

Nov. 16, 1965

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3,218,599

ELECTRICAL CONNECTOR

Filed March 6, 1963

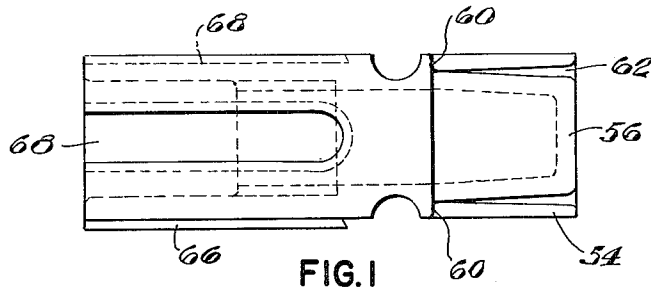


FIG. 1

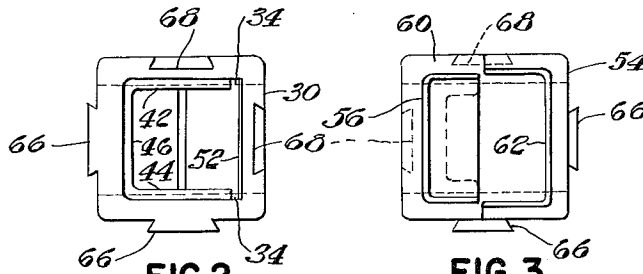


FIG. 2

FIG. 3

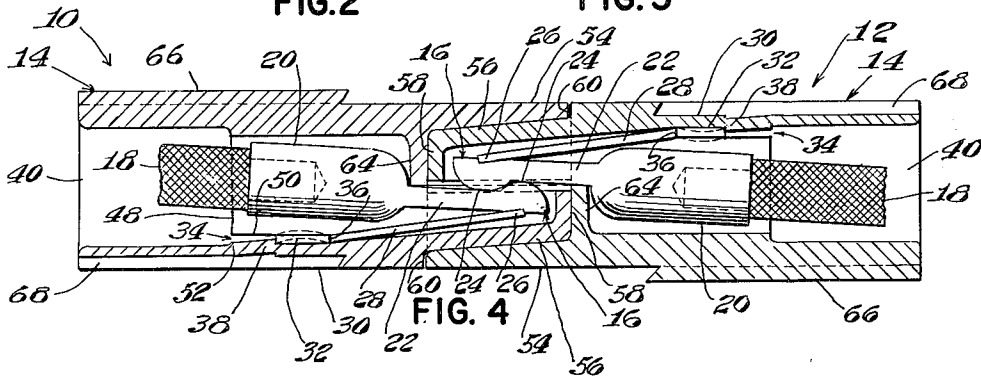


FIG. 4

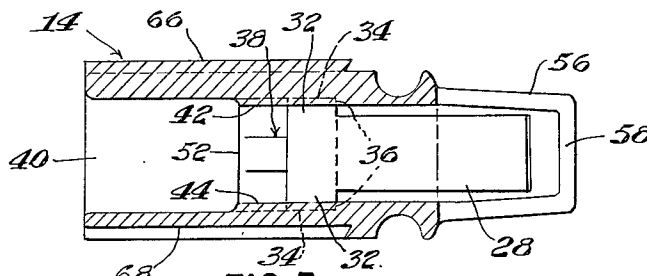


FIG. 5

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3,218,599

ELECTRICAL CONNECTOR

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Filed Mar. 6, 1963, Ser. No. 263,300
8 Claims. (Cl. 339-47)

This invention relates to an electrical connector.

The invention has for an object to provide a novel and improved electrical connector of the type adapted to be engaged by an identical connector and which is characterized by novel and simple structure whereby the connector may be more economically manufactured.

Another object of the invention is to provide a novel and improved structure of the electrical connector illustrated and described in my United States Patent No. 2,838,739, issued June 10, 1958.

With these general objects in view and such others as may hereinafter appear, the invention consists in the electrical connector hereinafter described and particularly defined in the claims at the end of this specification.

In the drawings illustrating the preferred embodiment of the invention:

FIG. 1 is a plan view detail of the insulating housing for the present connector;

FIGS. 2 and 3 are end views of the same as seen from the left and right hand ends, respectively, of the housing shown in FIG. 1;

FIG. 4 is a cross sectional view of a pair of identical single pole connectors joined together; and

FIG. 5 is a cross sectional view of the insulating housing showing a leaf spring terminal retaining member assembled therewith.

In general the present invention contemplates an electrical connector of novel construction of the type having one or more identical rigid contact or terminal members and which is adapted for longitudinal telescoping engagement with a second and identical connector. The present connector is provided with an insulating housing surrounding and enclosing the terminals for maximum insulating protection and in which provision is made for movably and yieldably mounting the terminals in a manner such that the terminals may be resiliently interlocked in their engaged position so as to prevent inadvertent disengagement thereof during normal usage. The present terminals are also adapted for self-cleaning during engagement and disengagement thereof and are shaped so that any pitting of the terminals caused by arcing at the extreme ends thereof during disengagement will not impair the efficiency of the terminals at the areas of contact in their engaged position.

Provision is made for resiliently urging the terminal member of one connector into contacting engagement with the terminal member of a second connector. In the illustrated embodiment of the invention an elongated leaf spring mounted in the housing and retained therein is arranged to resiliently bear against the rear face of a terminal member and is also arranged to cooperate with a portion of the terminal member to prevent withdrawal of the latter from its insulating housing. In accordance with the present invention the insulating housing is molded in one piece and is particularly formed in a manner such as to facilitate assembly of the leaf spring in the housing. After assembly of the leaf spring a portion of a wall of the housing is upset in a manner such as to retain the leaf spring in assembled relation with the housing to prevent displacement thereof in a simple, efficient and economical manner.

Referring now to the drawings, FIG. 4 illustrates a pair of single pole electric cable connectors, indicated generally at 10 and 12, comprising exact counterparts adapt-

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ed for longitudinal telescoping engagement to form an electrical connection. As herein shown, each connector includes a hollow insulating housing 14 arranged to support a rigid contact member 16 in detached relation to the walls of the housing and which forms the terminal of an electric cable 18. Each terminal is provided with a cylindrical end portion 20 bored to receive the end of the cable into which the latter may be soldered. The contacting end of each terminal comprises an extended portion 22 substantially rectangular in cross section and provided with a rounded or convex end portion 24 projecting from one surface thereof. The opposite face of the contacting end of each terminal is provided with a notch 26 arranged to be engaged by the forward or free end of an elongated leaf spring 28.

As herein shown, the elongated leaf spring 28 is T-shaped at its other end and is arranged to lie flat against the bottom wall 30 of the housing, as shown in FIG. 4, and a prestressed portion then extends upwardly at an angle to present the forward end of the leaf spring in a position to be engaged in the notch 26 of the terminal. The laterally extended legs 32 of the T are fitted into opposed grooves 34 formed in the bottom wall 30 of the one piece molded housing. The opposed grooves 34 terminate at 36 to form a stop for the forward edges of the legs of the T, and in assembly the leaf spring is extended through the cable end of the housing and into the grooves to present the forward edges of the legs of the T against the ends 36 of the grooves. The leaf spring thus assembled with the housing is frictionally retained in the groove, and in practice the legs of the T may be convex or curved in cross section, as shown in dotted lines in FIG. 4, so that when the T is inserted into the relatively narrow grooves 34 the ends of the legs will be resiliently flattened so as to assure frictional retention of the leaf spring in assembled relation with the housing. It will be observed that the grooves 34 hold the leaf spring from rocking movement and also prevent forward displacement of the spring. In order to prevent rearward displacement of the frictionally held leaf spring, the bottom wall 30 of the housing is then deformed upwardly at a point adjacent the rear edge of the T. This may be simply and economically performed by striking the outer wall with a tool so as to provide a relatively narrow upset portion 38 on the interior wall immediately behind the rear edge of the T and at a point intermediate the ends thereof, as shown in FIGS. 4 and 5, to thus prevent longitudinal displacement of the spring rearwardly toward the cable end. In the preferred embodiment of the invention, the insulating housing comprises a deformable plastic material, such as polycarbonate resin, characterized by its ability to be worked in a manner similar to a malleable metal so as to permit formation of the upset or offset portion 38 after the spring has been inserted in the grooves as described.

The illustrated hollow insulating housing 14 is substantially rectangular in cross section having a rearwardly extended rectangular opening 40 at its cable end. This opening 40 in the molded one piece structure is reduced in width along three walls thereof as indicated at 42, 44, 46, starting at a line 48, in FIG. 3, the reduced width side wall portions 42, 44 terminating at a point 50 upwardly from the bottom wall to form the upper walls of the grooves 34 as shown. The bottom wall 30 of the housing is also slightly increased in thickness as indicated at 52 to form the bottom wall of the opposed grooves 34.

The forward end of each housing is provided with forwardly extended upper and lower portions 54, 56, respectively, the lower portion 56 comprising a forwardly extended terminal receiving pocket substantially U-shaped

in cross section and closed at its forward end by an end wall 58. As shown in FIGS. 4 and 5, the terminal receiving pocket is substantially coextensive with the inner walls of the cable opening and is preferably tapered towards its forward end. As illustrated herein, the exterior walls of the pocket are recessed or offset from the many body portion providing shouldered portions 60. In practice the contacting end of the terminal is inserted through the cable end of the housing to present the convex contacting portion 24 into the pocket, and during the inserting operation the end of the terminal member engages and presses downwardly against the upwardly inclined portion of the leaf spring 28, and when the forward end of the terminal member passes beyond the free end of the leaf spring the spring will snap upwardly into the notch 26 to prevent withdrawal of the terminal member.

The forwardly extended upper portion 54 of the insulating housing is coextensive with the body portion and shaped to provide an inverted U-shaped socket 62 open at its outer end and closed at its inner end by a transversely extended wall portion 64. The socket forming extension 54 extends over the terminal receiving pocket 56 and is of a size and shape such as to snugly receive the pocket 56 of a second and identical connector, as shown in FIG. 4, the outer end of the socket forming extension of one connector engaging the shouldered portions 60 of the second connector when the connectors are fully engaged. Also, when thus engaged, the closed end wall 58 of the pocket 56 of one connector engages with the transversely extended inner wall 64 of the socket of the second connector.

With this construction it will be seen that when two identical connectors are engaged by extending the pocket of one connector into the socket of a second connector the rounded contacting faces 24 of each spring pressed terminal are slidingly engaged by each other, initial inward movement of the connectors effecting downward movement of the terminals in their respective pockets against the leaf springs 28. Upon continued inward movement the high points of the curved portions pass by each other, and as the connectors approach full engagement the springs 28 effect upward movement of the terminals in their pockets to present the curved portions 24 in hooked or interlocking relation to each other as illustrated.

The illustrated connectors embodying the present invention are substantially rectangular in cross sectional outline, as described, and are further provided with longitudinally extended dovetail shaped tongues 66 and grooves 68 on opposite sides thereof. This structure is for the purpose of permitting a plurality of electrical connectors to be assembled side by side and one on top of the other to provide a module assembly or bank of connectors adapted to be engaged by a bank of identical connectors. This feature of applicant's invention forms the subject matter of a second application filed concurrently herewith.

From the above description it will be seen that the present invention provides a novel and improved structure of electrical connector having novel provision for assembling and securing the terminal retaining leaf spring in the insulating housing in an efficient and economical manner.

While the preferred embodiment of the invention has been herein illustrated and described, it will be understood that the invention may be embodied in other forms within the scope of the following claims.

Having thus described the invention, what is claimed is:

1. An electrical connector comprising a hollow insulating housing, a rigid terminal member extended into the housing and carried in detached relation to the walls thereof, said terminal member being adapted for engagement with a terminal member of a second connector, a leaf spring carried by the housing having a fixed end and a free end, said free end being engageable with a portion

of said terminal to prevent withdrawal of the same, the fixed end of said leaf spring having laterally extended portions, one wall of said housing having an elongated interior groove closed at one end for receiving said laterally extended portions, said laterally extended portions being seated at the closed end of said groove to prevent longitudinal displacement of the same in one direction, and an upset portion in said one wall disposed to prevent longitudinal displacement of the leaf spring in the other direction.

2. An electrical connector as defined in claim 1 wherein the upset portion is formed after assembly of the leaf spring in said groove.

3. An electrical connector as defined in claim 1 wherein the upset portion is formed after seating the leaf spring in the closed end of said groove by striking a blow from the exterior to deform the interior wall of the housing.

4. An electrical connector as defined in claim 1 wherein the fixed end of the leaf spring is T-shaped, and said one wall is provided with opposed groove portions for receiving the laterally extended ends of said T-shaped end.

5. An electrical connector as defined in claim 4 wherein the laterally extended portion of the T is curved in cross section and the opposed groove portions are relatively narrow, said curved portion being resiliently flattened when inserted in said relatively narrow groove portions whereby to frictionally retain the leaf spring in the housing.

6. An electrical connector as defined in claim 1 wherein the insulating housing comprises a deformable plastic material and wherein said upset portion is formed by deforming said one wall after frictionally seating the leaf spring in said groove.

7. An electrical connector as defined in claim 6 wherein the upset portion is relatively narrow and is disposed medially of the ends of said laterally extended T-shaped end.

8. An electrical connector comprising a hollow one piece insulating housing of deformable plastic material having a connecting end and a cable end and adapted for longitudinal telescopic engagement with a second and identical connector, a rigid terminal member extended through the cable end in detached relation to the walls of the housing to present the contact end of the terminal member in operative relation to the connecting end, an elongated leaf spring carried by said housing and having a prestressed free end portion for resiliently urging the contact end of the terminal in a direction for cooperation with a terminal carried by a second connector, the free end of said leaf spring being engaged with a portion of said terminal to prevent withdrawal of the same, the fixed end of said leaf spring being T-shaped, said housing having an interior grooved portion closed at one end for receiving the laterally extended portion of the T prior to assembly of the terminal member, said T-shaped portion being frictionally retained in said grooved portion and held from longitudinal displacement toward the contact end by the closed end of said groove, and an upset portion formed in a wall of the housing after assembly of the leaf spring in the groove and disposed adjacent the outer edge of the T-shaped portion to prevent longitudinal displacement of the leaf spring toward the cable end of the housing.

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