

Description

The present invention relates to an electrical contact pin for mounting in a hole of an electrical component such as a printed circuit board, said pin comprising a longitudinal contact section which interacts with the hole when inserted therein, said contact section, being of generally H-shape in cross-section formed by four projecting fins extending generally parallel to the longitudinal axis of the pin and interconnected by a central crossbar along the length of the contact section, said fins and crossbar defining two longitudinal recesses disposed on both sides of the crossbar. A contact pin of this type is described in U.S. Patent 3 827 004 granted July 30, 1984 and assigned to the same assignee as the present application.

In the case of the contact pin disclosed in U.S. Patent 3 827 004, the four fins are gradually bent inwards when the pin is introduced into the hole in the printed circuit board so that the contact section is fixed at four points in the hole. The H-shaped construction reduces or eliminates the risk of rotating the pin during mounting. As a result, square pins of the type used on a large scale in the printed circuit board industry can then be used. The pairs of fins situated on both sides of the transverse section of the H-shaped contact section project perpendicularly from the said transverse section of the pin. In the introduction and final fixing of the contact section of the pin in the respective hole it is of the greatest importance that the projecting fins are constructed absolutely symmetrically and have the same thickness so that during the insertion movement into the hole all four are bent uniformly and grip the metallization in the hole. Even with very small differences in the thickness, and consequently in the stiffness, of the projecting fins, a different force acting on each fin will consequently occur on introducing the contact section into the hole. Rotation or eccentric positioning of the pin will result. This may cause serious damage to the metallization in the hole and even positioning of the pin becomes very difficult.

In practice these pins are almost always made from square wire or flat tape material, the recesses of the contact section being formed by stamping technology and the fins being forced outwards or extruded.

As a result of the flat floor on either side of the crossbar of the H-shaped contact section and the dies used for this purpose, the recesses are not completely centered and symmetrically formed in the stamping operation. As a result of the "floating" of the stamping operation, a truly absolute centering of the resultant recess is not obtained. Consequently, the fins obtained on both sides of the recess are virtually never of truly equal thickness or height. On introducing a contact section of this type into the hole of the printed circuit board, an unequal distribution of force occurs and one fin will bend earlier as a result of the lesser thickness, which in turn may cause the pin to rotate. This may damage the metallization more than is minimally acceptable

and even positioning of the pin may become impossible.

A further problem is that, due to the sharp angles which the fins make with the flat floor of the crossbar section of the H-shaped contact section, bending and or even cracking easily occurs in these angles during the insertion movement.

A different version of such an H-shaped pin is described in U.S. Patent 4 469 394 granted September 4, 1984, and also assigned to the same assignee as the present invention. The contact pin described in the patent has a serrated floor in order to better control the height of the fins. The extension which occurs during the deformations was found to be a disadvantage. It was possible to solve this partially by using this serrated floor, but not as yet with the desired result in relation to the desired symmetry.

Another electrical contact pin for mounting in a hole in a pc-board is described in EP-A 59 462. This known contact pin generally has a M-shape and in a variant thereof a H-shape of which the crossbar in its whole has a V-form. This crossbar is of thin construction and advantageously is elastically and plastically deformable. As a result of this deformability of the thin crossbar the fins on both sides of the crossbar which have a less elastical deformability, can easily grip into the exterior thin layer on the hole wall. This is in contradistinction with the contact pin of the invention, of which the crossbar is relatively thick and is constructed with two slightly V-shaped floors during the construction. This is then in order to provide the projecting fins to be absolutely symmetrical such that they have the same thickness whereby the insertion movement in the hole all four fins are bent uniformly gripping thereby the metallization in the hole. Said slightly V-shaped floors in the crossbar are formed by two corresponding knife-shaped dies during the stamping operation as a precentering for the more deeply penetrating stamping operation for the longitudinal recess. Thereby the fins produced in the process on both sides of the recess have the same height and thickness.

SUMMARY OF THE INVENTION

The electrical contact pin of the present invention solves the above problems by the measures as indicated in the characterizing clause of the main claim. In said contact section an absolutely symmetrical recess is obtained after manufacture of the material of the projecting fins on both sides of the recess having equal thickness.

In the contact pin according to the present invention, each longitudinal recess has a V-shaped floor in the crossbar, which is formed first by means of corresponding knife-shaped dies during the forming of the longitudinal recesses and, as precentering for the more deeply penetrating stamping operation for the longitudinal recess, provides for a symmetrical execution thereof. The fins produced in the process on both sides of the recess acquire the same height and thickness and that the transition

from the V-shaped floor to the fins on both sides of the recess is rounded off.

The invention will be explained in more detail on the basis of an exemplary embodiment with reference to the drawings in which the same components are indicated in the different figures by the same reference numerals, and in which:

Figure 1 is a perspective view of the contact section of a contact pin according to the invention;

Figure 2a and Figure 2b are, respectively, cross-sectional views of the contact section of Figure 1 and of a prior art contact pin;

Figures 2c-2f show cross-sections of individual embodiment versions of contact pins according to the invention;

Figure 3 is a plan view of a number of contact pins made from tape material which are still attached to the strip of tape; and

Figure 4 is a side view of a contact pin from Figure 3.

In Figure 1 the contact section is in general indicated by 1, the recess on one side of the contact section by 2, the two fins on both sides of the recess by 3 and 4, and the gradually decreasing transition, inclined inwards, from the fins to the remaining section of the pin by 7. In Figure 2a, the cross-sectional view (of Figure 1) is shown with V-shaped floor 5 in recess 2 and with the rounded-off angle 6 between the V-shaped floor and each projecting fin added. For comparison, in Figure 2b, a cross-sectional view is shown on the contact section of a prior art pin. The flat floor of the recess and the right angle between this floor and each projecting fin are clearly evident. In the prior pin, two V-shaped depressions are made on the side walls in order to be able to influence the height of the fins.

From the views in Figure 1 and 2a, the V-shaped floor is clearly evident in the crossbar of the H-shape in the recesses situated opposite each other in the contact section of the pin. During manufacture, this results in an exceptionally reliable and symmetrical stamping operation, as a result of which the recess is stamped out completely symmetrically in the contact section. As a result, the two projecting fins on both sides of the recess are of absolutely equal thickness. In other words, as a result of the V-form of the two dies situated opposite each other during stamping operation a tracking effect is obtained during the stamping operation with an absolutely reliable centering of the recess as a result. This is in contrast to the prior art, such as shown in Figure 2b, in which, as a result of the flat floor, a "floating" is encountered during the stamping operation with which results in an imprecise centering of the recess as a result and consequently an unequal thickness of the two projecting fins.

In Figures 1 and 2a, the rounding off between the projecting fins and the V-shaped floor is also clearly visible. As a result of this rounded-off transition, a stiffening of the initial section of the projecting fin is achieved. Bending or cracking is thereby avoided during the introduction of the contact section into the hole in the printed circuit board.

As a result of the exceptionally reliable centering of the forming of the recess, it is now possible to manufacture the contact pins from tape material which is per se substantially softer and better to work, in contrast to the state of the art in which the contact pins were principally made from square wire or hard drawn wire material.

Figures 2c-2f show cross-sections of embodiment variations of contact pins according to the invention. The essential point in each of these embodiment variations is the V-shaped floor. In Figure 2c, this forms a part of the crossbar. In Figure 2d, the parts between the rounded-off angle 6 and the V-shaped bottom are bent in a circular manner. In Figure 2e there is a short straight part in the V-shaped floor, while in Figure 2f the parts between the rounded-off angle 6 and the V-shaped floor 5 are straight.

Figure 3 shows a plan view of three contact pins punched out of a strip of tape. Figure 4 illustrates a side view of a contact pin from Figure 3. Owing to the gradually increasing and inwardly inclined transition 7 from the straight pin section to the contact section 2, a smooth introduction of the contact pin into a metallized hole in a printed circuit board is obtained without damage to the metallization therein.

In certain circumstances a number of contact pins can be introduced simultaneously into the corresponding holes of the printed circuit board, the contact pins only being broken off the main strip of tape after the insertion of the contact pins. If required, the operation of soldering the contact sections of each contact pin in the respective hole in the printed circuit board may follow.

Claims

1. An electrical contact pin for mounting in a hole of an electrical component such as a printed circuit board, said pin comprising a longitudinal contact section (1) which interacts with the hole when inserted therein, said contact section being of generally H-shape in cross-section formed by four projecting fins (3, 4) extending generally parallel to the longitudinal axis of the pin and interconnected by a central crossbar along the length of the contact section, said fins and crossbar defining two longitudinal recesses (2) disposed on both sides of the crossbar, characterized in that each longitudinal recess (2) has a V-shaped floor (5), that the fins (3, 4) on both sides of each longitudinal recess are of the same height and thickness, and that the transition (6) from the V-shaped floor (5) to the fins (3, 4) on both sides of each recess (2) is rounded.

2. An electrical contact pin according to claim 1, wherein the height of the pin is substantially the same over the length of the contact section (1), the height decreasing gradually only near the ends of the contact section into a transition section from the contact section to the remainder of the pin, wherein said transition section is also inwardly inclined (7) to provide a centered and smooth introduction of the pin into the hole.

3. A process for making the electrical contact pin according to claims 1 and 2, wherein the contact pin

from the V-shaped floor to the fins on both sides of the recess is rounded off.

The invention will be explained in more detail on the basis of an exemplary embodiment with reference to the drawings in which the same components are indicated in the different figures by the same reference numerals, and in which:

Figure 1 is a perspective view of the contact section of a contact pin according to the invention;

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Figures 2c-2f show cross-sections of individual embodiment versions of contact pins according to the invention;

Figure 3 is a plan view of a number of contact pins made from tape material which are still attached to the strip of tape; and

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From the views in Figure 1 and 2a, the V-shaped floor is clearly evident in the crossbar of the H-shape in the recesses situated opposite each other in the contact section of the pin. During manufacture, this results in an exceptionally reliable and symmetrical stamping operation, as a result of which the recess is stamped out completely symmetrically in the contact section. As a result, the two projecting fins on both sides of the recess are of absolutely equal thickness. In other words, as a result of the V-form of the two dies situated opposite each other during stamping operation a tracking effect is obtained during the stamping operation with an absolutely reliable centering of the recess as a result. This is in contrast to the prior art, such as shown in Figure 2b, in which, as a result of the flat floor, a "floating" is encountered during the stamping operation with which results in an imprecise centering of the recess as a result and consequently an unequal thickness of the two projecting fins.

In Figures 1 and 2a, the rounding off between the projecting fins and the V-shaped floor is also clearly visible. As a result of this rounded-off transition, a stiffening of the initial section of the projecting fin is achieved. Bending or cracking is thereby avoided during the introduction of the contact section into the hole in the printed circuit board.

As a result of the exceptionally reliable centering of the forming of the recess, it is now possible to manufacture the contact pins from tape material which is per se substantially softer and better to work, in contrast to the state of the art in which the contact pins were principally made from square wire or hard drawn wire material.

Figures 2c-2f show cross-sections of embodiment variations of contact pins according to the invention. The essential point in each of these embodiment variations is the V-shaped floor. In Figure 2c, this forms a part of the crossbar. In Figure 2d, the parts between the rounded-off angle 6 and the V-shaped bottom are bent in a circular manner. In Figure 2e there is a short straight part in the V-shaped floor, while in Figure 2f the parts between the rounded-off angle 6 and the V-shaped floor 5 are straight.

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In certain circumstances a number of contact pins can be introduced simultaneously into the corresponding holes of the printed circuit board, the contact pins only being broken off the main strip of tape after the insertion of the contact pins. If required, the operation of soldering the contact sections of each contact pin in the respective hole in the printed circuit board may follow.

Claims

1. An electrical contact pin for mounting in a hole of an electrical component such as a printed circuit board, said pin comprising a longitudinal contact section (1) which interacts with the hole when inserted therein, said contact section being of generally H-shape in cross-section formed by four projecting fins (3, 4) extending generally parallel to the longitudinal axis of the pin and interconnected by a central crossbar along the length of the contact section, said fins and crossbar defining two longitudinal recesses (2) disposed on both sides of the crossbar, characterized in that each longitudinal recess (2) has a V-shaped floor (5), that the fins (3, 4) on both sides of each longitudinal recess are of the same height and thickness, and that the transition (6) from the V-shaped floor (5) to the fins (3, 4) on both sides of each recess (2) is rounded.

2. An electrical contact pin according to claim 1, wherein the height of the pin is substantially the same over the length of the contact section (1), the height decreasing gradually only near the ends of the contact section into a transition section from the contact section to the remainder of the pin, wherein said transition section is also inwardly inclined (7) to provide a centered and smooth introduction of the pin into the hole.

3. A process for making the electrical contact pin according to claims 1 and 2, wherein the contact pin



is formed by a stamping operation using dies for the forming of the longitudinal recesses, and the V-shaped floor (5) on both sides of the crossbar are formed by means of the two corresponding knife-shaped dies, which V-shape provides a precentering for a more deeply penetrating stamping action to form the longitudinal recesses (2), thereby resulting in symmetrical fins (3, 4) of the same height and thickness on each side of the recess.

Patentansprüche

1. Elektrischer Kontaktstift zum Anbringen in einer Öffnung eines elektrischen Bauteils, wie einer gedruckten Schaltungsplatte, wobei der Stift einen Längskontaktabschnitt (1) aufweist, der mit der Öffnung zusammenarbeitet, wenn dieser dort eingeführt ist, wobei der Kontaktabschnitt eine im allgemeinen H-förmige Gestalt im Querschnitt hat, die von vier vorspringenden Rippen (3, 4) gebildet wird, die im allgemeinen parallel zur Längsachse des Stifts verlaufen und untereinander über ein zentrales Quertell längs der Länge des Kontaktabschnitts verbunden sind, und wobei die Rippen und das Quertell zwei Längsausnehmungen (2) bilden, die auf beiden Seiten des Quertells angeordnet sind, dadurch gekennzeichnet, daß jede Längsausnehmung (2) einen V-förmigen Boden (5) hat, daß die Rippen (3, 4) auf beiden Seiten jeder Längsausnehmung die gleiche Höhe und Dicke haben und daß der Übergang (6) von dem V-förmigen Boden (5) zu den Rippen (3, 4) auf beiden Seiten jeder Ausnehmung abgerundet ist.

2. Elektrischer Kontaktstift nach Anspruch 1, bei dem die Höhe des Stifts über die Länge des Kontaktabschnitts (1) im wesentlichen gleich ist, die Höhe allmählich nur in der Länge der Enden des Kontaktabschnitts zu einem Übergangsabschnitt von dem Kontaktabschnitt zu dem restlichen Teil des Stifts abnimmt und bei dem der Übergangsabschnitt ebenfalls nach innen geneigt (7) ist, um eine zentrierte und gleichmäßige Einführung des Stifts in die Öffnung zu ermöglichen.

3. Verfahren zum Herstellen des elektrischen Kontaktstifts nach Anspruch 1 und 2, bei dem der Kontaktstift durch eine Stanzbearbeitung unter Verwendung von Werkzeugen zur Ausbildung der Längsausnehmungen gebildet wird, und bei dem der V-förmige Boden (5) auf beiden Seiten des Quertells mit Hilfe von zwei zugeordneten, messerförmigen Werkzeugen gebildet wird, wobei die V-förmige Gestalt eine Vorzentrierung für ein tieferes Eindringen bei der Stanzbearbeitung ermöglicht, um die Längsausnehmungen (2) auszubilden, wodurch sich symmetrische Rippen (3, 4) mit derselben Höhe und Dicke auf jeder Seite der Ausnehmung ergeben.

Revendications

1. Une broche de contact électrique pour être montée dans un trou d'un composant électrique telle qu'une carte de circuit imprimé, ladite broche comportant une section de contact longitudinale (1) qui interagit avec le trou lorsqu'elle y est insérée, ladite section de contact ayant une section droite généra-

lement en forme de H et formée par quatre ailettes en saillie (3, 4) s'étendant dans une direction généralement parallèle à l'axe longitudinale de la broche et interconnectées par une entretoise centrale sur la longueur de la section de contact, lesdites ailettes et entretoise délimitant deux évidements longitudinaux (2) disposés des deux côtés de l'entretoise, caractérisée en ce que chaque évidement longitudinal (2) a une paroi (5) en forme de V, les ailettes (3, 4) des deux côtés de chaque évidement longitudinal ayant la même hauteur et la même épaisseur, et en ce que la transition (6) depuis la paroi (5) en forme de V jusqu'aux ailettes (3, 4) des deux côtés de chaque évidement (23) est arrondie.

2. Une broche de contact électrique suivant la revendication 1, dans laquelle la hauteur de la broche est sensiblement la même sur toute la longueur de la section de contact (1), la hauteur de décroissant graduellement qu'au voisinage des extrémités de la section de contact dans une section de transition depuis la section de contact vers le restant de la broche, dans laquelle ladite section de transition (7) est aussi inclinée vers l'intérieur pour permettre une introduction centrée et douce de la broche dans le trou.

3. Un procédé de fabrication de la broche de contact électrique selon les revendications 1 et 2, suivant lequel la broche de contact est formée par une opération de matriçage qui utilise des matrices pour le formage des évidements longitudinaux, et où les parois en forme de V (5) des deux côtés de l'entretoise sont formées au moyen des deux matrices en forme de couteau, ladite forme en V permettant d'obtenir un pré-centrage en vue d'un effort de matriçage pour une pénétration plus profonde afin de former les évidements longitudinaux (2) ce qui permet d'obtenir des ailettes (3, 4) symétriques de même hauteur et de même épaisseur de chaque côté de l'évidement.

