Nov. 15, 1966 J. E. MARLEY ET AL 3,286,220

ELECTRICAL CONNECTOR MEANS

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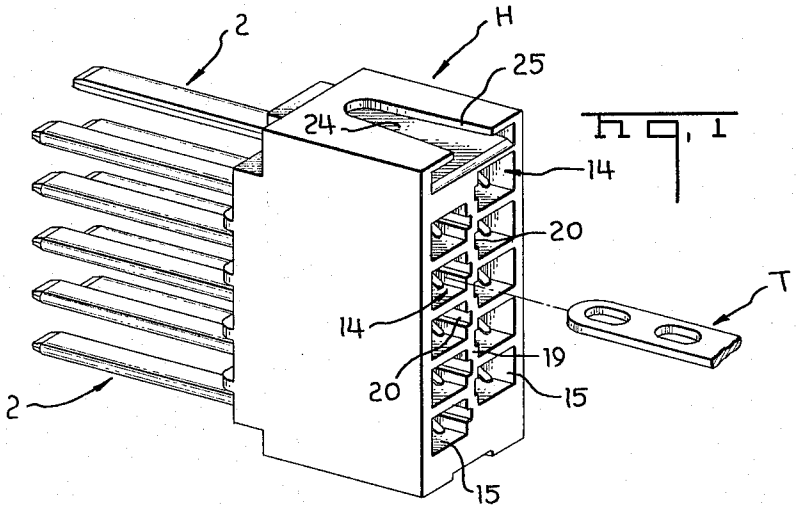


Fig. 1

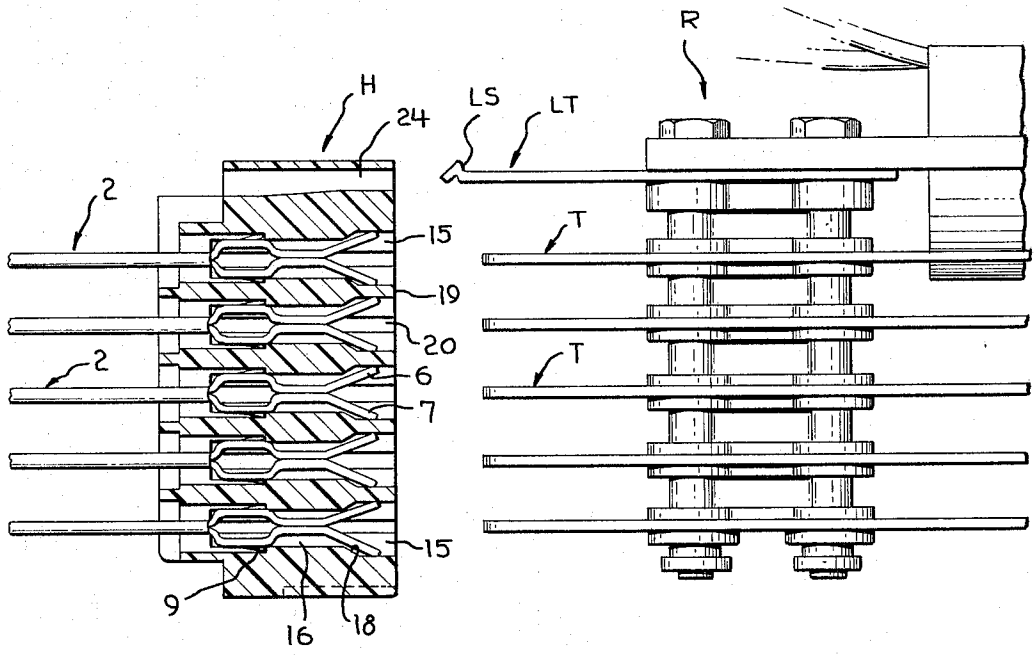


Fig. 2

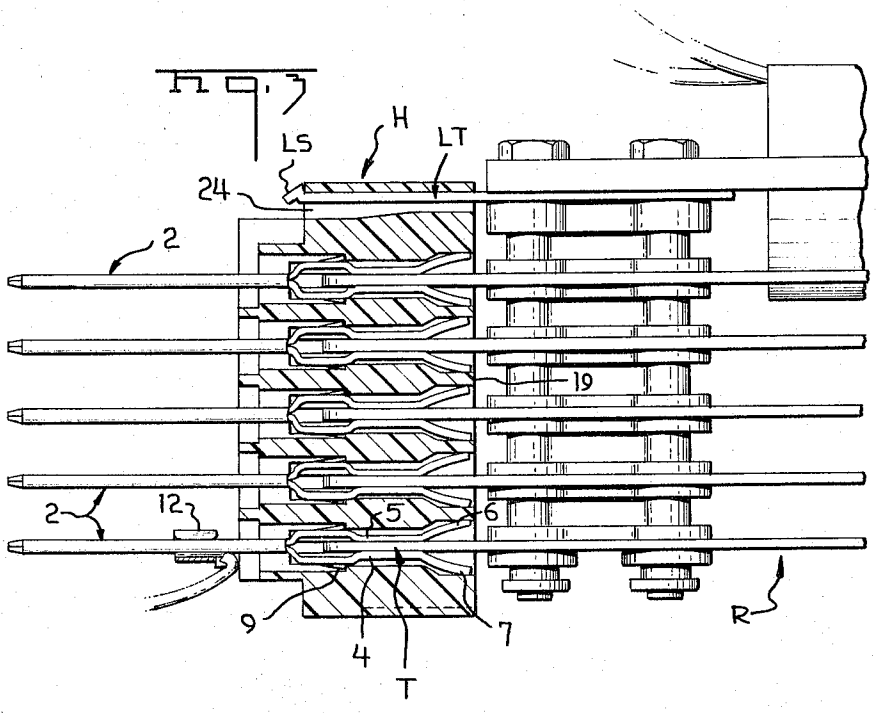
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Fig. 3



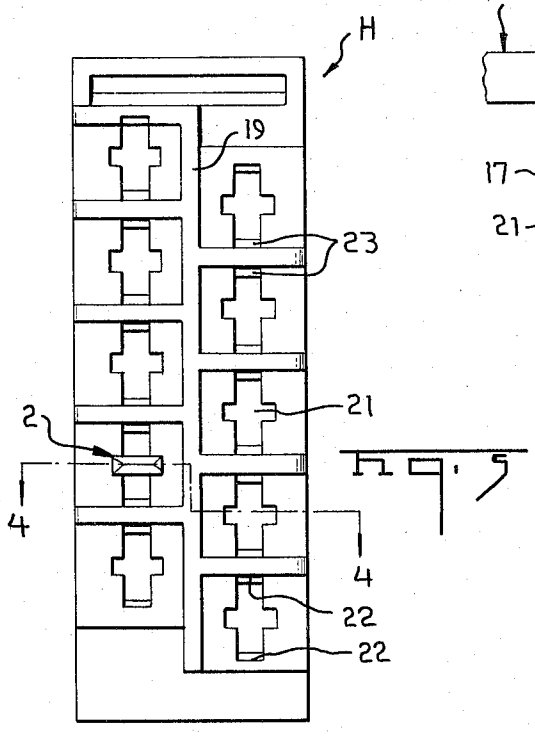


Fig. 5

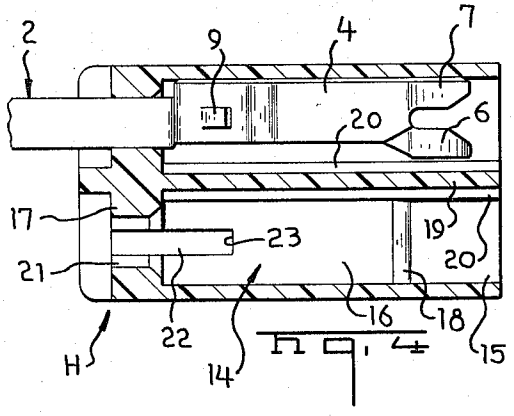


Fig. 4

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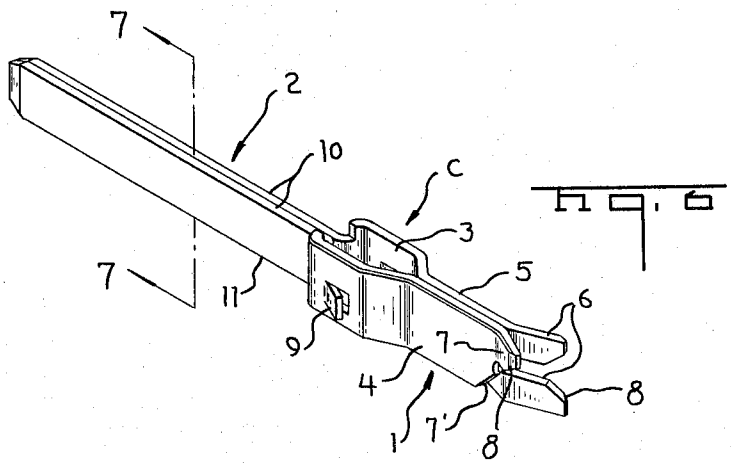


Fig. 6

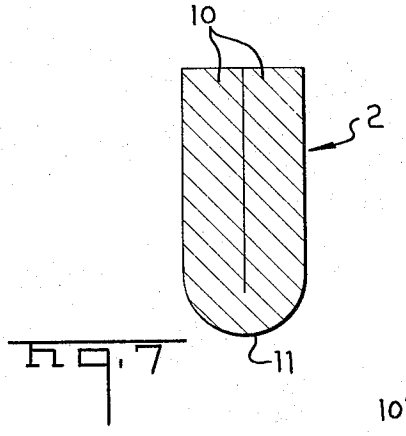


Fig. 7

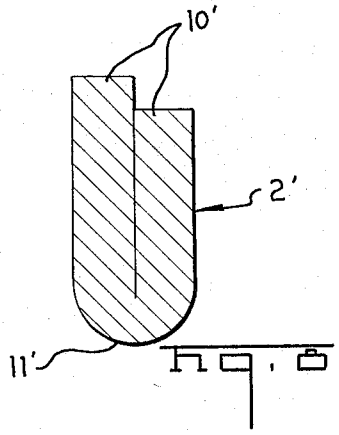


Fig. 8

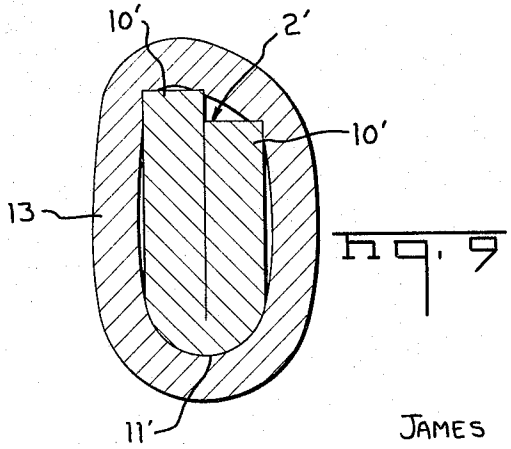


Fig. 9

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3,286,220

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ELECTRICAL CONNECTOR MEANS

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Filed June 10, 1964, Ser. No. 373,967

7 Claims. (Cl. 339—192)

This invention relates to electrical connector means and more particularly electrical connector means of the receptacle type adapted to receive tab means.

In the field of electrical connector means of the receptacle type, it is desirable that the contact receiving means for reception of a tab means provides a firm mechanical and electrical connection and remains reliable over an extended period of time as well as having low insertion and withdrawal force. It is also desirable in this type of electrical connector means or in any other type of electrical connector means that utilizes post means for connecting a lead means thereon, that the post means be suitable to be used for various types of connections and that it be of sufficient strength to withstand the force of connection.

It is, therefore, an object of the present invention to provide an electrical connector means that provides firm mechanical and electrical connection along an extended area.

Another object of the present invention is to provide post means for use in conjunction with various types of connections and which has strength to withstand force of connection.

A further object of the present invention is the provision of electrical connector means that provides uniform contact pressure at low insertion and withdrawal forces.

An additional object of the present invention is to provide an electrical connector means which is flexible to comply with connector elements of varying dimensions and of different types.

Other objects and attainments of the present invention will become apparent to those skilled in the art upon a reading of the following detailed description when taken in conjunction with the drawings in which there are shown and described illustrative embodiments of the invention; it is to be understood, however, that these embodiments are not intended to be exhaustive nor limiting of the invention but are given for purposes of illustration and principles thereof and the manner of applying them in practical use so that they may modify them in various forms, each as may be best suited to the conditions of a particular use.

In the drawings:

FIGURE 1 is a perspective view of housing and terminal assembly;

FIGURE 2 is a partial side elevational view of a relay with housing and terminal in section and exploded therefrom;

FIGURE 3 is a view similar to FIGURE 2 but with parts in engagement;

FIGURE 4 is a cross-sectional view taken along lines 4—4 of FIGURE 2;

FIGURE 5 is a rear view of FIGURE 2 of the housing with all but one terminal omitted for purposes of clarity;

FIGURE 6 is a perspective view of a terminal;

FIGURE 7 is a cross-sectional view taken along lines 7—7 of FIGURE 6;

FIGURE 8 is a view similar to FIGURE 7 but showing an alternative embodiment; and

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FIGURE 9 is a view similar to FIGURE 8 with wire-wrap thereon.

The present invention will be described in conjunction with relays wherein the tab portions of the contacts thereof, on which it is customary to solder wire to effect electrical connections thereto, will be engaged instead by novel connector means and the housing in which they are disposed to define a socket connector means; however, it is to be illustrative of the invention and not limited thereto.

Connector means C, as illustrated clearly in FIGURE 6, comprises a tab-receiving section **1** and a post section **2**. Section **1** includes almost identical portions in opposite relationship which define a box-shaped portion **3** and tines **4** and **5** which are in engagement from portion **3** to a point at which tine **5** has an outer forked section comprising two prongs **6** while tine **4** contains only one prong **7**. As can be discerned, prongs **6** and **7** extend away from each other at an angle of about 30° on each side of the center line of the connector means. The area between the box-shaped portion and the prongs defines a tab-engaging section.

The outside edge **8** of each prong is swaged. A lance **9** extends outwardly from the sides of box-shaped portion **3**, and its free end is directed toward the prongs. It should be noted that the forward ends of portion **3** are disposed at an angle of about 45° on each side of the center line.

Post section **2** includes an elongated portion **10** extending outwardly from each rear end of portion **3**, and elongated portions **10** are connected together at edge **11** along the entirety thereof from portion **3** to the outer ends thereof. Portions **10** are in tight engagement with each other, and this is effected during the formation of the connector means wherein edge **11** is the line along which portions **10** are folded, and the metal along edge **11** has been stretched with a recognized incipient yielded condition; however, such condition is not detrimental to the effect of normal forces that would tend to separate these portions. Connector means C is preferably formed in accordance with conventional progressive stamping techniques and post section **2** is formed during the stamping operation to effect the tight engagement between portions **10**. Thus, there is formed a post that is double in thickness which also has excellent strength characteristics to withstand any conventional connection pressure. The outer end of post section **2** has been swaged on all sides.

Post section **2** is, therefore, suitable to receive a connector **12** (see FIGURE 3) of the type disclosed in U.S. patent application, Serial No. 338,663, filed January 20, 1964, now Patent No. 3,243,757 and assigned to the present assignee. The swaged outer end of post **2** facilitates the application of such a connector thereon.

FIGURE 8 illustrates an alternative post section **2'** wherein the free ends of portions **10'** are offset one with respect to the other in order to provide three sharp edges instead of two as shown in FIGURE 7 where the free ends of portions **10** are disposed in the same plane. Post section **2'** is, therefore, suitable for the application of conventional wire-wrap **13** as shown in FIGURE 9.

Connector means C is formed from material having good conductivity and containing suitable spring characteristics in order that the tines remain in engagement along the tab-engaging section. Such a material is, for example, alloys of copper, nickel, or Phosphor bronze.

Turning now to FIGURES 1–5, there is illustrated a housing member H of suitable thermoplastic or thermo-

setting plastic material, such as, for example, phenolic, nylon, polypropylene, etc. Housing H includes rows of openings 14 extending therethrough. The openings in one row are offset with respect to the openings in the other row. While only two rows of openings have been illustrated, it is obvious that only one row or more than two rows may be provided in the housing and the number of openings in each row is dependent upon the number of tabs to be received therein.

Each opening comprises a substantially square section 15 at the entrance thereof and which extends a short distance thereinto. Beyond section 15 is a rectangular section 16 which extends to a rear wall 17. The upper and lower surfaces of each opening contain an inclined surface 18 extending between sections 15 and 16.

A wall 19 separates the rows of openings. A channel 20 is disposed in wall 19 of each opening and extends to rear wall 17. A cross-shaped opening 21 is disposed in rear wall 17 with the short legs being disposed normal to wall 19. The outer ends of the long legs of cross-shaped opening 21 are located in the planes of the surfaces of section 15 which merge with inclined surfaces 18. These outer ends communicate with channels 22 which extend into section 16. The inner ends of channels 22 have abutting surfaces 23. One end of housing H has an opening 24 extending therethrough, and the front bottom edge is inclined. A U-shaped opening 25 is disposed in the outer wall of opening 24 and extends almost to the inner end thereof.

In assembly, post section 2 of a connector means C is inserted within an opening 14 of the housing with the widest part of the post section disposed normal to wall 19. Post section 2 passes through the short-legged section of opening 21 and this is grasped and pulled until prongs 6 and 7 engage the entrance to the opening because they extend slightly therebeyond and the tines in the tab-engaging section are not in engagement therealong when tab-receiving section 1 is not restrained. A tool (not shown) is placed between the inner ends of prongs 6, and when force is exerted thereon, the connector means is pushed within the opening which cause lances 19 to be cammed inwardly through engagement with opposed surfaces of section 16 until they reach channels 22 whereupon they spring outwardly so as to be in alignment with abutting surfaces 23 and the inner ends of the box-shaped portion engage wall 17.

The connector means is now locked in position within its respective opening and the same procedure is followed to insert the other connector means in their respective openings. In order to remove the connector means from the housing, a suitable tool (not shown) is inserted within channels 22 which deflects lances 19 inwardly until they are clear of surfaces 23, and by pushing on post section 2, the connector means can be removed.

As can be discerned from FIGURE 2, swaged edges 8 of the prongs engage opposing surfaces of section 15 forward of inclined surfaces 18 and opposing surfaces of section 16 engage the sides of box-shaped portion 3. Thus, both ends of tab-receiving section 1 are restrained by the housing, and contact pressure is also applied to the tab-engaging section so that the tines in this area are in resilient engagement therealong.

When tabs T of a relay assembly R, as shown in FIGURES 2 and 3, are inserted within respective openings 14 upon housing H being moved theretoward, they are brought into alignment with the tab-engaging sections of the connector means through engagement with channels 20. Latching tab LT also enters opening 24 in order to polarize the housing with respect to the tabs of the relay structure.

As tabs T enter the tab-engaging section, tines 4 and 5 of this section move away from each other along a pivot point located at the innermost line of engagement thereof; prongs 6 and 7 slide along the respective surfaces of section 15 against which they engage and this is facilitated due to swaged edges 8 thereof. If the edges of the prongs were not swaged, they would tend to bite into their respective surfaces of section 15 and thereby increase the insertion and withdrawal forces as well as cause a buckling effect to occur along the tab-engaging section.

After the housing has been fully positioned on tabs T, a latching shoulder LS of latching tab LT moves into engagement with the inner end of the outer wall of opening 24 in order to latch the housing onto the relay structure thereby preventing same from being accidentally removed therefrom. As housing H is being moved to its latched position, tabs T are moved along the tab-engaging section until the tabs reach their fully engaged position. During this movement, tines 4 and 5 move completely away from each other and engage the tabs completely along the tab-engaging section as shown in FIGURE 3. As the innermost line of engagement of the tines is disengaged during the movement of the tabs along the tab-engaging sections, the pressure exerted on the box-shaped portions by the housing causes the tines to move slightly forward along the tabs. Thus, there is effected firm mechanical and electrical connection along an extended area that is of uniform pressure at low insertion and withdrawal forces.

As can be discerned, there has been disclosed a novel connector means having a tab-receiving section that provides firm mechanical and electrical connection along an extended area and a post section of double thickness capable of withstanding connection forces of conventional connection elements and techniques; however, it is to be understood that the post section may be employed with other types of connector means and, therefore, need not be restricted to the above-described connector means.

It will, therefore, be appreciated that the aforementioned and other desirable objects have been achieved; however, it should be emphasized that the particular embodiments of the invention, which are shown and described herein, are intended as merely illustrative and not as restrictive of the invention.

What is claimed is:

1. In combination with a housing means having a longitudinally extending passage therein provided with channels in opposed surfaces thereof and an inner abutment wall having an opening therethrough, said channels disposed forward of said wall, a connector means having a tab-receiving section and a post section, said tab-receiving section being disposed within said passage and having a box-shaped section and tine means, said box-shaped section engaging opposed surfaces of said passage and being disposed adjacent said inner wall, means on said box-shaped section and disposed in said channels to lock said connector means in said passage, said tine means extending along and toward a front opening of said passage, said tine means including portions in extended engagement defining a tab-engaging section and end sections extending away from each other with the ends thereof being in sliding engagement with said opposed surfaces, said box-shaped section and the ends of said end sections providing spaced lines of pressure being applied to said tab-engaging section to resiliently maintain said portions in engagement, said post section extending through the opening in said inner wall for engagement with a conductive means.

2. A housing means according to claim 1 wherein said housing means includes a polarizing means.

3. A connector means according to claim 1 wherein said post means has two portions in tight engagement along opposed surfaces and being interconnected along one longitudinal edge thereof.

4. A connector means according to claim 1 wherein the free edges of the post means are disposed in the same plane.

5. A connector means according to claim 1 wherein one free edge of the post means is offset from the other free edge.

6. A socket connector comprising a housing means having a passage extending therethrough to an inner wall thereof, an opening located in said inner wall, channels disposed in opposing surfaces of said passage forward of said inner wall, a connector means disposed in said passage having a tab-receiving section within said passage and a post section extending through the opening of and beyond said inner wall, said tab-receiving section having sections on each side of a tab-engaging section in engagement with the opposed surfaces of said passage to apply pressure to said tab-engaging section for resilient engagement along an extended area thereof with a tab element when it is inserted therein, and means on said tab-receiving section disposed in said channels to lock said connector means in said passage.

7. A socket connector according to claim 6 wherein said passage has a forward and inner section, said forward section being larger than said inner section.

References Cited by the Examiner

UNITED STATES PATENTS

2,511,806	6/1950	Macy	339—276
3,142,891	8/1964	Travis	339—276 X
3,178,674	4/1965	Scheller	339—256 X
3,192,445	6/1965	Evans et al.	339—17 X
3,192,498	6/1965	Ruehlemann	339—258 X

FOREIGN PATENTS

125,794	6/1945	Australia.
638,164	3/1962	Canada.
899,807	12/1953	Germany.
1,005,130	9/1965	Great Britain.

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