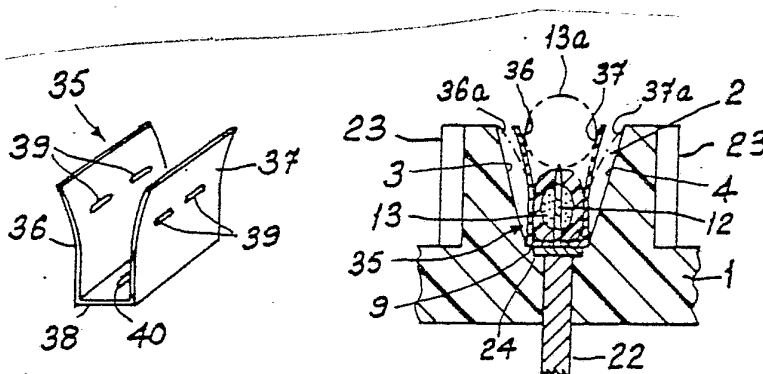




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ³ : H01R 4/24	A1	(11) International Publication Number: WO 83/ 02688 (43) International Publication Date: 4 August 1983 (04.08.83)
(21) International Application Number: PCT/GB82/00027 (22) International Filing Date: 2 February 1982 (02.02.82) (71)(72) Applicant and Inventor: HAYES, Derek [GB/GB]; Home Farm Cottage, St. Michael, Bungay, Suffolk NR35 1NF (GB). (74) Agent: NEWBY, Raymond, Laurence; J.Y. & G.W. Johnson, Furnival House, 14-18 High Holborn, Lon- don WC1V 6DE (GB). (81) Designated States: DE (European patent), FR (Euro- pean patent), JP, NL (European patent), SE (Euro- pean patent), SU. Published With international search report.		

(54) Title: ELECTRICAL COUPLING DEVICE



(57) Abstract

An electrical coupling device, for example an electric plug, for effecting electrical connection between an electrical-conducting member of the coupling device, for example a contact pin (22), and the electrically-conducting material of an insulated electrical conductor (13), comprises a base member (1), a cradle (35) provided on the base member (1) and having an internal space for the reception of the conductor (13), which space is defined between a pair of spaced-apart confronting surfaces (36, 37) of the cradle between which, in use of the coupling device, the conductor (13) is held, and a metallic, conductor-piercing means (12), electrically connected to the pin (22), which projects into the space between the confronting surfaces (36, 37). When the conductor (13) is introduced into the space between the confronting surfaces (36, 37), the conductor-piercing means (12) penetrates the electrically-insulating material of the conductor (13) and makes contact with the electrically-conducting material of the conductor while the conductor is held between the confronting surfaces (36, 37). The cradle (35), which may be formed integrally with the conductor-piercing means (12), may be arranged to displace insulating material from the conductor (13) during insertion of the latter into the cradle so that, in the inserted position of the conductor, localised regions of the confronting surfaces (36, 37) bear substantially directly on the conducting material of the conductor.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	LI	Liechtenstein
AU	Australia	LK	Sri Lanka
BE	Belgium	LU	Luxembourg
BR	Brazil	MC	Monaco
CF	Central African Republic	MG	Madagascar
CG	Congo	MR	Mauritania
CH	Switzerland	MW	Malawi
CM	Cameroon	NL	Netherlands
DE	Germany, Federal Republic of	NO	Norway
DK	Denmark	RO	Romania
FI	Finland	SE	Sweden
FR	France	SN	Senegal
GA	Gabon	SU	Soviet Union
GB	United Kingdom	TD	Chad
HU	Hungary	TG	Togo
JP	Japan	US	United States of America
KP	Democratic People's Republic of Korea		

- 1 -

Electrical coupling deviceTechnical Field

This invention relates to an electrical coupling device, and in particular, but not exclusively, it relates to a 3-pin, 13 amp fused plug.

5 Background Art

In my British Patent Specification No. 1,559,789 there is described and claimed an electrical coupling device comprising a body portion having an electrically-insulating part with a recess in its surface, and electric-
10 ally-conducting metallic piercing means mounted in said recess and extending generally in the direction of a pair of opposed sides of the recess but laterally spaced therefrom, and conductor-locating means comprising a pair of cooperating jaws movable relative to each other and having
15 first mutually confronting surfaces configured to receive between them and locate an insulated electrical conductor when said jaws are urged towards one another, at least one end of said pair of jaws being configured to enter into said recess and to allow entry of said piercing means
20 between the jaws and piercing of said conductor by said piercing means when said one end of the jaws is advanced into said recess, the outer surfaces of said pair of jaws and said opposed surfaces of said recess being configured to produce a camming action such that advancing said jaws
25 into said recess urges the jaws towards one another to locate said conductor at least during the piercing of the conductor by the piercing means.

I have now found that a conductor-locating means other than said pair of cooperating jaws may be employed
30 in coupling devices of the above-mentioned kind.

Disclosure of the Invention

According to the present invention, an electrical coupling device for effecting electrical connection between



- 2 -

an electrically-conducting member of the coupling device and the electrically-conducting material of an insulated electrical conductor, said coupling device comprising a base member, conductor-receiving means provided on the
5 base member for the reception of said conductor, and a metallic, conductor-piercing means, forming at least part of said electrically-conducting member, for penetrating the electrically insulating material of said conductor in said receiving means to make contact with the electric-
10 ally-conducting material of the conductor, is characterised in that said receiving means is in the form of a cradle having an internal space defined between a pair of spaced-apart confronting surfaces of the cradle between which, in use of the coupling device, said conductor is held,
15 and in that said conductor-piercing means projects into said space between said confronting surfaces.

Said confronting surfaces of the cradle may be arranged to displace insulating material from the conductor during insertion of the conductor into the cradle so that,
20 in the inserted position of the conductor, said confronting surfaces bear substantially directly on the conducting material of the insulated conductor. For example, said confronting surfaces may be provided with ribs or other projections which displace insulating material from local-
25 ised regions of the conductor as it is inserted into the cradle. Preferably, the insulation-displacing rib(s) or projection(s) on one of said confronting surfaces is (or are) opposite the insulation-displacing rib(s) or projection(s) on the other of said confronting surfaces,
30 and said piercing means is located either in the region or regions between opposed rib(s) or projection(s) of the two confronting surfaces or closely adjacent to said region or regions.

The metallic piercing means may form the electrically-
35 conducting member with which it is desired to connect



- 3 -

the insulated conductor in the coupling device. In this case, the coupling device may serve to provide electrical connection between two insulated electrical conductors, both of which would be inserted into said cradle, one
5 after the other, to be pierced by said piercing means, so that the latter provides the connection between the two conductors.

Alternatively, the piercing means may be joined to a further metallic member, for example a contact pin of
10 an electric plug, to which it is desired to connect the conductor.

In a first embodiment of a coupling device in accordance with the invention, said conductor-piercing means, as in the case of the coupling devices described in Specification No. 1,559,789, may be mounted in a recess in
15 said base member, so that it extends generally in the direction of a pair of opposed sides of the recess but laterally spaced therefrom. In this case, said pair of opposed sides of the recess forms said cradle, and these
20 sides of the recess may be provided with one or more ribs projecting from said sides and disposed substantially parallel to the conductor-piercing means. If, as in the case of the coupling devices described in Specification No. 1,559,789, said base member is made of electrically-
25 insulating plastics material, said ribs may be moulded integrally with the opposed sides of said recess. Alternatively, said ribs may be provided by strips of metallic material mounted in said opposed sides of the recess.

In this first embodiment of the coupling device in
30 accordance with the invention, the recess in the base member may be formed in the same way as described in Specification No. 1,559,789, or between a pair of spaced-apart pillars formed on, for example moulded integrally with, the base member.



- 4 -

In another embodiment of a coupling device in accordance with the invention, said cradle may be made entirely of metallic material and may be mounted on a base of electrically-insulating material. For example, the cradle
5 may be located in a recess in the base member or be simply secured to the base member.

An electrical coupling device in accordance with the invention may take the form of an electric plug, said base member then being made of electrically-insulating
10 material and carrying at least one metallic contact pin to which said metallic conductor-piercing means is electrically connected. In one embodiment of such a plug, said cradle may be provided by a pair of opposed walls of a recess formed in the base member. Alternatively,
15 said cradle may be formed integrally with, or be physically secured to, said pin. Although such a plug may have a single contact pin or two contact pins, the main interest of this aspect of the invention lies in the field of 3-pin plugs, in particular 3-pin, 13 amp fused plugs. The
20 plug may be of the rewirable kind, but it is at present considered that the kind of connection provided by a plug in accordance with this aspect of the invention would be more suitably effected in a factory-assembled plug of the non-rewirable kind.

25 Brief Description of the Drawing

The invention will now be described, by way of example, with reference to the accompanying drawing, in which

Figure 1 is a plan of part of a first embodiment
30 of an electrical coupling device in accordance with the invention,

Figure 2 is a sectional view taken on the line II - II of Figure 1,



- 5 -

Figure 3 is a view on an enlarged scale of a part of Figure 2,

Figures 4 and 5 are views similar to Figures 1 and 2, respectively, of part of a second embodiment of an electrical coupling device in accordance with the invention, Figure 5 being a section taken on the line V - V of Figure 4,

Figures 6 and 7 are views similar to Figures 1 and 2, respectively, of part of a third embodiment of an electrical coupling device in accordance with the invention, Figure 7 being a section taken on the line VII - VII of Figure 6,

Figure 8 is a side view of the cradle of the coupling device of Figures 6 and 7,

15 Figure 9 is a perspective view of the cradle of a fourth embodiment of an electrical coupling device in accordance with the invention,

Figure 10 is a sectional view of part of an electrical coupling device employing the cradle of Figure 9,

20 Figure 11 is a view similar to Figure 9 of part of the cradle of a fifth embodiment of an electrical coupling device in accordance with the invention, and

Figure 12 is a sectional side view of the cradle of Figure 11 showing its engagement with conductor piercing
25 blades.

Best Modes of Carrying Out the Invention

The coupling device shown in Figures 1 to 3 comprises a block 1 of electrically-insulating material in which there is a recess 2 with opposed, parallel side walls



- 6 -

3, 4. Two spaced-apart, parallel, metallic strips 5, 6, for example of brass, are secured in, and project from, the side wall 3 and two spaced-apart, parallel, metallic strips 7, 8 are secured in, and project from, the side wall 4. These strips 5-8 may be partially embedded in their associated side walls 3, 4, or they may be mounted in slots in these side walls. The plane of each of the strips 5-8 is disposed at right angles to its respective side wall 3 or 4, and the strips are disposed so that an edge of the strip 5 is opposite an edge of the strip 7 and an edge of the strip 6 is opposite an edge of the strip 8. The strips 5-8 are wider towards the bottom 9 of the recess 2 than at the top of the latter, so that the gap 10 between confronting edges of opposed pairs of strips decreases in width in the direction towards the bottom 9.

Secured in, and projecting upwardly from, the bottom 9 of the recess 2 between and parallel to the side walls 3, 4 are two metallic blades 11, 12, the blade 11 being disposed in the middle of the gap 10 between the confronting edges of the strips 5 and 7 and the blade 12 being disposed in the middle of the gap 10 between the confronting edges of the strips 6 and 8.

The coupling device of Figures 1 to 3 is employed to provide an electrical connection between two insulated conductors 13 and 14. As shown in Figure 2, the first conductor 13 is pushed down into the recess 2, between the pairs of strips 5 and 7 and 6 and 8, into a position where it lies close to, and substantially parallel to, the bottom 9 of the recess, an aperture 15 in one end wall 16 of the recess allowing the conductor 13 to take up this position. As the conductor is pushed down into the recess 2, the blades 11, 12 penetrate the conductor, and pass through the insulating sheath 17 (see Figure 3) and the conducting portion 18 of the conductor. At



- 7 -

the same time, the confronting edges of the strips 5 and 7 and the confronting edges of the strips 6 and 8 displace at least part of the insulating sheath 17 from the conductor, as shown for the pair of strips 6 and 8 in Figure 3. As a result, the confronting edges of the strips 5-8 bear on the conducting portion 18 of the conductor 13 either directly or through only a very thin residual layer of insulating material. The conducting portion 18 is therefore firmly held between the confronting edges of the strips 5-8 and makes good electrical contact with the blades 11 and 12.

The second conductor 14 is then pressed down into the recess 2 in the same way until it rests on top of the conductor 13, as shown in Figures 2 and 3, the conductor 14 then occupying the position shown in chain lines in Figure 1 where it passes out from the block 1 through the aperture 15. Again, the confronting edges of the strips 5-8 displace at least part of the insulating sheath 19 of the conductor 14 (see Figure 3) so that the conducting portion 20 of the conductor is firmly held between the strips and makes good electrical contact with the blades 11 and 12.

When the two conductors 13 and 14 have been pressed down into the recess 2 as described above, the two blades 11 and 12 provide effective electrical connections between the conducting portions of the two conductors. When the connection has been completed, a cover 21, shown in chain lines in Figure 2, may be secured to the block 1 over the open top of the recess 2. This cover may be removably mounted on the block 1 if the coupling device is intended to be of the rewirable type. If, however, the coupling device is intended to be of the non-rewirable type, the cover 21 may be permanently secured to the block 1, for example moulded onto the block. Whether the cover is removably or permanently mounted on the block 1, it may



- 8 -

comprise a projection 21a which enters the recess 2 to prevent the conductors 13 and 14 from rising in the recess. In the case of a cover 21 which is slid onto the base 1, for example as disclosed in British Patent Specification
5 No. 833,222, the underside of the cover may be shaped so that it engages the conductor 14 and forces it down into the gaps 10 as the cover is slid into its position of securement on the base 1.

It will be appreciated that, by suitable shaping
10 of the confronting edges of the strips 5-8, the coupling device of Figures 1 to 3 may be employed for connecting together conductors in a range of sizes.

Figures 4 and 5 show part of a coupling device in the form of an electric plug for connecting an insulated
15 conductor 13 to a pin 22 of the device. This coupling device is similar in many respects to the device shown in Figures 1 to 3, and like parts in the two devices have been designated with the same reference numerals. The device of Figures 4 and 5 again comprises a block 1 of
20 electrically-insulating material, which in this case forms the base of the plug from which the pin 22 projects. In this case, the recess 2 of the block is formed between two pillars 23 moulded integrally with the block, these pillars having spaced-apart, confronting walls 3, 4 corresponding to the side walls 3, 4 of the recess 2 of Figures
25 1 and 2. Metallic strips 5-8 are fixed to, and project from the walls 3, 4, as in the case of the device of Figures 1 to 3, and blades 11 and 12 project upwardly from the bottom 9 of the recess 2 in the middle of the
30 gaps 10 between confronting edges of the strips 5 and 7 and the strips 6 and 8. In this embodiment, however, the blades 11, 12 are secured to a plate 24 of metallic material which is joined to, or formed integrally with, the pin 22.

35 In the embodiment of Figures 4 and 5, the recess



- 9 -

has been shown considerably shallower than the recess 2 of the device of Figures 1 and 2, and the tips of the blades 11 and 12 are close to the open top of the recess.

In such cases, it is desirable to guide the conductor 5 13 as it is entered into the recess 2, to ensure that the blades 11, 12 pass centrally through the conductor 13. Such guidance may be provided by a jig 25, shown in chain lines in Figure 5, which is temporarily positioned over the recess 2. It will, of course, be appreciated 10 that a shallower recess 2 may be employed in the embodiment of Figures 1 and 2, and that a deeper recess 2 may be employed in the embodiment of Figures 4 and 5.

The strips 5-8 in the embodiment of Figures 4 and 5 serve the same purpose as the corresponding strips in 15 the device of Figures 1 to 3, i.e. they displace part of the insulating sheath of the conductor 13 as the latter is pressed down into the tapered gap 10 between confronting edges of the strips. By suitably shaping these confronting edges, the device can be arranged to accept conductors 20 in a range of different sizes.

As is the case of the embodiment of Figures 1 to 3, a cover (not shown) may be removably or permanently fixed over the block 1 when the conductor 13 has been pressed into the recess 2.

25 In the embodiments of Figures 1 to 5, the strips 5-8 are all separate from one another. In modified forms of these embodiments, the strips 5 and 6 and the strips 7 and 8, or the strips 5 and 7 and the strips 6 and 8 may be combined in pairs which are partially embedded 30 in, or otherwise secured to the walls 3, 4 of the recess 2. Again, all four of the strips 5-8 may be combined into a single unit which can be loosely mounted in the recess 2. In these modified forms, the strip units may be formed integrally with the blades 11, 12, and in the



- 10 -

case of coupling devices with pins, the strip units, blades and pins may be integral with one another.

Figures 6 to 8 show part of a coupling device in the form of an electric plug for connecting a conductor 13 to a pin 22 of the device. Again, this coupling device is similar in certain respects to the previously described embodiments, and parts in the embodiment of Figures 6 to 8 which are substantially the same as in the previous embodiments have been designated with the same reference numerals as in Figures 1 to 5.

In the embodiments of Figures 1 to 5, the cradle which receives the conductor 13 (or conductors 13 and 14), which is formed by the side walls 3, 4 of the recess 2 and the strips 5-8, is fixed relative to the blades 11, 12. This is not the case in the embodiment of Figures 6 to 8, in which the conductor-receiving cradle, generally designated by the numeral 26, is removably housed in the recess 2 of the block 1.

The cradle 26 has three spaced-apart, parallel limbs 27, 28 and 29, joined together by webs 30 and 31, so that the cradle has approximately the shape of a figure "2" as viewed from above (see Figure 6). Each of the limbs 27-29 has a tapered gap 10 formed therein, as can be seen for the limb 28 in Figure 7, and the webs 30 and 31 have the shape shown in Figure 8. As in the case of the embodiment of Figures 4 and 5, the coupling device of Figures 6 to 8 has its conductor-piercing blades 11 and 12 projecting upwardly in the recess 2 from a metallic plate 24 which is joined to, or formed integrally with, the pin 22. It will be noted, however, that in this embodiment, the blades 11, 12 are not located in the gaps 10 of the limbs 27-29, but the blade 11 is located between the limbs 27 and 28 and the blade 12 is located between the limbs 28 and 29.



- 11 -

The device of Figures 6 to 8 is employed in the same way as the device of Figures 4 and 5 for connecting a conductor 13 to the pin 22. From Figure 6 it will be seen that the end wall 32 of the recess 2 is provided with a recess 33 to accommodate the free end of the conductor 13.

As in the case of the previous embodiments, the block 1 may be provided with a cover (not shown) over the open top of the recess 2.

10 In a modified form of the coupling device of Figures 6 to 8, the cradle 26 is formed integrally with, or joined to, the pin 22. In this case, it may not be necessary to locate the cradle 26 in a recess in the block 1.

Figures 9 and 10 show part of another coupling device, 15 in the form of an electric plug, for connecting a conductor 13 to a pin 22 of the device. This coupling device is similar in certain respects to the embodiment described above with reference to Figures 4 and 5, and parts in the embodiment of Figures 9 and 10 which are substantially 20 the same as in the embodiment of Figures 4 and 5 have been designated with the same reference numerals.

The device of Figures 9 and 10 again comprises a block 1 of electrically-insulating material which forms the base of the plug from which the pin 22 projects. 25 A recess 2 is again formed in the block 1 between two spaced-apart pillars 23 forming an integrally moulded part of the block 1. The confronting walls 3, 4 of these pillars converge towards one another in the direction towards the bottom 9 of the recess. Conductor-piercing 30 blades, similar to the blades 11, 12 in Figures 4 and 5, project upwardly from the bottom 9 of the recess 2, one of these blades, designated by the numeral 12, being shown in Figure 10. These blades are again secured to



- 12 -

a plate 24 of metallic material which is joined to, or formed integrally with, the pin 22.

A cradle generally designated by the numeral 35, is received in the recess 2. This cradle, shown in perspective in Figure 9, is made from metallic sheet material and is of generally U-shape with two limbs 36, 37 connected by a web 38. The limbs 36 and 37 flare outwardly at their free ends, and each of the limbs is provided with slits 39, disposed parallel to the web 38 and positioned approximately mid-way between the web 38 and the free ends of the limbs 36, 37. The web 38 is provided with a pair of spaced-apart slits 40, only one of which can be seen in Figure 9. When the cradle 35 is placed in the recess 2, the blades 12 pass through the slits 40 and the blades locate the cradle in the longitudinal direction of the web 38. When the cradle is fully inserted into the recess 2, its web 38 is located in the transverse direction of the web at the corners between the bottom 9 of the recess 2 and the walls 3, 4 thereof.

When the conductor 13 is to be connected with the piercing blades 12, it is first placed in the position indicated by the chain line 13_a in Figure 10. It is then forced down between the limbs 36, 37 and the latter are forced outwardly, by bending in the region of the slits 39, to the positions 36_a, 37_a, shown in chain lines in Figure 10. The cradle 35 is then accurately centred in the recess 2, so that, as the conductor is pressed down to the bottom of the cradle, the piercing blades 12 pass through the centre of the conductor. When the conductor 13 is fully inserted into the cradle 35, the limbs 36, 37 reassert themselves and return to the positions shown in full lines in Figure 10. In the fully inserted position of the conductor 13, it is firmly held between the limbs 36, 37, close to the web 38, and the conducting portion of the conductor makes good electrical contact with the



- 13 -

piercing blades 12. Any subsequent deterioration of the plastics material of the block 1 will not affect this firm hold on the conductor 13.

As in the case of the previous embodiments, the block 1 may be provided with a cover (not shown) over the open top of the recess 2.

Figures 11 and 12 show a modified form of the cradle of Figure 9, in which the internal confronting surfaces of the limbs 36, 37 of the cradle 35 are provided with ribs 41 which serve to displace insulating material from the conductor 13 as it is pressed down into the cradle.

In addition, each of the limbs 36, 37 is provided with an inwardly-projecting tongue 42, which may be stamped out of the material of the cradle. When a conductor is pressed down into the cradle, the limbs 36, 37 at first flex outwardly to allow the conductor to pass the tongues 42. When, however, the conductor has been fully pressed into the cradle, the limbs 35, 36 re-assert themselves and return to the positions shown in full lines in Figure 10. The free ends of the tongues 42 then overlie the conductor and the latter cannot be removed from the cradle without damage being caused to the cradle, for example bending of the tongues 42 upwardly out of the way of the conductor.

Figure 12 also shows how the piercing blades 12 are provided with shoulders 43 under which the web 38 of the cradle engages when the cradle is placed in the recess 2, this positioning of the cradle being allowed by slight inward flexing of the blades 12 towards one another as they pass through the slits 40 followed by springing apart of the blades 12. It will then be impossible to remove the cradle 35 from the recess 2 without causing damage to the cradle and/or the blades 12. It is a requirement in some countries that non-rewirable coupling devices should be made in such a manner that disconnection of

- 14 -

the conductor from the coupling device cannot be achieved without permanent damage being caused to the coupling device. The above described tongues 42 and shoulders 43 are examples of two ways of satisfying this requirement.

- 5 Although the embodiments described above with reference to Figures 4 to 12 have a single pin 22, it will be appreciated that the invention includes coupling devices in the form of electric plugs comprising more than one pin and multi-pin fused plugs. In such plugs, each insulated conductor would be connected to its respective pin (or fuse clip) in the same way as the conductor 13.
- 10



- 15 -

CLAIMS

1. An electrical coupling device for effecting electrical connection between an electrically-conducting member of the coupling device and the electrically-conducting material (18, 20) of an insulated electrical conductor (13, 14), said coupling device comprising a base member (1), conductor-receiving means (2; 26; 35) on the base member for the reception of said conductor, and a metallic, conductor-piercing means (11, 12), forming at least part of said electrically-conducting member, for penetrating the electrically insulating material (17, 19) of said conductor in said receiving means (2; 26; 35) to make contact with the electrically-conducting material (18, 20) of the conductor, characterised in that said receiving means (2; 26; 35) is in the form of a cradle having an internal space (10) defined between a pair of spaced-apart confronting surfaces (3, 4; 30, 31; 36, 37) of the cradle between which, in use of the coupling device, said conductor is held, and in that said conductor-piercing means (11, 12) projects into said space (10) between said confronting surfaces (3, 4; 30, 31; 36, 37).

2. An electrical coupling device according to claim 1, characterised in that said cradle (2) comprises means (5-8) for displacing electrically-insulating material (17, 19) from said conductor (13, 14) during insertion of the conductor into the cradle.

3. An electrical coupling device according to claim 2, characterised in that at least one of said confronting surfaces (3, 4) of said cradle (2) is provided with at least one rib or other projection (5-8) which displaces electrically-insulating material from a localised region of the conductor as it is inserted into the cradle.

4. An electrical coupling device according to claim 3, characterised in that each of said confronting surfaces (3, 4) of the cradle (2) is provided with at least one



- 16 -

of said ribs or projections, the or each rib or projection (5, 6) on one of said confronting surfaces (3) being opposite a respective rib or projection (7, 8) on the other of said confronting surfaces (4).

- 5 5. An electrical coupling device according to claim 4, characterised in that said conductor-piercing means (11, 12) is located between opposed ribs or projections (5, 7; 6, 8) on the two confronting surfaces (3, 4) of the cradle.
- 10 6. An electrical coupling device according to any of the preceding claims, characterised in that said electrically-conducting member comprises a metallic pin (22) mounted on said base member (1) and electrically connected to said conductor-piercing means (11, 12).
- 15 7. An electrical coupling device according to claim 6, wherein said pin (22) is connected either directly or via a fuse to said conductor-piercing means (11, 12).
- 20 8. An electrical coupling device according to claim 6, characterised in that said pin (22) is formed integrally with said conductor-piercing means (11, 12).
- 25 9. An electrical coupling device according to any of the preceding claims, characterised in that said cradle is formed as a recess (2) in said base member (1).
- 30 10. An electrical coupling device according to claim 4 or 5, or any of claims 6 to 8 when dependent on claim 4 or 5, characterised in that said cradle is formed as a recess (2) in said base member (1), in that said base member is made of electrically-insulating plastics material, and in that said projections (5-8) are moulded integrally with said confronting surfaces (3, 4) of the cradle.
11. An electrical coupling device according to claim



- 17 -

4 or 5, or any of claims 6 to 8 when dependent on claim 4 or 5, characterised in that said cradle is formed as a recess (2) in said base member (1), in that said base member is made of electrically-insulating plastics material, 5 and in that said projections are provided by strips of metallic material (5-8) mounted in said confronting surfaces (3, 4) of the cradle.

12. An electrical coupling device according to claim 10 9, characterised in that said recess (2) is a hole in the base member (1).

13. An electrical coupling device according to claim 9, characterised in that said recess (2) is formed between two spaced-apart pillars (23) formed on the base member 15 (1).

14. An electrical coupling device according to any of claims 1 to 9, characterised in that said base member (1) is made of electrically-insulating material and said cradle (26; 35) is made entirely of metallic material.

20 15. An electrical coupling device according to claim 14, characterised in that said cradle (26; 35) is located in a recess in said base member (1).

16. An electrical coupling device according to claim 14 or 15, characterised in that said cradle (35) is a generally U-shaped member comprising a pair of spaced-apart 25 limbs (36, 37) connected by a web (38), the inwardly-facing surfaces of said limbs (36, 37) providing said confronting surfaces of the cradle.

17. An electrical coupling device according to claim 30 15, characterised in that said cradle (35) comprises means (42) for preventing removal of said conductor (13, 14) from said space.



- 18 -

18. An electrical coupling device according to any of claims 15 to 17, characterised by inter-engaging means (43) between said cradle (35) and said conductor-piercing means (11, 12) to prevent removal of said cradle from its location in said recess.



1

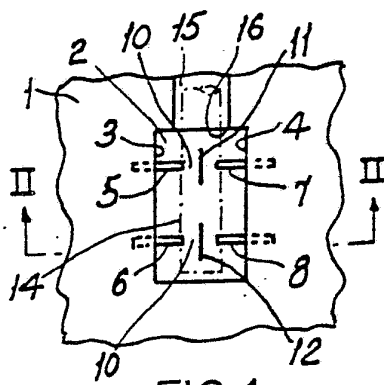


FIG. 1

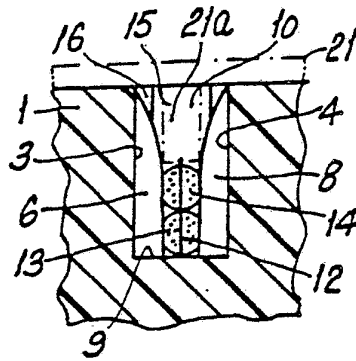


FIG. 2

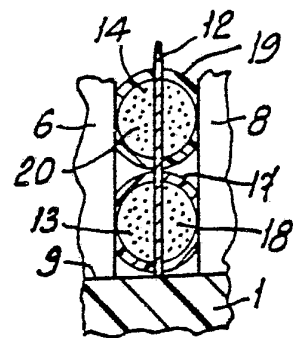


FIG. 3

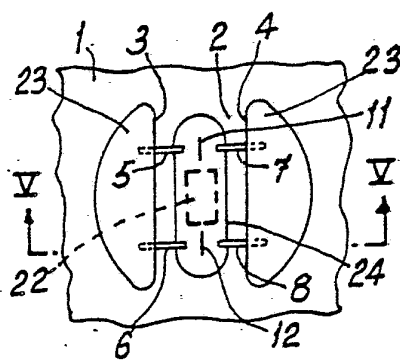


FIG. 4

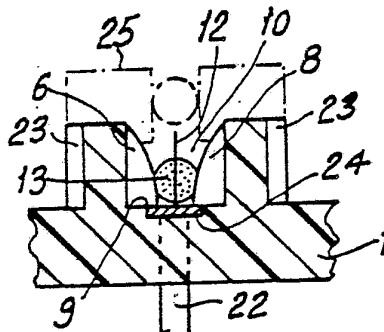


FIG. 5

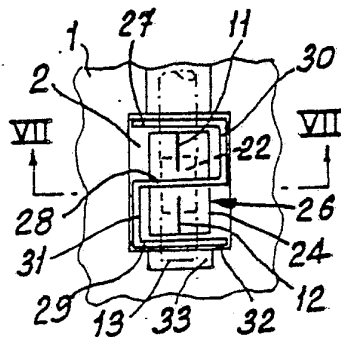


FIG. 6

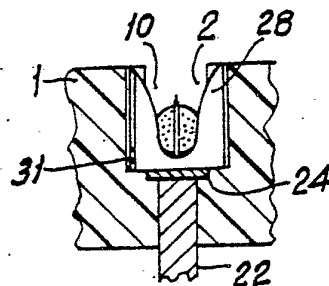


FIG. 7

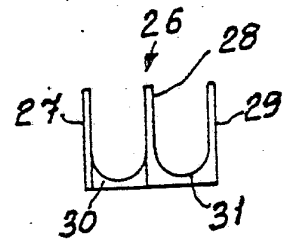


FIG. 8

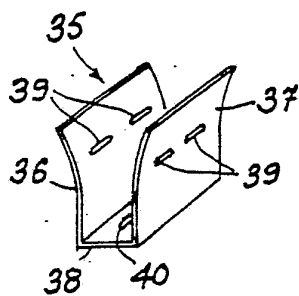
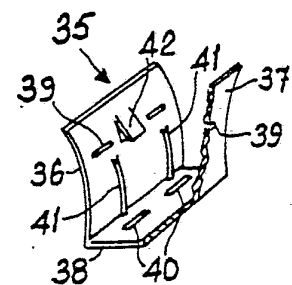


FIG. 9

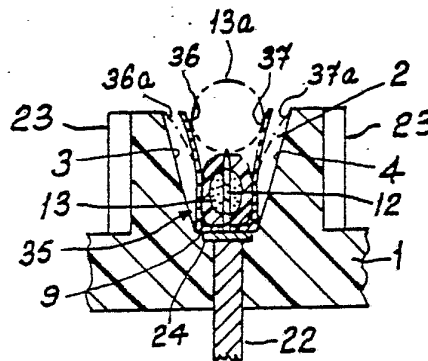


FIG. 10

FIG. 11

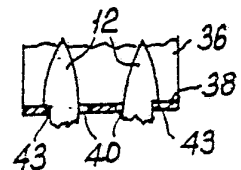


FIG. 12

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 82/00027

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ³ According to International Patent Classification (IPC) or to both National Classification and IPC IPC ³ : H 01 R 4/24						
II. FIELDS SEARCHED Minimum Documentation Searched ⁴ <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 25%; border-bottom: 1px solid black;">Classification System</th> <th style="border-bottom: 1px solid black;">Classification Symbols</th> </tr> <tr> <td style="height: 40px; vertical-align: middle; border-right: 1px solid black;">IPC³</td> <td style="text-align: center; vertical-align: middle;">H 01 R 4/24</td> </tr> </table> Documentation Searched other than Minimum Documentation to the extent that such Documents are Included in the Fields Searched ⁶			Classification System	Classification Symbols	IPC ³	H 01 R 4/24
Classification System	Classification Symbols					
IPC ³	H 01 R 4/24					
III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴						
Category *	Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁸				
E,X	GB, A, 2080638 (HAYES) 3 February 1982 see abstract; figures --	1-18				
Y	GB, A, 2077049 (HAYES) 9 December 1981 see page 3, lines 63-97; figures --	1,6-8,14, 15				
Y	US, A, 3320385 (SHERWOOD) 16 May 1967 see column 3, lines 6-28; figures --	1,2,5,13, 14,16				
A	US, A, 3177458 (BUCHANAN) 6 April 1965 see column 5, lines 7-33; figures --	1,2,5,6,8- 10,13-15				
A	US, A, 2964727 (HEBELER) 13 December 1960 see column 2, lines 35-61; figures --	1,2,5,14				
A	GB, A, 720254 (SCHULER) 15 December 1954 see page 1, lines 54-90; figures --	1,2,5,6,8, 9,14,15				
A	US, A, 3902154 (TRW) 26 August 1975 see column 2, line 67 - column 3, line	17 ./.				
* Special categories of cited documents: ¹⁵ "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" document member of the same patent family						
IV. CERTIFICATION						
Date of the Actual Completion of the International Search ² 5th October 1982	Date of Mailing of this International Search Report 14th October 1982					
International Searching Authority ¹ EUROPEAN PATENT OFFICE	Signature of Authorized Officer ²⁰ G.L.M. Kruidenberg					

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No ¹⁸
A	48; figures -- DE, B, 2507130 (AMACHER) 8 April 1976 see column 4, lines 10-38 -----	1,2,9,14,15