

PATENT SPECIFICATION (11)

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(54) IMPROVEMENTS IN OR RELATING TO SOCKET TERMINALS

(71) We, E.I. DU PONT DE NEMOURS AND COMPANY, a corporation organized and existing under the laws of the State of Delaware, located at Wilmington, State of Delaware, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to socket terminals for removably receiving elongate leads and provides an improved socket terminal which may be formed from thin flat sheet metal stock and which may be mounted on a circuit board.

In accordance with the invention there is provided a socket terminal comprising a pair of spaced aligned collars, contact means extending from one collar, and a pair of opposed spring contacts extending between said collars, each spring contact extending from said one collar through the interior opening of the other collar and joining said other collar at the edge thereof away from said one collar.

The consequent extension of the spring contacts results in a compact terminal having desirably long spring contacts for a given size of terminal.

Said contact means may comprise a bowed resilient pin for mounting the terminal in a circuit board hole. Halves of the pin are bowed outwardly from each other to form a spring system for resiliently retaining the socket terminal in the circuit board hole prior to soldering.

Locking tabs may extend across seams in the collars to prevent opening of the collars at the seams upon insertion of the lead into the socket terminal. In this way an improved spring connection is achieved between the lead and the spring contacts. Tear-shaped locating projections are provided on the median portions of the spring contacts to guide the lead into proper alignment during insertion. A solder resist may be provided in the interior of the collar

adjacent to the circuit board pin to prevent molten solder from being drawn up between the spring contacts. 50

Conventional types of socket terminals are shown in United States Patents Nos. 3,262,087, 3,268,851 and 3,262,008. The socket terminal disclosed herein represents a marked improvement over the conventional terminals. The spring contacts have a greater length for a given socket size thereby improving the contact properties of the terminal. Greater length results from the fact that one end of the contacts extends through a collar to join the outer collar edge. Permanent closure of the collar seams so that they do not open when a lead stresses the spring contacts may be ensured and this further enhances the spring properties of the terminal by removing the collars from the contact spring system. 55 60 65

The invention will be better understood from the following description by way of example of an embodiment of the invention with reference to the accompanying drawings, wherein:— 70

Figure 1 is a side view of a socket terminal according to the invention, 75

Figure 2 is a partially broken away view taken along line 2—2 of Figure 1,

Figure 3 is a sectional view taken along line 3—3 of Figure 2,

Figure 4 is a top view of a connector block holding socket terminals in accordance with the invention, 80

Figures 5 and 6 are sectional views taken along lines 5—5 and 6—6 respectively of Figure 4, and 85

Figure 7 is a sectional view showing a lead confined between the spring contacts, and

Figure 8 is a detailed sectional view of part of the socket terminal shown in Figures 1, 2 and 3. 90

Referring to the drawings, as illustrated in Figures 1 and 2 the socket terminal 10 includes a pair of spaced and aligned square collars 12 and 14, interconnected by a pair of opposed inwardly bowed spring arms or 95

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contacts 16, and a generally cylindrical circuit board pin 18. The spring contacts 16 extend from opposite sides of the collar 12 and are inwardly bowed to engage each other at a contact area 20. They extend from the contact area 20 through an interior opening 22 in the collar 14 and are bent back through reverse bends 24 to join opposed outer edges of the collar 14. As indicated in Figure 2 the width of the spring contacts 16 decreases to each side of contact area 20 so that the spring contacts are stressed uniformly upon insertion into the contact area 20 of a lead. Notches 26 are provided at the reverse bends 24 to facilitate flexing of the contacts or arms 16.

As indicated in Figures 2 and 3, a tear-shaped locating dimple 28 is formed on one edge of each spring arm 16. The edge 29 of each dimple nearest to the collar 14 is gradually tapered to the edge of the spring arm so that the dimples form lead-ins or guides to ensure that the end of a lead or contact inserted through the collar 14 and between the spring arms 16 is properly guided into the socket. The dimples 28 hold the spring arm contact surfaces 30 apart a slight distance prior to insertion of the contact into the socket terminal.

The socket terminal 10 is formed from thin sheet metal stock so that the collars 12 and 14 are each provided with a seam 32 extending across the collars at one corner of the collars. A locking tab 34 extends from one edge of each collar across the seam and is bent into flat engagement with the collar at the opposite side of the seam to prevent opening of the seams when a contact is inserted into the socket. In this way the contact surfaces 30 are maintained parallel to each other upon insertion of a lead thereby improving the spring characteristics of the socket terminal. If the seams were allowed to open the spring arms 16 would be twisted somewhat to each other and the contact pressure between the lead and the spring arms would be reduced. The tabs 34 ensure that the surfaces 30 are maintained in parallel relationship and that a high contact pressure is achieved. The collars are rigid and do not form part of the contact spring system.

The extension of the spring arms 16 through the collar 14 results in a very compact terminal with long spring arms for a socket of given height. In conventional terminals disclosed in the United States Patents previously referred to, the spring arms extend between opposing edges of the collars. Thus, in a socket of given height, the present construction will have longer and therefore more resilient arms than a conventional socket and thus the spring characteristics of the socket of the present construction as compared to the conventional socket will

be improved. Alternatively, for spring arms of a given length, a socket of the present construction will have a reduced height as compared to a conventional socket. The compact design of the socket terminal 10 is important in modern circuit design where a minimum of space is available. Socket terminals 10 may be used for mounting integrated circuit modules on circuit boards where it is desirable to minimize the height of the module above the circuit board. The compact design of the terminal 10 saves space and provides improved contact performance.

Generally the cylindrical circuit board pin 18 is formed from a pair of curved channels 36 extending outwardly of opposed edges of the collar 12. A seam 38 separates the channels 36 which are semi-circular in cross-section. The channels are bowed outwardly apart from each other to open the seam 38 somewhat and to provide a resiliency permitting mounting of the terminal 10 in a circuit board hole 40 (Figure 6) having a diameter slightly less than the median portions of the channels 36. Insertion of the pin 18 in the hole 40 bends the channels toward each other to form a tight resilient fit. The pin 18 may be soldered in the hole 40 to form a permanent connection.

Socket terminals 10 may be mounted in cavities 42 in an insulating connector block 44 as indicated in Figures 5 and 6. Entrances 46 extend through one side of the block 44 to communicate with each cavity 42. A lead 50 inserted through an entrance is pushed through the interior opening of the collar 14 and between the spring arms 16 to form an electrical connection between the socket terminal and the lead at the contact surfaces 30. As indicated in Figure 6, the lead spreads the spring arms apart thereby flexing the spring arms to provide the desired contact pressure between the lead and the contact surfaces 30. Barbs 48 extending laterally outwardly of the collar 12 engage the body of the block 44 to hold the socket terminals 10 within the cavities 42.

A solder resist coating 52 (see Fig. 8) may be applied within the interior of the collar 12 to prevent molten solder from wicking up between the contact arms 16 when the terminal 10 is soldered in the circuit board hole 14.

Whilst a preferred embodiment of the invention is described above, it is pointed out that this preferred embodiment is capable of modification, and the invention extends to all such modifications which fall within the scope of the appended claims.

WHAT WE CLAIM IS:—

1. A socket terminal comprising a pair of spaced aligned collars, contact means extending from one collar, and a pair of

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contacts 16, and a generally cylindrical circuit board pin 18. The spring contacts 16 extend from opposite sides of the collar 12 and are inwardly bowed to engage each other at a contact area 20. They extend from the contact area 20 through an interior opening 22 in the collar 14 and are bent back through reverse bends 24 to join opposed outer edges of the collar 14. As indicated in Figure 2 the width of the spring contacts 16 decreases to each side of contact area 20 so that the spring contacts are stressed uniformly upon insertion into the contact area 20 of a lead. Notches 26 are provided at the reverse bends 24 to facilitate flexing of the contacts or arms 16.

As indicated in Figures 2 and 3, a tear-shaped locating dimple 28 is formed on one edge of each spring arm 16. The edge 29 of each dimple nearest to the collar 14 is gradually tapered to the edge of the spring arm so that the dimples form lead-ins or guides to ensure that the end of a lead or contact inserted through the collar 14 and between the spring arms 16 is properly guided into the socket. The dimples 28 hold the spring arm contact surfaces 30 apart a slight distance prior to insertion of the contact into the socket terminal.

The socket terminal 10 is formed from thin sheet metal stock so that the collars 12 and 14 are each provided with a seam 32 extending across the collars at one corner of the collars. A locking tab 34 extends from one edge of each collar across the seam and is bent into flat engagement with the collar at the opposite side of the seam to prevent opening of the seams when a contact is inserted into the socket. In this way the contact surfaces 30 are maintained parallel to each other upon insertion of a lead thereby improving the spring characteristics of the socket terminal. If the seams were allowed to open the spring arms 16 would be twisted somewhat to each other and the contact pressure between the lead and the spring arms would be reduced. The tabs 34 ensure that the surfaces 30 are maintained in parallel relationship and that a high contact pressure is achieved. The collars are rigid and do not form part of the contact spring system.

The extension of the spring arms 16 through the collar 14 results in a very compact terminal with long spring arms for a socket of given height. In conventional terminals disclosed in the United States Patents previously referred to, the spring arms extend between opposing edges of the collars. Thus, in a socket of given height, the present construction will have longer and therefore more resilient arms than a conventional socket and thus the spring characteristics of the socket of the present construction as compared to the conventional socket will

be improved. Alternatively, for spring arms of a given length, a socket of the present construction will have a reduced height as compared to a conventional socket. The compact design of the socket terminal 10 is important in modern circuit design where a minimum of space is available. Socket terminals 10 may be used for mounting integrated circuit modules on circuit boards where it is desirable to minimize the height of the module above the circuit board. The compact design of the terminal 10 saves space and provides improved contact performance.

Generally the cylindrical circuit board pin 18 is formed from a pair of curved channels 36 extending outwardly of opposed edges of the collar 12. A seam 38 separates the channels 36 which are semi-circular in cross-section. The channels are bowed outwardly apart from each other to open the seam 38 somewhat and to provide a resiliency permitting mounting of the terminal 10 in a circuit board hole 40 (Figure 6) having a diameter slightly less than the median portions of the channels 36. Insertion of the pin 18 in the hole 40 bends the channels toward each other to form a tight resilient fit. The pin 18 may be soldered in the hole 40 to form a permanent connection.

Socket terminals 10 may be mounted in cavities 42 in an insulating connector block 44 as indicated in Figures 5 and 6. Entrances 46 extend through one side of the block 44 to communicate with each cavity 42. A lead 50 inserted through an entrance is pushed through the interior opening of the collar 14 and between the spring arms 16 to form an electrical connection between the socket terminal and the lead at the contact surfaces 30. As indicated in Figure 6, the lead spreads the spring arms apart thereby flexing the spring arms to provide the desired contact pressure between the lead and the contact surfaces 30. Barbs 48 extending laterally outwardly of the collar 12 engage the body of the block 44 to hold the socket terminals 10 within the cavities 42.

A solder resist coating 52 (see Fig. 8) may be applied within the interior of the collar 12 to prevent molten solder from wicking up between the contact arms 16 when the terminal 10 is soldered in the circuit board hole 14.

Whilst a preferred embodiment of the invention is described above, it is pointed out that this preferred embodiment is capable of modification, and the invention extends to all such modifications which fall within the scope of the appended claims.

WHAT WE CLAIM IS:—

1. A socket terminal comprising a pair of spaced aligned collars, contact means extending from one collar, and a pair of



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- opposed spring contacts extending between said collars, each spring contact extending from said one collar through the interior opening of the other collar and joining said other collar at the edge thereof away from said one collar.
2. A socket terminal as claimed in claim 1 wherein said opposed spring contacts are bowed inwardly towards one another.
3. A socket terminal as claimed in claim 1 or 2, wherein an aligning projection is located on the median portion of each spring contact, each projection including a lead-in surface gradually tapered outwardly toward the edge of the respective spring contact and facing in a direction toward the said other collar for guiding a lead inserted through said other collar to a position between said median portions.
4. A socket terminal as claimed in any preceding claim, wherein a seam extends through each of said collars, and locking means are provided for bridging each seam to prevent opening of the collars upon insertion of a lead into the socket.
5. A socket terminal as claimed in claim 4, wherein said locking means comprise tabs extending across said seams, the free end of each tab overlying the collar.
6. A socket terminal as claimed in claim 4 or 5, wherein said collars are rectangular and said seams are located at socket corners.
7. A socket terminal as claimed in any preceding claim comprising solder resist means at the junction between said contact means and said one collar for preventing the flow of molten solder from said contact means into said one collar.
8. A socket terminal as claimed in any preceding claim, wherein said contact means comprises a contact pin for mounting the socket terminal in a hole in a circuit board, said contact pin extending from the edge of said one collar away from said other collar.
9. A socket terminal as claimed in claim 8, wherein said contact pin comprises a pair of elongate legs positioned adjacent each other and separated by a longitudinal seam, the median portions of said legs being bowed outwardly from one another to form a spring system for resiliently confining the pin in the circuit board hole.
10. A socket terminal as claimed in claim 9, wherein said legs are each substantially semi-circular in cross-section.
11. A socket terminal as claimed in any preceding claim formed from thin strip metal stock.
12. A socket terminal substantially as herein described with reference to the accompanying drawings.
13. A circuit board having one or more circuit board holes and a socket terminal as claimed in any preceding claim mounted in a circuit board hole.
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