

[54] ELECTRICAL CONNECTOR

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[51] Int. Cl. **H01r 13/54**, H01r 13/62

[58] Field of Search 339/45, 75, 91; 24/230 AM, 24/230 AK, 230 AV, 230 A; 287/119, DIG. 9, DIG. 13; 285/81, 82, 87, 88, 305, 320, 89-91

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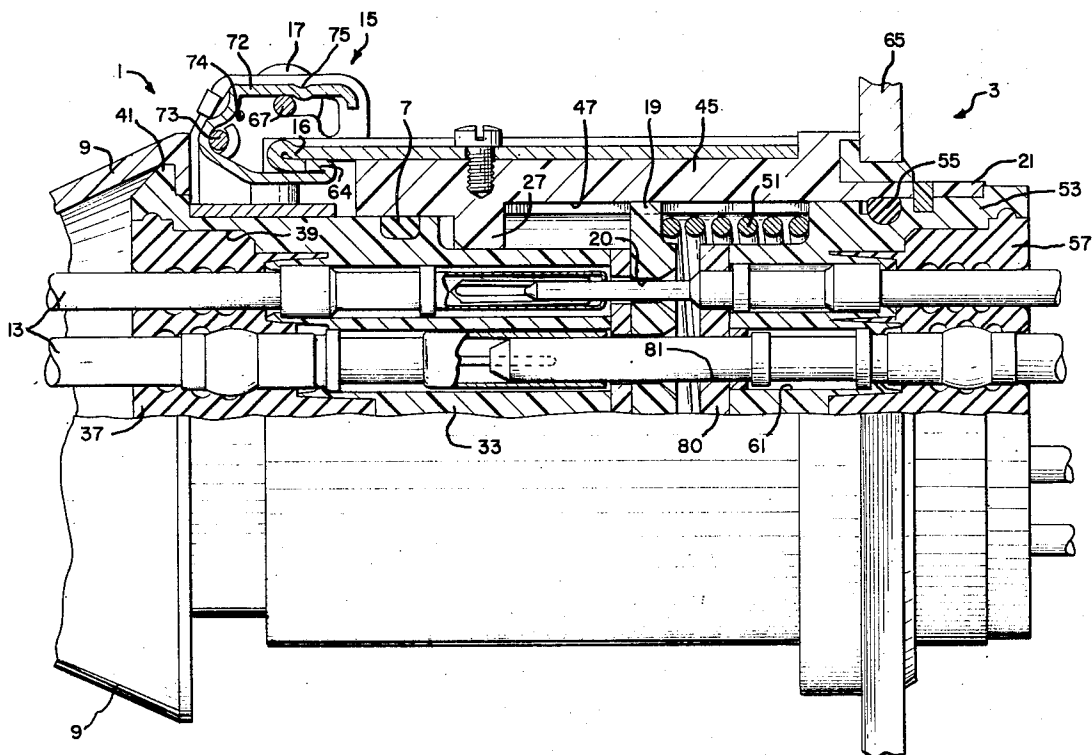
Assistant Examiner—Terrell P. Lears

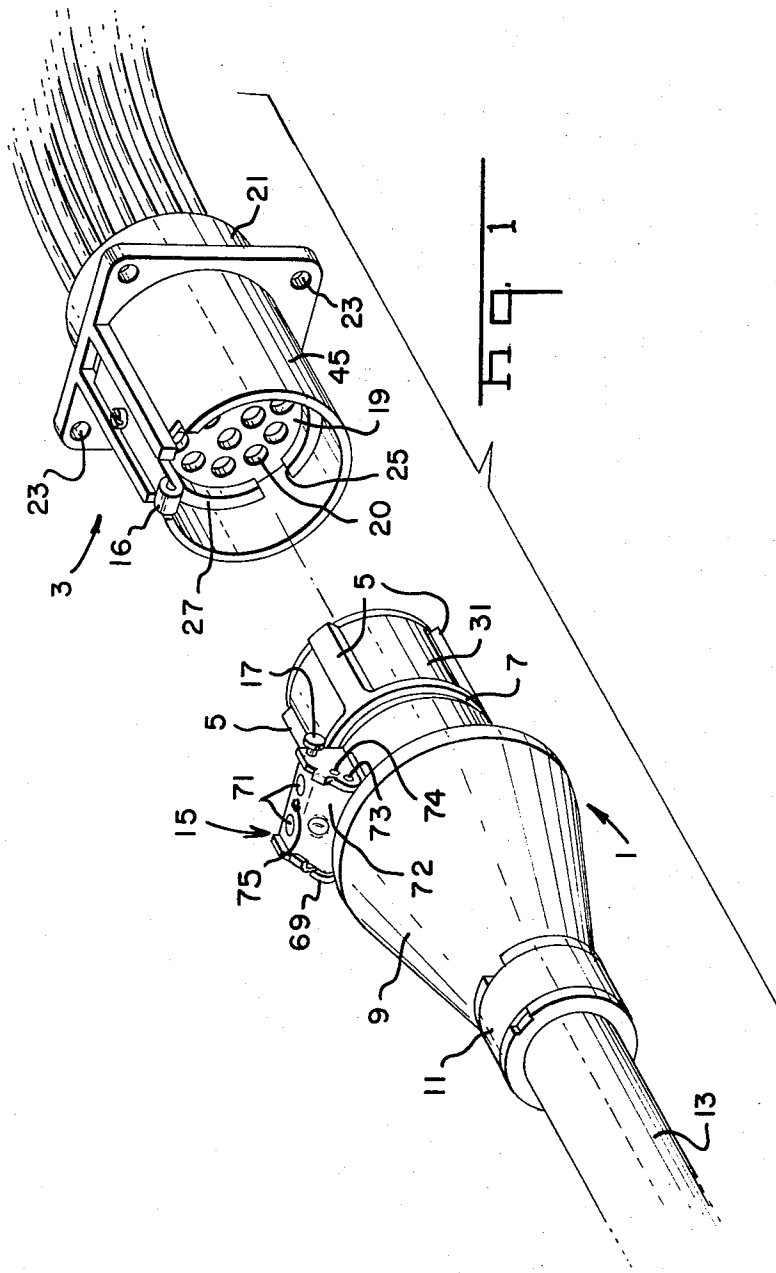
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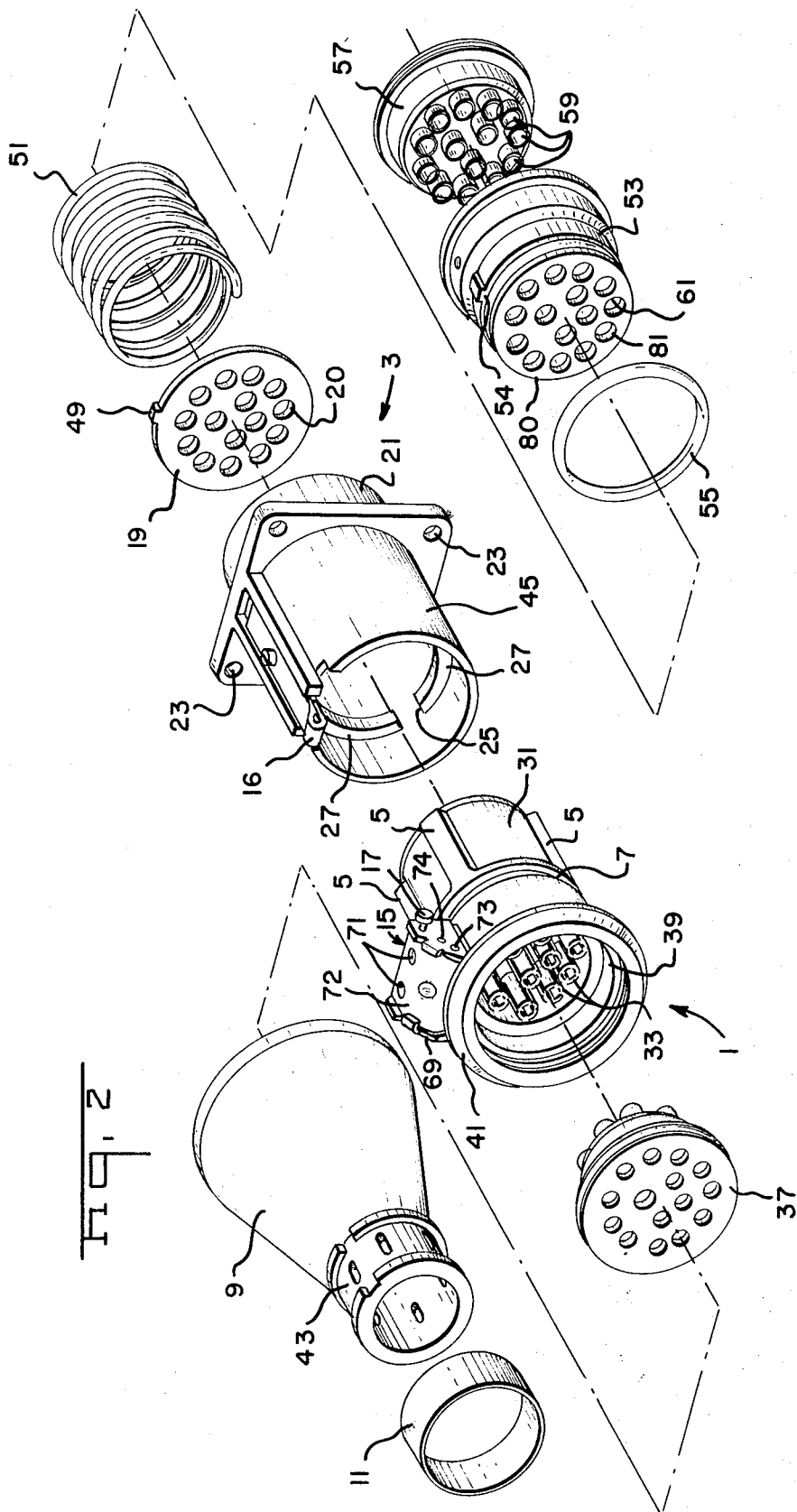
[57] **ABSTRACT**

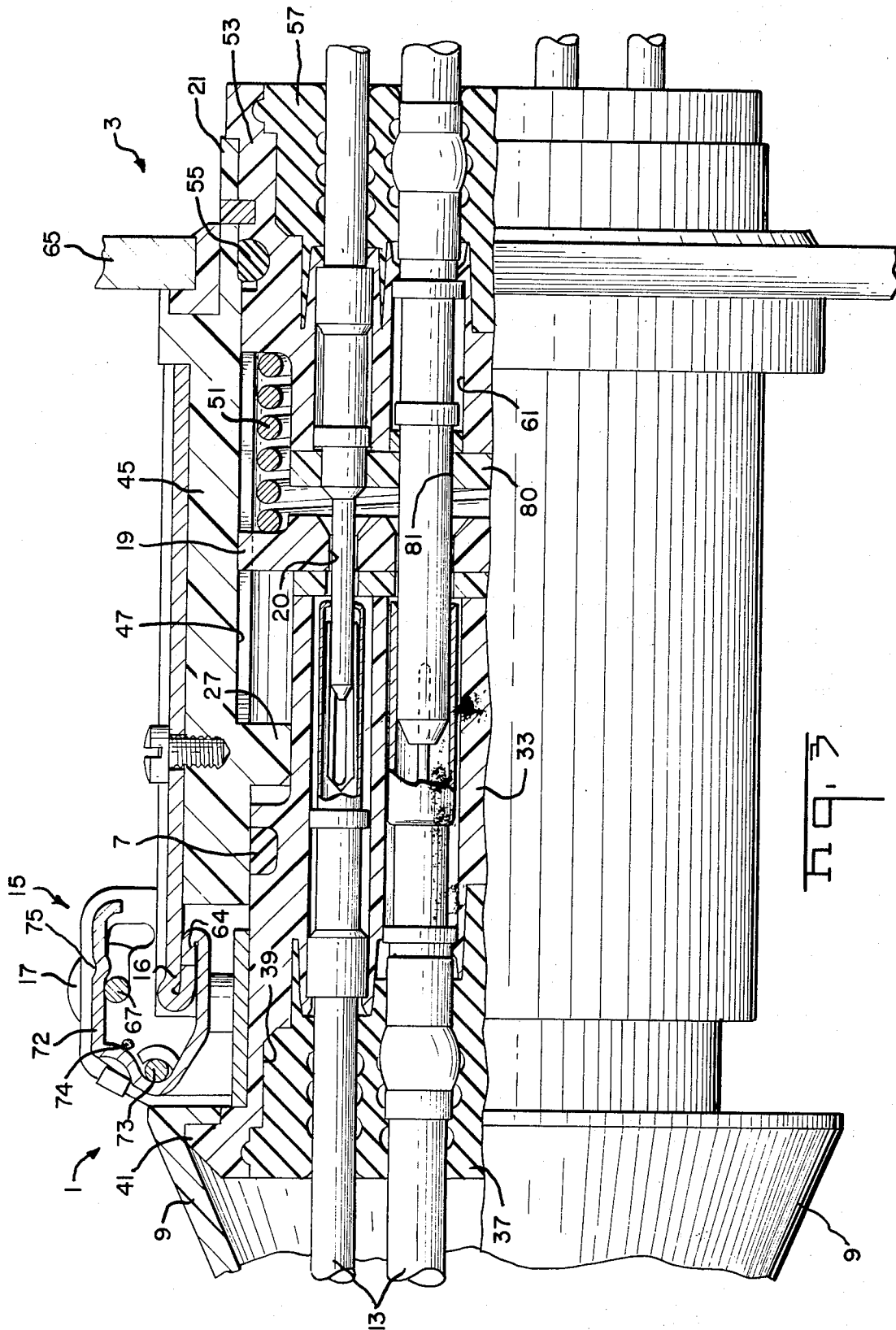
The disclosure relates to an electrical connector which comprises mateable housing parts having latching means to latch the housing parts together when they are mated together in a polarized manner. The latching means is provided with means to maintain the latching means in a positively latched position to maintain housing part latched and a loaded spring to disengage the members when unlatched. Integral contact retention means are provided in the housing parts to retain the electrical contacts within the housing parts.

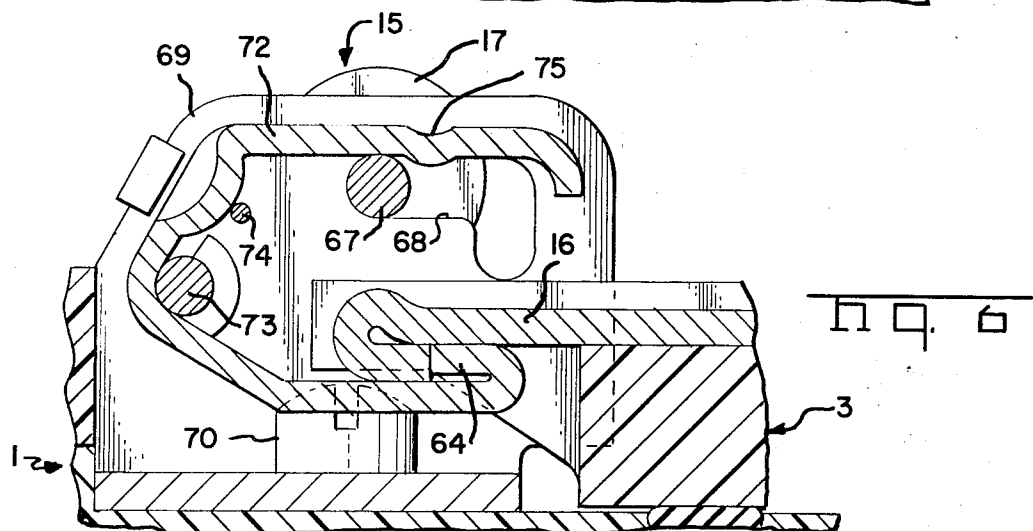
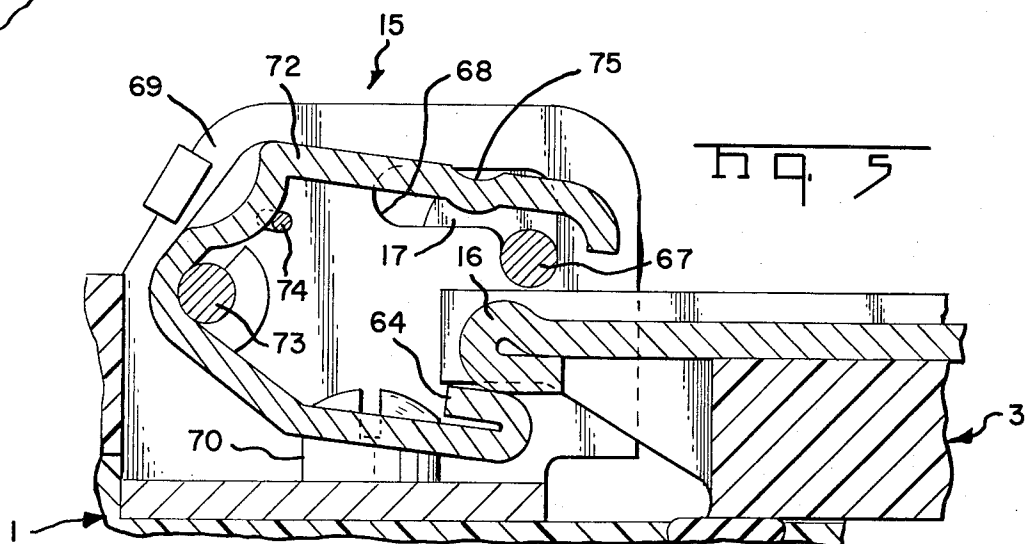
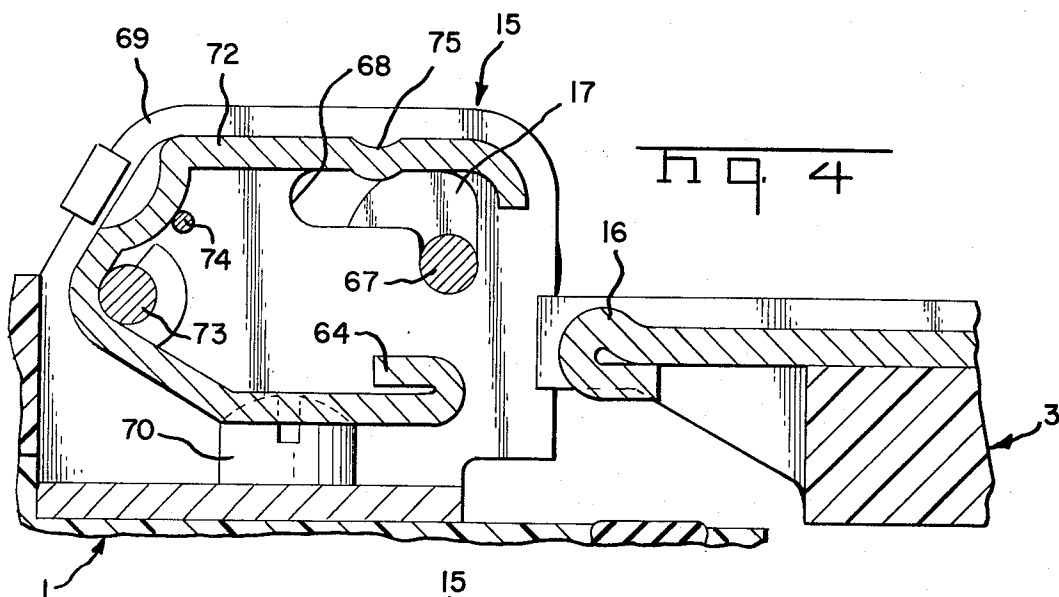
4 Claims, 10 Drawing Figures

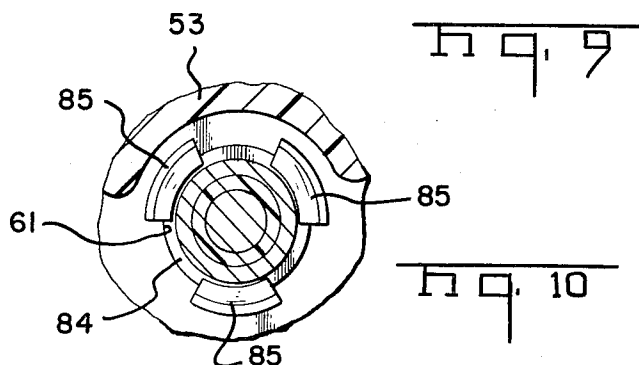
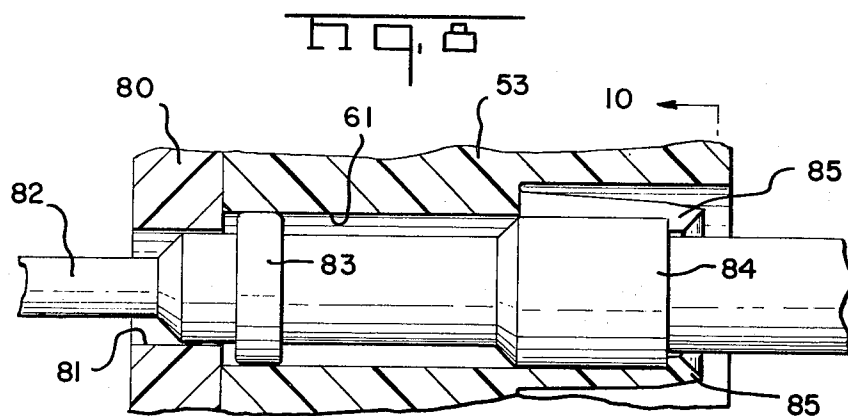
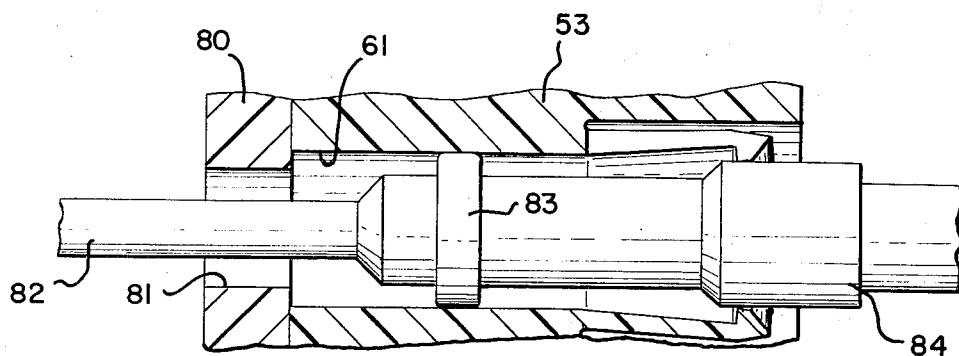
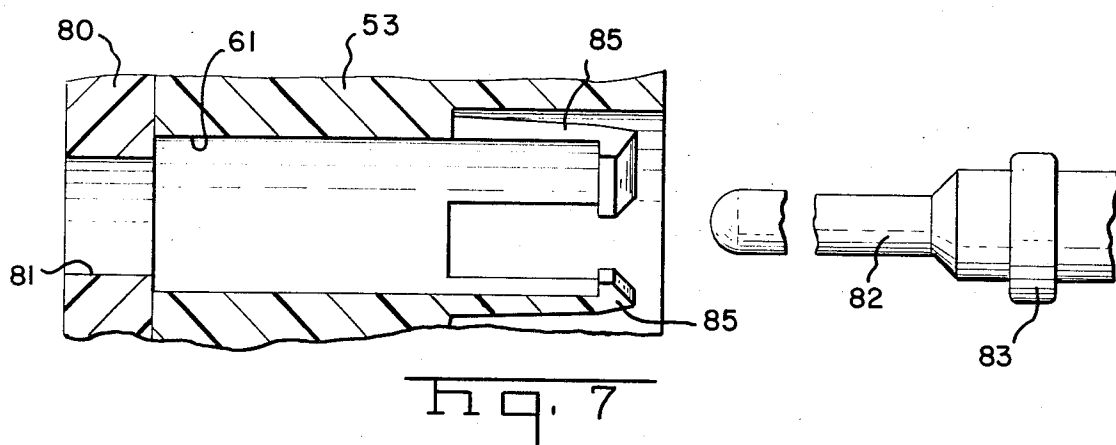












ELECTRICAL CONNECTOR

This invention relates to light weight rugged plug and receptacle having a quick connect snap latching and quick lease device.

General purpose pop out type connectors have been known in the art. However, connectors of this type have been relatively expensive to produce and have displayed problems in that the latching devices for maintaining the housing parts together often became unlocked, allowing the connector to become disassembled and thereby provide a break in the electrical circuits.

In accordance with the present invention, there is provided an electrical connector of the above type having a locking means for locking together the housing parts and maintaining the parts in the locked position without damaging the locking mechanism upon assembly of the parts. Briefly, the above is provided by the use of a multiple latching member which is rotated upon entry therinto of a notched member from the mating housing, the latching member rotating back to its original position upon entry of the notch completely therinto.

It is therefore an object of this invention to provide a light weight rugged plug and receptacle circular connector for blind assembly with a quick connect snap latching and quick release means.

It is a further object of this invention to provide a safety means integral with a guarded latch system whereby the release latch can be locked against release in either the assembled or disassembled position without damaging the latching mechanism upon assembly of the locked release latch.

It is a yet further object of this invention to provide molded contact retention means in the receptacle and the plug portions of the connector whereby both pin and receptacle contacts can be inserted into and released from their respective means by a simple commercially available tool inserted into the rear openings of the receptacle and plug.

It is a still further object of this invention to provide an elastic conical strain relief which is designed to be snap retained on the rear of the plug and compression retained on the interconnecting cable by means of a self-contained heat shrinkable plastic band at the rear of the strain relief, means being provided whereby the heat shrinkable band can be easily removed in case of complete cable repair.

It is a yet further object of this invention to provide means for easily environmentally shielding and RFI shielding the connector at very low additional cost.

It is a still further object of this invention to provide an electrical connector having the above features in a relatively small size and configuration at relatively low cost relative to prior art connectors of type.

The above objects and still further objects will immediately become apparent to those skilled in the art after consideration of the following preferred embodiment thereof which is provided by way of example and not by way of limitation wherein:

FIG. 1 is a perspective view of an electrical connector in accordance with the present invention;

FIG. 2 is an exploded view of the electrical connector in accordance with the present invention;

FIG. 3 is a cross sectional view of the electrical connector of FIGS. 1 and 2 after mating thereof;

FIG. 4 is a cross sectional view of the latch-device of FIG. 3 prior to mating of the housing members;

FIG. 5 is a view the same as FIG. 4 but with the housing members partially mated;

FIG. 6 is a view same as FIGS. 4 and 5 with the housing members fully mated;

FIG. 7 is a cross sectional view of the contact assembly of a connector of the present invention prior to insertion;

FIG. 8 is a cross sectional view the same as FIG. 7 with the contact member partially inserted;

FIG. 9 is a cross sectional view the same as FIGS. 7 and 8 with the contact member fully inserted; and

FIG. 10 is a view taken along the lines 10—10 of FIG. 9.

Referring first to FIG. 1, there is shown an electrical connector in accordance with the present invention having male connector portion 1 and female portion 3. The male connector portion includes guiding and polarizing keys 5, there being one such polarizing key positioned on the male portion 1. The male portion 1 also may include an O-ring 7 which provides an environmental seal when mating with the female portion 3. The portion 1 also includes an elastic strain relief member 9 which provides protection for the cables terminating in the connector and may provide RFI shielding and which is easily removable for repair of the cables therein. A heat shrinkable cable retention band 11 is positioned at the portion of the elastic strain relief member 9 remote from the connector portion 1, the band 11 locking the collapsible strain relief member thereunder and over the incoming cable 13 thereto. The male portion 1 also includes a guarded release latch 15 and a safety lock 17 which forms a portion of the latch 15, the latch being mateable with a portion 16 of the female connector member 3 to provide a locking or latching between the two connector members 1 and 3.

The connector receptacle portion 3 includes a spring loaded pin guard disc 19 having apertures 20 therein behind which are connector elements which may comprise pins or special sockets for receiving the pins or sockets from the connector portion 1. The connector receptacle portion 3 also includes a flanged pin housing 21 having apertures 23 therein for securing the member 3 to a panel board or the like. The latch finger 16 is positioned on the top surface between guard rails 16 of the connector portion 3 for mating with the latch 15 to provide the locking action as will be explained in detail hereinbelow. The member 3 also includes a stop member 27 for preventing the spring loaded pin guard disc 19 from being biased outwardly by the springs therebeyond, the spaces 25 providing desired polarization in cooperation with plug guide and polarizing keys 5.

Referring now to FIG. 2, there is shown an exploded view of the connector in accordance with the present invention. Male portion 1 of the connector includes the terminal housing 31 having the release latch 15 and the safety lock 17 thereon and the polarizing and guiding portions 5. The cable receiving end of the connector portion 1 includes female or special male contact retention subassemblies 33 for receiving the individual wires 13 there being a terminal on each of said wires which mates with the sub-assembly 33. A sealing grom-

met 37 is positioned over the sub-assembly 33 in locking relation with the terminal housing 31 and within the aperture 39 thereof. The strain relief boot 9 is positioned over the rearward end of the terminal housing 31 and extends over the flange 41 which surrounds the recess 39, the heat shrinkable cable retention band 11 fitting over the portion 43 of the strain relief boot 9 and being shrunk thereon and over the cable 13 (FIG. 1) to provide a seal between the wires 13 and the interior of the terminal housing 31.

The receptacle portion 3 of the connector includes the flanged pin housing 21 with apertures 23 thereon for mounting on a panel board or the like. The portion 3 includes a receptacle housing 45 which includes the stop members 27 with associated polarizing spaces 25. Positioned rearwardly of the stop members 27 is the spring loaded pin guard disc 19 having an ear 49 thereon for proper orientation thereof within a keyway 47 (FIG. 3) in the mounting housing 45. The disc 19 abuts the rearward surfaces of the stop members 27 and includes a spring member 51 positioned therebehind to bias said member 19 against the stop members 27. A contact terminal housing 53 fits within an O-ring 55, the far end of the spring 51 resting against the flange 54 of the terminal housing 53 and the O-ring 55 being positioned over the terminal housing 53 as will be explained in greater detail hereinbelow. The rear portion of the receptacle housing 45 includes a sealing grommet 57 which is secured within the terminal housing 53 and includes apertures 59 therein which align with the apertures 61 of the terminal housing 20 and of the disc member 19 to allow the insertion therein of male or special contact pin elements.

Referring now to FIG. 3, there is shown a connector in accordance with the present invention in mated relation. The connector portion 3 is shown mounted in a panel 65, the spring 51 being in retracted condition. The latch finger 16 is secured within the latching member 15 and against a finger portion 64 of the latch 15, the finger portion 64 being retained in locking relation with latch 16 by means of the locking pin 67 of the latch 15 which rides along an L-shaped guide track 68 in the latch housing 69. The latch housing 69 is secured to the body portion 31 by means of screw member 70 (FIGS. 3 to 6) to which access can be gained by means of holes 71 (FIG. 2) in the latch member 15. U-shaped member 72, of which the finger 64 is a part, is pivoted in a housing 69 on a pivot 73, the pivot 73 being secured in the housing 69, as shown in FIGS. 2 and 4 through 6. The member 72 is normally biased in a counterclockwise direction as viewed in FIG. 4, by the spring wire 74 which is secured in the housing 69. When the housing members 1 and 3 are mated, latch finger 16 will enter into latch member 15 as shown in FIG. 5, the latch member 16 causing the U-shaped member 72 to rotate in a clockwise direction against the bias of spring member 74, due to the interfacing of latch 16 with the finger 64 as shown in FIG. 5. Upon complete entry of the latch 16 into the latch 15, U-shaped member 72 will again rotate in a counterclockwise direction due to the bias from the spring 74 as shown in FIG. 6, thereby engaging the latch portions 16 and 64 to provide the locking action between the housing members 1 and 3.

The housing members 1 and 3 can be locked by moving the safety lock 67 along the L-shaped groove, as shown in FIG. 6 and beyond the detent dimple 75 in the member 72 to prevent clockwise motion of U-shaped member 72. The latch 16 is formed from resilient material so that, even if the safety lock 67 is in the locked position as shown in FIG. 6, interfacing between the latch 16 and finger 64 will still cause the latch 16 to move upwardly and allow locking of the two housings in the manner above described.

If it is desired to release the connector portions 1 and 3, the safety latch 67 is placed in the position shown in FIGS. 4 and 5, thereby allowing the arms 72 to be rotated in a clockwise direction by thumb or finger pressure which is applied thereto. This thumb or finger pressure which is applied thereto will rotate the arm 72 in the manner shown in FIG. 5 and allow removal of the latch member 16 therefrom. The clockwise movement of the U-shaped arm 72 will allow the latch member 16 to automatically pop out of the latch member 15 due to the bias applied by spring 51 against the spring loaded pin guard disc 19, as will be explained in more detail hereinbelow.

With reference now to FIGS. 2 and 3, in particular, it will be noted that when the connector member 1 is mated with the connector member 3, the polarizing and guiding keys 5 pass through spaces 25 and against the pin guard 19, thereby forcing the pin guard rearwardly in the receptacle housing 45 and compressing the spring 51, the spring 51 being shown in the compressed state in FIG. 3. Upon release of the latch as explained in detail hereinbelow, force applied by spring 51 against the pin guard disc 19 forces the connector member 1 out of the connector member 3, thereby completely breaking the electrical connections made and separating the two connector portions 1 and 3.

Terminal housing 53 and assembly 33 contain both male and female connector retention elements therein as shown in FIG. 3 and in greater detail in FIGS. 7 to 10. Since both the elements 33 and 53 will contain the same type of terminal retention means, a description will be made reference to only one of them, it being understood that the description applies to the other as well. The housing 53, as shown in FIG. 3, includes a bonded plate 80 on its leftward end having apertures 81 therein of slightly smaller dimension than the apertures 61 of the terminal housing 53. In this manner, with reference to FIGS. 7 to 10 in particular, a pin member 82 having a peripheral flange 83 thereon, will be forced through sealing grommet 57 (FIG. 3) and into the aperture 61 of the terminal housing 53. The pin 82 will continue to be advanced forward until the smaller diameter front end thereof passes through aperture 81 of the plate 80, the flange 83 coming to rest against the plate 80. The rear portion of the pin 82 includes an enlarged portion 84 which passes a plurality of latching fingers 85 and rests therewithin when the flange 83 abuts or substantially abuts plate 80, as shown in FIG. 9. At this point, the pin 82 is locked into the connector.

Though the invention has been described with respect to a specific preferred embodiment thereof, many variations and modifications thereof will immediately become apparent to those skilled in the art. It is therefore the intention that the appended claims be interpreted as broadly as possible in view of the prior art to include all such variations and modifications.

What is claimed is:

1. In an electrical connector having a pair of mating housing members with mateable electrical terminals in said housing member, the improvement comprising: a latching finger on one of said housing members, a latching member on the other of said housing members including a pivotally mounted and generally U-shaped member, resilient spring means engaging said U-shaped member, said latching finger being engageable with one end portion of said U-shaped member, said U-shaped member being pivotally actuatable upon said engagement by said latching finger and pivotally actuatable against the resilient action of said resilient spring means, thereby allowing said latching finger to be properly positioned for latching engagement with said resilient spring means, said U-shaped member being resiliently actuatable by said resilient spring means into latching engagement with said latch finger, the other end portion of said U-shaped member having a

manually pressible portion actuatable against the resilient action of said resilient spring means to unlatch said U-shaped member from said latching finger, and safety lock means engageable with said other end portion of said U-shaped member and preventing actuation of said U-shaped member in response to pressure against said pressible portion.

2. The structure as recited in claim 1, and further including, detent means on said other end portion of said U-shaped member for removably retaining said safety lock means.

3. The structure as recited in claim 1, and further including, groove means in said latch member for slidably receiving said safety lock means.

4. The structure as recited in claim 2, and further including: groove means in said latch member for receiving said lock means, with said detent means positioned adjacent to said groove means.

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