

Description

Background of the invention

The present invention relates to a method of mounting flat contact elements on a substrate. The invention furthermore relates to such a substrate provided with said flat contact elements.

In the electronics industry, much use is being made at the present time of substrates on which components connected by strips conductors are mounted. These components are often mounted on the substrates by a relatively new technique known as surface mounting. This technique uses sophisticated pick-up and positioning machines by which the components are mounted on the substrates made of plastics or ceramic boards.

From US-A-4081601 a substrate is known having components and strip connectors on one surface to form a plurality of separate contacting fingers or surfaces. A contact element or overlay is bonded on each of said contacting surfaces along the edge of said substrate. Said overlay has a composite structure consisting of various layers. Onto the copper base layer of said contact finger a solder layer is applied. First a bimetallic strip is produced respectively consisting of a copper and nickel layer. Then a solder layer is applied to the open surface of the copper layer and thereafter the nickel layer is gold-plated with the preferred thickness of gold. The resulting strip is slit into narrow ribbons from which the total overlays or contact elements are stamped and attached to the finger.

It often happens in practice that these substrates carrying components connected by strips conductors must be able to function as interchangeable units. The substrates therefore have plug-in edges which are provided with contact surfaces. Preferably, these contact surfaces should be gripped by an edge connector with the smallest possible spring or clamp force. Otherwise, rapid wear may occur or excessive force will be required to make the plug-in connection.

Summary of the invention

The present invention solves the problems mentioned above by providing a method by which it is possible to mount noble metal plated contact elements on a plug-in edge of a substrate in such a manner that very little spring and clamp force is required to enable them to be gripped by an edge connector. The invention also thereby provides a substrate with such refined contact elements.

The method of mounting and the substrate of the present invention are reflected by the measures as indicated in claims 1 and 6.

For holding the components, mentioned in the

introduction, in place for further processing, a solder paste mixed with adhesive is used. Alternatively, the adhesive and the solder paste may be applied separately in the form of two separate substances. To achieve secure fastening, infrared radiation is then applied in such a manner that the resulting induced heat melts the solder particles in the adhesive, thus bringing about an electrical connection between component and substrate.

Instead of heat inducted by infrared radiation, it is also possible to use other heat sources. One can use, for example, the heat of evaporation of a liquid suitable for the purpose, such as an inert fluorinated compound, which has a high evaporation temperature of, for example, 210°C. The resulting layer of heat of evaporation directly above the boiling liquid is used to solder the aforesaid components and/or contact elements to the appropriate adhesive surfaces on the substrates. The components and contact elements intended for this purpose, which have to be soldered to these soldering or adhesive surfaces, are all obviously resistant to high temperatures.

Since both the components and the noble metal plated contact elements are soldered in one process run to the appropriate adhesive surfaces with the aid of heat from infrared radiation or heat of the aforesaid evaporation method, a controlled edge contact element will be obtained. Since the contact element has a relatively low weight, the surface tension of the solder flux, e.g. resin or tin, at the bottom side will have a predominant action in the soldering process. The contact element or tag will thus center itself, with a resultant equilibrium of forces, during this fastening. Moreover, the contact element includes a bent inserting edge, which engages the substrate edge and through which a self-centering action, directed away from the substrate edge, comes about resulting from the surface tension of the solder flux.

Not according to the present invention, the prefabricated contact elements and also the other components for the substrate are fed in a carrier band to the substrate units, which are likewise moved along on a carrier band. With the aid of a sophisticated pick-up and positioning machine, the contact element is taken from the band and then placed on the appropriate soldering surface on the substrate. The substrate is then moved into an infrared radiation area or into the layer of the heat of evaporation of the liquid boiling beneath it.

Brief description of the drawings

The invention will be further explained with the aid of a preferred embodiment and with reference to the drawings, in which:

Figure 1 is a cross-sectional view of a substrate

provided on its edge with contact elements and of an edge connector lying opposite it;

Figure 2 is a view in perspective of the manner in which a pick-up and positioning machine picks up a contact element and places it on a substrate for which it is intended;

Figure 3 is a view in perspective on a larger scale of a part of the band carrying elements;

Figure 4 is a view in perspective on a larger scale of a part of the plug-in edge of the substrate shown in figure 2; and

Figures 5a, b and c are a cross-sectional view, a front view and a plan view respectively of a contact element on a soldering surface of a substrate.

Description of a preferred embodiment

Figure 1 is a cross-sectional view of a substrate 1 which is provided with contact elements 2, each having a bent inserting side 13, and which cooperates with a corresponding edge connector 3. In practice, the engagement between the edge connector 3 and the substrate 1 must be made with the least possible clamp or spring force in order to avoid wear and unnecessary plug-in force, while still achieving an excellent electrical connection.

Figure 2 shows a view in perspective of the manner in which a pick-up and positioning machine 4 picks up a contact element 2 from a band 6, which runs over a roller 11. Prefabricated contact elements 2 are embedded in band 6 at regular intervals. A protective band 7 is unwound from band 6 by means of a roller 12, so that the contact elements 2 are exposed. The pick-up and positioning machine 4 then picks up and places each contact element 2 on an adhesive or soldering surface 10 near the edge of the substrate 1.

As can be seen in figure 3, each of the contact elements 2 embedded in band 6 consists of a small, tight tag, which has a bent inserting side 13. Each contact element 2 is plated with a noble metal, f.i. gold plated, on its contact or upper side 8 and is activated at its bottom side 9, f.i. tin plated, etched, or provided with a solder flux.

As shown in figure 4, a solder paste mixed with adhesive is applied onto the soldering or adhesive surfaces 10 along the edge of substrate 1. Alternatively, the solder and adhesive may be applied separately on each adhesive surface 10. It is also possible for the above-noted components to be placed on the substrate 1 by means of another or the same pick-up and positioning machine.

The substrate 1 is then subjected to infrared radiation or it is passed along the layer of heat of evaporation of a liquid boiling underneath it. Since the weight of the contact element 2 is very slight,

the surface tension of the liquid tin on the bottom side 9 of the contact element is predominant. The contact element, therefore, will have a self-centering action during soldering. The bent inserting side 13, which engages the substrate edge, plays an important role as indicated in figure 5.

Figures 5a, 5b and 5c give a cross-sectional view, a front view and a plan view respectively of a contact element 2 having a bent inserting side 13 on a soldering pad 10 of the substrate 1. When soldering in reflow (heat of evaporation or radiation) the contact element floats on the liquid solder, f.i. tin. As a result of the surface tension of the liquid solder, the forces F1, F2, F3, F4 come about. Thereby a centering force component, directed away from the substrate edge, develops which component urges the bent inserting side 13 against the substrate edge and which centers the contact element 2 onto the soldering pad 10. The numeral 14 indicates a portion of the solder joint.

It should be understood that above is but a preferred embodiment of the present invention and that various changes may be made without departing from the scope of this invention.

Claims

1. A method of mounting flat contact elements (2) on a substrate (1) which includes strip connectors embedded therein to form a plurality of separate contacting surfaces, whereby a prefabricated contact element is placed on each of said contacting surfaces, each said contact element having a top surface (8), which is plated with a noble metal, and a bottom surface (9) to be bonded to a contacting surface (10), and whereby heat is applied to realize said bonding, wherein, preceding the said bonding, solder paste and an adhesive is applied on each said contacting surface being located at the edge of the substrate for plug-in connection, and that each said contact element on its bottom surface is activated, e.g. tin plated, that each said contact element comprises a bent inserting edge (13) engaging the substrate edge and has low weight so that forces acting on the contact element as a result of surface tension of the solder paste, causes a self-centering action, urging the bent inserting edge against the substrate edge.
2. A method according to claim 1, wherein the solder and adhesive are mixed together before being applied to each contacting surface.
3. A method according to claim 1, wherein the solder and adhesive are applied separately to each contacting surface.



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Figure 2 is a view in perspective of the manner in which a pick-up and positioning machine picks up a contact element and places it on a substrate for which it is intended;

Figure 3 is a view in perspective on a larger scale of a part of the band carrying elements;

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2. A method according to claim 1, wherein the solder and adhesive are mixed together before being applied to each contacting surface.
3. A method according to claim 1, wherein the solder and adhesive are applied separately to each contacting surface.



A method according to claim 1, wherein the heat applied is obtained by subjecting the substrate to infrared radiation.

5. A method according to claim 1, wherein the heat applied is obtained by passing the substrate over a boiling liquid, such as an inert fluorinated compound, which provides a layer of heat of evaporation above the liquid through which the substrate passes.

6. A substrate (1) having a plurality of components mounted on one side of said substrate, said components interconnected by a plurality of strip conductors embedded therein to form a plurality of separate contacting surfaces on at least one surface of the substrate and extending along one edge of the substrate, said substrate further comprising a plurality of contact elements (2), each one of them soldered separately to a contacting surface, and having a top surface (8) plated with a noble metal, whereby each contact element has an activated (e.g. tin plated) bottom surface (9) and low weight, and includes a bent insertion edge (13) engaging the edge of the substrate.

7. A substrate according to claim 6, wherein the top surface of each contact element is plated with gold and wherein the bottom surface of each contact element is plated with tin.

Patentansprüche

1. Verfahren zum Anbringen von flachen Kontaktelementen (2) auf einem Substrat (1), welches darin eingebettete Bandverbinder umfaßt, um eine Mehrzahl von gesonderten Kontaktflächen zu bilden, wobei ein vorgefertigtes Kontaktelement auf die jeweiligen Kontaktflächen gelegt wird, jedes Kontaktelement eine obere Fläche (8), die mit einem Edelmetall plattiert ist, und eine Bodenfläche (9) hat, welche mit einer Kontaktfläche (10) zu verbinden ist, und wobei Wärme zur Herstellung der Verbindung aufgebracht wird, bei dem vor der Verbindung eine Lötmittelpaste und ein Klebstoff auf die jeweilige Kontaktfläche aufgebracht wird, welche am Rand des Substrats zur Bildung einer Steckverbindung liegt, und bei dem jedes Kontaktelement auf der Bodenfläche aktiviert wird, beispielsweise mit Zinn plattiert wird, bei dem jedes Kontaktelement einen gebogenen Einschubrand (13), welcher mit dem Substratrand zusammenarbeitet und ein geringes Gewicht hat, aufweist, so daß auf das Kontaktelement wirkende Kräfte infolge der Oberflächenspannung der Lötmittelpaste eine Selbstzentrierung

bewirken, und der gebogene Einschubrand gegen den Substratrand gedrückt wird.

2. Verfahren nach Anspruch 1, bei dem das Lötmedium und der Klebstoff vermischt werden, bevor sie auf die jeweilige Kontaktfläche aufgebracht werden.

3. Verfahren nach Anspruch 1, bei dem das Lötmedium und der Klebstoff gesondert auf die jeweilige Kontaktfläche aufgebracht werden.

4. Verfahren nach Anspruch 1, bei dem man die aufgetragene Wärme dadurch erhält, daß man das Substrat einer Infrarotbestrahlung aussetzt.

5. Verfahren nach Anspruch 1, bei dem die aufgetragene Wärme dadurch erhalten wird, daß das Substrat über einer siedenden Flüssigkeit, wie einer inerten fluorierten Verbindung geführt wird, welche eine Wärmeverdampfungsschicht oberhalb der Flüssigkeit bereitstellt, durch die das Substrat geht.

6. Substrat (1), welches eine Mehrzahl von Komponenten hat, die auf einer Seite des Substrats angebracht sind, wobei die Komponenten durch eine Mehrzahl von darin eingebetteten Streifenleitern verbunden sind, um eine Mehrzahl von gesonderten Kontaktflächen auf wenigstens einer Fläche des Substrats zu bilden, welche sich längs eines Randes des Substrats erstrecken, wobei das Substrat ferner eine Mehrzahl von Kontaktelementen (2) aufweist, welche jeweils gesondert an einer Kontaktfläche angelötet sind und eine obere Fläche (8) haben, die mit einem Edelmetall plattiert ist, bei dem jedes Kontaktelement eine aktivierte (beispielsweise mit Zinn plattierte) Bodenfläche (9) und ein geringes Gewicht hat, und einen gebogenen Einschubrand (13) umfaßt, welcher mit dem Rand des Substrats zusammenarbeitet.

7. Substrat nach Anspruch 6, bei dem die obere Fläche des jeweiligen Kontaktelements mit Gold plattiert ist und bei dem die Bodenfläche des jeweiligen Kontaktelements mit Zinn plattiert ist.

Revendications

1. Un procédé de montage d'éléments de contact plats (2) sur un substrat (1) comprenant des connecteurs à bande noyés à l'intérieur de manière à former des surfaces de contact séparées, dans lequel un élément de contact préfabriqué est placé sur chacune desdites



- surfaces de contact, chacun desdits éléments de contact comprenant une surface supérieure (8) plaquée de métal noble, et une surface inférieure (9) à fixer par liaison sur une surface de contact (10), et dans lequel la fixation par liaison est assurée par application de la chaleur, dans lequel, avant ladite fixation par liaison, on applique de la pâte à souder et un adhésif sur chacune desdites surfaces de contact à placer sur le bord du substrat de manière à permettre une connexion par enfichage, et chacun desdits éléments de contact est activé sur sa surface inférieure, par exemple par étamage, chacun desdits éléments de contact comprenant un bord d'insertion incurvé (13) venant en prise sur le bord du substrat et étant de faible poids, de manière que les forces agissant sur l'élément de contact par suite de la tension superficielle de la pâte à souder, provoquent un effet d'auto-centrage sollicitant le bord d'insertion incurvé contre le bord du substrat.
2. Un procédé selon la revendication 1, dans lequel la soudure et l'adhésif sont mélangés ensemble avant d'être appliqués sur chaque surface de contact.
 3. Un procédé selon la revendication 1, dans lequel la soudure et l'adhésif sont appliqués séparément sur chaque surface de contact.
 4. Un procédé selon la revendication 1, dans lequel la chaleur appliquée est obtenue en traitant le substrat par rayonnement infrarouge.
 5. Un procédé selon la revendication 1, dans lequel la chaleur appliquée est obtenue par le passage du substrat sur un liquide en ébullition, tel qu'un composé fluoré inerte, formant une couche de chaleur de vaporisation au-dessus du liquide traversé par le support.
 6. Un substrat (1) comprenant une pluralité de composants montés sur une face dudit substrat, lesdits composants étant interconnectés par une pluralité de conducteurs à bande noyés en son sein, de manière à former une pluralité de surfaces de contact indépendantes sur au moins une surface du substrat, et s'étendant le long d'un bord du substrat, ledit substrat comprenant en outre une pluralité d'éléments de contact (2), chacun d'eux soudé séparément sur une surface de contact et pourvu d'une surface supérieure (8) plaquée en métal noble, chaque élément de contact comprenant une surface inférieure (9) activée (par exemple par étamage) et étant de faible

poids, et comportant un bord d'insertion incurvé (13) venant en prise sur le bord du substrat.

7. Un substrat selon la revendication 6, dans lequel la surface supérieure de chaque élément de contact est plaquée d'or et la surface inférieure de chaque élément de contact est étamée.