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3,112,149

FRONT RELEASE CONTACT RETENTION DEVICE

Filed Sept. 22, 1961

2 Sheets-Sheet 1

Fig. 1.

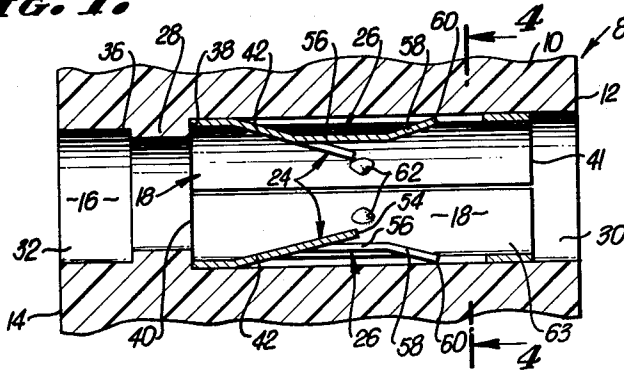


Fig. 2.

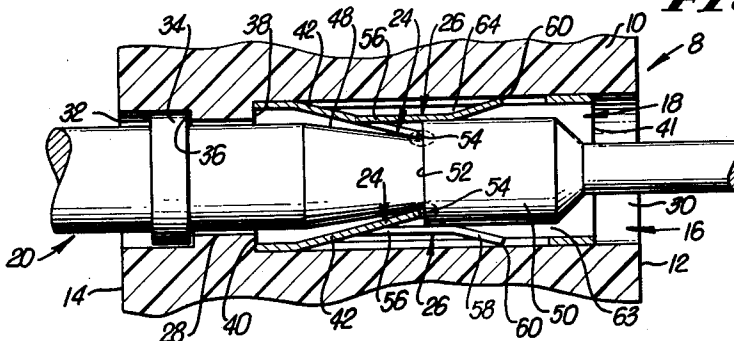


Fig. 3.

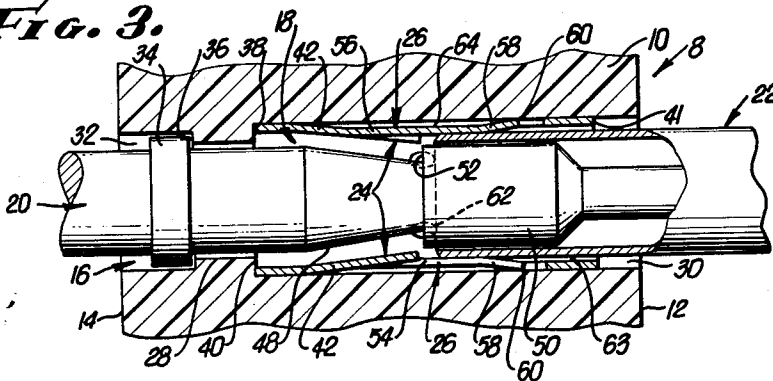
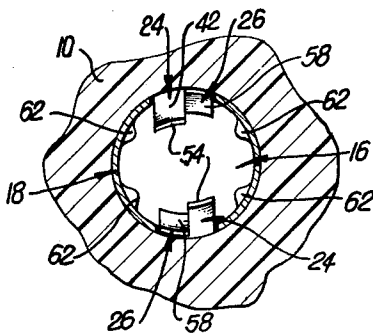


Fig. 4.



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FIG. 5.

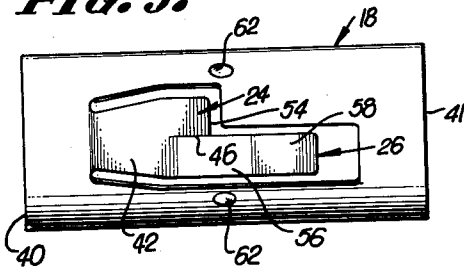


FIG. 6.

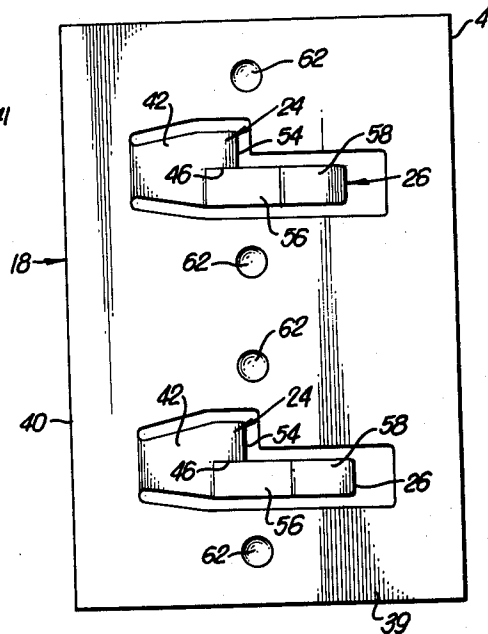


FIG. 7.

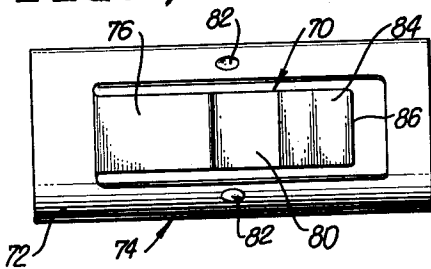


FIG. 8.

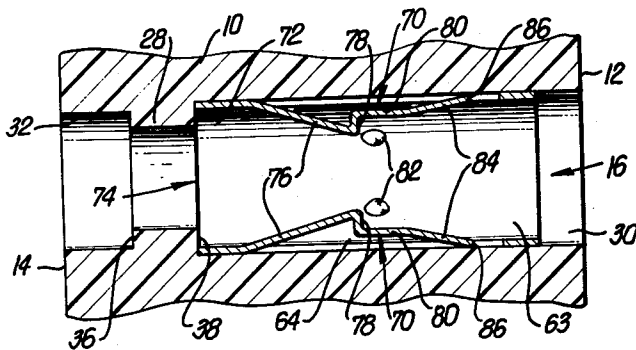
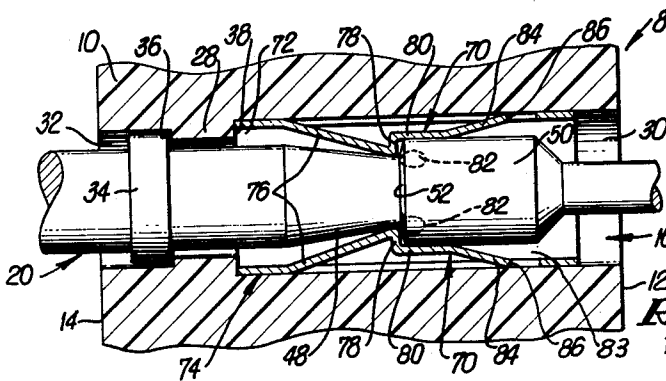


FIG. 9.



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3,112,149 FRONT RELEASE CONTACT RETENTION DEVICE

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7 Claims. (Cl. 339-217)

This invention is related to electrical components in the nature of connector units that include retention clips or sleeves that, with the cooperation of insulator bodies, releasably lock electrical contact terminals captive within the insulator bodies.

A principal object of this invention is to provide an electrical connector unit that includes an insulation body having lodged therein a retention device which includes essential components that have been stamped from a sheet of material and which are adapted, in cooperation with the insulation body, to releasably lock an elongated electrical contact terminal in said connector unit and with the aid of a tool, inserted into said insulation body, to engage and actuate the components, the contact terminal may be released from its locked position and withdrawn from the connector unit.

A further object of this invention is to provide a retention device having the foregoing characteristics wherein the essential components comprise a plurality of fingers or tangs that are employed to limit the movement of the contact terminal and in cooperation with the insulation body prevent inadvertent withdrawal of the electrical contact terminal from its captive condition.

A yet further object of this invention is to provide a retention sleeve or clip having the foregoing characteristics wherein the retention device includes provisions in the form of dimples or projections for stabilizing and centrally positioning the contact terminal in the retention device and for providing a safety stop, engageable by the tool, to protect certain elements against damage and impairment of operation.

A more specific object of this invention is to provide a connector unit that includes an insulation body having a bore therethrough with a front and rear end which has lodged in the bore a retention device which includes a plurality of fingers that incorporate stops that are adapted to limit the rearward movement of an electrical contact terminal inserted into engagement therewith and which in cooperation with a fixed stop on the insulation body releasably lock the contact terminal in the connector unit, and withdrawal of the contact terminal from the connector unit may be achieved with the aid of a tool inserted into the front end of said insulation body and into actuating engagement with the fingers to force the stops from the path of rearward withdrawal of the contact terminal.

Further objects and advantages of this invention will appear during the course of the following part of this specification, wherein the details of construction and mode of operation of a preferred embodiment are described with reference to the accompanying drawings, in which:

FIG. 1 is a longitudinal, vertical section illustrating one form of a retention clip or sleeve, according to the present invention, lodged in an insulation body.

FIG. 2 is a view similar to FIG. 1, and illustrating an electrical contact terminal releasably locked in position by the cooperation of the retention clip and insulator body.

FIG. 3 is a view similar to FIG. 2 but illustrating the employment of a removal tool for releasing the electrical contact terminal from its captive or locked position.

FIG. 4 is a cross-sectional view taken on line 4-4 of FIG. 1.

FIG. 5 is an elevation side view of the retention clip illustrating the relationship of the tangs or fingers employed for releasably locking the contact terminal in the connector unit and dimples for positioning the contact terminal and providing a safety stop for the removal tool.

FIG. 6 is a flat pattern layout illustrating the relationship of the various components of the retention clip prior to the forming thereof and as they appear stamped from a sheet of material.

FIG. 7 is a side elevation view similar to FIG. 5, but illustrating a modified form of retention clip.

FIG. 8 is a longitudinal, vertical section similar to FIG. 1 but illustrating the modified form of retention clip of FIG. 7.

FIG. 9 is a view similar to FIG. 2, but again illustrating the modified form of retention clip of FIG. 7.

Referring to the form of invention illustrated in FIGS. 1-6, the invention comprises a connector unit 8 that includes an insulator body 10 having a front or forward end 12 and a rear or back end 14. A bore 16 extending through the body has lodged therein a retention clip or sleeve 18 that is adapted in combination with the insulator body to releasably lock an elongated electrical contact terminal 20 captive in the connector unit. The contact terminal illustrated may be a pin contact terminal, a socket contact terminal, or it may take the form of a hermaphrodite or some other hybrid type of terminal. Release and withdrawal of the contact terminal from the captive condition is achieved with the aid of a tool 22 inserted into the forward end of bore 16 and into actuating engagement with the retention clip 18.

The retention clip 18 has, generally, a split cylindrical or tubular configuration that includes a plurality of sets of resilient fingers, preferably but not necessarily two sets. The sets of fingers are preferably stamped from a sheet of metal and are alternately arranged about the circumference thereof. One set of fingers or tangs, all being identical and therefore each being identified by the numeral 24, have the purpose of assisting in releasably locking the contact terminal captive within the connector unit and will be subsequently described in greater detail. The other set of fingers or tangs, all being identical and therefore each being identified by the numeral 26, are interconnected to fingers 24 and have the dual purpose of assisting in the centering and stabilizing of the contact terminal within the retention clip and providing an outwardly flared portion or ramp engageable by the tool 22, which serves to actuate fingers 26 and subsequently fingers 24 to release the contact terminal 20 from its captive condition. Fingers 26 will subsequently also be described in more extensive detail.

Bore 16, extending through the insulator body, is partitioned by an inwardly projecting annular flange 28 into a cylindrical expansion cavity 30 and a minor cavity 32 in alignment with cavity 30. The retention clip 18 is disposed in cavity 30 and the fingers 24 and 26 expand therein when the contact terminal is inserted from the rear of body 10 into the cavity and between the fingers. Insertion of the tool 22 from the front of the insulator body 22 into the cavity to obtain release of the contact terminal from engagement with the fingers also results in expansion of the fingers, FIG. 3.

The contact terminal 20 has an annular collar 34 thereon that is received in cavity 32, and insertion of the contact terminal into the bore 16 from the back of insulator body 10 is limited by the collar abutting a rearwardly facing shoulder 36 presented by the annular flange 28.

The flange 28 also presents a forwardly facing stop shoulder 38 the purpose of which will hereinafter be clarified.

FIG. 6 illustrates that the final generally split cylindrical or tubular configuration of the retention clip 18 is preferably produced from a flat, integral sheet of metal 39, although it may be cast or molded.

Insertion of the retention clip into cavity 30 is preferably made from the front end 12 of insulator body 10, and the rear edge 40 of the retention clip is urged into abutting engagement with the forwardly facing stop shoulder 38 to limit the rearward insertion of the retention clip into the cavity. The diameter of the retention clip is constricted within the cavity to produce an intimate and secure fit that tends to resist dislodgment. To insure against dislodgment of the retention clip from cavity 30 it is preferably cemented in place, but it can be retained within the cavity by molding it therein, by staking in place, by interference fit or other applicable methods. The forward edge 41 of insulator body 10 is spaced inwardly in the bore 16, from the front end 12 of the insulator body 10.

The earlier mentioned stamping operation performed on the sheet of metal 39 in addition to producing fingers or tangs 24 and 26 also produces a forwardly extending tapered neck portion 42 that merges into the forwardly extending fingers. During the stamping operation fingers 24 and 26 are sheared from each other along shear line 46, FIG. 6, so that each set of fingers may be formed and positioned in the proper attitude.

Each tapered neck portion 42, there being preferably a total of two, provides the interconnection between fingers 24 and 26. The neck is inclined forwardly and toward the axis of the retention clip and in the form of retention clip disclosed in FIGS. 1-6 each neck 42 and associated fingers 24 and 26 are preferably but not necessarily spaced approximately 180° from the other neck and fingers.

Resilient fingers or tangs 24, there being one integral with each neck, are inclined forwardly and toward the axis of the retention clip in linear alignment with the neck 42. The inclination of each neck 42 and each finger 24, associated with each neck, corresponds generally to the inclination of a tapered portion 48 of the contact terminal that is spaced forwardly from the annular collar 34.

Adjoining the tapered portion 48 of the contact terminal, forwardly thereof, is a cylindrical section 50 which in cooperation with the tapered portion presents a rearwardly facing stop shoulder 52 that engages a forwardly facing sheared edge serving as a stop 54, which is embodied in each of the fingers 24, when an effort is made to withdraw the contact terminal prematurely. The sheared edge provides a positive locking edge that is resistant to the normal forces that may be applied thereto.

Resilient fingers or tangs 26, there being one associated with each neck, include a section 56 that is integral with the tapered neck and extends forwardly therefrom in adjoining relationship to finger 24 associated therewith. Section 56 is bent radially outwardly from the inclined angle represented by the neck whereby the section 56 is substantially parallel to the axis of the retention clip. The forwardmost portion of section 56 bears against the cylindrical section 50 of the contact terminal and assists in stabilizing and centrally locating the contact terminal within the retention clip.

Each finger 26 further includes an outwardly flared tool-receiving section or ramp 58, the free end 60 thereof bearing against the wall of cavity 30.

Stabilization and centralization of the contact terminal 20 within the retention clip is further provided for by a plurality of inwardly projecting dimples or projections 62 formed in the retention clip 18. The formation of the dimples may be achieved by shearing, piercing, or stretching the material of the retention clip.

Additionally, the dimples are located forwardly of the free end 54 of each finger 24 and have the added function

of a safety stop to limit the insertion of tool 22 into cavity 30 to protect the free end 54 against damage and impairment of operation. The dimples define the rearward extent of an access passage 63 for the tool 22 that extends from the dimples to the front end 12 of insulator body 10.

When the contact terminal 20 is inserted into bore 16 from the rear of insulator body 10, the cylindrical section 50 of the terminal will engage each finger 24 to cam or flare the fingers 24 outwardly until section 50 of the terminal is in front of the stops 54, at which time the fingers 24 will snap radially inwardly to the locking position shown in FIG. 2. It may now be seen that the collar 34, on terminal 20, abutting against stop shoulder 36 limits the movement of the contact terminal in the forward direction, and rearward movement of the contact terminal is limited by shoulder 52 engaging stops 54. It is in this manner that contact terminal 20 is releasably locked in the connector unit 8.

Withdrawal of the contact terminal 14 from its captive relationship is accomplished by the employment of tool 22 which comprises an elongated hollow cylinder that is axially inserted into the access passage 63 from the front end 12 of the insulator body 10 and encircles a portion of the contact terminal 20. The tool 22 engages each of the ramps 58 and the resulting radially outwardly directed force coordinate causes each of the fingers 26 to flex or pivot about point 60 causing stops 54 to move radially outwardly into zone 64 out of the way of the shoulder 52 on the terminal, permitting the terminal to be withdrawn rearwardly from the bore 16.

As shown in FIG. 3, the safety stops 62 limit the rearward extent of travel of tool 22, and since safety stops 62 are positioned forwardly of stops 54, the tool 22 cannot contact stops 54. In this manner the safety stops 62 will prevent damage occurring to the now exposed stops 54.

The form of invention illustrated in FIGS. 7, 8 and 9 varies from the form shown in FIGS. 1-6, inclusive, in the details relative to the fingers 70 and the formation thereof. In all other respects the disclosure in FIGS. 7, 8 and 9 is identical to the form shown in FIGS. 1-6, inclusive.

A pair of opposed fingers or tangs 70 are preferably stamped from an integral sheet of metal 72 and the sheet of metal is formed into a retention clip 74 of split cylindrical or tubular configuration. The retention clip is inserted into the insulator body 10 in the same manner as retention clip or sleeve 18 to accomplish the same results.

Each finger includes a forwardly extending section 76 that is inclined toward the axis of the retention clip, and the inclination thereof corresponds generally to the inclination of the tapered portion 48 of the contact terminal 20.

An acute angle bend is formed in each finger 70 immediately adjacent section 76 to provide a relatively short section 78 that functions as a stop engageable by the rearwardly facing shoulder 52 on contact terminal 20.

A substantially right angle bend is formed in each finger 70 to provide a forwardly extending section 80 that bears against the cylindrical section 50 of the contact terminal 20 and assists the dimples or projections 82 in stabilizing and centralizing the contact terminal in the retention clip 74.

Section 80 is further bent or flared outwardly to produce a tool-receiving ramp 84 that is inclined away from the axis of the retention clip. The extreme free end 86 of each ramp engages the wall of cavity 30.

The dimples or projections 82 are forward of stops 78 and function in the same manner and for the same purposes as dimples 62 and define the rearward extent of an access passage 83 for the tool 22 that extends from the dimples to the front end 12 of insulator body 10.

When the contact terminal 20 is inserted into bore 16 from the rear of insulator body 10, the cylindrical section 50 of the terminal will engage sections 76 of fingers 70, flaring the fingers outwardly until section 50 of the termi-

nal is in front of the stops 73, at which time the fingers 70 will snap radially inwardly to the locking position shown in FIG. 9.

The mode of releasably locking the contact terminal in the connector unit is substantially the same as previously described. The collar 34 on the contact terminal abuts against stop shoulder 36 to limit movement of the contact terminal in the forward direction, and rearward movement of the contact terminal is limited by shoulder 52 engaging stops 78.

Withdrawal of the contact terminal 20 from its captive position is very similar to that previously described. Tool 22 is again employed by axially inserting it into access passage 83 from the front end 12 of insulator body 10 where it encircles a portion of the contact terminal. The tool engages each of the ramps 84 and the resulting radially outwardly directed force coordinate causes each of the fingers 70 to flex or pivot about point 86, causing stops 78 to move radially outwardly into zone 64, out of the way of the shoulder 52 on the terminal, permitting the terminal to be withdrawn.

While the instant invention has been shown and described herein in what are conceived to be the most practical and preferred embodiments, it is recognized that departures may be made therefrom within the scope of the invention, which is therefore not to be limited to the details disclosed herein, but is to be accorded the full scope of the claims.

I claim:

1. A connector unit comprising an insulation body having a bore therethrough with a front end and a rear end; a contact terminal member disposed in said bore; said bore including a forward cavity and a rearward cavity aligned with said forward cavity and separated therefrom by an annular wall portion presenting a rearwardly facing fixed stop means and a forwardly facing fixed stop means; said terminal member embodying a radial projection disposed in said rearward cavity and engageable with said rearwardly facing fixed stop means for limiting forward positioning of said terminal member axially inserted into said bore from the rear; a generally cylindrical retention clip entirely disposed in said forward cavity comprising resilient stop means in said forward cavity extending inwardly from the wall of the clip and inclined forwardly and toward the axis of the clip and which has a locking position adapted to limit rearward positioning of the terminal member in the bore; said terminal member further embodying a cylindrical section presenting a rearwardly facing shoulder; said cylindrical section being engageable with said stop means to radially cam the same outwardly upon insertion of the terminal member from the rear end of the bore and said stop means being released to move radially inwardly behind said rearwardly facing shoulder on the terminal member in the final forward position of the terminal member; support and safety stop means projecting inwardly from the wall of the clip in said forward cavity disposed forwardly of said resilient stop means and adapted to engage said cylindrical section in said final position of the terminal member; release means connected to said resilient stop means and positioned forward of said resilient stop means; and an access passage opening forwardly of the insulation body that provides clearance in the forward cavity for insertion of a tool between the terminal member and the release means and engageable with the safety stop means to force the resilient stop means radially outwardly whereby said rearwardly facing shoulder on the terminal member will clear said resilient stop means to permit withdrawal of the terminal member from the rear.

2. A connector unit comprising an insulation body having a bore therethrough with a front end and a rear end; a contact terminal member disposed in said bore; said bore including a forward cavity and a rearward cavity aligned with said forward cavity and separated therefrom by an annular wall portion presenting a rearwardly fac-

ing fixed stop means and a forwardly facing fixed stop means; said terminal member embodying a radial projection disposed in said rearward cavity and engageable with said rearwardly facing fixed stop means for limiting forward positioning of said terminal member axially inserted into said bore from the rear; a generally cylindrical retention clip formed from a sheet of material and being entirely disposed in said forward cavity comprising resilient stop means, the outline thereof being cut from said sheet of material and being located in said forward cavity; said resilient stop means being inclined forwardly and toward the axis of said retention clip and having a locking position adapted to limit rearward positioning of the terminal member in the bore; said terminal member further embodying an annular enlargement presenting a rearwardly facing shoulder; said annular enlargement being engageable with said stop means to radially cam the same outwardly upon insertion of the terminal member from the rear end of the bore and said stop means being released to move radially inwardly behind said rearwardly facing shoulder on the terminal member in the final forward position of the terminal member; support and safety stop means projecting inwardly from the wall of the clip in said forward cavity and disposed forwardly of said resilient stop means and adapted to engage said annular enlargement in said final position of the terminal member; release means, the outline thereof being cut from said sheet of material and being connected to said resilient stop means and positioned forward of said resilient stop means; and an access passage opening forwardly of the insulation body that provides clearance in the forward cavity for insertion of a tool between the terminal member and the release means and engageable with the safety stop means to force the resilient stop means radially outwardly whereby said rearwardly facing shoulder on the terminal member will clear said resilient stop means to permit withdrawal of the terminal member from the rear.

3. A connector unit according to claim 2 wherein said resilient stop means and release means are incorporated into a single finger, with said release means comprising a forward portion of the finger and said resilient stop means comprising a rearward portion of the finger.

4. A connector unit according to claim 3 wherein each of said fingers includes a first, second and third section, the first section being inclined forwardly and toward the axis of said retention clip, the second section being integral with and forward of said first section and being bent sharply outwardly presenting an abutment engageable by the rearwardly facing shoulder on said terminal member, and the third section being integral with said second section and being bent relatively sharply forward and then being flared outwardly to provide a tool-receiving ramp.

5. A connector unit according to claim 4 wherein said tool-receiving ramp includes a free end in contacting engagement with the wall of said forward cavity providing a point about which each finger pivots when engaged by said tool to force said resilient stop means radially outward.

6. A connector unit comprising an insulation body having a bore therethrough with a front end and a rear end; a contact terminal member disposed in said bore; said bore including a forward cavity and a rearward cavity aligned with said forward cavity and separated therefrom by an annular wall portion presenting a rearwardly facing fixed stop means and a forwardly facing fixed stop means; said terminal member embodying a radial projection disposed in said rearward cavity and engageable with said rearwardly facing fixed stop means for limiting forward positioning of said terminal member axially inserted into said bore from the rear; a generally cylindrical retention clip formed from a sheet of material and being entirely disposed in said forward cavity comprising a resilient neck member, the outline thereof being cut from said sheet of material; said resilient neck member being in-

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clined forwardly and extending inwardly from the wall of said clip; resilient stop means, the outline thereof being cut from said sheet of material and having a locking position adapted to limit rearward positioning of the terminal member in the bore; said resilient stop means being connected to said neck member forwardly thereof and being inclined forwardly and toward the axis of said retention clip; said terminal member further embodying an annular enlargement presenting a rearwardly facing shoulder; said annular enlargement being engageable with said stop means to radially cam the same outwardly upon insertion of the terminal member from the rear end of the bore and said stop means being released to move radially inwardly behind said rearwardly facing shoulder on the terminal member in the final forward position of the terminal member; support and safety stop means projecting inwardly from the wall of the clip in said forward cavity and disposed forwardly of said resilient stop means and adapted to engage said annular enlargement in said final position of the terminal member; release means, the outline thereof being cut from said sheet of material and being connected to said resilient stop means and positioned forward of said resilient stop means; said release means being connected to said neck member forwardly thereof; and an access passage opening forwardly of the

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insulation body that provides clearance in a forward cavity for insertion of the tool between the terminal member and the release means and engageable with the safety stop means to force the resilient stop means radially outwardly whereby said rearwardly facing shoulder on the terminal member will clear said resilient stop means to permit withdrawal of the terminal member from the rear.

7. A connector unit according to claim 6 wherein said release means and said resilient stop means are in side-by-side relationship.

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