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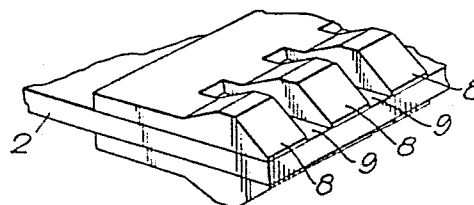
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(54) Electrical connector assembly.

(57) To reduce wear on the contact area of contacts of an electrical connector assembly each of the contacts of a male connector of the assembly is provided with a displacement member which is arranged to cooperate with respective contact members of a corresponding female connector of the assembly to displace the contact members during mating of the connectors. In a particular embodiment a printed circuit board (2) carries an attachment in the form of a comb which attachment has a plurality of displacement members (8) respectively arranged to lie alongside printed contact areas (9) of the printed circuit board (2). In use a part (7) of each contact member of a female connector rides up a forward ramp of the respective displacement member (8) travels along a plateau and rides down a rearward ramp after the leading edge of the printed circuit board (2) has passed over the contact area of the respective female contact. Preferably electrical contact between the female contact and the contact area (9) of the printed circuit board (2) is permitted after the leading edge has passed over the contact area but before completion of mating of the printed circuit board (2) to the female connector so as to assist the removal of any film or debris in the respective contact areas.

Fig.7.



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The present invention relates to electrical connector assemblies and more particularly but not exclusively to such assemblies comprising a male connector and a female connector detachably connectable to
5 each other.

Hitherto when a circuit board housing an edge connector (i.e. a "male connector") has been inserted into its socket (i.e. a "female connector") it has been usual for the edge of the board to be used to displace
10 the contacts of the socket to permit the insertion. Thus each time the board is inserted the edge thereof scrapes the electrical contact area. Whilst some wiping action of the electrical contact area on insertion is desirable to remove any film which may have built up,
15 the scraping action causes some damage to the contact area and may, if several insertions and removals of a particular board are required result in the removal of the precious metal plating of the contact area.

It is an object of the present invention to provide
20 an electrical connector assembly in which one connector causes displacement of the contact members of the other connector on insertion therein without interfering with the electrical contact area of the contact members.

According to the present invention in an electrical
25 connector assembly of the kind comprising a male connector and a female connector each of which has at least one respective contact member and which are detachably connectable one to the other, the or each contact member of a first of the connectors has at least one displacement
30 member associated therewith, said displacement member being disposed to one side of the contact member and being arranged to provide an inclined surface longitudinally of the direction of insertion of one connector in the other, the or each contact member of the other one of the connectors
35 has a portion arranged to co-operate with said displacement member, and said portion and said displacement

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member are adapted to co-operate with each other as mating of the connectors proceeds such that initially contact between the or each pair of corresponding contact members is prevented and subsequently contact between the 5 or each pair of corresponding contact members is permitted so that, during mating of the connectors, leading edges of each of the contact members are prevented from scraping contact areas of the corresponding opposite contact member.

Preferably, contact between the or each pair of 10 corresponding contact members is permitted after the leading edges of each of the contact members have passed over the contact areas of the corresponding opposite contact member and before completion of mating of the connectors so that the contact areas wipe across each other to 15 assist displacement of any disruptive film which may be present.

The displacement member may have a second inclined surface sloping in the opposed directions to said inclined surface so as to cause the contact members to come into 20 contact gradually. The two inclined surfaces of the displacement member may be mechanically linked by a plateau such that the displaced contact member traverses apart from and substantially parallel to the corresponding opposite contact member for part of the distance traversed during 25 mating of the connectors.

The displacement member may be associated with the male connector which connector may be either attached to or integral with a printed circuit board.

According to a feature of the present invention an 30 attachment for a male connector or a circuit board arranged to provide a displacement member for the or each contact member of such a connector or board for the purpose of converting the connector or board for use in a connector assembly in accordance with the invention comprises a 35 moulding having a forward ramp member and an integral

oppositely inclined rearward ramp member arranged when attached to a male connector or a circuit board during mating of such a male connector or board with a female connector initially to displace a contact member of a
5 said female connector laterally of the direction of insertion, and subsequently to permit that contact member to return substantially to its non-displaced position.

Preferably the attachment provides a plurality of displacement members integrally formed in the shape of
10 a comb.

A connector assembly in accordance with the invention will now be described by way of example only with reference to the accompanying drawings of which:-

Figure 1 shows a view of the assembly with the
15 male and female connectors fully disconnected;

Figure 2 shows a fragmentary view on the line II-II of Figure 1;

Figures 3 and 4 show a similar view to Figure 2
20 with the two connectors at different stages of mating;

Figure 5 shows a similar view to Figure 2 with the two connectors fully mated;

Figure 6 shows a fragmentary view at right angles
25 to the view of Figure 2 of part of a female connector of the assembly;

30 Figure 7 shows an isometric view of a part of the circuit board of Figure 1.

Referring to the drawings the assembly has a male connector 1 which is shown as integral with a printed circuit board 2 (only a part of which is shown) and a
35 female connector 3.

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The female connector 3 is similar in construction to many known connectors, and comprises an insulated housing holding a number of female contact members 5 in alignment and in pairs. Each female contact member 5 is connected to a respective further member 4 to which connection may be made by soldering or wire wrapping for example. For the purposes of description the face of the female connector 3 at the same end as that at which the contact member 5 is not connected to the further member 4 is referred to as the front of the female connector 3. It is here noted that the term mating face as used herein relates to the front end when applied to the female connector.

Referring particularly to Figures 2 and 6 each of the contact members 5 has a contact area 6 (shown shaded in Figure 6) which is the part of the contact most susceptible to having its plating removed by the edge of an inserted male connector. The contact members 5 are of resilient material for example phosphor bronze. the contact area 6 being spot plated with a precious metal for example gold.

At the front of each contact member 6 a semicircular portion 7 is provided which is wider than the contact areas 6 each that, referring also to Figure 7, when the male connector 1 is presented for insertion a respective displacement member 8 of each corresponding male contact member 9 causes the contact member 5 to open.

It is here noted that each of the displacement members 8 forms an upper displacement member for one of the male contact members 9 and a lower displacement member for an adjacent male contact member.

Referring now to Figures 2 to 5 as the circuit board 2 is presented to the female connector 3, the respective displacement members 8 engage with the edges of the semi-

circular portions 7 which as mating of the connectors continues are displaced so as to cause the contact members 5 to provide an opening which is wider than the circuit board 2. Thus the semi-circular portions 7 ride up a forward ramp and as the edge of the male connector 1 reaches the respective contact areas 6 so the portions 7 reach (Figure 3) a plateau which is substantially of the same width as the contact area.

As insertion of the male connector 1 continues (Figure 4) so the portions 7 ride down a rearward ramp of the displacement members 8 which permits the contact area 6 of the female contact members 5 to come into contact with the male contact members 9.

It will be appreciated that some wiping of the contact areas 6 on the male contact members 9 is desirable to remove disruptive film and the like. This wiping occurs once the semi-circular portions 7 have reached the end of the rearward ramp of the displacement members 8 as the circuit board 2 and the male connector 1 are pushed fully home in the female connector 3.

Referring again to Figure 1 the displacement members 8 may be suitably provided by a moulding of plastics material which may be in the form of a comb having a continuous rear strip for attachment to the male connector 1 or the circuit board 2 by rivetting for example.

It is noted that whilst as described herein the invention is realised by attachment of a moulding to the circuit board 2, the invention may be similarly implemented by attachment of a suitable moulding to a male connector of the kind arranged for subsequent attachment to tracks of a circuit board or for wiring connections.

In the case of a male connector it will also be realised that displacement members could be integrally moulded with the insulating material of the connector housing.

CLAIMS

1. An electrical connector assembly of the kind comprising a male connector (1) and a female connector (3) each of which has at least one respective contact member (5, 9) and which are detachably connectable one to the other
5 characterised in that the or each contact member (9) of a first of the connectors (3) has at least one displacement member (8) associated therewith and disposed to one side thereof, said displacement member (8) being arranged to provide an inclined surface longitudinally of the direction of insertion
10 of one connector (3) in the other (1) the or each contact member (5) of the other one of the connectors (1) has a portion (7) arranged to cooperate with said displacement member (8), and said portion (7) and said displacement member (8) are adapted to cooperate with each other as mating
15 of the connectors (1,3) proceeds such that initially contact between the or each pair of corresponding contact members (5, 9) is prevented and subsequently contact between the or each pair of contact members (5, 9) is permitted so that during mating of the connectors (1, 3) leading edges of each of the
20 contact members (5, 9) are prevented from scraping contact areas (e.g. 6) of the corresponding opposite contact member (9, 5).

2. An electrical connector assembly according to Claim 1 further characterised in that contact between the or
25 each pair of corresponding contact members (5, 9) during mating is permitted after the leading edges of each of the contact members (5, 9) have passed over the contact areas (e.g. 6) of the corresponding opposite contact member (9, 5) and before completion of the mating of the connectors (1, 3)
30 so that the contact areas (e.g. 6) wipe across each other to assist displacement of any disruptive film which may be present.

3. An electrical connector assembly according to Claim 1 or Claim 2 further characterised in that the
35 displacement member (8) has a second inclined surface sloping

in the opposed direction to the first said inclined surface so as to cause the contact members (5, 9) to come into contact gradually.

4. An electrical connector assembly according to

5 Claim 3 further characterised in that said first and second inclined surfaces of the displacement member (8) are mechanically linked by a plateau such that the displaced contact member (5) traverses apart from and substantially parallel to the corresponding opposite contact member (9) for part of
10 the distance traversed during mating of the connectors (1, 3).

5. An electrical connector assembly according to any preceding claim further characterised in that the displacement member (8) is associated with the male connector (1).

6. An electrical connector assembly according to Claim 5 further characterised in that the male connector (1) is either attached to or integral with a printed circuit board (2).

7. An attachment for a male connector (1) or a printed circuit board (2) arranged to provide a displacement member (8)
20 for a or each contact member (9) of such a connector (1) or board (2) so as to convert the connector (1) or board (2) for use in a connector assembly according to any one of Claims 1 to 6 characterised in that the attachment comprises a moulding having a forward ramp member and an integral oppositely-
25 inclined rearward ramp member arranged when attached to a male connector (1) or circuit board (2) during mating of such a male connector (1) or board (2) within a female connector (3) initially to displace a contact member (5) of a said female connector (3) laterally of the direction of insertion, and
30 subsequently to permit that contact member (5) to return substantially to its non-displaced position.

8. An attachment as claimed in Claim 7 further characterised in that said ramp members are integrally linked by a plateau.

35 9. An attachment as claimed in Claim 7 or Claim 8

further characterised in that a plurality of displacement members are integrally formed in the shape of a comb.

Fig. 1.

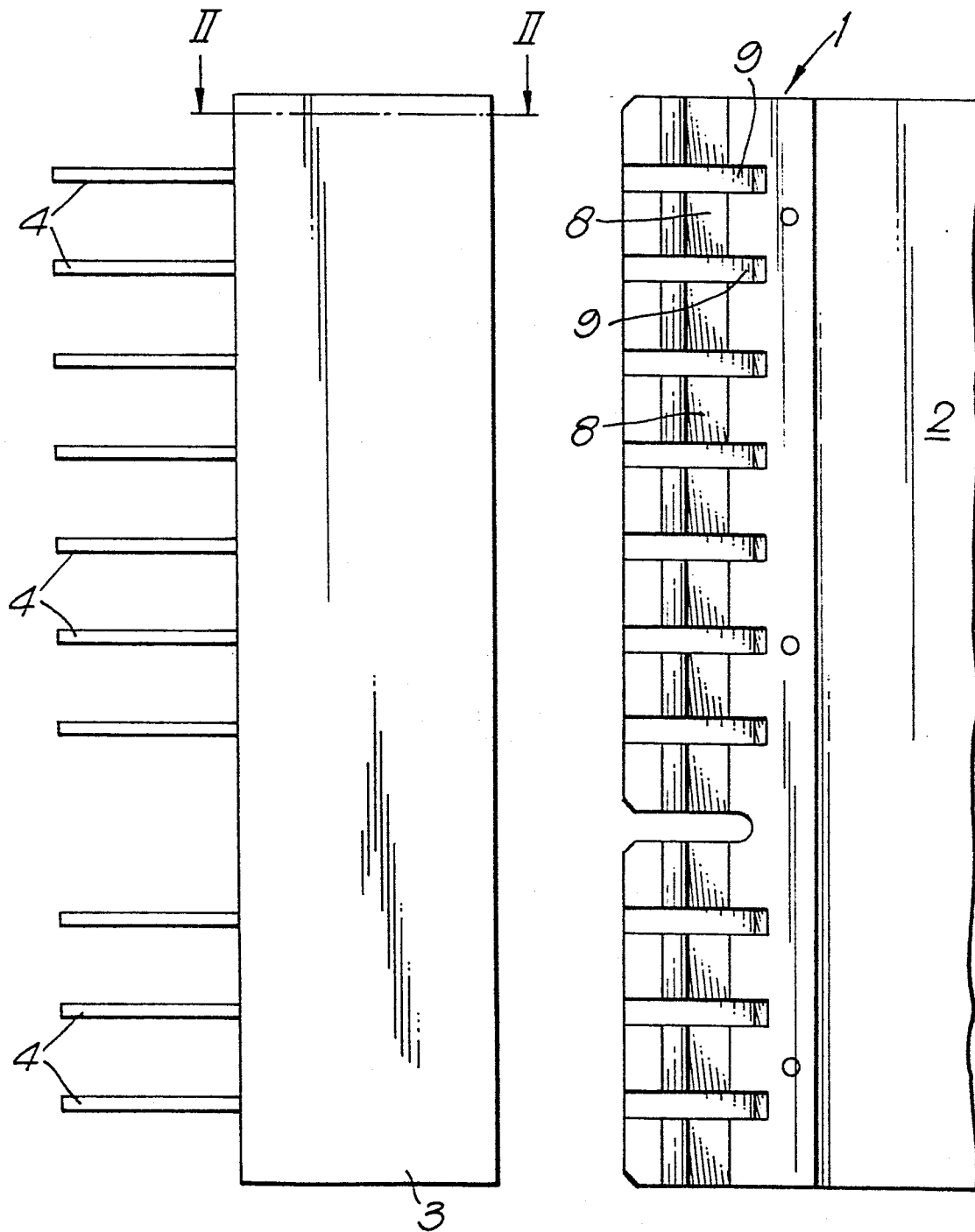


Fig. 2.

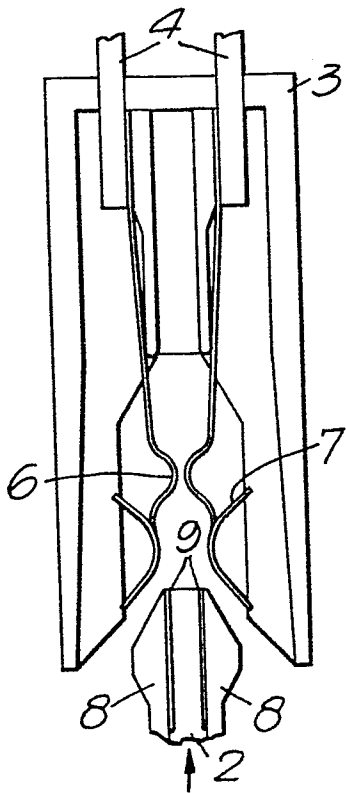
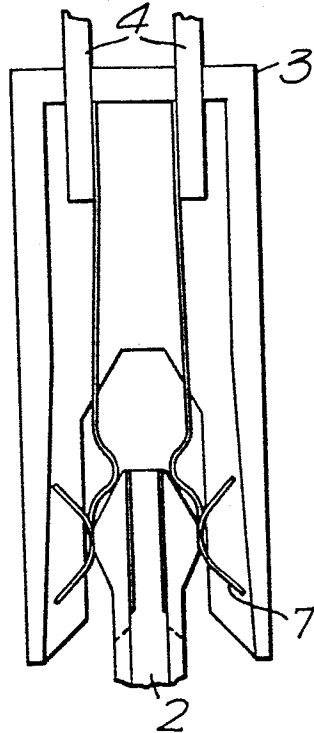
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Fig. 3.

Fig. 4.

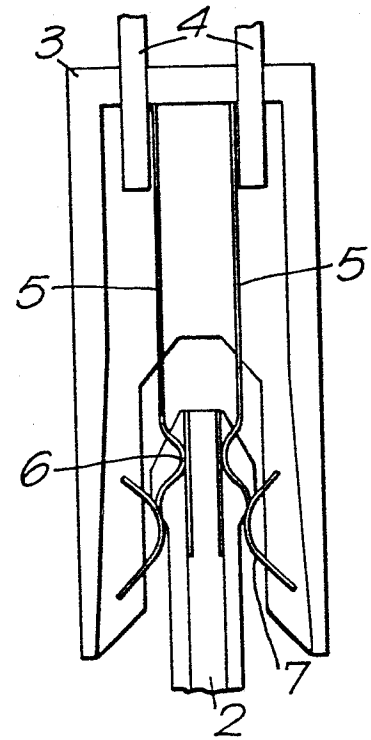


Fig. 5.

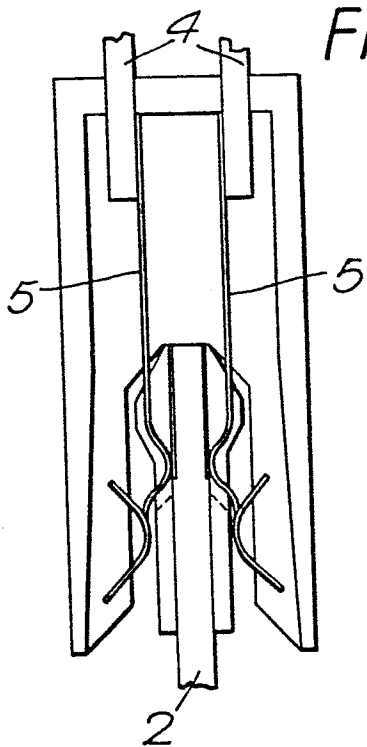


Fig. 6.

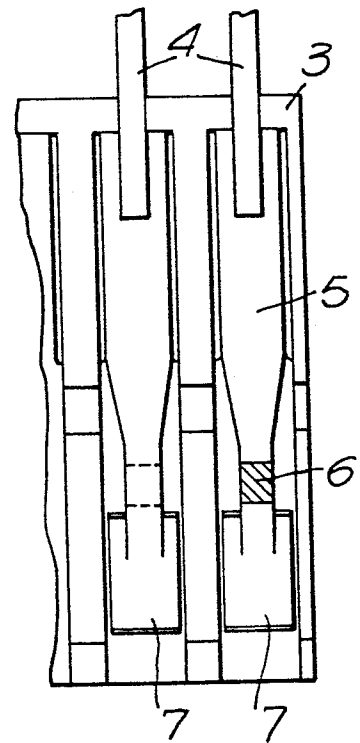
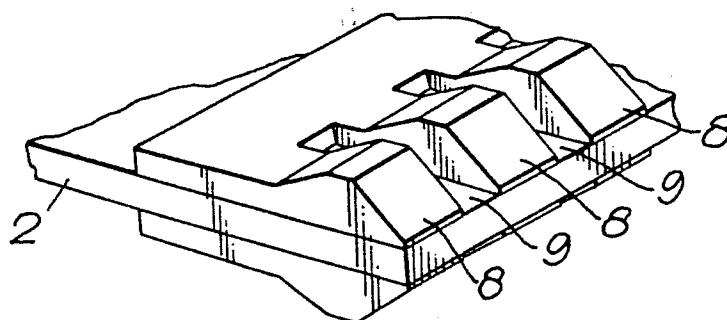


Fig. 7.





European Patent
Office

EUROPEAN SEARCH REPORT

0122758

Application number

EP 84 30 2367

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)
X	US-A-3 858 957 (AMP) * Figures 1-4; column 4, line 4 - column 5, line 49 *	1,3,5-8	H 01 R 23/68
A	US-A-4 279 459 (BELL TELEPHONE) * Figures 4-5; column 3, line 6 - column 4, line 28 *	1,3-8	
A	FR-A-1 295 024 (ISEC) * Figures 1-3; page 1, column 2, line 5 - page 2, column 1, line 1 *	1,6	
			TECHNICAL FIELDS SEARCHED (Int. Cl. 3)
			H 01 R 13/00 H 01 R 23/00
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 01-06-1984	Examiner WAERN G.M.
CATEGORY OF CITED DOCUMENTS 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 L : document cited for other reasons & : member of the same patent family, corresponding document			