

Description

This invention relates to an electrical connector assembly of the type comprising a plug and receptacle, the receptacle having a plug-receiving opening extending inwardly from its mating face. The invention is particularly directed to the achievement of a plug which can be produced in relatively small sizes and which has a latching system for latching the plug to the receptacle.

GB-2018048 discloses an electrical plug comprising an insulating housing having a leading end and a conductor-receiving end which faces oppositely with respect to the leading end, oppositely facing first and second sidewalls and oppositely facing endwalls extending from the leading end to the conductor-receiving end. A conductor-receiving opening extends inwardly from the conductor-receiving end towards the leading end and contact-receiving cavities having terminals therein are provided in the housing at the leading end for contacting conductors extending into the conductor-receiving opening. Each of the endwalls has a latch arm associated therewith, each latch arm having a fixed end and a free end, the fixed end being integral with the endwall adjacent to the leading end of the housing and the free end being proximate to the conductor-receiving end of the housing. Each latch arm extends divergently from its associated endwall from the fixed end to the free end. Each latch arm has a single rearwardly facing latching shoulder thereon intermediate its ends and has a handle portion extending from the latching shoulder to its free end.

A disadvantage of the known plug is that, as the free ends of the latch arms are spaced from the endwalls, there is a significant risk of their catching equipment and being pulled away from the body during handling with consequent damage.

The electrical plug according to the invention is characterised in that each latch arm has an ear on its free end extending laterally towards the associated endwall, each ear being offset relative to its associated latch arm and lying in a plane which is parallel to and spaced from one of the sidewalls, each ear substantially closing the gap between the free end of the latch arm and the associated endwall of the housing whereby the latch arm can be flexed towards the housing endwalls and the ears will move past the endwalls and partially across the one sidewall.

In accordance with further embodiments, the latching shoulders are in a plane between the housing sidewalls and each latch arm has a single handle portion which is proximate the housing sidewall. Each latch arm has a forward portion which extends from the shoulder to the fixed end, the forward portion having a thickness, as measured normally of the planes of the housing sidewalls, which is less than the thickness of the housing, as measured between the housing sidewalls, and is at least one-half the thickness of the housing, the handle portion of each latch arm having a thickness which is less

than the thickness of the forward portion by an amount equal to the thickness of the shoulder.

The invention will now be described, by way of example, with reference to the accompanying partly diagrammatic drawings, in which:—

FIGURE 1 is a perspective view of a connector assembly including a plug in accordance with the invention, the plug being exploded from and offset from the receptacle.

FIGURE 2 is a plan view showing the plug in alignment with the receptacle, the receptacle being shown in cross section.

FIGURE 3 is a view similar to Figure 2 showing the positions of the parts when the plug is inserted into the receptacle.

FIGURE 4 is a side view of the plug.

FIGURE 5 is a sectional side view showing the plug in alignment with the receptacle.

Figure 1 shows a plug 2 and a receptacle 4, the receptacle being mounted on the upper surface of a circuit board 8 and the plug having a cable 6 extending into its conductor-receiving end. In this embodiment, the connector assembly serves to connect conductors in the cable 6 to conductors on the underside of the circuit board 8. The circuit board is mounted adjacent to a panel 10 in which the mating face of the receptacle is located.

The plug 2 comprises a plug housing 12 having a leading end 14, a conductor-receiving end 16 which faces oppositely with respect to the leading end, a first or upper plug housing sidewall 18, a second or lower plug housing sidewall 20, and oppositely facing plug housing endwalls 22. A plurality of side-by-side cavities 24 extend inwardly from the second housing sidewall 20 adjacent to the leading end and have terminals 25 therein which contact terminals in the receptacle.

Latch arms 26 extend from the endwalls 22 of the plug housing, each latch arm having a fixed end 28 and a free end 29 which is adjacent to and which may extend beyond the conductor receiving end 16 of the housing. Each latch arm has a forward portion 30 that extends from the fixed end 28 to an intermediate rearwardly facing plug shoulder 32, Figure 2. The forward portion is relatively thick as measured in a vertical direction in the drawing or as measured normally of the planes of the sidewalls 18, 20. This forward portion has a thickness less than the thickness of the plug housing 12 and does not extend to the plane of the second or lower sidewall 20. The plug shoulder 32 is in a medial plane substantially midway between the first and second housing sidewalls 18, 20. The outside surface of each latch arm has a portion 33 adjacent to the shoulder which extends parallel to the plug axis. This surface portion provides clearance for the endwall as shown in Figure 3.

Each latch arm 26 has a handle portion 34 that extends from the shoulder 32 to the free end 29, these handle portions being of reduced thickness as compared with the forward portion and being proximate to the first sidewall 18. The upper

surfaces 36 of the handle portions may be substantially coplanar with the surface of the first sidewall 18 and the handle portions have ears 38 on their ends which extend towards each other and towards the housing endwalls 22. The ears are offset from the handle portions 34 and lie in a plane which extends parallel to, but which is spaced from, the plane of the first sidewall 18 so that the latch arms can be flexed towards the housing endwalls and the ears will move partially across the surface of the first sidewall 18. When the parts are in their normal positions, Figures 1 and 2, the ears substantially close the gap between the free ends of the latch arms and the endwalls 22 of the housing. The ears may have ribs 40 on the outwardly facing surfaces to facilitate grasping of the ears when they are flexed inwardly during mating or unmating.

The first sidewall may have keyways 42 therein extending rearwardly from the leading end of the housing which are dimensioned to receive complementary keys 43 in the plug receiving opening of the receptacle as shown in Figure 5.

The receptacle 4 comprises a receptacle housing 44 having a mating face 46 into which a plug receiving opening 48 extends. This opening has a first or upper opening sidewall 50, a second or lower opening sidewall 52, and opposed opening endwalls 54. The first and second opening sidewalls are opposed to the first and second plug sidewalls respectively when the parts are mated and the plug endwalls are adjacent to the opening endwalls 54.

Receptacle shoulders 56 are provided in the opening endwalls 54 which are recessed from, but adjacent to, the mating face 46 and are between the first and second opening sidewalls 50, 52. The plug receiving opening is of an intermediate width at the mating face in the vicinity of the shoulders as shown at 58 and the opening has a portion of reduced width 60 adjacent to the mating face which is below the portion 58 as viewed in Figure 5. The plug receiving opening is of increased width as shown at 62 in a zone adjacent to the mating face 46 and between the shoulders 56 and the first opening sidewall 50. As shown in Figure 2, the sidewalls slope inwardly from the mating face in this increased width portion 62 for the accommodation of the divergent latch arms on the plug. The lower portion 64 of the plug receiving opening is of a still further reduced width. This part of the opening does not receive the plug when the parts are mated.

The receptacle contact terminals have cantilever spring arms 66 which extend from the second opening sidewall 52. Each of these contact terminals comprises a single strip of sheet metal which is reversely bent at 68 and which extends rearwardly as shown at 70 in a recess in the underside of the receptacle housing. The end portion 72 of each contact member extends through an opening in the circuit board 8 and is soldered to a conductor on the underside of the circuit board.

When the plug is to be mated with the receptacle, it is merely necessary to align the leading end of the plug with the opening 48 and push the plug into the opening. The proper orientation for mating of the parts is immediately apparent from the stepped appearance of the plug receiving opening as shown in Figure 1 and the technician will instinctively orient the plug with the latch arms uppermost as viewed in Figure 1. When the plug is inserted, an audible click is experienced which indicates that the parts are properly mated.

As shown by Figure 3, the distance between the two plug shoulders 32 when the latch arms are in their normal positions is less than the distance between the receptacle shoulders 56 so that when the parts are mated, the latch arms will be held in an inwardly flexed condition and the ends of the ears 38 will overlap the housing endwalls 22. Since the latch arms are in a flexed condition in Figure 3, they have a tendency to return to their normal positions and the parts will remain engaged with each other.

The provision of the ears 38 on the latch arms is advantageous in that these ears prevent any foreign object from moving between the latch arms and the endwalls of the plug housing 12. As will be explained below, the latch arms are quite small and could be damaged if the cable 6 should be pulled and one of the ears were to encounter a stationary object such as a handle of an equipment rack. The ears 38 would cause the end portion of the cable including the plug to be deflected from the stationary object such as a part of an equipment rack and damage is thereby avoided.

The medial location of the shoulders on the plug and in the receptacle is desirable in that if a light strain is imposed on the cable 6 when the parts are mated, the strain will be resisted by the shoulders and the restraining forces will be centrally directed against the latch arm rather than being off center relative to the latch arms.

Connector plugs as shown in Figure 1 can be provided in a variety of sizes having greater numbers of contact terminals therein than are shown in Figure 1. For example, connectors having as many as twenty-six terminals therein can be produced and would be significantly wider between endwalls than the plug shown in Figure 1. Notwithstanding the increased width of the plug, the provision of the two latch arms on the endwalls is sufficient to latch the plug to a complementary housing.

Latch arms as shown in Figure 1 are durable and are resistant to damage even when the plug and the latch arms are produced in relatively small sizes. One specific connector plug in accordance with the invention has a thickness as measured between the sidewalls 18, 20 of 7.6 mm. The thickness of the handle portion of each latch arm is 2.5 mm and the ears have a thickness of about 0.9 mm. It can be seen that latch arms having these dimensions might easily be damaged but damage is avoided under most circumstances in the event of abusive or careless

handling by the provision of the ears and the arrangement of the latch arms on the housing endwalls.

Claims

1. An electrical plug (2) of the type comprising an insulating housing (12) having a leading end (14) and a conductor-receiving end (16) which faces oppositely with respect to the leading end, oppositely facing first (18) and second (20) sidewalls and oppositely facing endwalls (22) extending from the leading end (14) to the conductor-receiving end (16), a conductor-receiving opening extending inwardly from the conductor-receiving end towards the leading end, and contact-receiving cavities (24) having terminals (25) therein are provided in the housing at the leading end for contacting conductors extending into the conductor-receiving opening,

each of the endwalls (22) having a latch arm (26) associated therewith, each latch arm having a fixed end (28) and a free end (29), the fixed end (28) being integral with the endwall (22) adjacent to the leading end (14) of the housing (12) and the free end (29) being proximate to the conductor-receiving end (16) of the housing, each latch arm (26) extending divergently from its associated endwall (22) from the fixed end to the free end,

each latch arm (26) having a single rearwardly facing latching shoulder (32) thereon intermediate its ends and having a handle portion (34) extending from the latching shoulder (32) to its free end (29), characterised in that,

each latch arm (26) has an ear (38) on its free end (29) extending laterally towards the associated endwall (22), each ear being offset relative to its associated latch arm (26) and lying in a plane which is parallel to an spaced from one of the sidewalls (18), each ear (38) substantially closing the gap between the free end (29) of the latch arm and the associated endwall (22) of the housing whereby,

the latch arm can be flexed towards the housing endwalls (22) and the ears will move past the endwalls and partially across the one sidewall (18).

2. An electrical plug (2) as set forth in claim 1 characterised in that the latching shoulders (32) are in a plane which is between the housing sidewalls (18, 20).

3. An electrical plug (2) as set forth in claim 2 characterised in that each latch arm has a single handle portion (34) which is proximate the one housing sidewall (18).

4. An electrical plug (2) as set forth in claim 3 characterised in that each latch arm (26) has a forward portion (30) which extends from the shoulder (32) to the fixed end (28), the forward portion (30) having a thickness, as measured normally of the planes of the housing sidewalls (18, 20), which is less than the thickness of the housing (12), as measured between the housing sidewalls, and is at least one-half the thickness of the housing, the handle portion (34) of each latch

arm (26) having a thickness which is less than the thickness of the forward portion by an amount equal to the thickness of the shoulder (32).

Patentansprüche

1. Elektrischer Strecker (2) des Typs, der ein isolierendes Gehäuse (12) besitzt, das ein vorderes Ende (14) und ein in bezug auf das vordere Ende in die entgegengesetzte Richtung weisendes Leitaraufnahmeende (16) aufweist, wobei sich eine erste (18) und eine zweite (20) Seitenwand, die in entgegengesetzte Richtungen weisen, sowie in entgegengesetzte Richtungen weisende Endwände (22) von dem vorderen Ende (14) weg zu dem Leitaraufnahmeende (16) erstrecken, wobei sich eine Leitaraufnahmeöffnung von dem Leitaraufnahmeende nach innen in Richtung auf das vordere Ende erstreckt, und wobei Kontaktaufnahmekavitäten (24), die Anschlüsse (25) enthalten, in dem Gehäuse an dem vorderen Ende vorgesehen sind, um sich in die Leitaraufnahmeöffnung hinein erstreckende Leiter zu kontaktieren, wobei jeder der Endwände (22) ein Verriegelungsarm (26) zugeordnet ist und jeder Verriegelungsarm ein befestigtes Ende (28) und ein freies Ende (29) aufweist, wobei das befestigte Ende (28) in der Nähe des vorderen Endes (14) des Gehäuses (12) einstückig mit der Endwand (22) ausgebildet ist und sich das freie Ende (29) nahe bei dem Leitaraufnahmeende (16) des Gehäuses befindet, wobei sich jeder Verriegelungsarm (26) von seiner zugehörigen Endwand (22) in von dem befestigten Ende zu dem freien Ende divergierender Weise wegerstreckt, und wobei jeder Verriegelungsarm (26) zwischen seinen Enden mit einer einzelnen nach hinten weisenden Verriegelungsschulter (32) versehen ist sowie einen sich von der Verriegelungsschulter (32) zu seinem freien Ende (29) erstreckenden Handhabungsbereich (34) aufweist, dadurch gekennzeichnet, daß jeder Verriegelungsarm (26) an seinem freien Ende (29) einen Vorsprung (38) aufweist, der sich seitlich in Richtung auf die zugehörige Endwand (22) erstreckt, wobei jeder Vorsprung relativ zu seinem zugehörigen Verriegelungsarm (26) versetzt ist und in einer Ebene liegt, die zu einer der Seitenwände (18) parallel und von dieser beabstandet ist, und wobei jeder Vorsprung (38) den Spalt zwischen dem freien Ende (29) des Verriegelungsarms und der zugehörigen Endwand (22) des Gehäuses im wesentlichen schließt, wodurch sich der Verriegelungsarm in Richtung auf die Gehäuseendwände (22) biegen läßt und sich die Vorsprünge an den Endwänden vorbei und teilweise über die eine Seitenwand (18) bewegen.

2. Elektrischer Stecker (2) nach Anspruch 1, dadurch gekennzeichnet, daß sich die Verriegelungsschultern (32) in einer Ebene befinden, die zwischen den Gehäuseseitenwänden (18, 20) liegt.

3. Elektrischer Stecker (2) nach Anspruch 2, dadurch gekennzeichnet, daß jeder Verriegelungsarm einen einzelnen Handhabungs-

handling by the provision of the ears and the arrangement of the latch arms on the housing endwalls.

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1. An electrical plug (2) of the type comprising an insulating housing (12) having a leading end (14) and a conductor-receiving end (16) which faces oppositely with respect to the leading end, oppositely facing first (18) and second (20) sidewalls and oppositely facing endwalls (22) extending from the leading end (14) to the conductor-receiving end (16), a conductor-receiving opening extending inwardly from the conductor-receiving end towards the leading end, and contact-receiving cavities (24) having terminals (25) therein are provided in the housing at the leading end for contacting conductors extending into the conductor-receiving opening,

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each latch arm (26) has an ear (38) on its free end (29) extending laterally towards the associated endwall (22), each ear being offset relative to its associated latch arm (26) and lying in a plane which is parallel to and spaced from one of the sidewalls (18), each ear (38) substantially closing the gap between the free end (29) of the latch arm and the associated endwall (22) of the housing whereby, the latch arm can be flexed towards the housing endwalls (22) and the ears will move past the endwalls and partially across the one sidewall (18).

2. An electrical plug (2) as set forth in claim 1 characterised in that the latching shoulders (32) are in a plane which is between the housing sidewalls (18, 20).

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4. An electrical plug (2) as set forth in claim 3 characterised in that each latch arm (26) has a forward portion (30) which extends from the shoulder (32) to the fixed end (28), the forward portion (30) having a thickness, as measured normally of the planes of the housing sidewalls (18, 20), which is less than the thickness of the housing (12), as measured between the housing sidewalls, and is at least one-half the thickness of the housing, the handle portion (34) of each latch

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3. Elektrischer Stecker (2) nach Anspruch 2, dadurch gekennzeichnet, daß jeder Verriegelungsarm einen einzelnen Handhabungs-



bereich (34) aufweist, der sich in der Nähe der einen Gehäuseseitenwand (18) befindet.

4. Elektrischer Stecker (2) nach Anspruch 3, dadurch gekennzeichnet, daß jeder Verriegelungsarm (26) einen vorderen Bereich (30) aufweist, der sich von der Schulter (32) zu dem befestigten Ende (28) erstreckt, wobei der vordere Bereich (30) in der senkrecht zu den Ebenen der Gehäuseseitenwände (18, 20) gemessenen Richtung eine Dicke aufweist, die geringer als die zwischen den Gehäuseseitenwänden gemessene Dicke des Gehäuses (12) ist und wenigstens die Hälfte der Dicke des Gehäuses beträgt, und wobei der Handhabungsbereich (34) jedes Verriegelungsarms (26) eine Dicke aufweist, die in einem Ausmaß, das der Dicke der Schulter (32) gleich ist, geringer ist als die Dicke der vorderen Bereichs.

Revendications

1. Fiche électrique (2) du type comprenant un boîtier isolant (12) ayant une extrémité avant (14) et une extrémité (16) de réception de conducteurs, qui est tournée dans une direction opposée par rapport à l'extrémité avant, des première (18) et seconde (20) parois latérales tournées dans des directions opposées et des parois extrêmes (22) tournées dans des directions opposées, s'étendant de l'extrémité avant (14) à l'extrémité (16) de réception de conducteur, une ouverture de réception de conducteurs partant vers l'intérieur de l'extrémité de réception de conducteurs vers l'extrémité avant, et des cavités (24) de réception de contacts renfermant des bornes (25) sont prévues dans le boîtier, à l'extrémité avant, afin d'établir des contacts avec des conducteurs pénétrant dans l'ouverture de réception de conducteurs,

un bras de verrouillage (26) étant associé à chacune des parois extrêmes (22), chaque bras de verrouillage ayant une extrémité fixe (28) et une extrémité libre (29), l'extrémité fixe (28) étant intégrée à la paroi extrême (22) à proximité immédiate de l'extrémité avant (14) du boîtier (12) et l'extrémité libre (29) étant proche de l'extrémité (16) de réception de conducteurs du boîtier, chaque bras de verrouillage (26) partant de façon

divergente de la paroi extrême associée (22), de l'extrémité fixe jusqu'à l'extrémité libre,

chaque bras de verrouillage (26) portant, entre ses extrémités, un épaulement unique (32) de verrouillage tourné vers l'arrière et comportant une partie (34) de poignée s'étendant de l'épaulement (32) de verrouillage vers son extrémité libre (29), caractérisée en ce que

chaque bras de verrouillage (26) porte sur son extrémité libre (29) une patte (38) s'étendant latéralement vers la paroi extrême associée (22), chaque patte étant décalée par rapport au bras de verrouillage associé (26) et s'étendant dans un plan qui est parallèle à et espacé de l'une des parois latérales (18), chaque patte (38) fermant sensiblement l'intervalle entre l'extrémité libre (29) du bras de verrouillage et la paroi extrême associée (22) du boîtier, de manière que, le bras de verrouillage puisse fléchir vers les parois extrêmes (22) de boîtier et les pattes se déplacent au-delà des parois extrêmes et partiellement au-dessus de ladite paroi latérale (18).

2. Fiche électrique (2) selon la revendication 1, caractérisée en ce que les épaulements (32) de verrouillage sont situés dans un plan qui est compris entre les parois latérales (18, 20) du boîtier.

3. Fiche électrique (2) selon la revendication 2, caractérisée en ce que chaque bras de verrouillage comporte une partie unique (34) de poignée qui est proche de la paroi latérale (18) du boîtier.

4. Fiche électrique (2) selon la revendication 3, caractérisée en ce que chaque bras de verrouillage (26) comporte une partie avant (30) qui s'étend de l'épaulement (32) vers l'extrémité fixe (28), la partie avant (30) ayant une épaisseur, telle que mesurée perpendiculairement aux plans des parois latérales (18, 20) du boîtier, qui est inférieure à l'épaisseur du boîtier (12), telle que mesurée entre les parois latérales du boîtier, et qui est au moins égale à la moitié de l'épaisseur du boîtier, la partie de poignée (34) de chaque bras de verrouillage (26) ayant une épaisseur qui est inférieure à l'épaisseur de la partie avant, d'une quantité égale à l'épaisseur de l'épaulement (32).

