

June 4, 1957

L. J. HESS ET AL
ELECTRICAL CONNECTOR

2,794,963

Filed March 3, 1954

2 Sheets-Sheet 1

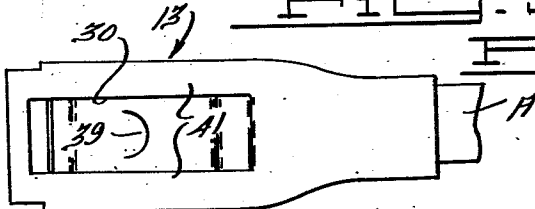
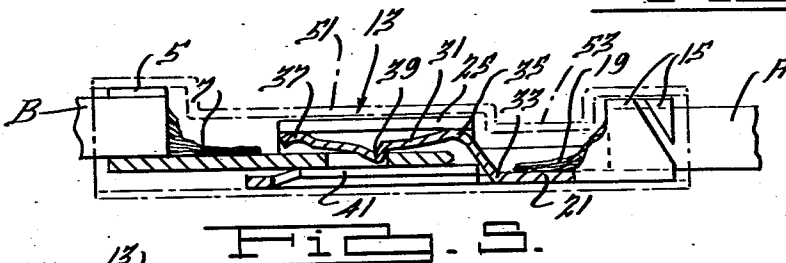
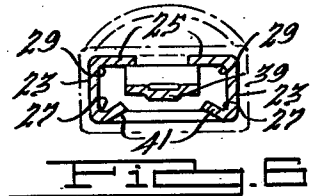
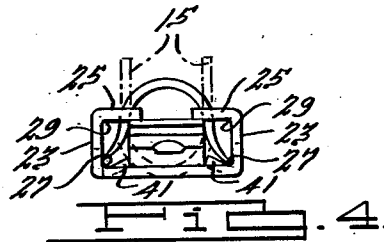
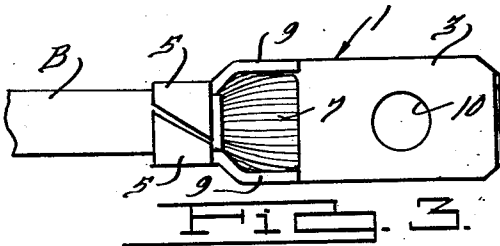
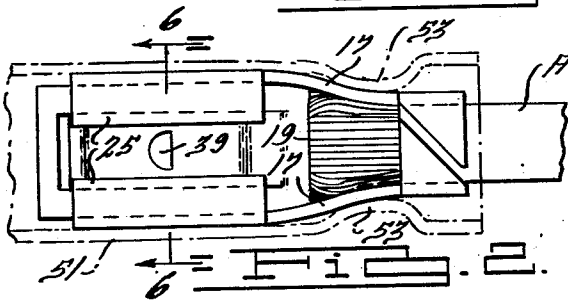
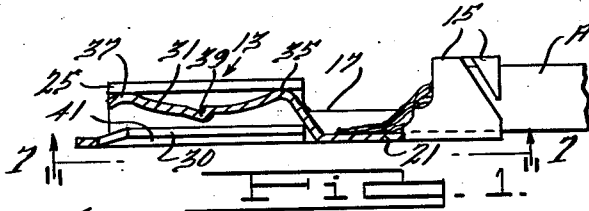


Fig. 7

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2 Sheets-Sheet 2

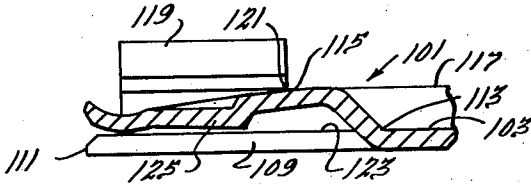


FIG. 8.

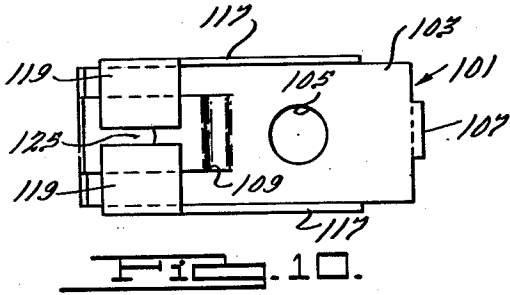


FIG. 10.

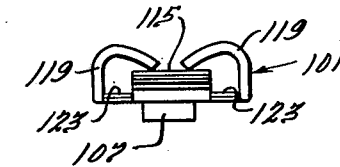


FIG. 9.

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ELECTRICAL CONNECTOR

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This invention relates to electrical connectors and, in particular, to an improved socket or receptacle type of connection constructed to receive a blade or spade type terminal. The invention provides a quick connect-disconnect device that is particularly useful in automotive electrical wiring.

It is an object of this invention to provide an electrical connector that may be readily and inexpensively manufactured on a mass production basis.

It is another object of this invention to provide an improved type of electrical connector in which a resilient member acts to maintain electrical contact and to yieldably resist entry or removal of the terminal blade.

Another object of the invention is to provide an electrical connector which has a low millivolt drop and which resists camming out of the blade terminal.

These and other objects of the invention are achieved by a connector structure that may be formed from flat metal strip and in which there is an arch, a base, and a flexible tongue between the arch and base. The blade is received between the tongue and the base but the tongue is braced by contact with the arch so that it resiliently holds the blade in contact with the base.

A preferred embodiment of the invention is illustrated in the accompanying drawings, in which:

Figure 1 is a longitudinal section through the socket member of this invention;

Fig. 2 is a plan view of the structure shown in Fig. 1;

Fig. 3 is a plan view of a blade terminal suitable for use in the receptacle of Figs. 1 and 2;

Fig. 4 is an end view taken from the left of Fig. 2;

Fig. 5 is a longitudinal section similar to Fig. 1 but showing the blade of Fig. 3 inserted in the terminal;

Fig. 6 is a section taken on line 6—6 of Fig. 2;

Fig. 7 is a bottom view of the connector taken along line 7—7 of Fig. 1;

Fig. 8 is a fragmentary section similar to Fig. 1 showing a modified form of the invention;

Fig. 9 is an end view taken from the left of Fig. 8; and

Fig. 10 is a plan view of the modified form shown in Figs. 8 and 9 as adapted to be fixed to a stud on a junction block instead of spot welded to a lead wire.

Referring to the drawings, the electrical connection of this invention is adapted to electrically interconnect the lead wires A and B in a quick acting connect-disconnect type of construction. The lead wire B has a male or blade terminal 1 formed as a metal stamping with a flat contact surface 3. The stamping has a pair of arms 5 which are bent around the insulation of the wire B to clamp the wire to the contact member 1. The fine strands which are exposed at the end of the wire B are spot welded at 7 to the terminal 1 and this operation is facilitated by means of the upright side barriers 9 that are formed in the member 1 to act as a pocket that confines the end of the wire and prevents excessive spreading thereof under pressure of the electrodes in the spot welding operation.

The wire A may be secured to the receptacle or female connector 13 by means similar to those described in con-

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nection with the terminal 1. Thus, the member 13, which is fabricated from flat metal, may have arms 15 that are initially in the dotted line position shown in Fig. 4 and which are bent around the insulation of the wire A to clamp it to the member 13. The member 13 may have upright side barriers 17 formed therein to define a pocket that prevents excessive spreading of the stranded ends of the lead wire A so that the wire may be properly spot welded at 19 to the flat bottom 21 of the member 13.

Integral with the portions of the member 13 which have just been described, are means for yieldably receiving the terminal 1, and in particular the blade portion 3 thereof, through an entry opening at the end opposite to the lead wire A. The base 21 extends throughout the length of the connector 13 and has electrical contact at 19 with the lead wire A and has electrical contact with the blade 1 at a portion spaced from the spot weld 19 and above which is formed an arch by the longitudinal upright legs 23 which are bent inwardly over the base 21 as indicated by the transverse flanges 25. The legs 23 are spaced apart by the width of the contact portion 3 and in bending them from flat stock into the arch radii will be formed in the corners at 27 and 29.

Sheared out along three sides of a substantially rectangular slot 30 in the base 21 is a cantilever tongue 31 and it is bent upwardly between the base and arch along an unsheared edge 33 adjacent to the spot weld 19. The tongue 31 is preferably given a somewhat arcuate shape as shown in the drawings so that it has two point engagement with the arch as shown by contact with leg portions 25 at the two points 35 and 37. The tongue 31 bellies or bows down toward the bottom 21 of the member 13 and the bowed portion will act as a spring to resiliently hold the terminal 1 in place. The bottom of tongue 31 is less than the thickness of blade 3 from the top of base 21.

A detent catch 39 is pressed in the tongue 31 to snap into the detent hole 10 of the terminal 1 and is shaped so that a certain minimum pull-out force must be applied before a blade 1 can be removed from the connector 13 but so that the blade may be easily inserted. The mouth at the front of the connector 13, as defined by base 21 and the bottom of tongue 31, is flared or tapering, as seen in Figs. 1 and 5, and this facilitates entry of the blade which will gradually cam the tongue 31 up against its spring resistance as it is pushed into the connector.

The tongue 31 engages the top surface of the contact portion 3 on the terminal 1 and presses it against the contact portions 41 that are formed in the base 21 of the receptacle 13. It is to be noted that the contact portions 41 are actually the sharp, sheared top edges of the rectangular slot 30 which are bent upwardly toward the leg portions 25 by an amount sufficient to clear the radii 27. The sharp edges of the contact portions 41 will tend to dig into the metal on the bottom of the blade 3 to form a pair of line contacts and this is believed to give a better electrical connection than can be actually obtained by means of allegedly flat surfaces in contact. Since the contact portions 41 are elevated above the radii 27 the radii will not cause interference and the blade portion 3 will fit snugly but freely between the legs 23 which will act to prevent camming out of the blade.

While, if desired, any suitable type of insulating housing 51 can be used around the connector 13, we presently prefer to use a housing formed of suitable plastic of a shape shown in phantom lines in Figs. 2 and 5 of the drawings. This is merely an extruded plastic member of suitable shape to receive the various portions of the connector 13 which is inserted from right to left into the housing. The housing 51 is then crimped at 53, either hot or cold depending on the material used, to the connector so that it is firmly and permanently attached to it. The housing 51 may be extended to the left as shown in

order to house the current transmitting portions of the spade terminal 1. The central portion of the housing 51 which encloses the portion 13 and the spot weld portion of the receptacle may be substantially rectangular in shape as indicated while the opposite ends of the housing which receive the lead wires A and B and the arms 5 and 15 that are clamped to these lead wires may be of an oval or cylindrical shape as indicated. This design permits the insulator to be readily and easily formed by simple molding apparatus.

Figures 8-10 show a modified form of the invention in which the female connector 101 is adapted to receive a spade terminal such as the terminal 1 or other types of blade design. The connector 101 is made from flat strip, like the preceding embodiment, such as Phosphor bronze, and has a flat bottom 103. Instead of being spot welded to a lead wire A, the connector 101 is, for the sake of illustrating the invention, shown as adapted for use in connection with a terminal block or junction block where-in a stud (not shown) will project up through the hole 105 in the bottom of the terminal and a nut screwed thereon against the terminal to provide electrical connection. The tab 107 which is turned over at the end may be used to shoulder against a suitable part of the junction block to properly align the connector.

The foregoing features of connector 101 are conventional and need not be described in greater detail. In accordance with the invention a rectangular slot 109 running to the entry end 111 of the connector is sheared out and bent up about the line 113 to form a tongue 115. If desired, the slot 109 may terminate before it reaches the end 111 of the terminal as is the case with slot 30 in the preceding embodiment, such termination providing increased resistance to spreading apart of the sides of the connector. The sides of the member 101 are bent up from the bottom 103 to form stiffening edges 117 extending throughout most of the length of the connector. Over the major portion of the length of the tongue 115 the sides of the connector are bent up and over as shown in Figure 9 to form curved legs 119 that lie above the tongue 115 to restrict its upward movement. The tongue 115 engages the legs 117 at only the point or line 121 at the rear of the legs when the connector is empty. When a blade is inserted so that it contacts the surface 123 the tongue 115 will be flexed upwardly against the resistance of the legs 119 as well as its own cantilever spring re-

sistance. A detent 125 is formed in the tongue to engage in the detent hole of the terminal. The inside end shoulder 127 of the tongue 115 will form a stop to limit insertion of the blade, the same being true of tongue 31, of course. Obviously, a housing can be placed around the connector 101, if desired, to insulate it.

It will be understood that the connectors 13 and 101 may be used with electrical lead-ins of various types other than the lead wire A or terminal studs and, if desired, for example, a wire may be attached to the connectors by means of conductor grip tabs.

We have illustrated our invention by showing preferred embodiments but it will be understood that various modifications are within the spirit and scope of the invention. It is obvious, of course, that our invention may be used in fields other than automotive equipment, for example in household appliances.

We claim:

1. An electrical connector to receive a terminal upon relative longitudinal movement of connector and terminal comprising a sheet metal member having a flat bottom, a portion partially sheared out of said bottom to form a slot having longitudinal edges bent upwardly from the bottom to present line contact surfaces, said bottom having legs bent upwardly therefrom and extending parallel to said line contact surfaces and the tops of said legs having inwardly bent transverse flanges spaced above said contact surfaces, the portion of said bottom which has been partially sheared from said bottom forming a cantilever tongue that is concave with respect to said contact surfaces and engages the transverse flanges on said legs.
2. The invention set forth in claim 1 including a detent formed in the tongue to engage a detent hole in a blade terminal.
3. The invention as set forth in claim 1 wherein said legs are bent downwardly toward said bottom and said cantilever tongue engages said legs at only one point.
4. The invention set forth in claim 1 wherein said cantilever tongue is bowed toward said bottom and contacts said transverse flanges at two longitudinally separated points.

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