United States Patent [19]

Kreutter et al.

[11] **3,866,997**

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[54] **PRINTED CIRCUIT BOARD CONNECTOR AND METHOD AND TOOL FOR REMOVING CONTACTS THEREFROM**

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[73] Assignee: **ITT Industries, Inc.**, New York, N.Y.

[22] Filed: **Oct. 23, 1973**

[21] Appl. No.: **408,593**

[30] **Foreign Application Priority Data**

Dec. 6, 1972 Germany 2259774

[52] **U.S. Cl.** ..... **339/217 S**, 339/176 MP

[51] **Int. Cl.** **H01r 9/08**

[58] **Field of Search** ..... 339/217, 176 MP, 17, 256, 339/258

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Assistant Examiner—Robert A. Hafer
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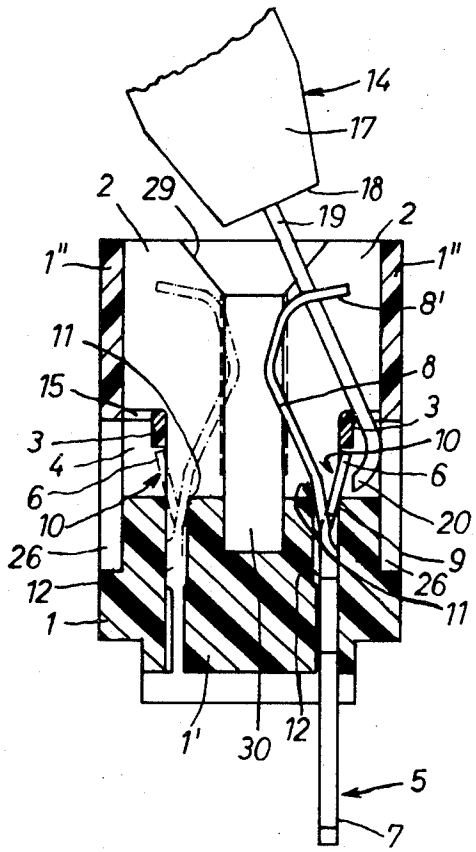
[57] **ABSTRACT**

A printed circuit board connector whose contact elements are unlockable both laterally and from the direction of plugging the board in the connector. A method and special tool for performing the unlocking are described.

7 Claims, 6 Drawing Figures



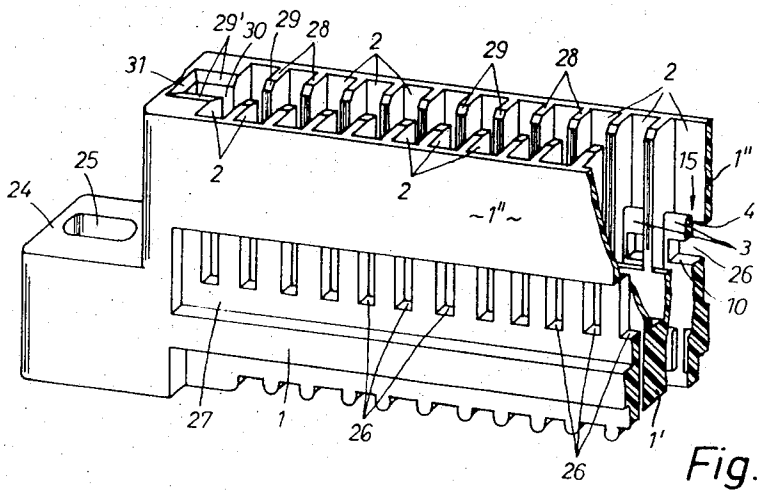


Fig.1

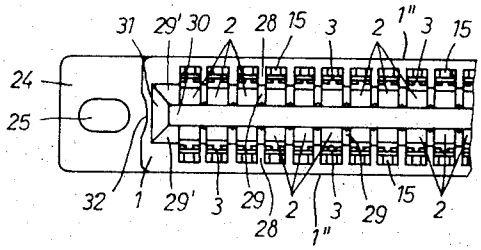


Fig.2

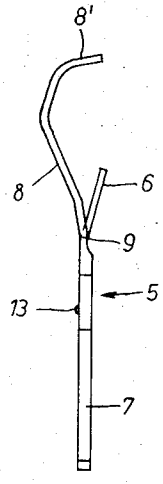


Fig.3

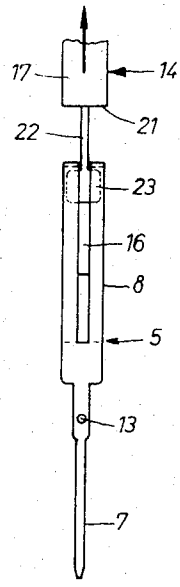


Fig.4

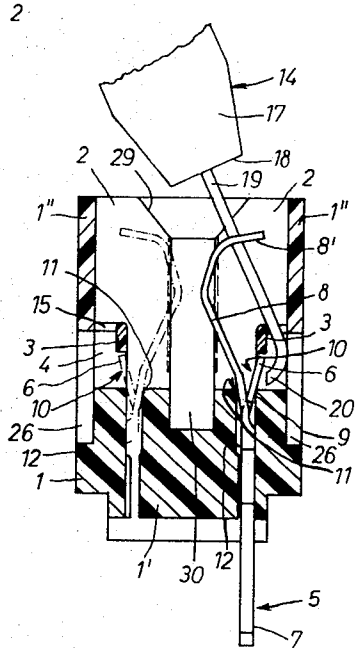


Fig.5

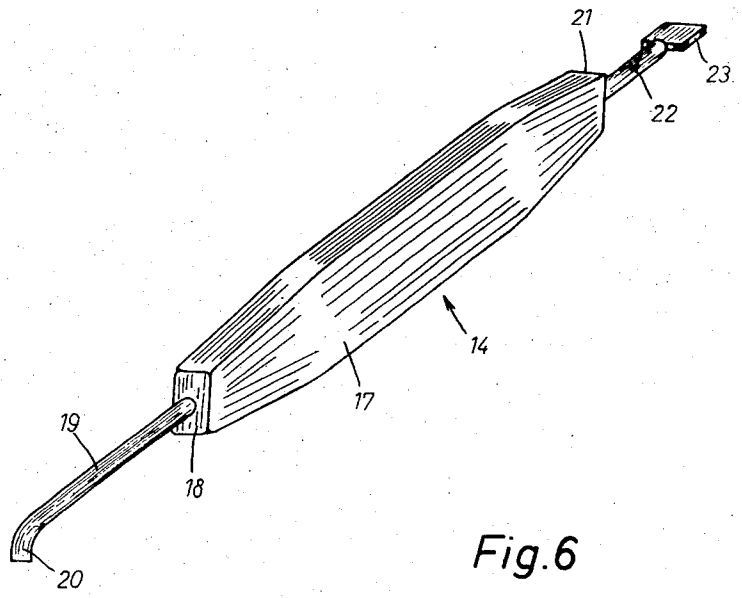


Fig.6

PRINTED CIRCUIT BOARD CONNECTOR AND METHOD AND TOOL FOR REMOVING CONTACTS THEREFROM

BACKGROUND OF THE INVENTION

The present invention relates to a multiterminal electrical printed circuit board connector with contacts unlockable in the direction of plugging.

Connectors are known which, when mated, can be unlocked from the cable side. For unlocking, use is made of a sleeve-shaped tool which is inserted from the cable side into the connector where it pushes the tongues of a holding sleeve aside, so that the socket or the pin with the wire attached thereto can be withdrawn.

Also known are connectors with a stamped-free and branching tongue at the terminal ends of the contacts, which, when inserted into the insulating body of the connector, snap behind an edge of the insulating body, thereby being held in place within the connector. It is also known to provide at the side of the insulating body of such a connector one opening per contact chamber so that the individual contact can be unlocked through this opening using, e.g., a pin.

However, both conventional methods of locking the individual contacts within a connector when inserting the contacts into the insulating body and, if necessary, of unlocking the individual contacts from outside, i.e., from the cable side or from the side of the insulating body, cannot be used in case of high packing density printed circuit board applications where the connectors are closely spaced on printed circuit boards. This is because the board prevents unlocking toward the connecting or cable side and lateral unlocking cannot be carried out since the sides of the connectors are not accessible because of their adjacent positioning on the board.

It is therefore the object of the present invention to provide a connector whose contact elements can be unlocked individually from the open plugging side (with the circuit board withdrawn) even though the connectors are closely packed.

SUMMARY OF THE INVENTION

According to the invention, there is provided a printed circuit board connector having an insulating housing in which there is formed one bridge member per contact chamber. The bridge member is spaced from the side wall and bottom of the housing defining upwardly and inwardly extending openings, the upwardly extending opening being accessible from the open plugging side of the housing. A contact element having a retention tongue and a contacting portion is disposed in each chamber, with the tongue disposed beneath the bridge member to retain the contact element in the housing. A tool may be inserted through the upwardly extending opening into the space behind the tongue from the open plugging side of the connector housing to remove the tongue from below the bridge member, thus allowing the contact element to be withdrawn from the housing.

The invention has its principal advantage in that, if connectors are arranged close together, e.g., on a printed circuit board, each one of the contact elements can be unlocked from the plugging side. The contact releasing tool itself is of simple design, can be used in two positions, and permits each one of the contact elements to be withdrawn from the insulating body in a simple manner following the unlocking operation.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective and enlarged fragmentary view of the insulating housing of the connector;

FIG. **2** is a top view of the fragment illustrated in FIG. **1**;

FIG. **3** is an enlarged side view of a contact element used in the housing illustrated in FIGS. **1** and **2**;

FIG. **4** is an enlarged view of a contact element as shown in FIG. **3**, looking on the surface of the contact element, with a withdrawal tool in engagement therewith;

FIG. **5** shows an enlarged cross section, viewed from one end, through the insulating housing of the connector shown in FIG. **1** and provided with contact elements, and illustrates the unlocking operation; and

FIG. **6** is a perspective and enlarged view of a tool for unlocking and withdrawing the contact element shown in FIGS. **3** and **4**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. **1**, the reference numeral **1** designates an insulating housing having a bottom **1'** and a pair of spaced upwardly extending side walls **1''**. A row of contact chambers **2** is provided along each sidewall **1''** each containing a contact element **5**. The insulating body **1** containing the contact elements is used as a connector for printed circuit boards. The connector is mounted by means of flanges **24** provided at both ends of the housing **1** and having mounting holes **25**.

Each contact chamber **2** contains a longitudinally extending bridge member **3**, which forms, in the lower portion of the contact chamber **2**, a space **4** which is accessible from three sides, i.e., toward the inside, parallel to the bottom of the contact chamber **2** through an opening **10**, at an angle of 90° thereto, parallel to the sidewalls of the housing **1** through an opening **15**, and at an angle of 180° to the first opening **10** through a lateral opening **26** in the housing **1**. On both sides of the housing **1** there is provided a recess **27** which extends along the outside of the side walls **1''** and contains the openings **26**. Each contact chamber **2** is limited by a transverse partition **28**. A central, elongated vertical slot **30** between the partitions **28** is provided for the insertion of a printed circuit board, not shown. The slot is provided with a chamber **29** facilitating the insertion of the printed circuit board. The insertion slot **30** extends somewhat beyond the contact chambers **2** and has insertion chamfers **29'** and **31** at the top of the housing **1**.

FIG. **2** is a top view, slightly reduced in size, of the insulating housing of FIG. **1**. The ends of the housing are provided with circular-arc-shaped recesses **32** which, when the housing is mounted via the flanges **24**, permits the use of a washer or of a screw with a larger head diameter.

FIGS. **3** and **4** show a contact element **5** in different views, with FIG. **3** showing the contact element as viewed from one narrow side, while FIG. **4** shows the contact element as viewed from one broad side. The contact element includes a lower terminal end **7** which, in the example shown, is designed as a square pin for wire wrap connections, and a resilient, bowed contact-

ing portion **8.** The upper end **8'** of the contacting portion is reversely bent to form a hook. The terminal end **7** may also be designed as a solder or crimp termination.

The terminal end **7** has a lateral thickening **13** which is designed to secure the contact element **5,** inserted into a hole **12** in the bottom **1'** of the housing, against play, so that the terminal ends **7** are fixed when a wrapped joint is produced. It is noted that the holes **12** are located inside or between the bridge members **3.**

At the point **9** at one end of the terminal end **7,** the latter passes into a bifurcation one end of which is formed by the contacting portion **8,** and the other by the tongue **6.**

As can be seen from FIG. **4,** the contacting portion **8** is divided by a slot **16** into two spring legs which are sprung open independently of one another when contacted by the printed circuit board. The slot **16** also facilitates the removal of a contact element **5.** For this purpose, there is provided a tool **14.** FIG. **6** shows the tool on an enlarged scale. The tool has a handle **17** from which wires **19** and **22** project at both ends **18** and **21.** The end **20** of the wire **19** is curved, while the end of the wire **22** has a shovel-shaped widening **23.** The shovel-shaped widening **23** is first positioned lengthwise in the slot **16** and then turned transversely to the slot. In this position of the tool **14,** the contact element **5** can be withdrawn from the contact chamber **2** in the direction of the arrow in FIG. **4** if the tongue **6** was previously released from its locked position under the bridge member **3.**

In FIG. **5,** this unlocking operation is explained in more detail with reference to a sectioned housing **1.** The terminal end **7** of a contact element **5** is so inserted into a hole **12** in the insulating body **1** that the play between the terminal end **7** and the wall of the hole **12** is compensated for by the lateral thickening **13.** Prior to the attainment of the end position for a contact element **5** in a contact chamber **2,** the tongue **6** slides along the inner wall of the bridge member **3** until it engages the opening **10** below the bridge member. Following the engagement of the tongue **6** or simultaneously with the engagement, the bifurcation **9** is supported on the upper rounded edge **11** of the hole **12.** Then, the contacting portion **8** of the contact element is in proper position within the contact chamber **2,** its bowed portion projection into the slot **30.**

To release contact element **5** from its locked position within the insulating body **1,** the tool **14** is used. The curved end **20** is inserted from the open plugging side of the housing through the opening **15** behind the bridge member **3.** The tool is pivoted to cause the end **20** to force the tongue **6,** located below the bridge member **3** in the locked condition, out of the opening **10,** so that the tongue no longer stands below the bridge member. The tongue may be slightly bent in the direction of the contacting portion to prevent any spring-back of the tongue during the withdrawal of the tool **14** from resulting in another engagement. The tool **14** is then withdrawn from the contact chamber **2** and reversed outside the housing **1** in such a manner that — as described with reference to FIG. **4** — the end **21** of the tool **14** is inserted into the slot **16** of the contact element and turned through 90°. In this way, the contact element **5** can be withdrawn from a chamber **2** of the insulating body **1** in the direction of the arrow (FIG. **4**) from the open plugging side of the housing **1.**

What is claimed is:

1. A printed circuit board connector comprising:

an insulated housing member having a bottom, a pair of spaced side walls extending upwardly from said bottom and plurality of contact chambers formed along at least one of said side walls above said bottom;

a slot in said housing member between said side walls communicating with said contact chambers and adapted to slidably receive a printed circuit board therein;

a longitudinally extending bridge member in each of said contact chambers, said bridge member in each said chamber being spaced from said one side wall and said bottom and defining a first upwardly extending opening and a second opening extending away from said bottom and bounded by said one side wall and said bridge member extending inwardly toward said slot from said one side wall and bounded by said bottom and said bridge member; and

a plurality of contact receiving holes in said bottom located on the side of said bridge member opposite to said one side wall.

2. A connector as set forth in claim **1** including a contact element in each of said chambers, each said contact element having a retention tongue, a terminal end and a contacting portion, said terminal end being mounted in one of said holes, said retention tongue extending into said second opening and said contacting portion extending into said slot for contact with a printed circuit board therein.

3. A connector as set forth in claim **2** wherein said contacting portion and said tongue of each said contact element bifurcate from said terminal end thereof in different directions.

4. A connector as set forth in claim **2** wherein the upper end of the contact portion of each of said contact elements is reversely bent to form a hook.

5. A connector as set forth in claim **4** wherein the contacting portion of each said contact element is divided by a slot into two spring legs.

6. A connector as set forth in claim **1** including:

lateral openings extending through said one side wall in alignment with said second openings.

7. A connector as set forth in claim **1** including:

a plurality of second contact chambers formed along the other of said side walls each provided with one of said bridge members; and

a plurality of second contact receiving holes in said bottom located on the side of said second contact chamber bridge members opposite to said other side wall.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 3,866,997

DATED : February 18, 1975

INVENTOR(S) : E. Kreutter-H. Lindner

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, lines 22 to 25 should read as follows:

tending opening extending away from said bottom and bounded by said one side wall and said bridge member and a second opening extending in-

Signed and Sealed this

Twentieth Day of July 1976

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks