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3,412,367 11/1968 Churla..... 339/91
 2,709,246 5/1955 Abbott..... 339/99

FOREIGN PATENTS

6,405,509 11/1965 Netherlands

OTHER REFERENCES

Angele, " 2-Connectors For Flat-Conductor Flexible Cables," Electrical Manufacturing, September, 1960, pages 8-12

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[54] **CONNECTOR FOR MULTIPLE CONDUCTOR CABLE**
6 Claims, 18 Drawing Figs.

[52] **U.S. Cl.**..... **339/103 M,**
 339/107, 339/176 MF

[51] **Int. Cl.**..... **H01r 13/58**

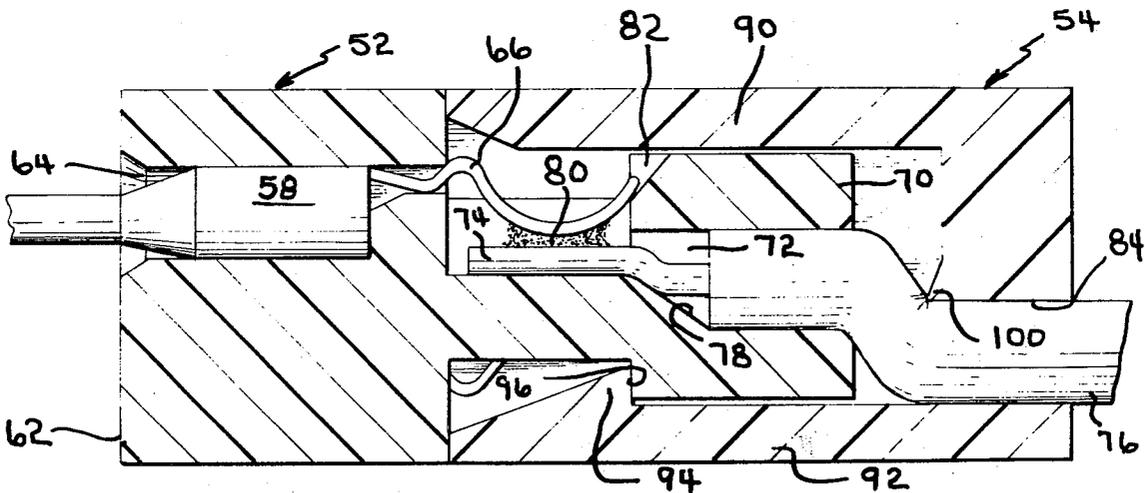
[50] **Field of Search**..... 339/103,
 107, 17 F, 17 L, 17 LC, 17 LM, 176 MF, 176 MP,
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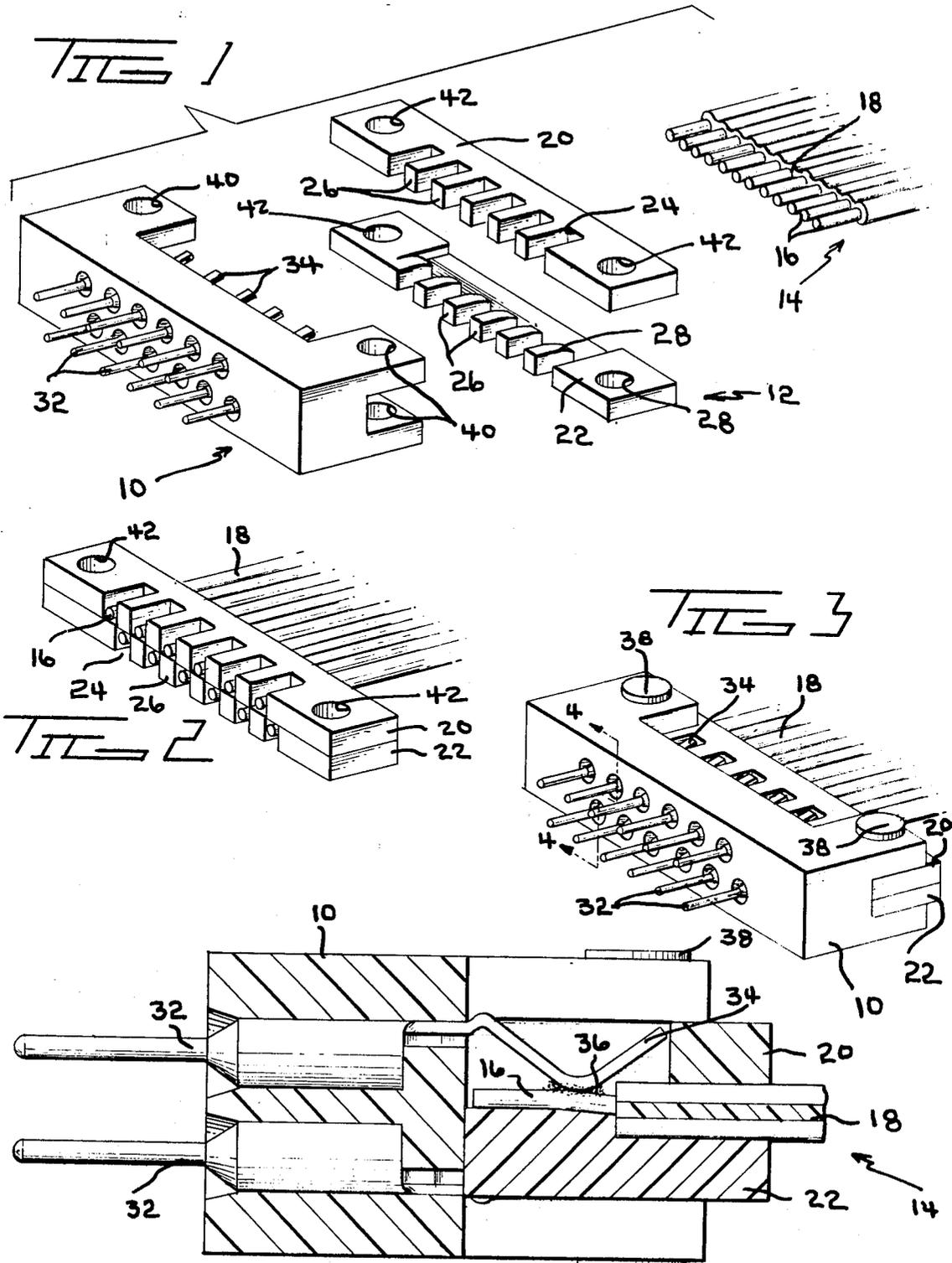
[56] **References Cited**

UNITED STATES PATENTS

2,648,827	8/1953	Knollman.....	339/256
3,017,602	1/1962	Little.....	339/174
3,149,897	9/1964	Martineck.....	339/176
3,278,887	10/1966	Travis.....	339/176

ABSTRACT: An electrical connector for multiple conductor electrical cable having a housing containing a plurality of contact means having contact tabs extending therefrom. A header block is adapted to receive the multiple conductor cable to orient the conductors in staggered relation along two planes. The header block is insertable within the housing whereby the contact tabs will electrically engage the conductors of the cable. A second form of the invention provides a one piece housing for both the electrical contacts and the multiple conductor cable and a strain relief is provided which is engageable with the housing for retaining the cable fixed relative to the housing.

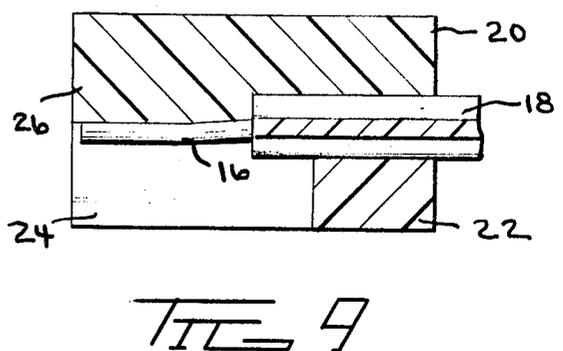
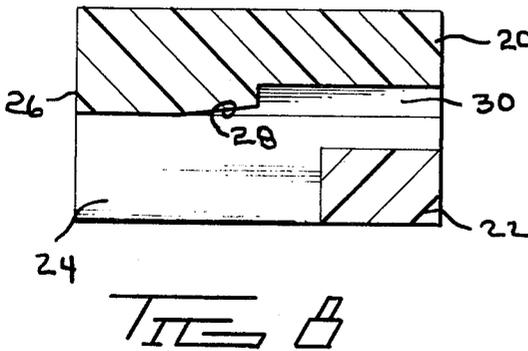
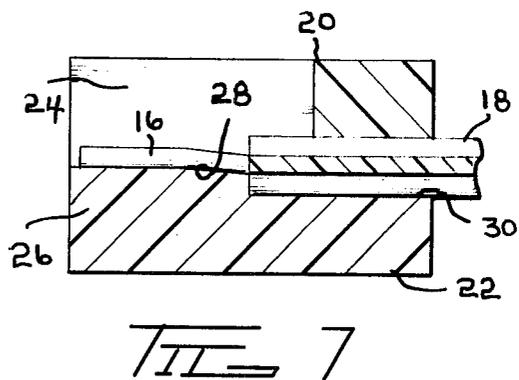
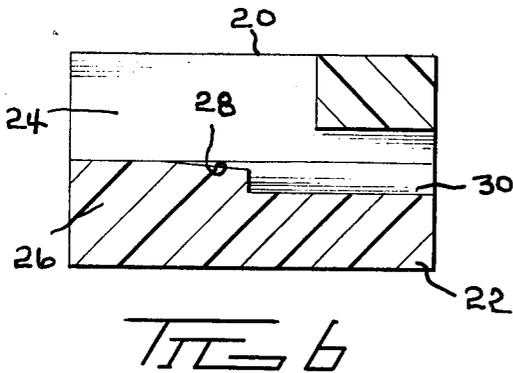
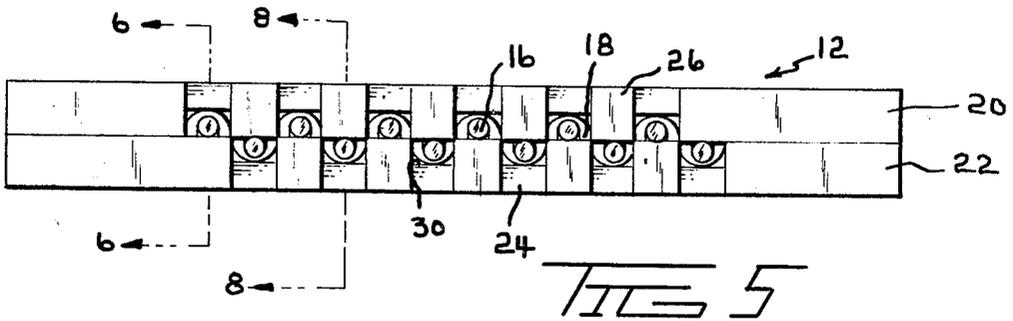


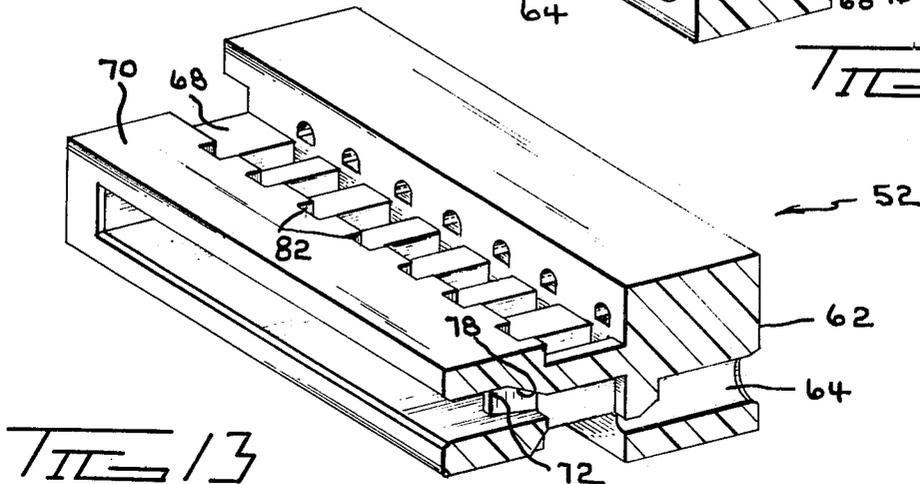
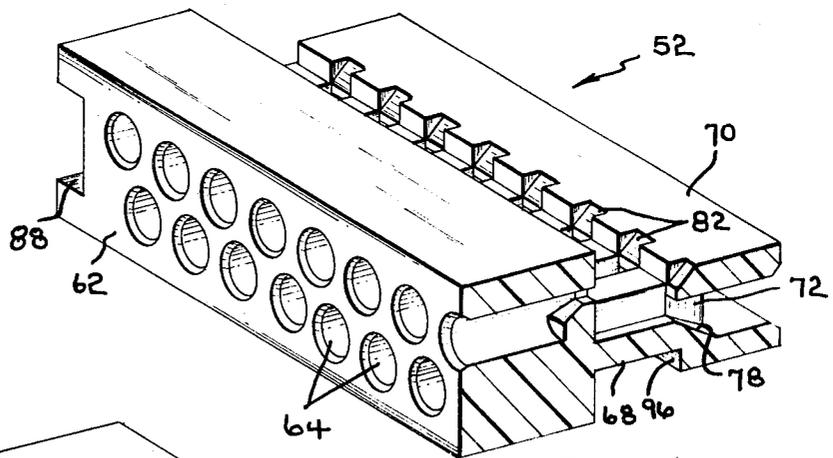
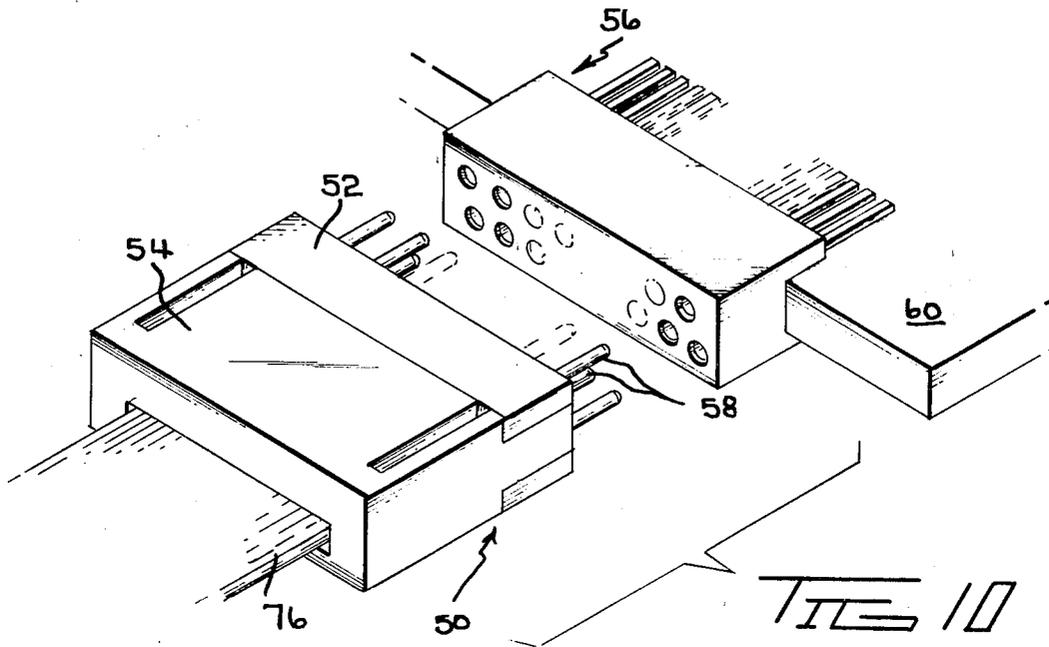


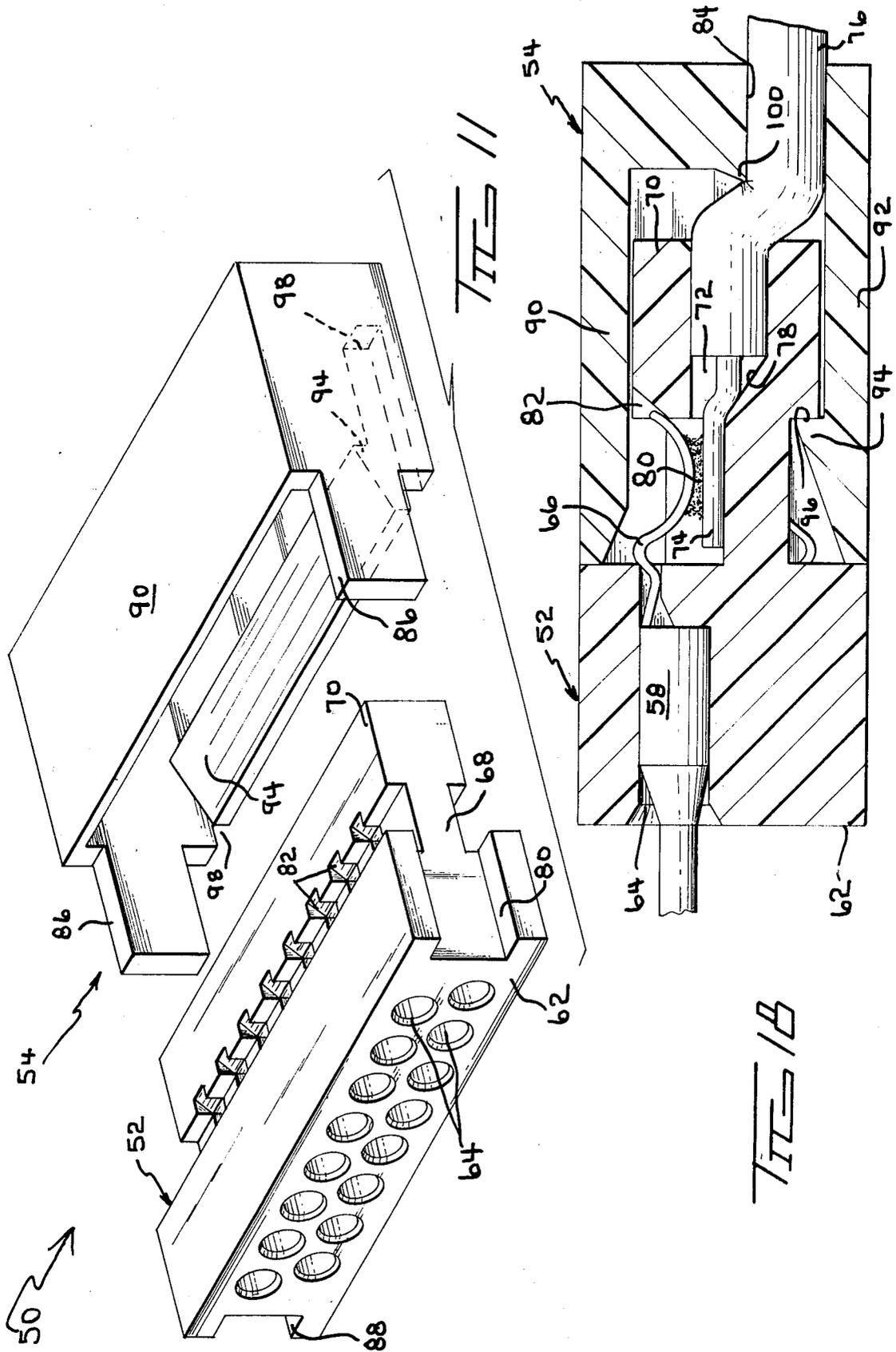
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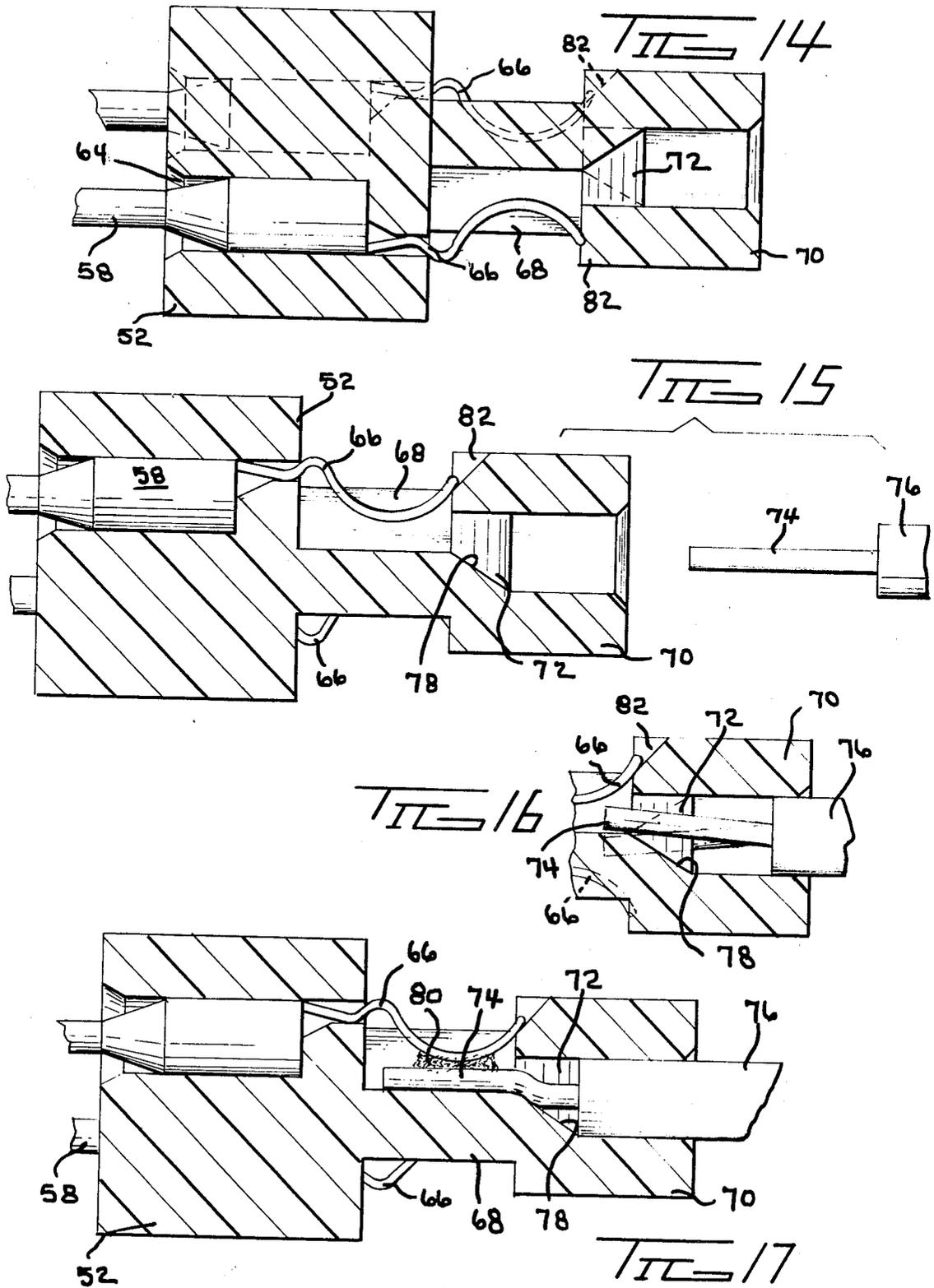
BY

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CONNECTOR FOR MULTIPLE CONDUCTOR CABLE

CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of my earlier application, Ser. No. 763,707 filed Sept. 30, 1968, entitled CONNECTOR FOR MULTIPLE CONDUCTOR CABLE.

This invention is directed to an electrical connector for flat or ribbon cable. In a first form of the invention the insulating housing and header block are combined as a unitary structure and there is also provided means for engaging the cable for relieving strain in the area where the cable is electrically connected to the contact tabs. A header block receives the cable and causes the individual conductors of the cable to lie within a plurality of slots formed in the header block and alternately disposed along upper and lower surfaces thereof. Contact means extending from an insulating housing have tab portions which lie within the header block slots and are preferably provided with a solder coating whereby heat may subsequently be applied to the connector to cause a solder connection between the contact tabs and the conductors of the cable.

It is, therefore, an object of the present invention to provide an electrical connector for flat or ribbon cable of relatively simple and inexpensive design.

A further object of the instant invention is to provide a connector having a header block of two part hermaphroditic construction.

A further object is to provide an electrical connector of miniature size to minimize the possibility of impedance mismatch through the connector.

BRIEF DESCRIPTION OF THE DRAWING

In the drawings in which like reference numerals refer to like parts:

FIG. 1 is an exploded perspective view showing the various components of the connector of the instant invention;

FIG. 2 is a perspective view showing the header block in position at the end of a multiple conductor cable;

FIG. 3 is a perspective view showing the electrical connector in its assembled form;

FIG. 4 is a cross-sectional view taken along the line 4-4 of FIG. 3 and showing details of the connection between the cable conductors and the contact tabs;

FIG. 5 is a side elevational view showing the cable conductors alternately located within the header block;

FIG. 6 is a cross-sectional view taken along the line 6-6 of FIG. 5 and showing the configuration of the conductor receiving slots within the upper portion of the header block;

FIG. 7 is a cross-sectional view similar to FIG. 6 and showing a cable conductor positioned within the slot;

FIG. 8 is a cross-sectional view taken along the line 8-8 of FIG. 5 and shows details of the conductor receiving slot and the lower portion of the header block;

FIG. 9 is a cross-sectional view similar to FIG. 8 and showing a cable conductor located within the slot in the header block;

FIG. 10 is a perspective view showing an alternative form of the present invention;

FIG. 11 is an exploded perspective view showing the connector housing and strain relief of the alternative embodiment;

FIG. 12 is a perspective view partly in section showing details of the connector housing;

FIG. 13 is a perspective view partly in section showing the connector housing from the opposite direction to that seen in FIG. 12;

FIG. 14 is a cross-sectional view showing the disposition of the contact tabs within the connector housing;

FIG. 15 is a cross-sectional view similar to FIG. 14 and showing the upper contact configuration as opposed to the lower contact shown in FIG. 14; FIG. 16 is a fragmentary cross-sectional view showing a ribbon cable being inserted into the connector housing;

FIG. 17 is a cross-sectional view showing the ribbon cable and electrical contacts mounted in the connector housing; and

FIG. 18 is a cross-sectional view similar to FIG. 17 and showing the cable strain relief in position relative to the connector housing.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The attainments of the present invention will become apparent to those skilled in the art upon a reading of the following detailed description when taken in conjunction with the drawings in which there are shown and described illustrative embodiments of the invention; it is to be understood, however, that these embodiments are not intended to be exhaustive nor limiting of the invention but are given for purpose of illustration in order that others skilled in the art may fully understand the invention and the principles thereof and the manner of applying it in practical use so that they may modify it in various forms, each as may be best suited to the conditions of a particular use.

With reference to the first embodiment, in FIG. 1 the various portions of the electrical connector are shown and comprise a housing 10, a header block 12, and a flat or ribbon cable 14. The cable 14 consists of a plurality of electrical conductors 16 disposed along parallel paths and insulated from each other by insulating means 18. One end of the cable has the insulation stripped therefrom as shown in FIG. 1, such stripping being accomplished by any conventional technique.

The header block 12 consists of a pair of identical halves although as an alternative simpler embodiment the header block could be formed as a single unit. The header block 12 as shown comprises an upper half 20 and a lower half 22. Each half has a plurality of slots 24 formed therein which slots extend through the upper and lower surfaces of the halves 20 and 22 as seen in FIG. 1. The slots 24 are regularly spaced along the upper and lower portions of the header block and the spacing between adjacent slots is determined by the spacing between conductors on the cable 14. The arrangement is such that adjacent slots in each portion are spaced a distance equal to twice the spacing between adjacent conductors of the cable. With this arrangement alternate conductors are located in the slots of portion 20 and the remaining conductors are located in the slots of portion 22 so that adjacent cable conductors lie in different planes separated by the header block portions.

The slots 24 are separated by land areas 26 which cause the cable conductors to enter the proper slots in the header block. These land areas have slightly tapered surfaces 28 which assist in leading the conductors into the slots. The land areas may be slightly wider than the width of slots 24 to insure proper separation between conductors. A recessed portion 30 is provided in each of the header block halves 20 and 22 and communicates with the slots 24. The portion 30 is adapted to receive the insulated portion 18 of the ribbon cable upon insertion of the cable within the header block. It may be noted at this point that the cable may either be inserted endwise into the block halves 20 and 22 after the halves are together or the cable may be placed in one of the halves and the opposite half may subsequently be brought into engagement with the cable. Either arrangement will cause the cable conductors 16 to lie in the appropriate slots 24 in the header block.

The housing 10 receives the header block 12 and has a plurality of contact means 32 disposed therein and spaced to conform with the slots 24 in the header block. The contact means 32 has contact tabs 34 extending therefrom in alignment with the slots 24 when the header block is positioned within the housing 10.

The tabs 34 are preferably provided with a layer of solder plated onto the tabs so that a reliable electrical connection between the tabs and the cable conductors may be achieved by merely applying heat and flux to the connector after assembly of the various components. A representative solder connection 36 can be seen in FIG. 4.

When the entire connector is assembled the connector is secured together by suitable bolt means 38 extending through apertures 40 in the housing 10 and apertures 42 in the header block. Suitable nut means 44 are secured to the bolts 38 to secure the bolts in position. Obviously other means may be provided for maintaining the connector in assembled position.

The header block 12 may be inserted into housing 10 either prior or subsequent to entry of the ribbon cable within the header block. The preferred method, however, is for the header block and the cable to form a subassembly as shown in FIG. 2 for insertion into the housing 10.

The completed connector is then capable of being plugged into a suitable mating connector on a printed circuit board or the like to thereby electrically connect the ribbon cable 14 to the circuitry on the printed circuit board. Alternatively the connector may be plugged into a mating connector secured to wire conductors or such other current carrying members as desired for a particular use. The entire connector of the instant invention is of extremely miniature size and thereby any impedance mismatch occurring at the point of connection is kept to a minimum. The miniature size of the connector is made possible primarily by the simplicity of the design of the header block 12.

Although a ribbon cable having 12 conductors has been shown in the drawings it is to be understood that the number of conductors in the cable and the number of slots in the header block may be varied at will without departing from the scope of the invention.

Turning now to FIGS. 10 through 18 a second form of connector is shown. The connector is indicated generally at 50 and comprises an insulating housing 52 and an insulating strain relief 54. A mating connector 56 is shown and includes a plurality of electrical contacts which mate with the contacts 58 extending from the connector 50. Connector 56 is shown mounted as an edge connector on a printed circuit board 60 although the particular type of connector which will mate with the connector 50 may vary as desired for a particular use.

In FIG. 11 the two main parts of connector 50 are shown, namely the housing 52 and strain relief 54. The housing 52 has a contact receiving portion on wall 62 having a plurality of regularly spaced apertures 64 disposed therein and lying generally along two parallel planes in the same manner as the housing 10 described above in connection with the embodiment of FIG. 1. The contacts 58 are disposed within the apertures 64 and have tab portions 66 extending therefrom and disposed in pockets in an intermediate section 68 of the housing. The tabs are alternately disposed along the upper and lower surface of the intermediate section to provide for close spacing between contacts as described in connection with the first embodiment of this invention.

The housing 52 further comprises a cable receiving section or segment 70 which generally replaces the header block 12 of FIG. 1. Section 70 is provided with a plurality of passageways 72 for receiving the conductors 74 of a multiconductor ribbon cable 76 and for spreading the conductors along the two parallel planes defined by the contacts 58. The passageways 72 have ramp means 78 therein for directing the conductor into either the upper or lower contact plane.

When the contacts 58 and cable 76 are inserted into their position within the housing 52 each of the conductors 74 of the cable will be positioned adjacent a contact tab 66 and will be disposed along the intermediate section 68 of the housing. The tabs will be connected to the cable by soldering or similar process as indicated at 80. To assist in maintaining the contact tabs 66 in proper position the cable receiving section 70 of the housing is provided with cut outs 82 for receiving the free ends of the contact tabs to insure that the tabs are properly oriented relative to the cable conductors.

At this point it can be seen that the solder connection 80 between the contact tabs and the cable conductors must be relied upon not only for electrical connection but also for mechanical strength between the contacts and the ribbon cable. In order to prevent any mechanical stress from being placed on the solder connection a strain relief 54 is employed with this embodiment of the invention, the strain relief being best seen in FIG. 11 and 18. The relief 54 has a slot 84 for receiving the cable 76. The cable extends through slot 84 and into the central cavity of the strain relief towards the connector housing. Relief 54 has a pair of side members 86 which are receivable within recesses 88 formed along opposite sides of the connector housing 52 for orienting the housing and strain relief relative to each other. The strain relief has an upper surface 90 which covers the cable receiving section of the housing and further has a lower surface 92 which covers the lower surfaces of the cable receiving section of the housing and surface 92 is provided with hook means 94 which is engageable with a shoulder 96 of the housing for maintaining the strain relief and the connector housing in assembled position. Slot means 98 are provided along either side of the hook means 94 for permitting the surface 92 to flex during assembly of the strain relief onto the housing.

As seen in FIG. 18 the strain relief causes a sharp bend in the ribbon cable 76 and the cable is locked relative to the strain relief by means of a barblike member 100 formed at the inner surface of slot 84. Barb 100 firmly engages the upper surface of the cable 76 and insures that a firm mechanical connection exists between the cable and the strain relief. It can be seen that any external force applied to cable 76 will be transmitted from the cable to the strain relief 54 and subsequently to the housing 52 and will not cause any stress on the solder joint 80 which exists between the cable and the contacts 58. Such an arrangement results in a more reliable connection and materially reduces the maintenance and repair problems of the connector.

Changes in construction will occur to those skilled in the art and various apparently different modifications and embodiments may be made without departing from the scope of the invention. The matter set forth in the foregoing description and accompanying drawings is offered by way of illustration only.

I claim:

1. An electrical connector for ribbon cable having the insulation stripped from an end thereof comprising a wall of insulating material, a plurality of apertures extending through the wall, a plurality of contacts disposed in said apertures having contact tabs extending therefrom and means for supporting the terminal end of each conductor of the cable in contact with a tab, said means including a pocket for reception of an intermediate portion of the tab, said means further including a segment integral with the wall, an opening in the segment for supporting a zone of the ribbon adjacent the stripped end and a ramp extending from the opening toward each pocket.

2. A connector as defined in claim 1 further including means for maintaining the tabs in a preset orientation.

3. A connector as defined in claim 2 wherein the maintaining means comprises a notch in the segment, the end of each tab being inserted in the notch.

4. An electrical connector as set forth in claim 1 further comprising means for preventing strain on the conductors when the cable is in position relative to the contact tabs.

5. An electrical connector as set forth in claim 4 wherein said strain relief means has locking means for locking the strain relief means to the connector wall.

6. A connector as set forth in claim 5 wherein said locking means comprises a flexible hook on the strain relief means for engaging a shoulder formed integral with the connector wall.