United States Patent

Steipe

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[54] CONNECTOR ELEMENT

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[52] **U.S. Cl.** .....**339/61 M**, 29/629, 339/176 MP, 339/278 C

[51] **Int. Cl.** **H05k 1/07**

[58] **Field of Search**.....339/17 F, 17 L, 17 LC, 17 LM, 339/17 M, 59 R, 59 M, 61 R, 61 M, 176 MF, 176 MP, 217 R, 176 M, 278 C; 29/629

[56] **References Cited**

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[57] **ABSTRACT**

A connector element is disclosed which is cut from an elongated plastic bar made by extrusion and having a longitudinal groove lined with a conductive layer with notches being cut to form individual socket elements.

7 Claims, 3 Drawing Figures

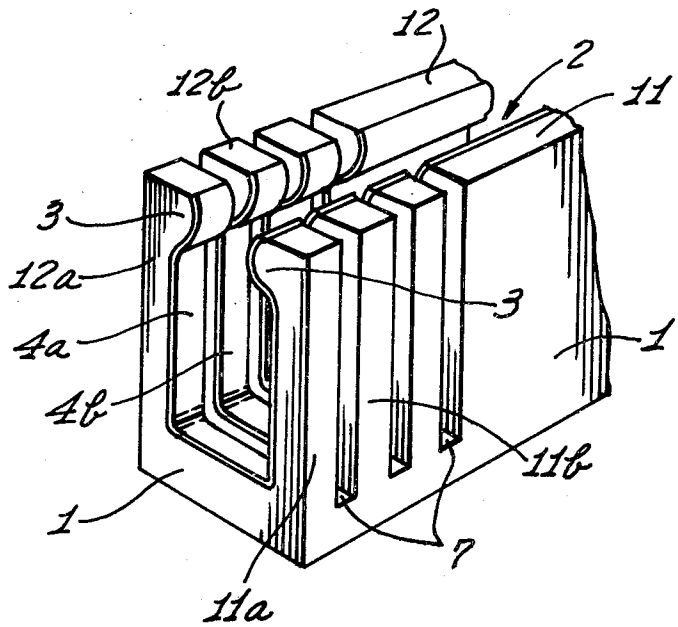


Fig. 1

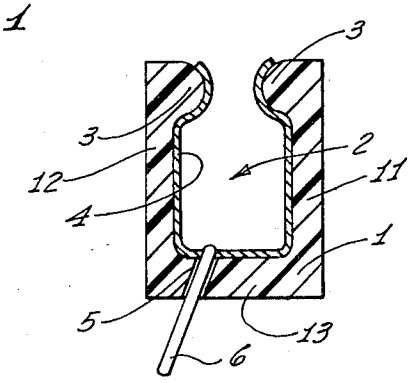


Fig. 2

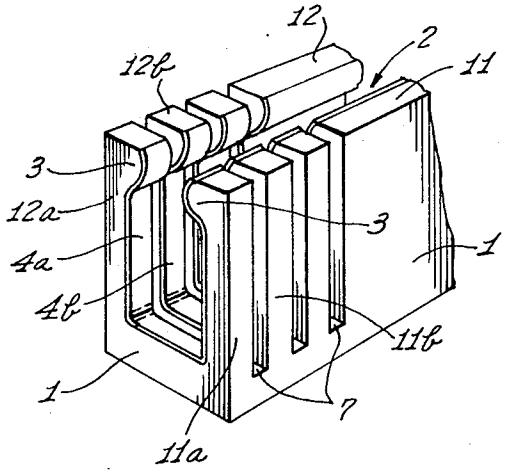
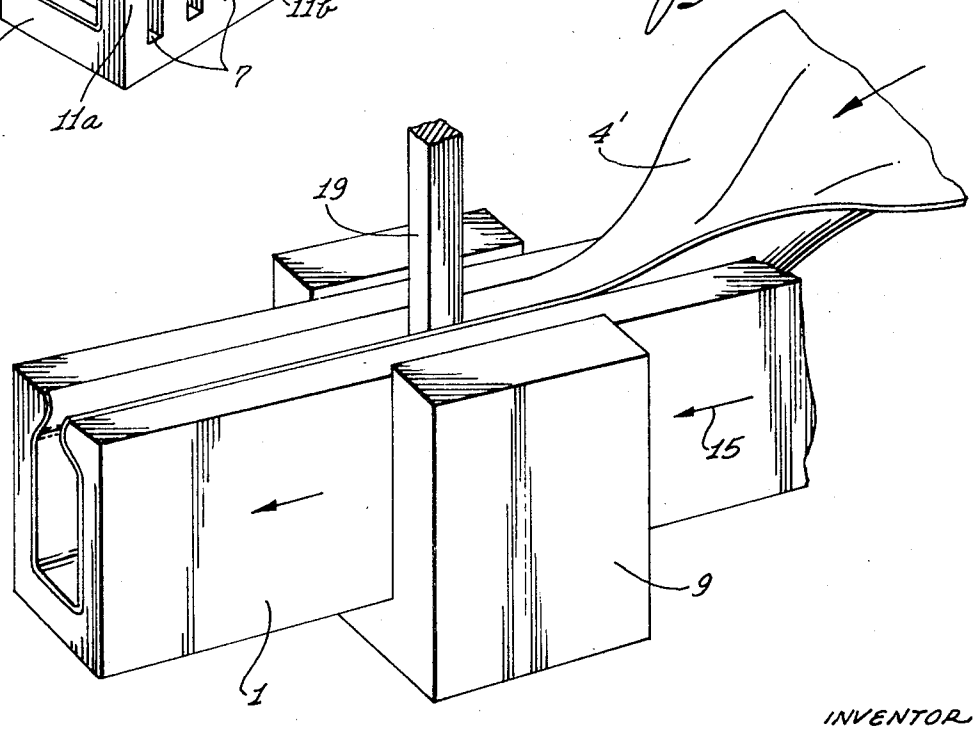


Fig. 3



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CONNECTOR ELEMENT

The present invention relates to connector elements or sockets particularly serving as connector elements for low-power circuitry, such as printed circuits, and to a method for making such a socket. It is the particular object of the present invention to provide such a connector socket element which is reliable but can be manufactured in a simple manner and inexpensively. It is another object of the invention to provide a simple multiconnection socket element.

In accordance with the present invention, the connector socket element is comprised of a plastic bar having an elongated indentation such as a groove. The connector bar thus has essentially U-shaped cross section lined with electrically conductive layering. The connector element is made by first forming an elongated bar of a plastic material, preferably in a continuous process, the bar being provided with grooves to have U-shaped cross section. Next, the interior of the groove is lined with an electrically conductive layer. Next, the notches are cut into the bar to the extent that a notch extends through the legs of the "U" as well as through the electrically conductive layer but not through the portion of the bar forming the bottom of the groove, so that the element remains contiguous through that bottom portion of the bar. Finally, connector elements are cut at desired length from the endless string. The last two cutting steps could be reversed in sequence. A finishing process may follow, If a connector prong to be inserted is resilient, the plastic bar used as multiconnection socket element does not have to be resilient in itself and can serve as support for other elements.

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention, it is believed that the invention, the objects and features of the invention and further objects, features and advantages thereof will be better understood from the following description taken in connection with the accompanying drawing in which:

FIg. 1 illustrates a cross section through a connector element in accordance with the preferred embodiment of the invention;

FIG. 2 illustrates a perspective end view of the element shown in FIG. 1; and

FIG. 3 illustrates in perspective view a phase of making such a connector element.

In FIGS. 1 and 2 there is illustrated a plastic bar 1 which has essentially rectangular cross section as to the outer contour. The bar is provided with a longitudinal grove 2. In order to obtain resilient engagement with connector pins to be inserted in the groove 2, lips or bulges 3 are provided to narrow the entrance to the groove 2. For reasons of saving material and also in order to obtain resilient action, the (original) sidewalls 11 and 12 of the grooved bar are rather thin, i.e., the overall cross section of the bar is actually U-shaped with rather narrow legs of the U.

Interior of the groove is lined with an (originally contiguous) electrically conductive layer 4. A bore such as 5 receives a connecting wire 6 contacting the layer 4 and traversing the body of bar 1 remote from the entrance to the groove, for example, at the bottom 13 thereof.

Individual socket elements are formed in that the bar 1 is provided with notches 7 giving the entire bar a comblike configuration. The notches extend through the legs 11 and 12 of the U, but not through the base 13 thereof, so that the individual sockets are integrally joined by means of the remaining portion 13 of bar 1, which is not traversed by notches 7. The notches do, however, traverse also the layer 4 along the sidewalls 11 and 12, as well as adjacent bottom portion 13 of the bar, for electrically separating the connecting elements, one in each socket element. Thus, as to the connecting element it is more correct to speak of individual contact elements 4*a*, 4*b*, etc., which have resulted from cutting notches into the layer 4.

Each contact element is thus established by a strip of electrically conductive layering along the bottom 13 of the bar, from which extend contact arms 4*a*, 4*b*, etc., along the notched sidewalls 11 and 12 of the bar, which, in the illustrated configuration, are actually individual resilient arms, 11*a*, 11*b*, 12*a*, 12*b*, etc., permitting some resilient pivot action on an axis which is longitudinal to the bar. Each such arm has a beaded portion 3, and contact-making proper will occur at the contact linings on the beaded portions, the lining having crimped configuration but following the contour of the bead or bulge. Of course, there must be as many lead-in wires 6 as there are different socket elements. A corresponding plurality of apertures 5 must be provided for receiving the connecting lead-in wires. These apertures may be provided in different locations, for example, near the entrance.

The connector element can thus be considered also as being comprised of a flat bar 13 from which extend two rows of arms 11*a*, 11*b*, etc., and 12*a*, 12*b*, etc. These arms are defined by way of notches 7 cut into walls 11 and 12. The arms extend parallel to each other and face each other in pairs across the space defined as groove 2. These arms permit some resilient pivoting relative to each other, so that the beaded portions at the entrance of groove 2 and extending towards each other as to each pair of arms from which they extend, can clamp a contact element when inserted, to thereby cause contact-making with the contact-making lining on the beaded or bulging end of each arm.

The connector socket element, as described, can be made in accordance with a first, preferred form of practicing the invention by way of continuously extruding plastic material to obtain a bar with essentially U-shaped cross section. In a subsequent step, an electric layer 4 is provided, for example, by way of electrolysis or by depositing an electrically conductive lacquer onto the interior wall defining the groove 2. Alternatively, an emulsion can be deposited on this interior wall of groove 2 or the layer can be produced by vapor depositing.

It should be noted that immediately after extrusion the bar has an elevated temperature and cools down subsequently. This, in turn, is of advantage in that a particular temperature, when reached, provides optimum adherence to a contact-making layer in the interior of groove 2 when provided onto the bar at that temperature. This is of particular importance if the layer 4 is provided during cooling of the bar by way of depositing an electrically conductive lacquer or by vapor depositing. In such a case, maximum adherence can be obtained at that elevated temperature, and the bar with its interior layer then cool together.

Still an alternative way of producing the contact in the interior of the socket bar, may include insertion of a metallic strip. As shown in FIG. 3, a metallic strip 4' is guided into the groove. The strip 4' may be reeled from a supply spool to run parallel to the bar, particularly after the latter has been manufactured. In FIG. 3, in particular, the bar 1 may have been made of plastic by way of extrusion molding. The bar is presumed to move in the direction of arrow 15, for example, as leaving the molding equipment and now passing through a region for cooling. Particularly, the bar is shown presently to pass through a gauging element 9. Metallic strip 4' or tape travels generally with the bar 1. By means of a stationary tool 19, the tape 4' is forced to enter the aperture on top of the bar and into the groove thereof for being forced in juxtaposed position to the wall defining the groove 2. In case, as illustrated, the bar has lips narrowing the entrance to the groove 2, one can use a resilient metal strip forced into the groove for positioning therein.

Subsequent to lining the interior of the bar with a contact-making layer, the notches are cut to provide individual contact sockets. The socket bar as outlined is of high advantage as a connector socket element for making connections with terminal contacts on a printed circuit board. Such a connector element can also be used as a semifinished product and individual multicontact connector elements or even individual socket elements for simple contact can be cut from such a bar. In other words, a bar of this type can be produced on a basis of indefinite continuous length and multicontact connector elements can be cut therefrom at convenient length, and for any desired number of individual contacts.

The invention is not limited to the embodiments described above but all changes and modifications thereof not constituting departures from the spirit and scope of the invention are intended to be included.

I claim:

1. A connector bar for receiving plugs or other contact elements, such as contact strips on printed circuit boards, or the like, comprising a plastic bar having a longitudinal groove to obtain a bottom and two walls defining essentially U-shaped cross section and profile, the groove being lined with an electrically conductive layer, and means to make electric contact with the layer, there being notches traversing the walls of the bar as corresponding to legs of the U-shaped profile and separating also the electrically conductive layer to provide individual contact socket elements.

2. A connector bar, as in claim 1, the plastic bar having rectangular outer cross section.

3. A connector element, as set forth in claim 1, the groove having lip-shaped inwardly projecting bulges narrowing the entrance to the groove.

4. A connector bar, as in claim 1, the legs of the U being selected to be resilient.

5. A connector bar, as in claim 1, there being at least one bore through the bar body, a wire inserted in the bore to provide connection to the lining in the groove.

6. A connector element, comprising;

a flat, elongated base of insulative material;

a plurality of arms extending in pairs from the base integral therewith and parallel to each other and defining two parallel rows, the arms of a pair pertaining to different rows, each arm of a pair of the pairs having a bulged portion on its end extending toward the respective bulged portion of the other arm of the pair; and

contact-making lining on at least a surface portion of at least one arm of each pair as facing the respective other arm of the pair.

7. A connector element as in claim 6, the arms of a pair being resilient for resilient pivoting of the respective bulged portions relative to each other.

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