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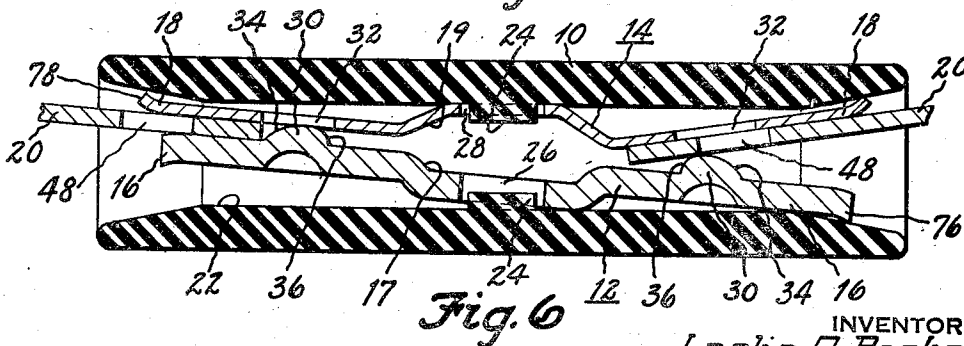
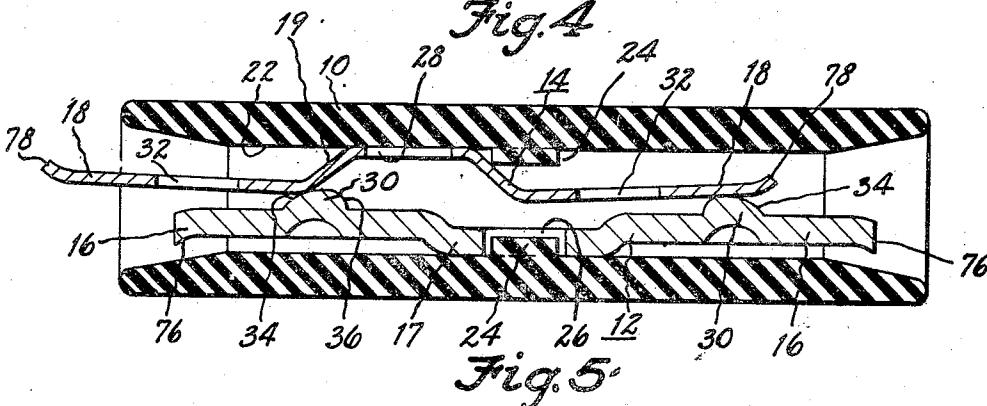
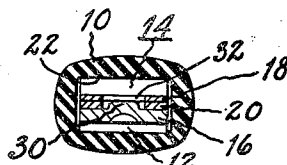
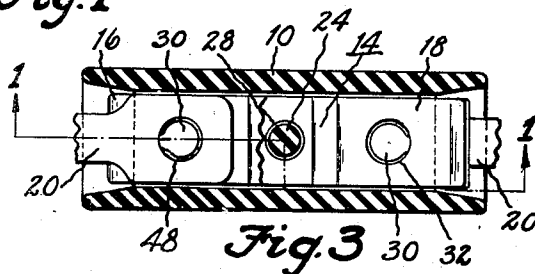
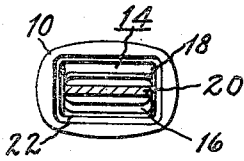
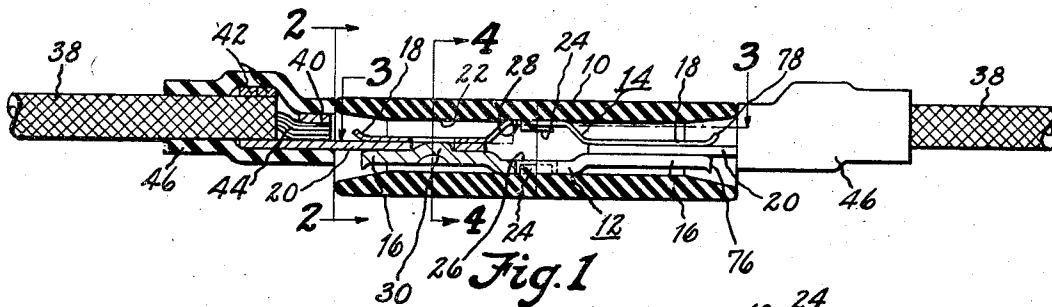
L. O. PARKER ET AL

2,301,447 •

CONNECTOR

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2 Sheets-Sheet 1



INVENTOR
Leslie O. Parker
Julius H. Bolles
Spencer, Hardman & Fitch
ATTORNEYS

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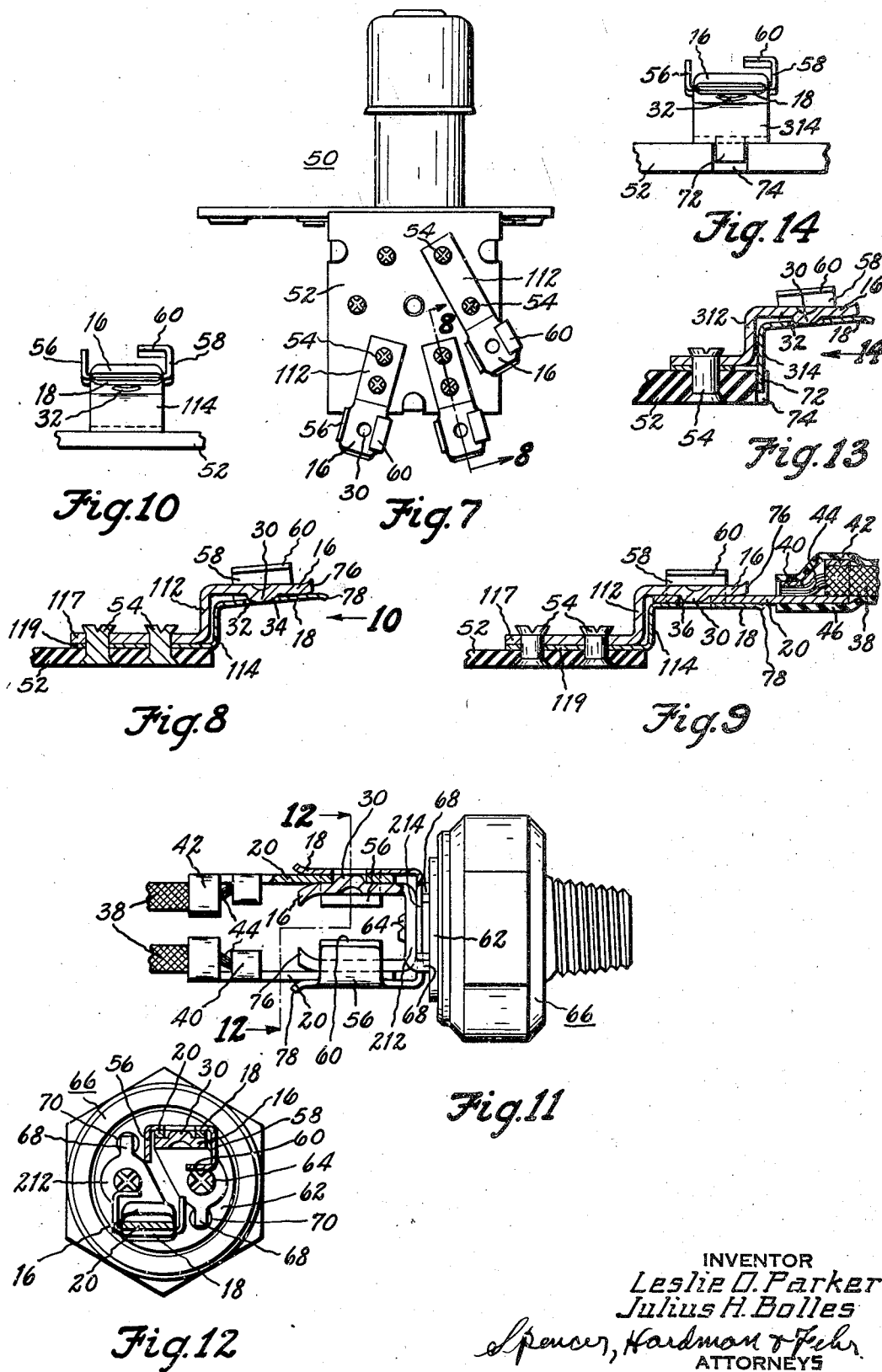
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2 Sheets-Sheet 2



INVENTOR
 Leslie O. Parker
 Julius H. Bolles
 Spencer, Hardman & Fehr
 ATTORNEYS

UNITED STATES PATENT OFFICE

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CONNECTOR

Leslie O. Parker and Julius H. Bolles, Anderson,
Ind., assignor to General Motors Corporation,
Detroit, Mich., a corporation of Delaware

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This invention relates to separable coupling devices, such as line and terminal connectors.

One object of the invention is to provide an electric connector of the type referred to, whose parts are separable only upon predetermined movement of the parts, and which are normally locked against accidental or incidental separation.

A further object of the invention is to provide a connector device of the snap type, that is susceptible of quick coupling for positive and certain electric connection, but is deprived of accidental separation, though readily and quickly separable when desired.

A further object of the invention is to provide an electric connector of the plug and jack type, wherein means are provided for increasing the resistance to separation of the parts.

A further object of the invention is to provide an electric connector of the plug and jack type, wherein means are provided for limiting the spread of the parts forming the receptacle.

A further object of the invention is to improve the retaining means of a plug by a jack type of electrical connector.

A further object of the invention is to provide a construction of the type referred to, that will necessitate a rocking or deflecting of the contributing parts out of axial alignment before separation thereof can be effected.

A further object of the invention is to provide a latch means that will be releasable upon deflection of one part relative to another.

A further object of the invention is to provide a separable connector of a construction in which the resistance to separation is greater than the resistance to coupling.

A further object of the invention is to provide a line connector of the separable type that will have a minimum number of parts for conducting current between two wires.

Another object of the invention is to provide a receptacle for a line connector that can be assembled by simply inserting the conductive elements within a housing member.

A further object of the invention is to provide a receptacle for a line connector in which the conductive elements can be secured in place by the inherent resiliency of one of the conductive parts.

Another object of the invention is to provide a receptacle or jack for line connectors, in which a non-conducting sleeve encloses bridging elements and plug retainers of novel formation, the sleeve and elements being so constructed that the

elements are secured within the sleeve by the cooperable formations thereof, and without the use of additional elements such as screws and the like.

5 A still further object of the invention is to provide a separable connector formed from sheet metal stampings, and which include a rigid member or bracket in engageable relation with a spring member adapted to receive between them a plug like member, one of the members providing a raised portion of compound curvature cooperating with a recess or opening of the plug like member for effecting greater resistance to separation of the plug like members from the receptacle, than is effected to coupling of the cuplike member with the receptacle.

The foregoing objects are accomplished by fashioning the conductive elements or contact members of the coupling device from sheet metal strips of proper gauge, such as to provide a bracket or rigid member that will be substantially non-yieldable, and so as to provide a spring like or yieldable member for cooperable relation therewith. The contact members are thence supported in relatively firm relation so as to be co-extensive, and preferably in normally engageable relation yet capable of separation upon insertion of a plug like member therebetween. For retention of the plug like member against accidental separation or removal, one of the contact members is provided with an embossment of particular form the sloping of which makes for relatively easy insertion of the plug like members between the contact members, but makes it rather difficult for withdrawing of the plug like member from between the bridging members. That is effected by striking an embossment in one of the members that is of semiovoid contour, that is half egg shaped, with the lesser degree of slope positioned toward the entering end of the receptacle.

Support of the contact members is effected, in one instance by a tubular casing of insulating material with provisions for retaining the contact members therein by interengaging portions and in another instance by means clamping the contact members in non-rotating relation on a body of insulation. In both instances back stops are provided for limiting the separation of the superimposed contact portions.

50 Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

Fig. 1 is a longitudinal sectional view through one form of the connector device, a line connector, with the parts at one end thereof being shown in elevation substantially as indicated by the line and arrows 1—1 of Fig. 3.

Fig. 2 is a transverse sectional view substantially as indicated by the line and arrows 2—2 of Fig. 1.

Fig. 3 is a longitudinal sectional view showing certain parts in plan, substantially as indicated by the line and arrows 3—3 of Fig. 1.

Fig. 4 is a transverse sectional view through the plug retaining means, substantially as indicated by the line and arrows 4—4 of Fig. 1.

Fig. 5 is longitudinal sectional view, on an enlarged scale, illustrating the relation of the parts at one point in the act of assembly.

Fig. 6 is a similar view, illustrating other relations of the parts such as when a plug is being inserted in and withdrawn from the receptacle.

Fig. 7 is an elevational view illustrating a modified form of the invention, a terminal connector, as applied to a certain type of switch.

Fig. 8 is a longitudinal sectional view through that connector, substantially as illustrated by the line and arrows 8—8 of Fig. 7.

Fig. 9 is a similar view, showing the relation of the parts of the terminal connector when coupled with a line wire.

Fig. 10 is an end elevation of the terminal device in its free state, substantially as indicated by the arrow 10 in Fig. 8.

Fig. 11 is an outline view of another type of switch with parts in section, showing a terminal connector of the type referred to modified slightly for convenience of mounting.

Fig. 12 is a transverse sectional view through the connector device, substantially as indicated by the line and arrows 12—12 of Fig. 11.

Fig. 13 is a longitudinal sectional view through a modified form of connector device.

Fig. 14 is an end elevation of the same, substantially as indicated by the arrow 14 of Fig. 13.

Referring particularly to the drawings, and first as respects the form of invention as illustrated in Figs. 1 to 6, the particular improvement is embodied in a receptacle 10 supporting a pair of conductive elements 12 and 14 so disposed as to have their contact portions 16 and 18 normally in engagement but adapted to be separated by insertion of a plug like member 20 therebetween. In the instance of a line connector, the receptacle 10 comprises a tubular member or sleeve of non-conducting material, preferably molded in rectangular cross-section so as to provide a longitudinal bore 22, of sufficient extent to completely enclose the conductive elements 12 and 14. In fashioning the sleeve 10, there are provided at the middle portion, and extending from opposite walls radially toward the axial center, a pair of opposed turrets or pilot portions 24 that operate as retainers for the conductive elements 12 and 14, as will presently be explained.

The conductive elements 12 and 14 comprise stampings of sheet metal, the element 12 being comparatively heavy and of thick gauge metal so as to be relatively non-flexible, and therefore providing a bracket member. The conductive element 14 is fashioned from a lighter gauge material having springy or resilient characteristics. Both of the conductive elements 12 and 14 have their central portions, that is the portions located between the contact portions 16 and 18 respectively, depressed or deflected from the general plane of the metal so as to provide offset

portions 17 and 19, which in turn are provided with apertures 26 and 28 respectively. The conductive elements 12 and 14 are so fashioned that when they are assembled in superimposed relation, such that their offset portions 17 and 19 are oppositely extending away from one another, the maximum dimension across the assembly at the off-sets being slightly less than the inside dimension of the bore 22 for the receptacle 10, but being considerably greater than the minimum dimension between the opposed faces of the oppositely extending turrets or pilots 24.

The conductive elements 12 and 14 have provisions for securely retaining the plug like member when it is inserted therebetween, that means taking the form of an embossment 30 on one of the contact portion that is in cooperable relation with an aperture 32 in the opposing contact portion. The boss and aperture provide interengaging portions between the contact members while in their normal or uncoupled relation with the plug member and secure retention means for the plug when it is inserted between the contacts. The particular form of embossment illustrated is one of compound curvature in that the slope 34 of rise from the plane of the contact portion is more gradual than is the slope 36. The slopes of the embossment are so arranged as to present that of lesser degree toward the opened end of the connector device where it will be engaged by the plug member 20 when connection is being made, and to present the slope 36 of more abrupt rise toward the interior of the coupling device, so that a more abrupt shoulder will be presented to the plug member during withdrawal of the plug member than is encountered during insertion. In the preferred form of the invention the embossments 30 are struck from the rigid or bracket member 12 while the receiving apertures 32 are located in the yieldable member 14.

The preferred form of embossment is that of semiovoid shape, or half egg shaped, though one of angular contour may be adapted instead.

In assembling the conductive elements within the sleeve 10, the bracket member 12 is located in the bore 22 of the sleeve until the central aperture 26 receives one of the turret portions 24 and so that the offset 17 rests against the surface of the bore. Then the flexible or yieldable element 14 is inserted in the bore of the sleeve between the embossed face of the member 12 and the opposite wall of the bore 22, and thence pushed endwise to a position such as illustrated in Fig. 5, which illustrates the conductive elements substantially in their free or unflexed state. It will be observed that then the contact portions of the member 14 ride on the high points of the embossments 30, and that the offset portion 19 of the member 14 rests against the inside of the sleeve and engages the corner of the turret 24. By endwise movement of the member 14 the same will be caused to flex by reason of the camming action of the turret 24 riding over the incline of the offset portion. When the conductive element 14 has been inserted to substantially central position, the offset portion will have ridden over the turret 24 until the aperture 28 is in receiving position for the turret 24, whereupon the conductive element 14 will reflex or return to its preformed condition and move laterally to engage about the turret 24, and assume a position substantially as indicated in Figs. 1, 3 and 6. The parts are thereby retained in assembled relation by the cooperable action and reaction of the conductive elements and sleeve member, such that a

plug receptacle is provided, wherein the conductive elements are substantially completely enclosed, and are adapted for quick connection and disconnection with respect to a pair of line wire, such as indicated at 38 in Fig. 1.

It will be understood of course that the line wires 38 are each provided with one of the plug like members 20, which are preferably fashioned from strip metal, such as to provide a blade like member insertable between the contact elements of the receptacle. The blade is provided with clamp rings 40 and 42 adapted to secure the end of a conductive element 44 provided by the line wires 38, and an insulating sheath 46 such as soft rubber tubing may be disposed thereover to guard against short circuiting. Making for secured retention in the contact device, the blade member of the plug 20 has an aperture 48 adapted to receive the embossment 30 of the contact member when the plug is inserted between the contact elements 16 and 18.

The plug like member cooperates with the contact elements 16 and 18 and the embossment 30 substantially as indicated in Fig. 6, where there is shown at the left hand side of the figure the plug as being inserted in the receptacle, while at the right hand end of the figure there is shown the plug as being withdrawn from the receptacle. It will be observed that when the plug is inserted between the contact elements 16 and 18, that the end of the plug engages the lesser slope 34 of the embossment, over which it easily rides in coming to the position illustrated in Fig. 1. In so doing, the conductive element 14 yields or springs away from the rigid element 12 to allow passage of the plug over the embossment 30 until the same is aligned with the aperture 48 in the plug 20. When that position is reached the plug is yieldingly clamped between the contact element 16 and 18, and the more abrupt shoulder 36 engaging the wall of the aperture 48 retains the plug against accidental or incidental removal.

While the plug is securely retained against easy withdrawal, it is nevertheless quickly and easily removed by special manipulation of the plug with respect to the conductive elements. That is accomplished by deflecting or canting the plug element out of alignment with the rigid element, somewhat as suggested by the right hand end of Fig. 6. Before the plug is attempted to be withdrawn from between the contact elements, it is first pushed side-wise against the yieldable element 14, or its contact position 18 so as to tilt the inner end of the plug up and away from the more abrupt shoulder of the slope 36 of the embossment. The action presents a more gradual surface of inclination to be engaged by the back edge of the aperture 48, so that then a lineal motion of the plug 20 can accomplish withdrawing of the same from the lock relation behind the embossment 30. The bore 22 of the sleeve is sufficiently large to permit that canting of the plug and contact elements, but is also small enough to act as stops defining the limits to which the contact elements may be separated so that the yieldable element may not be flexed beyond its elastic limit. The bore of the sleeve also tends to keep the contact portions in superimposed relation or so that they will not become laterally displaced.

In the form of the invention as it is applied to a terminal connector, reference is now made to Figs. 7 to 14 inclusive of the drawings, wherein Fig. 7 illustrates the terminal connector as applied to a foot dimmer switch 50, having a non-

conducting case portion 52. The conductive elements here comprise a rigid bracket member 112, and a yieldable member 114, each of which have their free ends fashioned as set out with respect to Figs. 1 to 6 inclusive, and which are each provided at the other end with supporting portions in offset and overlying relation as shown at 117 and 119 in Figs. 8 and 9, through which rivets 54 pass and are headed over to retain the parts in firm and supported relation on the non-conducting case portion 52. The contact element 18 is further fashioned to provide the side flanges 56 and 58, that extend on each side, with clearance, of the contact member 16, the side flange 58 having an overhanging portion 60 curving back of the rigid contact 16. The flanges 56 and 58 provide keepers for the plug element 20, in that it cannot be moved laterally from between the contact elements 16 and 18, but must be withdrawn therefrom against the more abrupt slope 36 of the embossment 30. The overhanging portion 60 prevents relative separation of the contact members 16 and 18 beyond the elastic limit of either member, such that the parts always remain in operable condition. This terminal connector assembled with a plug and line wire is illustrated in section in Fig. 9.

With respect to Figs. 11 and 12, the contact elements 16 and 18 comprise angular extensions of the conductive elements 212 and 214 respectively, which elements are secured to a non-conducting member 62 by rivets or the like 64, which may form contacts on the interior of a hydraulic or fluid operated switch 66. Here, too, the yieldable contact element 18 is provided with the side flanges 56 and 58 and the overhanging flange 60, as has just been described, and all of which makes for like cooperation with the plug elements 20 in locking relation about the embossments 30. Due to the limited space available, the brackets 212 have angular lug extensions 68 receivable in recesses 70 in the non-conducting member 62, which when the rivets 64 are tightened down prevent rotation of the bracket members out of position, accomplishing a result similar to that shown in Figs. 8 and 9, where two rivets 54 passing through the nonconducting member 52 and the conductive elements 112 and 114, prevent their rotation.

A convenient method of accomplishing the same result is illustrated in Figs. 13 and 14, where the contact elements 16 and 18 comprise angular extensions of conductive elements 312 and 314 respectively the overlying portions of which are retained in position on the nonconducting member by a single rivet 54. Relative rotation between the contact elements 16 and 18 is prevented by the hereinbefore described flanges 56 and 58, and rotation of the terminal connector as a whole with respect to the nonconducting support 62 is effected by striking a tongue or lug 72 from the body of the yieldable conductive element 314 so as to interengage in a notch 74 appropriately provided in the nonconducting base 52.

Irrespective of the form of support provided for the contact elements 16 and 18, that is, irrespective of the particular form of the receptacle as a whole, the conductive elements 16 and 18 are maintained in cooperable relation, preferably in normal engagement, so that a connector plug 20 may be readily inserted between the contact elements and easily forced over the embossment 30 to a retained position. Facilitating easy start of that insertion, the extreme free ends of the contact elements may be flared outwardly slightly as

indicated throughout by the reference characters 76 and 78 respectively, and it is preferred that the ends of the yieldable element 14 extend slightly beyond the end of the rigid element 12, such that a substantial ledge is afforded at the end of the contact element 16, to which the end of the plug 20 may be applied for engagement with the contact element 18 in springing it away slightly from the element 16, to make initial entry easily accomplished.

While the embodiments of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A quick detachable connector means, comprising in combination, a rigid member, a yieldable member arranged in parallelism therewith, means holding portions of the two members normally in engagement but susceptible of separation by interposition of a third member, said rigid member providing a raised portion normally disposed in an opening of the yieldable member but adapted to be withdrawn therefrom upon insertion of said third member between the rigid and yieldable members, said raised portion being of curved contour and having dissimilar slopes of rise from the body of the rigid member at opposite points along the line of the third member movement and adapted to seat in an aperture of the third member when aligned therewith, the dissimilar slopes of the raised portion increasing the resistance of withdrawing the third member, over the resistance to insertion thereof.

2. A quick detachable connector means, comprising in combination, a rigid member, a yieldable member arranged in parallelism therewith, means supporting the two members in cooperable relation for reception of a third member and between, said members having normally interengaging parts adapted to be separated for reception and retention of said third member, said interengaging parts comprising a semi-ovoid embossment on the rigid member engageable in a recess of the yieldable member after projecting through an aperture in said third member, and fashioned to effect a greater resistance to withdrawing of the third member than the resistance to insertion of the third member.

3. A quick detachable connector means, comprising in combination, a flat rigid member, a flat yieldable member arranged in parallelism therewith, means supporting both members for yieldable separation thereof, one of said members having an aperture therein and the other of said members having a protrusion therefrom normally seating in said aperture, said members being separable upon insertion of a flat third member between the aperture and the protrusion, said three members when in inserted relation resisting separation with greater force than insertion to withdraw the protrusion from the aperture, and means defining the limits of yieldable separation of the said members.

4. The combination set forth in claim 3, wherein the said protrusion is located on the rigid member and has a semiovoid contour with the steeper slope arranged to increase the resistance to withdrawal of the third member disposed between the contact members.

5. A quick detachable connector means comprising in combination, a rigid member, a yieldable member arranged in parallelism therewith, a tubular casing surrounding the members for

supporting the members in cooperable relation, means including pilots on the casing engaging openings in the members for retaining the members loosely against dislodgement from the casing, said members adapted to receive a plug-like member insertable there-between to interlock therewith, and means comprising a semi-ovoid boss on one member operating when said parts are so interlocked to enter a recess in the plug-like member to effect a greater resistance to withdrawal of the plug-like member than was experienced upon insertion of the plug-like member, said yieldable member when assembled with the rigid member being sufficiently flexible to pass between the pilots of the casing in assembling and adapted to snap thereover to maintain the parts in assembled relation.

6. A quick detachable connector means, comprising in combination, a rigid member, a yieldable member arranged in parallelism therewith, a unitary tubular casing extending the full length of said members, interlocking means between said casing and members whereby said members are retained in the casing in cooperable relation for reception of a plug-like member therebetween, said interlocking means comprising inward extending pilots provided by the casing, and cooperating apertures in the members for receiving the pilots of the casing said yieldable member being flexible to pass between the pilots in assembling and adapted to snap thereover to maintain the parts in assembled relation.

7. Quick detachable connector means, comprising in combination, a rigid member of sheet metal, a yieldable member coextensive of the rigid member, both of said members having offset central portions and each being provided with an aperture, a sleeve of nonconducting material having a bore therethrough adapted to loosely enclose the said members when assembled with their offset portions oppositely extending, diametrically arranged pilot portions within the sleeve adapted to engage within the apertures of said offsets, the clearance between the faces of the pilots being materially less than the maximum dimension across the offset portions when the members are assembled in cooperable relation, but adapted to permit insertion of the cooperable members therebetween for assembly by consequent flattening of the offset portion of the yieldable member, whereby when the pilots and apertures are in registry the yieldable member will reflex to retain the sleeve and cooperable members in assembled relation.

8. Quick detachable connector means, comprising in combination, a rigid member of sheet metal, a yieldable member coextensive of the rigid member, both of said members having offset central portions and each being provided with an aperture, a sleeve of nonconducting material adapted to enclose and loosely retain said members therein, said sleeve having projections receptive of the said apertures for retention of the members, said rigid member having portions on each side of the central aperture for interlocking engagement with a plug member having an aperture therein, said interlocking means comprising an embossment of semiovoid contour having the lesser slope toward the open end of the sleeve.

9. Quick detachable connector means comprising in combination, a rigid member of sheet metal, a yieldable member of sheet metal coextensive with the rigid member and both being of strip-like formation, both of said members having offset portions provided with apertures, a tubular

casing, means including the offset aperture portions of the members and bosses of the casing for supporting the metal members in cooperable relation within the casing, so as to provide normally free but relatively separable end portions for reception of a plug member therebetween, and means for limiting the separation of the free ends of the members within the flexible limit of both members, and means including the offset apertures and bosses for maintaining the rigid member and flexible member in substantially superimposed relation.

10. A quick detachable line connector comprising in combination a pair of loosely assembled contact members, one of which is resilient, a unitary tubular casing enclosing said contact members, means within the bore of the tube retaining the contact members within the casing including portions integral with the casing extending into cooperable receiving apertures provided by the contact members.

11. A quick detachable line connector comprising in combination, a pair of contact members, a unitary casing substantially enclosing the members and having inwardly extending projections, said contact members having apertures adapted to be disposed about said projections for retention of the contact members within the casing and means including parts of the contact members in the region of the apertures maintaining the members spaced a distance greater than the distance between the projections.

12. A quick detachable line connector comprising in combination a pair of contact members, one of which is yieldable, both of said contact members having central apertures and providing

oppositely extending free end portions, a unitary sleeve member for surrounding the contact members and providing oppositely disposed inwardly extending pilot portions each projecting into the apertures of one of said contact members, one of said contact members being yieldable at its central portion for passage between the face of the pilots during assembly.

13. A quick detachable line connector comprising in combination a pair of contact members in sheet metal strip form and having centrally disposed apertures, one of said members having a semiovoid embossment on each side of said opening, the other of said contact members being apertured in substantial registry with said embossments, one of said members being yieldable to permit insertion of a plug like member between the contact members, a casing for retaining the contact members in cooperable relation and including integrally formed portions engaging each within one of the centrally disposed apertures of the contact members.

14. A quick detachable line connector comprising in combination a pair of contact members one of which is resilient, a tubular casing for the contact members having inwardly extending bosses diametrically disposed, said contact members being bowed apart at the middle portion and disposed in spaced relation at the bowed portion a distance greater than the distance between the casing bosses, and means for retaining the contact members within the casing including interlocking portions of the contact members surrounding the bosses of the casing.

LESLIE O. PARKER.
JULIUS H. BOLLES.