United States Patent

Primorac

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[54] ELECTRICAL CONNECTOR AND BLOCK

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[21] Appl. No.: **73,752**

[52] **U.S. Cl.**.....**339/176 MP,** 339/255 R, 339/258 R, 339/276 T

[51] **Int. Cl.**.....**H05k 1/07,** H01r 5/08

[58] **Field of Search**.....339/176, 30, 176 M, 176 MP, 339/176 MF, 222 R, 222 T, 223 R, 256, 258, 259, 276 T, 278 C, 217 S, 255 R, 255 A, 262 R

[56] **References Cited**

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3,317,887	5/1967	Henschen et al.	339/256 R
3,317,888	5/1967	Mancini	339/258 R
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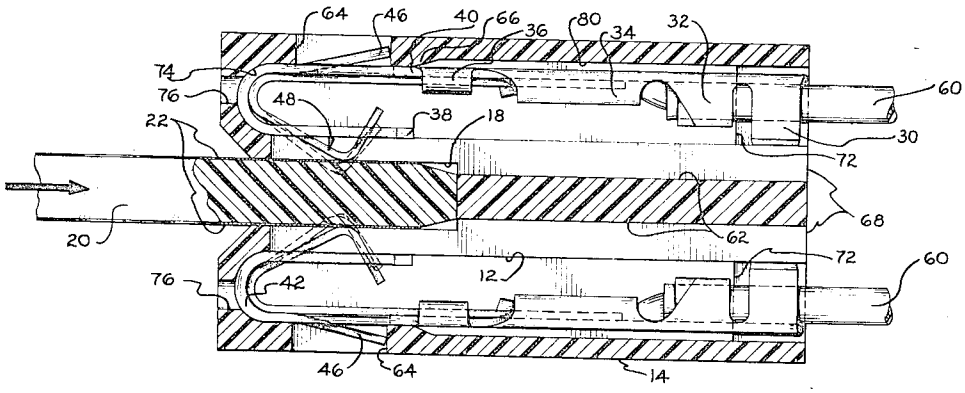
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Assistant Examiner—Lawrence J. Staab
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[57] **ABSTRACT**

A circuit board connector block is provided with bi-metal terminals. Each terminal includes a body formed of a relatively maleable strip stock having a spring guard portion and a crimp barrel. A spring metal contact is confined within the guard with a portion extending into the crimp barrel so that when a bared wire is positioned in the barrel and the barrel is crimped, direct electrical connection is formed between the wire and the spring contact. Each terminal is snugly fitted within a cavity in an insulating body to form a connector block for circuit boards or the like.

12 Claims, 7 Drawing Figures



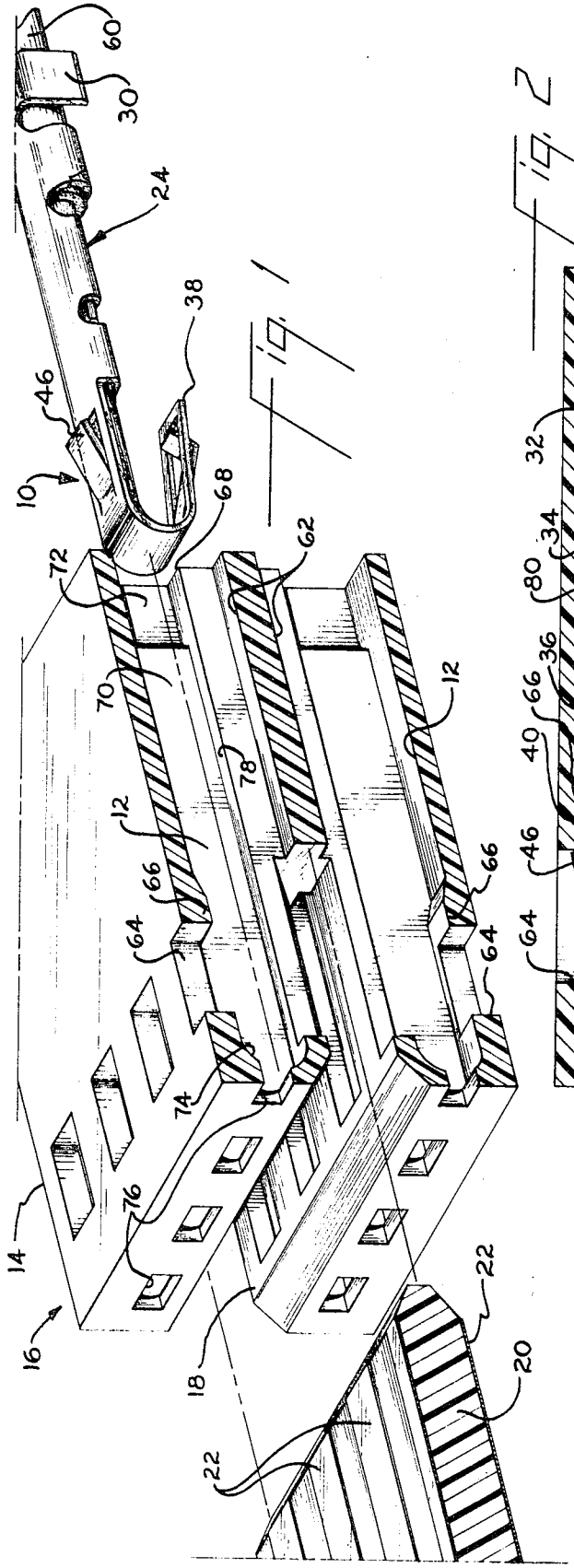


Fig. 1

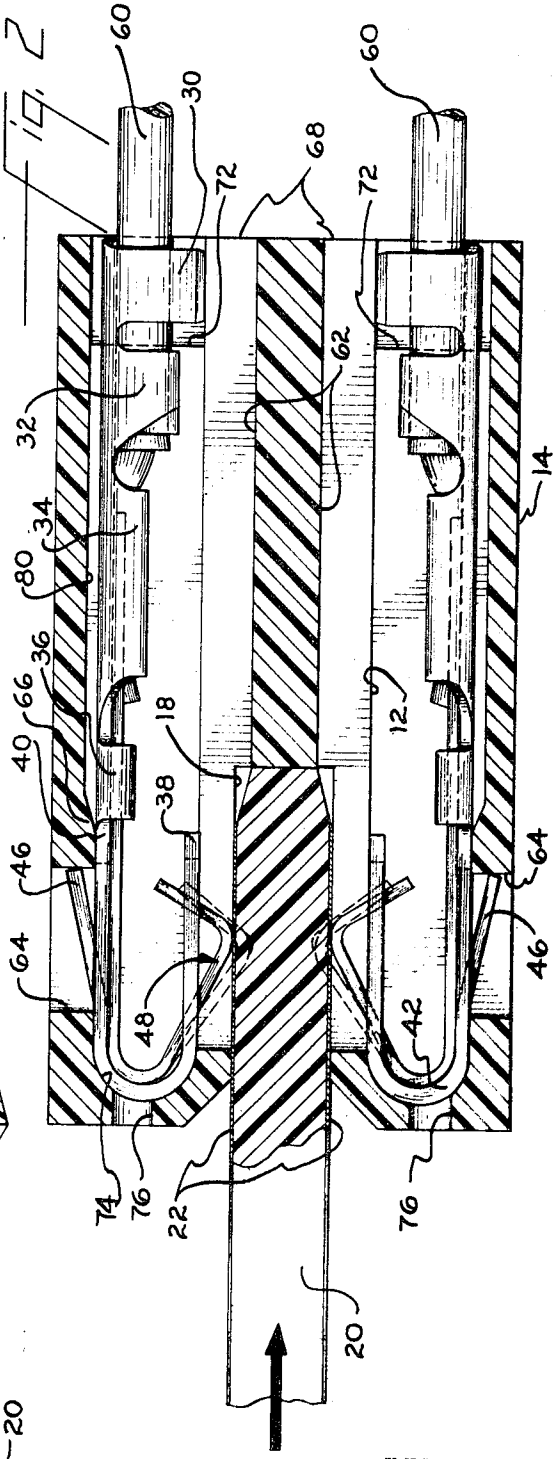
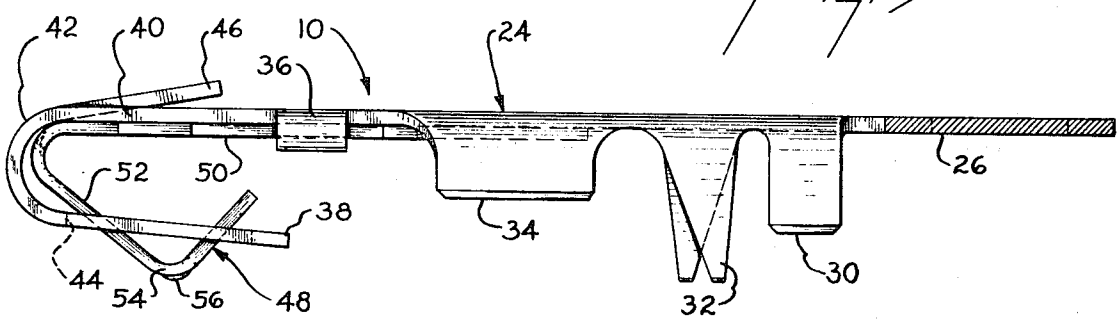


Fig. 2

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Fig. 3



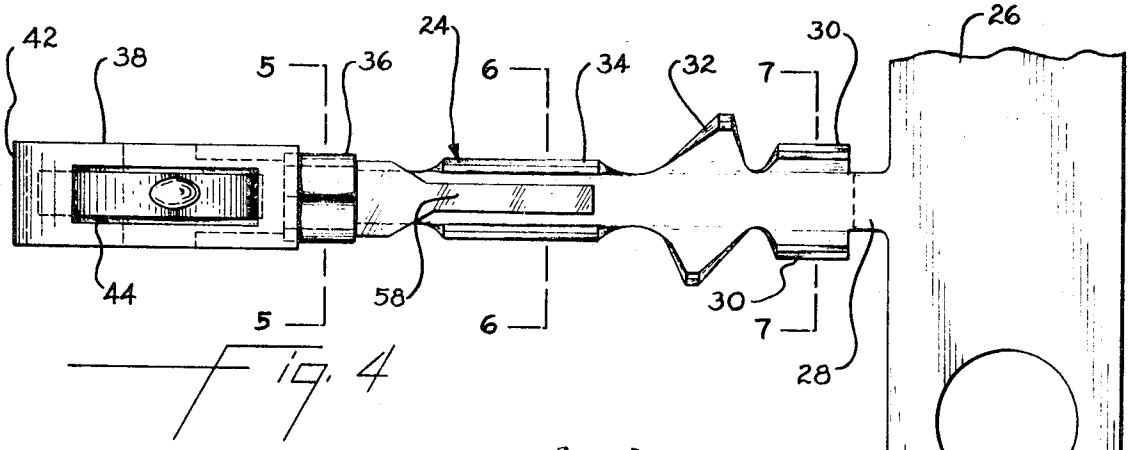


Fig. 4



Fig. 6

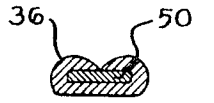


Fig. 5

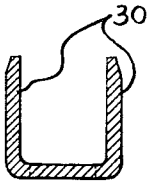


Fig. 7

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ELECTRICAL CONNECTOR AND BLOCK

The invention relates to an improved connector block and a terminal of a bi-metal type. The connector block may be used to form electrical connections with contact pads on the edge of a circuit board or a similar panel.

Each terminal includes a relatively maleable brass body formed from strip stock which includes a reverse bend guard portion, a pair of crimp barrels and a pair of stand-off tabs. A terminal spring is formed from a strip of spring metal and includes a spring contact positioned within the guard formed in the body and a crimp contact extending through both crimp barrels. A first barrel is crimped to physically confine the spring to the body. A bared wire is positioned within the second barrel so that when the barrel is crimped closed a direct electrical connection is formed between the wire and the spring contact. Thus the body does not form part of the circuit path of the terminal.

The contact portion of the spring projects from the guard through a window for establishing an electrical connection with a circuit pad on the circuit board. The guard surrounds and protects the contact portion so as to prevent it being bent past its yield point during manufacture and shipping. The terminals are preferably formed in a chain and wound on a reel. The guard prevents bending of the spring resulting from reeling the terminal chain.

Each terminal is snugly fitted within a cavity in the connector block and is positively secured within the cavity by a spring detent which is struck from the terminal body. The stand-off tabs cooperate with the guard to confine the terminal snugly within the terminal cavity.

The bi-metal construction is particularly useful since the spring metal contact assures that there is a high spring contact pressure at the connection between the terminal and the circuit board while the relatively maleable terminal body permits the formation of a crimp connection between the terminal and the wire. Because the spring contact extends into the wire crimp barrel, there is a direct electrical connection formed between the wire and the spring which reduces contact resistance of the type experienced in conventional bi-metal terminals of the types disclosed in U.S. Pat. Nos. 3,317,888 and 3,359,532.

Other objects 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 are two sheets.

IN THE DRAWINGS

FIG. 1 is a partially broken away perspective view illustrating a terminal in position for insertion within the terminal block and a circuit board which is mated with the block;

FIG. 2 is a sectional view of the connector block with the terminals and board inserted therein;

FIG. 3 is a side view of a terminal according to the invention;

FIG. 4 is a bottom elevational view of the terminal illustrated in FIG. 3, and

FIGS. 5, 6 and 7 are sectional views of the terminal taken along lines 5—5, 6—6 and 7—7 respectively of FIG. 4.

Terminals **10** are inserted into cavities **12** formed in insulating body **14** of connector block **16**. There are two rows of cavities **12** extending along the length of the block with a circuit board receiving slot **18** formed in one side of the block **14** between the rows of cavities. Circuit board **20** is inserted within slot **18** so that the circuit board pads **22** on both sides of the board establish electrical connections with the terminals **10** in the block as illustrated in FIG. **2**.

Referring now to FIGS. **3** thru **7**, each terminal **10** includes a body **24** which is preferably stamp formed from a strip of relatively maleable metal stock such as brass. The bodies **24** extend laterally from a carrier strip **26** and are each connected to the strip by a severable strip portion **28**.

The individual bodies **24** include a pair of stand-off tabs **30** located adjacent strip **26**, insulation crimp barrel **32**, a wire crimp barrel **34** and a spring crimp barrel **36** which are arranged respectively along the length of the body outwardly of strip **26**.

The end of the body **24** away from strip **26** is bent through nearly 180° back toward the strip to form the end **38** spaced from body portion **40** and connected thereto by a C-shaped bend **42**. A window **44** is formed in end **38**. Portion **40**, bend **42** and end **38** form a guard for protecting the terminal spring contact. A spring detent **46** is punched out of the terminal body portion **40** and serves to latch the terminal within a cavity **12**.

Each terminal includes a spring **48** formed from a strip of spring metal. One end of spring **48** is generally U-shaped. Flat spring portion **50** rests upon and extends along body **24** through spring barrel **36** and wire barrel **34**. During the manufacture of terminals **24** the springs **48** are positioned as illustrated in FIG. **3** and then spring barrels **36** are crimped closed to form a physical connection between the spring and body as illustrated.

End **52** of the spring **50** is bent back adjacent spring portion **50** and is confined within the guard defined by body portions **38**, **40** and **42** with a contact knuckle **54** projecting through window **44**. A dimple **56** is formed on the side of knuckle **54** adjacent strip **26** for establishing a high pressure electrical connection with a circuit board pad.

FIG. **5** illustrates the physical connection formed between the spring **50** and the spring crimp barrel **36**. FIG. **6** illustrates the position of spring portion **58** within wire crimp barrel **34** before a bared conductor is positioned in the barrel and the barrel is crimped to form a direct electrical connection between the conductor and spring portion **58**. FIG. **7** illustrates the upstanding stand-off tabs **30** which are used to confine the terminal snugly within a cavity **12**.

Following manufacture of terminals **10** on strip **26**, the terminals and strip may be wound on a reel under tension and retained on the reel during storage and shipment. When on the reel the terminals are likely to be pressed against each other. Because the terminal springs **48** are confined within the guard formed in body **24**, there is little likelihood that the springs will be deformed or bent past their yield point. Thus, by providing the guard uniform spring properties are maintained despite reeling. The guard also protects the terminal spring during insertion into a block cavity **12**.

Bared wires **60** are secured to the terminals by crimping barrels **32** and **34** to form wire crimp and insulation crimp connections as illustrated in FIGS. **1** and **2**. The wires extend between the upstanding tabs **30**. The terminals **10** may be severed from strip **26** at **28** prior to or subsequent to attachment of the wires **60**.

Each terminal cavity **12** in block **14** is provided with a groove **62** in the side thereof adjacent circuit board slot **18**. The grooves **62** have a depth sufficient to intersect the slot thereby forming an opening between the cavities **12** and slot **18**. A window **64** is formed in the side of each cavity **12** away from slot **18** and cooperates with latch or detent **46** to confine a terminal within the cavity. A cam shoulder **66** is located at the edge of each window **64** adjacent the terminal receiving end **68** of each cavity. The cavity side walls **70** adjacent end **68** are relieved at **72** to accommodate tabs **30**.

The ends **74** of cavities **12** are rounded so that when the terminals are fully inserted within the cavities, the bend **42** of each body **24** is snugly confined against an end **74**. A small window **76** is formed within each end **74** to permit insertion of a tool to remove the terminal from the recess when detent **46** is depressed.

As illustrated in FIGS. **1** and **3**, terminal body end **38** diverges somewhat from body portion **40** so that as the terminal **10** illustrated in FIG. **1** is inserted into a cavity **12** and the edges of end **38** engage shoulders **78** on the bottom of the cavity, the end **38** is bent toward portion **40** thereby assuring a snug fit between the lead end of the terminal and the recess.

During insertion the spring contact knuckle **54** extends into recess **62** and is lightly stressed until the terminal is inserted

far enough so that it projects into slot 18. In this way the spring is not stressed past its yield point during the insertion of the terminal into the block and uniform high pressure spring contact connections are formed between the terminals and the circuit pads 22 on board 24.

When the terminal is fully inserted as illustrated in FIG. 2, latch 46 has ridden over cam 66 and snapped back within window 64 so as to confine the terminal in the cavity with the lead end thereof snugly fitted against end 74. A groove 80 is provided in the top wall of each cavity 12 to minimize stressing of latch 46 during insertion of the terminal and in that way prevent deformation of the latch. The edges of terminal body 24 lie flush upon the side of cavity 12 away from slot 18.

Tabs 30 form a snug fit within the recess 72 to prevent movement of the crimp end of the terminal within the cavity. Thus the tabs 30, the resiliently confined lead end of the terminal 10 and the latch 46 cooperate to confine the terminal 10 snugly within the cavity 12. With the terminal so positioned the contact 48 projects into recess 18 as shown in dotted lines in FIG. 2. Circuit board 20 may then be pushed into recess 18 so that the spring contacts 48 are bent back to the contact position shown in solid lines in FIG. 2 thereby forming uniform high pressure spring contact connections between the circuit board pads 22 and the conductors of wires 60. Dimples 56 face away from the mouth of slot 18 to form a binding connection with the pads 22 thereby increasing the force required to remove the circuit board from the recess.

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 bi-metal terminal including a body formed of relatively maleable strip metal stock and a spring formed of spring stock, said spring including a spring contact and a crimp contact, said body including a guard surrounding said spring contact and having a window formed therein with the contact surface of said spring contact projecting outwardly of the guard through said window, means forming a physical connection between the body and the spring, and a crimp barrel, said crimp contact extending into the crimp barrel for establishing a direct electrical connection with a wire positioned in said barrel.

2. A terminal as in claim 1 wherein said means comprises a crimp connection.

3. A bi-metal terminal including a body formed of relatively maleable strip metal stock and a spring formed of spring stock, said spring including a spring contact and a crimp contact, said body including a guard surrounding said spring contact and having a window formed therein with the contact surface of said spring contact projecting through said window, means forming a physical connection between the body and the spring, and a crimp barrel, said crimp contact extending into the crimp barrel for establishing a direct electrical connection with a wire positioned in said barrel, said guard comprising a reverse bend portion of said body and said spring contact comprising a reverse bend portion of the spring fitted within said body reverse bend portion with a knuckle projecting through said window.

4. A terminal as in claim 3 wherein said contact portion includes a dimple on said knuckle.

5. A terminal as in claim 4 wherein said dimple is located on one side of the knuckle.

6. A terminal as in claim 3 wherein said body includes a pair of tabs for locating the terminal in a block, said crimp barrel being located between said means and said tabs along the length of the terminal.

7. A crimp type terminal for use in establishing an electrical connection between a conductor and a second element comprising a body formed of relatively maleable metal and a spring; said body including a wire crimp barrel, means for mechanically securing the spring to the body, and a U-shaped guard portion having an opening formed therethrough; said spring including a spring contact surrounded by said guard portion and having a contact projecting outwardly of said guard portion through said opening for forming an electrical connection with a circuit element, and a contact portion extending into said crimp barrel; whereby when the conductor is positioned in the barrel and the barrel is crimped closed, a high pressure metal to metal electrical connection is formed between the conductor and the spring.

8. A terminal as in claim 7 wherein said means comprises a second crimp barrel for mechanically securing the spring to the body.

9. A connector block comprising an insulating body having a series of terminal cavities therein and an outside wall with openings communicating with said cavities, a plurality of bi-metal terminals with each terminal confined in a cavity and including a body formed of relatively maleable strip stock having a spring guard with an opening therein and a wire crimp barrel, and a spring contact having a contact portion extending through said guard opening and the opening in the terminal cavity for establishing an electrical connection with a circuit element adjacent said wall and a crimp contact portion extending into said wire crimp barrel for establishing a direct electrical connection with a conductor crimped in said barrel, each of said terminals including means for physically securing said body and said spring contact together.

10. A connector block as in claim 9 wherein said terminals are elongate and include means at each end thereof cooperable for snugly securing the terminals within the terminal cavities so as to prevent movement of the terminals within the insulating body.

11. A connector block as in claim 9 wherein in each terminal said means comprises a crimp barrel on said body crimped to said spring contact.

12. A connector block as in claim 9 wherein in each terminal said guard includes a reverse bend portion of said body surrounding said spring contact portion and said opening comprises a window in said reverse bend portion.

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