

Description

This invention relates to electrical terminals of the type having aligned parallel plate-like members at one end and conductor-receiving slots in the plate-like members and two pairs of contact arms at the other ends thereof with a transition section between the plate-like members and the contact portion.

U.S. Patent 4,159,158 describes a sheet metal electrical terminal comprising parallel spaced apart plate-like members which have aligned conductor-receiving slots. The terminal further has a contact portion comprising side-by-side arms that extend from the plate-like members and which engage a complementary contact terminal when the two terminals are mated. Terminals of the type shown in U.S. Patent 4,159,158 have come into widespread usage and are highly regarded for the reason that a conductor can be connected to the terminal by merely moving the conductor laterally of its axis and into the conductor-receiving slots. A variety of tools and automatic machines have been developed for connecting individual conductors to terminals contained in an insulating housing. Terminals of the general type described in the above-identified U.S. patent thus permit manufacture of electrical harnesses at minimum cost and in a variety of forms.

Presently available terminals of the general type shown in U.S. Patent 4,159,158 are somewhat limited as regards the characteristics of the contact portion of the terminal. The terminal shown in that patent has a contact portion comprising side-by-side arms which receive a complementary terminal post between their opposed surfaces. Because of the manner in which these terminals are manufactured, the side-by-side arms cannot conveniently be resiliently biased against each other and the terminal is therefore limited with regard to the amount of contact force which can be developed when the terminal is mated with a complementary terminal. Under such circumstances, a relatively high contact force is required and existing terminals of the type shown in U.S. Patent 4,159,158 are incapable of satisfying the requirement of a high contact force.

In accordance with one aim thereof, the invention is directed to the achievement of a terminal of the general type disclosed in U.S. Patent 4,159,158 having contact arms which are resiliently biased against each other thereby to provide a relatively high contact force when the terminal is mated with a complementary terminal.

A further shortcoming of terminals of the general type shown in U.S. Patent 4,159,158 is that when such terminals are assembled to a multiconductor connector, the terminals must be positioned in side-by-side spaced apart relationship and the contact portions of the terminals are such that the connector cannot be designed to be mated with a plurality of simple terminal tabs which are disposed in parallel planes with each terminal located relatively close to its immediate neighbors. It is common practice in the manufacture of

many electrical devices to provide simple rectangular tabular tabs in spaced apart relationship with the tabs in parallel planes and a connector for an array of tabs must be capable of being mated with the tabs.

In accordance with a further aim thereof, the present invention is also directed to the achievement of a terminal which can be assembled to a connector housing and which can be mated with closely spaced terminal tabs in side-by-side relationship with the tabs in parallel spaced apart planes.

The invention comprises a stamped and formed electrical terminal of the type having a conductor-receiving end and a contact end, a conductor-receiving portion which extends from the conductor-receiving end, a contact portion which extends from the contact end, and a transition portion which is between the conductor-receiving portion and the contact portion. The conductor-receiving portion comprises first and second aligned flat plate-like members which are connected to each other, the plate-like members having aligned conductor-receiving slots so that a conductor can be moved laterally of its axis and into the conductor-receiving slots. The transition portion and the contact portion extend from the first and second plate-like members. The terminal is characterized in that the transition portion comprises first and second extensions of the plate-like members and first and second U-shaped sections. The first and second extensions extend from the first and second plate-like members convergently towards a medial plane that is parallel to, and between, the first and second plate-like members. Each of the U-shaped sections comprises a web and sidewalls; the webs extending from the extensions and being on each side of the medial plane. The sidewalls extend away from the medial plane. The contact portion comprises first and second pairs of contact arms which extend from the sidewalls of the first and second U-shaped sections. The arms of each pair of contact arms have free ends which have opposed contact zones whereby a conductor which is in the conductor-receiving slots will lie in the plane of a terminal tab which is inserted between the contact zones of the first and second pairs of contact arms.

A further embodiment is characterized in that the transition sections are secured to each other by an ear which extends from the web of one of the U-shaped sections and which is interlocked with the web of the other U-shaped section.

FIGURE 1 is a perspective view of an electrical terminal in accordance with the invention;

FIGURE 2 is a perspective view of a flat blank from which the terminal of Figure 1 is produced by forming operations;

FIGURES 3, 4 and 5 are views similar to Figure 2 but illustrating the successive forming operations which are performed on the blank prior to bending the blank into the shape of the finished terminal; and

FIGURE 6 is a view showing a plurality of terminal tabs on a support, such as a circuit board,

and showing a connector containing terminals in accordance with the invention in alignment with the terminal tabs.

Referring first to Figure 1, a terminal 2 in accordance with the invention is of stamped and formed sheet metal, such as brass, and has a conductor-receiving portion 4, a contact or mating portion 6, and a transition section 8 which is between the conductor-receiving portion and the contact portion.

The conductor-receiving portion comprises a pair of parallel plate-like members 10, 10a which are connected together at their upper ends 12 (as viewed in Figure 1) by spaced-apart connecting straps 14. The plate-like members are provided with aligned wire-receiving slots 16, 16a so that a wire 50 can be connected to the terminal by moving the wire laterally of its axis and into the slots as shown in Figure 6.

The transition section 8 comprises first and second flat extensions 18, 18a of the first and second plate-like members 10, 10a. The extensions 18, 18a are inclined inwardly towards each other and towards a medial plane which extends parallel to the planes of the plate-like members 10, 10a and is midway between the plate-like members. The extensions 18, 18a have converging side edges 20, 20a and 22, 22a which are integral with the flat web portions 26, 26a of U-shaped sections 24, 24a. The U-shaped sections have sidewalls 28, 30, 28a, 30a extending from the webs 26, 26a, the sidewalls extending in opposite directions from the side edges of the web portions. The web portions are parallel to each other and are on each side of, and adjacent to, the medial plane.

First and second pairs of contact arms 32, 34, 32a, 34a extend from the sidewalls of the U-shaped sections 24, 24a to the free ends 36, 36a of the terminal. The arms of each pair are inclined towards each other and are against each other in the vicinity of contact zones 40, 40a. The portions which extend beyond the contact zones are curved outwardly and away from each other to facilitate mating of the terminal with a terminal tab 52.

Terminals as shown in Figure 1 are produced by stamping and forming as shown in Figures 2 to 5. In these Figures, the same reference numerals, differentiated by prime marks, are used to indicate the portions of the blank as are used to identify the parts of the finished terminal.

The terminals are produced in the form of continuous strip with the ends of each blank 2' integral with carrier strips 44, 44a. In addition it will be understood that each terminal is connected to the next adjacent terminals in the strip by additional carrier strips which extend from the connecting strips 14', Figure 2. These additional connecting strips or carrier strips are not shown in the interest of clarity and facility. In the forming operation, the contact arms 32', 34', 32a', 34a' are first bent upwardly from the plane of the blank and the outer ends of the arms are curled downwardly as viewed in Figure 3. Thereafter, the

triangular extensions 18', 18a' are bent as shown in Figure 4 so that the U-shaped sections 24', 24a' are disposed in a plane which is parallel to but beneath the plane of the central portion of the blank. Thereafter, the sidewalls of the blank are bent upwardly as shown in Figure 5 to bring the contact zones 40, 40a against each other. When the final bending operation is carried out as shown in Figure 5, the arms will be resiliently biased against each other so that a relatively high contact force will be achieved when the terminal is mated with a terminal tab 52.

In the final forming operation, the terminal is bent along bend lines 46, 46a to place the first and second plate-like members 10, 10a in parallel spaced apart planes. Advantageously, a latching ear 42 extends from the web 26' and, after the final bending operation, this latching ear is bent through an angle of 180 degrees as shown in Figure 1 so that the two sections of the terminal will be latched to each other.

Terminals as shown in Figure 1 are used with an insulating housing 48 that has the capability of accommodating a plurality of terminals 2 in side-by-side spaced apart relationship. As shown in Figure 6, the terminal tabs for which the terminal 2 is intended are usually positioned in parallel spaced apart planes on a support member 54. By virtue of the fact that the terminal 2 receives a tab 52 which is in a plane extending through the aligned slots 16, 16a, the terminals can be placed on relatively close centers in the connector housing 48.

It will be apparent from the foregoing that terminals in accordance with the invention can be produced by relatively simple stamping and forming operations involving only forming of the arms 32, 34, 32a, 34a, bending of the sidewalls as shown in Figure 5, and then bending of the first and second plate-like members to produce the terminal in Figure 1. It should be noted that the sidewalls 28, 30, 28a, 30a extend at an angle of substantially 90 degrees to their respective webs 26, 26a and this sidewall bending operation is carried out after the flat transition sections 18, 18a are bent downwardly as shown in Figure 3. All of these bending operations can be carried out with relative ease in a progressive stamping and forming die. There is no necessity for forming operations which require the production of complex shapes in the transition zone.

Claims

1. A stamped and formed electrical terminal (2) of the type having a conductor-receiving end and a contact end, a conductor-receiving portion (4) extending from the conductor-receiving end and a contact portion (6) extending from the contact end, and a transition portion (8) between the conductor-receiving portion and the contact portion, the conductor-receiving portion (4) comprising first and second aligned flat plate-like members (10, 10a) which are connected to each other, the plate-like members having aligned conductor-

and showing a connector containing terminals in accordance with the invention in alignment with the terminal tabs.

Referring first to Figure 1, a terminal 2 in accordance with the invention is of stamped and formed sheet metal, such as brass, and has a conductor-receiving portion 4, a contact or mating portion 6, and a transition section 8 which is between the conductor-receiving portion and the contact portion.

The conductor-receiving portion comprises a pair of parallel plate-like members 10, 10a which are connected together at their upper ends 12 (as viewed in Figure 1) by spaced-apart connecting straps 14. The plate-like members are provided with aligned wire-receiving slots 16, 16a so that a wire 50 can be connected to the terminal by moving the wire laterally of its axis and into the slots as shown in Figure 6.

The transition section 8 comprises first and second flat extensions 18, 18a of the first and second plate-like members 10, 10a. The extensions 18, 18a are inclined inwardly towards each other and towards a medial plane which extends parallel to the planes of the plate-like members 10, 10a and is midway between the plate-like members. The extensions 18, 18a have converging side edges 20, 20a and 22, 22a which are integral with the flat web portions 26, 26a of U-shaped sections 24, 24a. The U-shaped sections have sidewalls 28, 30, 28a, 30a extending from the webs 26, 26a, the sidewalls extending in opposite directions from the side edges of the web portions. The web portions are parallel to each other and are on each side of, and adjacent to, the medial plane.

First and second pairs of contact arms 32, 34, 32a, 34a extend from the sidewalls of the U-shaped sections 24, 24a to the free ends 36, 36a of the terminal. The arms of each pair are inclined towards each other and are against each other in the vicinity of contact zones 40, 40a. The portions which extend beyond the contact zones are curved outwardly and away from each other to facilitate mating of the terminal with a terminal tab 52.

Terminals as shown in Figure 1 are produced by stamping and forming as shown in Figures 2 to 5. In these Figures, the same reference numerals, differentiated by prime marks, are used to indicate the portions of the blank as are used to identify the parts of the finished terminal.

The terminals are produced in the form of continuous strip with the ends of each blank 2' integral with carrier strips 44, 44a. In addition it will be understood that each terminal is connected to the next adjacent terminals in the strip by additional carrier strips which extend from the connecting strips 14', Figure 2. These additional connecting strips or carrier strips are not shown in the interest of clarity and facility. In the forming operation, the contact arms 32', 34', 32a', 34a' are first bent upwardly from the plane of the blank and the outer ends of the arms are curled downwardly as viewed in Figure 3. Thereafter, the

triangular extensions 18', 18a' are bent as shown in Figure 4 so that the U-shaped sections 24', 24a' are disposed in a plane which is parallel to but beneath the plane of the central portion of the blank. Thereafter, the sidewalls of the blank are bent upwardly as shown in Figure 5 to bring the contact zones 40, 40a against each other. When the final bending operation is carried out as shown in Figure 5, the arms will be resiliently biased against each other so that a relatively high contact force will be achieved when the terminal is mated with a terminal tab 52.

In the final forming operation, the terminal is bent along bend lines 46, 46a to place the first and second plate-like members 10, 10a in parallel spaced apart planes. Advantageously, a latching ear 42 extends from the web 26' and, after the final bending operation, this latching ear is bent through an angle of 180 degrees as shown in Figure 1 so that the two sections of the terminal will be latched to each other.

Terminals as shown in Figure 1 are used with an insulating housing 48 that has the capability of accommodating a plurality of terminals 2 in side-by-side spaced apart relationship. As shown in Figure 6, the terminal tabs for which the terminal 2 is intended are usually positioned in parallel spaced apart planes on a support member 54. By virtue of the fact that the terminal 2 receives a tab 52 which is in a plane extending through the aligned slots 16, 16a, the terminals can be placed on relatively close centers in the connector housing 48.

It will be apparent from the foregoing that terminals in accordance with the invention can be produced by relatively simple stamping and forming operations involving only forming of the arms 32, 34, 32a, 34a, bending of the sidewalls as shown in Figure 5, and then bending of the first and second plate-like members to produce the terminal in Figure 1. It should be noted that the sidewalls 28, 30, 28a, 30a extend at an angle of substantially 90 degrees to their respective webs 26, 26a and this sidewall bending operation is carried out after the flat transition sections 18, 18a are bent downwardly as shown in Figure 3. All of these bending operations can be carried out with relative ease in a progressive stamping and forming die. There is no necessity for forming operations which require the production of complex shapes in the transition zone.

Claims

1. A stamped and formed electrical terminal (2) of the type having a conductor-receiving end and a contact end, a conductor-receiving portion (4) extending from the conductor-receiving end and a contact portion (6) extending from the contact end, and a transition portion (8) between the conductor-receiving portion and the contact portion, the conductor-receiving portion (4) comprising first and second aligned flat plate-like members (10, 10a) which are connected to each other, the plate-like members having aligned conductor-



receiving slots (16, 16a) so that a conductor (50) can be moved laterally of its axis and into the conductor-receiving slots, the transition portion (8) and the contact portion (6) extending from the first and second plate-like members (10, 10a), the terminal being characterized in that:

the transition portion (8) comprises first (18) and second (18a) extensions of the plate-like members (10, 10a) and first and second U-shaped sections (24, 24a), the first and second extensions (18, 18a) extending from the first and second plate-like members (10, 10a) convergently towards a medial plane that is parallel to, and between, the first and second plate-like members,

each of the U-shaped sections (24, 24a) comprising a web (26, 26a) and sidewalls (30, 30a), the webs extending from the extensions (18, 18a) and being on each side of the medial plane, the sidewalls (30, 30a) extending away from the medial plane,

the contact portion (6) comprising first and second pairs (32, 34, 32a, 34a) of contact arms which extend from the sidewalls (28, 30, 28a, 30a) of the first and second U-shaped sections, the arms of each pair of contact arms having free ends (36, 36a), the free ends having opposed contact zones (40, 40a) whereby a conductor (50) which is in the conductor-receiving slots (16, 16a) will lie in the plane of a terminal tab (52) which is inserted between the contact zones (40) of the first and second pairs of contact arms (32, 34, 32a, 34a).

2. A stamped and formed electrical terminal (2) as set forth in Claim 1 characterized in that the transition sections (8) are secured to each other.

3. A stamped and formed electrical terminal (2) as set forth in Claim 2 characterized in that the transition sections (8) are secured to each other by an ear (42) extending from the web (26) of one of the U-shaped sections (24) which is interlocked with the web (26a) of the other U-shaped section (24a).

4. A stamped and formed electrical terminal (2) as set forth in either of Claims 1 or 3 characterized in that the first and second plate-like members (10, 10a) are connected to each other by connecting straps (14, 14a) which extend between, and are integral with, the first and second plate-like members.

5. A stamped and formed electrical terminal (2) as set forth in Claim 4 characterized in that the first and second extensions (18, 18a) are flat and each extension has convergent side edges (20, 22, 20a, 22a).

Patentansprüche

1. Gestanzter und geformter elektrischer Anschluß (2) derjenigen Art, die ein Leitaraufnahmeende und ein Kontaktende besitzt, wobei sich ein Leitaraufnahmeabschnitt (4) von dem Leitaraufnahmeende und ein Kontaktabschnitt (6) von dem Kontaktende weg erstrecken und ein Übergangsabschnitt (8) zwischen dem Leitaraufnahmeabschnitt und dem Kontaktab-

schnitt liegt, wobei ferner der Leitaraufnahmeabschnitt (14) erste und zweite ausgerichtete flache plattenförmige Elemente (10, 10a) besitzt, die miteinander verbunden sind und die plattenförmigen Elemente ausgerichtete Leitaraufnahmeschlitz (16, 16a) besitzen, so daß ein Leiter (50) seitlich zu seiner Achse in die Leitaraufnahmeschlitz hineinbewegt werden kann, und wobei der Übergangsabschnitt (8) und der Kontaktabschnitt (6) sich von dem ersten und zweiten plattenförmigen Element (10, 10a) weg erstrecken, dadurch gekennzeichnet, daß der Übergangsabschnitt (8) erste (18) und zweite (18a) Verlängerungen der plattenförmigen Elemente (10, 10a) und erste und zweite U-förmige Abschnitte (24, 24a) umfaßt, wobei sich die ersten und zweiten Verlängerungen (18, 18a) von dem ersten und zweiten plattenförmigen Element (10, 10a) konvergierend zu einer Mittelebene weg erstrecken, die parallel zu und zwischen den ersten und zweiten plattenförmigen Elementen liegt, daß jeder der U-förmigen Abschnitte (24, 24a) einen Steg (26, 26a) und Seitenwände (30, 30a) umfaßt, wobei die Stege sich von den Verlängerungen (18, 18a) weg erstrecken und auf beiden Seiten der Mittellinie liegen, während die Seitenwände (30, 30a) sich von der Mittelebene weg erstrecken, und daß der Kontaktabschnitt (6) erste und zweite Paare (32, 34, 32a, 34a) von Kontaktarmen umfaßt, die sich von den Seitenwänden (28, 30, 28a, 30a) der ersten und zweiten U-förmigen Abschnitte weg erstrecken, wobei die Arme jedes Paares von Kontaktarmen freie Enden (36, 36a) besitzen, und diese freien Enden gegenüberliegende Kontaktzonen (40, 40a) aufweisen, wodurch ein Leiter (50), der sich in den Leitaraufnahmeschlitz (16, 16a) befindet, in der Ebene einer Anschlußlasche (52) liegt, welche zwischen die Kontaktzonen (40) der ersten und zweiten Paare von Kontaktarmen (32, 34, 32a, 34a) eingesetzt ist.

2. Gestanzter und geformter elektrischer Kontakt (2) nach Anspruch 1, dadurch gekennzeichnet, daß die Übergangsabschnitte (8) aneinander befestigt sind.

3. Gestanzter und geformter elektrischer Kontakt (2) nach Anspruch 2, dadurch gekennzeichnet, daß die Übergangsabschnitte (8) aneinander durch eine Lasche (42) befestigt sind, welche sich von dem Steg (26) eines der U-förmigen Abschnitte (24) weg erstreckt, welcher mit dem Steg (26a) des anderen U-förmigen Abschnitts (24a) verriegelt ist.

4. Gestanzter und geformter elektrischer Anschluß (2) nach Anspruch 1 oder 3, dadurch gekennzeichnet, daß die ersten und zweiten plattenförmigen Elemente (10, 10a) durch Verbindungstreifen (14, 14a) miteinander verbunden sind, welche sich zwischen den ersten und zweiten plattenförmigen Elementen und einstückig mit diesen erstrecken.

5. Gestanzter und geformter elektrischer Anschluß (2) nach Anspruch 4, dadurch gekennzeichnet, daß die ersten und zweiten Verlängerungen (18, 18a) flach sind und jede Verlängerung



konvergierende Seitenkanten (20, 22, 20a, 22a) besitzt.

Revendications

1. Borne électrique découpée et formée (2) du type comportant une extrémité de réception de conducteur et une extrémité de contact, une partie (4) de réception de conducteur s'étendant à partir de l'extrémité de réception de conducteur et une partie (6) de contact s'étendant à partir de l'extrémité de contact, et une partie (8) de transition située entre la partie de réception de conducteur et la partie de contact, la partie (4) de réception de conducteur comprenant des premier et second éléments plats et alignés (10, 10a), analogues à des plaques, qui sont reliés l'un à l'autre, les éléments analogues à des plaques présentant des fentes alignées (16, 16a) de réception de conducteur de manière qu'un conducteur (50) puisse être déplacé latéralement à son axe et introduit dans les fentes de réception de conducteur, la partie (8) de transition et la partie (6) de contact s'étendant à partir des premier et second éléments (10, 10a) analogues à des plaques, la borne étant caractérisée en ce que:

la partie (8) de transition comprend des premier (18) et second (18a) prolongements des éléments (10, 10a) analogues à des plaques et des première et seconde sections (24, 24a) de forme en U, les premier et second prolongements (18, 18a) partant des premier et second éléments (10, 10a) analogues à des plaques, en convergeant vers un plan médian qui est parallèle à, et situé entre, les premier et second éléments analogues à des plaques,

chacune des sections (24, 24a) de forme en U comprenant une âme (26, 26a) et des parois latérales (30, 30a), les âmes s'étendant à partir des prolongements (18, 18a) et étant situées de

chaque côté du plan médian, les parois latérales (30, 30a) s'éloignant du plan médian,

la partie (6) de contact comprenant des première et seconde paires (32, 34, 32a, 34a) de lames de contact qui s'étendent à partir des parois latérales (28, 30, 28a, 30a) des première et seconde parties de forme en U, les lames de chaque paire de lames de contact présentant des extrémités libres (36, 36a), les extrémités libres ayant des zones de contact opposées (40, 40a), de manière qu'un conducteur (50), qui se trouve dans les fentes (16, 16a) de réception de conducteur, s'étende dans le plan d'une patte de borne (52) qui est insérée entre les zones de contact (40) des première et secondes paires de lames de contact (32, 34, 32a, 34a).

2. Borne électrique découpée et formée (2) selon la revendication 1, caractérisée en ce que les sections (8) de transition sont fixées l'une à l'autre.

3. Borne électrique découpée et formée (2) selon la revendication 2, caractérisée en ce que les sections (8) de transition sont fixées l'une à l'autre par une languette (42) dépassant de l'âme (26) de l'une des sections (24) de forme en U, qui est enclenchée avec l'âme (26a) de l'autre section (24a) de forme en U.

4. Borne électrique découpée et formée (2) selon l'une des revendications 1 ou 3, caractérisée en ce que les premier et second éléments (10, 10a) analogues à des plaques sont reliés entre eux par des barrettes de liaison (14, 14a) qui s'étendent entre, et qui sont réalisées d'une seule pièce avec, les premier et second éléments analogues à des plaques.

5. Borne électrique découpée et formée (2) selon la revendication 4, caractérisée en ce que les premier et second prolongements (18, 18a) sont plats et chaque prolongement comporte des bords latéraux convergents (20, 22, 20a, 22a).

