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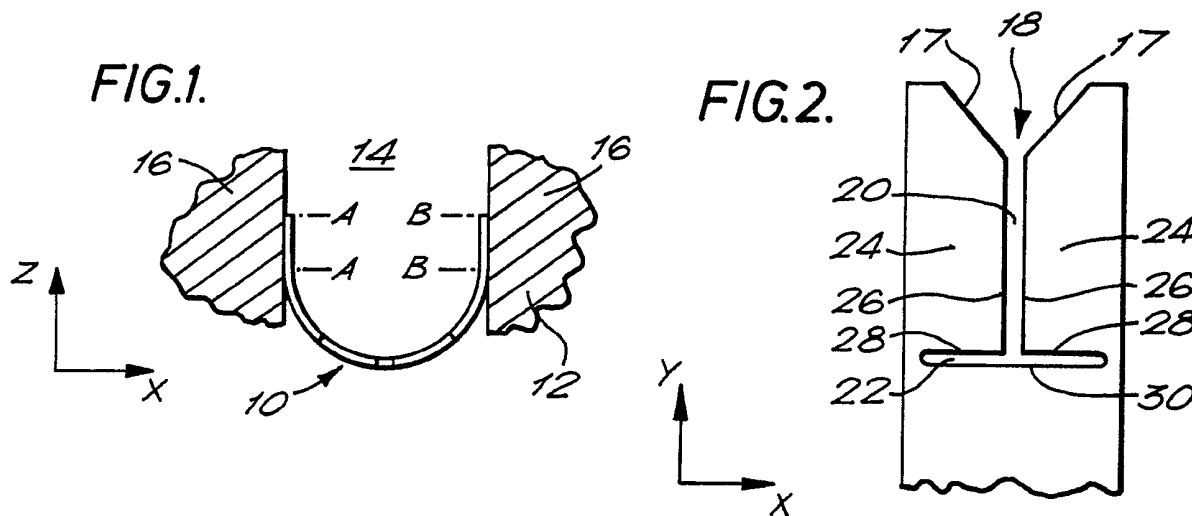
(52) UK CL (Edition N )  
**H2E EPSA**

(56) Documents Cited  
**GB 1362416 A** **GB 0906665 A** **EP 0274948 A1**  
**EP 0271413 A1** **EP 0000624 A1** **US 5219302 A**  
**US 4648678 A** **US 4153324 A** **US 4141618 A**

(58) Field of Search  
UK CL (Edition M ) **H2E EPSA**  
INT CL<sup>5</sup> **H01R**  
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## (54) Contacts for insulation displacement connectors

(57) An insulation displacement contact (10) has a generally arcuate configuration. A longitudinal slot (20) and optionally a lateral slot (22) extending from the base of the longitudinal slot define a pair of tynes (24). The free ends of the tynes (AA, BB) are parallel to one another to assist location in an insulation displacement connector housing (12).



GB 2 290 174 A

FIG.1.

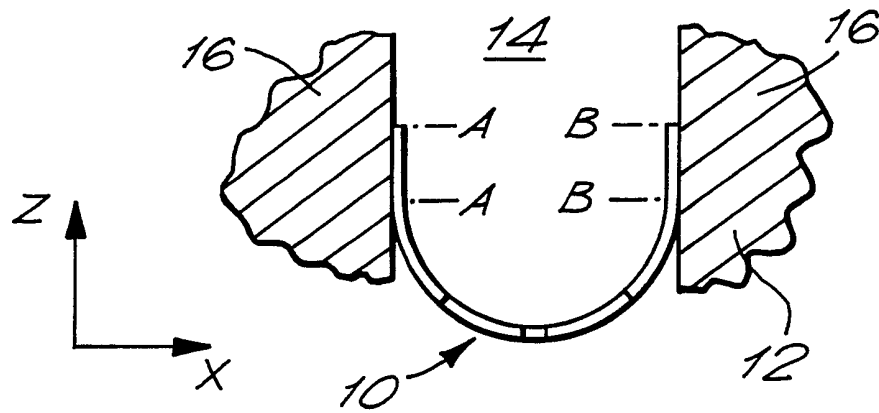


FIG.2.

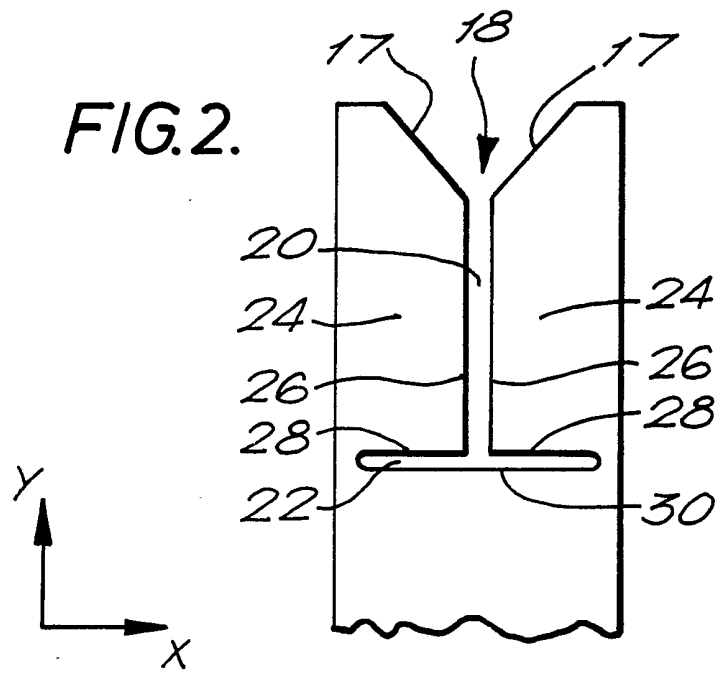


FIG.3.

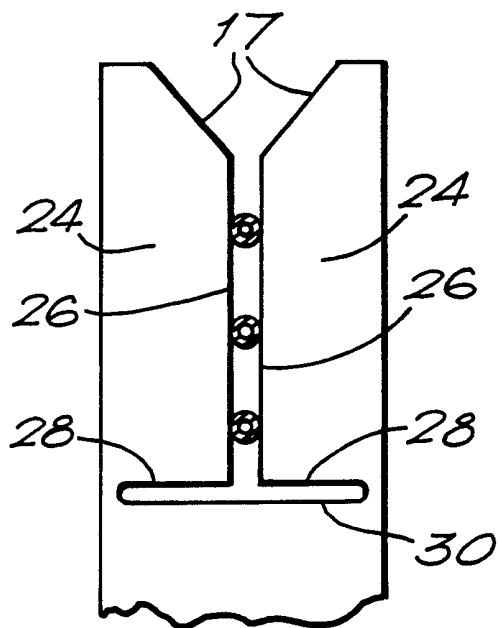
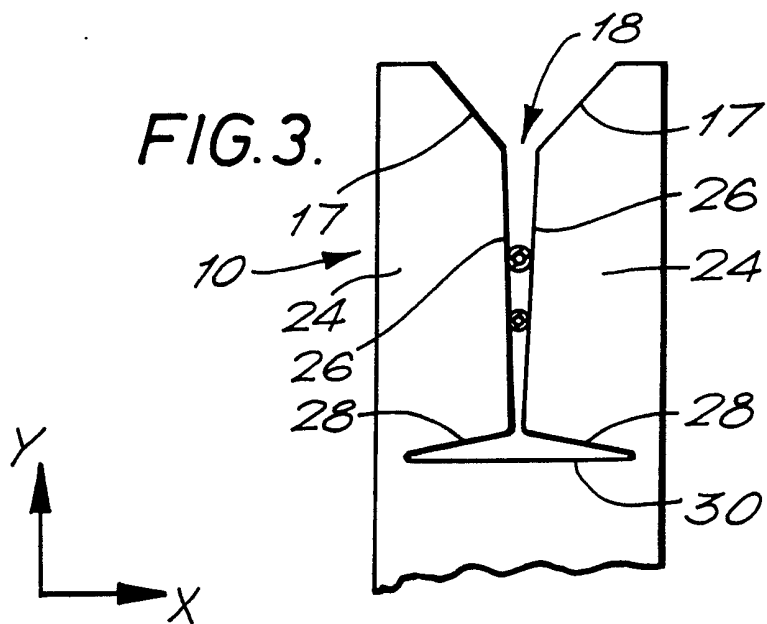


FIG.4.

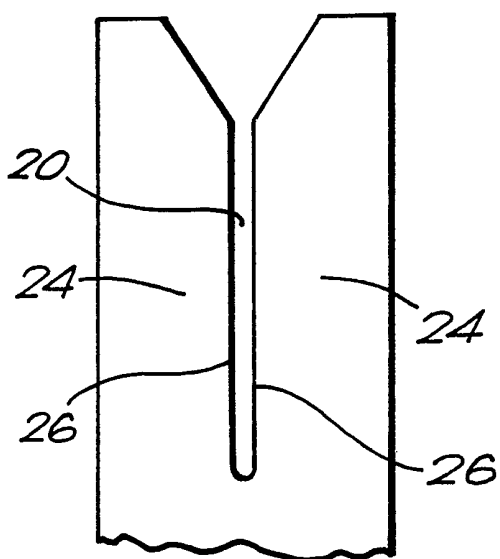


FIG.5.

CONTACTS FOR INSULATION DISPLACEMENT CONNECTORSFIELD OF THE INVENTION

This invention relates to insulation displacement connectors (IDCs) for use, e.g. in the communications industry. It is particularly concerned with the design of contacts used in IDCs and their fixing in IDC housings.

BACKGROUND TO THE INVENTION

In the application of insulation displacement connectors (IDC's) in the communications industry, it is often desirable to be able to connect two wires into a single contact. Many methods of achieving this have been devised. Some consist of a single planar metal contact with two slots, each to accommodate one wire, but more sophisticated designs which can connect two wires in a single insulation displacement slot have generally proved more simple in use, and generally therefore more commercially acceptable.

One of the most used connectors is made by Krone GmbH of Berlin, Germany, and sold as the LSA PLUS connector. The construction is described in DE 2,725,551 and uses a planar metallic contact constrained within a plastic connector body to remain at 45° to the wire to be terminated. In use, when two wires are inserted, the contact, which is constrained both at the top and the bottom of the slot, will flex and deform symmetrically around two wires of the same size. Because of the symmetrical nature of the contact's mechanics, this system has the disadvantage that it will only work satisfactorily with two wires of the same conductor size. It has the further disadvantage that it requires the wire to be securely gripped within the connector body to overcome the mechanical forces tending to rotate the conductor into mechanical equilibrium at 90° to the IDC contact.

Another form of IDC capable of terminating two wires is described in US 4,141,618. This contact is cylindrical and has an axial slot in which wires may be inserted. It is mechanically superior to the design disclosed in DE 2,725,551, because it is capable of functioning without either the wire or the contact having to be constrained in any state of tension or torsion. However, it has

the disadvantages that it requires a relatively large amount of material to manufacture the contact, and it is not possible to make connection to a wire without cutting the wire; thus, it is not possible to have a pass-through connection, which is often desirable in communications wiring. For these reasons, despite its excellent connection characteristics, it has been a relatively unsuccessful contact in the industry.

Another form of contact can be made, by the use of two IDC blades each at 45° to the wire. This is described first in GB 1,361,127 with most recent techniques being disclosed in US 5,044,979, and WO 91/22941. This contact has the advantage of incorporating the mechanical equilibrium of the slotted cylinder arrangement, with the feed-through wiring capability of the 45° contact of DE 2,725,551. It has been commercially manufactured by the present applicant for several years, and has proved functionally reliable in the termination of two wires of the same conductor size. The design attempts to replicate the function of the slotted cylinder contact, but uses flat blades, and hence a simplified manufacturing process. It has the disadvantages of requiring a very precise mechanical restraint system in the plastic body of the connector to restrain the contact blades from rotation, and like the 45° planar contact, can only work with two wires of the same conductor size because it is constrained to deform symmetrically around the conductors by its mechanical arrangement.

It is desirable to increase the functionality of IDC's in the telecommunications industry. It would be particularly desirable to produce a contact which can either terminate more than two wires of the same size, or two wires of slightly different conductor size, such as is possible with the contacts disclosed in US 4,141,618, but which does not suffer from the disadvantages associated with split cylinder type contacts discussed previously.

The invention resides generally in the provision of a contact which is generally arcuate. More specifically there is provided a contact for an insulation displacement connector comprising a first contact portion for receiving one or more wires and a second contact portion, the first contact portion having a central

longitudinal slot defining a pair of contact tynes, being of generally arcuate shape and being symmetrical about the longitudinal slot.

The invention also resides in an insulation displacement connector housing a plurality of insulation displacement contacts as defined.

Preferably the first contact portion is semi-elliptical and symmetrical about the longitudinal slot. One preferred construction is semi-circular. The arcuate construction may have parallel end portions to assist retention in a housing.

The use of an arcuate contact portion overcomes the disadvantages of the split cylinder design in that it has a feed through capacity. However it retains the advantage that two wires of different thicknesses may be retained at the same time. Moreover it avoids the disadvantage of the V shaped contact as precise mechanical restraint in the plastic housing of the connector is not necessary.

#### BRIEF DESCRIPTION OF THE DRAWINGS

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

Figure 1 is a top view of a part-cylindrical contact received in an IDC housing and embodying the invention;

Figure 2 is a front view of the contact of Figure 1 housing the contact slot;

Figure 3 is a similar view to the Figure 2 showing how the contact behaves with two wires of differing diameter;

Figure 4 is a similar view to Figures 2 and 3, showing how the contact behaves with more than two wires of similar diameter; and

Figure 5 is a similar view to Figure 2 of an alternative embodiment of the invention.

#### DESCRIPTION OF BEST MODE

Referring to Figures 1 and 2, the contact 10 is shown received in a slot in a IDC housing 12. The IDC housing is only shown in part for ease of understanding and it is to be understood that any housing is suitable for receiving the contacts, for example, the housings disclosed in the aforementioned WO 92/22941. The contact is part-cylindrical and the functional part of the contact is semi-circular although other arcuate contact shapes could be used. Moreover, the free ends of the contact may be extended. In Figure 1 the ends AA and BB are parallel and assist in seating the contact in the housing slot 14. Movement outwards of the sides of the contact is constrained by the plastics side walls 16 of the slot in the connector body. Thus, the side walls 16 act as a restraining means to prevent spreading of the contact outwards on insertion of a wire.

Referring to Figure 2, the contact has a pair of sloping walls 17 defining a tapered wire entry portion 18 which, on insertion of a wire, slices the wire insulation. The entry portion 18 tapers to a longitudinal slot 20 at the base which extends, on either side of the slot, a lateral slot 22. The lateral slot defines a pair of tynes 24 on either side of the longitudinal slot 20 and allows the side walls 26 of the tynes, which define the longitudinal slot, to open parallel to one another when wires are inserted. It will be appreciated that when wires are inserted, the tynes will move in both the X and Z axes as defined in Figure 1.

The base of the contact is not illustrated in the figures as it is not germane to the invention. Any suitable base construction may be chosen depending on the nature of the contact to be made. For example, a post type tail may be used for connection to a printed circuit board. Another type of connector base is shown in WO 92/22941. The appropriate base is a simple matter of design choice and is known to those skilled in the art.

The slot in the housing may be a simple rectangular cavity which is very easy to manufacture and much more simple than the constructions required to anchor the V type contacts of WO 92/22941.

Figure 3 shows how the contact behaves when two wires of different

diameter are inserted into the slot. The movement of the tynes is exaggerated for clarity and it can be seen how the tynes will move additionally in the Y direction. Thus, the side walls 26 which define the longitudinal slot are no longer parallel and the bottom walls 28 are no longer parallel to the bottom wall 30 of the lateral slot. In effect, each tyne is pivoting about a respective end 32 of the longitudinal slot.

It is preferable, as shown in Figure 3, that the larger diameter wire is inserted last. However this is not essential. If the larger wire is inserted first, the direction of movement in the Y direction will be the opposition of that illustrated.

In Figure 4, three wires of equal diameter are shown inserted in the longitudinal slot 20. As the half-cylinder will deform symmetrically due to the symmetrical nature of the displacement forces caused by the wires, the side walls 26 of the tynes will remain parallel. The contact will work just as well with only two wires and, depending on the length of the slot, can work with more than three wires.

In an alternative embodiment illustrated in Figure 5, the longitudinal slot is relatively long with respect to the wire conductor diameter enabling the lateral slot to be omitted.

Other possible embodiments will be apparent to those skilled in the art. For example the contact form can be semi-elliptical instead of semi-circular, or it can be a greater or lesser segment of a circle or ellipse, provided that this segment is great enough to allow the contact to function mechanically. Alternatively the shape could be formed of successive shorter planar portions, instead of being a continuous curve. All these contacts are generally arcuate in shape.

The tynes have been described as symmetrical about the longitudinal slot 20. Whilst this is desirable it is not essential. An asymmetric arrangement could be used whereby one tyne is fixed allowing only the other blade to move.

When mounted in a plastic connector body, the contacts may either be disposed on one side of the centre line of the connector, or



alternatively inverted to reduce the overall length of the connector for a given number of contacts, as disclosed in WO 92/22941.

## CLAIMS

1. A contact for an insulation displacement connector comprising a first contact portion for receiving one or more wires and a second contact portion, the first contact portion having a central longitudinal slot defining a pair of contact tynes, and being of generally arcuate shape.
2. A contact according to Claim 1, wherein the first contact portion includes a lateral slot extending from the base of the lateral slot on both sides of the lateral slot.
3. A contact according to Claim 1, wherein the first contact portion is semi-elliptical.
4. A contact according to Claim 3, wherein the first contact portion is semi-circular.
5. A contact according to any preceding claim, wherein the first contact portion comprises a plurality of planar portions to produce the generally arcuate shape.
6. A contact according to any preceding claim, wherein the free ends of the first contact portion have substantially parallel portions.
7. A contact according to any preceding claim, wherein the first contact portion is symmetrical about the longitudinal slot.
8. An insulation displacement connector comprising a housing having a plurality of apertures and a plurality of insulation displacement contacts according to any

claims 1 to 7, one contact being received in each aperture.

9. A connector according to Claim 8, wherein the apertures are rectangular.
10. A connector according to claim 8 or 9, wherein the apertures have side walls which act as a restraining means to prevent spreading of the tynes on insertion of a wire into the longitudinal slot.
11. An insulation displacement contact, substantially as herein described with reference to figures 1 to 4 or 5 of the accompanying drawings.
12. An insulation displacement connector, substantially as herein described with reference to figures 1 to 4 or 5 of the accompanying drawings.

<b>Patents Act 1977</b> <b>Examiner's report to the Comptroller under Section 17</b> <b>(The Search report)</b>	Application number GB 9411060.8
<b>Relevant Technical Fields</b>  (i) UK Cl (Ed.M)      H2E (EPSA) (ii) Int Cl (Ed.5)      H01R	Search Examiner MRS J BANNISTER
<b>Databases (see below)</b> (i) UK Patent Office collections of GB, EP, WO and US patent specifications.  (ii) ONLINE DATABASES: WPI	Date of completion of Search 24 AUGUST 1994  Documents considered relevant following a search in respect of Claims :- ALL

**Categories of documents**

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<b>A:</b>	Document indicating technological background and/or state of the art.	<b>&amp;:</b>	Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
X	GB 1362416	(AMP) see the figures and eg page 1 line 20	1,7
X	GB 0906665	(WEC) see the figures and especially page 1 lines 14-20 page 1 lines 27-30	1,5,6,7,8
X	EP 0274948 A1	(TELEMECANIQUE) see especially Figure 1c, contact 2, Figure 4	1,6-9
X	EP 0271413 A1	(TELEMECANIQUE) see especially Figures 1d, 4	1,7,8
X	EP 0000624 A1	(AMP) see especially Figure 1	1,6-10
X	US 5219302	(AMP) see contact 70 Figures 2,3	1,2,4,7,8
X	US 4648678	(BRAND-REX) see Figure 15 and Figure 1 eg	1,6-10
X	US 4153324	(MICRODOT) eg see Figures 2,3	1,2,5,6,8
X	US 4141618	(AMP) see the figures	1,2,6,7,8

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