United States Patent

[11] 3,617,615

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[21] Appl. No. **3,635**
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[45] Patented **Nov. 2, 1971**

[54] **PROTECTOR FOR ELECTRICAL TERMINALS**
9 Claims, 13 Drawing Figs.

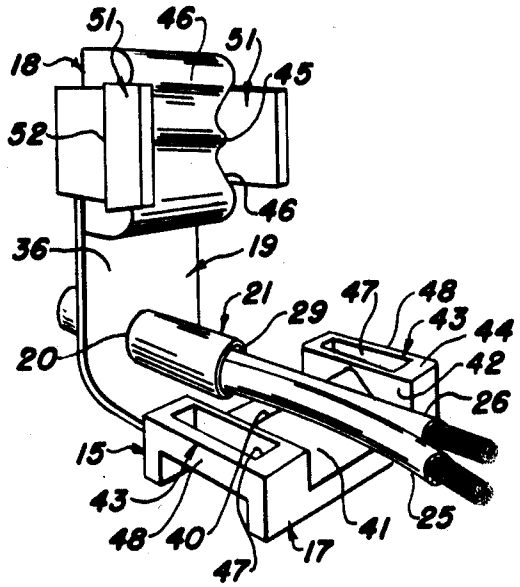
[52] **U.S. Cl.** ..... **174/87,** 174/138 F, 339/107
[51] **Int. Cl.** **H02g 15/08**
[50] **Field of Search** 174/87, 138.4; 339/205, 211, 213, 107

[56] **References Cited**
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Primary Examiner—Darrell L. Clay
Attorneys—Alfred G. Gross and Elmer A. Johnson

ABSTRACT: The protector has a pocket of insulating material which encloses the spliced stripped ends forming the terminal of electrical conductors, the terminal being secured in the pocket to prevent removal therefrom. In addition, a cord strain relief on the protector secures the conductors to the protector independently of the pocket to provide another lock which prevents removal of the terminal from its pocket, to thereby effect two safety features against possible exposure of the terminal causing shock hazards when embodied in an electrical appliance.



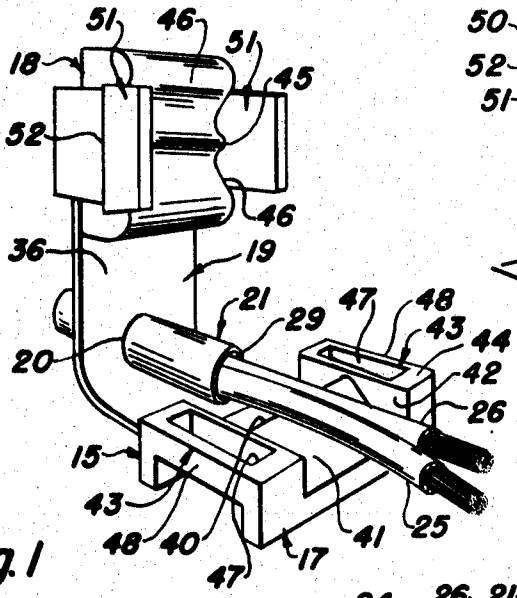


Fig. 1

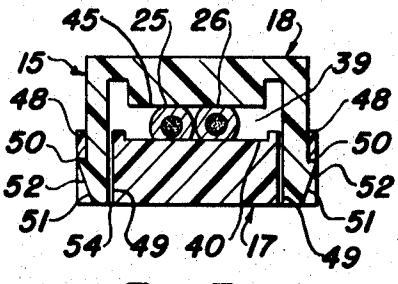


Fig. 3

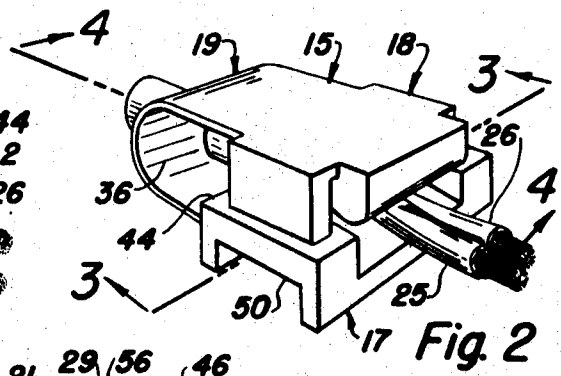


Fig. 2

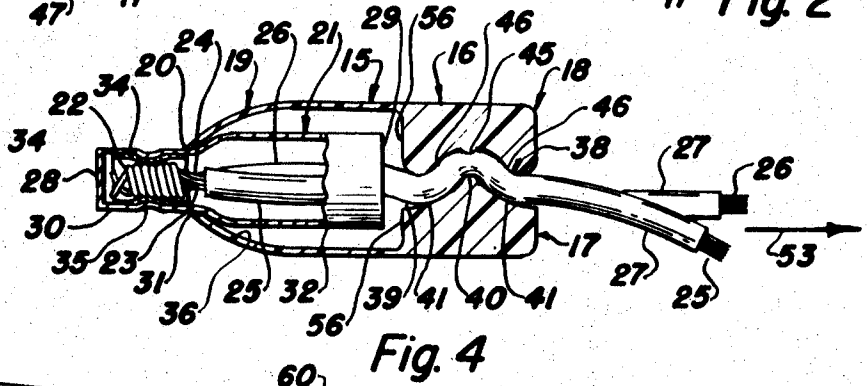


Fig. 4

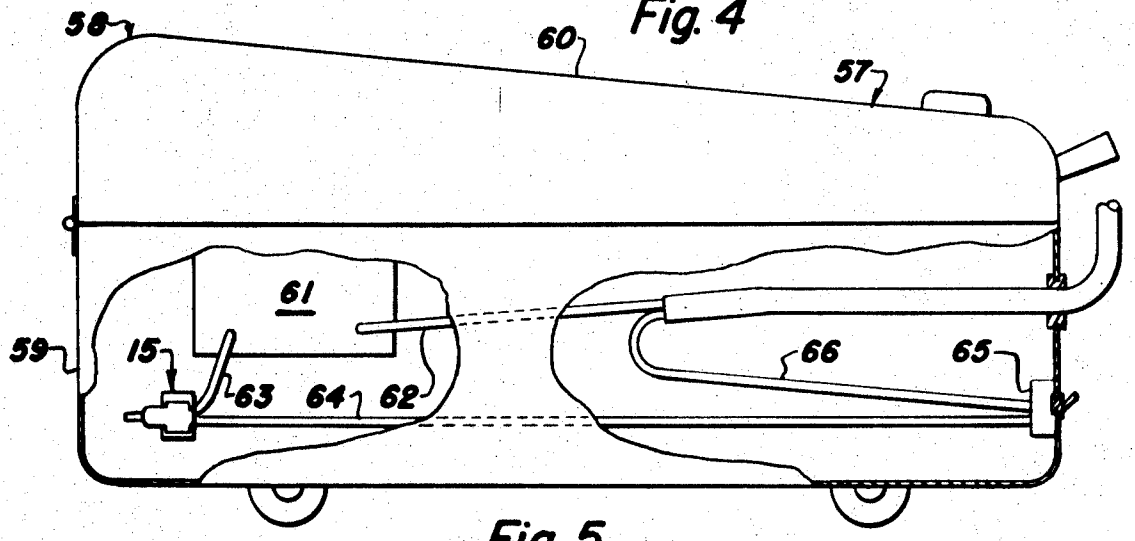


Fig. 5

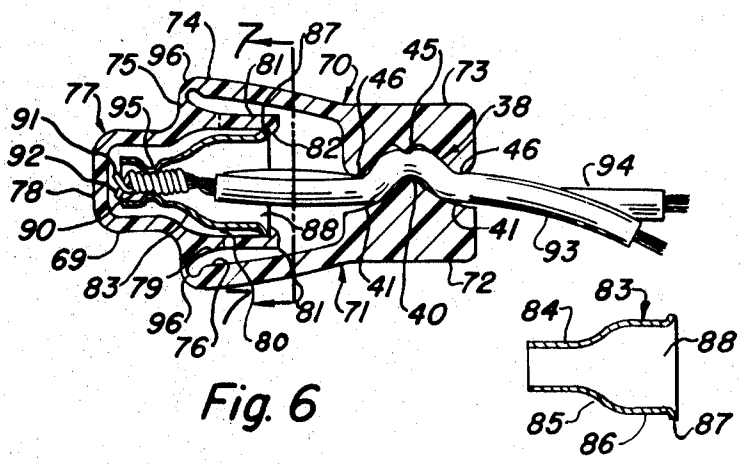


Fig. 6

Fig. 8

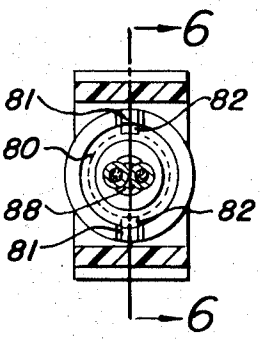


Fig. 7

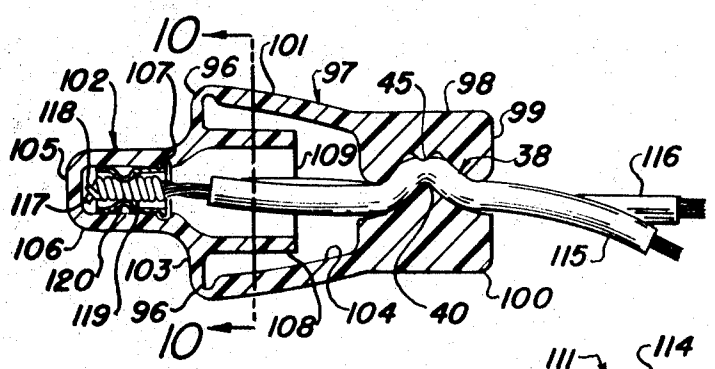


Fig. 9

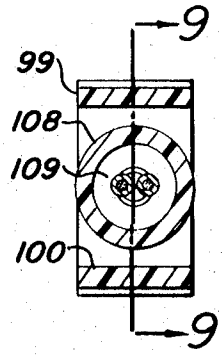


Fig. 10

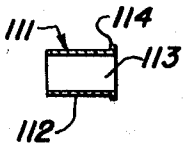


Fig. 11

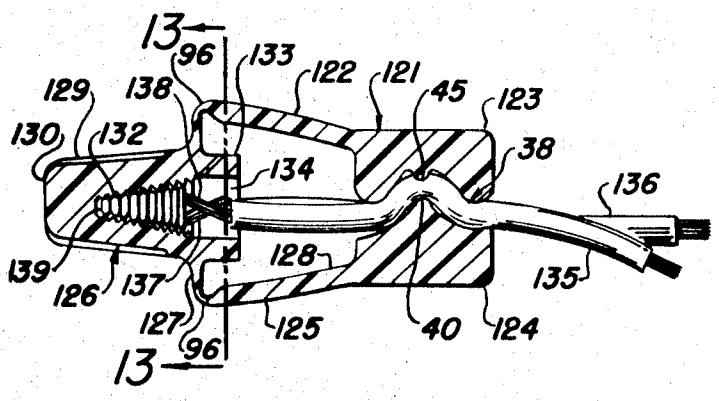


Fig. 12

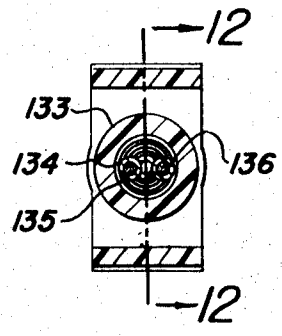


Fig. 13

PROTECTOR FOR ELECTRICAL TERMINALS

BACKGROUND OF THE INVENTION

The invention relates to protectors for spliced ends forming terminals of conductors adapted to be included in the circuit of an electrical appliance. The protectors completely enclose the bare ends of the terminals and provide a plurality of locking means to prevent removal from the protectors in the event the terminals have been improperly spliced or inserted in the protectors to thereby avoid shock hazards.

SUMMARY

According to the present invention the terminal protector is made from electric insulating material and includes a pocket which may be an integral part of or separate from the body of the protector. The bare terminal is inserted in the pocket and the latter is provided with a lock to prevent removal of the terminal and the wires forming the terminal. The pocket can also be provided with a metal connector which is squeezed about the terminal to improve the electrical connection between the spliced conductors, or the metal connector can be omitted and threads molded into the pocket and the stripped ends of the conductors threaded into the pocket to form a spliced terminal.

In addition, the protector is provided with a cord strain relief which locks the insulated portions of the conductors to prevent movement of the latter relative to the terminal in the pocket and to the protector.

Thus, it is an object of the invention to provide a terminal protector having two locking devices, both of which operate to retain the terminal and the bare wires forming the latter within the pocket of the protector.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the first embodiment of the invention showing the protector in open position,

FIG. 2 is a perspective view of the protector but shown in closed locked position,

FIG. 3 is a section along line 3—3 in FIG. 2,

FIG. 4 is a section along line 4—4 in FIG. 2,

FIG. 5 is a broken view of an electrical appliance, such as a suction cleaner, showing the protector embodied in the circuit of the appliance,

FIG. 6 is a section along line 6—6 in FIG. 7 of a second embodiment of the invention showing the pocket as an integral part of the protector,

FIG. 7 is a section along line 7—7 in FIG. 6,

FIG. 8 is a section of the metal connector separated from the protector in FIG. 6,

FIG. 9 is a section along the line 9—9 in FIG. 10 disclosing a third embodiment of the invention wherein the metal connector is press-fitted into the pocket,

FIG. 10 is a section along line 10—10 in FIG. 9,

FIG. 11 is a section of the metal connector separated from the protector in FIG. 9,

FIG 12 discloses a fourth embodiment of the invention wherein threads are molded into the pocket, and is taken along the line 12—12 in FIG. 13, and

FIG. 13 is a section along line 13—13 in FIG. 12.

DESCRIPTION OF THE FIRST EMBODIMENT

The embodiment of the invention in FIGS. 1 to 4 discloses a protector 15 for an electric terminal and comprises a body 16 of Polypropylene, Nylon, Delrin or other suitable moldable electric insulating material, having opposite end portions 17 and 18 connected by a relatively flexible intermediate portion 19. Midway in the portion 19 is an opening 20 in which is supported a pocket 21 forming an enclosure for an electric terminal 22. The electric terminal 22 includes twisted-together bare ends 23 and 24 of electrical conductors 25 and 26 respectively, each of which are coated with insulation 27.

The pocket 21 is of tubular configuration formed of molded electric insulating material closed at one end 28 and its opposite end is provided with an opening 29 for insertion of the terminal 22. The pocket 21 includes a reduced tubular section 30 extending from the closed end 28 to a shoulder 31 from which extends an enlarged tubular skirt section 32 terminating at the inlet opening 29.

A metal sleeve or connector 34 is secured in the reduced tubular section 30 during the molding of the pocket 21 and receives the twisted ends of the terminal 22 when the latter has been inserted through the opening 29 of the pocket 21. The connector or metal sleeve 34 and the enclosing reduced tubular section 30 are suitably crimped as indicated at 35, to more firmly secure the terminal 22 in the sleeve 34 and the latter to the reduced tubular section 30, and to also clamp the stripped ends 23–24 of the conductors 25–26 together to form a good electrical connection therebetween. Thereafter, the pocket 21 is supported on the intermediate portion 19 of the protector 15 by inserting the tubular section 30 through the opening 20 until the shoulder 31 abuts the inner surface 36 of the body intermediate portion 19, and the insulation 27 of the conductors 25–26 overlie the end 17 of the protector body 16, as shown in FIG. 1.

The opposite ends 17–18 of the body 16 are formed complementary to each other to provide a cord strain relief 38 having an undulating longitudinally extending passageway 39 when the protector is in its folded position to accommodate the electrical conductors 25 and 26 as shown in FIG. 4. The end 17 of the body 16 has a rib 40 disposed between two concaved surfaces 41 which extend transversely of the body and abut the side wall 42 of two latch keepers 43 to define an undulating surface having the rib 40 terminating short of the top surface 44 of the latch keepers 43. The other complementary end 18 of the body 16 is provided with a rib 45 recessed with respect to two spaced convexed projections 46.

It will be noted from FIG. 4 that when the body 16 is in its folded position the convex projections 46 are arranged opposite their cooperating concaved surfaces 41 and the ribs 40–45 bend the electric cords 25–26 in the passageway 39 to prevent displacement of the cords relative to the protector 15 and the terminal 22 with respect to the pocket 21.

In order to lock the protector 15 in its folded position, each of the keepers 43 in the body end portion 17 is provided with an opening 47 which extends through the body 16, and the outer wall 48 of each keeper 43 is shorter than the opposite inner wall 49 to form a shoulder 50. At the other end 18 of the body 16, along its opposite edges, is a projecting tongue 51, each provided with a latch flange 52 adapted to be inserted into its opening 47 for engagement with the shoulders 50 in the body other end portion 17 to lock the protector 15 in its latched folded position, whereby the electric cords 25–26 will be retained against displacement in the passageway 39 when a pull is applied to the conductors in the direction of the arrow 53 shown in FIG. 4, to prevent the pull being transferred to the spliced terminal 22, the connector 34 and reduced tubular pocket portion 30. The latching tongues 51 are biased outwardly from the inner sidewalls 49 of the openings 47 so that the flanges 52 move into engagement with the shoulders 50 when the body is folded about the pocket to lock the protector 15 in its folded position.

It will be noted in FIG. 3 that the latching tongues 51 have their inner surfaces spaced from the adjacent inner wall 49 of the openings 47 as indicated at 54. These spaces 54 permit the latching tongues 51 to be pressed inwardly against the inner walls 49 of the openings 47 so that the flanges 52 clear the shoulders 50, whereby the tongues 51 can be withdrawn from the keepers 43 allowing the body ends 17 and 18 to be separated from each other to expose the electric cords 25 and 26 as shown in FIG. 1.

When the body 16 is unfolded, the pocket 21 can be removed from the protector 15 and a different pocket and terminal inserted in the opening 20 and thereafter the body is again folded to its locked condition.

The terminal 22 is attached to the protector 15 by inserting it in the metal connector 34 in the pocket 21, and thereafter suitable crimping tool is applied to the reduced portion 30 of the pocket 21 to lock the terminal 22 with respect to the metal connector 34 and pocket 21, as indicated by the opposed crimped areas 35. The pocket 21 is then inserted through the opening 20 in the protector 15 with the cords 25–26 arranged over the rib 40 as shown in FIG. 1. The protector 15 is then folded about the tubular portion 32 of the pocket 21 into its locked position by inserting the tongues 51 into the keeper openings 47 until the flanges 52 engage the shoulders 50. When the protector 15 is in its closed folded position the cords 25–26 are bent in the passageway 39 and the opposing ribs 40–45 press into the insulation of the cords to securely lock them relative to the body to further insure that a strain will not be placed upon the spliced wires of the terminal 22 and also the pocket 21 cannot be removed from the protector 15 to expose the stripped ends 23–24 of the conductors and cause a possible shock hazard.

The open end 29 of the pocket 21 is spaced a short distance from the inner surfaces 56 of the body end portions 17–18 so that if the pocket 21 is displaced in its opening 20, the pocket end 29 will abut the surfaces 56 to prevent the reduced end 30 of the pocket from being dislodged through the opening 20.

The protector 15 is particularly adapted for use in electrical appliances, for example a canister-type suction cleaner 57, as shown in FIG. 5. The cleaner 57 includes a body 58 having a base 59 provided with a cover 60 for access to the interior of the cleaner body. A motor 61 is mounted in the body 58 and is connected in an electric circuit, including one of the power leads 62, a wire 63 from the motor 61 to the protector 15, from which extends conductor 64 to a switch 65 connected to the other power lead 66.

In the event the cord strain relief structure has not been locked properly so that the protector 15 unfolds, as for example as shown in FIG. 1, the bare ends of the terminal 22 remain covered by the pocket 21, or if the terminal 22 is improperly made or assembled in the pocket 21, the bare wires forming the terminal 22 will not be exposed because of the locked cord strain relief structure 38, and accordingly, the terminal 22, and the bare ends 23–24 of the cords 25–26 respectively cannot contact a metallic part of the cleaner and create a shock hazard.

DESCRIPTION OF THE SECOND EMBODIMENT

A second embodiment of the invention is disclosed in FIGS. 6 to 8 and comprises a protector 70 molded from suitable plastic material.

In the present embodiment the protector 70 includes a body 71 having opposite end portions 72 and 73 connected by a flexible intermediate portion 74. Midway in the body intermediate portion 74 and projecting from opposite sides 75 and 76 thereof is an integrally molded pocket 77 having a reduced section 69 provided with a closed end 78 projecting beyond the outer face 75 of the body intermediate portion 74, and a skirt 79 extends from the other face 76 and terminates in an inlet opening 80.

Projecting from the pocket opening 80 are two diametrically arranged latch fingers 81 provided at their free ends with a shoulder 82, and the latch fingers 81 are normally biased toward the interior of the pocket opening 80

A tubular metal connector or sleeve 83 is seated in the pocket 77 and includes a reduced portion 84, an inclined section 85 and a skirt portion 86 having an outwardly radially flared edge 87 at the entrance 88 to the connector 83.

The terminal 90 formed by the spliced bare ends 91–92 of the electrical conductors 93–94 respectively are secured within the reduced portion 84 of the connector 83 by use of a crimping tool which forms the indentations 95 in the reduced portion 84 of the connector 83.

The connector 83 and terminal 90 are removably secured in the pocket 77 by inserting the connector into the reduced portion 69 of the pocket 77 to such an extent that the shoulder 82 of each latch finger 81 engages the flared end 87 of the connector 83, as shown in FIG. 6.

The thickness of the intermediate portion 74 of the body 71 at opposite sides of the pocket 77 is reduced as indicated at 96 to provide a pair of hinges so that intermediate portion 74 may be folded into locked position over the latch fingers 81 as shown in FIG. 6 to prevent access thereto when the protector is in its folded locked position.

The opposite end portions 72–73 of the body is provided with the cord strain relief 38 described in connection with the first embodiment of the invention in FIGS. 1 to 4, and accordingly the cords 93–94 are locked to the protector 70 to prevent any stress being applied to the terminal 90, connector 83, or the pocket 77.

From the foregoing it will be apparent that the terminal 90 is locked in the connector 83 by the crimped metal indentations 95 and the connector 83 is locked in the pocket 77 by the latch fingers 81, however, if it is desired to replace the connector 83, the latch fingers 81 may be spread apart from the flared end 87 of the connector 83 to release the latter from the pocket 77.

This embodiment, as in the first, provides a double lock to prevent removal of the terminal 90 from the pocket 77, because the latch fingers 81 form one locking device and the cord strain relief 38 an additional latch for the conductors 93–94 and thus for the terminal 90 and connector 83.

DESCRIPTION OF THE THIRD EMBODIMENT

Another embodiment of the invention is disclosed in FIGS. 9 to 11 and comprises a protector 97 molded from suitable plastic material and is provided with a body 98 having opposite end portions 99–100 connected by a flexible intermediate portion 101 in which is molded a pocket 102 projecting from the opposite sides 103–104 thereof. The pocket 102 is tubular and has a closed end 105 in a reduced portion 106 and is provided with an annular recess 107 from which extends a skirt section 108 having an opening 109.

A tubular metal sleeve or connector 111 is disposed in the reduced portion 106 of the pocket 102 and includes a cylindrical section 112 terminating in an opening 113 having a flanged end 114. The external diameters of the cylindrical section 112 and the flanged end 114 are so sized with respect to the interior diameters of the pocket reduced section 106 and annular recess 107, that the connector 111 is secured in the pocket 102 by forcing it into the pocket to form a press-fit therewith.

The remainder of the protector 97 is similar to that described in FIGS. 6 to 8 and includes a pair of hinges 96 and the cord strain relief 38 to secure the conductors 115–116 to the protector 97.

In this embodiment the bare ends 117–118 of the conductors 115–116 are spliced together to form a terminal 119 which is inserted in the connector 111 and the latter is crimped to the terminal 119 as indicated at 120 by a crimping tool. The connector 111 is press-fitted into the reduced area 106 of the pocket 102 to prevent removal from the latter and thus provides one lock to prevent removal of the terminal 119. In addition, the cord strain relief 38 locks the conductors 115–116 and thus prevents a stress being applied therethrough to the terminal 119 in the pocket 102.

DESCRIPTION OF THE FOURTH EMBODIMENT

The final embodiment of the invention is shown in FIGS. 12 and 13 and comprises a protector 121 molded from suitable plastic material and is provided with a body 122 having opposite end portions 123–124 and an intermediate portion 125 in which is molded a pocket 126 projecting from the opposite faces 127–128 of the body intermediate portion 125. The portion 129 of the pocket 126 projecting from the face 127 has a closed end 130 and a conical-shaped interior provided with molded threads 132 which terminate in an enlarged skirt portion 133 having an opening 134.

The remainder of the protector **121** is similar to that described in FIGS. **9** to **11** and includes a pair of hinges **96**, and the cord strain relief **38** to secure conductors **135–136** to the protector **121**.

In order to assemble the cords **135–136** in the protector **121** the latter is opened to a position similar to that shown in FIG. **1** and the unspliced bare ends **137–138** of the cords are inserted through the opening **134** into the pocket **126**. The cords **135–136** are then rotated in a clockwise direction to thread the bare ends **137–138** inwardly into the conical-threaded portion **132** of the pocket **126**. Continued rotation of the bare ends **137–138** cause the latter to advance toward the closed end **130** of the pocket **126** to confine the ends in a smaller area as the diameter of the conical tube decreases. Such rotation and the reduction of space toward the closed end **130** of the conical portion **132** causes the bare wire ends **137–138** to become twisted together, that is spliced, to form a terminal **139**. In addition, the terminal **139** is retained in the conical tubular portion **132** by being embedded in the threads to thereby prevent removal of the terminal **139** from the pocket **126**.

The cord strain relief **38** provides another lock to secure the conductors **135–136** relative to the protector **121** and the pocket **126** to thereby assure that the terminal **139** will not be dislodged from the pocket **126** and cause a shock hazard.

It will be understood that the disclosed structure is for illustrative purposes only and is not to be taken in a limiting sense. The present invention includes all equivalent variations of the disclosed structure and is limited only by the scope of the claims.

I claim:

1. A protector for the stripped terminal ends of insulated electrical conductors, comprising:
- a body of flexible dielectric material having means providing a pocket for receiving the stripped ends of two electrical conductors;
- locking means in said pocket for retaining said conductor stripped ends therein;
- strain relief means carried by said body in spaced relation to said pocket for locking said conductors to said body independently of said pocket locking means; and
- said strain relief means including upper and lower portions securable together and such portions having respective surfaces in facing relation cooperable to provide an undulating passageway for said conductors.

2. A protector for the stripped terminal ends of insulated electrical conductors as described in claim **1**, wherein:
- said body is elongated;
- said upper and lower strain relief portions are located at opposite ends of said elongated body; and
- said means providing a pocket being disposed intermediate said upper and lower strain relief portions.

3. A protector for the stripped terminal ends of insulated electrical conductors as described in claim **1**, wherein:
- said means providing a pocket in said body extends in a direction transverse to the longitudinal axis of body; and
- said means for providing a pocket in said body further provides an entrance to said pocket which entrance faces said strain relief means when said upper and lower portions are secured together.

4. A protector for the stripped terminal ends of insulated electrical conductors as described in claim **1**, including:
- a metal connector disposed in said pocket for receiving said stripped terminal ends; and
- said locking means in said pocket engages said metal connector for releasably locking said metal connector in said pocket.

5. A terminal protector as described in claim **4**, wherein:
- said locking means in said pocket includes a latch finger formed of a resilient material to releasably engage said metal connector; and
- said latch finger engages the end of said metal connector located adjacent said strain relief means.

6. A protector for the stripped terminal ends of insulated electrical conductors as described in claim **1**, including:
- a metal connector disposed in said pocket for enclosing said terminal and
- the external diameter of said metal connector is smaller than the internal diameter of said pocket to cause an interference fit when said metal connector is placed inside of said pocket.

7. A protector for the stripped terminal ends of insulated electrical conductors as described in claim **1**, wherein:
- said elongated flexible body being generally in the shape of a flat strip;
- said pocket being supported on an intermediate portion of said body strip;
- said body strip being foldable about said pocket; and
- said upper and lower strain relief portions, located on said body strip end portions, being securable together for locking said conductors in said undulating passageway and retaining said body strip intermediate portion folded about said pocket.

8. A protector for the stripped terminal ends of insulated electrical conductors as described in claim **1**, wherein
- said means providing a pocket being removably supported in an opening in said body;
- said means providing a pocket having an enlarged portion at one end thereof to prevent said pocket providing means from pulling through one side of said body opening: and
- said strain relief means, when locked about said conductors, being arranged with respect to said pocket providing means to abut said enlarged portion to prevent removal of said means providing a pocket from the second side of body opening.

9. A protector for the stripped ends forming the terminal of electrical conductors, comprising:
- a. a body of flexible insulating material;
- b. a pocket supported on said body for enclosing the stripped ends of conductors forming a terminal;
- c. locking means in said pocket for locking said terminal and said conductors in said pocket;
- d. cord strain relief means on said body beyond one end of said pocket for locking said conductors to said body independently of said locking means for said terminal and conductors; and
- e. said body formed of molded plastic material with said pocket forming an integral part thereof, and thread means molded in the interior of said pocket for receiving said stripped ends of said conductors, rotation of said stripped ends along said molded thread means splicing said ends together and securing the latter in said pocket.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,617,615 Dated November 2, 1971

Inventor(s) Jerry L. Balzer

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet insert -- [73] Assignee The Hoover Company, North Canton, Ohio --.

Signed and sealed this 24th day of October 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

FORM PO-1050 (10-69)

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