

[54] **INTEGRATED WIRE TERMINATION
 SYSTEM WITH INTEGRAL RETAINER**

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 [51] Int. Cl. **H01r 13/54**
 [58] Field of Search **339/74, 217, 253, 255, 256, 339/258, 259, 262**

[56] **References Cited**

UNITED STATES PATENTS

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|-----------|--------|----------------|-----------|
| 3,597,726 | 8/1971 | Appleton | 339/255 R |
| 3,683,322 | 8/1972 | Hults | 339/256 R |

FOREIGN PATENTS OR APPLICATIONS

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|-----------|--------|---------------|-----------|
| 1,465,689 | 5/1969 | Germany | 339/256 R |
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[57] **ABSTRACT**

A connector socket of the integrated wire termination system (IWTS) type adapted to receive any one of a plurality of different types of "standard" terminal (connector) pins, having tips of different lengths, 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 been sheared to provide a generally U-shaped cut across the split. The socket has an aperture in one side. This split sleeve is placed around the apertured section, and the split and sheared side is formed into 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.

8 Claims, 7 Drawing Figures

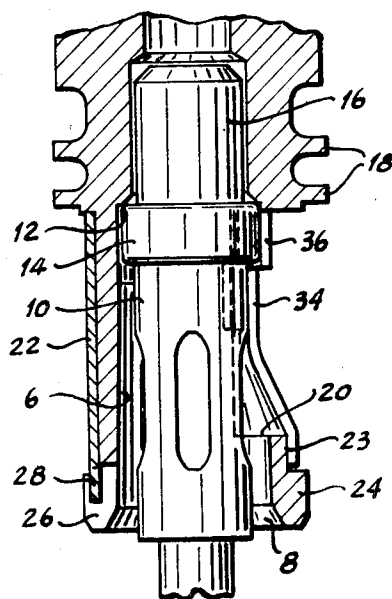


Fig. 1

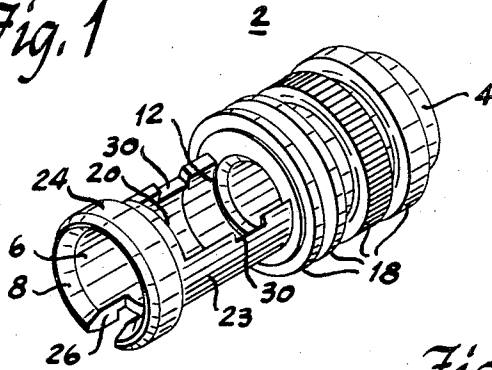


Fig. 2

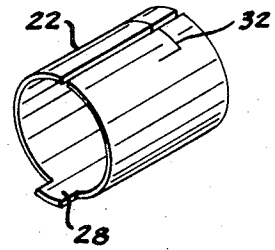


Fig. 3

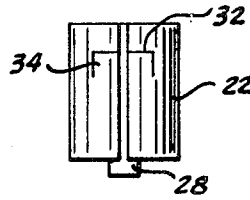


Fig. 4

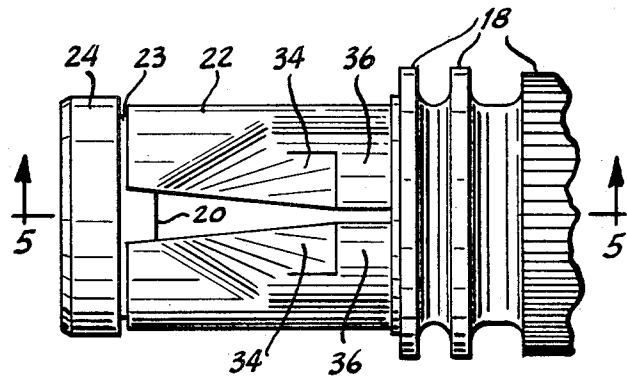


Fig. 6

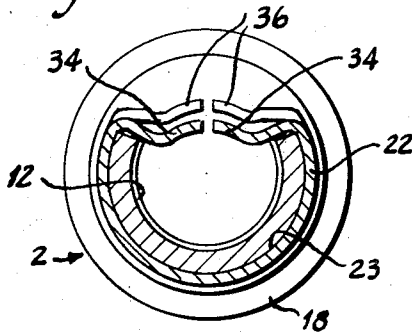
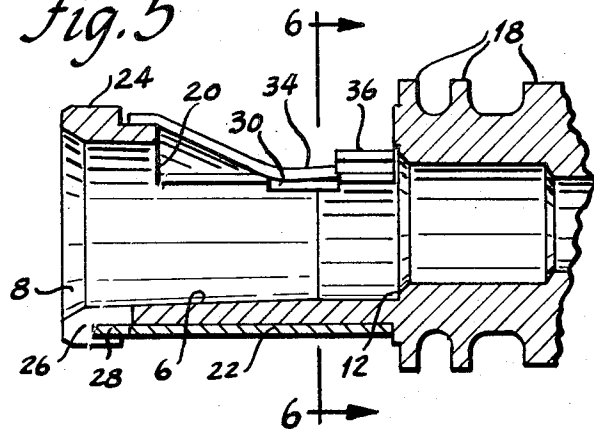


Fig. 5



INTEGRATED WIRE TERMINATION SYSTEM WITH INTEGRAL 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 against the annular shoulder of a terminal pin that is adapted to be inserted in the sleeve. A tool inserted from the rear biases this tongue outwardly to 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. Hulst copending application Ser. No. 42,995, filed June 3, 1970, has a cylindrical socket of electrically conducting material with an aperture in one side. A rigid catch is held in such aperture by a split sleeve spring surrounding the socket. The catch engages the annular shoulder of a terminal pin. The terminal pin is inserted and withdrawn by means of a tool as above.

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 integrated wire termination system having an integral retainer.

A more specific object of the invention is to provide an improved split sleeve retainer for an integrated wire termination system.

Another specific object of the invention is to provide an integrated wire termination system with an improved integral retainer affording non-tipping, direct lateral force on the terminal pin shoulder for good electrical contact.

Another object of the invention is to provide an improved split-sleeve retainer for an IWTS that can be formed thereon without tearing.

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

Other objects and advantages of the invention will hereinafter appear.

BRIEF DESCRIPTION OF THE DRAWING

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 top view of the integral retainer of FIG. 2 showing the split and the U-shaped cut thereacross;

FIG. 4 is a still further enlarged top view of the complete IWTS, showing the integral retainer assembled and formed on the connector socket;

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. 5; and

FIG. 7 is an enlarged cross-sectional view of the connector socket of FIG. 1 showing the terminal pin locked therein.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, there is shown the connector socket portion of the integrated wire termination system (IWTS) constructed in accordance with the invention. This connector socket comprises a generally cylindrical member 2 having a contact 4 at the closed end. A bore 6 extends in from the open rear end almost to the front 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 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 generally rectangular aperture 20 in the arcuate wall thereof into which the split sleeve retainer 22 is formed. The portion of this connector socket adjacent aperture 20 has abutment means comprising a reduced external diameter 23 leaving an enlarged diameter collar 24 at the open end to provide a seat for the split sleeve retainer to hold it on the socket. The split sleeve retainer fits around this reduced diameter section and is retained therein by the collar at the rear end and the first annular rib or shoulder at its forward end. A notch 26 is provided in this collar for receiving a tab 28 integrally formed on the split sleeve retainer to keep the latter from rotating thereon. A pair of shallow notches 30 are provided in the two linear sides of aperture 20, one in each side, and are equally spaced from the forward end (the end adjacent the first annular rib) of the retainer seat to provide clearance for the formed part of the retainer as hereinafter described.

An intermediate step in the formation of the retainer is shown in FIGS. 2 and 3. As shown therein, first there is provided a split sleeve 22 of proper diameter. This split sleeve is cut to the proper length, leaving a short positioning tab 28 at one end on the opposite side from the split.

A generally inverted U-shaped cut 32 is then sheared symmetrically across the split near the forward end as most clearly shown in FIG. 3, the arms of the U extending toward the rear end. This cut is spaced from the forward end a proper distance to match the corresponding ends of the pair of notches 30 in the sides of the aperture. Thus formed, the split sleeve is spread sufficiently

to pass over collar 24 onto the reduced diameter section 23 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 as the assembly is placed in a forming press, and an external die is brought down onto the shared portion to form the split sleeve retainer as shown in FIGS. 4-7. As seen in FIGS. 5 and 6, the two square tabs 34 that were provided on opposite sides of the split that were provided by cut 32 are offset downwardly into arcuate shape having a dip on each side. The ends of these square tabs so offset provide a catch for the annular shoulder 14 of the terminal pin. The end portion of the split sleeve retainer 22 adjacent cut 32 is also formed downwardly as indicated at 36 in FIGS. 5 and 6 partly into the aperture 20 in the connector socket. This method affords forming the retainer in situ without any tearing.

As will be apparent, this formed end portion 36 will provide a direct lateral force on shoulder 14 of the terminal pin 10 to provide good, long arcuate distance, large area electrical contact between the opposite side of such shoulder and the inner wall of the bore within the connector socket. That is, this force, which is toward the left in FIG. 7, is at a 90° angle with respect to the axis of the terminal pin so that no tipping of the terminal pin will be caused thereby. As a result, the terminal pin will be held substantially coaxially centered within the socket with the terminal pin axis parallel with the socket axis to facilitate insertion of the usual split-sleeve release tool therearound when it is desired to disconnect the terminal pin from the connector socket.

As shown in FIG. 6, both the locking tabs 34 and the force applying end portion 36 are formed to a curvature throughout a long arc to afford good, 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 tool will lift the locking tabs 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. When the release tool is inserted to lift the locking tabs clear of the terminal pin shoulder, the retainer will spread at the split. Notches 30 provide clearance for the dips on opposite sides of the arcuate catch as shown in FIG. 5, allowing these dips to move outwardly without interference.

The split sleeve retainer may be made of beryllium copper or the like 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 with integral 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 with integral retainer comprising:

an elongated socket member having a bore extending thereinto from the rear end thereof adapted to receive an annular shouldered terminal pin attached to a wire;

an aperture in the side of said socket member;

a spring biased retainer extending through said aperture partly into said bore for engaging the annular shoulder of the terminal pin when the latter is pressed into said bore and to bias the terminal pin against the inner wall of said socket member; and abutment means for holding said retainer fixed on said socket member;

said retainer comprising:

a split sleeve of spring material having a generally inverted U-shaped cut sheared across the split near the forward end thereof to provide two forwardly extending tabs one on each side of said split; said split sleeve being assembled around said socket member and fixed thereon by said abutment means;

and the portion of said split sleeve adjacent said tabs being formed partly through said aperture to cause the forward edges of the tabs to serve as a catch for the terminal pin shoulder and to provide an inclined inner surface behind said tabs for engagement by a release tool to bias said catch clear of the terminal pin shoulder for release.

2. The invention defined in claim 1, wherein:

said aperture is generally rectangular in shape and is provided with a pair of notches on opposite sides of said tabs generally in alignment therewith to provide clearance to allow spreading of said catch when the release tool is inserted.

3. The invention defined in claim 1, wherein:

said elongated socket member comprises a generally cylindrical electrically conducting member having said bore extending from the open rear end almost to the front end.

4. The invention defined in claim 3, wherein:

said abutment means comprises a smaller external diameter section providing a larger diameter collar at the rear end and a shoulder at the forward end for fixing said split sleeve retainer in place.

5. The invention defined in claim 4, wherein:

said split sleeve retainer comprises a tab at one end thereof;

and a notch in said socket member for receiving said tab to prevent relative rotation therebetween.

6. The invention defined in claim 1, wherein:

the part of said split sleeve retainer ahead of said tabs is formed to apply a lateral force on the annular shoulder of the terminal pin to afford a good electrical contact between the opposite side of the annular shoulder and the inner wall of said socket member whereby the terminal pin axis remains parallel with the socket axis.

7. The invention defined in claim 1, wherein:

said tabs are provided with a configuration affording large angle, long arcuate distance contact with the surface of the terminal pin.

8. An integrated wire termination system with integral retainer comprising:

a generally cylindrical socket member having a bore extending thereinto from the rear end thereof adapted to receive an annular shouldered terminal pin;

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a reduced external diameter section on said socket member between an enlarged collar at the rear end thereof and a shoulder at the forward end thereof; an aperture in the side of said reduced external diameter section; 5
and a spring biased retainer extending through said aperture partly into said bore for engaging the annular shoulder of the terminal pin when the latter is pressed into said bore and to bias the terminal pin against the internal wall of said socket member; 10
said retainer comprising:
a split sleeve of spring material having a generally inverted U-shaped cut sheared across the split 15

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therein near one end thereof;
said split sleeve being assembled on and substantially coextensive with said reduced external diameter section with the split overlying said aperture;
and the portion of said split sleeve adjacent the split and cut thereof being formed partly through said aperture to cause the forward edges of the tabs formed by said split and said cut 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 the terminal pin shoulder for release of the terminal pin for disconnection.

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