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(54) **Method of mounting an electrical connector to a printed circuit board**

(57) A method for mounting an electrical connector to a printed circuit board comprising the steps of: (a) pressing a fold line on the circuit board such that the circuit board is divided into a primary board and a secondary board; (b) fixing a U-shaped retainer to the secondary board such that the connector is fixed relative to the circuit board; (c) performing a first SMT process; (d) performing a second SMT process after turning the circuit board over; and (e) removing the secondary board and the retainer simultaneously. Alternatively a second method has the following steps:

(a) providing a U-shaped retainer having a frangible

leg portion such that the retainer is fixed on the circuit board and temporarily fixes the connector to the circuit board;

(b) performing a first SMT process; (c) performing a second SMT process after turning the circuit board over; and (d) removing the retainer along the frangible leg portion. This method allows fixing the connector to the circuit board without damaging or dropping the connector particularly during the second SMT process. Therefore, the quality and yield of the circuit board-mounted connectors are enhanced.

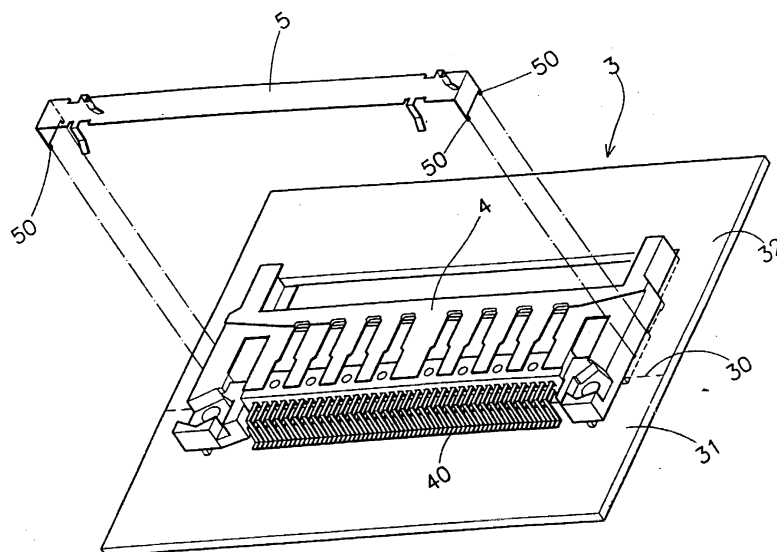


FIG. 5

Description

Field of the Invention

[0001] The present invention relates to a method of mounting an electrical connector to a printed circuit board whereby the connector can be firmly assembled to the printed circuit board without risk of deflection and dropping.

Background of the Invention:

[0002] In known notebook computers, electronic card connectors are mounted within the computer to receive IC cards or the like which store memory or perform various peripheral functions. However, as the demand for notebook computers is to be more compact and versatile, the electronic card connectors have been arranged on the edge of the main printed circuit board or motherboard of the computer to fully exploit the usable area on the motherboard. Conventionally there are two manufacturing methods to assemble electronic card connectors to the edge of the motherboard. As shown in Figures 1 and 2, the first method comprises the following steps: pressing the motherboard 1 to form a fold line 10 that has a predetermined spacing to the edge of the motherboard such that the motherboard is divided into a primary board 11 and a secondary board 12 separated by the fold line; clamping a connector 2 at a location between the primary board and the secondary board with the terminals of the connector contacting the soldering pads of the primary board; performing a front-side SMT (surface mount technology) process to connect the terminals of the connector to the solder pads of the primary board; turning over the mother board and performing a back-side SMT process; and, finally, removing the secondary board. The second method is simply where the connector 2 is mounted on the motherboard and then the front-side SMT process and the back-side SMT process are performed.

[0003] In above-mentioned methods, when the motherboard is turned over to perform the back-side SMT process, the solder attached to terminals 20 of the connector may not yet be solidified, thus resulting in a chance that the connector may fall off the motherboard, as shown in Figure 3. As a result, the terminals of the connector may be distorted or fall from the motherboard, resulting in poor contact, short circuiting and open circuits within the connector. Therefore, if the backside SMT process is performed without overcoming the above-mentioned problems, this may result in irreparable damage or disfunction of the connector.

Summary of the Invention

[0004] It is therefore an object of the present invention to overcome the above problems in mounting an electrical connector to a printed circuit board.

[0005] One aspect of the invention contemplates a method of mounting an electrical connector to a motherboard wherein a U-shaped retainer is provided to clamp the connector to the motherboard before the SMT processes. Therefore the connector will not lose its position or fall off the motherboard during the SMT process.

[0006] In another aspect of the present invention, the structure of the retainer varies according to the type and method of the motherboard. When the motherboard comprises a primary board and a secondary board separated by a fold line as described above, the retainer is arranged on the secondary board and is removed with the secondary board. If the motherboard is a single board that does not use the frangible secondary board, the retainer includes a solder leg with a frangible portion and is arranged on the mother board such that the retainer is easily removed after the SMT process.

[0007] Other objects, features and advantages of the invention will be apparent from the following detailed description taken in connection with the accompanying drawings.

Brief Description of the Drawings

[0008] The features of this invention which are believed to be novel are set forth with particularity in the appended claims. The invention, together with its objects and the advantages thereof, may be best understood by reference to the following description taken in conjunction with the accompanying drawings, in which like reference numerals identify like elements in the figures and in which:

Figure 1 is a perspective view showing a connector mounted on a motherboard in a convention mounting method;

Figure 2 is a sectional view showing a front side SMT process of a connector in a conventional mounting method;

Figure 3 is the sectional view showing a back side SMT process of a connector in a conventional mounting method, wherein the connector has fallen partially off the motherboard;

Figure 4 is an assembly flowchart according to a preferred embodiment of the present invention;

Figure 5 is a perspective view of the retainer of the present invention before being mounted on the motherboard;

Figure 6 is a perspective view of the retainer of the present invention after being mounted on the motherboard;

Figure 7 is a section view showing the front side SMT process of a connector using the retainer in the mounting method disclosed in the present invention;

Figure 8 is a sectional view showing the back side SMT process of a connector using the retainer in

the mounting method disclosed in the present invention;

Figure 9 is the assembly flowchart according to a second embodiment of the present invention; and Figure 10 is a perspective view of the retainer according to the second embodiment of the invention before being mounted on the motherboard.

Detailed Description of the Preferred Embodiment

[0009] Figure 4 shows a flowchart describing a first embodiment of the invention and Figures 5 through 8 are views depicting this embodiment. The first embodiment of the invention is applied to a printed circuit board such as a motherboard 3 comprising a primary board 31 and a secondary board 32 and on which a connector 4 is to be mounted. The mounting method according to this embodiment comprises the following steps:

- a) Pressing a fold line on motherboard 3. In this step, a fold line 30 is formed with a predetermined distance to the edge of the mother board such that the mother board is divided into the primary board 31 and the secondary board 32 separated by fold line 30;
- b) Providing a retainer to clamp the connector to the motherboard. In this step, a U-shaped retainer 5 is fabricated of metal and is assembled to connector 4 as shown in Figure 5. Retainer 5 includes a horizontal portion extending across connector 4 and two vertical portions each having a solder leg 50 soldered to secondary board 32. Therefore, connector 4 is located between primary board 31 and secondary board 32, and terminals 40 of connector 4 are in contact with solder pads of primary board 31, as shown in Figures 5 and 6;
- c) Front side SMT process. As shown in Figure 7, motherboard 3 faces upward and an SMT process, such as reflow solder or IR, is performed to connect terminals 40 of connector 4 to the corresponding solder pads of the motherboard;
- d) Back side SMT process. As shown in Figure 8, mother board 3 is turned over and an SMT process is performed on the backside thereof; and
- e) Removing secondary board 32 and retainer 5. By folding secondary board 32 along fold line 30, retainer 5 is removed simultaneously with the secondary board.

[0010] Moreover, as shown in Figures 9 and 10, in a second embodiment of the invention, the inventive method is implemented in a motherboard 3 without a secondary board.

[0011] The method according to the second embodiment of the invention comprises following steps:

- a) Providing a retainer to clamp the connector to the motherboard. In this step, U-shaped retainer 5 is as-

sembled to connector 4 and is fabricated of metal as shown in Fig. 10. Retainer 5 includes a horizontal portion which extends across connector 4 and two vertical portions each with a solder leg 50 terminating in a frangible portion 500 soldered to the motherboard. Therefore, connector 4 is preparatively fixed to mother board 3 and terminals 40 of connector 4 are in contact with the solder pads of mother board 3;

b) Front side SMT process. Mother board 3 faces upward and an SMT process, such as reflow solder or IR solder, is performed to connect terminals 40 of connector 4 to corresponding solder pads of the motherboard;

c) Back side SMT process. Mother board 3 is turned over and an SMT process is performed on the backside thereof; and

d) Removing retainer 5. By tearing away retainer 5 at frangible portion 500, retainer 5 can be removed from the mother board.

[0012] As is realized from the above description, because connector 4 is clamped by retainer 5, connector 4 will not move or fall off the motherboard during the SMT process of soldering terminals 40 of connector 4 to corresponding pads on the motherboard. More particularly, in the back side - SMT process of the prior art connector-mounting methods, connector 4 is not preparatively clamped by auxiliary means and therefore connector 4 may either move off its correct position, or fall off the motherboard altogether due to the weight of the connector against gravity. The problem becomes worse when the tin paste or solder applied in the front side SMT process is not solidified or properly cured. Nevertheless, in the present invention, connector 4 is clamped by retainer 5 and therefore does not move or fall during the back side SMT process even though the tin paste or solder applied during the front side SMT process is not solidified. Therefore, the quality and yield of connectors mounted on such motherboards is improved. Moreover, retainer 5 can be easily removed from the connector by providing frangible break points on the solder legs thereof for removing the retainer simultaneously with secondary board 32.

[0013] Although the present invention has been described with reference to the preferred embodiment thereof, it will be understood that the invention is not limited to the details thereof. Various substitutions and modifications have been suggested in the foregoing description, and others will occur to those of ordinary skill in the art. Therefore, all such substitutions and modifications are intended to be embraced within the scope of the invention as defined in the appended claims.

Claims

1. A method of mounting an electrical connector to a

printed circuit board. comprising the steps of:

- a) pressing a fold line on the circuit board at a predetermined distance to the edge of said circuit board such that said circuit board is divided into a primary board and a secondary board separated by said fold line;
b) providing a retainer to fix said connector relative to the circuit, wherein said retainer is fixed on said secondary board and hold said connector at a location between said primary board and said secondary board such that terminals of said connector are in contact with corresponding solder pads of said primary board;
c) performing a first SMT process, wherein said circuit board faces upward and said terminals of said connector are soldered to the corresponding solder pads of the primary board;
d) performing a second SMT process, wherein the circuit board is turned over and an SMT process is performed on the backside of said circuit;
e) simultaneously removing said secondary board and said retainer, wherein said secondary board is broken away from the primary board by folding along said fold line, and said retainer is simultaneously removed
2. The mounting method as set forth in claim 1 wherein said retainer is fixed on said secondary board by a small amount of tin paste and said retainer is simultaneously removed with said secondary board after said second SMT process.
3. A mounting apparatus for mounting a connector to a printed circuit board, said printed circuit board comprising a primary board and a secondary board separated by a fold line; said apparatus comprising: a retainer fixed to said secondary board adapted to hold said connector relative to the printed circuit board during soldering of the connector to the printed circuit board, wherein said retainer is removed simultaneously with said secondary board after soldering of the connector to the printed circuit board.
4. The mounting apparatus as set forth in claim 3 wherein said retainer is a U-shaped metal piece and comprises a horizontal portion extending across said connector and two vertical portions each having a solder leg adapted to be soldered on said secondary board.
5. A method for mounting an electrical connector to a printed circuit board comprising the steps of:
 - a) providing a retainer fixed on said circuit board, said retainer fixing the electrical connector relative to the circuit board and holding terminals of said connector in contact with corresponding solder pads of said circuit board;
 - b) performing a first SMT process, wherein said circuit board faces upwardly and said terminals of said connector are soldered to the corresponding pads;
 - c) performing a second SMT process, wherein the circuit board is turned over and an SMT process is performed on the backside of the circuit board;
 - d) removing said retainer from said circuit board.
6. The mounting method as set forth in claim 1, wherein said retainer includes a solder leg with a frangible portion such that said retainer is soldered to the circuit board and can be removed from the circuit board after the second SMT process.
7. A mounting apparatus for mounting an electrical connector with terminals to a printed circuit board, said apparatus comprising a retainer fixed relative to said circuit board, wherein said connector is held to the circuit board and the terminals are in contact with corresponding solder pads of the circuit board.
8. The mounting apparatus as set forth in claim 7, wherein said retainer is U-shaped and is fabricated of metal and further comprises a horizontal portion extending across said connector and two vertical portions each having a solder leg soldered to the circuit board and a frangible portion wherein the retainer can be removed from said circuit board after the terminals are soldered to the solder pads.

FIG. 1

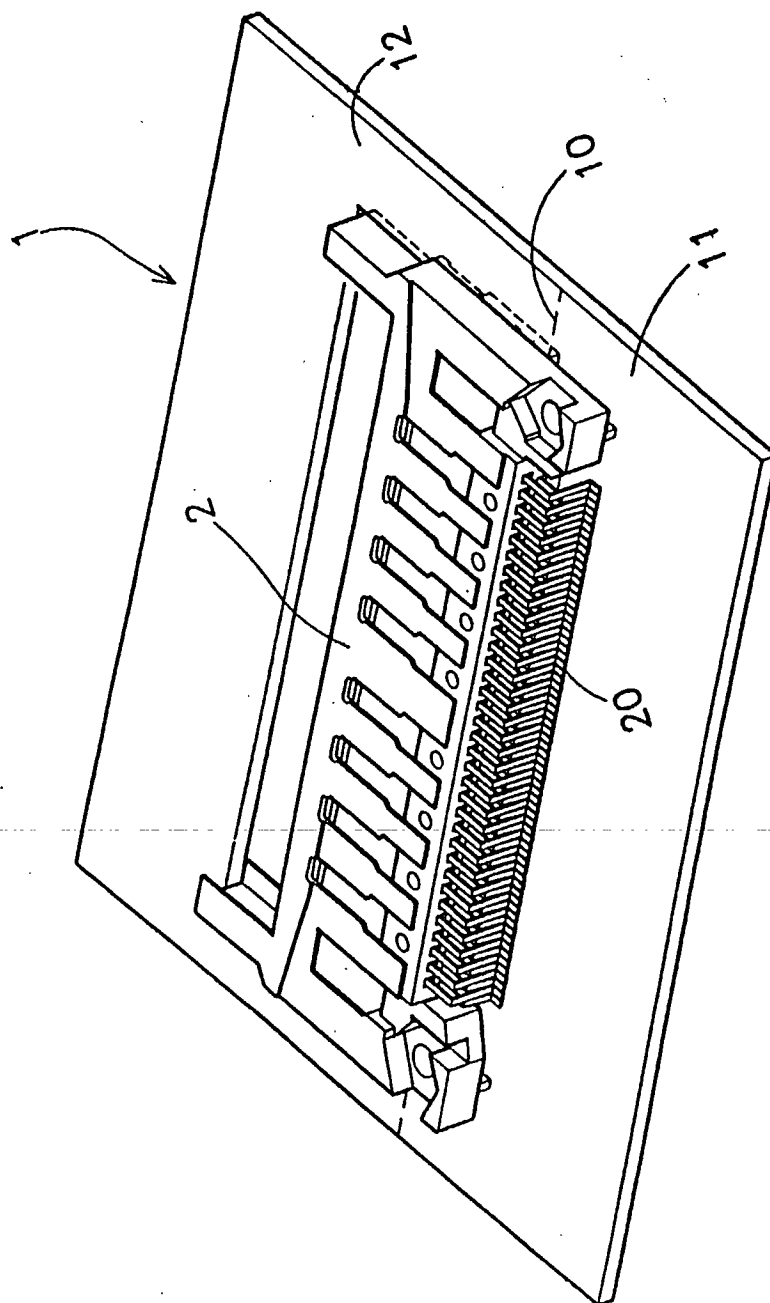


FIG. 2

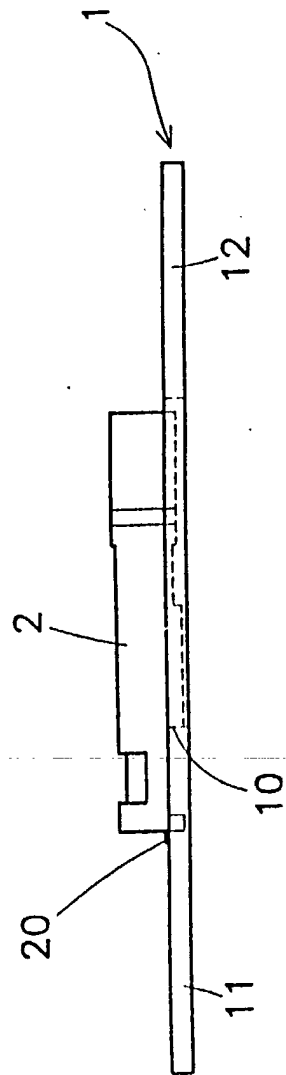


FIG. 3

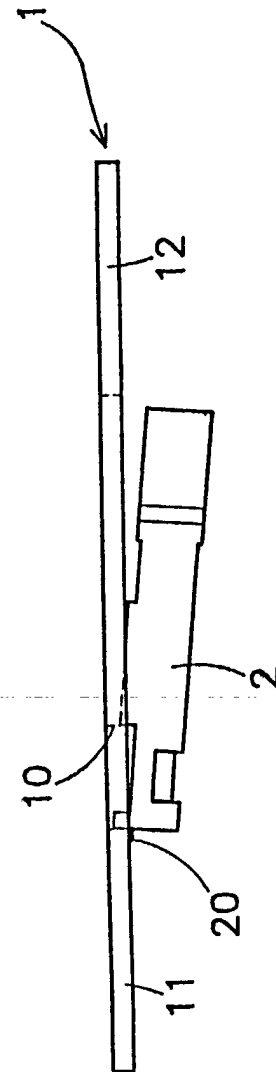


FIG. 4

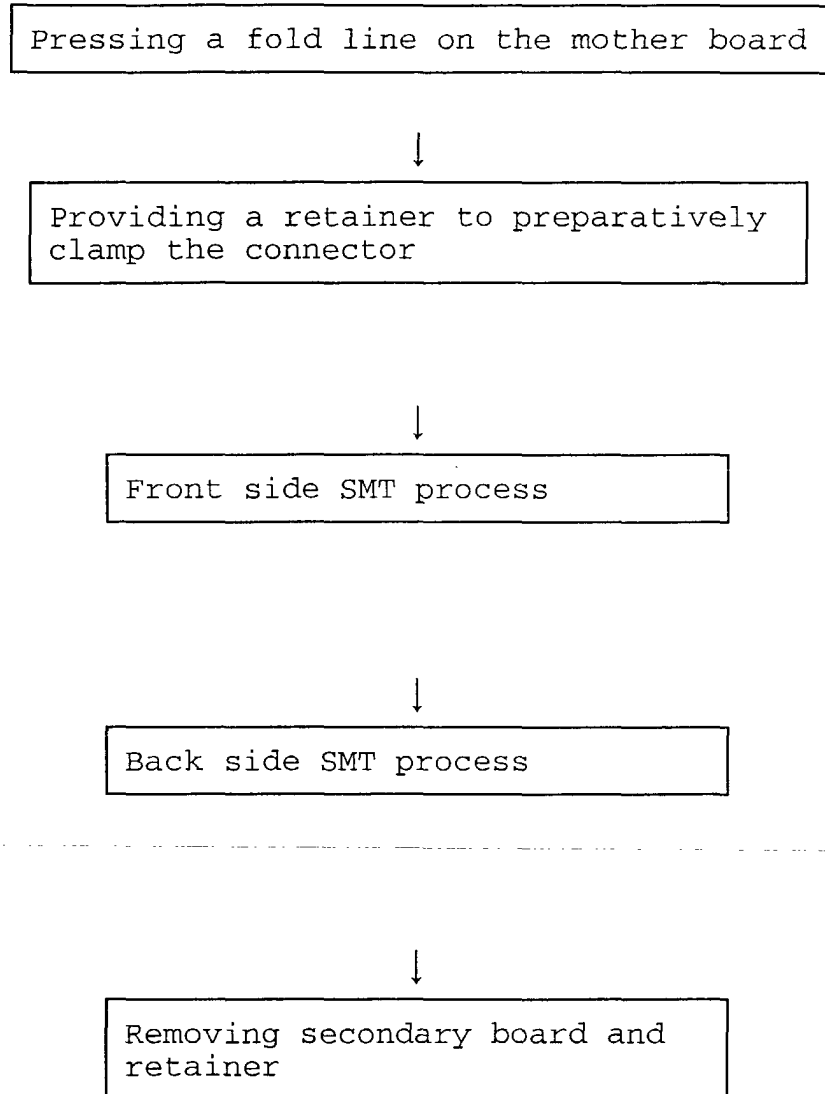
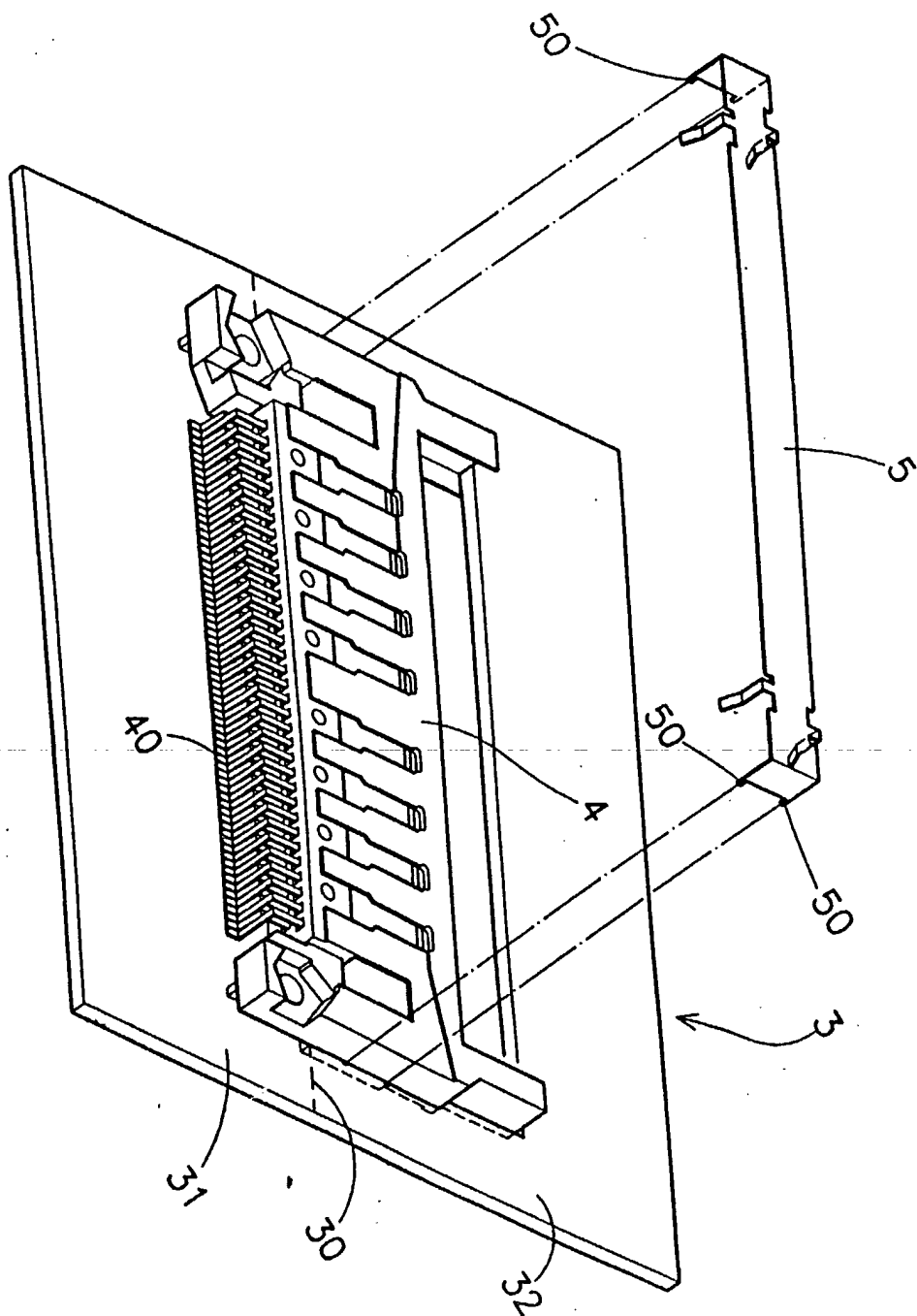


FIG. 5



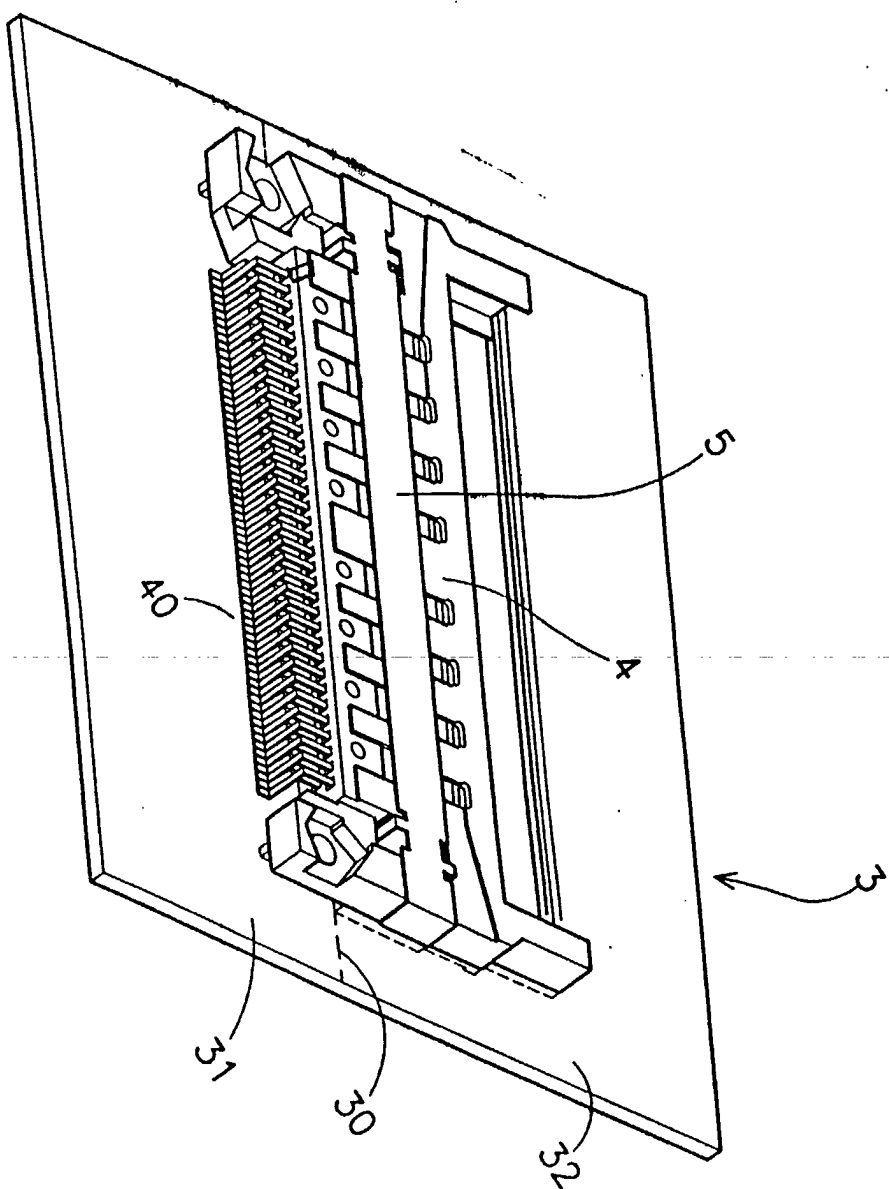


FIG. 6

FIG. 7

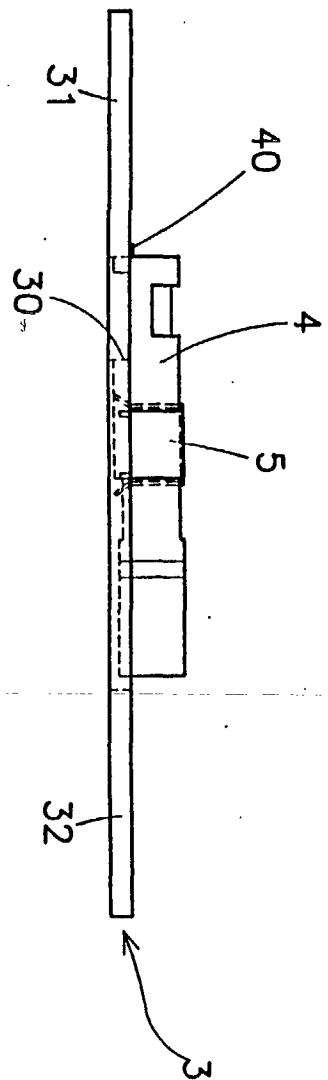


FIG. 7

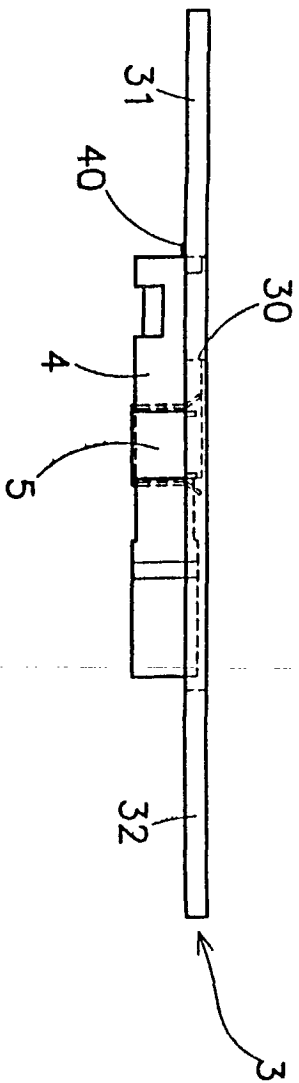


FIG. 8

FIG. 9

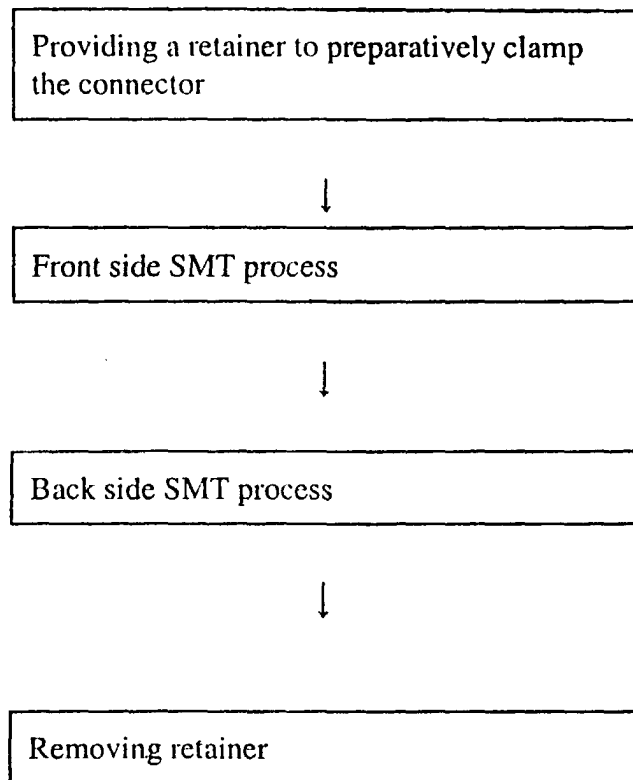
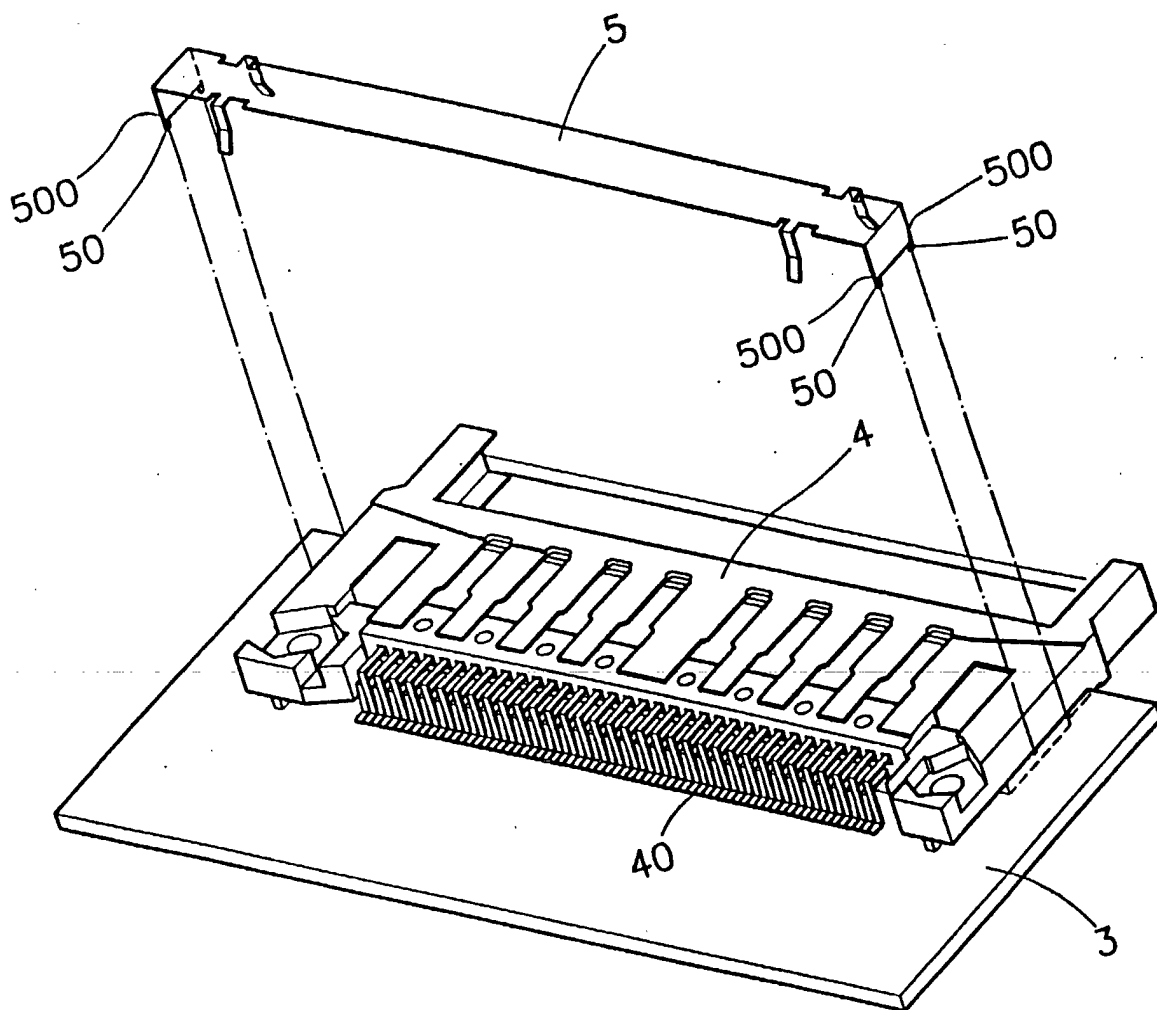


FIG. 10





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 99 12 6183

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