July 25, 1967 R. C. DONNELLY 3,333,226

TORSION BAR ELECTRICAL CONNECTOR

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FIG. 1

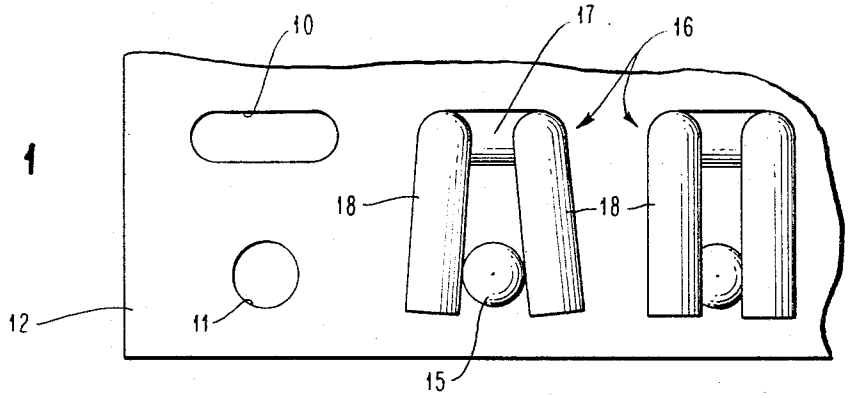


FIG. 3

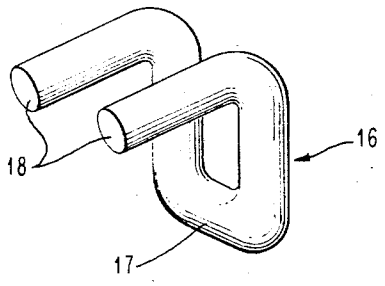
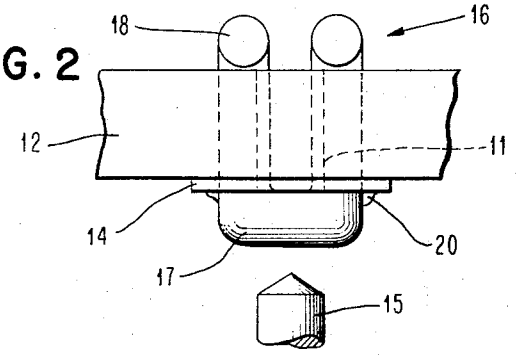


FIG. 2



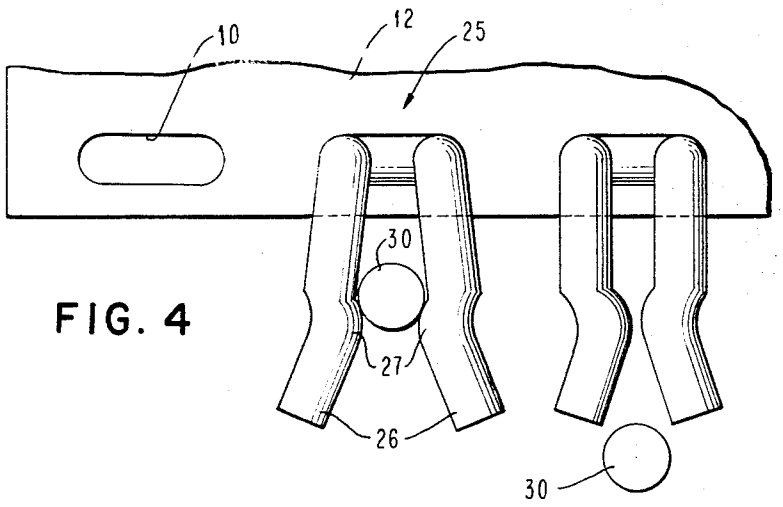


FIG. 4

INVENTOR

RAYMOND C. DONNELLY

BY John L Stirling

ATTORNEY

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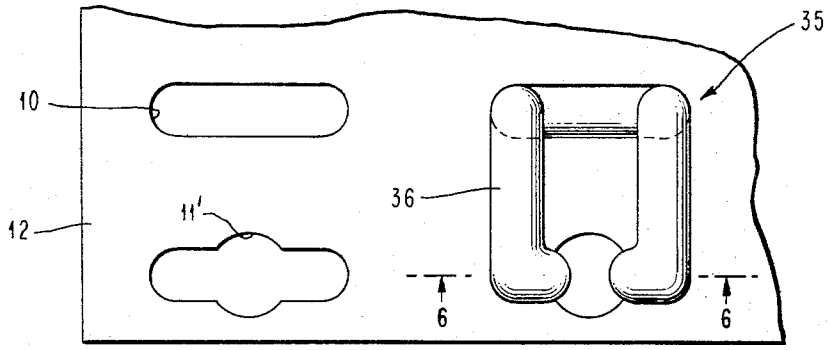
FIG. 5



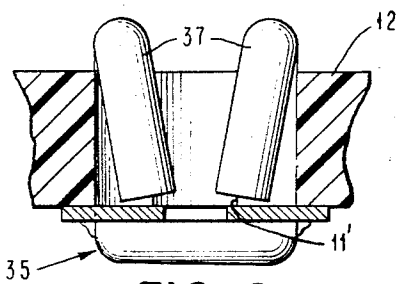


FIG. 6

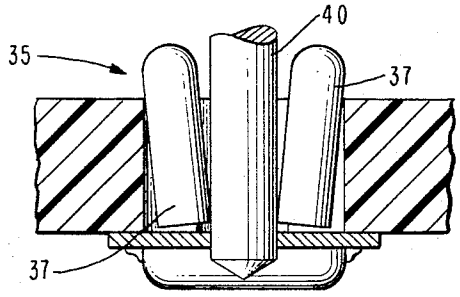
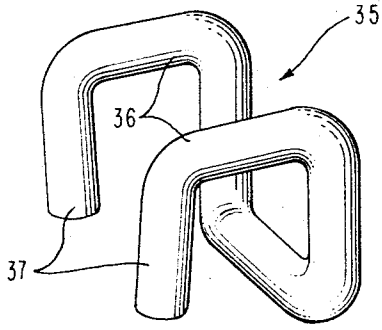


FIG. 7

FIG. 8



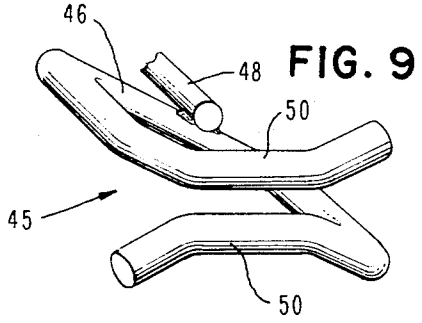
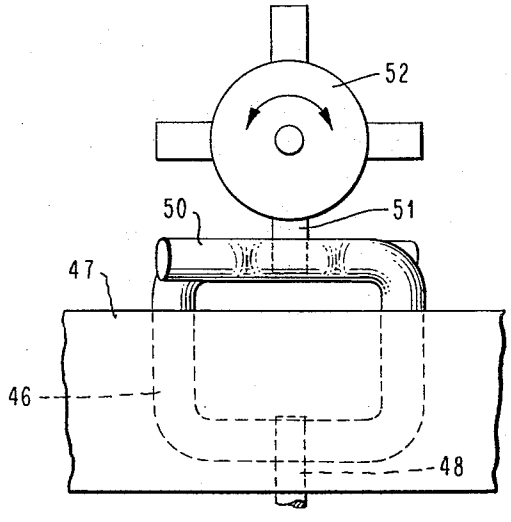


FIG. 9

FIG. 10



United States Patent Office 3,333,226 Patented July 25, 1967

3,333,226

TORSION BAR ELECTRICAL CONNECTOR

Raymond C. Donnelly, Wappingers Falls, N.Y., assignor to International Business Machines Corporation, New York, N.Y., a corporation of New York

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2 Claims. (Cl. 339—17)

This invention relates to electric connectors and more particularly those in which the contacts thereof rely on torsion in the members to effect firm contact pressure.

In existing connectors the contact members are of resilient spring stock that uses the inherent resilience to effect contact pressure. In this form of connector the frame is used as a fulcrum and, therefore, must necessarily be bulky which more or less precludes their use in micro-miniature applications.

It is, therefore, the principal object of this invention to provide a connector the contacts of which rely on torsion within its members to effect a firm contact pressure.

Another object is to provide a connector the contacts of which are formed of wire of materials having good tension characteristics.

A further object is to provide a connector in which the wire contacts provide point-line contact.

A still further object is to provide a connector adaptable for use in micro-miniature installations.

The foregoing objects are accomplished according to the present teachings to the provision of a sub-miniature connector for modules and printed circuits wherein the conductive contact when in operative position is under torsion rather than tension or compression. They are so formed that the body portion is held rigid while the free ends thereof place all or portions of the body portion in torsion when engaged by a module pin or connector. The contacts are formed of simple preformed shapes of rigid metallic wire preferably round in cross section and preclad or coated with gold or other highly conductive metal. The round configuration insures line point contact, that is unlikely to be scratched, galled or otherwise damaged even after countless contact operations.

The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of the preferred embodiments of the invention, as illustrated in the accompanying drawings.

In the drawings:

FIG. 1 is a plan view of a portion of a circuit board with the preferred form of the invention shown in operated and unoperated condition.

FIG. 2 is a front elevation of FIG. 1 showing the method of fastening the contact.

FIG. 3 is an isometric showing the contact member of FIG. 1.

FIG. 4 shows a modification of the connector shown in FIG. 1.

FIG. 5 is a plan view showing a further modified form of the invention.

FIG. 6 is a cross-section taken along line 6—6 of FIG. 5 showing the connector in normal position.

FIG. 7 is a cross-section similar to FIG. 6 showing the invention in operated condition.

FIG. 8 is an isometric showing of the modified form of FIG. 5.

FIG. 9 is a plan view of a still further modified form of the invention, and

FIG. 10 is an isometric of the contact member of FIG. 9.

This connector is for use principally with micro modules and printed circuits where tolerances are close. In view of this the contacts as disclosed are of fine wires.

However, it is obvious that the contacts can be flat, square or of any suitable configuration.

Unlike previous connectors the contact thereof does not rely on the resilience of its members to effect good contact pressure, but uses torsion built up in one member by the leverage exerted by a second member. It may be well to point out that each contact comprises a unitary structure composed of members one or more of which are placed in torsion by the movement of the free end members of the structure.

In FIG. 1, holes **10** and **11** are formed in a printed circuit board **12** having the circuitry **14** on the reverse side. The circuits on the board are to be connected by pins **15** to another circuit, module or component. The contact **16** is formed of a U-shaped body member **17** and two arms **18** (FIG. 3). The U-shaped body **17** is inserted in hole **10** with the arms **18** resting on the surface of the circuit board (FIG. 2). The hole **10** having been cut through a land or portion of circuitry **14** at the base of the U-shaped body, may be soldered or welded to that circuitry as at **20**. When a pin **15** is passed through hole **11** between the arms **18**, the arms of the body **17** are twisted about their longitudinal axis thus building up torsion which holds the arms in resilient and constant contact with the pin. The contact is formed of stiff wire such as steel, Phosphor bronze, and the like, the arms **18** or the entire structure being gold-plated to effect low contact resistance.

The contact **25** shown in FIG. 4 is similar to that of FIG. 1 with the exception that the arms **26** are formed with shoulders **27** permitting the pin **30** to be used in edge-connecting two circuits or a module. The shoulders act to lock the pin from being easily dislodged.

In FIG. 5 the contact **35** is similar to contacts **16** and **25**, except that arms **36** are provided with depending arms **37** extending into a hole **11'**. This form provides a wiping line contact between pin **40** and arms **37** upon insertion.

The contact **45** in FIG. 9 operates on the same principle as those above. However, here the U-shaped body portion **46** is molded in a block **47** of plastic or the like and has a contact wire **48** soldered thereon that extends out of the casing. The arms **50** extend parallel to each other and free of the block. When an arm **51** of rotary switch member **52** moves between the arms **50**, the arms of body portion **46** are placed in torsion, thereby insuring firm, even contact pressure.

While the invention has been particularly shown and described with reference to preferred embodiments thereof, it will be understood by those skilled in the art that the foregoing and other changes in form and details may be made therein without depatring from the spirit and scope of the invention.

What is claimed is:

1. In an electrical device:
a printed circuit board having circuitry on the back thereof;
an aperture through said board and circuitry;
a contact comprising a U-shaped body portion having arms bent at right angles to said body in parallel relation with each other;
said arms being bent to form centrally located shoulders;
said body portion being housed in said aperture with the base thereof connected to said circuitry; and
a second contact adapted upon being inserted between said arms and retained by said shoulders to place said body portion under torsion to maintain good contact.

2. In an electrical device:
a printed circuit board having circuitry on the back thereof and;

two apertures through said board and circuitry in parallel relation;

a wire-like contact of uniform diameter, said contact comprising a U-shaped body portion having arms bent at right angles to said body, the free ends of said arms being bent at right angles to the body of said arms with the ends converging toward each other;

said body portion being housed in one of said apertures with the base thereof connected to said circuitry;

said free ends extending over said circuit board with the converging ends extending into the second of said apertures, said free ends being movable between an inoperative position and an operative position wherein portions of said body portion within said aperture are torsionally stressed;

a second contact inserted between said converging ends and holding said free ends in said operative position whereby the torsional stresses in said body portion maintain said second contact and said converging ends in firm electrical contact.

References Cited

UNITED STATES PATENTS

1,735,133	11/1929	Schmidt	339—194
2,535,578	12/1950	Johanson	339—258 X
3,188,599	6/1965	Roberts	339—17 X
3,230,297	1/1966	Means	339—17 X
3,246,280	4/1966	Scagnelli	339—176 X

MARVIN A. CHAMPION, *Primary Examiner.*

ALFRED S. TRASK, PATRICK A. CLIFFORD, *Examiners.*