

Description

The present invention relates to an electrical connecting terminal for a connector, comprising an elongated flat base portion, a female contact portion formed at one end portion of said base portion, and comprising a pair of opposing elastic contact segments, a pair of engaging segments formed at an intermediate portion of said base portion, for restricting outward deformation of said contact segments, and a terminal portion formed at the other end of said base portion.

In conventional electrical connecting terminals female contact segments can easily be deformed by "wobble" movement of the male pin, which occurs when a male pin is inserted or pulled out. The deformation is permanent, and results in poor contact with the male pin.

In U.S. Patent 3,363,224 this deformation by "wobble" movements of a male pin is prevented by using engaging segments restricting outward deformation of the contact segments. In the flat metal plate prior to bending to obtain a box contact, these engaging segments and the elastic contact segments form one part. Then the elastic contact segments and engaging segments are severed and the engaging segments are coined, such that their ends are beyond the ends of the elastic contact segments such that upon deformation of the elastic contact segments these will engage the engaging segments. This known female connector comprises a bottom portion, two side portions and a top or roof portion, forming an elongated box which gives the connector sufficient mechanical strength against deformation forces.

The present invention provides an electrical connecting terminal for a connector of general right-angled U-shaped cross section which prevents excessive deformation of contact segments when pins are inserted or pulled out.

According to the present invention, there is provided an electrical connecting terminal in which said contact portion comprises a pair of support segments extending upwards in a lateral direction from two side edges of said one end portion of said flat base portion, such that said one end portion and said support segment form a right-angled U-shaped opening for insertion of a male pin;

said pair of engaging segments extending upward in a lateral direction from two side edges of said intermediate base portion in substantially the same direction as that of said support segments, such that said intermediate base portion and said engaging segments form a right-angled U-shaped opening for receiving the end portion of said male pin;

in which each elastic contact segment extends

slightly inward from a corresponding side edge of each of said support segments to the other end of said base portion and bent slightly outward again from their intermediate portion;

further comprising at least one wrinkle portion, formed on a portion of and crossing said base portion between said support segments and said engaging segments for contacting said base portion in the longitudinal direction thereof, so as to position the distal ends of said contact segments between said pair of engaging segments, so that the distal ends of said contact segments will be in contact with said engaging segments when said contact segments are excessively deformed outward when a male pin is inserted, in which one surface of said wrinkle portion is projected and the other surface is recessed.

Design Engineering, Vol. 2, August 1984, pages 29, 32, also discloses a box-shaped connecting terminal comprising a female contact having two elongated elastic contact segments and engaging segments as in US Patent 3,363,224. The remaining two elongated side portions of this box connector show wrinkle portions. However, this publication does not mention the purpose of these wrinkle portions.

Stretching elastic contact segments to meet an engaging segment is known per se from "Research Disclosure", No. 160, August 19, 1977, page 51.

Brief Description of the Drawings

Fig. 1 is a perspective view of an electrical connecting terminal for a connector according to an embodiment of the present invention;

Fig. 2 is a front view of the terminal in Fig. 1; and

Fig. 3 is a plan view of a plate 10 used for forming the terminal of Fig. 1.

Detailed Description of the Preferred Embodiments

An embodiment of the present invention will be described with reference to Figs. 1 to 3.

Fig. 1 shows an electrical connecting terminal for a connector. The terminal shown in Fig. 1 has elongated flat base portion 20. Contact portion 23 is formed on one end of portion 20 in the longitudinal direction, and terminal portion 30 is formed on the other end thereof. Portion 23 has a pair of opposing elastic contact segments 21, and a pair of opposing support segments 22. Segments 22 extend from two side edges in the lateral direction of portion 20 to be substantially perpendicular to the surface of portion 20. Segments 21 extend slightly inward from the corresponding side edges of segments 22 toward portion 30. Furthermore,

segments 21 are bent slightly outward at their central portions so that their distal ends (free ends) are substantially parallel to each other.

A pair of engaging segments 24 are formed on the center of portion 20 to restrict outward deformation of segments 21. Segments 24 extend from two edges in the lateral direction of portion 20 in substantially the same direction as segments 21.

Portion 30 has two urging portions 25 and 26. Portions 25 and 26 have slots 25a and 26a, which have a substantially U-shaped cross-section and receive a single wire (not shown) from which a distal end coating is removed. Slot 25a is narrower than slot 26a. Portion 25 is located between portion 26 and segments 24, and the core wire of the wire is urged against portion 25 to electrically connect the core wire to the electrical connecting terminal. The wire is also urged on portion 26 to fix it on the terminal.

Wrinkle portion 27 is formed by pressing that part of portion 20 which corresponds to segments 21, so as to cross portion 20. The upper surface of portion 27 turns outward, and the lower surface thereof is recessed. Portion 27 is formed, contracting portion 20 in the longitudinal direction by a predetermined length, whereby the distal ends of segments 21 are located between segments 24. More specifically, portion 27 is formed, positioning segments 21 such that the distal ends of segments 21 can engage with segments 24 when they are excessively deformed outward.

Fig. 3 shows plate 10, which is used to form the electrical connecting terminal shown in Figs. 1 and 2. Plate 10 can be obtained by punching a metal plate (e.g., phosphor bronze) with good conductivity and elasticity. Plate 10 has portion 11 extending in the longitudinal direction thereof. Portion 11 is used as base portion 20 of the electrical connecting terminal (Figs. 1 and 2). A pair of rectangular elongated holes 12 are formed in one end portion of plate 10 and extend in the longitudinal direction of plate 10. Holes 12 are located on the sides of portion 11. Two sides of plate 10 opposite to the long sides of holes 12 are notched. Portions 17 of plate 10 are sheared along lines extending outward from the short sides of holes 12 near the center of plate 10, thereby forming a pair of portions 13 adjacent to portion 11 at one end and used as contact segments 21 and support segments 22 (Figs. 1 and 2). Two notches are cut in either long side portion of plate 10, on the right side of portion 17, thus forming a pair of portions 14, a pair of portions 15, and a pair of portions 16. The bottoms of each row of notches are aligned with the surfaces of holes 12 nearest the center of plate 10. Portions 14 are used as engaging seg-

ments 24. Portions 15 are used as a part of urging portion 25. Portions 16 are used as a part of urging portion 26.

A portion extending from one end portion to the central portion of plate 10 is bent substantially vertically along holes 12. As a result, contact segments 21 and support segments 22 shown in Figs. 1 and 2 are formed from portions 13. Engaging segments 24 shown in Figs. 1 and 2 are formed from portions 14. (Note that the bent shape of segments 21 has already been described).

The other end portion of plate 10 is bent into a U-shape, in the longitudinal direction. As a result, urging portion 25 is formed from portions 15 and the corresponding part of portion 11, and urging portion 26 is formed from portions 16 and the corresponding part of portion 11.

As described above, the electrical connecting terminal shown in Figs. 1 and 2 can be formed by bending plate 10 of Fig. 3, which has been obtained by punching a metal plate.

It is difficult to locate the distal ends of segments 21 between segments 24 using only the above bending process. This is because portions 13 and 14 are positioned adjacent to each other and sandwich portions 17 therebetween. In this state, when segments 21 are greatly deformed outward, it is impossible to engage their distal ends with segments 24.

In this embodiment, wrinkle portion 27 (Fig. 2) is formed in that part of portion 20 which corresponds to segments 21. Due to this wrinkle portion 27, distance D between segments 22 and 24 (Fig. 2) is shorter by a predetermined value than distance D' for which the parts of portion 13 corresponding to segments 22 and 24 are separated before the bending process. (Distance D' is equal to the length which hole 12 has before the bending process.) In this way, the distal ends of segments 21 can be located between segments 24 so that they are engaged with the latter when segments 21 greatly deformed outward.

A connector socket (not shown) is constituted by mounting a plurality of electrical connecting terminals (Figs. 1 and 2) in a connector housing. When a plug (not shown) having a plurality of male pins is fitted in the socket, each pin is inserted in contact portion 23 of the corresponding terminal. Thus, the pin is brought into elastic contact with a pair of contact segments 21 of portion 23, thereby electrically connecting the pin and the terminal.

When the plug is inserted in or pulled out from the socket, "wobble" occurs in the socket or plug. The distal ends of segments 21 are elastically deformed outward by "wobble" movement of the pin. When wobble is considerable, segments 21 are significantly deformed. In this case, the distal ends of segments 21 are engaged with segments 24.

thereby restricting the further outward deformation of segments 21. Hence, permanent deformation of segments 21 can be prevented. With the terminal of the present invention, even when a wire with a large diameter is forcibly inserted between segments 21 and deforms them during a wire urging or harness operation, deformation is kept to a minimum.

The embodiment of the present invention has been described. However, the present invention is not limited to the particular embodiment, and various other changes and modifications may be made within the scope of the invention as defined by the appended claims. For example, a plurality of wrinkle portions 27 can be formed, and can project upward or downward. Both upward and downward projections can be formed. Terminal portion 30 can comprise a male pin which is inserted in a through hole of a printed circuit board.

Claims

1. An electrical connecting terminal for a connector, comprising an elongated flat base portion (20), a female contact portion (23) formed at one end portion of said base portion (20), and comprising a pair of opposing elastic contact segments (21), a pair of engaging segments (24) formed at an intermediate portion of said base portion (20), for restricting outward deformation of said contact segments (21), and a terminal portion (30) formed at the other end of said base portion (20),

characterized in that:

said contact portion comprises a pair of support segments (22) extending upwards in a lateral direction from two side edges of said one end portion of said flat base portion (20), such that said one end portion and said support segment (22) form a right-angled U-shaped opening for insertion of a male pin;

said pair of engaging segments (24) extending upward in a lateral direction from two side edges of said intermediate base portion (20) in substantially the same direction as that of said support segments (22), such that said intermediate base portion and said engaging segments (24) form a right-angled U-shaped opening for receiving the end portion of said male pin;

in which each elastic contact segment (21) extends slightly inward from a corresponding side edge of each of said support segments (22) to the other end of said base portion (20) and bent slightly outward again from their intermediate portion;

further comprising at least one wrinkle portion (27), formed on a portion of and crossing

said base portion (20) between said support segments (22) and said engaging segments (24) for contacting said base portion (20) in the longitudinal direction thereof, so as to position the distal ends of said contact segments (21) between said pair of engaging segments (24), so that the distal ends of said contact segments (21) will be in contact with said engaging segments (24) when said contact segments are excessively deformed outward when a male pin is inserted, in which one surface of said wrinkle portion (27) is projected and the other surface is recessed.

2. A terminal according to claim 1, wherein said wrinkle portion (27) is formed by pressing.
3. A terminal according to claim 1, wherein said terminal portion (30) is an urging portion for connecting a wire by urging.

4. A method for making the terminal of claim 1 comprising the steps of:

forming a substantially flat metal plate which contains in the plane thereof all the sections of said terminal, including said pairs of support sections (22), elastic contact sections (21), engaging sections (24), and flat base portion (20), the distal end of each contact section (21) being formed at this stage integral with its corresponding engaging section (24);

severing the distal end of each contact section (21) from its corresponding engaging section (24);

bending said pairs of support sections (22) and engaging sections (24) upward until they extend substantially vertically from said flat base portion (20);

bending each contact section (21) first inwardly and then outwardly so that the distal ends of said contact sections (21) extend substantially parallel to one another and are separated by a distance which is less than the distance between the other ends of said contact sections (21) joined to said support sections (22), said distal ends at this stage not extending between said engaging section (24); and

forming a deformation across the flat base portion (20) and thereby shortening the length of said flat base portion (20) by a predetermined distance sufficient to move the distal ends of said elastic contact sections (21) forward to a position between said pair of opposing engaging sections (24).



thereby restricting the further outward deformation of segments 21. Hence, permanent deformation of segments 21 can be prevented. With the terminal of the present invention, even when a wire with a large diameter is forcibly inserted between segments 21 and deforms them during a wire urging or harness operation, deformation is kept to a minimum.

The embodiment of the present invention has been described. However, the present invention is not limited to the particular embodiment, and various other changes and modifications may be made within the scope of the invention as defined by the appended claims. For example, a plurality of wrinkle portions 27 can be formed, and can project upward or downward. Both upward and downward projections can be formed. Terminal portion 30 can comprise a male pin which is inserted in a through hole of a printed circuit board.

Claims

1. An electrical connecting terminal for a connector, comprising an elongated flat base portion (20), a female contact portion (23) formed at one end portion of said base portion (20), and comprising a pair of opposing elastic contact segments (21), a pair of engaging segments (24) formed at an intermediate portion of said base portion (20), for restricting outward deformation of said contact segments (21), and a terminal portion (30) formed at the other end of said base portion (20),

characterized in that:

said contact portion comprises a pair of support segments (22) extending upwards in a lateral direction from two side edges of said one end portion of said flat base portion (20), such that said one end portion and said support segment (22) form a right-angled U-shaped opening for insertion of a male pin;

said pair of engaging segments (24) extending upward in a lateral direction from two side edges of said intermediate base portion (20) in substantially the same direction as that of said support segments (22), such that said intermediate base portion and said engaging segments (24) form a right-angled U-shaped opening for receiving the end portion of said male pin;

in which each elastic contact segment (21) extends slightly inward from a corresponding side edge of each of said support segments (22) to the other end of said base portion (20) and bent slightly outward again from their intermediate portion;

further comprising at least one wrinkle portion (27), formed on a portion of and crossing

said base portion (20) between said support segments (22) and said engaging segments (24) for contacting said base portion (20) in the longitudinal direction thereof, so as to position the distal ends of said contact segments (21) between said pair of engaging segments (24), so that the distal ends of said contact segments (21) will be in contact with said engaging segments (24) when said contact segments are excessively deformed outward when a male pin is inserted, in which one surface of said wrinkle portion (27) is projected and the other surface is recessed.

2. A terminal according to claim 1, wherein said wrinkle portion (27) is formed by pressing.
3. A terminal according to claim 1, wherein said terminal portion (30) is an urging portion for connecting a wire by urging.

4. A method for making the terminal of claim 1 comprising the steps of:

forming a substantially flat metal plate which contains in the plane thereof all the sections of said terminal, including said pairs of support sections (22), elastic contact sections (21), engaging sections (24), and flat base portion (20), the distal end of each contact section (21) being formed at this stage integral with its corresponding engaging section (24);

severing the distal end of each contact section (21) from its corresponding engaging section (24);

bending said pairs of support sections (22) and engaging sections (24) upward until they extend substantially vertically from said flat base portion (20);

bending each contact section (21) first inwardly and then outwardly so that the distal ends of said contact sections (21) extend substantially parallel to one another and are separated by a distance which is less than the distance between the other ends of said contact sections (21) joined to said support sections (22), said distal ends at this stage not extending between said engaging section (24); and

forming a deformation across the flat base portion (20) and thereby shortening the length of said flat base portion (20) by a predetermined distance sufficient to move the distal ends of said elastic contact sections (21) forward to a position between said pair of opposing engaging sections (24).



Revendications

1. Une borne de connexion électrique pour connecteur, comportant une embase plate oblongue (20), une partie de contact femelle (23) ménagée au niveau de l'une des extrémités de ladite embase (20) et comportant une paire de contacts élastiques en regard (21), une paire de segments de mise en prise (24) ménagés au niveau d'une partie intermédiaire de l'embase (20), de façon à limiter la déformation vers l'extérieur desdits segments de contact (21) et une partie terminale (30) ménagée au niveau de l'autre extrémité de ladite embase (20), caractérisée en ce que:
 - ladite partie de contact comporte une paire de segments support (22) se prolongeant vers le haut dans une direction latérale à partir des deux arêtes latérales de ladite partie d'extrémité de ladite embase plate (20), de sorte que ladite partie d'extrémité et ledit segment support (22) délimitent une ouverture à angle droit en forme de U, destinée à l'insertion d'une broche mâle;
 - ladite paire de segments de mise en prise (24) s'étendant vers le haut dans une direction latérale à partir des deux arêtes latérales de ladite partie intermédiaire de l'embase (20) sensiblement dans la même direction que celle desdits segments support (22), de sorte que ladite partie intermédiaire de l'embase et lesdits segments de mise en prise (24) délimitent une ouverture à angle droit en forme de U destinée à recevoir la partie d'extrémité de ladite broche mâle;
 - dans laquelle chaque lame élastique de contact (21) s'étend légèrement vers l'intérieur à partir d'une arête latérale correspondante de chacun desdits segments support (22) vers l'autre extrémité de ladite embase (20) et s'infléchit légèrement à nouveau vers l'extérieur à partir de leur partie intermédiaire;
 comportant en outre au moins une partie plissée (27), ménagée sur une partie de ladite embase (20) et la traversant entre lesdits segments support (22) et lesdits segments de mise en prise (24) afin de venir en contact avec ladite embase (20) dans la direction longitudinale de celle-ci, de façon à positionner les extrémités distales desdits segments de contact (21) entre ladite paire de segments de mise en prise (24), de sorte que les extrémités distales desdits segments de contact (21) viendront en contact avec lesdits segments de mise en prise (24) lorsque lesdits segments de contact (21) sont déformés, de façon excessive, vers l'extérieur lorsqu'une broche mâle est insérée, dans laquelle une face de ladite partie plissée (27) est en saillie tandis que l'autre surface est en creux.
2. Une borne selon la revendication 1, dans laquelle ladite partie plissée (27) est réalisée par emboutissage.
3. Une borne selon la revendication 1, dans laquelle ladite partie terminale (30) est une partie de fixation par application de pression destinée à connecter un fil sous contrainte de pression.
4. Une méthode pour fabriquer la borne de la revendication 1, comprenant les étapes de:
 - former une plaque métallique sensiblement plate qui contient dans son plan toutes les sections de ladite borne, y compris lesdites paires de section de support (22), de section de contact élastique (21), de section de mise en prise (24) et l'embase plate (20), l'extrémité distale de chaque section de contact (21) étant réalisée, dans cette étape, solidaire de sa section de mise en prise correspondante (24);
 - sectionner l'extrémité distale de chaque section de contact (21) à partir de sa section de mise en prise correspondante (24);
 - plier lesdites paires de sections supports (22) et de sections de mise en prise (24) vers le haut jusqu'à ce qu'elles s'étendent de façon sensiblement verticale par rapport à ladite embase plate (20);
 - plier chaque section de contact (21) d'abord vers l'intérieur, ensuite vers l'extérieur, de sorte que les extrémités distales desdites sections de contact (21) s'étendent de façon sensiblement parallèle l'une à l'autre et soient séparées par une distance qui est inférieure à la distance entre les autres extrémités desdites sections de contact (21) réunies auxdites sections support (22), lesdites extrémités distales, dans cette étape, ne s'étendant pas entre lesdites sections de mise en prise (24); et
 - réaliser une déformation transversale de l'embase plate (20) en raccourcissant ainsi la longueur de ladite embase (20) d'une distance prédéterminée suffisante pour déplacer les extrémités distales desdites sections de contact élastique

(21) vers l'avant jusqu'à une position entre ladite paire de sections de mise en prise opposées (24).

Patentansprüche

1. Elektrisches Anschlußendstück für einen Verbinder, welches einen länglichen, flachen Basisabschnitt (20), einen aufnehmenden Kontaktabschnitt (23), welcher an einem Endabschnitt des Basisabschnittes (20) ausgebildet ist, und ein Paar von gegenüberliegenden, elastischen Kontaktsegmenten (21) aufweist, ein Paar von Eingriffssegmenten (24), die an einem Zwischenabschnitt des Basisabschnittes (22) zur Begrenzung der nach außen gerichteten Verformung der Kontaktsegmente (21) ausgebildet ist, und einen Anschlußabschnitt (30) aufweist, welcher am anderen Ende des Basisabschnittes (20) ausgebildet ist,

dadurch gekennzeichnet, daß:

der Kontaktabschnitt ein Paar von Stützsegmenten (22) aufweist, die in einer Querrichtung von den beiden Seitenkanten des einen Endabschnittes des flachen Basisabschnittes (20) derart nach oben verlaufen, daß ein Endabschnitt und das Stützsegment (22) eine rechtwinklige U-förmige Öffnung zum Einführen eines Steckstifts bilden;

das Paar von Eingriffssegmenten (24) in einer Querrichtung von den beiden Seitenkanten des Zwischenbasisabschnittes (20) im wesentlichen in dieselbe Richtung wie die Stützsegmente (22) derart verläuft, daß der Zwischenbasisabschnitt und die Eingriffssegmente (24) eine rechtwinklige U-förmige Öffnung zur Aufnahme des Endabschnittes des Steckstifts bilden;

jedes elastische Kontaktsegment (21) geringfügig von einer zugeordneten Seitenkante des jeweiligen Stützsegmentes (22) nach innen zu dem anderen Ende des Basisabschnittes (20) verläuft und geringfügig nach außen nochmals ausgehend von dem Zwischenabschnitt gebogen ist;

ferner wenigstens einen wellenförmigen Abschnitt (27) aufweist, der an einem Teil des Basisabschnittes (20) und diesen kreuzend zwischen den Stützsegmenten (22) und den Eingriffssegmenten (24) zur Kontaktierung des Basisabschnittes (20) in Längsrichtung desselben ausgebildet ist, so daß die distalen Enden der Kontaktsegmente (21) zwischen dem Paar von Eingriffselementen (24) derart positioniert werden, daß die distalen Enden der Kontaktsegmente (21) in Kontakt mit den Eingriffssegmenten (24) kommen, wenn die Kontaktsegmente beim Einführen eines Steckstifts in

überstarkem Maße nach außen verformt werden, wobei eine Fläche des wellenförmigen Abschnittes (27) vorsteht und die andere Fläche ausgenommen ist.

2. Anschlußendstück nach Anspruch 1, bei dem der wellenförmige Abschnitt (27) mittels Pressen ausgebildet ist.

3. Anschlußendstück nach Anspruch 1, bei dem der Anschlußabschnitt (30) ein Treibabschnitt zum Verbinden eines Drahtes durch Treiben ist.

4. Verfahren zum Herstellen des Anschlusses nach Anspruch 1, welches die folgenden Schritte aufweist:

Ausbilden einer im wesentlichen flachen Metallplatte, welche in ihrer Ebene alle Abschnitte des Anschlusses einschließlich der Paare von Stützabschnitten (22), der elastischen Kontaktabschnitte (21), der Eingriffsabschnitte (24) und des flachen Basisabschnittes (20) enthält, wobei das distale Ende jedes Kontaktabschnittes (21) in diesem Schritt einstückig mit dem zugeordneten Eingriffsabschnitt (24) ausgebildet ist;

Abtrennen des distalen Endes jedes Kontaktabschnittes (21) von dem zugeordneten Eingriffsabschnitt (24);

Biegen der Paare von Stützabschnitten (22) und der Eingriffsabschnitte (24) nach oben, bis diese im wesentlichen vertikal von dem flachen Basisabschnitt (20) wegverlaufen;

Biegen jedes Kontaktabschnittes (21) zuerst nach innen und dann nach außen, so daß die distalen Enden der Kontaktabschnitte (21) im wesentlichen parallel zueinander verlaufen und um einen Abstand getrennt sind, welcher kleiner als der Abstand zwischen den äußeren Enden der Kontaktabschnitte (21) ist, die mit den Stützabschnitten (22) verbunden sind, wobei die distalen Enden in dieser Stufe nicht zwischen dem Eingriffsabschnitt (24) verlaufen; und

Ausbilden einer Verformung am flachen Basisabschnitt (20) um hierdurch die Länge des flachen Basisabschnittes (20) um eine vorbestimmte Strecke zu verkürzen, welche ausreicht, um die distalen Enden der elastischen Kontaktabschnitte (21) nach vorne in eine Position zwischen dem Paar von gegenüberliegenden Eingriffsabschnitten (24) zu bewegen.

