

Description

This invention relates to an electrical connector to be mounted on a printed circuit board, and more particularly an electrical connector for a resilient flat cable.

Recently, there has been increased usage for a resilient flat cable which can be connected to electrical wiring for high density equipment usage so as to make small-sized and light-weight electrical equipment. Along with this increased use, since several electrical connectors need to be mounted in a printed circuit board in a high density fashion, it is required to provide a smaller-sized electrical connector. As an electrical connector for a resilient flat cable to be mounted to a printed circuit board, a known electrical connector comprises an insulating housing having a plurality of contact elements with contact arms contacting with the conductor parts within the opening so as to receive the conductor part of the flat cable and a plug member is hingedly connected to the housing and having a projection capable of being fitted into said opening.

In order to connect the flat cable by using this connector, the conductor part of the flat cable is inserted into the opening with the projection being fitted into the opening. Thus, the conductor part is pushed by the projection into contact with the contact arms so as to accomplish the electrical connection. However, in the case where flat cable is to be connected to a connector on a printed circuit board, other components mounted under high density conditions on the printed circuit board may hinder the flat cable, with the result that it sometimes is difficult to move the plug member relative to the housing and, further, it is hard to connect the flat cable or remove it from the connector.

It is known from EP—A—099 680 to provide an electrical connector comprising an insulating housing having an opening opened to face upward for use in accepting a part of a resilient flat cable composed of a plurality of parallel conductors; a plurality of contact elements each having one end provided with resilient contact arms arranged to extend into said opening of said housing and the other end provided with a contact leg passing from within said opening through a bottom part of said insulating housing to project downwardly, the contact elements being fixed in a row within said insulating housing; and a plug member having a projection which is insertable into said opening so as to cause the part of said flat cable receivable in said opening to be contacted with said resilient contact arms, said resilient contact arms yielding when said projection is inserted between said arms.

It is an object to provide an improved electrical connector of the known kind.

Accordingly the invention is characterized in that guide grooves extend along a pair of opposite sides of said plug member and are mated with guide projections located at a pair of opposite sides of said insulating housing so that said plug

member is slidable with respect to said insulating housing; wherein said guide grooves and said guide projections being slidably press fitted to each other at a cable receiving position with said plug member in an upper position, and said plug member is kept stationary with respect to said insulating housing so as to enable the part of said flat cable to be received in said opening of said housing; and means provided by said plug member to engage with means provided by said insulating housing to maintain said plug member and housing at a cable connecting position when said plug member is moved downwardly in which exposed conductors of the part of said flat cable in said opening are contacted with said resilient contact arms by said projection.

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

Figures 1 and 2 are perspective views showing the electrical connector of the present invention, respectively, wherein Figure 1 shows a condition in which a plug member is located at a cable receiving position, and Figure 2 shows a condition in which a plug member is located at the cable connecting position;

Figures 3 to 5 are perspective views showing a plug member, contact element and insulating housing having contact elements therein for forming an electrical connector of the present invention;

Figures 6 and 7 are a perspective view and a side elevational view when the electrical connector of the present invention is located at the cable receiving position;

Figure 8 is a cross-sectional view taken along line II—II of Figure 1; and

Figure 9 is a cross-sectional view taken along line III—III of Figure 2.

Referring now to the drawings, one preferred embodiment of the present invention will be described.

Figures 1 and 2 are perspective views for showing one example of an electrical connector of the present invention. Figure 1 shows a condition in which the plug member 10 is moved upwardly in respect to the insulating housing 30 and placed at a cable receiving position. Figure 2 shows a condition in which the plug member 10 is moved downwardly and placed at a cable connecting position.

This electrical connector is comprised of the insulating housing 30 having guide projections 31a and 31b at both ends thereof. A plurality of contact elements 50 are arranged in an opening 45 formed in insulating housing 30 while a plug member 10 has guide grooves 11a and 11b so as to be fitted to the guide projections 31a and 31b at both ends thereof. The plug member 10 is slidable upwardly and downwardly with respect to insulating housing 30 under the management of the guide projections 31a and 31b and the guide grooves 11a and 11b. Guide projections 31a, 31b can be on plug member 10 and guide grooves 11a, 11b can be on insulating housing 30 if desired.

Figure 3 is a perspective view showing plug member 10, which is preferably made of a suitable insulating plastic material. Guide grooves 11a and 11b are formed at both side walls 12a and 12b, and a downwardly extending projection 14 is formed at the lower surface of the upper wall 13 connecting the upper ends of both side walls 12a and 12b.

Figure 4 is a perspective view showing electrical contact 50 which is stamped from metal having resilient characteristics and it has a pair of resilient contact arms 52 extending upwardly from the ends of a base part 51 and they face slightly inwardly. A contact leg 53 extends downwardly and vertically from one side of base part 51, while the upper ends of resilient contact arms 52 are formed with inwardly projecting contact sections 52a.

Figure 5 is a perspective view showing a plurality of contact elements 50 secured within insulating housing 30. Insulating housing 30 is made of a suitable resilient plastic material and formed as a box-like shape having side walls 32a, 32b, a front wall 33, a rear wall 34 and a bottom wall 35, and further has an opening 45 enclosed by these walls and opened to face upward. A plurality of grooves 36 are located on the inner surfaces of walls 33, 34, 35 for receiving and holding contact elements 50. Contact elements 50 are arranged in grooves 36 in an alternating reverse pattern such that contact legs 53 pass through the bottom wall 35 and project downwardly in a zig-zag form. The outer surfaces of both side walls 32a and 32b are formed with guide projections 31a and 31b and mate with guide grooves 11a and 11b of plug member 10.

The assembled unit of plug member 10, insulating housing 30, and a plurality of contact elements 50 corresponds to the connector shown in Figures 1 and 2. The rear side of the connector shown in Figure 1 corresponds to one shown in Figure 6 and, as apparent from Figures 8 and 9, an engagement groove 16 is formed on the inner surface of a central rear wall section 15a of rear wall 15 of the plug member 10 intersected by two slits 15b, 15b, and an engaging projection 37 formed on the outer surface of rear wall 34 of insulating housing 30.

The connector is fixed to a printed circuit board so that the contact legs 53 that pass through lower wall 35 of insulating housing 30 and extend downwardly are fitted in holes in the printed circuit board. Under this condition, in order to connect flat cable 1, plug member 10 is first moved upwardly with respect to insulating housing 30 and cable 1 is then located at the cable receiving position shown in Figure 1. Figure 7 illustrates a left side elevational view of the connector, wherein the width of guide groove 11a formed in plug member 10 is made such that the width "B" and the lower end is slightly smaller than the width "A" of the other portion, and the width "C" of guide projection 31a to be fitted in guide groove 11a is smaller than width "A" and slightly larger than width "B". Due to this fact,

when plug member 10 is moved upwardly and located at the cable receiving position, guide projection 31a is press fitted in the portion of width "B" at the lower end of guide groove 11a and plug member 10 is kept stationary at that position. The amount of press fitting of plug member 10 is slight and can be moved by a slight external force, that is, the plug is slidably press fitted.

Figure 8 illustrates clearance 3 formed between the upper edge of insulating housing 30 and the lower edge of projection 14 of plug member 10 such that it is possible to insert end part 1a of flat cable 1 into opening 45 of insulating housing 30 through clearance 3. Flat cable 1 is of a flexible cable provided with a plurality of parallel conductors 2 (see Figure 2) therein. End part 1a of flat cable 1 to be inserted into opening 45 has conductors 2 exposed by the desired amount.

When the exposed conductor end part 1a of flat cable 1 is received in opening 45, plug member 10 is pressed downwardly. This pressing force causes press fitting between guide groove 11a and guide projection 31a to be released, while plug member 10 is moved downwardly along guide groove 11a and, as shown in Figure 2, is positioned at the cable connecting position. An engaged condition between the plug member 10 and the insulating housing 30 at this cable connecting position is shown in Figure 9.

When plug member 10 is moved downwardly from the cable receiving position to the cable connecting position, projection 14 of plug member 10 is fitted between pairs of resilient contact arms 52 of contact elements 50 within opening 45 of insulating housing 30. With this arrangement, projection 14 pushes exposed conductors 2 of flat cable 1 against contact parts 52a whereby flat cable 1 is electrically connected to contact elements 50. During the downward movement of projection 14, exposed conductors 2 are wipingly engaged with contact parts 52a so that a complete and optimum electrical connection can be attained.

At the cable connecting position, engaging projection 37 on the rear wall 34 of the insulating housing 30 is engaged with engaging groove 16 on central rear wall section 15a of plug member 10 and maintained at this position under a resilient force generated by rear wall section 15a.

As described above, according to the present invention, the plug member is slidable with respect to the insulating housing. The end part of the flat cable is inserted between the insulating housing and the plug member at the cable receiving position when the plug member is in an upper position. The plug member is then moved downwardly to the cable connecting position to enable an electrical connection between the exposed conductors of the flat cable and the contact elements within the insulating housing to be made. In order to insert or remove the flat cable, the plug member may merely be moved up and down and the flat cable can easily be connected or removed without being hindered by other

components on the printed circuit board on which the present connector is mounted.

Additionally many variations of the present invention may be practiced without departing from the scope of the present invention. For example, the contact legs of the contact elements may be modified so as to accommodate surface mounting. Additionally, different types of guide projections and guide grooves may be utilized and slightly different contact parts contained on the contact elements may be used. Further, the engagement grooves and engagement projections may be moved or different types of locking arrangements may be utilized.

Claims

1. An electrical connector comprising:

an insulating housing (30) having an opening (45) opened to face upward for use in accepting a part (1a) of a resilient flat cable (1) composed of a plurality of parallel conductors (2);

a plurality of contact elements (50) each having one end provided with resilient contact arms (52) arranged to extend into said opening of said housing and the other end provided with a contact leg (53) passing from within said opening through a bottom part (35) of said insulating housing to project downwardly, the contact elements (50) being fixed in a row within said insulating housing; and

a plug member (10) having a projection (14) which is insertable into said opening so as to cause the part (7a) of said flat cable (1) receivable in said opening to be contacted with said resilient contact arms (52), said resilient contact arms (52) yielding when said projection (14) is inserted between said arms (52), characterized in that:

guide grooves (11a, 11b) extend along a pair of opposite sides (12a, 12b) of said plug member (10) and are mated with guide projections (31a, 31b) located at a pair of opposite sides of said insulating housing (30) so that said plug member (10) is slidable with respect to said insulating housing (30);

wherein said guide grooves (11a, 11b) and said guide projections (31a, 31b) being slidably press fitted to each other at a cable receiving position with said plug member (10) in an upper position, and said plug member (10) is kept stationary with respect to said insulating housing (30) so as to enable the part (1a) of said flat cable (1) to be received in said opening (45) of said housing (30); and

means (16) provided by said plug member (10) to engage with means (37) provided by said insulating housing (30) to maintain said plug member (10) and housing (30) at a cable connecting position when said plug member (10) is moved downwardly in which exposed conductors of the part (1a) of said flat cable in said opening (45) are contacted with said resilient contact arms (52) by said projection (14).

2. A device according to claim 1, further characterized in that each said guide groove (11a, 11b)

have a reduced section so as to frictionally engage the complementary guide projection (31a, 31b) and thereby maintaining said plug member (10) in said first position.

3. A device according to claim 1, further characterized in that said plug member (10) has a rear wall (15) disposed adjacent to said projection (14), said rear wall (15) having an engagement groove (16) therein for locking engagement with an engagement projection (37) disposed on an adjacent wall of said housing (30), thereby maintaining said plug member (10) in said second position.

4. A device according to claim 1, further characterized in that said contacts (50) are substantially uniplanar having two substantially parallel contact arms (52) extending in the same direction from a base part (51) which joins the two.

Patentansprüche

1. Elektrischer Verbinder mit:

einen isolierenden Gehäuse (30) mit einer nach oben weisenden Öffnung (45) zur Verwendung bei der Aufnahme eines Teils (1a) eines elastischen Flachkabels (1), das aus einer Mehrzahl paralleler Leiter (2) gebildet ist;

einer Mehrzahl von Kontaktelementen (50), die je an ihrem einen Ende mit federnd nachgiebigen Kontaktarmen (52) versehen sind, die derart angeordnet sind, daß sie sich in die Öffnung des Gehäuses hinein erstrecken, und die je an ihrem anderen Ende mit einem Kontaktschenkel (53) versehen sind, der sich von innerhalb der Öffnung durch einen Bodenteil (35) des isolierenden Gehäuses derart hindurcherstreckt, daß er unten aus diesem herausragt, wobei die Kontaktelemente (50) innerhalb des isolierenden Gehäuses in einer Reihe befestigt sind; und

mit einem Steckerteil (10), das einen Fortsatz (14) aufweist, der in die Öffnung derart einführbar ist, daß der in der Öffnung aufnehmbare Teil (7a) des Flachkabels (1) dazu veranlaßt wird, mit den federnd nachgiebigen Kontaktarmen (52) in Kontakt zu treten, wobei die federnd nachgiebigen Kontaktarme (52) beim Einführen des Fortsatzes (14) zwischen die Arme (52) nachgeben,

dadurch gekennzeichnet, daß sich Führungsnuten (11a, 11b) entlang zweier einander entgegengesetzter Seiten (12a, 12b) des Steckerteils (10) erstrecken und mit an zwei einander entgegengesetzten Seiten des isolierenden Gehäuses (30) befindlichen Führungsvorsprüngen (31a, 31b) derart in Verbindung stehen, daß das Steckerteil (10) in bezug auf das isolierende Gehäuse (30) gleitend verschiebbar ist;

wobei die Führungsnuten (11a, 11b) und die Führungsvorsprünge (31a, 31b) in einer Kabelaufnahmeposition, in der sich das Steckerteil (10) in einer oberen Position befindet, im Preßsitz gleitend verschiebbar miteinander verbunden sind und das Steckerteil (10) in bezug auf das isolierende Gehäuse (30) stationär gehalten ist, so daß eine Aufnahme des Teils (1a) des Flachkabels (1) in der Öffnung (45) des Gehäuses (30) ermöglicht ist; und



components on the printed circuit board on which the present connector is mounted.

Additionally many variations of the present invention may be practiced without departing from the scope of the present invention. For example, the contact legs of the contact elements may be modified so as to accommodate surface mounting. Additionally, different types of guide projections and guide grooves may be utilized and slightly different contact parts contained on the contact elements may be used. Further, the engagement grooves and engagement projections may be moved or different types of locking arrangements may be utilized.

Claims

1. An electrical connector comprising:
an insulating housing (30) having an opening (45) opened to face upward for use in accepting a part (1a) of a resilient flat cable (1) composed of a plurality of parallel conductors (2);

a plurality of contact elements (50) each having one end provided with resilient contact arms (52) arranged to extend into said opening of said housing and the other end provided with a contact leg (53) passing from within said opening through a bottom part (35) of said insulating housing to project downwardly, the contact elements (50) being fixed in a row within said insulating housing; and

a plug member (10) having a projection (14) which is insertable into said opening so as to cause the part (7a) of said flat cable (1) receivable in said opening to be contacted with said resilient contact arms (52), said resilient contact arms (52) yielding when said projection (14) is inserted between said arms (52), characterized in that:

guide grooves (11a, 11b) extend along a pair of opposite sides (12a, 12b) of said plug member (10) and are mated with guide projections (31a, 31b) located at a pair of opposite sides of said insulating housing (30) so that said plug member (10) is slidable with respect to said insulating housing (30);

wherein said guide grooves (11a, 11b) and said guide projections (31a, 31b) being slidably press fitted to each other at a cable receiving position with said plug member (10) in an upper position, and said plug member (10) is kept stationary with respect to said insulating housing (30) so as to enable the part (1a) of said flat cable (1) to be received in said opening (45) of said housing (30); and

means (16) provided by said plug member (10) to engage with means (37) provided by said insulating housing (30) to maintain said plug member (10) and housing (30) at a cable connecting position when said plug member (10) is moved downwardly in which exposed conductors of the part (1a) of said flat cable in said opening (45) are contacted with said resilient contact arms (52) by said projection (14).

2. A device according to claim 1, further characterized in that each said guide groove (11a, 11b)

have a reduced section so as to frictionally engage the complementary guide projection (31a, 31b) and thereby maintaining said plug member (10) in said first position.

3. A device according to claim 1, further characterized in that said plug member (10) has a rear wall (15) disposed adjacent to said projection (14), said rear wall (15) having an engagement groove (16) therein for locking engagement with an engagement projection (37) disposed on an adjacent wall of said housing (30), thereby maintaining said plug member (10) in said second position.

4. A device according to claim 1, further characterized in that said contacts (50) are substantially uniplanar having two substantially parallel contact arms (52) extending in the same direction from a base part (51) which joins the two.

Patentansprüche

1. Elektrischer Verbinder mit:

einen isolierenden Gehäuse (30) mit einer nach oben weisenden Öffnung (45) zur Verwendung bei der Aufnahme eines Teils (1a) eines elastischen Flachkabels (1), das aus einer Mehrzahl paralleler Leiter (2) gebildet ist;

einer Mehrzahl von Kontaktelementen (50), die je an ihrem einen Ende mit federnd nachgiebigen Kontaktarmen (52) versehen sind, die derart angeordnet sind, daß sie sich in die Öffnung des Gehäuses hinein erstrecken, und die je an ihrem anderen Ende mit einem Kontaktschenkel (53) versehen sind, der sich von innerhalb der Öffnung durch einen Bodenteil (35) des isolierenden Gehäuses derart hindurcherstreckt, daß er unten aus diesem herausragt, wobei die Kontaktelemente (50) innerhalb des isolierenden Gehäuses in einer Reihe befestigt sind; und

mit einem Steckerteil (10), das einen Fortsatz (14) aufweist, der in die Öffnung derart einführbar ist, daß der in der Öffnung aufnehmbare Teil (7a) des Flachkabels (1) dazu veranlaßt wird, mit den federnd nachgiebigen Kontaktarmen (52) in Kontakt zu treten, wobei die federnd nachgiebigen Kontaktarme (52) beim Einführen des Fortsatzes (14) zwischen die Arme (52) nachgeben,

dadurch gekennzeichnet, daß sich Führungsnuten (11a, 11b) entlang zweier einander entgegengesetzter Seiten (12a, 12b) des Steckerteils (10) erstrecken und mit an zwei einander entgegengesetzten Seiten des isolierenden Gehäuses (30) befindlichen Führungsvorsprüngen (31a, 31b) derart in Verbindung stehen, daß das Steckerteil (10) in bezug auf das isolierende Gehäuse (30) gleitend verschiebbar ist;

wobei die Führungsnuten (11a, 11b) und die Führungsvorsprünge (31a, 31b) in einer Kabelaufnahmeposition, in der sich das Steckerteil (10) in einer oberen Position befindet, im Preßsitz gleitend verschiebbar miteinander verbunden sind und das Steckerteil (10) in bezug auf das isolierende Gehäuse (30) stationär gehalten ist, so daß eine Aufnahme des Teils (1a) des Flachkabels (1) in der Öffnung (45) des Gehäuses (30) ermöglicht ist; und



wobei eine von dem Steckerteil (10) vorgesehene Einrichtung (16) zum in Eingriff Treten mit einer von dem isolierenden Gehäuse (30) vorgesehenen Einrichtung (37) vorhanden ist, wodurch sich das Steckerteil (10) und das Gehäuse (30) bei nach unten bewegtem Steckerteil (10) in einer Kabelanschließposition halten lassen, in der freiliegende Leiter des Teils (1a) des Flachkabels in der Öffnung (45) durch den Fortsatz (14) mit den federnd nachgiebigen Kontaktarmen (52) kontaktiert werden.

2. Vorrichtung nach Anspruch 1, weiterhin dadurch gekennzeichnet, daß jeder der Führungsnuten (11a, 11b) einen reduzierten Abschnitt zum reibungsschlüssigen Eingriff mit dem komplementären Führungsvorsprung (31a, 31b) sowie zum dadurch erfolgenden Halten des Steckerteils (1) in der genannten ersten Position aufweist.

3. Vorrichtung nach Anspruch 1, weiterhin dadurch gekennzeichnet, daß das Steckerteil (10) eine in der Nähe des Fortsatzes (14) angeordnete Rückwand (15), aufweist, wobei die Rückwand (15) eine Eingriffsnut (16) zum Verriegelungseingriff mit einem an einer angrenzenden Wand des Gehäuses (30) angeordneten Eingriffsvorsprung (37) aufweist, wodurch sich das Steckerteil (10) in der genannten zweiten Position halten läßt.

4. Vorrichtung nach Anspruch 1, weiterhin dadurch gekennzeichnet, daß die Kontakte (50) im wesentlichen planar in einer Ebene ausgebildet sind und zwei im wesentlichen parallel Kontaktarme (52) aufweisen, die sich in derselben Richtung von einem die beiden Kontaktarme miteinander verbindenden Basisteil (51) wegerstrecken.

Revendications

1. Connecteur électrique comprenant:

un boîtier isolant (30) présentant une ouverture (45) débouchant de façon à être tournée vers le haut pour être utilisée de manière à recevoir une partie (1a) d'un câble élastique plat (1) composé de plusieurs conducteurs parallèles (2);

plusieurs éléments de contact (50) ayant chacun une première extrémité comportant des bras élastiques (52) de contact agencés de façon à pénétrer dans ladite ouverture dudit boîtier et dont l'autre extrémité comporte une branche (53) de contact passant de l'intérieur de ladite ouverture à travers une partie de fond (35) dudit boîtier isolant pour faire saillie vers le bas, les éléments de contact (50) étant fixés en une rangée à l'intérieur dudit boîtier isolant; et

un élément de fiche (10) ayant une saillie (14) qui peut être insérée dans ladite ouverture afin d'amener la partie (7a) dudit câble plat (1), pou-

vant être reçue dans ladite ouverture, à entrer en contact avec lesdits bras élastiques (52) de contact, lesdits bras élastiques (52) de contact fléchissant lorsque ladite saillie (14) est insérée entre lesdits bras (52), caractérisé en ce que:

des gorges de guidage (11a, 11b) s'étendent le long de deux côtés opposés (12a, 12b) d'un élément de fiche (10) et sont accouplées avec des saillies de guidage (3a, 31b) situées sur deux côtés opposés dudit boîtier isolant (30) afin que ledit élément de fiche (10) puisse glisser par rapport audit boîtier isolant (30);

lesdites gorges de guidage (11a, 11b) et lesdites saillies de guidage (31a, 31b) étant ajustées à force de façon à pouvoir glisser les unes par rapport aux autres dans une position de réception de câble, ledit élément de fiche (10) étant dans une position haute, et ledit élément de fiche (10) étant maintenu immobile par rapport audit boîtier isolant (30) afin de permettre à la partie (1a) dudit câble plat (1) d'être reçue dans ladite ouverture (45) dudit boîtier (30); et

des moyens (16) présentés par ledit élément de fiche (10) étant destinés à s'enclencher avec des moyens (37) présentés par ledit boîtier isolant (30) pour maintenir ledit élément de fiche (10) et ledit boîtier (30) dans une position de connexion de câble, lorsque ledit élément de fiche (10) est déplacé vers le bas, position dans laquelle ladite saillie (14) fait porter lesdits bras élastiques (52) de contact contre des conducteurs exposés de la partie (1a) dudit câble plat dans ladite ouverture (45).

2. Dispositif selon la revendication 1, caractérisé en outre en ce que chacune desdites gorges de guidage (11a, 11b) présente une section réduite de façon à s'enclencher par frottement avec la saillie de guidage complémentaire (31a, 31b) et à maintenir ainsi ledit élément de fiche (10) dans ladite première position.

3. Dispositif selon la revendication 1, caractérisé en outre en ce que ledit élément de fiche (10) comporte une partie arrière (15) disposée de façon à être adjacente à ladite saillie (14), ladite paroi arrière (15) présentant une gorge (16) d'enclenchement destinée à s'enclencher et se bloquer avec une saillie (37) d'enclenchement disposée sur une paroi adjacente dudit boîtier (30), afin de maintenir ledit élément de fiche (10) dans ladite seconde position.

4. Dispositif selon la revendication 1, caractérisé en outre en ce que lesdits contacts (50) sont sensiblement dans un seul plan, comportant deux bras sensiblement parallèles (52) de contact s'étendant dans la même direction à partir d'une partie de base (51) qui les joint.