

Electrical plug receptacle connector

(18)

We have described in European Patent Application 79.301574.5, Publication Number EP-A1-9867, several embodiments of an electrical plug receptacle connector comprising an insulating housing having a plug-receiving end and an opposite rearward end, a plug-receiving opening extending into the plug-receiving end, the opening having first opposed internal side walls and second opposed internal side walls, and a plurality of stamped and formed electrical terminals mounted on the housing, each such terminal comprising a wire connecting portion, an intermediate portion and a contact spring portion, the contact spring portion extending from one of the first internal side walls at a position adjacent to the plug-receiving end, diagonally into the opening and towards the opposite internal side wall, the intermediate portions of the terminals being received in juxtaposed channels in that external side wall which is adjacent to the one internal side wall, the channels extending across such adjacent external side wall towards the rearward end of the housing.

Such receptacle connectors are intended for use, in particular in the telephone industry, and are generally known as «modular telephone jacks». Such jacks are usually of miniature size, and their housings, being hollow, are easily crushed or otherwise damaged.

The connectors described in EP-A1-9867 are all adapted to be mounted to printed circuit cards and to this end, the terminals comprise post portions which extend from the housing for insertion in holes in the cards to make electrical connection with the circuits thereon.

This invention is concerned in general with a modular telephone jack which can be terminated to wire leads instead of to a printed circuit card, since in some telephone equipments no printed circuit card is provided.

Although modular telephone jacks which can be terminated to wire leads are known from US-A-3,850,497, for example, the terminals of these known jacks are in the form of wires, which are crimped to the leads prior to being inserted individually into circular cross-section openings in the housing. These terminals are not susceptible to being previously gold plated by current selective gold plating techniques over their contact areas only, as are the stamped and formed terminals of a connector according to EP-A1 9867 and are much less easily assembled to the housing of the connector.

The present invention is concerned in particular with the problem of providing a modular telephone jack the terminals of which can be connected to wire leads by the use of conventional automated machinery, after the terminals have been assembled to the housing and without damage thereto.

According to the invention, therefore, an electrical plug receptacle connector according to the first paragraph of this specification is characterised by

a ledge extending from, and overhanging, the rearward end of the housing and by a plurality, equal to the number of terminals, of stalls provided on the ledge and having open tops facing away therefrom, the stalls having front and rear stall side walls which face forwardly and rearwardly of the housing, respectively, each rear stall side wall having a wire admitting slot therein, opening in a direction away from the ledge, the intermediate portions of the terminals extending into the stalls, each of the wire connecting portions of the terminals being disposed in one of the stalls and comprising a plate upstanding from the ledge, and being formed with a wire-receiving slot opening into an edge of the plate remote from the ledge, the ledge being capable of being supported upon a supporting surface of an anvil for co-operation with a wire insertion tool, for inserting wires into the wire-receiving slots and the associated wire admitting slots, transversely of the longitudinal axis of the wire.

The wire insertion forces, which may be very substantial especially where all the terminals are connected to wires simultaneously, are transmitted to the housing by way of the ledge so that damage to the housing is avoided. By virtue of the wire admitting slots, the wires are automatically dressed so that they extend rearwardly of the housing and so do not interfere with the insertion of the forward end of the housing into an opening in a supporting panel e.g. in a telephone instrument, the engagement of the wires in the wire admitting slots, providing strain relief for the connections between the terminals and the wires. By virtue of the stalls, the wire receiving portions of the terminals are insulated against accidental contact and at the same time the simultaneous assembly of the terminals to the housing is not impeded.

An electrical connector provided with terminals having wire-receiving slots is *per se* known, for example from US-A-4,159,158.

For a better understanding of the invention reference will now be made by way of example to the accompanying drawings, in which:

Figure 1 is a partially exploded perspective view of an electrical plug receptacle connector, showing an electrical plug aligned for mating therewith, an electrical terminal positioned for insertion in the housing of the connector and an electrical wire positioned for insertion in the terminal;

Figure 2 is a sectional view of the receptacle connector when in use, the connector being mounted in a panel and mated with the plug;

Figure 3 is a sectional view of the receptacle connector in operative association with tooling for connecting a wire to a terminal of the connector;

Figure 4 is a fragmentary top perspective view of a sheet metal blank from which terminals for the connector are to be formed;

Figure 5 is a similar view to that of Figure 4 illustrating the terminals in a partially formed

condition; and

Figure 6 is a sectional view of the connector illustrating the manner in which the terminals are assembled to the housing of the connector.

As will be apparent from Figures 1 and 2 an electrical plug receptacle connector 2 serves to connect individual insulated wires 4 of a flat cable 6 to individual insulated wires 8. The wires 4 are terminated to exposed contacts 88 of an electrical plug 86. When the plug is mated with the connector the contacts 88 engage individual electrical terminals 30 of the connector 2 which terminals are in turn connected to the wires 8.

The connector 2 comprises a one-piece, moulded, insulating housing 10 having a plug-receiving end 12, an opposite rearward end 14, and an opening 16 for receiving the plug 86, which opening extends into the plug-receiving end 12. The opening 16 has first opposed internal side walls 18 and 20 and second opposed internal side walls 22. The housing 10 has external side walls 24 and 26, and laterally facing side walls 28.

The individual terminals 30 are stamped and formed from spring metal, for example phosphor bronze, each terminal having a contact spring portion 32, an intermediate portion 34 and a wire-receiving portion 58. The portion 32 may be plated with a narrow band 33 of electrodeposited, corrosion resistant metal, for example gold. The intermediate portions 34 of the terminals 30 are disposed in channels 36 in the side walls 24, which communicate with the interiors of juxtaposed stalls 46, described below, the terminals 30 being retained in the channels 36 by means of barbs 38 projecting from the side edges of the portions 34 of the terminals. The contact spring portion 32 of each terminal 30 normally extends, as shown in Figure 3, from a bight 42 thereof through an opening 40 at the end of the respective channel 36, diagonally into the opening 16 and towards the rearward end 14 of the housing 10.

A planar ledge 44 extending normally of the end 14 of the housing, substantially in alignment with the walls 18 and 24, overhangs the end 14 of the housing 10, as best seen in Figure 2. The stalls 46, which are formed on the upper surface of the ledge 44, are open at their ends remote from the ledge 44 and have forwardly facing walls 48 provided with vertical slots 54, through which the portions 34 of the terminals 30 extend, and rearwardly facing rear walls 50 provided with vertical wire admitting slots 56. The slots 54 and 56 open in a direction away from the ledge 44. Adjacent stalls 46 are separated from each other by barriers 52, the end stalls 46 each being bounded by a barrier 52 and an end wall 53, as shown in Figure 1. As shown in Figure 1, the wire-receiving portions 58 of the terminals 30 are wider than their intermediate portions 34 and contact spring portions 32.

Each portion 58 comprises a pair of parallel plates 60 and 62 which are upstanding from the ledge 44, and are connected at their ends remote from the ledge 44 by spaced straps 64. Each plate 60 and 62 has a wire-receiving slot 66 extending from its end remote from the ledge 44, towards the

ledge 44. Each slot 66 is dimensioned to receive an insulated wire 8 forced into the slot 66 transversely of the longitudinal axis of the wire 8, so that the edges of the slot 66 pierce the insulation of the wire to make electrical contact with the metal core 9 of the wire 8.

As shown in Figure 3, each wire 8 is inserted into the slots 66 of respective terminal 30, to be received in the associated wire admitting slot 56, by means of tooling comprising an anvil 70 and an insertion punch 76. The anvil 70 has a rectangular recess 71 for receiving the housing 10 and the base of which constitutes a connector supporting surface 74. Outside the recess 71 is a further supporting surface 72 parallel to and vertically spaced from the surface 74. The connector 2 is supported on the surfaces 72 and 74 of the anvil 70, with the wall 26 supported on the surface 74 and the ledge 44 supported on the surface 72 so that when the wires 8 are forced into the slots 66 by the punch 76 the insertion forces are transmitted to the anvil 70 by way of the ledge 44 and so do not act upon the hollow and therefore easily damaged part of the housing 10.

Although the wires 8 may be inserted individually into the slots 66 of the terminals 30, at successive insertion strokes of the punch 76 it is preferable for the punch 76 to be constructed for inserting wires 8 into the slots 66 of all the terminals 30 at a single insertion stroke of the punch 76. Wired connectors 2 can be produced, for example, by feeding a succession of connectors 2 to an automatic machine according to US-A-4,043,017 for example (specifically adapted, of course, to the connector 2), having means for locating wires 8 simultaneously in alignment with the respective wire receiving portions 58 in the connector 2, and an insertion punch for inserting all the wires 8 into their respective wire-receiving portions 58. With such simultaneous insertion of the wires 8, the insertion force is, of course, a multiple of the force required to insert a single wire 8 into the slots 66 of a single terminal 30.

As shown in Figures 4 and 5, the terminals 30 are produced in continuous strip form from a sheet metal blank 78 by stamping out groups 80 of terminal blanks, the number of individual terminal blanks in each group 80 being equal to the number of terminals required for a single housing 10. In Figures 4 and 5, the parts of the terminal blanks are identified with the same reference numerals, but differentiated by prime symbols, as are used herein with reference to the terminals 30.

In order to permit the formation of the wire receiving portions 58 of the terminals 30, slots 82 are formed beside each group of terminal blanks, these slots extending inwardly from an edge 84 of the blank 78 and alongside the portions 58' of the terminal blanks which are to be formed into the wire-receiving portions 58. The portions 58 are provided by forming the terminal blanks of the group 80 to U-shape as shown in Figure 5. The individual groups of terminals, as so far formed, can then be assembled to the housing, as shown in

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Figures 1 and 6. The portions 32' are depressed so as to extend at right angles to the intermediate portions so that the entire group of partially formed terminals can be pushed down by a tool 59 (Figure 6) until the portions 32' extend through the openings 40 in the housing 10 and the wire-receiving portions 58 are received in the stalls 46. A plug 86 when first inserted into the plug-receiving opening 16, serves to bend the contact spring portions 32' inwardly of the opening 16 (see Figure 2) so that when the plug 86 is removed therefrom, these portions resile to the positions in which they are shown in Figure 3.

Central shoulders 69 may be provided in the stalls 46 against which shoulders the straps 64 bear against when the terminals are assembled to the housing 10. The shoulders 69 serve to support the straps 64 and thereby to support the entire wire-receiving portions 58 of the terminals when the wires 8 are inserted into the slots 66 thereof. However, the insertion force is, in this case also, applied to the anvil 70 by way of the ledge 44.

The plug 86 has on its underside, a latch arm 92 having spaced shoulders 94 (only one of which is shown in Figure 2), for engaging shoulders 99 in the opening 16, when the plug 86 has been fully inserted thereinto as shown in Figure 2, a similar plug is described in detail in US-A-3,860,316, for example.

The connector 2 is intended to be mounted in a slot in a panel 96, as shown in Figure 2, and has, to this end, resilient V-shaped retaining springs 98 (Figure 1) formed integrally with bosses 100 which are in turn formed integrally with the end walls 28, adjacent to the respective walls 24 and 26 of the housing 10. When the connector 2 is slid laterally into the slot through an open end (not shown) thereof, the springs 18 resiliently engage the panel 96 to retain the connector 2 in position.

The engagement of the wires 8 in the slots 56 serves to protect the connections between the wires 8 and the plates 60 and 62, against tensile forces exerted on the wires 8.

Claims

1. An electrical plug receptacle connector comprising an insulating housing (10) having a plug-receiving end (12) and an opposite rearward end (14), a plug-receiving opening (16) extending into the plug-receiving end (12), the opening (16) having first opposed internal side walls (18 and 20) and second opposed internal side walls (22), and a plurality of stamped and formed electrical terminals (30) mounted on the housing (10), each such terminal (30) comprising a wire connecting portion (58), an intermediate portion (34) and a contact spring portion (32), the contact spring portion (32) extending from one (18) of the first internal side walls (18 and 20) at a position adjacent to the plug-receiving end (12), diagonally into the opening (16) and towards the opposite, internal side wall (20), the intermediate portions (34) of the terminals (30) being received

in juxtaposed channels (36) in that external side wall (24) which is adjacent to the one internal side wall (18), the channels (36) extending across such adjacent external side wall (24) towards the rearward end (14) of the housing (10), the receptacle connector (2) being characterised by a ledge (44) extending from, and overhanging, the rearward end (14) of the housing (10) and by a plurality, equal to the number of the terminals (30), of stalls (46) provided on the ledge (44) and having open tops facing away therefrom, the stalls (44) having front and rear stall side walls (48 and 50) which face forwardly and rearwardly of the housing, respectively, each rear stall side wall (50) having a wire admitting slot (56) therein, opening in a direction away from the ledge (44), the intermediate portions (34) of the terminals (30) extending into the stalls (46), each of the wire connecting portions (54) of the terminals (30) being disposed in one of the stalls (46) and comprising a plate (60) upstanding from the ledge (44), and being formed with a wire-receiving slot (66) opening into an edge of the plate (60) remote from the ledge (44), the ledge (44) being capable of being supported upon a supporting surface (72) of an anvil (70) for co-operation with a wire insertion tool (76), for inserting wires (8) into the wire-receiving slots (66) and the associated wire admitting slots (56), transversely of the longitudinal axis of the wire (8).

2. A connector according to Claim 1, characterised in that the ledge (44) extends normally of the rearward end (14) of the housing (10) in substantial alignment with the one internal side wall (18) and the adjacent external side wall (24).

3. A connector according to Claim 1 or 2, characterised in that it is shaped for reception in a rectangular recess (71) in the anvil (70) with the external side wall (26) resting upon a floor (74) of the recess, and the ledge (44) resting on the supporting surface (72) which is disposed outside the recess (71) and extends parallel to the floor (74).

4. A connector according to Claim 1, 2 or 3, characterised in that each front side wall (48) of each stall is provided with a slot (54) opening in a direction away from the ledge (44), through which slot (54) the intermediate portion (34) of the associated terminal (30) extends.

Patentansprüche

1. Elektrischer Steck- und Buchsenverbinder, der ein isolierendes Gehäuse (10) mit einem einen Stecker aufnehmenden Ende (12) und einem gegenüberliegenden rückwärtigen Ende (14) aufweist, wobei eine den Stecker aufnehmende Öffnung (16) sich in das Steckeraufnahmeende (12) erstreckt, die erste einander gegenüberliegende innere Seitenwände (18 und 20) und zweite einander gegenüberliegende innere Seitenwände (22) hat, wobei eine Vielzahl von ausgestanzten und geformten elektrischen Anschlüssen (30) an

Figures 1 and 6. The portions 32' are depressed so as to extend at right angles to the intermediate portions so that the entire group of partially formed terminals can be pushed down by a tool 59 (Figure 6) until the portions 32' extend through the openings 40 in the housing 10 and the wire-receiving portions 58 are received in the stalls 46. A plug 86 when first inserted into the plug-receiving opening 16, serves to bend the contact spring portions 32' inwardly of the opening 16 (see Figure 2) so that when the plug 86 is removed therefrom, these portions resile to the positions in which they are shown in Figure 3.

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2. A connector according to Claim 1, characterised in that the ledge (44) extends normally of the rearward end (14) of the housing (10) in substantial alignment with the one internal side wall (18) and the adjacent external side wall (24).

3. A connector according to Claim 1 or 2, characterised in that it is shaped for reception in a rectangular recess (71) in the anvil (70) with the external side wall (26) resting upon a floor (74) of the recess, and the ledge (44) resting on the supporting surface (72) which is disposed outside the recess (71) and extends parallel to the floor (74).

4. A connector according to Claim 1, 2 or 3, characterised in that each front side wall (48) of each stall is provided with a slot (54) opening in a direction away from the ledge (44), through which slot (54) the intermediate portion (34) of the associated terminal (30) extends.

Patentansprüche

1. Elektrischer Steck- und Buchsenverbinder, der ein isolierendes Gehäuse (10) mit einem einen Stecker aufnehmenden Ende (12) und einem gegenüberliegenden rückwärtigen Ende (14) aufweist, wobei eine den Stecker aufnehmende Öffnung (16) sich in das Steckeraufnahmeende (12) erstreckt, die erste einander gegenüberliegende innere Seitenwände (18 und 20) und zweite einander gegenüberliegende innere Seitenwände (22) hat, wobei eine Vielzahl von ausgestanzten und geformten elektrischen Anschlüssen (30) an





dem Gehäuse (10) montiert ist, von denen jeder Anschluss (30) einen Drahtverbindungsteil (58), einen Zwischenteil (34) und einen Kontaktfeder- (32) aufweist, wobei sich der Kontaktfeder- (32) von einer (18) der ersten inneren Seitenwände (18 und 20) in einer Stellung benachbart dem Steckeraufnahmeende (12), diagonal in die Öffnung (16) und gegen die gegenüberliegende innere Seitenwand (20) erstreckt, wobei die Zwischenteile (34) der Anschlüsse (30) in nebeneinanderliegenden Kanälen (36) in derjenigen äusseren Seitenwand (24) aufgenommen sind, die der einen inneren Seitenwand (18) benachbart ist, und wobei sich die Kanäle (36) über diese benachbarte äussere Seitenwand (24) gegen das rückwärtige Ende (14) des Gehäuses (10) erstrecken, wobei der Buchsenverbinder (2) gekennzeichnet ist durch eine Leiste (44), die sich von dem rückwärtigen Ende (14) des Gehäuses (10) her erstreckt und dieses überragt, und durch eine Vielzahl von auf der Leiste (44) vorgesehenen Abteilen (46), deren Zahl der Anzahl der Anschlüsse (30) gleich ist und die offene Oberseiten haben, die von der Leiste wegweisen, wobei die Abteile (46) vordere und rückwärtige Abteilseitenwände (50) einen Drahteinlassschlitz (56) hat, der sich in einer Richtung weg von der Leiste (44) öffnet, wobei sich die Zwischenteile (34) der Anschlüsse (30) in die Abteile (46) hinein erstrecken und jeder der Drahtverbindungsteile (58) der Anschlüsse (30) in einem der Abteile (46) untergebracht ist und eine gegenüber der Leiste (44) vorstehende Platte (60) aufweist und mit einem Drahtaufnahmeschlitz (66) ausgebildet ist, der sich in eine Kante der Platte (60) hinein öffnet, die von der Leiste (44) abgekehrt ist, wobei die Leiste (44) in der Lage ist, auf einer Stützfläche (72) eines Gegenhalters (70) zum Zusammenwirken mit einem Drahteinsetzwerkzeug (76) abgestützt zu werden, um Drähte (8) in die Drahtaufnahmeschlitz (66) und die zugehörigen Drahteinlassschlitz (56) quer zu der Längsachse des Drahtes (8) einzusetzen.

2. Verbinder nach Anspruch 1, dadurch gekennzeichnet, dass die Leiste (44) sich senkrecht zu dem rückwärtigen Ende (14) des Gehäuses (10) im wesentlichen ausgerichtet mit der einen inneren Seitenwand (18) und der benachbarten äusseren Seitenwand (24) erstreckt.

3. Verbinder nach Anspruch 1 oder 2, dadurch gekennzeichnet, dass er zur Aufnahme in einer rechteckigen Ausnehmung (71) in dem Gegenhalter (70) gestaltet ist, wobei die äussere Seitenwand (26) auf einer unteren Oberfläche (74) der Ausnehmung ruht und wobei die Leiste (44) auf der Stützfläche (72) ruht, die ausserhalb der Ausnehmung (71) angeordnet ist und sich parallel zu der unteren Oberfläche (74) erstreckt.

4. Verbinder nach Anspruch 1, 2 oder 3, dadurch gekennzeichnet, dass jede vordere Seitenwand (48) jedes Abteils mit einem Schlitz (54) versehen ist, der sich in einer Richtung weg von der Leiste (44) öffnet, durch welchen Schlitz (54) sich der Zwischenteil (34) des zugehörigen Anschlusses (30) erstreckt.

Revendications

1. Connecteur électrique à fiche et douille comprenant un boîtier isolant (10) ayant une extrémité (12) de réception de fiche et une extrémité arrière opposée (14), une ouverture (16) de réception de fiche pénétrant dans l'extrémité (12) de réception de fiche, l'ouverture (16) ayant des premières parois latérales internes opposées (18 et 20) et des secondes parois latérales internes opposées (22), et plusieurs bornes électriques (30) embouties et formées, montées sur le boîtier (10), chacune de ces bornes (30) comprenant une partie (58) de connexion de fil, une partie intermédiaire (34) et une partie à ressort de contact (32), la partie à ressort de contact (32) s'étendant de l'une (18) des premières parois latérales internes (18 et 20), dans une position adjacente à l'extrémité (12) de réception de fiche, diagonalement vers l'intérieur de l'ouverture (16) et en direction de la paroi latérale interne opposée (20), les parties intermédiaires (34) des bornes (30) étant reçues dans des rainures juxtaposées (36) dans la paroi latérale externe (24) qui est adjacente à la paroi latérale interne (18), les rainures (36) s'étendant en travers de cette paroi latérale externe adjacente (24) vers l'extrémité arrière (14) du boîtier (10), le connecteur à douille (2) étant caractérisé par un rebord (44) dépassant en surplomb de l'extrémité arrière (14) du boîtier (10) et par plusieurs logements (46), en nombre égal à celui des bornes (30), prévus sur le rebord (44) et ayant des dessus ouverts dans une direction s'éloignant du rebord, les logements (46) ayant des parois latérales avant et arrière (48 et 50) qui sont tournées vers l'avant et vers l'arrière du boîtier, respectivement, chaque paroi latérale arrière (50) de logement présentant une fente (56) d'admission de fil, s'ouvrant dans une direction s'éloignant du rebord (44), les parties intermédiaires (34) des bornes (30) pénétrant dans les logements (46), chacune des parties (54) de connexion de fil des bornes (30) étant disposée dans l'un des logements (46) et comprenant une plaque (60) s'élevant du rebord (44), et étant formée avec une fente (66) de réception de fil débouchant dans un bord de la plaque (60) éloigné du rebord (44), le rebord (44) pouvant être supporté par une surface (72) de support d'une enclume (70) destinée à coopérer avec un outil (76) d'insertion de fils, pour insérer des fils (8) dans les fentes (66) de réception de fils et dans les fentes associées (66) d'admission de fils, transversalement à l'axe longitudinal du fil (8).

2. Connecteur selon la revendication 1, caractérisé en ce que le rebord (44) dépasse normalement de l'extrémité arrière (14) du boîtier (10), sensiblement en alignement avec la paroi latérale interne (18) et la paroi latérale externe adjacente (24).

3. Connecteur selon la revendication 1 ou 2, caractérisé en ce qu'il est configuré pour être reçu dans un évidement rectangulaire (71) de l'en-



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clume (70), la paroi latérale externe (26) reposant sur un fond (74) de l'évidement, et le rebord (44) reposant sur la surface (72) de support qui est disposée extérieurement à l'évidement (71) et qui s'étend parallèlement au fond (74).

4. Connecteur selon la revendication 1, 2 ou 3,

caractérisé en ce que chaque paroi latérale avant (48) de chaque logement présente une fente (54) s'ouvrant dans une direction s'éloignant du rebord (44), fente (54) à travers laquelle la partie intermédiaire (34) de la borne associée (30) passe.

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