

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number:

0 095 885
A2

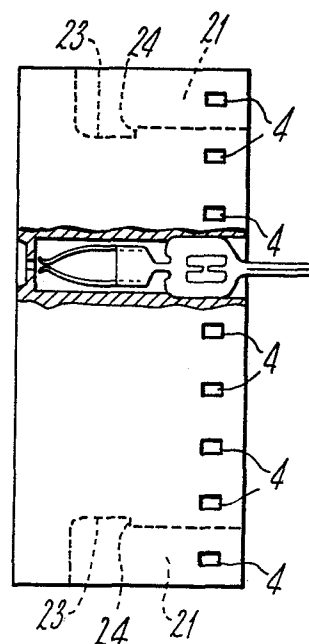
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EUROPEAN PATENT APPLICATION

(21) Application number: **83302983.8**(51) Int. Cl.³: **H 01 R 13/62**(22) Date of filing: **24.05.83**(30) Priority: **28.05.82 GB 8215701**(71) Applicant: **The General Electric Company, p.l.c., 1 Stanhope Gate, London W1A 1EH (GB)**(43) Date of publication of application: **07.12.83**
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(54) Electrical connector assemblies.

(57) The housing of an electrical connector assembly includes a respective channel 21 at each end thereof which opens towards the rear of the housing. A deepened section 24 of the channels 21 presents a face 24 towards the opening thereof. An insertion tool (not shown) has a plurality of arms spaced apart by the same distance as the channels 21 and provides a grip at a distance from the rear of the housing to facilitate connection of the assembly to a corresponding assembly which may be surrounded by other connector assemblies thus preventing gripping the assembly by hand. A disengagement tool (Figure 7) has a plurality of arms 25 spaced apart by a corresponding distance to the channels 21. Each of the arms has a locking member 27 arranged to co-operate with the faces 24 of the channels to facilitate removal of a connector assembly from a corresponding assembly. The disengagement tool is preferably of a plastics material which has sufficient resilience to enable the arms 25 to flex to permit insertion of the arms 25 in the channels 21.



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The present invention relates to electrical connector assemblies. Electrical connectors are often closely mounted on the back face of racks of electronic equipment. With high packing densities it may be difficult to remove or connect a connector assembly which may be surrounded by other connector assemblies.

It is an object of the present invention to provide improvements in electrical connector assemblies and in tools therefor which overcome such difficulties.

According to one aspect of the present invention in an electrical connector assembly a housing is arranged to hold a plurality of contacts in alignment, said housing having a plurality of channels spaced apart therein and longitudinal of the direction of insertion of the contacts, said channels each having an aperture at the rear of the housing and the termination of said channels being towards the front of the housing such that a tool having a plurality of arms correspondingly spaced apart and attached to a planar member may be used to facilitate the connection of the assembly to another assembly by inserting the arms in the channels to provide a grip at a distance from the rear of the housing.

Preferably each of the channels has a deepened section along a part of the length thereof and towards the respective terminations thereof arranged to provide a partial termination towards the apertures such that a disengagement tool having arms correspondingly spaced apart and having locking members attached thereto may be used to facilitate the disconnection of the assembly from another assembly by co-operation of the key members with the respective partial terminations of the channels.

According to a second aspect of the present invention, a disengagement tool for use with a connector assembly as described in the preceding paragraph, has at one end a plurality of arms spaced apart and arranged for insertion in a correspondingly spaced apart plurality of

channels in a connector housing, and at the other end a hand-grip, each of said arms having a member extending at an angle to the direction of insertion as aforesaid and said members being arranged to co-operate with respective terminations in channels of a connector housing under the influence of the resilience of the material of the arms to effect a disengageable connection between the tool and a housing to permit the tool to be used to assist disengagement of a pair of mating connectors.

10 Preferably the extension members extend in opposed directions and may be arranged to face each other inwardly of said arms.

 The arms may be arranged to have a scissor action relative to the handle, the scissor action being dependent upon the flexibility of the plastics material of the tool. The scissor action may be assisted by providing three channels in the moulding arranged with one channel central of the width of the moulding towards the rear of the arms and the other channels at an angle to the first channel towards the handle of the moulding.

20 The tool may be arranged such that pressure on a side of the moulding towards the handle section causes the key sections to move apart to permit disengagement of the tool from a housing to which the tool is attached.

25 An electrical connector assembly in accordance with the invention and tools for use therewith will now be described by way of example only with reference to the accompanying drawings of which:-

 Figure 1 is a front elevation of the housing of the assembly,

 Figure 2 is a side elevation of the housing,

 Figure 3 is a plan view of the housing partially sectioned to show the location of a contact in the housing,

 Figure 4 is a rear elevation of the housing,

35 Figures 5 and 6 are respectively a plan view and a

side elevation of an insertion tool for use with the assembly; and

Figures 7 and 8 are respectively a plan view and a side elevation of a disengagement tool for use with
5 the assembly.

Referring to Figures 1 to 4 the housing comprises eighteen segments 1 and 2 of two kinds arranged in two parallel rows of nine segments each. Each segment is arranged to hold one electrical contact which is fitted
10 by sliding insertion, shoulders of the contact being inserted into channels 3 provided at the rear of the segment. When a contact is fully inserted in one of the segments 1, 2 a key member of the contact springs into position through an aperture 4 to prevent the contact
15 from sliding out. Thus far the connector assembly is similar to many known connector assemblies and most such connector assemblies may be modified to implement the invention.

Referring now to Figures 2, 3, 5 and 6 the insertion
20 tool 19 has a pair of arms 20 arranged to co-operate with a pair of channels 21 disposed in the ends of the housing. The insertion tool 19 is moulded from for example a plastics material and, in use, the arms 20 slide into the channels 21 until the front of the arms reach the end of
25 the channels.

The arms 20 of the insertion tool 19 have a thinner cross section than the body which in dependance on the resilience of the plastics material allows a limited amount of movement of the arms such that small variations
30 in the separation of the channels 21 between connectors may be accommodated. It is here noted that the separation of the arms 20 is marginally less than the nominal separation of the channels 21 so that when a connector is being fitted using the tool it is firmly gripped.

35 Thus if a male contact connector assembly is surrounded by other connector assemblies which already have

corresponding female connector assemblies fitted, the female connector assembly previously referred to may be fitted to its male counterpart even if there is insufficient space for the housing to be gripped by hand.

5 Once the connector assembly has been fitted the forces between the male and female contacts are sufficient to hold the connector in place whilst the insertion tool is withdrawn.

10 The insertion tool is provided with a thickened section 22 at the opposed end to the arms 20 to facilitate the withdrawal of the tool and to provide a grip when the tool is in use for engaging a connector assembly.

15 Referring now to Figures 2, 3, 7 and 8 it will be noted that the channels 21 each have a deepened section 23 which provides a back wall 24 in the housing to facilitate disengagement of the connector assembly from its counterpart.

20 The disengagement tool comprises a pair of arms 25, spaced apart each of which has an inwardly extending section 27. In use the arms 25 are inserted in the channels 21 and as they are pushed into engagement the wedge shaping of the front of the section 21 causes the arms 25 to open. The opening of the arms 25 being dependent on the resilience of the plastics material from which the tool is moulded may cause the plastics material to crack. Accordingly three channels 26 are provided in the moulding which whilst retaining the tension which maintains the arms 25 in their usual closed position permits a scissor like action when the sections 27 are
25 inserted into the channels.
30

35 It will be noted that the channels 26 are terminated in a thickened section 28 of the moulding to give added strength. To prevent the channels 26 from extending by cracking of the plastics material the channels are terminated with a circular section 29.

When the tool is pushed forward to the limit of the channels 21 the resilience of the plastics material causes the arms 25 to move back to their normal position. The extended sections 27 thus enter the deepened sections 5 23 of the channel 21 and when the tool is pulled back towards the user by use of a handle section 30 the rear of the sections 27 engage with the back face 24.

Pulling the tool further causes the connector assembly to disengage from its corresponding connector 10 assembly. Thus as with the insertion tool connector assemblies may be tightly packed together and their independant removal for maintenance or replacement is still possible.

Having disengaged the connector assembly disconnecting 15 the tool from the housing is simply a matter of pressing the scissor assembly at points 31 to cause the arms 25 to move apart. The housing may then be removed from the tool.

To prevent a user of the tool from overstressing 20 the plastics material when removing a housing, sections 32 are provided which come into contact with the body of the handle section to limit the movement provided by the scissor action.

To improve the grip provided at the handle 30 a 25 thickened guard section 33 is provided. This prevents excessive pressure on the fingers of the user.

Claims

1. An electrical connector assembly of the kind in which a housing is arranged to hold a plurality of contacts in alignment characterised in that the housing has a plurality of channels (21) spaced apart therein
5 and longitudinal of the direction of insertion of the contacts, said channels (21) each having an opening at the rear of the housing and terminating towards the front of the housing such that a tool having a plurality of arms (20) correspondingly spaced apart and attached to
10 a planar member (19) may be used to facilitate the connection of the assembly to another assembly by inserting the arms (20) in the channels (21) to provide a grip at a distance from the rear of the housing.
2. An electrical connector assembly as claimed in
15 Claim 1 wherein each of the channels (21) has a respective deepened section (23) along a part of the length thereof and towards the respective termination thereof arranged to provide a respective partial termination (24) towards the opening thereof such that a disengagement tool having
20 arms (25) correspondingly spaced apart and having locking members (27) attached thereto may be used to facilitate disconnection of the assembly from another assembly by co-operation of the locking members (27) with the respective partial terminations (24) of the channels (21).
- 25 3. A disengagement tool, for use with an electrical connector assembly as claimed in Claim 2, characterised in that at one end the tool has a plurality of arms (25) spaced apart and arranged for insertion in a correspondingly spaced apart plurality of channels (21) in a con-
30 nector housing, and has at the opposed end a hand grip (33), each of said arms (25) having a member (27) extending at an angle to the direction of insertion aforesaid and said members (27) are arranged to co-operate with respective terminations (24) in channels (21) of a

connector housing under the influence of the resilience of the material of the arms (25) to effect a disengageable connection between the tool and a housing to permit the tool to be used to assist disengagement of a pair of mated connectors.

4. A disengagement tool according to Claim 3 wherein the members (27) extend in opposed directions.

5. A disengagement tool according to Claim 3 or Claim 4 wherein the members (27) are arranged to face each other inwardly of said arms (25).

6. A disengagement tool according to Claim 3, Claim 4 or Claim 5 wherein the arms (25) have a scissor action relative to said hand grip (33) said scissor action being dependent upon the flexibility of the material of the tool.

7. A disengagement tool according to Claim 6 wherein three channels (26) are provided in the moulding of the tool arranged with a first of the channels (26) substantially central of the width of the moulding and extending longitudinally of the arms (25) and the other channels (26) extending at an angle to said first channel (26) towards the handgrip (33) to assist the scissor action of the tool.

8. A disengagement tool according to Claim 7 wherein the two channels (26) extending at an angle each include a stop member (32) to prevent over-stressing of the material of the tool when the scissor action is used.

Fig. 1.

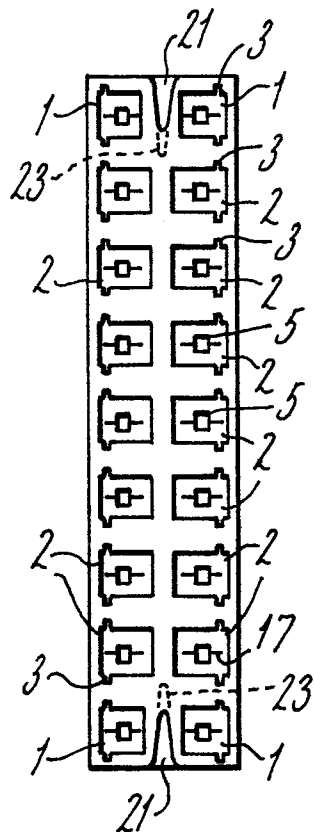
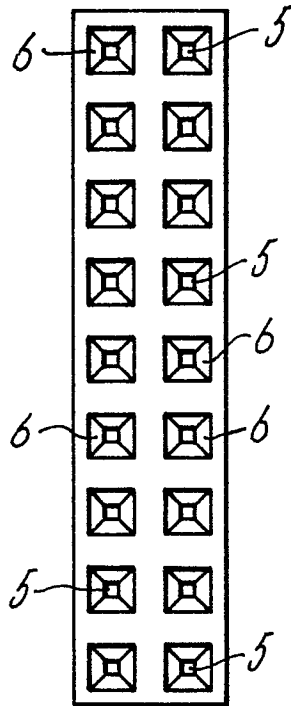


Fig. 2.

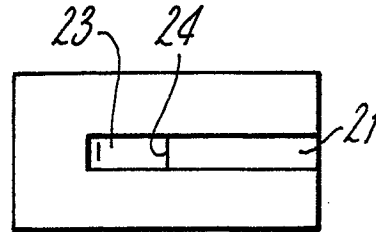


Fig. 3.

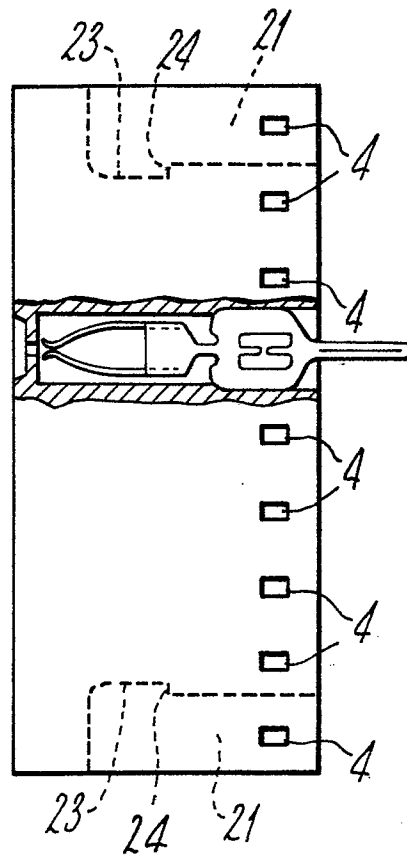


Fig. 4.

Fig. 5.

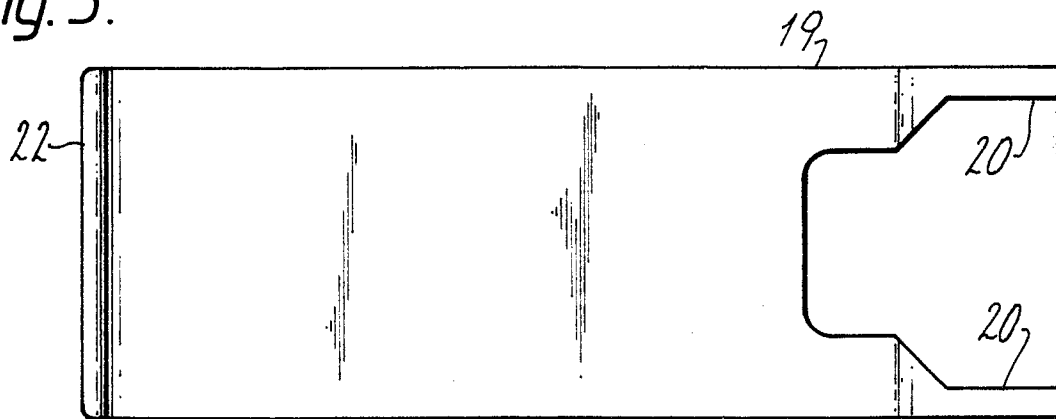


Fig. 6.

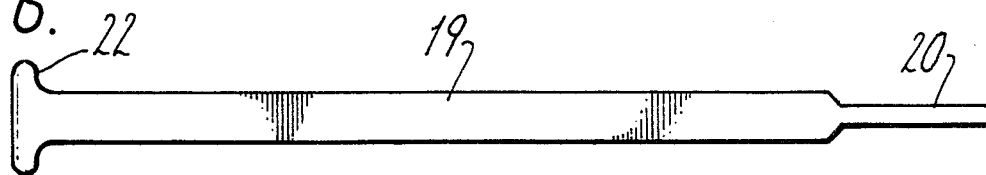


Fig. 7.

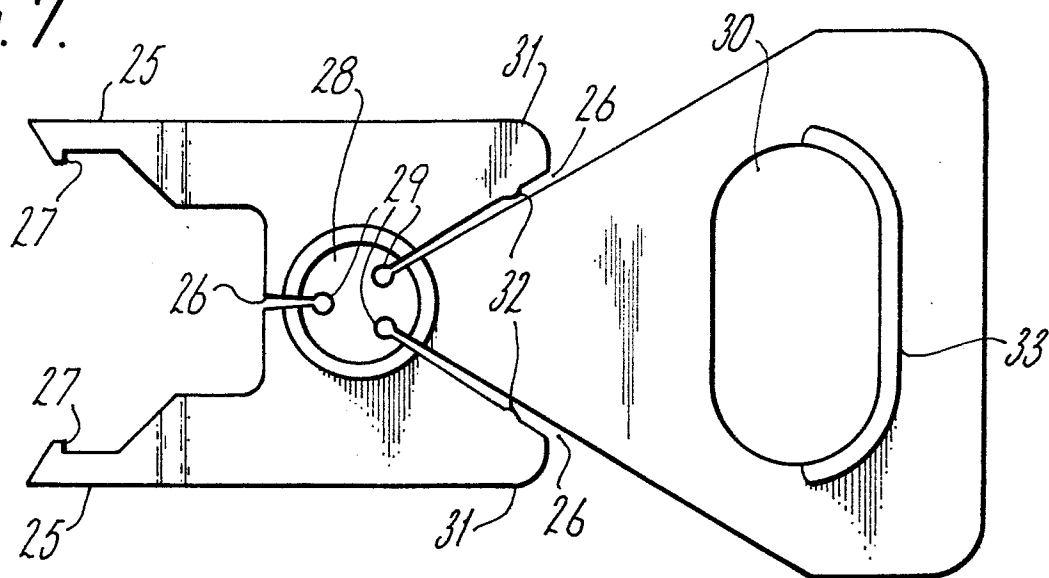


Fig. 8.

