

Description

Technical Field

The present invention relates to a socket connector in which the contact elements have multiple pin contacting areas.

Background Art

It has long been recognized that in socket connectors it is preferable that the contact element have multiple wiping surfaces to resiliently press against the opposite sides of a pin and provide multiple electrical contacts to the pin. Socket connectors of this type are illustrated in U.S. Patent Numbers 3,917,375; 3,966,295; 3,955,869; 4,040,705; 4,073,560; 4,094,566; 4,230,387; and 4,232,927 and Japanese Patent Publication JA 52-3188 published January 11, 1977. When resistance to removal of the socket connector has been desired, for example where vibration is a problem, a latching mechanism between the socket connector and the part containing the pins has been provided such as that disclosed in U.S. Patent No. 4,230,387.

U.S. Patent No. 4066316, discloses such a socket connector in which contact elements are provided in a plurality of apertures through an insulating body from a connecting surface to an opposed external surface, each contact element being stamped from sheet metal and having a connecting end extending from the connecting surface of the insulating body and a pin contacting end within a contact element aperture, the pin contacting end having a pin contact area defined by spaced facing portions that are connected along one edge by a connecting link extending between them.

Disclosure of Invention

The present invention provides a socket connector comprising an insulating body (10) having a plurality of contact element apertures (16) therethrough from a connecting surface (17) to an opposed external surface (18), and a plurality of contact elements (12 or 14), one in each of said contact element apertures, each said contact element being stamped from sheet metal and having a connecting end extending from said connecting surface of said insulating body and a pin contacting end within a said contact element aperture, said pin contacting end having a pin contact area defined by spaced facing portions that are connected along one edge by a connecting link extending between them, characterized in that said pin contacting end has a main body portion (25) with a pin guiding and contacting surface (26) and a pair of pin contact areas (35, 36) spaced from and facing said pin guiding and contacting surface and spaced from each other longitudinally with respect to the insertion of a pin into the contact element aperture, said pin contact areas being defined on a pair of spring arms (28, 29) facing said pin guiding and contacting surface and cantilevered in opposite directions from a bridge (31), said bridge being con-

nected along one edge to the connecting link (33) which extends between said main body portion and said bridge and has a greater area of connection to said main body portion than to said bridge.

The two spring arms and the pin guiding and contacting surface provide three contacts to a pin, the second spring arm engaging the pin near the end of its insertion into the socket connector and approximately doubling the pin contacting force so that vibration can be withstood without a latching mechanism.

Brief Description of the Drawings

Figure 1 is a top view of a socket connector constructed in accordance with the present invention with the cover in the open position;

Figure 2 is a cross-sectional view of the connector taken generally along line 2—2 of Figure 1;

Figure 3 is a front elevation view of one of the contact elements in the connector of Figures 1 and 2;

Figure 4 is a side elevation view of the contact element of Figure 3;

Figure 5 is a side elevation view of the contact element of Figure 3 with a pin partially inserted into it;

Figure 6 is a front elevation view of a second embodiment of a contact element for use in the connector; and

Figure 7 is a side elevation view of the contact element of Figure 6.

Detailed Description

The socket connector of the present invention comprises an insulating body 10 and a plurality of contact elements 12 (illustrated in the embodiment of Figures 1—5) or 14 (illustrated in Figures 6 and 7). The two forms of contact elements 12 and 14 illustrated are very similar and like numerals are used to designate like parts.

The insulating body 10 has a plurality of contact element apertures 16 extending therethrough from a connecting surface 17 to an opposed external surface 18. A contact element 12 or 14 is retained in each of the contact element apertures 16.

Each contact element 12 or 14 is stamped from sheet metal and has a connecting end 20 extending from the connecting surface 17 of the body and a pin contacting end 21 within the contact element aperture 16. In the illustrated embodiments the connecting end 20 is a bifurcate flat plate insulation displacement wire contact which will cut through the insulation on a wire 24 and make electrical connection to the conductive core upon being forced into the slot formed in the contact. An insulating cover 23 is provided with slots to receive the connecting ends 20 of the contact elements so that wires 24 will be pressed into the slots in the wire connecting ends 20 of the contact elements upon pressing the cover 23 toward the body 10.

The pin contacting end 21 of each contact element 12 or 14 has a main body portion 25 with a flat pin guiding and contacting surface 26, a pair

of spring arms 28 and 29 facing the surface 26 and joined at a bridge 31, and a connecting link 33 joining the main body portion 25 and the bridge 31. A pair of pin contact areas 35 and 36 are defined one on each of the spring arms 28 and 29, respectively, spaced from and facing the flat pin guiding and contacting surface 26 and spaced from each other longitudinally with respect to the insertion of a pin 38 into the contact element aperture 16.

The spring arms 28 and 29 are cantilevered in opposite directions from the bridge 31. In both embodiments the lower spring arm 28 extends from the bridge 31 at an angle toward the pin guiding and contacting surface 26 and adjacent its end is turned outward from the pin guiding and contacting surface and the pin contact area 35 is defined at the bend in the spring arm 28. In the embodiment of Figures 1—5, the upper spring arm 29 likewise extends away from the bridge 31 at an angle toward the pin guiding and contacting surface 26 and adjacent its end is turned outward away from the pin guiding and contacting surface and the pin contact area 36 is defined at the bend in the spring arm 29. In the second embodiment illustrated in Figures 6 and 7, the upper spring arm 29 extends away from the bridge 31 and is then curled back upon itself to define the pin contact area 36 thereon.

The connecting link 33 has a greater area of connection to the main body portion 25 than to the bridge 31, in the illustrated embodiment linearly decreasing in cross-section from the main body portion 25 to the bridge 31. And, the bridge 31 is connected along one edge to the connecting link 33. The tapered connecting link 33 assures stability of the main body portion 25 and yet permits twisting or pivoting of the bridge 31 in response to a pin being inserted between the pin guiding and contacting surface 26 and the lower spring arm 28.

The twisting or pivoting of the bridge 31 upon engagement between the lower spring arm 28 and a pin 38 moves the upper spring arm 29 toward the pin guiding and contacting surface 26 as illustrated in Figure 5. Thus, when the pin 38 engages the upper spring arm 29, force is applied tending to twist the bridge 31 back to its original position applying greater force to the lower spring arm 28 and provides a third pin contact point at the upper pin contact area 36. It has been found that with the design illustrated in Figures 1—5 with the upper spring arm 29 having a length approximately 5/6 that of the lower spring arm 28, the force when the pin engages the upper spring arm 29 is approximately twice the force of the pin engaging the lower spring arm 28 only. This significant increase in force during the small distance of travel necessary to engage the upper spring arm has made it feasible to make a socket connector without any additional latching system for use even where vibration may be a problem. Additionally, the three point contact with the high engagement force achieved upon complete pin insertion provides stability in the connection areas to minimize fretting inducing movements.

In one specific embodiment, a socket connector was constructed as illustrated in Figures 1—5 with six contact elements 12 on 0.396 cm centers for connecting to 0.114 cm pins. The contact elements were stamped out of 0.0381 cm thick CA 770 spring hard sheet metal, a copper-nickel alloy. The bridge 31 was 0.102 cm in length. From the bridge to the bend in the lower spring arm 28 was 0.318 cm, from the bridge to the bend in the upper spring arm 29 was 0.254 cm and from the bend in each spring arm to its end was 0.102 cm, all of these distances being measured parallel to the main body portion 25. The bridge 31 and the spring arms 28 and 29 had a width of 0.135 cm. The pin contact areas 35 and 36 on the spring arms 28 and 29 were spaced 0.0889 cm. from the pin guiding and contacting surface 26. The connecting link 33 had a length of 0.178 cm. between the main body portion 25 and the bridge 31 and it had a width at the main body portion of 0.305 cm and a width at the bridge of 0.102 cm, the same as the length of the bridge. This connector was tested on square pins and found to require a force of 18 to 22 newtons to move the connector onto the pins when the lower spring arms 28 were engaged which increased to 36 to 44 newtons upon engagement of the upper spring arms 29.

Claims

1. A socket connector comprising an insulating body (10) having a plurality of contact element apertures (16) therethrough from a connecting surface (17) to an opposed external surface (10), and a plurality of contact elements (12 or 14), one in each of said contact element apertures, each said contact element being stamped from sheet metal and having a connecting end extending from said connecting surface of said insulating body and a pin contacting end within a said contact element aperture, said pin contacting end having a pin contact area defined by spaced facing portions that are connected along one edge by a connecting link extending between them, characterized in that said pin contacting end has a main body portion (25) with a pin guiding and contacting surface (26) and a pair of pin contact areas (35, 36) spaced from and facing said pin guiding and contacting surface and spaced from each other longitudinally with respect to the insertion of a pin into the contact element aperture, said pin contact areas being defined on a pair of spring arms (28, 29) facing said pin guiding and contacting surface and cantilevered in opposite directions from a bridge (31), said bridge being connected along one edge to the connecting link (33) which extends between said main body portion and said bridge and has a greater area of connection to said main body portion than to said bridge.

2. The socket connector of claim 1 characterized in that said connecting link (33) of each said contact element has a linearly decreasing cross-section in the longitudinal direction of the spring arms from said main body portion (25) to said bridge (31).



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of spring arms 28 and 29 facing the surface 26 and joined at a bridge 31, and a connecting link 33 joining the main body portion 25 and the bridge 31. A pair of pin contact areas 35 and 36 are defined one on each of the spring arms 28 and 29, respectively, spaced from and facing the flat pin guiding and contacting surface 26 and spaced from each other longitudinally with respect to the insertion of a pin 38 into the contact element aperture 16.

The spring arms 28 and 29 are cantilevered in opposite directions from the bridge 31. In both embodiments the lower spring arm 28 extends from the bridge 31 at an angle toward the pin guiding and contacting surface 26 and adjacent its end is turned outward from the pin guiding and contacting surface and the pin contact area 35 is defined at the bend in the spring arm 28. In the embodiment of Figures 1—5, the upper spring arm 29 likewise extends away from the bridge 31 at an angle toward the pin guiding and contacting surface 26 and adjacent its end is turned outward away from the pin guiding and contacting surface and the pin contact area 36 is defined at the bend in the spring arm 29. In the second embodiment illustrated in Figures 6 and 7, the upper spring arm 29 extends away from the bridge 31 and is then curled back upon itself to define the pin contact area 36 thereon.

The connecting link 33 has a greater area of connection to the main body portion 25 than to the bridge 31, in the illustrated embodiment linearly decreasing in cross-section from the main body portion 25 to the bridge 31. And, the bridge 31 is connected along one edge to the connecting link 33. The tapered connecting link 33 assures stability of the main body portion 25 and yet permits twisting or pivoting of the bridge 31 in response to a pin being inserted between the pin guiding and contacting surface 26 and the lower spring arm 28.

The twisting or pivoting of the bridge 31 upon engagement between the lower spring arm 28 and a pin 38 moves the upper spring arm 29 toward the pin guiding and contacting surface 26 as illustrated in Figure 5. Thus, when the pin 38 engages the upper spring arm 29, force is applied tending to twist the bridge 31 back to its original position applying greater force to the lower spring arm 28 and provides a third pin contact point at the upper pin contact area 36. It has been found that with the design illustrated in Figures 1—5 with the upper spring arm 29 having a length approximately 5/6 that of the lower spring arm 28, the force when the pin engages the upper spring arm 29 is approximately twice the force of the pin engaging the lower spring arm 28 only. This significant increase in force during the small distance of travel necessary to engage the upper spring arm has made it feasible to make a socket connector without any additional latching system for use even where vibration may be a problem. Additionally, the three point contact with the high engagement force achieved upon complete pin insertion provides stability in the connection areas to minimize fretting inducing movements.

In one specific embodiment, a socket connector was constructed as illustrated in Figures 1—5 with six contact elements 12 on 0.396 cm centers for connecting to 0.114 cm pins. The contact elements were stamped out of 0.0381 cm thick CA 770 spring hard sheet metal, a copper-nickel alloy. The bridge 31 was 0.102 cm in length. From the bridge to the bend in the lower spring arm 28 was 0.318 cm, from the bridge to the bend in the upper spring arm 29 was 0.254 cm and from the bend in each spring arm to its end was 0.102 cm, all of these distances being measured parallel to the main body portion 25. The bridge 31 and the spring arms 28 and 29 had a width of 0.135 cm. The pin contact areas 35 and 36 on the spring arms 28 and 29 were spaced 0.0889 cm. from the pin guiding and contacting surface 26. The connecting link 33 had a length of 0.178 cm. between the main body portion 25 and the bridge 31 and it had a width at the main body portion of 0.305 cm and a width at the bridge of 0.102 cm, the same as the length of the bridge. This connector was tested on square pins and found to require a force of 18 to 22 newtons to move the connector onto the pins when the lower spring arms 28 were engaged which increased to 36 to 44 newtons upon engagement of the upper spring arms 29.

Claims

1. A socket connector comprising an insulating body (10) having a plurality of contact element apertures (16) therethrough from a connecting surface (17) to an opposed external surface (10), and a plurality of contact elements (12 or 14), one in each of said contact element apertures, each said contact element being stamped from sheet metal and having a connecting end extending from said connecting surface of said insulating body and a pin contacting end within a said contact element aperture, said pin contacting end having a pin contact area defined by spaced facing portions that are connected along one edge by a connecting link extending between them, characterized in that said pin contacting end has a main body portion (25) with a pin guiding and contacting surface (26) and a pair of pin contact areas (35, 36) spaced from and facing said pin guiding and contacting surface and spaced from each other longitudinally with respect to the insertion of a pin into the contact element aperture, said pin contact areas being defined on a pair of spring arms (28, 29) facing said pin guiding and contacting surface and cantilevered in opposite directions from a bridge (31), said bridge being connected along one edge to the connecting link (33) which extends between said main body portion and said bridge and has a greater area of connection to said main body portion than to said bridge.

2. The socket connector of claim 1 characterized in that said connecting link (33) of each said contact element has a linearly decreasing cross-section in the longitudinal direction of the spring arms from said main body portion (25) to said bridge (31).



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3. The socket connector of claim 1 characterized in that for each of said contact elements the spring arm (28) nearest said external surface (18) of said insulating body extends from said bridge (31) at an angle toward said pin guiding and contacting surface (26) and adjacent its end is turned outward away from said pin guiding and contacting surface.

4. The socket connector of claim 3 characterized in that each of said spring arms (28, 29) extends from said bridge (31) at an angle toward said guiding and contacting surface (26) and adjacent its end is turned outward away from said pin guiding and contacting surface.

5. The socket connector of claim 3 characterized in that the spring arm (29) farthest from said external surface (18) of said insulating body extends away from said bridge and is then curled back upon itself to define said pin contact area (36).

6. The socket connector of claim 1 characterized in that said connecting end (20) of each of said contact elements (12 or 14) is a bifurcate flat plate insulation displacement wire contact.

Patentansprüche

1. Buchsenleiste mit einem Isolierkörper (10), der von einer Mehrzahl von Kontaktstücköffnungen (16) durchsetzt ist, die von einer Verbindungsfläche (17) zu einer ihr entgegengesetzten Außenfläche (18) führen, und mit einer Mehrzahl von in je einer der Kontaktstücköffnungen angeordneten Kontaktstücken (12 oder 14), von denen jedes aus Blech gestanzt ist und ein Verbindungsende besitzt, das sich von der Verbindungsfläche des Isolierkörpers weg erstreckt, und ein Stiftberührungsende, das in der Kontaktstücköffnung angeordnet ist und eine Stiftberührungsfläche besitzt, die von im Abstand von einander angeordneten und einander zugekehrten Teilen gebildet wird, die an einem Rand durch ein sich zwischen ihnen erstreckendes Verbindungsglied miteinander verbunden sind, dadurch gekennzeichnet, daß das Stiftberührungsende einen Hauptteil (25) mit einer Stiftführungs- und -berührungsfläche (26) und einem Paar von Stifanlagebereichen (35, 36) besitzt, die im Abstand von der genannten Stiftführungs- und -berührungsfläche angeordnet und ihr zugekehrt und in der Richtung der Einführung eines Steckerstiftes in die Kontaktstücköffnung im Abstand voneinander angeordnet sind und von einem Paar von Federarmen (28, 29) gebildet werden, die der Stiftführungs- und -berührungsfläche zugekehrt sind und in entgegengesetzten Richtungen von einer Brücke (31) vorkragen, die an einem Rand mit dem Verbindungsteil (33) verbunden sind, der sich zwischen dem Hauptteil und der Brücke erstreckt und mit dem Hauptteil auf einer größeren Fläche verbunden ist als mit der Brücke.

2. Buchsenleiste nach Anspruch 1, dadurch gekennzeichnet, daß der Querschnitt des Verbindungsteils (33) jedes der Kontaktstücke in der Längsrichtung der Federarme von dem Hauptteil (25) zu der Brücke (31) linear abnimmt.

3. Buchsenleiste nach Anspruch 1, dadurch gekennzeichnet, daß bei jedem der Kontaktstücke der der Außenfläche (18) des Isolierkörpers nächstliegende Federarm (28) sich von der Brücke (31) unter einem Winkel zu der Stiftführungs- und berührungsfläche (26) erstreckt und dieser Federarm im Bereich seines Endes von der Stiftführungs- und -berührungsfläche weggebogen ist.

4. Buchsenleiste nach Anspruch 3, dadurch gekennzeichnet, daß sich jeder der Federarme (28, 29) von der Brücke (31) unter einem Winkel zu der Führungs- und Berührungsfläche (26) erstreckt und im Bereich seines Endes von der Stiftführungs- und -berührungsfläche weggebogen ist.

5. Buchsenleiste nach Anspruch 3, dadurch gekennzeichnet, daß der von der Außenfläche (18) des Isolierkörpers am weitesten entfernte Federarm (29) sich von der Brücke weg erstreckt und dann zur Bildung der Stifanlagefläche (36) eingerollt ist.

6. Buchsenleiste nach Anspruch 1, dadurch gekennzeichnet, daß das Verbindungsende (20) jedes der Kontaktelemente (12 oder 14) ein Isolierungsverschiebendes, flaches gegabeltes Blechstück zum Angriff an einem Draht ist.

Revendications

1. Connecteur à douille comprenant un corps isolant (10) qui comporte une pluralité d'ouvertures (16) d'éléments de contact, qui traversent ce corps d'une surface de raccordement (17) à une surface extérieure opposée (18), et une pluralité d'éléments de contact (12 ou 14), un dans chacune desdites ouvertures d'éléments de contact, chacun desdits éléments de contact étant estampé à partir d'une feuille de métal et comportant une extrémité de raccordement, qui fait saillie par rapport à ladite surface de raccordement dudit corps isolant, et une extrémité de contact de broche située à l'intérieur d'une dite ouverture d'élément de contact, ladite extrémité de contact de broche présentant une région de contact de broche définie par des parties espacées face-à-face qui sont reliées le long d'un bord par un élément de jonction s'étendant entre ces parties, caractérisé en ce que ladite extrémité de contact de broche comprend une partie principale de corps (25), avec une surface (26) de guidage et de contact de broche, et deux régions (35, 36) de contact de broche espacées de ladite surface de guidage et de contact de broche, en face de cette surface, et espacées l'une de l'autre longitudinalement par rapport à l'insertion d'une broche dans l'ouverture d'élément de contact; lesdites régions de contact de broche étant définies sur deux bras élastique (28, 29) disposés en face de ladite surface de guidage et de contact de broche et en porte-à-faux dans des directions opposées à partir d'un pont (31), ce pont étant relié le long d'un bord à l'élément de jonction (33) qui s'étend entre ladite partie principale de corps et ledit pont et qui a une plus grande surface de jonction avec ladite partie principale de corps qu'avec ledit pont.

2. Connecteur à douille suivant la revendication



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1, caractérisé en ce que ledit élément de jonction (33) de chaque dit élément de contact a une section transversale, dans la direction longitudinale des bras élastiques, qui est linéairement décroissante, de ladite partie principale de corps (25) audit pont (31).

3. Connecteur à douille suivant la revendication 1, caractérisé en ce que, pour chacun desdits éléments de contact, le bras élastique (28) le plus proche de ladite surface extérieure (18) dudit corps isolant est incliné à partir dudit pont (31) vers ladite surface (26) de guidage et de contact de broche et, près de son extrémité, il est replié vers l'extérieur à l'opposé de ladite surface de guidage et de contact de broche.

4. Connecteur à douille suivant la revendication 3, caractérisé en ce que chacun desdits bras élas-

tiques (28, 29) est incliné à partir dudit pont (31) vers ladite surface (26) de guidage et de contact et, près de son extrémité, il est replié vers l'extérieur à l'opposé de ladite surface de guidage et de contact de broche.

5. Connecteur à douille suivant la revendication 3, caractérisé en ce que le bras élastique (29) le plus éloigné de ladite surface extérieure (18) dudit corps isolant part dudit pont et est ensuite recourbé sur lui-même pour définir ladite région de contact de broche (36).

6. Connecteur à douille suivant la revendication 1, caractérisé en ce que ladite extrémité de raccordement (20) de chacun desdits éléments de contact (12 ou 14) est un contact de câble à déplacement d'isolant à plaque plate fourchue.

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