

12

EUROPEAN PATENT APPLICATION

21 Application number: 84301138.8

51 Int. Cl.³: **H 01 R 13/115**

22 Date of filing: 22.02.84

30 Priority: 10.03.83 US 474107

43 Date of publication of application:
31.10.84 Bulletin 84/44

84 Designated Contracting States:
AT BE CH DE FR GB IT LI NL SE

71 Applicant: **AMP INCORPORATED**
P.O. Box 3608 449 Eisenhower Boulevard
Harrisburg Pennsylvania 17105(US)

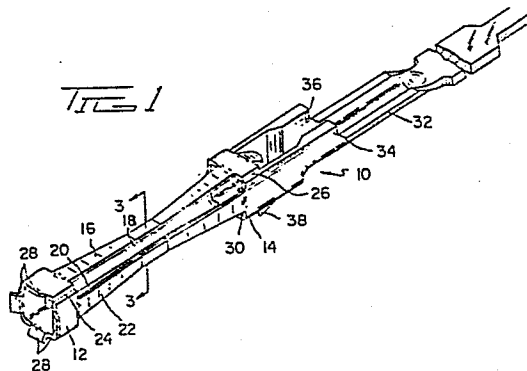
72 Inventor: **Heisler, George Henry**
818 West Charles Avenue
Mechanicsburg Pennsylvania 17055(US)

72 Inventor: **Rubendall, Douglas Charles**
295 Union Street
Millersburg Pennsylvania 17061(US)

74 Representative: **Gray, Robin Oliver et al,**
BARON & WARREN 18 South End Kensington
London W8 5BU(GB)

54 Electrical beam receptacle terminal.

57 A receptacle terminal (10) is formed with two spaced axially aligned end frames (12, 14) interconnected by four spring arms (16, 18, 20, 22), each integrally connected at opposite ends to a respective side of each of the end frames (12, 14). Each spring arm (16, 18, 20, 22) is inwardly tapered from its ends to a central portion and is likewise formed with a semi-elliptical shape so that the terminal (10) can be formed with an accurate square cross section along its entire axial length without the spring arms (16, 18, 20, 22) interfering.



0123383

"ELECTRICAL BEAM RECEPTACLE TERMINAL"

The present invention relates to an improved receptacle terminal and in particular to one which can be readily and accurately formed with a true square cross section.

5 There have long been available electrical terminal sockets which are comprised essentially of two square frame sections interconnected by four semi-elliptical springs. The springs are inwardly concave relative to the socket axis and are adapted to engage a pin inserted into the terminal along the axis. The terminal is completed with the
10 usual retaining ears, locking lances, and a second engaging portion which can be, for example, a mounting post or wire receiving portion. An example of this type of terminal can be found in U.S. Patent No. 3,404,367.

15 A difficulty in producing terminals of the above described type is that the semi-elliptic springs are uniform along their length and come in to interfering contact when the receptacle portion is formed. It is the interference of these springs that has prevented such terminals from being formed with an accurate square cross section. This causes subsequent mounting and alignment problems and becomes
20 a particular problem when it is desired to use the box-like receptacles in a high density closely spaced configuration where accuracy in forming becomes an important criteria due to space limitations.

25 The present invention relates to an improved receptacle terminal which has two spaced apart axially aligned square frame sections interconnected by four spring arm members each integral at its ends with a corresponding side of a respective frame section. Each spring arm is inwardly concave with respect to the axis of the socket and is

0123383

formed with a uniform taper extending inwardly from each end to their point of narrowest approach at the center of each spring arm. The taper gives each spring arm sufficient stiffness to be the functional equivalent of the prior art straight beams while allowing the contact points to be formed with a smaller gap than straight beam contacts. The socket terminal also includes retaining ears, locking lances, and an interconnect portion which may be, for example, a mounting post, solder pin, or crimp barrel.

An embodiment of the present invention will now be described by way of example with reference to the accompanying drawings in which:

FIGURE 1 is a perspective view of a socket terminal in accordance with the present invention;

FIGURE 2 is a plan view of the blank used to form the terminal according to the present invention; and

FIGURE 3 is a transverse section taken along line 3-3 of Figure 1.

The subject socket terminal 10 has two spaced apart substantially square end or frame sections 12, 14 which are interconnected by four spring arms 16, 18, 20, 22, each spring arm being integral with corresponding sides of the end sections. Each spring arm is semi-elliptic and is inwardly tapered from the ends towards the center. The semi-elliptic shape of the spring arms brings their center sections into close proximity as best seen in Figure 3. Their inward taper from their ends allows these central portions to be freely formed, without interfering with one another, while providing contact forces equal to or better than those provided by previous socket terminals.

Socket terminals of this type are advantageously manufactured by die stamping and forming so that an open seam 24, 26 remains in one corner of each end section. The spring arms 16, 18, 20, 22 are concave inwardly towards the axis of the socket but are capable of substantial deflection upon insertion of a terminal pin (not shown) axially of the socket so that a wide range of pin sizes can be accommodated by a single socket size.

Laterally extending ears or flanges 28 are provided on the free edge of frame section 12 for mounting purposes. One side 30 of the frame section 14 has an rearwardly extending web 32 from which sidewalls 34, 36 extend. These walls form rearwardly directed extensions or continuations of the adjacent sides of the frame section 14. A retaining lance 38 is struck from the web 30 and extends divergently from the socket axis and has a free end directed towards the frame section 14.

The web 32 is here shown as a slightly bowed or U-shaped section which is adapted to be inserted into a hole in a circuit board (not shown) or the like and can be soldered to conductors (also not shown) on the circuit board. This construction permits the achievement of several different types of good patterns of posts in a receptacle block as will be explained below. Alternately, a plurality of such webs 32 can be interconnected by clip type wiring devices (not shown) or wire wrapping techniques (also not shown) although a different form of post sections may be required for such alternate interconnection methods. It is also within the perview of the invention to have this portion of the terminal formed with either an insulation displacing conductor gripping profile, with a crimp barrel, or with a compliant mounting portion, such as those shown in U.S. Patent Nos. 3,805,214; 3,990,143; and 4,186,982, respectively, the disclosures of which are incorporated herein by reference.

The present invention may be advantageously be used with a housing of the type shown in U.S. Patent No. 3,404,367, the disclosure of which is incorporated herein by reference. The housing is primarily an elongated block of rigid insulative material having a plurality of through passages each receiving a respective terminal of the subject type. The terminals would extend between mating and mounting faces of the housing and the web portions 32 can even be bent at a right angle to the axis of the terminal for right angle mounting of the connector housings.

Terminals according to the present invention can be manufactured in extremely small sizes. For example, terminals of this type have been manufactured from beryllium copper stock with the

0123383

socket portion having an overall length of about 0.265 inches with
end sections of about .046 inches square OD closing to about .018
inches ID at the center of the semi-elliptic springs. This particular
socket is used in a receptacle block having cavities spaced apart by
5 0.050 inches thus permitting a contact density of 400 contacts per
square inch.

CLAIMS:

1. An electrical receptacle terminal (10) having two spaced apart, axially aligned square end frame sections (12, 14), four semi-elliptical spring members (16, 18, 20, 22) each of which is
5 integral at its ends with a pair of corresponding sides of said frame sections (12, 14), each spring arm (16, 18, 20, 22) being inwardly concave with respect to the axis of the socket (10), characterized in that each said spring arm (16, 18, 20, 22) is inwardly tapered from its ends towards its central portion so that said socket can be formed
10 with a square cross section along its entire axial length without said arms (16, 18, 20, 22) coming into interference with one another.

2. The receptacle terminal (10) according to claim 1 further characterized by means (28) to mount said terminal (10) in a housing.

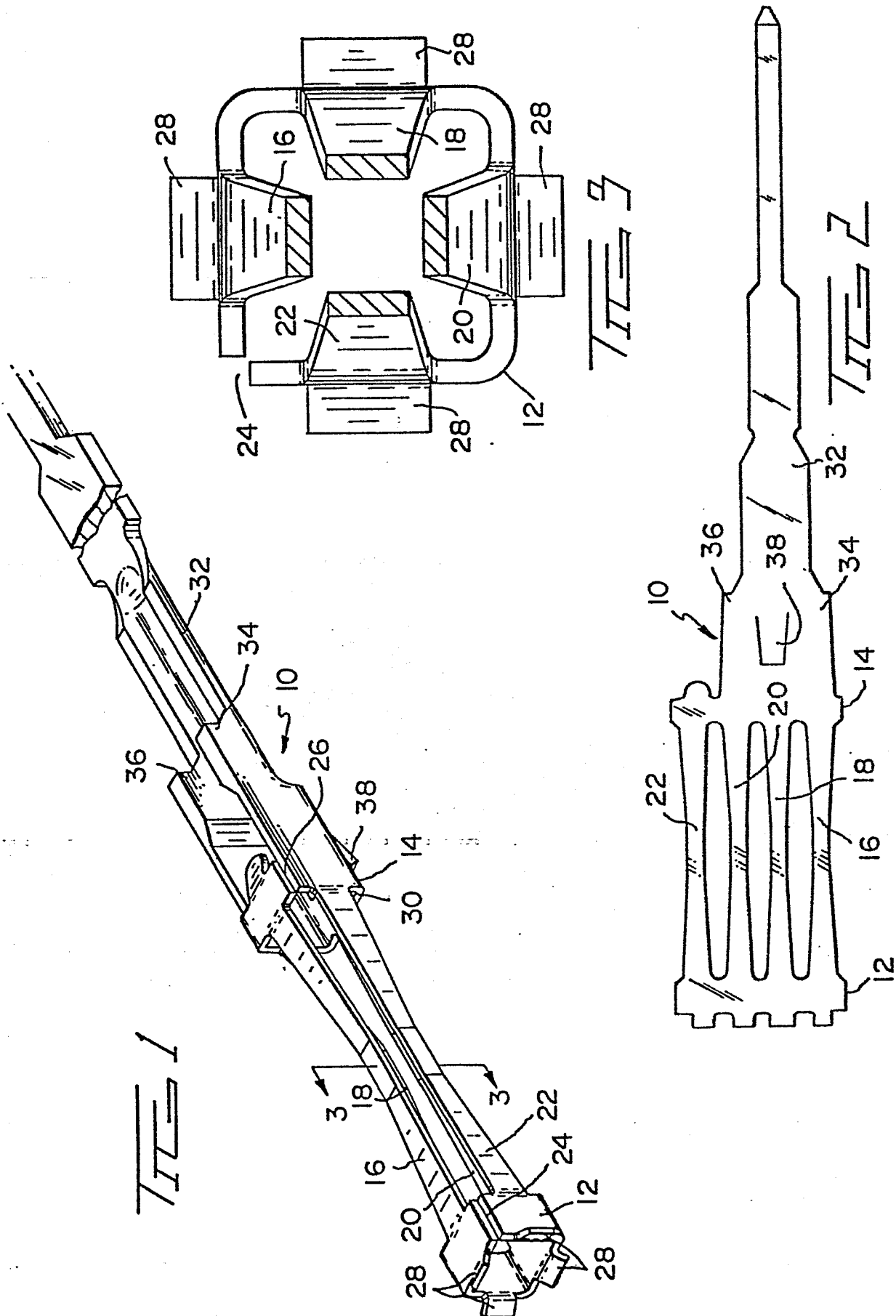
3. The receptacle terminal (10) according to claim 1 further
15 characterized by a web (32) extending from one of said end frame sections (12, 14), said web (32) being profiled for mating with further conductive means.

4. The receptacle terminal (10) according to claim 3 further characterized by said profile having a pin shape adapted for mounting
20 in an aperture in a circuit board or the like.

5. The receptacle terminal (10) according to claim 4 further characterized by said web (32) having a profile for insulation displacing engagement with a conductor.

6. The receptacle terminal (10) according to claim 4 further
25 characterized by said web (32) forming a crimp barrel.

7. The receptacle terminal (10) according to claim 4 further characterized by said web (32) being profiled for compliant pin mounting in a circuit board.





European Patent
Office

EUROPEAN SEARCH REPORT

0123383

Application number

EP 84 30 1138

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. ³)
D,X	DE-A-1 615 609 (AMP) * Page 10, paragraph 1 - page 12, paragraph 2; figures 1-8 *	1-4,7	H 01 R 13/115
Y		5,6	
Y	FR-A-2 449 982 (TRW) * Page 9, lines 30-33 *	5	
Y	US-A-4 032 215 (JARMOFSKY) * Column 3, lines 26-34 *	6	
A	US-A-3 538 491 (LONGENECKER)		
			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
			H 01 R 13/00
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 27-06-1984	Examiner TIELEMANS H.L.A.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone		T : theory or principle underlying the invention	
Y : particularly relevant if combined with another document of the same category		E : earlier patent document, but published on, or after the filing date	
A : technological background		D : document cited in the application	
O : non-written disclosure		L : document cited for other reasons	
P : intermediate document		& : member of the same patent family, corresponding document	