

[54] **WIRE TERMINAL**

[75] Inventor: **William A. Reimer, Wheaton, Ill.**

[73] Assignee: **GTE Automatic Electric Laboratories Incorporated, Northlake, Ill.**

[22] Filed: **Sept. 24, 1973**

[21] Appl. No.: **399,895**

[52] U.S. Cl. **339/75 R, 339/97 R, 339/206 R, 339/248 R, 339/249 R, 339/253 R**

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

[58] Field of Search **339/206, 207, 208, 209, 339/210, 247, 245, 248, 249, 250, 253, 276, 75 R, 75 M, 76, 97 R, 97 L, 97 P, 98, 99**

[56] **References Cited**

UNITED STATES PATENTS

839,346	12/1906	Wardman.....	339/248 R
2,525,449	10/1950	Coutant	339/210 R
2,587,239	2/1952	Smith.....	339/206 R
2,894,243	7/1959	Hayes.....	339/206 R

Primary Examiner—Bobby R. Gay

Assistant Examiner—Robert A. Hafer

Attorney, Agent, or Firm—R. F. Van Epps

[57]

ABSTRACT

A wire terminal includes a longitudinal strip of electrically conductive material having a plurality of longitudinally arranged fingers laterally spaced in two different planes and a pair of identical U-shaped encapsulating members arranged to mate in locking relationship, each having a plurality of longitudinally arranged cavities divided by abutment walls. The cavities are formed to receive the extending fingers and have converging top and bottom walls so that when the members are locked together, the fingers are placed in spring tension by the converging walls to maintain a constant contact force on a wire placed between the fingers to securely hold the wire in place against the abutment wall and to make intimate electrical contact with the wire.

9 Claims, 12 Drawing Figures

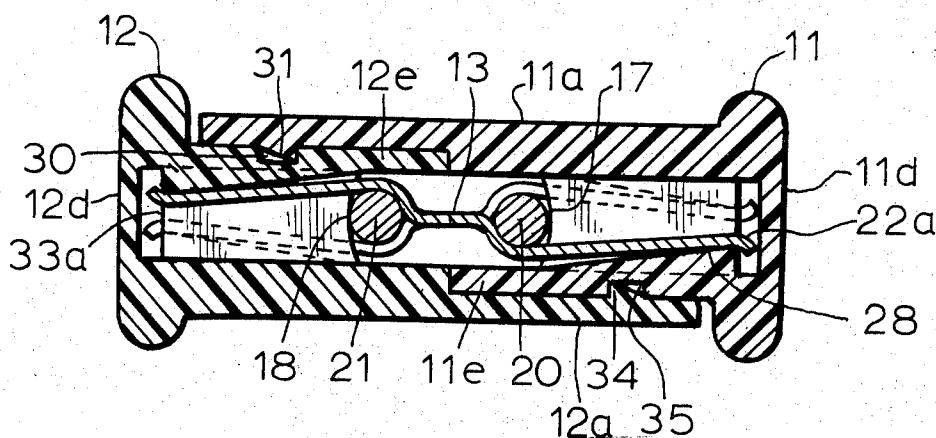


FIG. 1

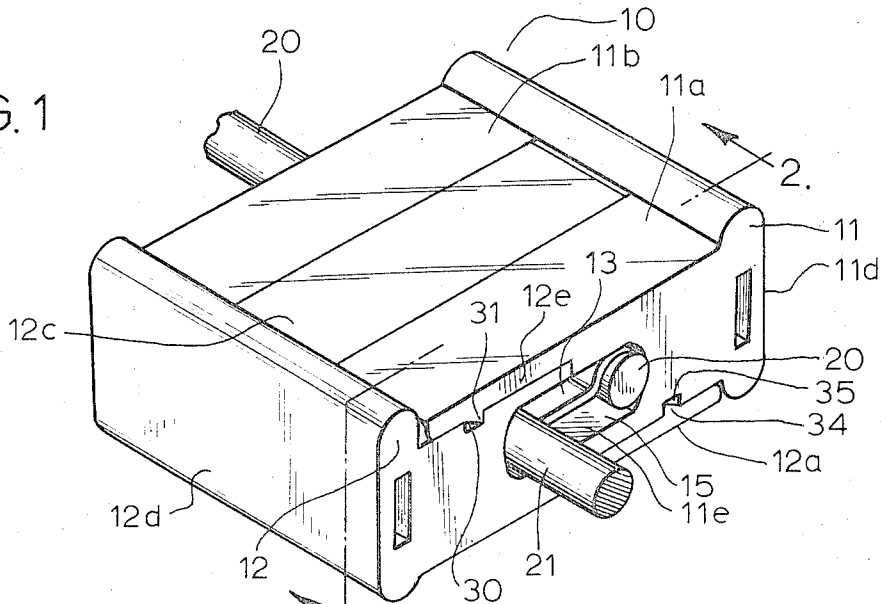


FIG. 2

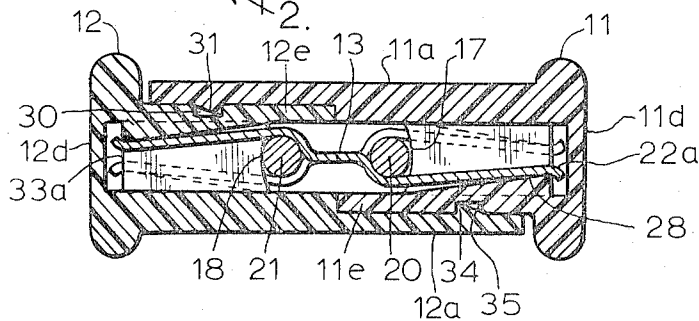


FIG. 3

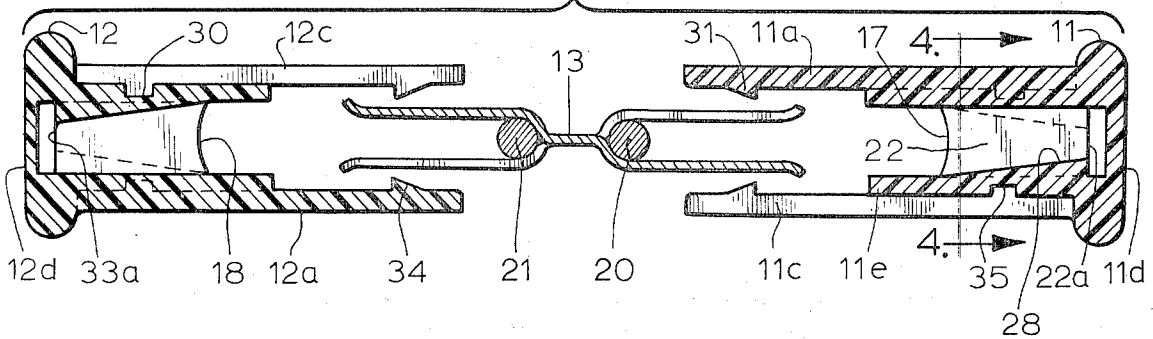


FIG. 4

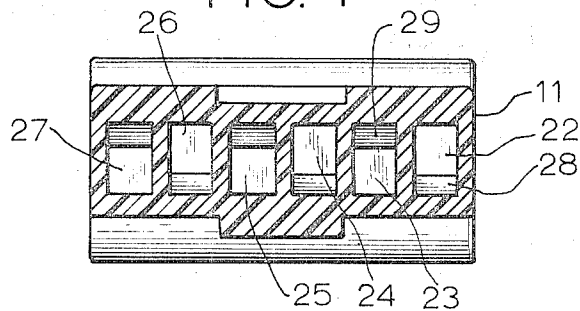


FIG. 5

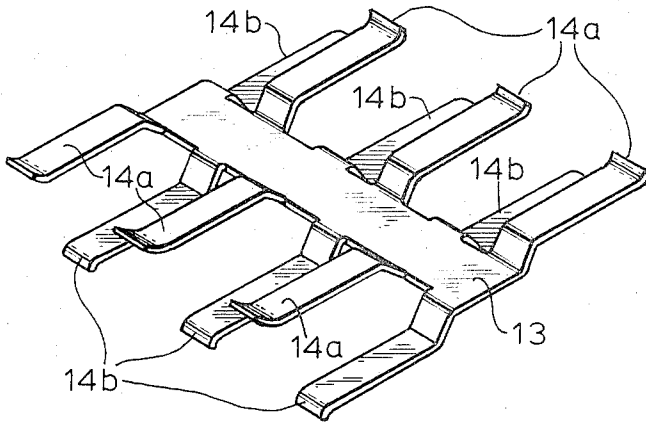


FIG. 6

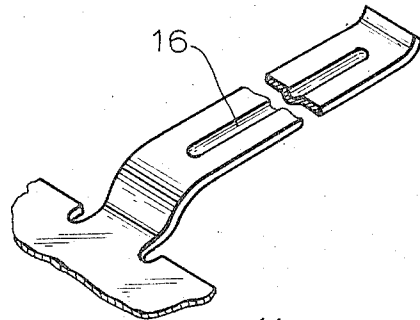


FIG. 7c

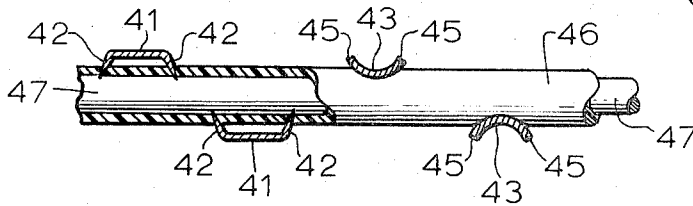


FIG. 7a

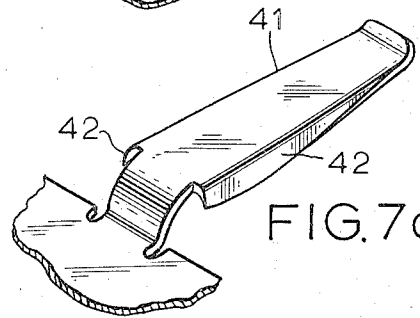


FIG. 7b

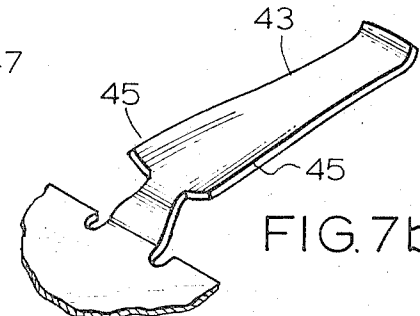


FIG. 8

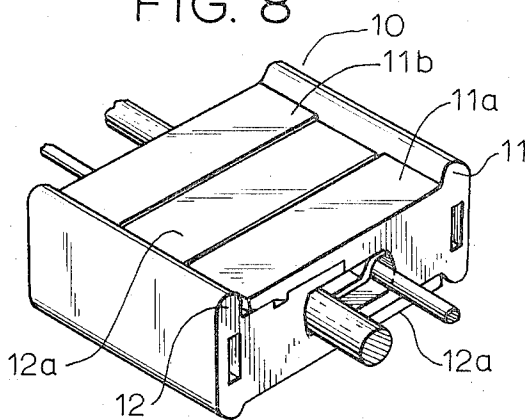


FIG. 9

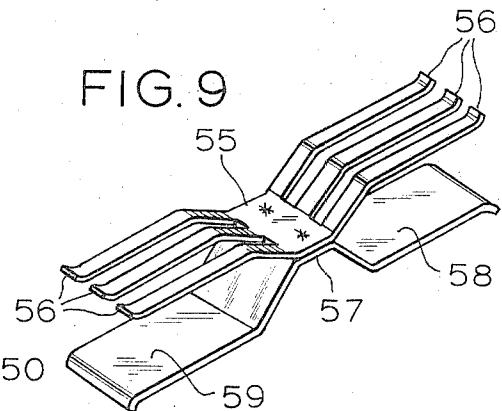
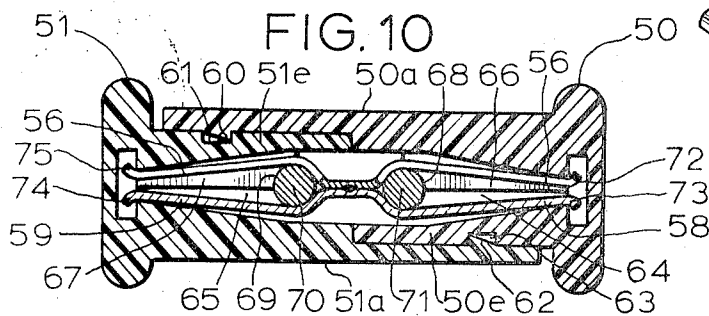


FIG. 10



WIRE TERMINAL

BACKGROUND OF THE INVENTION

Common to all electronic systems is the need to terminate wires, both of the solid and stranded varieties. Unfortunately, wire terminals of the prior art suffer from a number of drawbacks.

Prior wire terminals in general have been unable to accommodate wires of differing gauges. This is particularly troublesome when a wire of one gauge is to be interconnected with a wire of another gauge. Also, many wire terminals in current use require special termination tools. This can be an annoyance because the special tools must always be carried by the workman. Another drawback in current wire terminals is that the contact integrity between the terminated wire and the terminal diminishes with age. This results because the wire eventually deforms at the contact point. Where a number of wires must be terminated together, present wire terminals are usually complex and thus quite costly. The cost of such devices is further aggravated when constructed to terminate wires of different gauges.

It is therefore, a general object of the present invention to provide a wire terminal which avoids the disadvantages of prior art wire terminals.

It is a more particular object of the present invention to provide a wire terminal capable of accommodating wires of different size.

It is another object of the present invention to provide a wire terminal which securely holds and maintains intimate contact with wire notwithstanding wire deformation.

The invention provides a wire terminal having a substantially planar strip of electrically conductive material having first and second sets of laterally spaced fingers extending therefrom, the first set being disposed above the plane and the second set being disposed below the plane. The invention further includes an enclosure of insulating material comprising a pair of complementary encapsulating members adapted to lock together each comprising an inner abutment wall and a plurality of laterally spaced cavities having converging top and bottom walls aligned to receive the fingers so that when the encapsulating members lock together, the fingers are placed in spring tension by the converging cavity walls to maintain a constant contact force against a wire placed therebetween to securely hold the wire in place against the abutment wall and to make intimate electrical contact with the wire notwithstanding wire deformation.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention, together with the objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawings, and the several figures of which like reference numerals identify like elements, and in which:

FIG. 1 is a perspective view of a wire terminal embodying the present invention;

FIG. 2 is a cross-sectional view taken along lines 2—2 of FIG. 1;

FIG. 3 is an exploded view in cross-section showing the wire terminal of FIG. 1 in greater detail;

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

FIG. 5 is a perspective view showing the form that an element of the inventive wire terminal may take;

FIG. 6 is a partial view showing one variation of the present invention;

FIG. 7a and 7b show an alternative form to which the present invention may take;

FIG. 7c is a partial side view, partially cut away, showing a wire being terminated by the form of the present invention as shown in FIGS. 7a and 7b;

FIG. 8 is a perspective view of a wire terminal embodying the present invention terminating wires of different sizes;

FIG. 9 is a perspective view showing another variation of one element of the present invention; and

FIG. 10 is a cross-sectional view of a wire terminal incorporating the element of FIG. 9.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIGS. 1, 2 and 3 there is shown a wire terminal 10 embodying the present invention after wires 20 and 21 have been terminated. The wire terminal comprises a substantially planar sheet of electrically conductive material 13 (more clearly seen in FIG. 5), and an enclosure of insulating material comprising a pair of complementary encapsulating members 11 and 12.

Members 11 and 12 are complementary, that is, when locked together as shown in FIG. 1 they totally encapsulate the area of wire termination except for the necessary access opening 15. In the preferred embodiment members 11 and 12 are identical but when mated are inverted one to the other. Accordingly considering member 11 to be right-side-up, it is shown to include longitudinally spaced major cover sections 11a and 11b and a major cover section 11c laterally staggered and between cover sections 11a and 11b. All are in extension from an end wall 11d. Correspondingly, in inverted relation to member 11 is member 12 having like designated major cover sections 12a, 12b (not shown) and 12c extending from end wall 12d. The major sides of the wire terminal are in three sections, member 11 having major cover sections 11a and 11b, and member 12 having major cover section 12c. Because the encapsulating members are complementary on the major side opposite that shown, member 12 has two major cover sections 12a and 12b and member 11 has one major section 11c.

For each major cover section on one encapsulating member, there is a corresponding underlying minor cover section on the other member. Each minor cover section has a notch which receives a stud on its corresponding major cover section for locking engagement. For example, minor member 12e has notch 30 which receives stud 31 of major cover member 11a and minor member 11e at notch 35 receives stud 34 of major member 12a.

Referring to FIG. 5, the substantially planar strip of electrically conductive material 13 has a plurality of longitudinally arranged laterally spaced fingers 14a and 14b extending from each of its major sides. Every other one of the extending fingers is disposed above the plane and every other one below the plane forming a first set of extending fingers 14a above the plane and a second set of fingers 14b below the plane. The fingers are verti-

cally spaced to accommodate the placement of a wire in between them.

Referring now to FIGS. 2, 3 and 4, encapsulating members 11 and 12 additionally include a curved inner abutment wall 17 and 18 respectively. Extending back from each abutment wall is a plurality of longitudinally arranged cavities 22 through 27. The cavities are spaced and formed to receive the fingers 14a, 14b of planar strip 13. Every other one of the cavities has an inclined bottom wall and every other one has a declining top wall. For example, cavity 22 has an inclined bottom wall 28 and cavity 23 has declining top wall 29.

In operation, wires 20 and 21 to be terminated are placed in between fingers 14a and 14b as shown. Planar strip 13 is then disposed between encapsulating members 11 and 12, the fingers being aligned with the cavities. The complementary encapsulating members 11 and 12 are then brought together, each finger being inserted into its corresponding cavity. The encapsulating members are brought together until they are in locked relation as shown in FIG. 2.

The converging top and bottom walls of the cavities place the fingers in spring tension around wires 20 and 21 to securely hold the wires against abutment walls 17 and 18 and to make intimate electrical contact between the wires and the fingers.

Because the fingers are in spring tension around the wires, a constant contact force against the wires is maintained so that, should the wires deform with termination age, contact integrity is maintained. The ends of each of the fingers are bent outwardly and protrude through openings 22a and 33a to restrict movement of the fingers.

If it is desired to stiffen each of the fingers 14a, 14b of planar strip 13, an elongated indentation may be provided in each of the fingers. Such a construction is shown in the partial view of FIG. 6. Elongated stiffening indentation 16 may be desirable where extra gripping force on the wire is required.

If it is required to terminate insulated wire without stripping, the fingers on planar strip 13 may have the construction as shown in FIGS. 7a and 7b. The sides of fingers 41 in FIG. 7a are bent towards wire 46 forming a pair of flanges 42 on each side. Each flange has a sharpened end sufficient for piercing the wire insulation. Fingers 43 as shown in FIG. 7b has sides 45 bent outwardly so that they are bent away from the wire. This construction helps hold the wire securely in place. Fig. 7c shows how fingers 41 and fingers 43 may be used together to terminate an insulated wire. Flanges 42 pierce the wire insulation 46 to make intimate contact with the conductive wire 47. Fingers 43 hold the wire securely in place. The modified construction as shown in FIGS. 7a and 7b may be incorporated into fingers 14a, 14b of planar strip 13 and used in the environment of encapsulating members 11 and 12 as shown in FIGS. 1 through 4. The converging top and bottom walls, while urging the fingers around the wire, will force the flanges through the wire insulation.

FIG. 8 shows the wire of FIG. 1 terminating four wires of two different sizes. Because a wire can be securely held by any three fingers, the terminal of FIG. 1 by having 12 fingers can terminate as many as four wires simultaneously. The fingers when urged around each wire will conform to the diameter of each wire. Therefore, the wire terminal of the present invention

will securely terminate any wire which fits between the fingers.

FIG. 9 shows the inner conductive finger bearing element in another form. It comprises a substantially planar strip of conductive material 55 having longitudinally arranged laterally spaced fingers 56 extending therefrom. The fingers are disposed above the plane of planar strip 55 as shown. Below and welded to planar strip 55 is a second planar strip 57 having continuous extensions 58 and 59 lying beneath the plane of the planar strip 57 and also beneath fingers 56. Because the extensions 58 and 59 are of continuous conductive material, the current handling capability of a wire terminal of this construction is increased.

Such a wire terminal is shown in cross-section in FIG. 10. In its locked position, stud 60 of major cover section 50a is received by notch 61 of minor cover section 51e. Stud 62 of major cover section 51a is received by notch 63 of minor cover section 50e. The wires 70 and 71 are disposed between the fingers 56, extensions 58 and 59 and abutment surfaces 68 and 69. The encapsulating members 50 and 51 have continuous cavities 64 and 65 to accommodate extensions 58 and 59 respectively. Cavities 64 and 65 have inclined bottom walls to urge extensions 58 and 59 around wires 71 and 70. Encapsulating members 50 and 51 also have a plurality of partial cavities 66 and 67 which are laterally spaced to receive fingers 56. Cavities 66 and 67 have declining top walls to urge fingers 56 around wires 70 and 71. The conjoint action of fingers 56 and extension 58 and 59 force the wires against abutment surfaces 68 and 69 to securely hold the wires in place. The force exerted against the wires by fingers 56, extensions 58 and 59, allow intimate electrical contact to be made between the wires and the conductive fingers and extensions to provide termination.

The ends of fingers 56 and extensions 58 and 59 are bent outwardly and extend through slots 72 through 75 to assure that the wires are held stationary.

It can be appreciated from the foregoing that the wire terminal of the present invention can accommodate any number of different size wires. Additionally, because the termination on either side of the wire terminal is independent from the other, the wire terminal of the present invention can accommodate different size wires in one termination. No special termination tools are required making the use of the present invention most convenient. A constant contact force is maintained against the terminated wires assuring contact integrity throughout the service life of the termination.

While particular embodiments of the invention have been shown and described, modifications may be made, and it is intended in the appended claims to cover all such modifications as may fall within the true spirit and scope of the invention.

I claim:

1. A wire terminal comprising;

a substantially planar strip of electrically conductive material having first and second sets of longitudinally arranged laterally spaced fingers extending therefrom, said first set being disposed above said plane and said second set being disposed below said plane; and

an enclosure of insulating material comprising a pair of complementary encapsulating members adapted to lock together, each comprising an inner abutment wall and a plurality of longitudinally arranged

5

cavities having converging top and bottom walls aligned to receive said fingers; whereby when said encapsulating members are locked together, said fingers are placed in spring tension by said converging cavity walls to maintain a constant contact force against a wire placed therebetween to securely hold the wire in place against said abutment wall and to make intimate electrical contact with the wire notwithstanding wire deformation.

2. A wire terminal in accordance with claim 1 wherein said cavities extend from said abutment wall.

3. A wire terminal in accordance with claim 1 wherein said strip has two major peripheral sides and wherein said first and second sets of fingers extend from said major sides.

4. A wire terminal in accordance with claim 1 wherein said first set of fingers comprises every other one of said fingers.

5. A wire terminal in accordance with claim 1 wherein said fingers include an elongated indentation for stiffening said fingers.

6. A wire terminal in accordance with claim 1 wherein side portions of first given pairs of said fingers are contoured away from the wire and side portions of given pairs of said fingers are contoured towards the wire, whereby second given pairs of fingers pierce the insulation of an insulated wire to be terminated.

7. A wire terminal in accordance with claim 1 wherein said cavities have end openings and the ends of said fingers are bent outwardly whereby said fingers are placed in locked engagement with said encapsulating members when said finger ends are inserted past said end openings.

8. A wire terminal comprising:
a first substantially planar strip of electrically con-

6

ductive material having a plurality of longitudinally arranged laterally spaced fingers extending therefrom, said fingers being disposed in a plane displaced from said planar strip;

a second substantially planar strip of electrically conductive material integral with said first planar strip having continuous extending portions aligned with said fingers and spaced apart therefrom;

an enclosure of insulating material comprising a pair of complementary encapsulating members adapted to be locked together, each comprising an inner abutment surface, a plurality of longitudinally arranged cavities having declining top walls, said cavities being aligned to receive said fingers and a continuous cavity having an inclined bottom wall aligned with said plural cavities and spaced apart therefrom to receive said continuous extending portions; whereby,

when said encapsulating members are locked together, said fingers and said extending portions are placed in spring tension around a wire placed therebetween by said declining top and inclining bottom walls respectively to maintain a constant contact force against the wire to securely hold the wire in place against said abutment surface and to make intimate electrical contact with the wire notwithstanding wire deformation.

9. A wire terminal in accordance with claim 8 wherein each of said plural cavities and said continuous cavities have end openings and the ends of said fingers and said extending portions are bent outwardly whereby said fingers and extending portions are placed in locked engagement with said encapsulating members when said bent ends are inserted past said end openings.

* * * * *

40

45

50

55

60

65