

Description

This application relates to an electrical terminal and a zero insertion force electrical connector comprising such terminals.

A multiplicity of terminals may be provided in an electrical connector for making electrical connections to an edge portion of a circuit board, the board carrying a complex electrical circuit, for example of a portable calculator, or forming part of the circuitry of a larger and more complex computer.

In such applications it is of the greatest importance, in the interest of unfalsified operation of the circuits concerned, that the integrity of the connection between the electrically conductive surfaces of the board edge conductors (pads) and the contact surfaces of the terminals should not be impaired by contaminants which may be present on the conductors or the terminals.

Such contaminants may include oxide coatings which accumulate on the pads, dust particles, and shards of plastics material which have been accidentally chipped or scraped from the insulating housing of the connector or from the circuit board.

In a conventional electrical connector, the contact surfaces of the terminals automatically wipe the conductors of the circuit board during its insertion into the connector.

The number of terminals in the connector may, however, be such that the force which must be exerted upon the circuit board in order to insert it into the connector is undesirably high. In order to avoid this disadvantage there have been developed so called "zero insertion force electrical connectors, in which the terminals are initially maintained in a position in which the contact surfaces of the terminals are withdrawn from the insertion path of the board, the terminals then being deflected into a contact position, after the insertion of the board so that the contact surfaces of the terminals engage the surfaces of the board edge connectors. In this case there is no wiping action between the terminal and the board conductors.

We have described in EP—A1—2114 (Application number 78300558.0), an electrical terminal for a zero insertion force connector, the terminal which is in the form of a strip of resilient sheet metal stock, comprising a contact spring portion at one end, a mounting part, and a spring beam part intermediate the contact spring portion and the mounting part, the contact spring portion having a contact surface, and an abutment surface to which a force can be applied in the lengthwise direction of the terminal resiliently to deflect the spring beam part and the contact spring portion relative to the mounting part, when the mounting part is fixedly positioned in a support.

According to one aspect of the invention a terminal as defined in the preceding paragraph of the specification is characterised in that the contact spring portion is formed in such a way that

the contact surface is substantially parallel to the spring beam portion and substantially at right angles to the abutment surface such that upon the initial application of the force to the abutment surface, in the lengthwise direction of the terminal, the contact spring portion is deflected relative to the spring beam part, prior to the spring beam part being deflected relative to the mounting part, whereby upon cessation of the force, the contact spring portion returns towards its initial position along such a return path that the contact surface wipes along an electrical conductor when such is positioned so as to intersect the return path of the contact surface.

According to another aspect of the invention, a zero insertion force circuit board edge electrical connector, comprising an insulating housing having an elongate opening for receiving a circuit board along a board insertion path; at least one row of electrical terminals positioned beside the opening and extending in the longitudinal direction thereof, each terminal having at one end a resilient contact spring portion having an abutment surface, and a contact surface for engaging a conductor of the circuit board when such has been inserted into the opening along the insertion path, a mounting part fixedly positioned in the housing and a spring beam part intermediate the contact spring portion and the mounting part; and a cam follower having a cam surface for engaging the abutment surfaces of the terminals, the cam follower being displaceable by a cam between a first position in which the cam surface engages the abutment surfaces of the terminals to deflect the contact spring portions and the spring beam parts of the terminals away from the insertion path and a second position in which the cam follower is retracted to allow the contact spring portions to intersect the insertion path; is characterised in that each contact spring portion is formed in such a way that the contact surface is substantially parallel to the spring beam portion and substantially at right angles to the abutment surface such that when its abutment surface is engaged by the cam surface of the cam follower, the contact spring portion is deflected away from the board insertion path, relative to the spring beam part, prior to the spring beam part being deflected away from such path, the cam follower being arranged initially to apply a force to the abutment surface normally thereof, whereafter the line of action of the force is inclined in a direction away from the board insertion path, the contact spring portion returning under its own resilience, upon retraction of the cam follower, along such a path that the contact surface of the contact spring portion, after initially engaging the conductor of the inserted circuit board, wipes along the surface of such conductor.

Although there is described in US—A—2,811,700, a zero insertion force printed circuit edge connector, in which the terminals are arranged to wipe the inserted circuit board, the wiping action is effected by moving the circuit

board relative to the terminals after the terminals have been moved into contact with the conductors of the circuit board.

The present state of the art is also exemplified by US—A—3,899,234 and US—A—4,047,782.

For a better understanding of the invention an embodiment thereof will now be described by way of example with reference to the accompanying drawings, in which:—

Figure 1 is an enlarged perspective view of an electrical terminal for a zero insertion force circuit board edge electrical connector;

Figures 2 to 5 are enlarged cross-sectional views of a zero insertion force circuit board edge connector provided with terminals according to Figure 1, illustrating respective stages in the operation of the connector;

Figure 6 is an enlarged fragmentary cross-sectional view of the connector illustrating the action of parts thereof; and

Figure 7 is an enlarged diagrammatic elevational view of the terminal of Figure 1, with part omitted.

As best seen in Figures 1 and 7, an electrical terminal, 10 is in the form of a strip of sheet metal stock pre-milled for the provision of a reduced thickness hooked contact spring portion 12 at the upper (as seen in Figures 1 and 7) end of the terminal 10. The portion 12 has an abutment surface 14 and a contact surface 16. The portion 12 extends from a thicker spring portion 18 having an outwardly bowed part 20, a stacking boss 22 and a mounting shoulder 26 from which projects a connecting post portion 28. The end section is shown profiled to define eleven beam segments while the intermediate section is profiled to define five beam segments.

As best seen in Figure 7, the contact surface 16 extends substantially at right angles to the abutment surface 14 which is formed on a free end portion 14' of the portion 12. The free end of the portion 14' is directed inwardly towards the centre of a bight 15 of the portion 12, which bight is bowed oppositely to the part 20. At its lower (as seen in Figure 7) end the bight 15 adjoins the portion 18 and is connected at its opposite end to a first rectilinear part 17 of the portion 12, which part is in turn connected by a bight 19 to a second rectilinear part of the portion 12 which parts presents the contact surface 16. The part 17 is inclined with respect to the abutment surface 14 by approximately 20°. The bowed portion 20 and the bight 15 have approximately equal radii of curvature. That end part 29 of the portion 18, which comprises the boss 22 and the shoulder 26 constitutes a mounting part of the terminal 10, the remaining part 31 of the portion 18, constituting a spring beam.

The portions 12 and 18 comprise a multiplicity of beams which have sixteen axes of rotation, A to P (in Figure 7), eleven of which, A to K, are in the portion 12, being spaced peripherally thereof.

As shown in Figures 2 to 5, a zero insertion force circuit board edge connector 30 comprises an elongate insulating housing 32 having an

elongate, circuit board receiving opening 34 in the base 35 of which is formed a groove 36 communicating with the opening 34. An oblong, cross-section cam 38 in the groove 36 is rotatable to displace a channel shaped cam follower 40 having side walls 42 and 44, normally of the base 37 of the groove 36. Convex free edge cam surface 46 of the side walls 42 and 44 are engageable with the abutment surfaces 14 of the terminals 10 (two of which are shown) which are arranged in two rows one on each side of the opening 34 and are held in place frictionally in the housing 32 by means of the staking bosses 22, the shoulders 26 engaging the housing 32 to restrain axial displacement of the terminals upwardly (as seen in Figures 2 to 5).

In the angular position of the cam 38, shown in Figure 2, the cam follower 40 is in a retracted position, out of engagement with the surfaces 14, the outer faces of the side walls 42 and 44 of the cam follower 40 are, however engaged resiliently with the crests of the bowed portions 20 of the terminals 10, so that the terminals are pre-loaded, for a purpose explained below. As shown in Figure 2, the contact surfaces 16 of the terminals 10 intersect the path, indicated by an arrow X, of insertion of a circuit board 50 (Figures 4 and 5) into the opening 34. As shown in Figure 2, the surfaces 16 are parallel to one another and are also parallel to the direction of the path X.

The cam 38 is now rotated to the position in which it is shown in Figure 3 so that the cam follower 40 is advanced normally of the base 37 of the groove 36 so that the crest of each free edge surface 46 of the cam follower 40 applies to the abutment surface 14 of one of the terminals 10, a force Q (Figure 6), to rotate the portion 12 of the terminal 10 away from the path X, so that the contact surface 16 of the terminal is displaced therefrom as shown in Figure 3 and the bowed part 20 of the terminal is lifted from the cam follower 40. As will be apparent from that Figure, as well as from Figure 6 (in which the portions 12 are shown in full lines in their Figure 2 positions and in broken lines in their Figure 3 positions) that the portions 12 are rotated away from the path X, principally about their axes of rotation I, before the parts 31 of the portions 18 of the terminals 10 are swung away from one another about their bosses 22. This is because the forces Q are applied in the general direction of the lengths of the portions 18, until the portions 12 have been rotated to such an extent that the points of application of, and the lines of action of, the forces exerted by the surfaces 46 against the surfaces 14 alter so that such lines of action are inclined in a direction away from the path X, as will best be apparent from Figure 6.

With the cam 38 in the position of Figure 3, the circuit board 50 is inserted into the opening 34 so that its edge portion is received between the side walls 42 and 44 of the cam follower 40, and the cam 38 is rotated in an anticlockwise (as seen in Figure 4) sense to retract the cam follower 40 towards the position in which it is shown in

Figures 2 and 5. The terminals 10 are thereby released to engage conductors 52 on the board 50, the parts 20 re-engaging the cam follower 40. As will be apparent from a comparison of Figures 4 and 5 and also from Figure 6, the portions 12 of the terminals 10 perform a rotary movement as they return under their own resilience towards the path X. As will be apparent from Figures 4 and 5, however, the rotary movement is converted into a linear movement parallel to the path X as the contact surfaces 16 engage the conductors 52, so that the contact surfaces 16 wipe along the conductors 52, after having initially engaged them. The construction of the terminal 10 so that it comprises a multiplicity of relatively rotatable beams, as shown in Figure 7, provides it with the flexibility which enables this wiping movement to be achieved. However, the relative rotations of these beams are too slight to be satisfactorily represented in the drawings. Figure 5 shows the terminals in their rest position in engagement with the conductors 52. As shown in Figure 5, the parts 31 of the portions 18 of the terminals 10 have now been deflected away from the cam follower 40 by the action of the portions 12 against the board 50.

The preloading of the terminals 10 by the engagement of their bowed parts 20 against the cam follower 40, reduces the deflection of the terminals 10 needed to generate a minimum required contact force against a minimum thickness circuit board and to compensate for spring set of the terminals 10. The minimum board thickness as measured from the right hand, as seen in Figure 6, side of the opening 34 is indicated by the line R in Figure 6, the maximum board thickness being indicated by the line S.

In a practical application of the invention the length of wipe of the surfaces 16 along the conductors 52 may be, for example, of the order of 0.4 mm, for minimum thickness boards and of the order of 0.5 mm for maximum thickness boards.

The connector may comprise only one row of terminals for engaging only one side of a circuit board.

Claims

1. An electrical terminal for a zero insertion force connector, the terminal (10) which is in the form of a strip of resilient sheet metal stock, comprising a contact spring portion (12) at one end, a mounting part (29), and a spring beam part (31) intermediate the contact spring portion (12) and the mounting part (29), the contact spring portion (12) having a contact surface (16) and an abutment surface (14) to which a force (Q) can be applied lengthwise of the terminal (10) resiliently to deflect the spring beam part (31) and the contact spring portion (12) relative to the mounting part (29), when the mounting part (29) is fixedly positioned in a support (32); characterised in that the contact spring portion (12) is formed in such a way that the contact surface (16) is sub-

stantially parallel to the spring beam portion (18) and substantially at right angles to the abutment surface (14) such that upon the initial application of force (Q) to the abutment surface (14), in the lengthwise direction of the terminal (10), the contact spring portion (12) is deflected relative to the spring beam part (31) prior to the spring beam part (31) being deflected relative to the mounting part (29), whereby upon cessation of the force (Q), the contact spring portion (12) returns towards its initial position along such a return path that the contact surface (16) wipes along an electrical conductor (52) when such is positioned so as to intersect the return path of the contact surface (16).

2. A terminal according to Claim 1, characterised in that the contact spring portion (12) is in the form of a hook having an inwardly directed free end portion (14') the outer face of which constitutes the abutment surface (14), the contact surface (16) being constituted by an outer face of the hook adjacent to the abutment surface (14).

3. A terminal according to Claim 1 or 2, characterised in that the contact spring portion (12) is shaped so as to consist of a multiplicity of beams having axes of rotation (A to K) spaced peripherally of the contact spring portion (12).

4. A terminal according to Claim 3, characterised in that the axes of rotation (A to K) of the contact portion (12) are eleven in number, the spring beam part (31) having five such centres of rotation (L to R).

5. A terminal according to any one of the preceding claims, characterised by the metal stock being pre-milled so that the contact spring portion (12) is of reduced thickness.

6. A terminal according to any one of the preceding claims, characterised in that the spring beam part (31) has a bowed part (20) adjacent to the contact spring portion (12), the crest of the bowed part (20) being directed in the return direction of the spring beam part (31).

7. A zero insertion force circuit board edge electrical connector, comprising an insulating housing (32) having an elongate opening (34) for receiving a circuit board (50) along a board insertion path (X); at least one row of electrical terminals (10) positioned beside the opening (34) and extending in the longitudinal direction thereof, each terminal (10) having at one end a resilient contact spring portion (12) having an abutment surface (14), and a contact surface (16) for engaging a conductor (52) of the circuit board (50) when such has been inserted into the opening (34) along the insertion path (X), a mounting part (29) fixedly positioned in the housing (32) and a spring beam part (31) intermediate the contact spring portion (12) and the mounting part (29); and a cam follower (40) having a cam surface (46) for engaging the abutment surfaces (14) of the terminals (10), the cam follower (40) being displaceable by a cam (38) between a first position in which the cam surface (46) engages the abutment surfaces (14) of the terminals (10) to deflect the contact spring portions (12) and the spring beam

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stantially parallel to the spring beam portion (18) and substantially at right angles to the abutment surface (14) such that upon the initial application of force (Q) to the abutment surface (14), in the lengthwise direction of the terminal (10), the contact spring portion (12) is deflected relative to the spring beam part (31) prior to the spring beam part (31) being deflected relative to the mounting part (29), whereby upon cessation of the force (Q), the contact spring portion (12) returns towards its initial position along such a return path that the contact surface (16) wipes along an electrical conductor (52) when such is positioned so as to intersect the return path of the contact surface (16).

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parts (31) of the terminals (10) away from the insertion path (X) and a second position in which the cam follower (40) is retracted to allow the contact spring portions (12) to intersect the insertion path (X); characterised in that each contact spring portion (12) is formed in such a way that the contact surface (16) is substantially parallel to the spring beam portion (18) and substantially at right angles to the abutment surface (14) such that when its abutment surface (14) is engaged by the cam surface (46) of the cam follower (40), the contact spring portion (12) is deflected away from the board insertion path (X), relative to the spring beam part (31), prior to the spring beam part (31) being deflected away from such path (X), the cam follower (40) being arranged initially to apply a force (Q) to the abutment surface (14), normally thereof, whereafter the line of action of the force (Q) is inclined in a direction away from the board insertion path (X), the contact spring portion (12) returning under its own resilience, upon retraction of the cam follower (40), along such a path that the contact surface (16) of the contact spring portion (12), after initially engaging the conductor (52) of the inserted circuit board (50), wipes along the surface of such conductor (52).

8. A connector according to Claim 7, characterised in that the spring beam part (31) of each terminal (10) is provided with a projection (20) which resiliently engages the cam follower (40) in the second position thereof so as to preload the terminal (10).

Patentansprüche

1. Elektrischer Anschluß für einen Verbinder mit einer Einsetzkraft Null, wobei der Anschluß (10), der die Form eines Streifens aus federnd nachgiebigem Metallblech besitzt, einen Kontaktfederbereich (12) an einem Ende, einen Befestigungsteil (29) sowie einen Federarmteil (31) zwischen dem Kontaktfederbereich (12) und dem Befestigungsteil (29) aufweist, wobei der Kontaktfederbereich (12) eine Kontaktfläche (16) aufweist und eine Anlagefläche (14), auf die eine Kraft (Q) in Längsrichtung des Anschlusses (10) ausgeübt werden kann, um den Federarmteil (31) und den Kontaktfederbereich (12) relativ zu dem Befestigungsteil (29) zu verbiegen, wenn der Befestigungsteil (29) in einem Träger (32) fest positioniert ist, dadurch gekennzeichnet, daß der Kontaktfederbereich (12) derart ausgebildet ist, daß die Kontaktfläche (16) im wesentlichen parallel zu dem Federarmbereich (18) ist und im wesentlichen rechtwinkelig zu der Anlagefläche (14) verläuft, so daß nach der anfänglichen Ausübung der Kraft (Q) auf die Anlagefläche (14) in Längsrichtung des Anschlusses (10) der Kontaktfederbereich (12) relativ zu dem Federarmteil (31) verbogen wird, bevor der Federarmteil (31) relativ zu dem Befestigungsteil (29) verbogen wird, wodurch nach Beendigung der Ausübung der Kraft (Q) der Kontaktfederbereich (12) entlang eines derartigen Rückkehrweges in seine ursprüngliche Position zurückkehrt, daß sich die Kontaktfläche (16) wi-

schend an einem elektrischen Leiter (52) entlangbewegt, wenn ein solcher derart positioniert ist, daß er den Rückkehrweg der Kontaktfläche (16) schneidet.

2. Anschluß nach Anspruch 1, dadurch gekennzeichnet, daß der Kontaktfederbereich (12) die Form eines Hakens aufweist, der einen nach innen gerichteten freien Endbereich (14') besitzt, dessen außenliegende Fläche die Anlagefläche (14) bildet, und daß die Kontaktfläche (16) durch eine an die Anlagefläche (14) angrenzende außenliegende Fläche des Hakens gebildet ist.

3. Anschluß nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß der Kontaktfederbereich (12) derart geformt ist, daß er aus einer Vielzahl von Armen besteht, die Drehachsen (A bis K) aufweisen, die umfangsmäßig über den Kontaktfederbereich (12) beabstandet sind.

4. Anschluß nach Anspruch 3, dadurch gekennzeichnet, daß die Anzahl der Drehachsen (A bis K) des Kontaktbereichs (12) elf beträgt und der Federarmteil (31) fünf solche Drehachsen (L bis P) aufweist.

5. Anschluß nach einem der vorausgehenden Ansprüche, dadurch gekennzeichnet, daß das Metallblech vorbearbeitet ist, so daß der Kontaktfederbereich (12) eine reduzierte Dicke aufweist.

6. Anschluß nach einem der vorausgehenden Ansprüche, dadurch gekennzeichnet, daß der Federarmteil (31) einen an den Kontaktfederbereich (12) angrenzenden gebogenen Teil (20) aufweist, wobei der Scheitel des gebogenen Teils (20) in die Rückkehrrichtung des Federarmteils (31) weist.

7. Elektrischer Schaltungsplattenrandverbinder mit einer Einsetzkraft Null,

mit einem Isoliergehäuse (32), das eine längliche Öffnung (34) zur Aufnahme einer Schaltungsplatte (50) entlang einer Platteneinführungsbahn (X) aufweist,

mit wenigstens einer Reihe elektrischer Anschlüsse (10), die neben der Öffnung (34) positioniert sind und sich in Längsrichtung derselben erstrecken, wobei jeder Anschluß (10) an einem Ende einen federnd nachgiebigen Kontaktfederbereich (12) mit einer Anlagefläche (14) und einer Kontaktfläche (16) zum Angreifen an einem Leiter (52) der Schaltungsplatte (50), wenn eine solche längs der Einführungsbahn (X) in die Öffnung (34) eingesetzt ist, sowie einen fest in dem Gehäuse (32) positionierten Befestigungsteil (29) und einen Federarmteil (31) zwischen dem Kontaktfederbereich (12) und dem Befestigungsteil (29) aufweist, und

mit einem Steuerflächenfolgeglied (40), das eine Steuerfläche (46) zum Angreifen an den Anlagenflächen (14) der Anschlüsse (10) aufweist, wobei das Steuerflächenfolgeglied (40) durch ein Steuerflächenglied (38) zwischen einer ersten Position, in der die Steuerfläche (46) an den Anlagenflächen (14) der Anschlüsse (10) angreift, um die Kontaktfederbereiche (12) und die Federarmteile (31) der Anschlüsse (10) von der Einführungsbahn (X) weg zu biegen, und einer zweiten Position, in der das Steuerflächenfolgeglied (40) zurückbewegt



ist, so daß die Kontaktfederbereiche (12) die Einführbahn (X) schneiden können, verschiebbar ist; dadurch gekennzeichnet,

daß jeder Kontaktfederbereich (12) derart ausgebildet ist, daß die Kontaktfläche (16) im wesentlichen parallel zu dem Federarmbereich (18) ist und im wesentlichen rechtwinklig zu der Anlagefläche (14) verläuft, so daß dann, wenn die Steuerfläche (46) des Steuerflächengliedes (40) an seiner Anlagefläche (14) angreift, der Kontaktfederbereich (12) von der Platteneinführbahn (X) weg relativ zu dem Federarmteil (31) verbogen wird, bevor der Federarmteil (31) von dieser Bahn (X) weg gebogen wird, wobei das Steuerflächenglied (40) derart angeordnet ist, daß es anfangs eine Kraft (Q) senkrecht auf die Anlagefläche (14) ausübt, wonach sich die Wirkungslinie der Kraft (Q) in Richtung von der Platteneinführbahn (X) weg neigt, und wobei der Kontaktfederbereich (12) nach der Zurückbewegung des Steuerflächenfolgliedes (40) unter seiner eigenen Federkraft entlang einer derartigen Bahn zurückkehrt, daß die Kontaktfläche (16) des Kontaktfederbereichs (12) nach anflänglichem Anliegen an dem Leiter (52) der eingesetzten Schaltungsplatte (50), sich wischend über die Oberfläche eines solchen Leiters (52) bewegt.

8. Verbinder nach Anspruch 7, dadurch gekennzeichnet, daß der Federarmteil (31) jedes Anschlusses (10) mit einem Vorsprung (20) ausgestattet ist, der in federnd nachgiebiger Weise an dem Steuerflächenfolglied (40) in der zweiten Position desselben angreift, um den Anschluß (10) vorzuspannen.

Revendications

1. Borne électrique destinée à un connecteur à force d'insertion nulle, la borne (10) qui se présente sous la forme d'une lame en tôle élastique, comprenant une partie flexible (12) de contact à une extrémité, une partie (29) de montage et une partie à poutre flexible (31) située entre la partie flexible (12) de contact et la partie (29) de montage, la partie flexible (12) de contact présentant une surface de contact (16) et une surface de butée (14) à laquelle une force (Q) peut être appliquée longitudinalement à la borne (10) pour déplacer élastiquement la partie à poutre flexible (31) et la partie flexible (12) de contact par rapport à la partie (29) de montage lorsque celle-ci est positionnée fixement dans un support (32); caractérisée en ce que la partie flexible (12) de contact est formée d'une manière telle que la surface (16) de contact est sensiblement parallèle à la partie à poutre flexible (18) et est sensiblement perpendiculaire à la surface de butée (14) afin que, à la suite de l'application initiale de la force (Q) à la surface (14) de butée, dans la direction longitudinale de la borne (10), la partie flexible (12) de contact soit déplacée par rapport à la partie à poutre flexible (31) avant que celle-ci soit déplacée par rapport à la partie (29) de montage, de manière que, une fois que la force (Q) n'est plus appliquée, la partie flexible (12) de contact re-

vienne vers sa position initiale suivant un trajet de retour tel que la surface (16) de contact frotte le long d'un conducteur électrique (52) lorsque celui-ci est disposé de façon à couper le trajet de retour de la surface (16) de contact.

2. Borne selon la revendication 1, caractérisée en ce que la partie flexible (12) de contact se présente sous la forme d'un crochet comportant une partie extrême libre (14') dirigée vers l'intérieur, dont la face extérieure constitue la surface (14) de butée, la surface (16) de contact étant constituée par une face extérieure du crochet adjacente à la surface (14) de butée.

3. Borne selon la revendication 1 ou 2, caractérisée en ce que la partie flexible (12) de contact est configurée de façon à constituer un grand nombre de poutres ayant des axes de rotation (A à K) espacés à la périphérie de la partie flexible (12) de contact.

4. Borne selon la revendication 3, caractérisée en ce que les axes de rotation (A à K) de la partie (12) de contact sont au nombre de onze, la partie à poutre flexible (31) comportant cinq de ces centres de rotation (L à P).

5. Borne selon l'une quelconque des revendications précédentes, caractérisée en ce que la tôle est préalablement fraisée afin que la partie flexible (12) de contact soit d'épaisseur réduite.

6. Borne selon l'une quelconque des revendications précédentes, caractérisée en ce que la partie à poutre flexible (31) comporte une partie bombée (20) adjacente à la partie flexible (12) de contact, la crête de la partie bombée (20) étant dirigée dans la direction du retour de la partie à poutre flexible (31).

7. Connecteur électrique pour bord de plaquette à circuit, à force d'insertion nulle, comprenant un boîtier isolant (32) présentant une ouverture allongée (34) destinée à recevoir une plaquette (50) à circuit suivant un axe (X) d'insertion de plaquette; au moins une rangée de bornes électriques (10) disposées à côté de l'ouverture (34) et s'étendant dans sa direction longitudinale, chaque borne (16) comportant, à une extrémité, une partie flexible et élastique (12) de contact présentant une surface (14) de butée, et une surface (16) de contact destinée à porter contre un conducteur (52) de la plaquette (50) à circuit lorsque celle-ci a été insérée dans l'ouverture (34) suivant le trajet d'insertion (X), une partie (29) de montage positionnée fixement dans le boîtier (32) et une partie à poutre flexible (31) située entre la partie flexible (12) de contact et la partie (29) de montage; et un suiveur de came (40) présentant une surface de came (46) destinée à porter contre les surfaces (14) de butée des bornes (10), le suiveur de came (40) pouvant être déplacé par une came (38) entre une première position dans laquelle la surface de came (46) porte contre les surfaces de butée (14) des bornes (10) afin d'écarter du trajet d'insertion (X) les parties flexibles (12) de contact et les parties (31) à poutre flexible des bornes (10), et une seconde position dans laquelle le suiveur de came (40) est rétracté pour permettre aux parties flexibles (12) de contact de couper le trajet d'in-



sertion (X); caractérisé en ce que chaque partie flexible (12) de contact est formée d'une manière telle que la surface (16) de contact est sensiblement parallèle à la partie (18) à poutre flexible et est sensiblement perpendiculaire à la surface de butée (14) afin que, lorsque la surface de came (46) du suiveur de came (40) porte contre la surface de butée (14), la partie flexible (12) de contact soit écartée du trajet (X) d'insertion de la plaquette, par rapport à la partie à poutre flexible (31), avant que cette dernière soit écartée de ce trajet (X), le suiveur de came (40) étant disposé pour appliquer initialement une force (Q) à la surface de butée (14), perpendiculairement à elle, après quoi, la ligne d'action de la force (Q) est

inclinée dans une direction s'éloignant du trajet (X) d'insertion de la plaquette, la partie flexible (12) de contact revenant, sous l'effet de sa propre élasticité, à la suite du retrait du suiveur de came (40), suivant un trajet tel que la surface de contact (16) de la partie flexible (12) de contact, après avoir porté initialement contre le conducteur (52) de la plaquette (50) à circuit insérée, frotte le long de la surface de ce conducteur (52).

8. Connecteur selon la revendication 7, caractérisé en ce que la partie à poutre flexible (31) de chaque borne (10) comporte une saillie (20) qui porte élastiquement contre le suiveur de came (40) dans sa seconde position afin de précharger la borne (10).

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