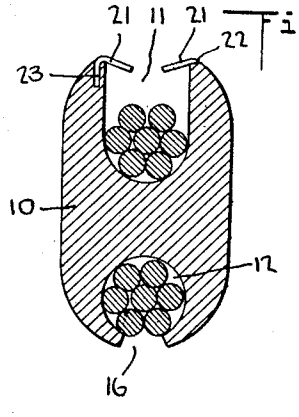
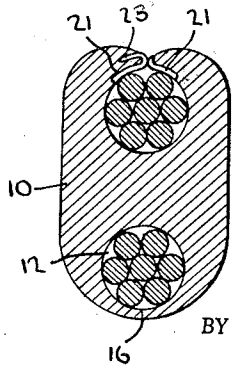


Fig. 6.



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Fig. 7.

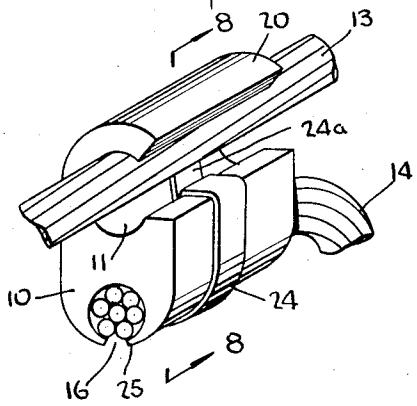


Fig. 8.

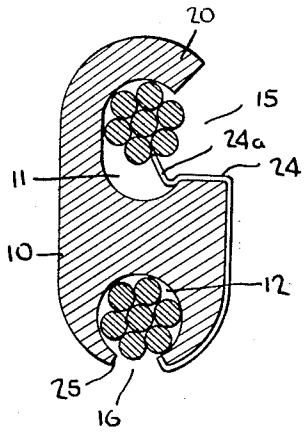


Fig. 10.

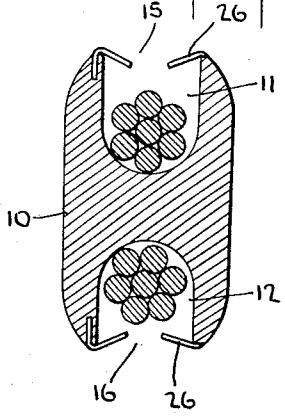


Fig. 9.

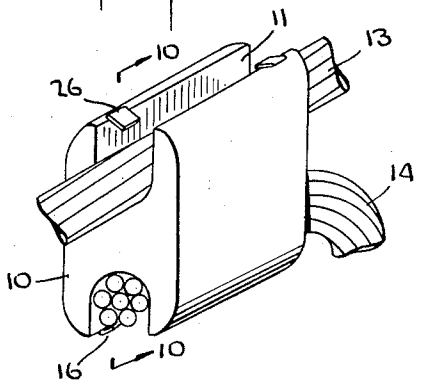
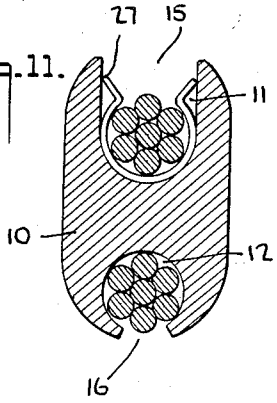


Fig. 11.



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PARALLEL TAP CONNECTOR

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4 Claims. (Cl. 174—94)

This invention relates generally to connectors for interconnecting a plurality of electrical lines and more particularly to a parallel tap connector adapted to effect interengagement between a main line and one or more branch lines and to maintain the lines in electrical contact at the point of engagement without external holding means.

In planning the construction of electrical power circuits there are numerous factors which must be considered in determining the route of the line, such as topography, accessibility, future power markets and other factors which cannot be accurately predicted. Once these lines are installed, because of anticipated or unanticipated requirements, whichever the case may be, it is often necessary to tap into the main lines at various points in order to obtain branch lines so as to supply power to other areas or to new installations, etc. For this purpose it is known to make use of metallic connectors which are designed to interlink the lines to be connected, the connector being deformable to lock-in the interconnected lines.

These electrical lines frequently transmit large amounts of power and the connection between the main and tap lines must therefore be made with a great deal of care. The connectors presently available for this purpose have the disadvantage that the lineman making the connection must hold the connector in engagement with the main line while installing the connector. This is extremely dangerous for the connector may become disengaged from the main line or move out of position before the connection is completed. In addition the lineman making the connection is restricted to the use of one hand since the other hand must hold the connector in engagement with the main line. Consequently the lineman has only one hand available with which to use the tool for deforming the connector to lock-in the lines.

In view of the foregoing it is the primary object of the present invention to provide a parallel tap connector which is adapted to be hooked over the main line and resiliently held in place without the use of external holding means, whereby the installer has both hands available to complete the installation.

Another object of the present invention is to provide a parallel tap connector adapted to be deformed to substantially enclose the portions of the lines engaged by the connector, the connector including resilient guard means for admitting the lines to the connector channels therefor and to resist the removal of the lines from the channels prior to deformation.

A further object of the present invention is to provide a parallel tap connector which facilitates the interconnection of a main and tap lines and affords a positive and permanent inter-connection therebetween.

Still another object of the present invention is to provide an efficient and reliable connector of the above-described type which may be manufactured at relatively low cost.

Briefly stated the objects of the present invention are

accomplished by providing a deformable connector made from an electrically conductive material and formed into an elongated body having a generally oval cross-section. The connector is provided with at least two spaced parallel channels extending axially therethrough. The connector is also provided with longitudinal openings communicating with the channels to form peripheral openings in the channels extending axially the full length of the connectors. One of these channels is adapted to have received therein a main line and the other channel a tap or branch line. The main line channel has resilient guard means associated with its peripheral opening which permits insertion of the line therethrough but which restrains removal or disengagement therefrom. The tap line channel peripheral opening may also in one form of the invention be provided with resilient guard means, or with a lip portion to prevent disengagement of the tap line from the connector. If the tap line channel peripheral opening is provided with lip portions the tap line is inserted in the channel axially through the open ends thereof rather than radially through the peripheral opening. When the main and tap lines are in engagement with the connector the connector is deformed to close around the conductors.

These and further objects of the invention will be understood from the following description to be read in conjunction with the accompanying drawings wherein like components in the several views are identified by the like reference numerals.

In the drawings:

Figure 1 is a perspective view of a preferred embodiment of a parallel tap connector according to the present invention, the connector being shown in engagement with a main and tap line before the connector has been deformed to completely close around the lines.

Figure 2 is a cross-section taken in the plane indicated by the line **2—2** in Figure 1.

Figure 3 is a view similar to Figure 2 but showing the connector after it has been deformed.

Figure 4 illustrates in perspective another preferred embodiment of the parallel tap connector according to the present invention.

Figure 5 is a cross-section taken in the plane indicated by the line **5—5** in Figure 4, the connector being shown prior to deformation.

Figure 6 is a view similar to Figure 5 but illustrating the connector after it has been deformed.

Figure 7 is a perspective view of still another preferred embodiment of the parallel tap connector.

Figure 8 is a cross-section taken in the plane indicated by the line **8—8** in Figure 7.

Figure 9 is a perspective view illustrating yet another embodiment of the parallel tap connector.

Figure 10 is a section taken in the plane of line **10—10** in Figure 9, and

Figure 11 is a section taken through a further preferred embodiment of the parallel tap connector.

Referring now to the drawings, and particularly to Figures 1 through 3, there is shown one embodiment of the parallel tap connector of the present invention. The connector is designated in general by the numeral **10** and is in the form of an elongated block of conductive material having a generally oval cross-section. The connector **10**, for a purpose to be presently described, is preferably made from aluminum or copper which are good electrical conductors and can be readily deformed under pressure without breaking or cracking.

Formed in connector **10** and extending axially therethrough are two channels **11** and **12** of circular cross-section. Channels **11** and **12** are in spaced parallel relation, channel **11** being disposed adjacent the top of the connector and channel **12** adjacent the bottom thereof.

The upper channel 11 is adapted to have received therein a main line 13 for engagement with the connector 10, while the lower channel 12 is adapted to have received therein a tap line 14 for electrical interconnection with the main conductor 13. The size and configuration of the channels 11 and 12 is of course determined by the size and configuration of the lines 13 and 14 and which are to be interconnected.

As illustrated in Figures 1 and 2 a portion of each channel 11 and 12 has an external peripheral opening extending longitudinally the length of the connector 10. These openings are formed by cutting or forming longitudinal slots in the connector 10 in communication with the channels 11 and 12. The opening 15 communicates with the channel 11, while the opening 16 communicates with the channel 12. The purpose of these openings as well as their size and relative angular positioning with respect to the walls of the channels will be presently described. The dimensions of opening 15 are such as to admit the main line 13 laterally into the channel 11, whereas the dimensions of opening 16 does not admit the line 14, this line being inserted axially in the channel.

Opening 15 has associated therewith springs 17 or other resilient guard means which are adapted to yield under pressure to permit lateral insertion of the main line 13 in the channel 11 through the opening 15, but which effectively restrains removal therefrom. The springs 17 illustrated in Figures 1 through 3 are short lengths of wire made for example from stainless steel. The springs 17 are attached to a convenient portion of the connector 10, such for example as to the outer surface thereof adjacent the lower bank 18 of opening 15. The springs 17 are attached to the connector 10 by forcing the ends of the springs under pressure into the metallic body portion of the connector 10. The metal of the connector cold flows around the embedded ends of the springs to anchor them in position.

As illustrated in Figure 2, the portions of the springs 17 extending from the connector 10 are bent in such manner as to extend over the bank 18 of the opening 15 into the channel 11 partially to block the opening. In this manner when the main line 13 is inserted in the channel 11 through the opening 15 the free ends of the springs 17 nestle between the strands of wire forming the main line and pin the line against the wall of the channel. The springs 17 are depressed when the main line 13 is inserted in the channel 11 and return to their original position once the main line is completely inserted in the channel 11. The springs 17 therefore prevent the main line 13 from becoming dislodged from the connector 10 through the opening 15.

When it is desired to use the connector 10 of the present invention to interconnect a main and tap line, the tap line 14 may first be inserted in the lower channel 12. The tap line 14 can either be inserted axially in the lower channel 12 through the open ends thereof, or radially through the opening 16. If the tap line is to be inserted laterally through the opening 16 this opening must be of such size as to permit radial insertion of the tap line, and the opening 16 must also have associated therewith springs or other resilient guard means to prevent the tap line from becoming disengaged from the connector 10. In Figures 1 through 3 the tap line 14 has been inserted axially in the lower channel 12 and the opening 16 is provided for a purpose to be presently described. The banks 19 of the opening 16 as illustrated in Figures 1 and 2 are spaced apart a smaller distance than the diameter of the tap line 14, and thereby both support the tap line and prevent it from becoming disengaged from the connector 10 by passage through the opening 16.

When the tap line 14 is positioned in the lower channel 12 the connector 10 is hooked over the main conductor 13. This is accomplished by abutting the opening 15 against the main line 13 and exerting sufficient pressure

on the connector 10 to slightly depress the springs 17 and thereby permit the main line to pass through the opening 15 into the channel 11. The angular positioning of the opening 15 with respect to the wall of the channel 11 is such as to provide the channel 11 with an overhanging lip portion 20. When the tap connector is hooked over the main line 13 it is supported thereon by engagement of the main line with the lip portion 20. It is to be understood that the tap line 14 may be inserted in the lower channel 12 after the connector 10 has been hooked over the main line 13.

It can therefore be seen that when the tap connector 10 is hooked over the main line 13 it is effectively retained in position thereon and prevented from becoming disengaged therefrom. With the connector of the present invention once these initial connections have been made it is not necessary to hold the connector 10 in position by any external means and the individual making the interconnection between the two lines is free to use both hands to complete the connection.

The interconnection of the two conductors is completed with a crimping tool of any available type capable of deforming the connector 10 substantially to close the openings 15 and 16 as illustrated in Figure 3. When the connector 10 is crimped or deformed in this manner the connector fastens around the main and tap lines and secures the two lines together. The electrical interconnection between the two lines is completed by the connector 10 which is preferably made from a highly conductive material, such as aluminum, copper or any other suitable metal.

The connector 10 illustrated in Figures 4 through 6 differs from the connector illustrated in Figures 1 through 3 primarily in the location of the opening 15 and the manner in which the springs are attached to the connector 10. As illustrated in Figure 4 the openings 15 and 16 are directly opposite each other at the respective top and bottom sides of the connector 10. In this embodiment the channel 11 is not provided with an overhanging lip portion and therefore when the connector 10 is hooked over to the main connector 13 the connector is supported therefrom solely by the springs 21.

The opening 15 in Figure 4 has associated therewith two springs 21, each spring being mounted on opposing ends of each of the banks 22 of the U-shaped channel 11. The springs 21 are short flat strips of spring material, one end of each spring 21 being mounted in a groove 23 on each bank 21. When the springs 21 are positioned in the grooves 23 the grooves are crimped in order to anchor the springs in position. Any other convenient means of attachment can be used. The free ends of the springs 21 extending from the banks 22 are bent downwardly in such manner as to extend into the channel 11 as illustrated in Figure 5. The connector 10 of this embodiment is thereafter deformed in the manner as shown in Figure 6.

The tap connector illustrated in Figures 7 and 8 is similar to the connector illustrated in Figures 1 through 3 with the exception that the spring member 24 has a terminal tag 24*a* which serves as a guard element in channel 11. Spring 24 of this embodiment is formed by a strap of flat spring material which is shaped so as to snap on to the side wall of the connector extending between the channel openings, the end of the strap providing the guard element. If desired the spring 24 may be permanently attached to the connector 10 by inserting it in a groove formed in the connector 10 and then crimping the sides of the groove to secure the spring in position. The tag 24*a* of spring 24 illustrated in Figure 8 extends within the upper channel 11, the other end of spring 24 bearing against bank 25 of lower opening 16.

The tap connector 10 illustrated in Figures 9 and 10 is similar to the connector illustrated in Figures 4 through 6 save that in this embodiment springs 26 are also associated with the U-shaped lower channel 12. With the

tap connector illustrated in Figures 9 and 10 the tap conductor **14** may be inserted both axially in the lower channel **12** or radially through the opening **16**.

The tap connector **10** illustrated in Figure 11 is identical to the connector illustrated in Figures 4 through 6 with the exception of the spring member **27**. In the embodiment of Figure 11 the spring **27** is formed in an Omega configuration as shown and snapped into position in the upper channel **11**.

What has been described is a parallel tap connector which is adapted to interconnect a main and tap line. The connector of the present invention has the advantage of permitting rapid and safe interconnection of electrical lines since once engagement is effected between the connector and the main line the connector remains fixed in position relative to the main line and cannot become dislodged therefrom.

While the connectors shown in the figures have in all instances only two channels, it is to be understood that three or more may be used to interconnect a like number of lines. The invention moreover is not limited to the connector configurations and spring designs shown which may be changed or modified to suit particular purposes without departing from the essential scope of the invention as defined in the claims annexed hereto.

We claim:

1. A parallel tap connector for interconnecting a plurality of electrical lines comprising a conductive block member of deformable metal having a like plurality of spaced channels extending through the full length thereof for accommodating said lines, said block having slots formed therein in communication with said channels throughout the respective lengths thereof to provide longitudinal openings, and resilient guard means secured to said block member adjacent the slot of at least one of said channels partially to block the opening thereof, said guard means permitting insertion of one of said lines in said channel through the opening therefor but resisting removal therefrom, said block being deformable under compressive force to securely grip said lines and to make good electrical contact therebetween, said guard means being bendable within said channel and into said line upon deformation of said block to enhance resistance of the deformed connector to relative axial movement thereof with respect to said line.

2. A parallel tap connector for interconnecting a plurality of electrical lines comprising a conductive block member of deformable metal having a like plurality of spaced channels extending through the full length thereof for accommodating said lines, said block having slots formed therein in communication with said channels throughout the respective lengths thereof to provide longitudinal openings, and resilient guard means secured to said block member adjacent the slot of at least one of said channels and having angular extensions disposed inwardly into said slot partially to block the opening thereof, said guard means permitting insertion of one of said lines in said channel through the opening therefor but resisting removal therefrom, said block being deformable under compressive force to securely grip said lines and to make good electrical contact therebetween, said guard means being bendable with said channel and into said line upon deformation of said block to enhance resistance of the deformed connector to relative axial movement thereof with respect to said line.

3. A parallel tap connector for interconnecting main and tap electrical lines comprising a conductive block member of deformable metal having a main channel extending through the full length thereof adjacent the top portion of the block for accommodating said main line and a tap channel extending the full length thereof parallel to said main channel and adjacent the bottom portion of said block for accommodating the tap line, said block having slots formed therein in communication with said channels throughout the respective lengths thereof to provide longitudinal openings, said chain channel slot being formed to one side of said block to define an overhanging lip portion whereby said connector may be suspended from said main line, and resilient guard means secured to said block member adjacent the slot of said main line channel and having angular extensions disposed inwardly into the latter said slot partially to block the opening thereof and arranged to permit insertion of said main line in said main line channel through the opening therefor but resisting removal therefrom, said block being deformable under compressive force to securely grip said lines and to make good electrical contact therebetween, said guard means being bendable within said channel and into said line upon deformation of said block to enhance resistance of the deformed connector to relative axial movement thereof with respect to said line.

4. A parallel tap connector for interconnecting main and tap electrical lines comprising an elongated conductive block member of generally oval cross-section formed of deformable metal and having a main channel extending axially through said block adjacent the top portion thereof adapted to receive said main line and a tap channel extending axially the full length thereof parallel to said main channel and adjacent the bottom portion of said block adapted to receive the tap line, said block having slots formed therein in communication with said channels throughout the respective lengths thereof to provide longitudinal openings, said main channel slot being formed to one side of said block to define an overhanging lip portion whereby said connector may be suspended from said main line, and a pair of resilient wires embedded at one of their ends in said block member at spaced positions along the lower edge of said main channel slot and having angular extensions disposed upwardly and inwardly under said lip portion partially to block the opening of said main line channel and bendable to permit insertion of said main line in said main line channel through the opening therefor but resisting removal therefrom, said block being deformable under compressive force to substantially close said openings and securely grip the lines in said channels and to make good electrical contact therebetween, said wires being bendable within said channel and into said line upon deformation of said block to enhance resistance of the deformed connector to relative axial movement thereof with respect to said line.

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