

DEVICE FOR FORMING CONNECTION ELEMENTS

The invention relates to a device for forming connection elements for connecting a printed circuit board to other electrical components. The invention also relates to an arrangement which includes a frame for a signal receiver with a device for forming connection elements of a printed circuit board, and also to a method of forming connection elements of a printed circuit board.

Signal receivers of this kind process practically all electrical signals and transfer such signals to other electrical components for further processing. Such other electrical components may be other printed circuit boards, for example, a so-called main board of a television set or a TV card of a PC. The signal receiver itself consists of a frame in which various SMDs (Surface Mounted Devices) are mounted on the surface of a printed circuit board.

For the mounting of the printed circuit board first solder paste is deposited on the printed circuit board in a predetermined pattern while using a screen printing method. Subsequently, the SMDs are positioned on the printed circuit board and possibly fixed to the surface of the printed circuit board by means of a non-conductive adhesive; the connections of the devices then come into contact, in given locations, with the solder paste pattern printed on the printed circuit board. The devices themselves and their connections are situated on the same side of the printed circuit board. Subsequently, a so-called reflow soldering process is carried out. The solder on the printed circuit board is then melted by application of heat in a suitable furnace, thus forming fixed electrical soldered connections between the SMDs and the printed circuit board.

The transfer of the signals between the signal receiver and other circuit components requires the use of devices which conduct the electrical signals from the printed circuit board to the components. To this end, known embodiments are provided with connection elements or pin stripes which are embedded in thin plastic strips and are arranged, together with the SMDs, on the printed circuit board after the application of the solder paste. The plastic strips then act as a guide for the connection elements and provide an insulated connection to the frame.

It is a drawback that an additional surface area is occupied thereby on the printed circuit board and the necessary, but also problematic, tolerances of the plastic strips, for example, the distance between the connection elements, bent plastic strips, fluctuations occurring in the material and during the processing, also form a drawback. A further
5 disadvantage resides in the additional costs of the plastic material used, since this material may not become liquefied at the high temperatures occurring during the reflow soldering process. Such additional costs cannot be ignored, that is, in particular in the case of mass production. As an alternative it is known to use separate connection elements which are soldered onto the printed circuit board by hand only after completion of the reflow soldering
10 process; however, this leads to additional costs of labor.

It is an object of the invention to provide a device for forming connections of a printed circuit board arranged within a signal receiver frame, which device has a high mechanical stability, a high thermal strength and can be mounted as economically as possible.

15 This object is achieved in that the device comprises a plurality of connection elements having a bent end portion, a respective detainer, having a bent end portion, being provided between each time two connection elements, and the end portions of the connection elements defining a plane which extends parallel to a plane defined by end portions of the retainers.

20 During the mounting of the device the connection elements are inserted into a plurality of holes in the printed circuit board which are provided for the connection elements. The printed circuit board is then situated in the frame of the signal receiver, so that the connection elements bear on the frame or the printed circuit board via the retainers which bear on the frame. The connection strip serves for guiding and for stable positioning of the
25 retainers.

After insertion of the connection elements of the device into the printed circuit board, a soldering process is performed during which the frame, the printed circuit board and the connection elements are soldered to one another. After completion of the soldering process, the connection strip is separated and the retainers are removed.

30 Because the connection elements are supported by the retainers, the entire device can be provided on the printed circuit board in a stable manner. Undesirable bending of the device is prevented by the retainers as well as by the connection strip. The manufacture of such a device is very simple so that the costs of manufacturing the signal receiver are reduced.

The device consists of one piece only and is uniformly made of an electrically conductive material, for example, sheet metal. It is punched in its entirety from the material and bent as necessary. This leads to a higher stability of the connection elements, notably because there are no transitions between different of the connection element and the connection strip.

Because of the use of only a single material, the device is less subject to mechanical strains since different thermal expansion coefficients do not occur within the device. This property becomes manifest notably during the soldering process. At the same time an increased temperature stability can be achieved by choosing the appropriate material.

The connection elements and the detainers are preferably L-shaped. The use of an L-shape for the connection elements and the detainers ensures stability of the device during mounting, because the detainers can perform a supporting function on a right-angled frame so that the entire device can be stabilized during the introduction of the connection elements into the printed circuit board.

The embodiment in conformity with claim 5 offers the advantage that a projection of the end portion additionally stabilizes the connection element in its position in a further application of the connection elements. The mounting of a module (for example, a signal receiver) on a main board (for example, a television set, a PC board) can be performed by means of a soldering operation. The connection elements are then heated again so that they could drop out of the printed circuit board or fall over due to the liquefying of the soldered connection. As a result of the stepped projection of the end portion, the connection element bears on the printed circuit board so that its position does not change when the soldered connection is liquefied.

The invention also relates to an arrangement which includes a frame which is intended in particular for receiving a printed circuit board for a signal receiver with a device connected to the frame. The device then consists of a plurality of right-angled connection elements which are arranged at equal distances from one another. The connection elements serve as an electrical connection between the printed circuit board and other components, for example, other printed circuit boards. Between two connection elements there is provided a respective detainer which serves to stabilize the position of the device. The connection elements are guided in the frame and the printed circuit board by a connection strip of the device. The connection strip positions and stabilizes the detainers on the frame.

The invention also relates to a method of manufacturing connection elements of a printed circuit board for connection to a frame of a signal receiver. A device which

comprises a plurality of connection elements with a bent end portion and a respective
detainer, having a bent end portion, between each time two connection elements, is attached
to the frame prior to the soldering of the connection elements. The end portions of the
connection elements define a plane which extends parallel to a plane defined by the end
5 portions of the detainers. The connection elements are inserted into the printed circuit board
and at the same time the device is supported on the frame and/or the printed circuit board via
the detainers. The connection elements are separated from the device after completion of the
soldering operation.

10 Embodiments of the invention will be described in detail hereinafter with
reference to the Figures. Therein:

Fig. 1 shows a device,

Fig. 2 shows a detail of a connection element at an increased scale, and

15 Fig. 3 shows a signal receiver frame with the device.

The device 1 shown in Fig. 1 is punched from an electrically conductive
material, for example, sheet metal, and bent to the appropriate shape.

20 The device consists of a connection strip 2 and a plurality of L-shaped
connection elements 3a ... 3k. An end portion of each connection element 3a ... 3k is bent at
right angles and is provided with two projections 5 and 6 whereby the connection elements
3a ... 3k are supported on a printed circuit board. Fig. 2 shows the projections at an increased
scale for the sake of clarity.

25 Between each time two connection elements 3a and 3b there is provided a
respective L-shaped detainer 4a ... 4j whose end portion is also bent at right angles.

The connection strip 2 is intended to guide the connection elements 3a ... 3k
and to stabilize the detainers 4a ... 4j. The detainers 4a ... 4j fix the position of the device 1
while the printed circuit board is subjected to a soldering process during which the
30 connection elements are soldered. To this end, they bear on the frame of the signal receiver.

Fig. 3 shows the device 1 provided in the signal receiver frame 7. The device 1
is mounted on the frame 7 prior to the beginning of the soldering process. The connection
elements 3a ... 3k of the device 1 are then inserted into holes provided in the printed circuit
board (not shown) for this purpose. The connection elements 3a ... 3k are meanwhile

supported via the retainers 4a ... 4j. The projections 5 and 6 of each connection element 3a ... 3k bear on the printed circuit board.

During the soldering process the necessary soldered connections are established between the connection elements and the printed circuit board. Not only the
5 printed circuit board, but also the entire device 1 is then subject to high temperatures.

After completion of the soldering process, the connection strip 2 as well as the retainers 4a ... 4j are removed. The remaining connection elements 3a ... 3k constitute electrical connections to other electrical printed circuit boards of an apparatus.

CLAIMS:

1. A device

- which comprises a plurality of connection elements (3a ... 3k) having a bent end portion,
- a respective detainer (4a ... 4j), having a bent end portion, being provided between each time two connection elements (3a ... 3k), and

5 - the end portions of the connection elements (3a ... 3k) defining a plane which extends parallel to a plane defined by the end portions of the detainers (4a ... 4j).

2. A device as claimed in claim 1, characterized in that the device consists of one piece.

10

3. A device as claimed in claim 1, characterized in that the connection elements (3a ... 3k) and detainers (4a ... 4j) are L-shaped.

4. A device as claimed in claim 1, characterized in that the connection elements
15 (3a ... 3k), the detainers (4a ... 4j) and the connection strips uniformly consist of an electrically conductive material.

5. A device as claimed in claim 1, characterized in that each end portion of the connection elements (3a ... 3k) is provided with at least one projection (5).

20

6. An arrangement which includes a frame, notably for receiving a printed circuit board for a signal receiver with a device connected to the frame, which device

- consists of a plurality of connection elements (3a ... 3k) having a bent end portion,
- a respective detainer (4a ... 4j), having a bent end portion, being provided between each
25 time two connection elements (3a ... 3k), and

- the end portions of the connection elements (3a ... 3k) defining a plane which extends parallel to a plane defined by the end portions of the detainers (4a ... 4j).

7. A method of manufacturing connection elements of a printed circuit board with a frame, in which

- a device (1), comprising a plurality of connection elements (3a ... 3k) having a bent end portion, a respective detainer (4a ... 4j), having a bent end portion, being provided
5 between each time two connection elements (3a ... 3k), and the end portions of the connection elements (3a ... 3k) defining a plane which extends parallel to a plane defined by the end portions of the detainers (4a ... 4j), is connected to the frame, the connection elements (3a ... 3k) being inserted into the printed circuit board and the device (1) being supported on the frame and/or the printed circuit board via the detainers (4a ... 4j), and
10 - the connection elements (3a ... 3k) are separated from the device (1).