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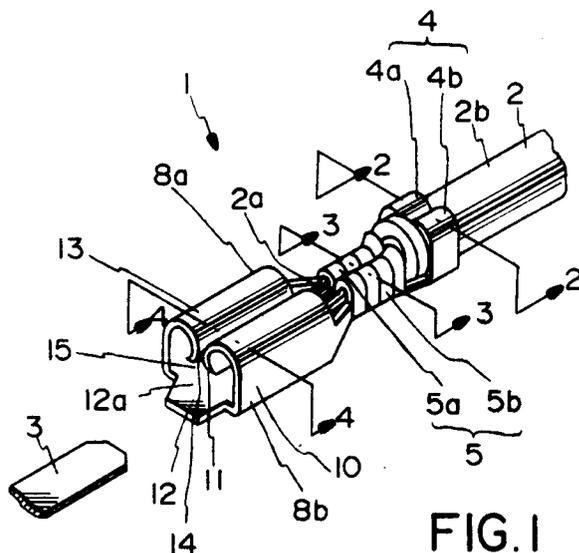
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54 Improvement in or relating to receptacle terminals.

57 An improved receptacle terminal (1) includes crimping sections (4, 5) to firmly hold an insulated wire (2) at one end of the terminal and two female terminal portions (8a, 8b) arranged laterally side by side adapted to receive a mating terminal tab (3) at the other end of the terminal. Each female terminal portion (8a, 8b) includes a rising side wall (10) integrally connected to a common base (12) and a curved top wall integrally connected to the rising side wall, and including a descending free end (10) curved toward the rising side wall. The curved shape of each of the free ends has the effect of suppressing the outward deflection of the female terminal portions (8a, 8b) upon insertion of the mating terminal tab (3) into the receptacle terminal.



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Field of the Invention

The invention relates to improvement in or relating to receptacle terminals.

5 Background of the Invention

Receptacle terminals each having a structure to terminate an insulated wire on one side of the terminal and a female portion allowing insertion of a mating terminal tab on the other side are known in the art. As seen Fig. 5, two female terminal portions 8a' and 8b' are arranged laterally side by side, each including a rising side wall 10' integrally connected to a common base 12' and a curved top wall 13' integrally connected to the rising side wall 10' and having a descending end 11' extending toward the common base surface 12a'.

When a mating terminal tab is inserted in a gap 15' of the receptacle terminal 1', both portions 8a' and 8b' deflect a certain measurable amount. Particularly, the deflection of the female terminal portion 8a' is measured in terms of the deflection of a selected point B' relative to the deflection of a selected point A' on the descending end 11' of the top wall 13' and the deflection of a selected point C' relative to the deflection of a selected point A'. Experiments have shown that the deflections of the selected point B' and of the selected point C' are relatively large with respect to that of the selected point A'.

The deflections of these selected points are so large that insertion of the terminal tab in the receptacle terminal when it is mounted on a printed circuit board, may affect surrounding parts mounted on the printed circuit board.

Additionally, it was also determined that maximum stress is developed at the center of each side wall 10' and that the amount of the stress is of a relatively high value which may result in metal fatigue.

25 Summary of the Invention:

In accordance with the present invention the prior art problems are solved by providing a receptacle terminal which reduces such deflections of each female terminal portion upon insertion of the terminal tab in the receptacle terminal.

Correspondingly, the maximum stress developed in each female terminal portion upon insertion of the terminal tab in the receptacle terminal is also reduced.

The advantageous structural arrangement of the receptacle terminal allowing termination of an insulated wire on one side of said terminal and allowing insertion of a mating terminal tab on the other side of the terminal is achieved by having two female terminal portions arranged laterally side by side, each including a rising side wall integrally connected to a common base and a curved top wall integrally connected to the rising side walls and each having a descending end extending toward the common base. The two female terminal portions are arranged laterally side by side with a gap therebetween, and the descending end of each is curved to extend toward the rising side wall.

Other objects, features and advantages of the invention will be apparent from the following detailed description taken in connection with the accompanying drawings.

Brief Description of the Drawings

- Figure 1 is a perspective view of a receptacle terminal embodying features of the present invention;
- 45 Figure 2 is a cross section of the receptacle terminal taken along the line 2-2 in Figure 1 as seen in the direction indicated by arrows;
- Figure 3 is a cross section of the receptacle terminal taken along the line 3-3 in Figure 1 as seen in the direction indicated by arrows;
- Figure 4 is a cross section of the receptacle terminal taken along the line 4-4 in Figure 1 as seen in the direction indicated by arrows; and
- 50 Figure 5 is a cross section of a prior art receptacle terminal.

Detailed Description

As seen in Fig. 1, a receptacle terminal 1 is shown as having one end adapted to terminate an insulated wire 2, and a second end adapted to receive a mating terminal tab 3. The insulated wire 2 is composed of core conductors 2a and surrounding insulation 2b.

The end of receptacle terminal to which an insulated wire 2 is terminated has insulation crimping portion 4 with a pair of insulation crimping sections 4a and 4b, and core conductor portion 5 with a pair of core conductor crimping sections 5a and 5b. The insulation and core crimping sections 4 and 5 along with a pair of female terminal portions 8a and 8b, which will be later described, may be made of sheet metal. The insulation crimping sections 4a and 4b are integrally connected to the opposite sides of a base plate 6 and project therefrom upward forming a "U" shaped section to receive the insulated wire 2. The projecting sections 4a and 4b are bent over the insulation 2b of the insulated wire 2 to crimp and anchor it to the terminal as shown in Fig. 1. Similarly, the opposite core crimping sections 5a and 5b are also integrally connected to the opposite sides of the base plate 6 and project therefrom upward to receive the core conductors 2a. The sections 5a and 5b are bent over the core conductors 2a of the insulated wire 2 to crimp the conductors as shown from Fig. 1.

The other end of the receptacle terminal 1 which is adapted to receive a terminal tab 3. Two female terminal portions 8a and 8b are arranged laterally side by side symmetrically with respect to the center line of the receptacle terminal. Specifically, each female terminal portion 8a and 8b is composed of a rising-and-curving portion 10 and 13 integrally connected to either side of a base plate 12 and each having a free end 11 generally descending and extending toward the base plate 12.

A tab inlet 15 is defined between the base plate 12 and the descending ends 11 of the adjacent rising-and-curving portions 10 and 13. Insertion of the tab 3 into the tab inlet 15 causes the descending ends 11 of the adjacent rising-and-curving portions 10 and 13 to resiliently deflect and thereby to apply a force to the tab 3 to hold it firmly in place.

The description of the structure of terminal 1 so far is the same as for the prior art receptacle terminal 1' shown in Fig. 5. The central feature of the receptacle terminal 1, according to the present invention, is that a gap 14 exists between the opposing female terminal portions 8a and 8b before and after mating with tab 3, and that the free end of each female terminal portion extends towards the rising section of the rising-and-curving portion 8a or 8b. As seen in Fig. 5, the free end 11' of the curved section of each female terminal portion 8a' or 8b' of the prior-art receptacle terminal 1' extends straight towards the surface 12a' of the base plate 12'. In contrast to this, the free end 11 of the curved section of each female terminal portion 8a or 8b extends towards the surface 12a of the base plate 12 and, at the same time, is curved toward the rising section 10 of each female terminal portion 8a or 8b, as shown in Fig. 4.

The internal stresses measured at selected points of female terminal portions 8a and 8b upon insertion of the terminal tab 3 into the tab inlet 15 of the receptacle terminal 1 were compared with those measured at selected points of female terminal portion 8a' and 8b' upon insertion of the terminal tab 3 in the tab inlet 15' of the prior art receptacle terminal 1'. The results of measurements in the prior art receptacle terminal are given in Table 1, and the results of measurements in the receptacle terminal of the present invention are given in Table 2. Also, a comparison was made as to where the maximum internal stress was developed and what the maximum internal stress was in the receptacle terminal 1 and the prior art receptacle terminal 1'. It was determined that the maximum internal stress occurred in the vicinity of the free end 11 of the curved section 13 of each female terminal portion 8a and 8b (present invention); and the maximum internal stress occurred at the center of the rising section 10' of each female terminal portion 8a' and 8b' (prior art receptacle terminal).

Figs. 4 and 5 show selected points at which deflections were measured. Outward deflections in the x- or y-direction caused by insertion of the terminal tab 3 in the tab inlet 15 and 15' are indicated by a preceding positive sign whereas inward deflections in the x- or y- direction are indicated by a preceding negative sign.

When the terminal tab 3 is inserted into the tab inlet 15' of the prior art receptacle terminal 1', the deflection of Point A' in the y-direction was + 0.03mm, the deflection of Point B' in the y-direction was + 0.027mm; and the de

Table 1

	<b>deflection</b> of free end A' in y-direction: 0.03mm	<b>deflection</b> of free end A' in y-direction: 0.06mm
<b>deflection</b> of Point B'	0.027mm in y-direction	0.054mm in y-direction
<b>deflection</b> of Point C'	-0.014mm in x-direction	-0.028mm in x-direction
stress kgf/mm <sup>2</sup>	13.26	26.53

Table 2

	deflection of free end A in y-direction: 0.03mm	deflection of free end A in y-direction: 0.06mm
deflection of Point B	0. 019mm in y-direction	0.038mm in y-direction
deflection of Point C	-0.016mm in x-direction	-0.031mm in x-direction
stress kgf/mm <sup>2</sup>	9.18	18.36

deflection of Point C' in the x-direction was - 0.014mm. In contrast to this, when the terminal tab 3 was inserted in the tab inlet 15 of the receptacle terminal 1 of the present invention, the deflection of Point A in the y-direction was + 0.03mm; the deflection of Point B in the y-direction was + 0.019mm; and the deflection of Point C in the x-direction was - 0.016mm. From this data it was apparent that the outward deflection at Point B of the left female terminal portion 8a in the present invention is appreciably smaller, compared with that at Point B' of the left terminal portion 8a' of the prior art receptacle terminal. Likewise, when the deflections of Points A and A' in the y-direction were + 0.06mm, it was apparent that the outward deflection of the left female terminal portion 8a at Point B is appreciably smaller, compared with that at Point B' of the left terminal portion 8a'. Thus, it may be concluded that the receptacle terminal 1, according to the present invention, has substantially less deformation than the prior art receptacle terminal 1' upon insertion of the mating terminal tab 3.

The maximum internal stresses were determined for two different deflections of Points A and A' of the left female terminal portions 8a and 8a' of the receptacle terminals 1 and 1'. For the 0.03 millimeter vertical deflection of Point A' of the left female terminal portion 8a' of the prior art receptacle terminal 1' the maximum internal stress was 13.26 kgt/mm<sup>2</sup>. The maximum internal stress developed in the receptacle terminal 1 of the present invention is substantially smaller 9.18 kgt/mm<sup>2</sup> than that in the prior art receptacle terminal 1'. Likewise, for the 0.06 millimeter vertical deflections of Point A' and A the maximum internal stress developed in the receptacle terminal 1 of the invention is substantially smaller than that in the prior art receptacle terminal 1'. This indicates an even distribution of internal stresses over the female terminal portion in the receptacle terminal according to the present invention. Also, it should be noted that limitation of the maximum internal stress in the vicinity of the free end 11 of each female terminal portion of a receptacle terminal according to the present invention has the effect of suppressing its outward deflection.

As may be understood from the above, the curving end 11 of each female terminal portion 8a, 8b is directed toward the upwardly projecting section 10 of the female terminal portion. This has the effect of suppressing the outward deflection of the female terminal portion upon insertion of the terminal tab in the receptacle terminal.

**Claims**

1. A receptacle terminal (1) having a first means (4) adapted to receive an insulated wire (2) on one side of said terminal, and a second means (8) adapted to receive a mating terminal tab (3) on the other side of said terminal, said second means comprising two female terminal portions (8a, 8b) arranged laterally side by side, each including a rising side wall (10) integrally connected to a common base (12) and a curved top wall (13) integrally connected to said rising side wall, and each having a free end (11) extending toward said common base (12) , wherein the improvement comprises in that said two female terminal portions (8a, 8b) define a gap (14) therebetween, and that each said extending free end (10) is curved toward its respective rising side wall (10).
2. A receptacle terminal in accordance with claim 1, wherein said first means (4) includes a base (6), a first pair of crimping sections (4a, 4b) projecting upwards from the base adapted to receive and crimp said insulated wire (2).
3. A receptacle terminal in accordance with claim 2, wherein said insulated wire (2) includes a plurality of conductors (2a) and wherein a second pair of crimping sections (5a, 5b) project upwards from said base (6) and said second crimping sections are adapted to receive and crimp said conductors.

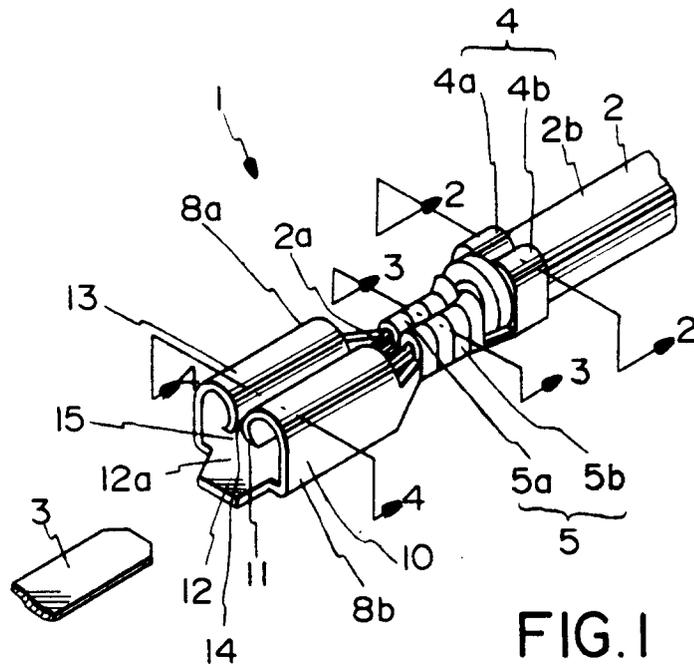


FIG. 1

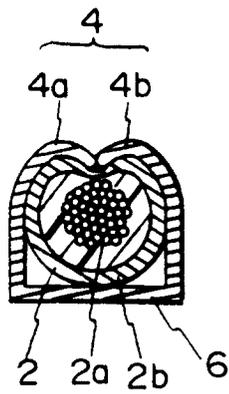


FIG. 2

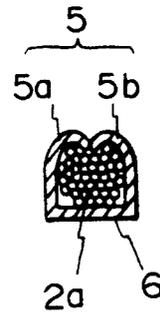


FIG. 3

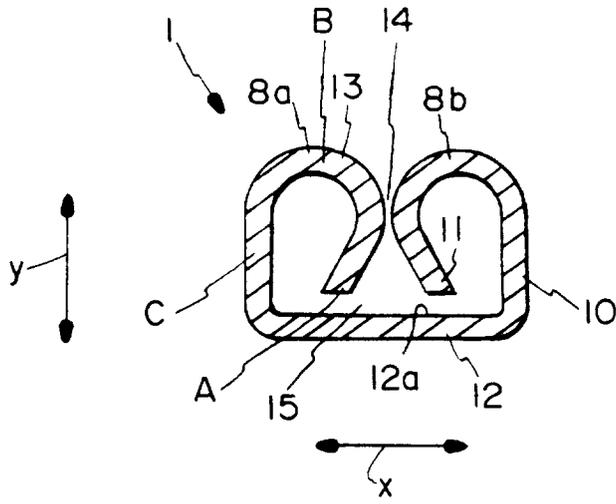


FIG. 4

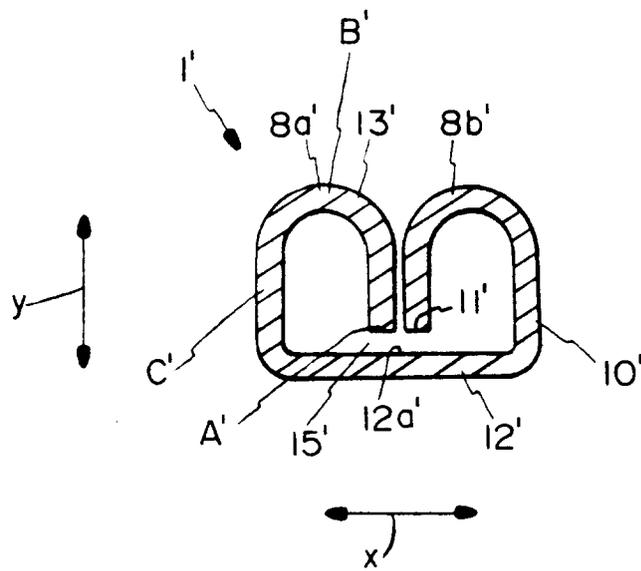


FIG. 5  
(PRIOR ART)



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	DE-B-1 799 770 (STOCKO METALLWARENFABRIK) * abstract; figure 1 * ---	1-3	H01R13/115
A	DE-B-1 197 950 (STOCKO METALWARENFABRIKEN) * column 3, line 34 - line 48; figures 1,4,5 * ---	1	
X	FR-A-1 087 955 (AIRCRAFT-MARINE PRODUCTS INC.) * page 3, left column, line 55 - right column, line 8; figure 7 * ---	1	
A	FR-A-1 372 753 (AMP INC.) * page 1, left column, line 29 - line 37; figure 1 * ---	1-3	
A	US-A-3 534 325 (JULLIEN-DAVIN) * column 2, line 63 - line 70; figure 2 * -----	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			H01R
Place of search THE HAGUE		Date of completion of the search 14 SEPTEMBER 1993	Examiner HORAK A.L.
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application I : document cited for other reasons ..... & : member of the same patent family, corresponding document	