

May 29, 1951

R. G. OLSON
ELECTRICAL CONNECTION HAVING IDENTICAL
BIFURCATED PLATE MEMBERS

2,554,876

Filed Oct. 2, 1948

2 Sheets-Sheet 1

Fig. 1.

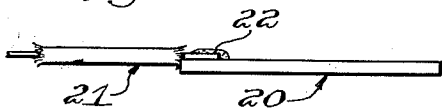


Fig. 2.

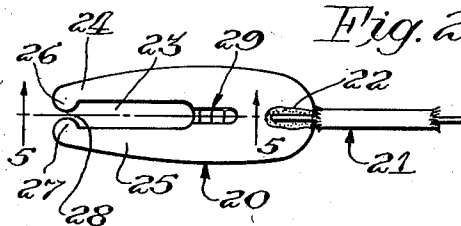


Fig. 4.

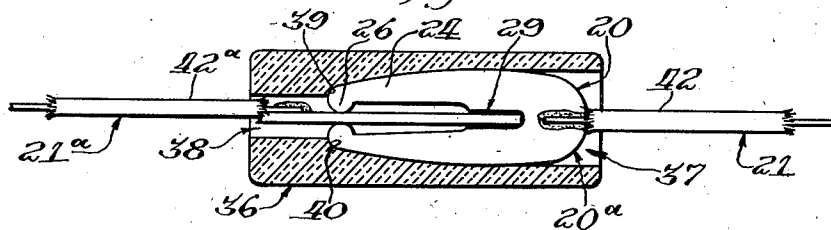


Fig. 5.

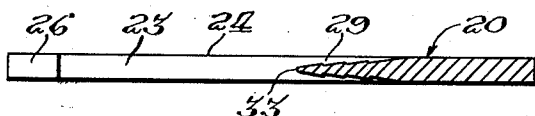


Fig. 3.

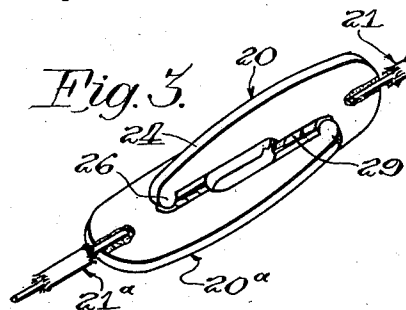


Fig. 7.

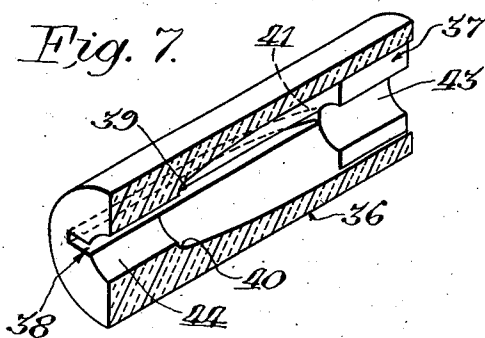


Fig. 6.

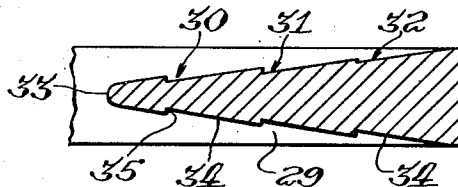
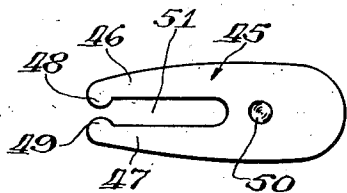


Fig. 8.



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Fig. 9.

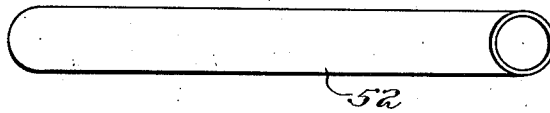


Fig. 10.

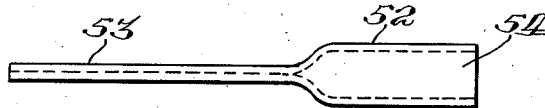


Fig. 11.

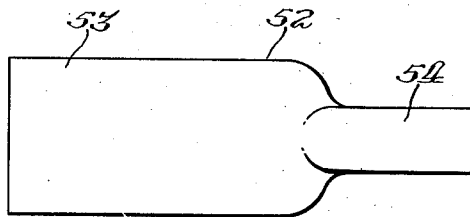


Fig. 12.

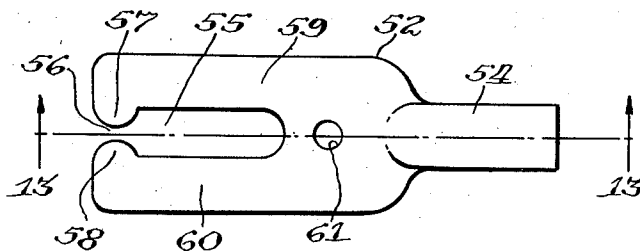
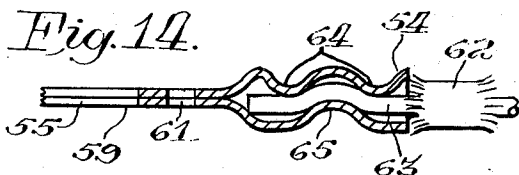


Fig. 13.



Fig. 14.



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UNITED STATES PATENT OFFICE

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ELECTRICAL CONNECTION HAVING IDENTICAL, BIFURCATED PLATE MEMBERS

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13 Claims. (Cl. 173—363)

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This invention relates to a new and improved electrical connector.

Electrical connectors have been made in numerous forms. There are screw-type connectors, jack connectors, plug connectors and many, many others. Similarly there are numerous uses for electrical connectors and certain types are more effective under certain conditions. There has long been a need for an electrical connector which is quickly attachable and detachable, and one which will physically hold together as well as form a perfect electrical connection. There are other desirable features for electrical connectors such as means for insulating the connection, and having that insulation capable of ready attachment or removal from the electrical connection.

A principal object of this invention is therefore to provide identical electrical connector members which may be conveniently joined together for electrical as well as physical connection.

An important object of this invention is the provision of means in electrical connector elements to obtain a snap fastening therebetween.

Another important object of this invention is to provide electrical connector means of identical construction which may be conveniently covered with an insulating sleeve member, and which will effectively prevent longitudinal movement of the insulating sleeve with respect to the electrical connection.

Another important object of this invention is to provide substantially flat electrical connector members which upon being engaged with each other at right angles thereto, will effect a firm grip therebetween for physical and electrical connection.

A still further important object of this invention is the provision of notch means in the surface of adjoining connectors within which the connectors may be gripped one to the other.

Another important object of this invention is to supply electrical connector elements which are constructed and arranged with a series of steps of gradually decreasing depth upon which the connecting elements may be snapped for gradually increasing the force necessary to effect separation of the electrical connector elements.

Still another important object of this invention is to provide notch means in the form of an aperture through the relatively flat connector member and into which opposing gripping means may be entered from both sides thereof.

Another and still further important object of

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this invention is the provision of an electrical connector element formed of metal tubing and retaining a portion thereof undeformed for the reception of an electrical conductor.

Still a further object of this invention is the provision of a method of manufacturing quickly attachable and detachable electrical connector elements.

Still another object of this invention is the provision of a sleeve type insulator for crossed connectors and arranged in such a manner that each connector member is inserted from opposite ends of the insulating sleeve member, and locked internally of the sleeve to thereby prevent longitudinal movement of the insulating sleeve.

Other and further important objects of this invention will become apparent from the disclosures in the following specification and accompanying drawing.

In the drawings:

Figure 1 is an edgewise view of one of the electrical connectors of this invention and having an electrical wire fastened thereto.

Figure 2 is a front elevation view of the device as shown in Figure 1.

Figure 3 is a perspective view showing the electrical connectors of Figures 1 and 2 joined with a complementary connector.

Figure 4 is a longitudinal sectional view of the electrical connection such as shown in Figure 3 with an insulating sleeve mounted thereover.

Figure 5 is a sectional view taken on the line 5—5 of Figure 2.

Figure 6 is an enlarged detail of the stepped notch means such as shown in Figure 5.

Figure 7 is a perspective view of the insulating sleeve member employed on this electrical connection and having a half thereof removed for purposes of showing the interior thereof.

Figure 8 is a front elevational view of a modified form of connector.

Figure 9 shows a short length of tubing.

Figure 10 is a subsequent view of the tubing of Figure 9 after it has been partially deformed for the purpose.

Figure 11 shows a top plan view of the deformed tubing as shown in Figure 10.

Figure 12 shows a top plan view of the deformed tubing as shown in Figure 11 with the final cutout step completed in the manufacture of this electrical connector.

Figure 13 is a sectional view taken on the line 13—13 of Figure 12.

Figure 14 is a partial side elevational view of

the electrical connector of Figure 12 having an electrical conductor fastened thereto.

As shown in the drawings:

The reference numeral 20 indicates generally a substantially flat electrical connector element of this invention. An electrical conductor 21 is shown soldered at 22 to the end of the connector element 20.

As best shown in Figure 2, an open end slot 23 is positioned in the connector 20 substantially centrally thereof and at the end opposite the attachment of the electrical conductor 21. The open end slot 23 forms substantially parallel arms 24 and 25. Each of the arms 24 and 25 have a certain amount of spring and is provided with a projection 26 and 27 respectively at their outer ends which are directed inwardly toward each other forming a restricted opening 28 at the outer end of the elongated slot 23.

Notch means 29 are formed in the electrical connector inwardly of the inner end of the slot 23, and spaced forwardly from the end of the electrical conductor 21. The notch means 29 is in alignment with the slot 23 and as best shown in Figures 5 and 6 the notch means depicted at 29 comprises a series of depressions or notched steps 30, 31 and 32, which are provided with a forward apex portion 33, constituting the inner end of the elongated slot 23. The depressions 30, 31 and 32 vary in depth from a substantial depth at 30 to a considerably lesser depth at 32. Symmetrical depressions are formed on the opposite or under side of the flat electrical connector 20 as indicated in both of the Figures 5 and 6. The depressions are similar to saw teeth in shape having a relatively long inclined wall represented by the numeral 34 and a relatively short substantially vertical wall 35.

Two electrical connectors such as that shown at 20 are required to make an electrical connection. As best shown in Figure 3, electrical conductors 21 and 21a are electrically joined together by means of the connector elements 20 and 20a. The connector 20a has been angularly turned with respect to the connector 20 and preferably through a right angle. Subsequently the connectors are moved toward each other so that the slots inter-engage and the jaws of the respective slots spread upon continued endwise force to climb upwardly over the apex 33 of the notch means 29 and rest within the depression 30. The inwardly extending projections 26 and 27 thus engaging the depression 30 on both sides of the connector resist longitudinal separation of the connector elements by reason of their engaging the substantially vertical walls 35. A single depression therefore serves to electrically and physically connect the opposed connectors 20 and 20a which in their interlocked position form a cross in cross section. However, for purposes of greater connecting strength a continued endwise movement forcing the members 20 and 20a together causes the projections 26 and 27 to ride upwardly within the notch means depression 31 and finally in the depression 32, whereupon the spring arms 24 and 25 are considerably spread and the projections 26 and 27 tightly and snugly engage the surfaces of this relatively shallow depression. The connection between the conductors 21 and 21a is now complete, and the physical interlocking between the connector elements 20 and 20a is so great that a considerable force is required to dislodge the inward projections 26 and 27 of the parallel arms 24 and 25 from the notch means depression 32. The projections as

shown are rounded so that upon some predetermined pull apart force the arms will spread and the projections pull out of the notch means. The projections could be made in the form of teeth so they would lock behind the notch means and require a tool to effect release.

As best shown in Figure 4, an insulating sleeve member 36, cylindrical in shape is provided with an opening 37 from one end thereof and an opening 38 from the other end thereof. The size and shape of the respective openings 37 and 38 are similar to the substantially flat electrical connector elements 20 and 20a. Further, the openings 37 and 38 are placed at an angle to one another simulating the crossed connector elements 20 and 20a as shown in Figure 3. This angle is preferably a right angle. Shoulders 39 and 40 at the inner end of the opening 37 abuttingly receive the outer ends of the substantially parallel arms 24 and 25. Similar shoulders 41 as best shown in Figure 7 define the end of the opening 38 and likewise abuttingly receive the ends of the parallel arms of the connector element 20a. If it is desired to electrically insulate the connection, the insulating sleeve 36 is employed and in order to effect a mounting of the cylindrical insulating sleeve over the connection, it is necessary to insert one connector element from each end of the sleeve 36 through the respective openings 37 and 38, whereupon as endwise force is exerted on each of these connector elements, the interlock between the elements is occasioned by the yieldable spreading of the inwardly extending projections engaging the notch means in the opposite or other connector element. It should be understood that the interlocking takes place within the insulating sleeve. The insulating sleeve 36 is of sufficient length to completely enclose the interlocked connecting elements 20 and 20a and further to include a portion of the insulation 42 and 42a of the electrical conductors 21 and 21a respectively. This insures that there shall be no exposure of the electrical wires either in the connection or closely adjacent thereto. Once the insulating sleeve 36 is in position over the interlocked connectors 20 and 20a, it is impossible to longitudinally slide the insulating sleeve with respect to the connection without separating the connector elements 20 and 20a. This is accomplished by means of the shoulders 39, 40 and 41, and the fact that the substantially flat openings 37 and 38 do not project fully through the sleeve member 36. As best shown in Figure 7, each of the openings 37 and 38 is provided with a substantially cylindrical portion 43 and 44, respectively, into which the conductors 21 and 21a with their insulating covers 42 and 42a may project.

Figure 8 shows a modified form of electrical connector 45, which is provided with the same forward portion having parallel arms 46 and 47, and these arms having inwardly extending projections 48 and 49 respectively. The notch means in the device of Figure 8 differs from that of Figures 1 through 6, in that it includes merely single, shallow, opposed depressions 50 spaced inwardly of the inner end of the elongated open end slot 51. A pair of complementary connectors 45 are joined in the same manner as those of 20 and 20a. The electrical and physical interlock between the connector members 45 is accomplished by the projections 48 and 49 engaging the depression 50 in the surface of the substantially flat connectors 45. The final result is of course similar to that of the connectors 20 and 20a engaging the stepped notches or depressions

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30, 31 and 32. It should also be understood that the insulating sleeve is equally well adaptable for the connectors 45 as for the connectors 20 and 20a.

Figures 9 through 14 depict a method of making an electrical connector similar to but slightly modified from the connectors 20 and 45. As best shown in Figure 9, the stock of material is a short piece of tubing 52, which as shown in Figures 10 and 11, has its one end 53 deformed by flattening such as shown in the side view of Figure 10 and widely spread as shown in the top plan view of Figure 11. The end 54 of the tubing is not deformed and retains its cylindrical form. The next step in the manufacture of the electrical connector is to form by punching the elongated slot 55 which is open at its outer end 56 and having inwardly extending projections 57 and 58, restricting the opening 56 to the elongated slot 55. The slot 55 also defines the substantially parallel arms 59 and 60, which are comparable to the arms 24 and 25 of the connector shown in Figure 2. Simultaneously with the punching or cutting out of the slot 55, notch means in the form of a circular aperture 61 is also punched in the flat portion 53 of the tubular member 52 at a position spaced inwardly of the inner end of the elongated slot 55, and in alignment therewith. The sectional view of Figure 13 indicates the shape and physical makeup of the connector as shown in Figure 12. The tubular end 54 not deformed is employed for the insertion of the end of an electrical conductor 62, such as shown in Figure 14, wherein the uncovered wire 63 is inserted into the tubular end 54 and the end 54 thereupon crimped as shown at 64 and 65 on the upper and lower sides respectively, and offset one from the other in order to positively grip the wire within the sleevelike socket 54.

The electrical connector of Figure 12 operates in identically the manner of the connector 20 or 45 in that opposed slots 55 in complementary connectors interengage at right angles to one another and thereafter endwise pushing of the connector elements causes the projections 57 and 58 to jump over the inner end of the elongated slots 55 and engage the aperture 61 which is the notch means in this connector. The projections 57 and 58 are of a size and shape to enable slight penetration of the aperture 61 but not to pass through the aperture. Separation of the connectors is accomplished merely by pulling longitudinally apart the two joined connectors. The manufacture of the connector from tubing eliminates the necessity of requiring the conductors to be soldered to the ends of the connectors and thus provides for a neat attachment of the conductor to the connector merely by the crimping of a portion of the undeformed end 54 of the original tube 52. The double thickness of the parallel arms 59 and 60 as shown particularly in Figure 13 is valuable for supplying necessary rigidity to these arms and permitting greater spring action within the arms for effecting the snap over lock within the notch means.

The connector of Figure 12 operates in the same manner with the insulating sleeve 36 as the connectors 20 and 45, and hence the insulating sleeve is not shown separately on this modified connector.

Numerous details of construction may be varied throughout a wide range without departing from the principles disclosed herein, and I therefore do not propose limiting the patent granted here-

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on otherwise than as necessitated by the appended claims.

I claim:

1. An electrical connector for joining conducting wires including a substantially flat plate member attached to one of said conducting wires and a similar substantially flat plate member attached to the other of said conducting wires, each of said substantially flat plate members having a centrally located open end slot extending longitudinally inwardly from one end thereof a uniform distance, and forming parallel disposed arms on each of said plate members, the ends of each of said arms having projections extending inwardly toward its adjacent parallel arm, and each of said plate members having notch means disposed inwardly of the inner end of said slots and in alignment therewith, whereby said plate members may be interlocked by turning one through a right angle and sliding them longitudinally together with an endwise force in such a manner that the parallel disposed arms of each plate member slide across the other plate member over the slot therein to form a cross shape in cross section, and continued endwise force exerted on the plate members causes the projections on the arms to move up on the plate member over the inner ends of the slots and rest within the notch means causing the plate members to resist longitudinal separation.

2. A device as set forth in claim 1 in which the notch means comprises a series of longitudinally disposed steps decreasing in depth from a position adjacent the end of the slot and longitudinally thereaway.

3. A device as set forth in claim 1 in which the notch means includes a plurality of aligned sawtooth notches in which the notch adjacent the inner end of the slot has great depth and the succeeding notches inwardly of the end of the slot having gradually lesser depths.

4. A device as set forth in claim 1 in which the notch means includes a plurality of aligned sawtooth notches on both sides of the flat plate member and uniformly varying in depth from a substantial depth adjacent the slot to a lesser depth away from the slot.

5. A device as set forth in claim 1 in which the notch means comprises depressions in both sides of the flat plate member.

6. A device as set forth in claim 1 in which the notch means comprises the plate having an aperture therethrough and the aperture of a size in which the arm projections can readily engage.

7. A device as set forth in claim 1 in which an insulating sleeve is provided for said flat plate members when they are interlocked, said insulating sleeve having an opening in one end thereof corresponding in cross sectional shape to that of a flat plate member, said insulating sleeve having an opening in the other end thereof positioned at right angles with respect to the opening in the one end and also corresponding in cross sectional shape to that of a flat plate member, said insulating sleeve having an overall length greater than the interlocked length of the two flat plate members, and said insulating sleeve having internal shoulders at the inner end of each of said openings whereby the insulating sleeve is prevented from longitudinal sliding movement in either direction as long as the flat plate members remain interlocked within the insulating sleeve.

8. A device as set forth in claim 1 in which the notch means comprises depressions.

9. An electrical connector having two identical

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elements, each of said elements comprising a tubular portion for reception of an electrical conductor, a substantially flat portion having an elongated open end slot defining spring arms and notch means spaced inwardly from the inner end of said open end slot, said spring arms having inwardly extending projections for engaging said notch means in the opposite element, whereby identical elements may be interlocked.

10. A device as set forth in claim 9 in which the notch means comprises the flat portion having a hole.

11. An electrical connector for joining conducting wires including a substantially flat plate member attached to one of said conducting wires and a similar substantially flat plate member attached to the other of said conducting wires, each of said substantially flat plate members having a centrally located open end slot extending longitudinally inwardly from one end thereof a uniform distance, and forming parallel disposed arms on each of said plate members, the ends of each of said arms having projections extending inwardly toward its adjacent parallel arm, and notch means in each of said plate members disposed inwardly of the inner ends of said slots and in alignment therewith, whereby said plate members may be interlocked by turning one through an angle and sliding them longitudinally together with an endwise force in such a manner that the parallel disposed arms of each plate member slide across the other plate member over the slot therein, and continued endwise force exerted on the plate members causes the projections on the arms to move up on the plate member and rest within the notch means causing the plate members to resist longitudinal separation.

12. An electrical connection including a pair of identical connectors each of which comprises

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a substantially flat body portion having an open end slot in one end thereof, laterally inwardly extending projections on said body portion adjacent the end of the open end slot, notch means

5 in said body portion spaced longitudinally inwardly of the inner end of said open end slot, whereby a joining of the identical connectors by sliding them longitudinally together over the opposed open end slots causes an interlocking engagement of the laterally inwardly extending projections of the body of one connector with the notch means in the other connector.

13. A device as set forth in claim 12 in which an insulating sleeve in combination therewith 15 includes the sleeve having openings in the opposite ends thereof of substantially the same cross sectional shape as each connector, and shoulders internally of said sleeve adjacent the inner end of each of said openings whereby a locking of 20 said connectors together causes said sleeve to become locked in position around the connection.

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