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Halbeck

[11] **3,717,838**

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[54] **INTEGRATED WIRE TERMINATION SYSTEM HAVING INTEGRALLY FORMED RETAINER**

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[52] **U.S. Cl.**.....**339/74 R,** 339/253 R, 339/256 R, 339/262 R

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

[58] **Field of Search**.....339/74, 217, 253, 255, 256, 339/258, 259, 262

[56] **References Cited**

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FOREIGN PATENTS OR APPLICATIONS

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[57] **ABSTRACT**

A connector socket of the integrated wire termination system (IWTS) type adapted to receive a "standard" terminal (connector) pin inserted therein by a split-sleeve tool. The socket includes an integral retainer formed thereon for engaging the annular shoulder of the terminal pin to lock it in electrically conducting relation therewithin. This integral retainer is a split spring sleeve that has a notch at its forward end on the side opposite the split providing a catch. The socket has an aperture in one side. This split and notched sleeve is placed around the aperture section, and the part back of the notch is formed partly through such aperture to form a catch for engaging the annular shoulder of the terminal pin. Insertion of a split-sleeve release tool from the rear allows release of the terminal pin for disconnection.

4 Claims, 7 Drawing Figures

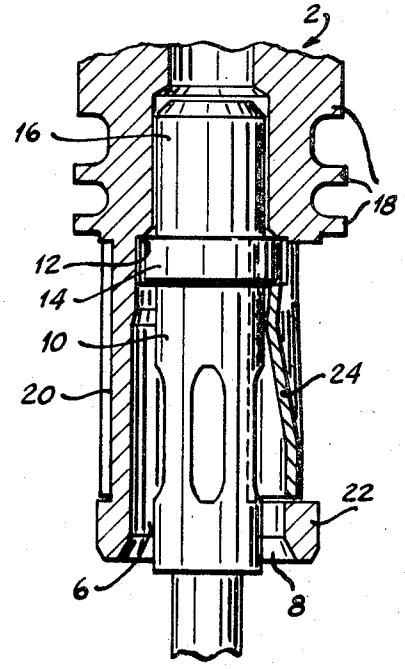


Fig. 1

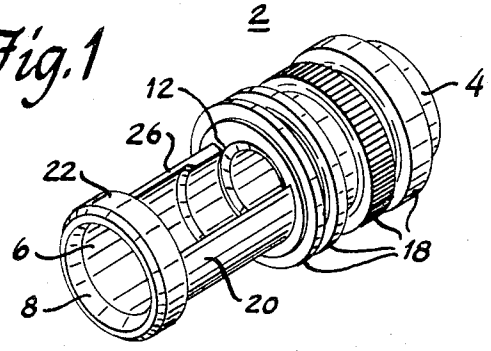


Fig. 2

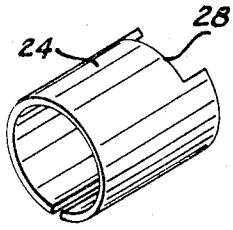


Fig. 3

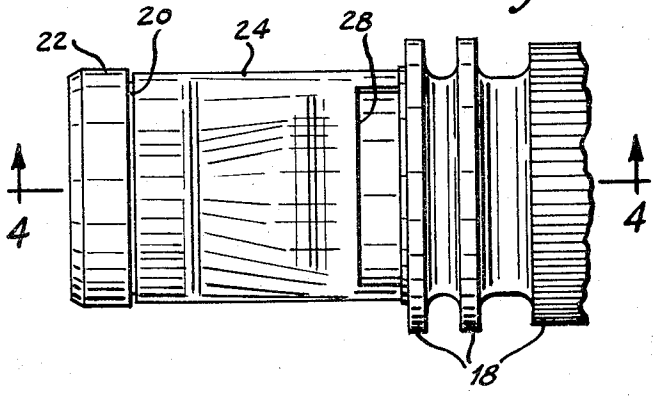


Fig. 7

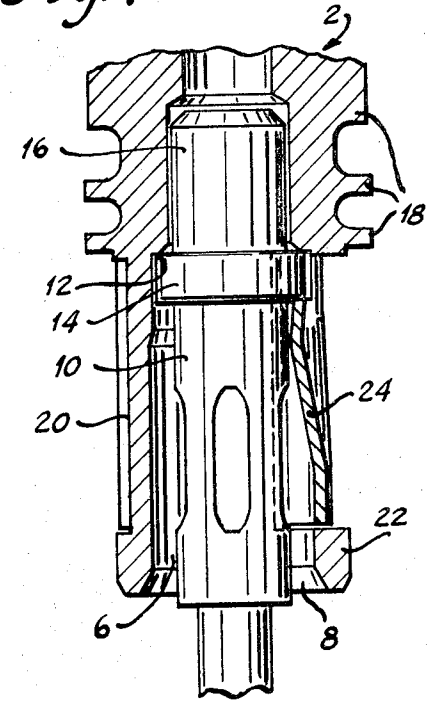


Fig. 4

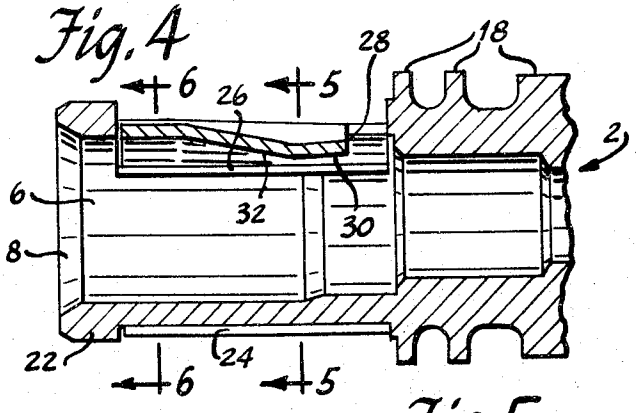


Fig. 6

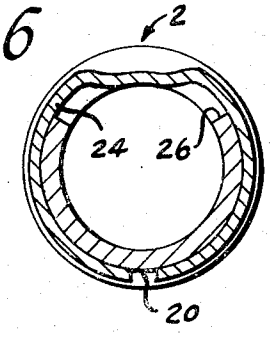
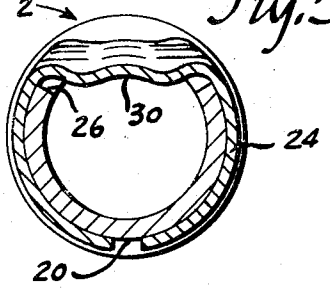


Fig. 5



INTEGRATED WIRE TERMINATION SYSTEM HAVING INTEGRALLY FORMED RETAINER

BACKGROUND OF THE INVENTION

Rear release electrical connectors have been known heretofore.

One known type has a socket made from a sleeve of spring material. This sleeve is split so that it can be squeezed and inserted into a bore in an insulating mounting member and allowed to expand to be securely retained therein. One or more tongues sheared from the sides of this sleeve and bent at a small angle inwardly lock the annular shoulder of a terminal pin inserted in the sleeve. A tool inserted from the rear biases this tongue outwardly to clear the shoulder and release the terminal pin for removal. In one form, the tip of the terminal pin extends out beyond the sleeve and insulating mounting member to enable an electrical connection to be made thereto. In another form, the tongue biases the tip of the terminal pin against a bus bar, contact or the like, within the insulating mounting member to make an electrical connection.

Another type disclosed in H. W. Hults copending application Ser. No. 42,995, filed June 3, 1970, has a conducting cylindrical member having a bore therein forming a connector socket. The socket has an aperture in one side for retaining a rigid catch that engages the annular shoulder of a terminal pin inserted in the bore. A split-sleeve spring biases the catch in its aperture. An inclined surface on the catch allows it to be biased clear of the terminal pin shoulder by a split sleeve release tool to separate the connector parts.

While these prior connectors have been useful for their intended purposes, this invention relates to improvements thereon.

SUMMARY OF THE INVENTION

This invention relates to an integrated wire termination system (IWTS) of the rear release type.

An object of the invention is to provide an improved IWTS having an integral retainer.

A more specific object of the invention is to provide an improved split sleeve retainer formed on and constituting an integral part of an IWTS.

Another specific object of the invention is to provide an IWTS with an improved integral retainer affording more points of good electrical contact between an inserted terminal pin and its connector socket.

Another object of the invention is to provide a method of making an improved IWTS having an integrally formed retainer.

Other objects and advantages of the invention will hereinafter appear.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an enlarged isometric view of the connector socket of the IWTS before assembly of the retainer;

FIG. 2 is an enlarged isometric view of the partially formed integral retainer thereof;

FIG. 3 is a still further enlarged top view of the complete IWTS, showing the integral retainer of FIG. 2 assembled and formed on the connector socket of FIG. 1;

FIG. 4 is a center cross-sectional view taken along line 4—4 of FIG. 3;

FIG. 5 is a cross-sectional view taken along line 5—5 of FIG. 4;

FIG. 6 is a cross-sectional view taken along line 6—6 of FIG. 4; and

FIG. 7 is a view like FIG. 4 but in the opposite direction and showing the terminal pin locked therein.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, there is shown the connector socket portion of the IWTS constructed in accordance with the invention. This connector socket comprises a generally cylindrical member 2 having a contact 4 at its closed forward end. A bore 6 extends in from the open, rear end almost to the forward end, with the entrance to the bore being chamfered as indicated at 8 to facilitate insertion of a terminal pin 10 therein, such terminal pin hereinafter described in connection with FIG. 7. The bore is provided with a shoulder 12 against which annular shoulder 14 of the terminal pin stops, the bore being of smaller diameter beyond this shoulder as shown in FIGS. 1, 5 and 7 for receiving the tip 16 of the terminal pin. The portion of the connector socket around this smaller diameter bore is surrounded by a plurality of annular ribs 18 whereby it is adapted to be securely retained in a molded insulating supporting member such as a switch base.

The portion of the connector socket around the larger diameter bore 6 is provided with a reduced external diameter 20 leaving an enlarged diameter collar 22 at the rear end and a shoulder at its forward end to provide a seat for the split sleeve retainer 25 hereinafter described. This reduced diameter section is provided with a generally rectangular aperture 26 in the arcuate wall thereof into which the split sleeve retainer 24 is formed. The split sleeve retainer fits around this reduced diameter section and is held therein by the collar at the rear end and the first annular rib or shoulder at the front end.

An intermediate step in the formation of the split sleeve retainer is shown in FIG. 2. As shown therein, first there is provided a split sleeve 24 of proper diameter. This split sleeve is cut to the proper length and notched at one end to provide an edge 28 to serve as a catch for the terminal pin.

The split sleeve 24 having been thus formed and notched is then spread sufficiently to pass over collar 22 onto the reduced diameter section 20 and to snap snugly therearound.

The retainer is then formed on the connector socket. For this purpose, an internal die is inserted within the bore, the assembly is placed in a forming press, and an external die is brought down onto the portion back of the notch to form the retainer shown in FIGS. 3–7. Edge 28 of the notch is offset inwardly through aperture 26 within the bore to serve as a catch for the annular shoulder of the terminal pin when it is inserted in the socket as shown in FIG. 7. As shown in FIGS. 4 and 5, the configuration of the retainer is such that it has a small inward angle 30 from edge 28 toward the rear as far as the cross-section plane of FIG. 5. The angle there smoothly changes to a small outward angle 32 that continues in a gradual curvature to the form shown in FIG. 6 which then continues substantially unchanged to the rear end of the retainer.

For forming the split sleeve retainer in situ as just described, the internal die has a configuration similar to the final form of the retainer except deeper to allow for spring back of the retainer after formation. The external die has a configuration similar to that of the internal die except larger diameter to allow for the thickness of the split sleeve retainer material.

As will be apparent, when the terminal pin **10** is inserted in the connector socket by a split-sleeve nylon insertion tool, its annular shoulder rides along incline **32** and then along incline **30** whereafter edge **28** snaps behind this annular shoulder **14** to lock the terminal pin in place.

Inclined surface **30** and the reentrant point between inclined surfaces **30** and **32** apply a lateral force on the terminal pin behind the annular shoulder thereof. This force causes the terminal pin to tip over slightly from coaxial alignment within the connector socket to afford a plurality of points of good electrical contact. As will be apparent, this lateral force causes a first pressure point of contact between the opposite side of the terminal pin annular shoulder and the inner wall of the bore. This lateral force also causes a second pressure point of contact between the terminal pin tip on the same side directly ahead of the catch and the inner wall of the reduced part of the bore.

To release the terminal pin, a split sleeve nylon release tool is inserted around the terminal from the rear and around the wire attached thereto, and is pushed in. This tool engages inclined surface **32** to bias the catch edge **28** clear of the annular shoulder **14**. Then both the tool and the terminal pin are withdrawn together to effect a disconnection.

As shown in FIG. **5**, the surface **30** is formed to a curvature throughout a long arc to afford good, large angle, long arcuate distance, large area mechanical and electrical contact between the split sleeve retainer and the terminal pin. This mechanical contact insures that the conventional split-sleeve release tool will lift the locking edge **28** clear of the terminal pin shoulder even in instances where the split in the release tool comes directly therebetween, which would not be the case if only a point contact were made.

The split sleeve retainer may be made of beryllium copper or the like capable of being formed in situ and having resiliency for allowing insertion of the terminal pin into the socket and applying a spring force thereto in the manner hereinbefore described.

While the apparatus hereinbefore described is effectively adapted to fulfill the objects stated, it is to be understood that the invention is not intended to be confined to the particular preferred embodiment of integrated wire termination system having integrally formed retainer disclosed, inasmuch as it is susceptible of various modifications without departing from the scope of the appended claims.

I claim:

1. An integrated wire termination system having an integrally formed retainer comprising:

an electrically conducting connector socket having a bore extending thereinto from the rear end thereof adapted to receive a shouldered terminal pin;

an aperture in the side of said connector socket;

and a spring-biased catch extending through said aperture partly into said bore for engaging the annular shoulder of the terminal pin pressed into said bore and to bias the terminal pin against the internal wall of said connector socket for good electrical contact therewith;

said catch comprising a split sleeve retainer of resilient material surrounding said socket and held thereon and having a notch at its forward end on the side opposite the split and overlying said aperture;

and a portion of said split sleeve retainer back of said notch overlying said aperture being formed through said aperture to cause the edge of said notch to serve as a catch for the terminal pin shoulder and to provide an inclined inner surface that may be engaged by a release tool to bias said catch clear of said shoulder for release of said terminal pin for disconnection.

2. The invention defined in claim **1**, wherein:

said connector socket comprises a generally cylindrical member having said bore extending from the open rear end almost to the forward end thereof;

and the section within said split sleeve retainer being of reduced external diameter affording an enlarged collar at the rear end thereof and a shoulder at the forward end thereof for holding said split sleeve retainer in place;

the resilience of said split sleeve retainer affording spreading thereof sufficiently to assemble it over said collar.

3. The invention defined in claim **1**, wherein:

the portion of said split sleeve retainer formed through said aperture is provided with a configuration affording large angle long arcuate distance engagement with the terminal pin.

4. The invention defined in claim **1**, wherein:

said portion of said split sleeve retainer formed through said aperture applies a lateral force to the terminal pin behind the annular shoulder thereof to effect two good electrical contacts between said terminal pin and said connector socket on the opposite side at said annular shoulder and on the same side at the tip of the terminal pin.

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