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(56) Documents Cited

**EP 0313253 A2 US 5433629 A**

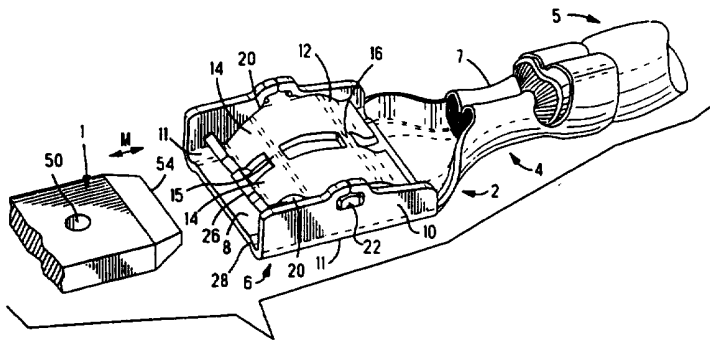
(58) Field of Search

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E264**

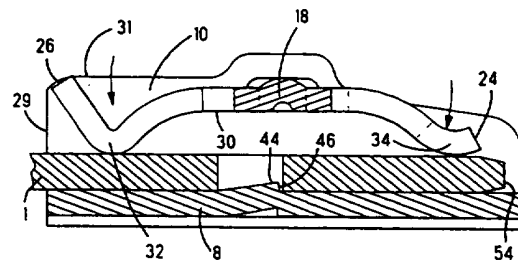
**INT CL<sup>0</sup> H01R**

(54) **Low insertion force receptacle contact**

(57) A receptacle terminal (2) comprises a contact section (6) having a pivotable pressure member (12) pivotally mounted over a base wall (8). The pressure member features contact spring arms (32, 34) one at each end. The fulcrum of the pressure member is positioned between two contact protrusions to enable low insertion force for a mating tab (1) therewith. The insertion force is particularly reduced when the tab (1) abuts a locking dimple stamped in the base of the terminal, the dimple being positioned roughly below the fulcrum.



*Fig. 1*



*Fig. 3B*

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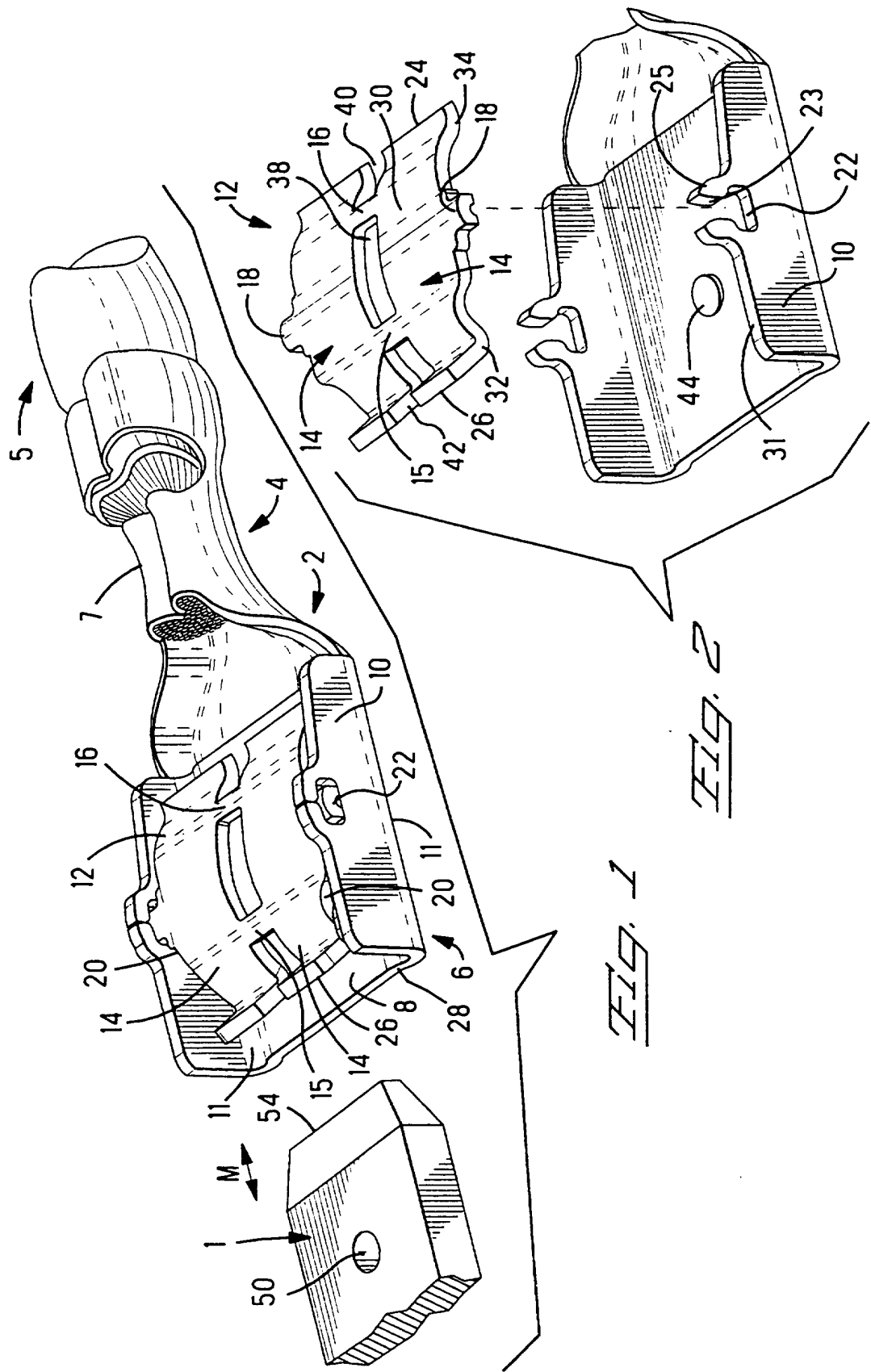
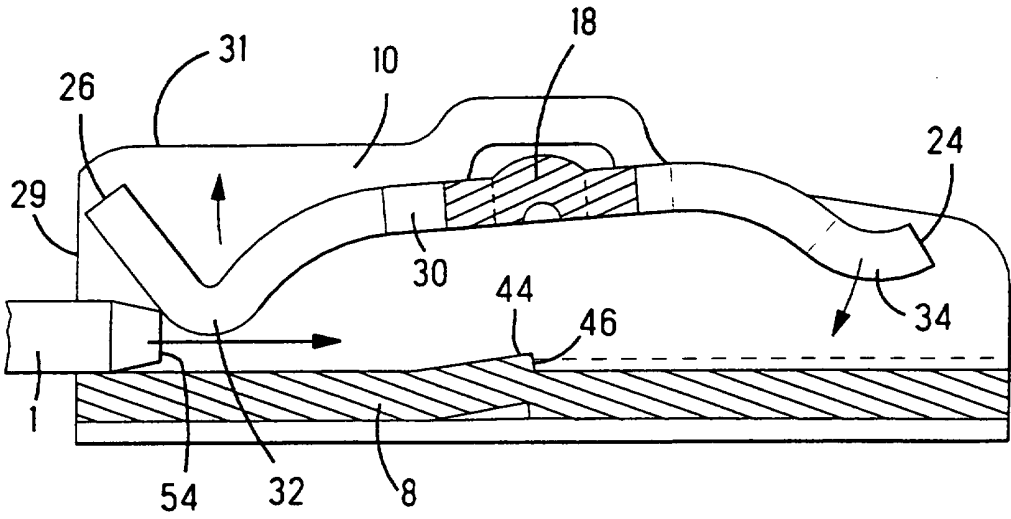
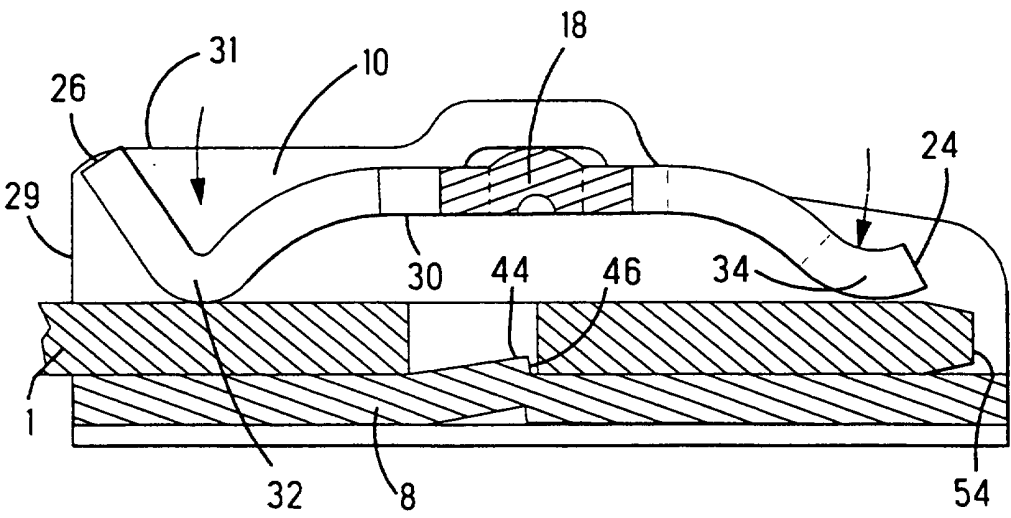


FIG. 1

FIG. 2



*Fig. 3A*



*Fig. 3B*

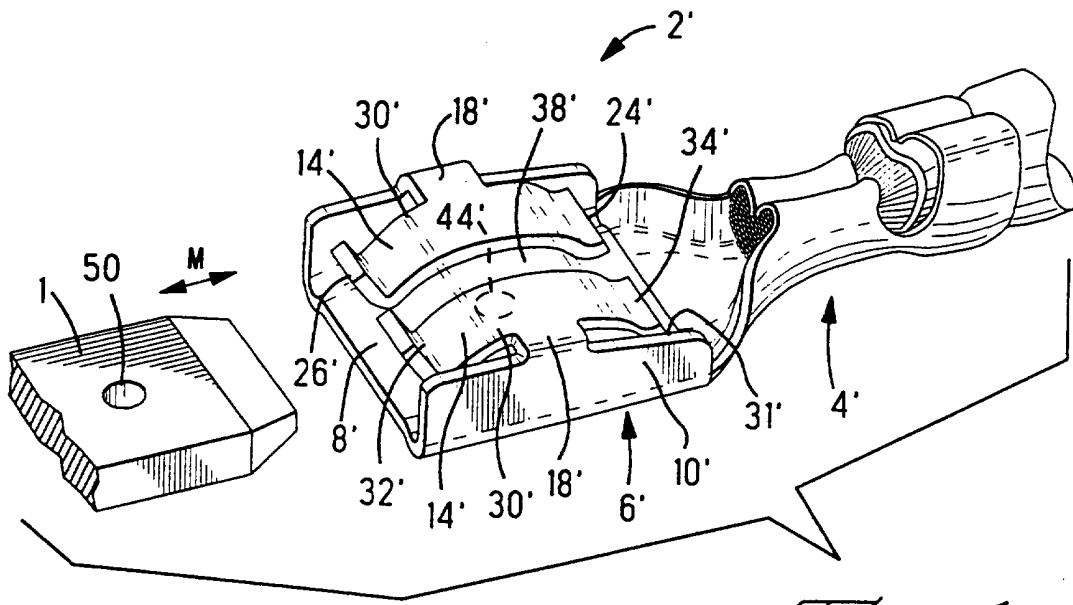


Fig. 4

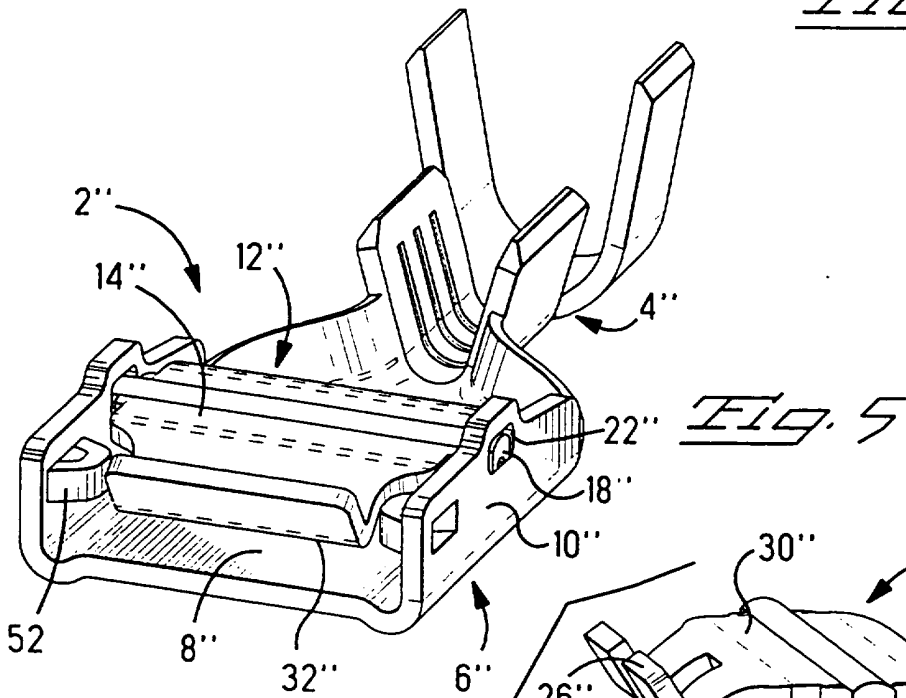
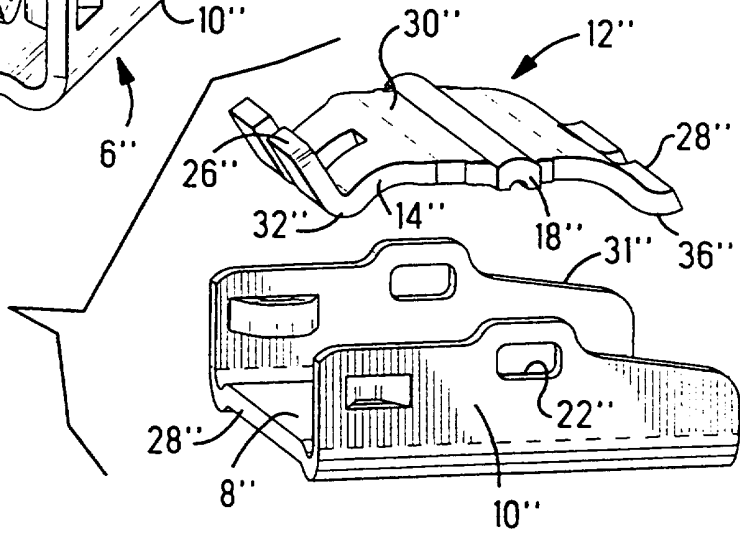


Fig. 5

Fig. 6



LOW INSERTION FORCE RECEPTACLE CONTACT

This invention relates to a receptacle contact for mating with a tab terminal.

5 An example of a stamped and formed receptacle terminal for mating with a flat tab terminal is disclosed in U.S. Patent 3,729,701. In the latter patent, the receptacle terminal comprises a connection portion for crimping to a conducting wire, and a contact portion  
10 having a substantially flat base and the side walls folded upwards from lateral edges of the base, further comprising cantilever beam contact arms extending over the base attached at an end of the base wall proximate the connection section. A mating tab terminal is insertable  
15 between the base wall and the cantilevered beam contact arms which bias upwardly and engage the portions attached to the side walls for increasing the contact force. The base wall further comprises an upwardly sheared locking dimple that engages in a complementary hole in the mating  
20 tab terminal for locking the mated contacts together. The locking dimple is a relatively short and stiff component because it needs to be relatively robust in order to support high pulling forces on mated contacts. The latter however causes a problem during mating, in that when the  
25 mating tab engages the dimple, high resistance to mating occurs. These high mating forces are disadvantageous.

It would be desirable to overcome the above mentioned problems. Furthermore, it would be desirable to provide a cost effective and reliable terminal.

30 It is therefore an object of this invention to provide a receptacle contact for mating with a tab terminal, that has secure and robust locking means but nevertheless generates low mating forces.

35

Objects of this invention have been achieved by

providing the contact according to claim 1. Advantageously, a robust and secure locking dimple is provided yet nevertheless a low insertion force of a mating tab terminal in the receptacle terminal is enabled.

5 Side walls of the receptacle contact can be provided to extend at or beyond the mating end of the upper contact arms for protection thereof. By provision of the blocking dimple in the vicinity below the pivot point of the upper contact pressure arms, a particularly low insertion force  
10 is provided yet allowing a low-height contact body.

Embodiments of this invention will now be described by way of example, with reference to the accompanying  
15 drawings, in which:-

Figure 1 is an isometric view of a first embodiment of a receptacle terminal according to this invention, crimped to a conducting wire:

Figure 2 is a similar view to that of Figure 1 but  
20 with the contact pressure arms removed from the base portion;

Figures 3a and 3b are longitudinal cross-sectional views of the terminal of Figure 1 being mated to a complementary tab terminal, Figure 3a showing initial  
25 insertion of the tab in the receptacle terminal, and Figure 3b showing full insertion;

Figure 4 is an isometric view of a second embodiment;

Figure 5 is an isometric view of a third embodiment;  
and

30 Figure 6 is an isometric view of the embodiment of Figure 5 with the contact pressure spring removed.

Referring to Figures 1-3, a receptacle terminal 2 comprises a connection section 4 for connection to a conducting wire 5, and a contact section 6. The connection  
35 section 4 comprises crimping arms 7 for crimping to conducting strands of the wire 5. The contact section 6

comprises a substantially planar base wall 8, and side walls 10 bent substantially orthogonally therefrom and extending along lateral edges 11 of the base wall 8.

5 The contact section 6 further comprises a contact pressure member 12 positioned over the base wall 8 and permanently fixed to the side walls 10. The contact pressure member 12 comprises spring arms 14 (in this embodiment a pair of contact arms) that are interconnected by bridging portions 15,16, the arms further comprising 10 pivots in the form of projections 18 projecting beyond opposed lateral edges 20 of the contact member 12 for engagement in corresponding pivot holes in the form of cutouts 22 in the side walls 10. The spring arms 14 extend from a rear end 24 facing the connection section 4, to a 15 mating end 26 proximate a mating end 28 of the base wall 8 facing a complementary tab 1 when initially received by the contact section for mating therewith. The spring arms extend in the direction of mating M of the terminal 2 with the complementary tab terminal 1, and comprise a central 20 portion 30 outwardly bowed with respect to the base wall 8, and arcuate pressure protrusions 32,34 at either end of the central portion 30 proximate the mating end 26 and connection end 24 respectively. The mating end 26 and connection end 24 are outwardly flared with respect to the 25 base wall 8 in order to form the arcuate contact pressure protrusion 32,34 respectively. The pivots 18 are situated along the central portion 30, a little closer to the connection end 24 than to the mating end 26, such that the spring arms have a greater length from the pivot point 18 30 towards the mating end 26 than from the pivot point towards the connection end 24. The bridging portions 15,16 are positioned respectively proximate the contact pressure protrusions 32,34 and are relatively thin strips such that longitudinal slots 38,40,42 are formed between the 35 adjacent contact arms 14. The slots enable some flexibility between the movement of the spring arms 14

such that there is some independent adjustment of the spring arms to the surface of a mating tab 1. The latter enables an optimal pressure of the four pressure points 32,34 against a mating tab 1. The linking portions 15,16 are positioned slightly towards the pivot point 18 with respect to the pressure protrusions 32,34 respectively, and their position and thickness can be tuned in order to provide optimal independent movement of the spring arms whilst nevertheless ensuring the requisite structural rigidity holding the spring arms together and to the side walls 10.

The base wall 8 is provided with a sheared locking tab or dimple 44 having a sheared edge forming a locking shoulder 46 directed towards the connection section 4, for engaging in a corresponding locking hole 50 of the mating tab 1.

Referring more particularly to Figures 3a and 3b, mating of the receptacle terminal 2 with the tab 1 will now be explained. Initially, the mating end 54 of the tab is inserted between the base wall 8 and abuts the mating end protrusion 32 of the spring arms which pivot away from the base about the pivots 18. Upon continued insertion, the tab mating end 54 abuts the locking protrusion 44. Due to the outward pivoting of the spring arm mating end section, the tab can ride over the locking protrusion 44 with very low frictional force. As the locking tab 44 is positioned roughly in the region below the pivot 18, there is a large distance separating the locking tab from the pivots for free movement of the mating end of the tab 54 therepast. The latter position enables a fairly low height (or compact) receptacle connector to be provided. Upon further insertion the tab abuts the connection end protrusion 34 thereby pivoting the mating end protrusion 32 onto the tab. Resiliency of the central portion 30 of the contact pressure member 12 thus provides the contact pressure applied by the protrusions 32,34. High frictional



forces are thus only present over a short travel when the mating end of the tab 54 abuts the connection end protrusion 34 until shortly thereafter when the locking members 44,50 engage. These forces are nevertheless  
5 significantly lower than the peak force that occurs in prior art solutions when the mating end of the tab 54 abuts the locking protrusions 44.

The receptacle contact side walls 10 extend to a mating end 29 which is substantially aligned with the base  
10 wall mating end 28, which is positioned beyond the mating end 26 of the spring arms 14. An upper free edge 31 of the side walls extends beyond the contact pressure member 12 with respect to the base wall 8. The side walls 10 thus provide optimal protection for the pivotable contact  
15 member 12, from damage from external objects for example, whereby the side walls 10 also have the function of guiding the tab 1 during insertion.

Referring more particularly to Figure 2, assembly of the contact pressure member 12 to the side walls 10 is  
20 effected by providing the pivot holes 22 with a slot 23 extending from the pivot hole to the side wall upper free edges 31. Once the pivots 18 are inserted into the holes 22, the short tab wall portions 25 either side of the slot 23 can be stamped together to form a closed seam 27 as  
25 shown in Figure 3b. It would also be possible to provide no seam and assemble the contact member 12 to the cutouts 22 by folding the side walls 10 with the pivots 18 being positioned for reception in the cutouts 22 as the side walls 10 are folded in.

Referring now to Figure 4, a second embodiment 2' is  
30 shown. Similar features of the embodiment 2' to those of the previous embodiment 2, will be denoted with the same numbering elevated to a prime. Only the features that differ from the first embodiment will be described. In  
35 lieu of the separate contact pressure member 12, the second embodiment comprises contact spring arms 14'

similarly constructed to the spring arms 14 of the previous embodiment, but integrally attached via pivot portions 18' to the side walls 10' at the upper free edge 31'. The pivot portions 18' are sufficiently narrow (with  
5 respect to their width in the direction of mating M) to enable flexible pivoting of the contact pressure protrusions 32',34' respectively. The pair of contact pressure arms 14' are not joined together but are separated by a continuous slot or gap 38' which is also  
10 the result of the folding together of the sheet metal. It could also be imagined to provide the sheet metal with a seam positioned along the base wall and held together by crimping or laser welding, and providing bridging portions 15,16 similar to that shown in Figure 1.

15 Referring to Figures 5 and 6, a third embodiment 2'' is shown. Similar features to those of previous embodiments will be denoted with the same numbering elevated to a double prime. Only features that differ will be described. Compared to the embodiment 2 of Figure 1,  
20 the pressure member 12'' is provided without slots between spring arms. As the member 12,12'' serves mainly to increase pressure of a mating tab against the base 8,8'' for good electrical contact therebetween, it is not essential to have multiple separate spring arms 14. The  
25 third embodiment 2'' is assembled by folding the side walls 10'' toward each other until the pressure member pivot supports 18'' engage in the side wall complementary holes 22''. The third embodiment further comprises guide extensions 52 stamped inwardly from the side walls 10'' at  
30 a certain height above the base wall 8'' for guiding a tab 1 therebetween. The extensions serve in particular to prevent damage to the pressure member 12'' by stubbing of the tab 1 therewith or excessive lifting of the pressure member 12'' during mating by the tab 1.

CLAIMS

1. A receptacle terminal for mating with a tab terminal comprising a base member and a contact pressure member, the base member having a base wall and side walls upstanding from lateral edges of the base wall, the contact pressure member  
5 comprising one or more spring arms extending in the mating direction of the terminal from a connection end to a mating end, the or each spring arm having a central bowed section facing the base wall and contact pressure protrusions proximate the mating and connection ends, respectively, on  
10 either end of the central bowed section, the contact pressure member being pivotally supported by supports extending between the bowed section and the side walls, and the base wall comprising a locking protrusion positioned below the bowed section for engaging a complementary locking hole of the  
15 mating tab terminal.
2. The terminal of claim 1 wherein the locking protrusion is disposed generally at the same position with respect to the mating direction as the supports.
3. The terminal of claim 1 or 2 wherein the side walls  
20 extend to a mating end substantially at or beyond the mating end of the spring arm(s).
4. The terminal of claim 3 wherein upper free edges of the side walls extend to a height above the base wall beyond that of the contact pressure protrusions above the base wall.
- 25 5. The terminal of any one of the preceding claims wherein the supports are positioned closer to the connection end contact protrusion(s) than to the mating end contact protrusion(s).
6. The terminal of any one of the preceding claims wherein  
30 the supports are integral with the side walls and the contact member.
7. The terminal of any one of claims 1 to 5 wherein the contact pressure member is a separate part from the base member.

8. The terminal of claim 7 wherein the contact pressure member supports are protrusions received in pivot support holes in the side walls.

5 9. The terminal of any of the preceding claim wherein the contact pressure member comprises a pair of spring arms joined together by at least one thin strip bridging portion to enable semi-independent movement of the arms with respect to each other.

10 10. The terminal of claim 9 wherein there are two such bridging portions at or adjacent the central bowed section.

11. A terminal receptacle for mating with a tab terminal constructed substantially as hereinbefore described with reference to Figures 1 to 3 or Figure 4 or Figures 5 and 6 of the accompanying drawings.



Application No: GB 9715995.8  
Claims searched: 1 to 11

Examiner: Mr F J Fee  
Date of search: 29 September 1997

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): H2E [EHAD, EHDG, EHDX, E262, E263, E264]

Int Cl (Ed.6): H01R

Other:

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
A	EP 0313253 A2 [INTERLOCK]	
A	US 5433629 [YAGI]	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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