United States Patent

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[54] **PLUGGABLE SOCKET CONNECTOR**
12 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** ..... **339/17 C,** 174/68.5, 287/111 R, 317/101 CC, 339/17 R, 339/256 R
[51] **Int. Cl.** **H05k 1/02**
[50] **Field of Search** ..... 339/17 R, 17 C, 220, 217, 216, 219, 256 R; 174/68.5; 317/101 C, 101 CC, 101 D; 287/110, 111, 52, 126

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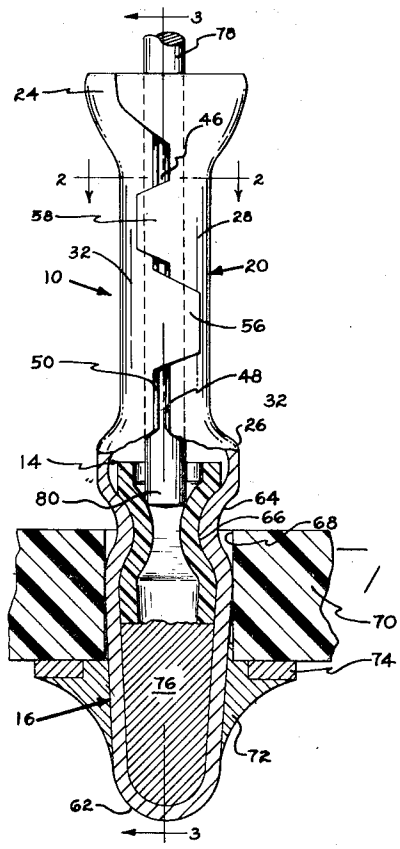
ABSTRACT: A circuit board socket connector having a longitudinal seam with antispreading fingers on both sides of the seam extending across the seam and into close proximity with the outside part of the socket across the seam. The fingers limit spreading of the seam when a lead is inserted into the socket.



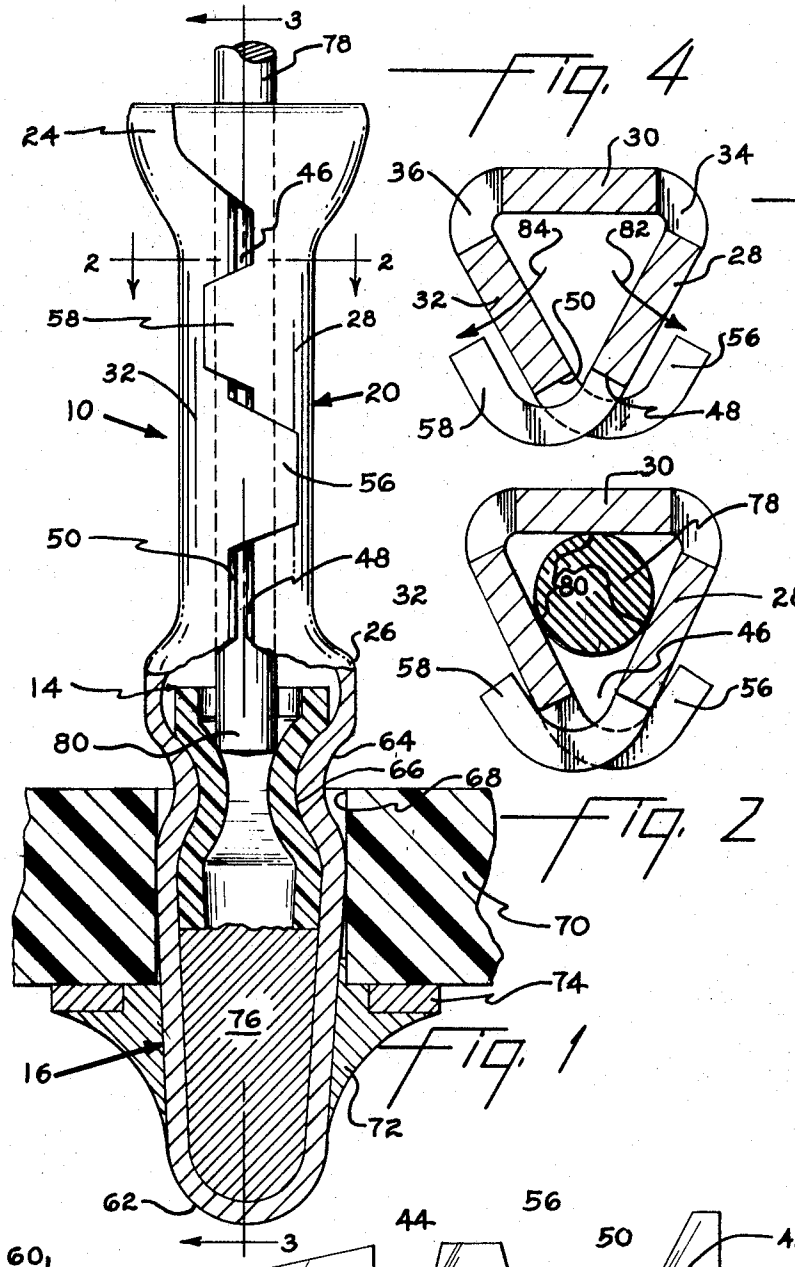


Fig. 1

Fig. 4

Fig. 2

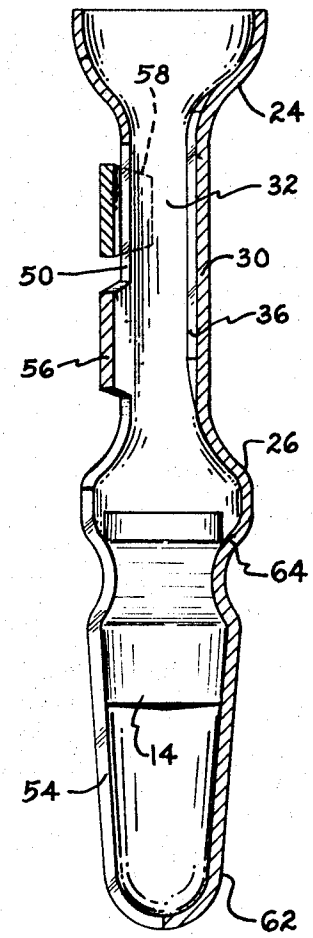


Fig. 3

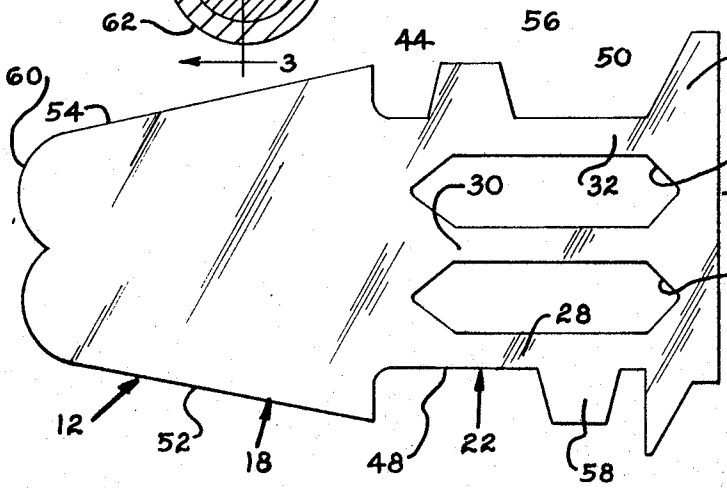


Fig. 5

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PLUGGABLE SOCKET CONNECTOR

The invention relates to a plug-type disconnect socket connector for mounting on a circuit board with a solder connection between the socket and printed circuitry on the board. The socket is rolled from sheet metal stock and includes an elongate socket body with a longitudinal seam extending along one side of the body. Fingers extend from the body on each side of the seam across the seam and into close engagement with the outside of the body on the opposite side of the seam. When a contact lead is inserted into the socket body, it engages the portions of the socket to either side of the seam to form electrical connections therewith. The fingers limit opening of the seam during insertion of the lead so that the lead is confined within the socket. The fingers also serve to increase the contact pressure between the socket and large diameter leads.

A generally conical solder plug is provided at one end of the disconnect socket body. The seam which runs along the socket extends along the plug. A cylindrical plastic solder stop is confined in the end of the plug adjacent the socket body to prevent solder which during solder dipping flows into the interior of the plug through the seam from seeping into the socket.

The pluggable socket connector represents an improvement over conventional circuit board sockets, such as disclosed in U.S. Pat. No. 3,268,851 in that the antispreading fingers assure that the socket is not permanently deformed during insertion of the lead. Also, the socket provides improved high-pressure line contact electrical connections with lead, as opposed to the point contact connections of conventional circuit board connections. The connector is inexpensively and easily manufactured from strip metal stock and plastic tubing.

Other object and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawings illustrating the invention, of which there is one sheet.

In the drawings:

FIG. 1 is a partial sectional view taken through a circuit board illustrating a pluggable socket connector;

FIG. 2 is a sectional view taken along line 2—2 of FIG. 1;

FIG. 3 is a sectional view of a pluggable socket connector taken along line 3—3 of FIG. 1 before the connector is soldered to a circuit board and a lead has been inserted;

FIG. 4 is a sectional view like FIG. 2 but before a lead has been inserted into the connector; and

FIG. 5 is a plan view illustrating a blank from which the connector may be formed.

Pluggable socket connector **10** may be formed from blanked part **12** of FIG. 5 and a cylindrical Teflon solder stop **14**. The connector **10** includes a generally conical solder plug **16** which is rolled from portion **18** of blank **12** and a disconnect socket **20** which is rolled from socket portion **22** of blank **12**. The Teflon cylinder **14** is confined in the end of plug **16** adjacent socket **20** during the rolling operation.

Disconnect socket **20** is provided with annular collars **24** and **26** at the ends thereof. Collar **24** is funnel-shaped to facilitate insertion of a lead into a socket. The collars **24** and **26** are joined together by three longitudinally extending strips **28, 30** and **32**. Strips **28** and **30** are spaced apart by slit **34** and strips **30** and **32** are spread apart by slit **36**. The slits are formed during rolling of blank **12** from cutouts or slits **38** and **40** of blank portion **22**. Collar **24** is formed from blank strip **42** and collar **26** is formed from blank strip **44**. In the blank, strips **42** and **44** are joined together by strips or rungs **28, 30** and **32**.

As illustrated in FIGS. 2 and 4, a cross section of socket **20** taken through strips **28, 30** and **32** is generally triangular in shape with the strips defining the sides of a triangle and slits **34** and **36** and seam **46** defining the corners of the triangle. By utilizing a triangular cross section, a line contact is formed between each of the strips and a lead inserted into the socket.

Longitudinally extending seam **46** extends along the body of connector **10**. In socket **20** the seam is defined by the side edges **48** and **50** of strips **28** and **32**. The seam extends along the solder plug **16** and is defined by abutting edges **52** and **54** of blank portions **18**. In the socket **20**, edges **48** and **50** are spaced slightly so that the seam is open.

Fingers **56** and **58** extend from edges **48** and **50** of strips **32** and **28** respectively across seam **46** and into close proximity with the outside of the strip on the opposite side of the seam. This relationship is best illustrated in FIG. 4. Fingers **56** and **58** are longitudinally spaced along seam **46**. Plug portion **18** of blank **12** is generally trapezoidal in shape with the major base of the trapezoid adjoining strip **44**. The minor base of the trapezoid compresses a pair of convex arcs **60** which, when the connector is rolled from blank **12**, form the rounded end **62** of plug **16**.

During the rolling operation, the Teflon cylinder **14** is positioned in the plug adjacent socket portion **20**. Annular groove **64** is formed in the outside of the plug so that the cylinder **14** is stressed to an hourglass configuration and a tight solder-resistant compression seal is formed at the interface **66** between the Teflon cylinder and the inner surface of the plug.

The plug of connector **10** is inserted into hole **68** formed through the thickness of the circuit board **70** so that the lower end of plug **16** extends below the circuit board. The circuit board may then be wave soldered to form a solder connection **72** between the connector and printed circuitry **74** on the circuit board. During soldering a mass of solder **76** seeps into the interior of the plug **16** through the lower portion of seam **46**. The Teflon cylinder **14** prevents the solder **76** in the interior of the plug from flowing up the connector **10** and into the disconnect socket **20**. In this way the formation of the solder connection between the plug and the circuit board does not affect the use of the disconnect socket.

While the embodiment of the invention disclosed herein utilizes a cylindrical piece of Teflon plastic to prevent solder from flowing into the socket of the connector, other means may be utilized to prevent the flow of solder into the socket.

With a pluggable socket connector **10** secured to circuit board **70** in electrical connection with printed circuitry **74**, a disconnect lead **78** may be inserted into the disconnect socket portion **20** in order to form an electrical connection with the connector **10**. During insertion, lead-in **24** guides the lead into the socket. When the lead is fully inserted, as illustrated in FIG. 1, the end **80** of the lead engages the Teflon cylinder **14** which forms a stop. Insertion of the lead into he socket brings the lead into engagement with strips **28, 30** and **32** so as to form a longitudinally extending line contact **80** with each strip. Contacts **80** extend along the strips **28, 30** and **32**. As the lead is inserted, strips **28** and **32** are pivoted in the direction of arrows **82** and **84** relative to strip **30**, as illustrated by comparing FIGS. 2 and 4 of the drawings, so as to form the electrical connections and open seam **46**. Fingers **56** and **58** lie in pivot paths of the strips **28** and **32**. The connections between strips **28** and **32** and strip **30** at collars **24** and **26** are deformed during insertion of lead **78** to provide spring contact pressure between the strips **28, 30** and **32** and lead **78**.

Fingers **56** and **58** extend across seam **46** and limit opening of the seam during insertion of the lead to assure that the lead is properly inserted within the socket. If the lead **78** moves strips **28** and **32** sufficiently to engage the fingers **56** and **58** as shown in FIG. 2, the fingers back up the strips and prevent further opening of seam **46**. In this way the fingers increase the contact pressure between the lead **78** and the contact strips **28, 30** and **32**. Finger **56** limits movement of strip **28** outwardly of the socket **20** and finger **58** limits movement of strip **32** outwardly from the socket. The two fingers cooperate to limit opening of the seam and back up the contact strips **28** and **30**. The fingers also prevent the lead **76** from being pulled laterally out of the connector. If fingers were not provided, lateral movement of the lead would tend to open the seam **46** and permit the lead to be moved laterally from the socket. During insertion of the lead, the fingers prevent the end **80** from opening seam **46**. The slits **34** and **36** provided between the strips **28** and **30** and **30** and **32** facilitate the described movement of strips **28** and **32** outwardly of the socket during insertion of lead **78**.

While the pluggable socket connector disclosed herein utilizes a solder plug **16** for establishing an electrical connection with a circuit element, in this case printed circuitry **74**, it is obvious that the socket **20** may be provided with other types of electrical contacts and it is not intended that my invention be limited to a connector with a solder plug.

While I have illustrated and described a preferred embodiment of my invention, it is understood that this is capable of modification, and I therefore do not wish to be limited to the precise details set forth, but desire to avail myself of such changes and alterations as fall within the purview of the following claims.

What I claim as my invention is:

1. A disconnect socket comprising an elongate hollow socket body having a longitudinally extending seam on one side thereof, a pair of fingers spaced along the seam, each finger extending from said body at one side of the seam, past the seam and into spaced overlapping proximity with the outer surface of the body at the opposite side of the seam, a lead contact on the inner surface of the body at each side of the seam adjacent the fingers, and electrical contact means on one end of said body, whereby the fingers limit opening of the seam upon insertion of a lead into the socket for engagement with said lead contacts.

2. A disconnect socket as in claim **1** including a funnel-type lead-in at the other end of said body and wherein said electrical contact means comprises a circuit board solder plug.

3. A disconnect socket as in claim **1** wherein said body is triangular in cross section and longitudinal slits extend along two corners of the body, said seam extending along the third corner of the body, and the portions of said body at the ends of said slits join together portions of the body at the sides of said slits.

4. A disconnect socket comprising an elongate hollow body of generally triangular cross section having a seam extending along one corner thereof, the body including a pair of spaced circumferential collars and a strip at each side of the seam extending between said collars, said strips each including a lead engaging contact on the side thereof facing the interior of the body, a finger projecting from the edge of each of said strips adjacent said seam and past the seam and into spaced overlapping proximity with the outer side of the strip across said seam, and electrical contact means for forming an electrical connection between said socket and a circuit element.

5. A disconnect socket as in claim **4** wherein all of said strips are generally flat and slots extend along the corners to either side of the strip opposite the seam.

6. A disconnect socket as in claim **5** wherein said electrical contact means comprises a solder plug at one end of said body.

7. A disconnect socket as in claim **6** wherein said seam extends along said plug and antisolder flow means is provided in said socket adjacent said one end of said body so as to prevent molten solder from flowing from the interior of the solder plug into the interior of the body.

8. A disconnect socket as in claim **7** wherein said antisolder flow means comprises a cylindrical plastic insert held in said solder plug by an annular compression seal.

9. A blanked strip-metal part adapted to be formed into a disconnect socket, said part comprising a number of spaced parallel strips, bands joining said strips at the ends thereof, means for forming an electrical contact on the side of one band away from said strips, and a finger on the outer edge of each outer strip extending away from said strip, said fingers being spaced at different longitudinal locations along the outer strips.

10. A blanked strip-metal part as in claim **9** wherein said means comprises a generally trapezoidal portion of said strip with the major base joining said one strip.

11. A blanked strip-metal part as in claim **10** wherein the minor base of said strip portion comprises two convex arcs.

12. A disconnect socket comprising an elongate hollow body including two contact strips extending along the body and contact means joining said strips for forming an electrical connection with a circuit element, and a finger projecting from one edge of each strip across the opening between the strips and into spaced overlapping proximity with the outside of the other strip, the fingers being spaced apart along the opening between the strips.

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