

[54] **LOW PROFILE CONTACT FOR INSERTION IN PRINTED CIRCUIT BOARD**

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[57] **ABSTRACT**

A low profile contact means stamped from a section of flat stock material and comprising an incomplete cylindrical portion having a C-shaped cross-sectional configuration and further having a flanged portion at one end thereof. A terminal pin extends from the other end of said cylindrical portion. The contact is inserted through an aperture in a printed circuit board with the flanged portion seated on the surface of said circuit board. A tang formed from the cylinder wall extends downwardly into said cylindrical section and towards the gap created by the incomplete cylindrical section. A male pin inserted in said cylindrical section will be pressed by said tang into said gap in said cylindrical section and against the wall of the printed circuit board aperture.

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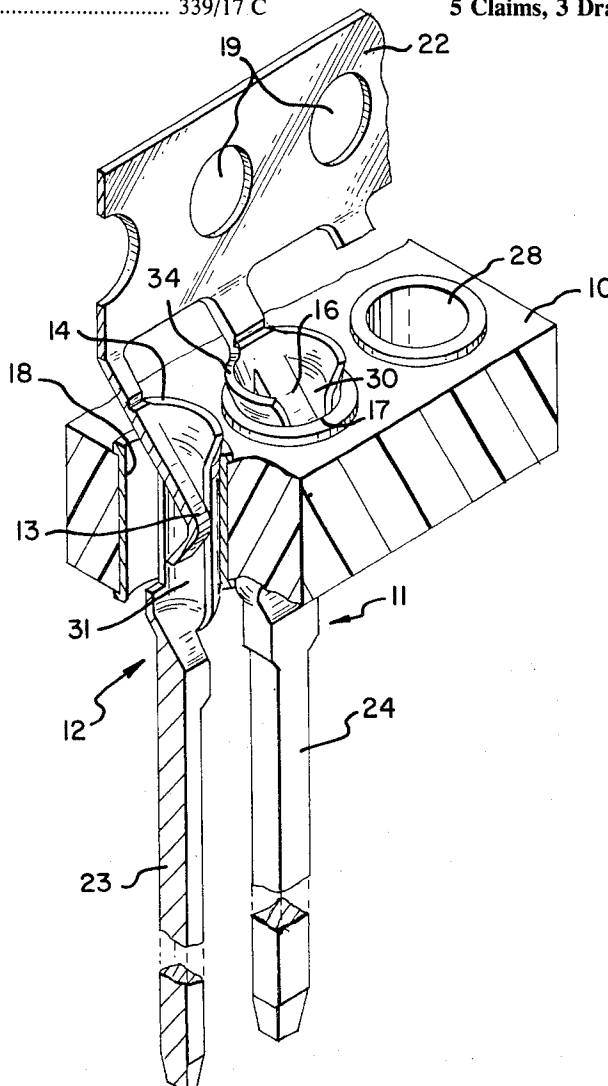
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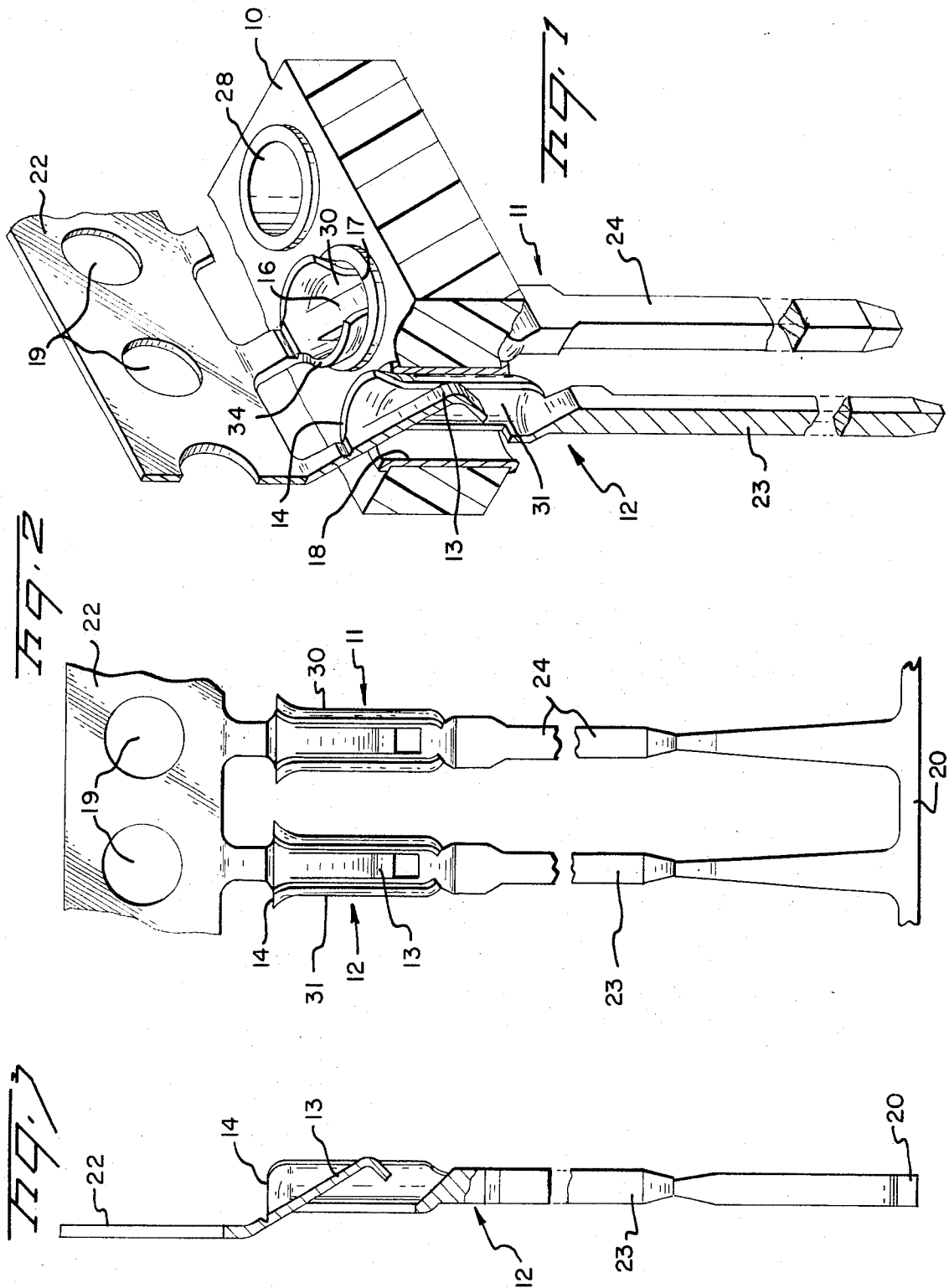
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5 Claims, 3 Drawing Figures





LOW PROFILE CONTACT FOR INSERTION IN PRINTED CIRCUIT BOARD

BACKGROUND OF THE INVENTION

This invention relates generally to a low profile insertion type contact and more particularly to a low profile contact which is inserted through a hole in a printed circuit board and which is fabricated by a stamping process from a continuous supply of flat stock material rather than being fabricated by conventional screw machine techniques.

A type contact in wide use today with printed circuit boards is a contact having a pin at one end and a female receptacle at the other. This contact is inserted through a hole in a printed circuit board so that the female portion is engageably secured to the wall of the hole in the printed circuit board and the pin portion thereof extends through the printed circuit board and forms a terminal post for one or more wires. Such wires can be connected to the terminal post in the well known wrap-around means or any other suitable methods for securing a wire to a post. Components having male pin type terminals are then mounted on the circuit board by insertion of said male pins into the female portion of the inserted contacts.

In certain applications such as hand calculators, where space is at a premium, it is desired that the female portion of insertion type contacts have a low profile, i.e., the receiving opening of said female portion should be nearly flush with the surface of the printed circuit board. As a result of such low profile contacts components mounted therein will also be positioned close to the surface of the printed circuit board, thereby conserving space. Up to the present time such low profile insertion type contacts have been fabricated by screw machine techniques. Moreover, in most types of screw machine fabricated contacts it has been necessary to insert a spring in the female portion of the contact in order to make the structure capable of retaining a male pin subsequently inserted therein.

Furthermore, in contacts fabricated by a screw machine technique, the female portion consists of a closed cylindrical section having very little spring, or give. Thus, the tolerances of both the diameter of such female portions and also the diameter of the hole in the printed circuit board must be maintained within close limits. If the hole in the printed circuit board is too large compared to the diameter of the female portion of the contact, neither a good mechanical or a good electrical contact will be made when the contact is inserted therein. On the other hand if the aperture in the printed circuit board is too small, the plating on the walls of the printed circuit board hole is very apt to be scraped away when the contact is inserted therein, thus producing a poor electrical contact.

A further disadvantage of the screw machine type insertion contact lies in the fact that not one, but two, electrical contacts must be made. Firstly, the male pin inserted therein must make good contact with the female portion of the insertion contact, and secondly, the insertion contact must make good electrical contact with the wall of the printed circuit board hole since the male pin does not make direct physical contact with the wall of said hole.

OBJECTS OF THE INVENTION

It is a primary object of the invention to provide an

inexpensive, low profile female contact for insertion through a printed circuit board.

A second aim of the invention is to provide an inexpensive, low profile contact having a post at one end and a cylindrically shaped female receptacle at the other end, with said female receptacle having a capability of being radially compressed to enable its use in printed circuit board holes having a relatively wide range of diameter tolerances.

It is a third purpose of the invention to provide a low profile contact means consisting of a pin and a cylindrically shaped female receptacle insertable through a hole in a printed circuit board and consisting of a single element fabricated by stamping from flat stock material.

A fourth object of the invention is an inexpensive, low profile contact means having a cylindrically shaped female receptacle insertable through a printed circuit board hole and capable of receiving a male pin therein, and in which said male pin makes contact simultaneously with the female receptacle and the wall of the printed circuit board hole.

A fifth aim of the invention is the improvement generally of insertion type contact means for use in printed circuit boards.

STATEMENT OF INVENTION

In accordance with the invention there is provided a low profile contact means consisting of a single element which is stamped from a section of a continuously fed supply of flat stock material, and having a female receptacle portion thereof which engages the wall of a hole in a printed circuit board through which the contact is inserted. This female portion of the contact is constructed to be generally cylindrical in configuration but open over one arcuate section so that it has a resultant C-shaped cross-sectional configuration. The top portion of this cylindrical portion of the contact is flared outwardly to form a flange which seats on the top surface of the printed circuit board around the perimeter of the hole in said circuit board. The cylindrical portion further comprises a tang or finger which is stamped from a portion of the cylinder wall and which extends outwardly from said cylinder wall into the center portion of the cylindrical portion towards the open portion of the cylinder wall. Thus, when a male pin is inserted into the cylindrically shaped female portion of the contact means, said pin will be forced by said tang against that portion of the wall of the printed circuit board aperture which is exposed through the open portion of the contact means cylinder wall. Also attached to said cylindrical portion of the contact means is a post to which a conductor can be secured by any suitable technique, such as wire-wrapping.

BRIEF DESCRIPTION OF THE DRAWINGS

The above-mentioned and other objects and features of the invention will be more clearly understood from the following detailed description thereof when read in conjunction with drawings, in which:

FIG. 1 is a perspective view of the invention and specifically shows two of contact means inserted through a printed circuit board, with one of the contact means being broken away to show the details thereof;

FIG. 2 is a plan view of two of the contact means with connecting carrier strips also shown; and

FIG. 3 is a plan view of the side of one of said contact means with said carrier means.

DESCRIPTION OF THE INVENTION

Referring now to FIG. 1, the two contact means 11 and 12 are shown inserted through holes 17 and 18 in the printed circuit board 10, of which board 10 only a small section is shown. Each of the two contact means 11 and 12 are identical. However, contact 12 is shown with a portion of the printed circuit board broken away to disclose the details of said contact means 12. The contact means 12 can be seen to consist of three principal parts, including a pin 23, a semicylindrical section 31 with a flared-out flange 14 formed at the top thereof, and a tang 13, which is formed from a section of the wall of cylindrical section 31.

The contacts 11 and 12 are secured at their upper end to a common carrier strip 22 which has a plurality of holes 19 formed therein. Such holes 19 are utilized with appropriate means, such as a sprocket wheel, to drive-feed a strip of flat stock material (not shown) from which the contacts 11 and 12 are formed, through appropriate stamping and cutting dies.

In use, the contact means 11 and 12 are inserted through apertures 17 and 18 in a printed circuit board 10. Each of the apertures 17 and 18 in the printed circuit board segment 10 can be prepared with a previously inserted metal tubular section 28, or alternatively the element 28 can represent a conductive plated-through coating on the inner walls of apertures 17 and 18.

The flange portions 34 and 14 of contact means 11 and 12 seat upon the surface of printed circuit board 10 to thereby provide a low profile female contact means which can receive male pin terminals.

Such male pin terminals (not shown), when inserted into the female receptacles of contacts 11 and 12, are forced against the walls of the aperture holes by means of the tangs such as tangs 16 and 13. More specifically, the cylindrical portions 30 and 31 of the contacts 11 and 12 do not extend around a complete 360° sweep, but rather are C-shaped and leave a portion of the printed circuit board aperture walls exposed to the inner portion of the cylindrical receptacles 30 and 31. The tangs 16 and 13 are formed to extend towards this exposed portion of the aperture walls so that when a male pin terminal (not shown) is inserted in the cylindrical receptacles 30 or 31 the tangs 16 and 13 will force said pins against the walls of the apertures, thereby creating a direct electrical contact between the inserted male pins and the aperture walls, as well as establishing a direct electrical contact between the inserted pins and the contact means 11 and 12.

The outside diameter of the cylindrical portions 30 and 31 of contact means 11 and 12 are fabricated to be slightly greater than the diameter of the printed circuit board holes 17 and 18 plus a predetermined diameter tolerance for said holes. Because the cylindrical portion does not define a completely closed cylinder, it can act in the nature of a spring when inserted in a smaller diameter printed circuit board hole. The cylindrical portions of the contact means will be radially compressed by the smaller diameter holes of the printed circuit board to establish a continuous outwardly directed spring force against the sides of the aperture walls, thereby establishing both a good mechanical contact

and a good electrical contact with said aperture walls.

Referring now to FIG. 2 there is shown a plan view of the two contact means 11 and 12 when they are not inserted in a printed circuit board. Also shown in FIG. 2 is the carrier strip 22, as well as a second carrier strip 20 which is secured to the ends of the pins 23 and 24 of the two contact means 12 and 11. Before gang insertion of pins 23 and 24 into appropriate holes in a printed circuit board, the lower carrier strip 20 must first be separated from the contacts. However, the upper carrier strip 22 is not so separated, thereby permitting gang insertion into a row of holes in a printed circuit board to be effected quickly and efficiently since alignment of the pins with the holes is maintained by the carrier strip 22. After insertion of the contacts the carrier strip 22 is separated from the contacts.

Referring now to FIG. 3, it can be seen that tang element 13 extends into the gap created as a result of the cylindrical portion 31 of the contact 12 not extending around through a complete 360° sweep.

It is to be specifically noted that carrier strips 20 and 22 and the complete contact means attached thereto, such as contact means 11 and 12, are fabricated from a single, continuously fed supply of flat stock material. No other parts are needed. Such flat stock material is fed to one or more work stations (not shown) where the proper stamping, cutting and cold working is accomplished to form the continuous strip of contacts and carriers.

It is to be understood that the form of the invention shown and described herein is but a preferred embodiment thereof and that various changes in configuration and proportions can be made without departing from the spirit and scope thereof.

What is claimed is:

1. The combination of a stamped, single element, low profile contact inserted through an aperture in a circuit board and comprising:

a partially completed cylindrical section in which a gap parallel to the axis of said cylindrical section exists in the wall thereof;

a flange portion formed around the rim of one end of said cylindrical section and constructed to form a seat for said contact when said contact is inserted in said circuit board;

said flange portion being flared outwardly and upwardly from said cylindrical section to facilitate entry of a mating male contact therewith; and an elongated element formed from the wall of said cylindrical section and extending inwardly into the space defined by said cylindrical section and into said gap;

said gap being sufficiently wide to enable entry of said elongated element therein.

2. The combination in accordance with claim 1 in which said circuit board aperture has walls of conductive material; and

in which the outside diameter of said cylindrical section is slightly greater than the diameter of said aperture to ensure good electrical contact between said cylindrical section and the walls of said aperture when said cylindrical section is inserted in said aperture.

3. The combination in accordance with claim 1 in which a portion of said elongated element is positioned within said gap in the wall of said cylindrical section to

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force said male pin inserted in said aperture through said gap and into pressure contact with the wall of said aperture in said circuit board.

4. A single element low profile contact constructed entirely from a section of flat stock material and which is adapted for insertion through an aperture in a circuit board and further, which comprises:

a partially completed cylindrical section in which a gap exists in the wall thereof;

a flange portion formed around the rim of one end of the said cylindrical section and constructed to form a seat for said contact when it is inserted through said circuit board;

said flange portion being flared outwardly and upwardly from said cylindrical section to facilitate

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entry of a mating male contact therein;
an elongated element formed from the wall of said cylindrical section and extending across the interior of said cylindrical section towards said gap; said gap being sufficiently wide to enable entry of said elongated element therein; and
terminal means attached to the other end of said cylindrical section.

5. A low profile contact in accordance with claim 4 in which a portion of said elongated element is positioned within said gap in the wall of said cylindrical section to force said male contact inserted in said aperture through said gap and into pressure contact with the wall of said aperture in said circuit board.

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