

[54] **FLAT MULTI-CONDUCTOR CABLE
HOLDER**

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abandoned.

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339/186 M

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[58] Field of Search 339/17, 18, 75, 59, 60,
339/61, 95, 97, 99, 103, 107, 176, 217, 220,
221, 256, 258, 119, 125; 317/101

[56] **References Cited**

UNITED STATES PATENTS

2,724,813 11/1955 Leland 339/220 R X

3,065,444	11/1962	Crimmins.....	339/176 MF
3,369,214	2/1968	Krumreich et al.	339/176 M X
3,562,696	2/1971	Barnhart et al.	339/60 M
3,641,482	2/1972	Bretting.....	339/17 F X
3,663,922	5/1972	Foust, Jr. et al.	339/17 F
3,691,509	9/1972	Krol.....	339/17 F X
3,697,925	10/1972	Kenschen.....	339/97 R X

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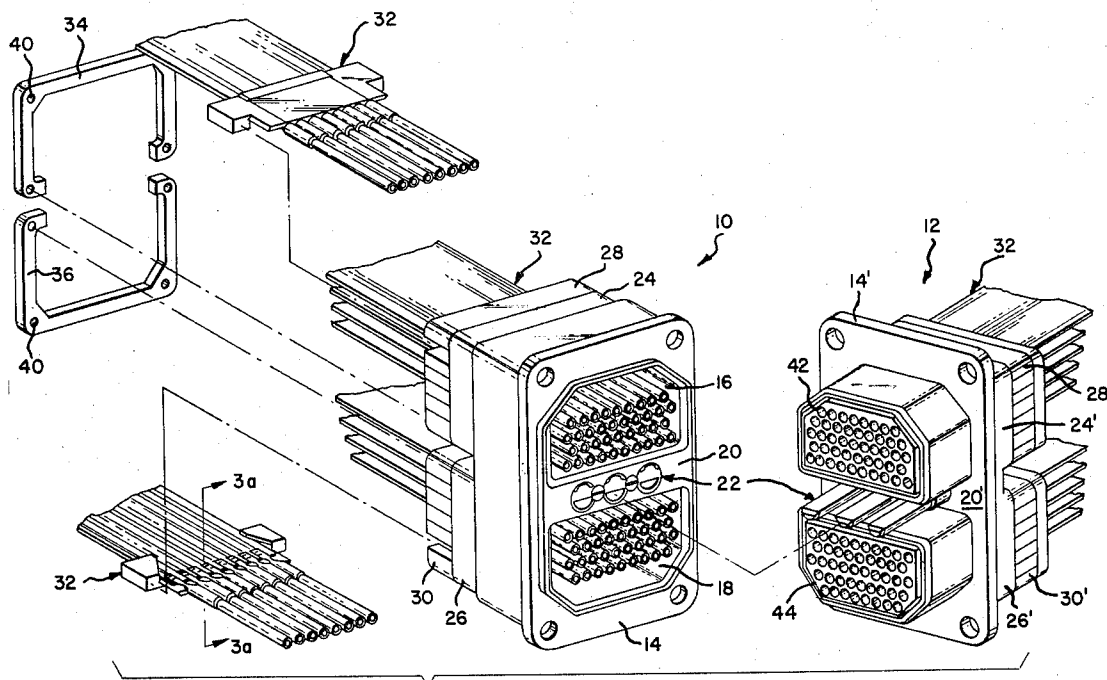
Attorney, Agent, or Firm—AMP Incorporated

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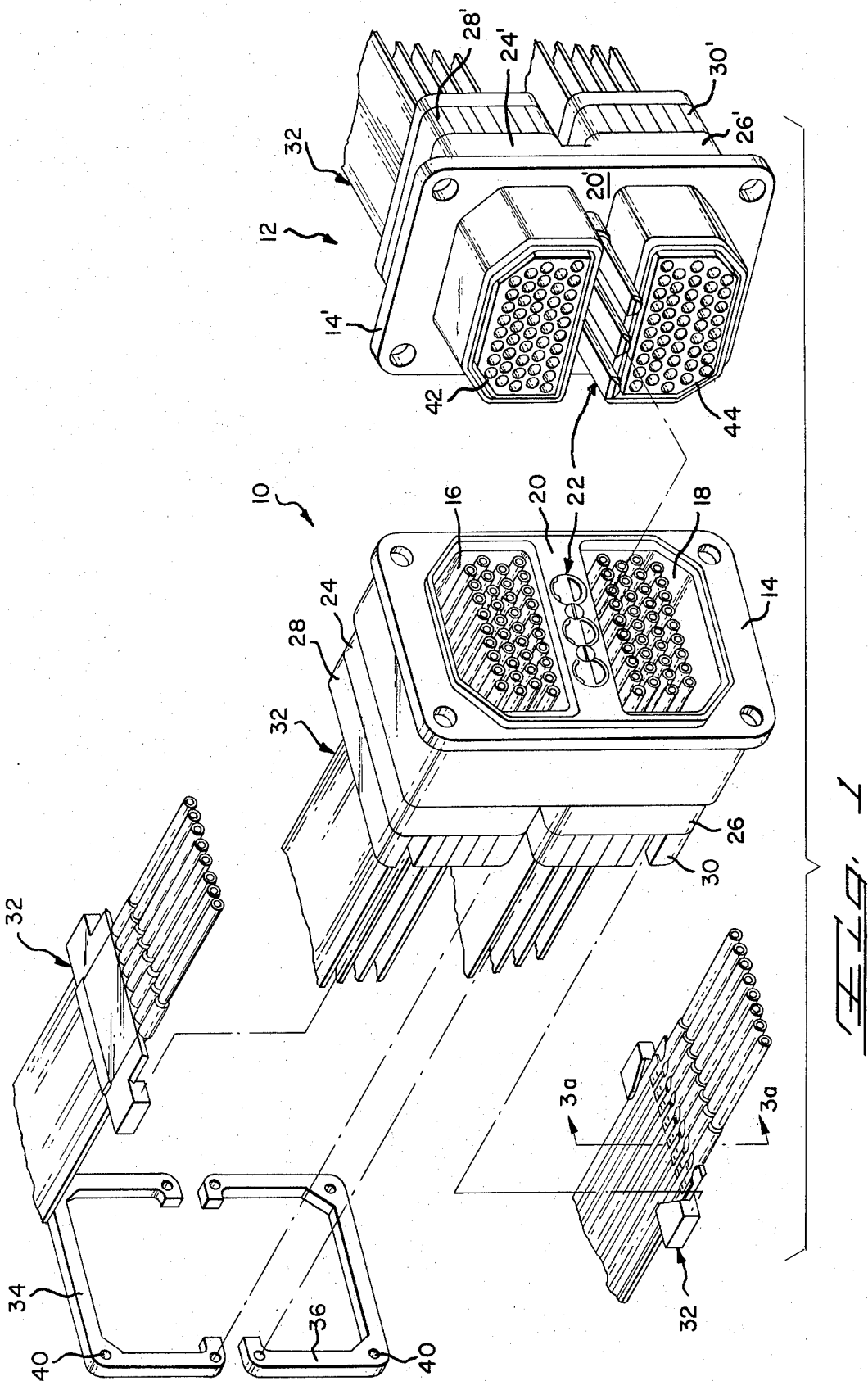
ABSTRACT

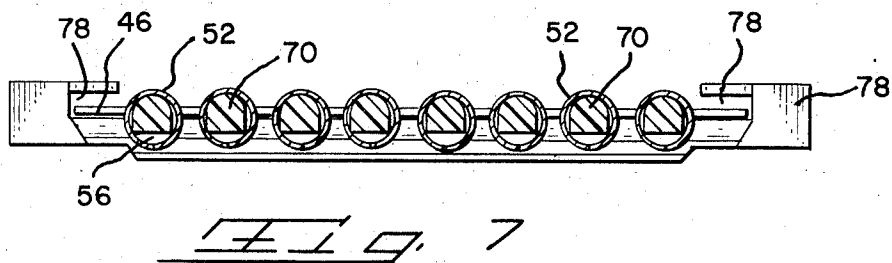
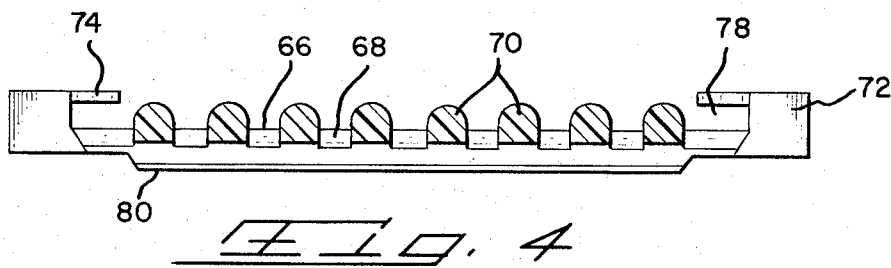
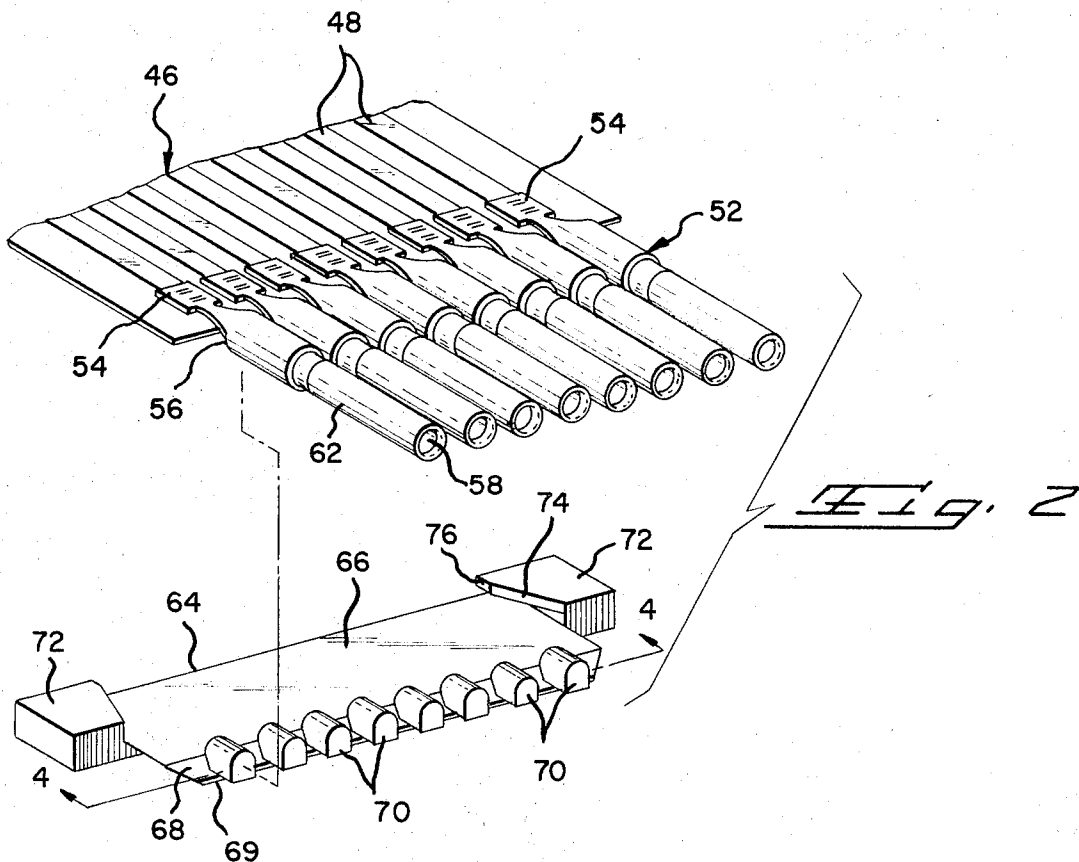
This invention relates to a flat multi-conductor cable holder and more particularly to a holder having a number of studs thereon which fit into cavities in terminal contacts which are crimped onto the cable so that the end of the cable abuts the ends of the studs, retaining such in the aforementioned cavities.

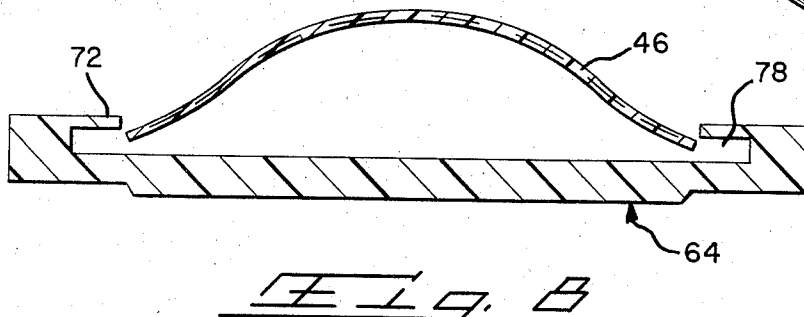
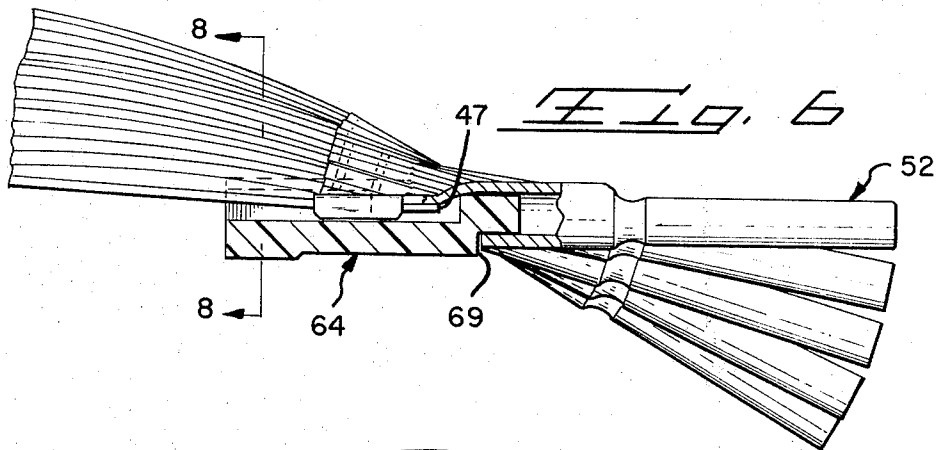
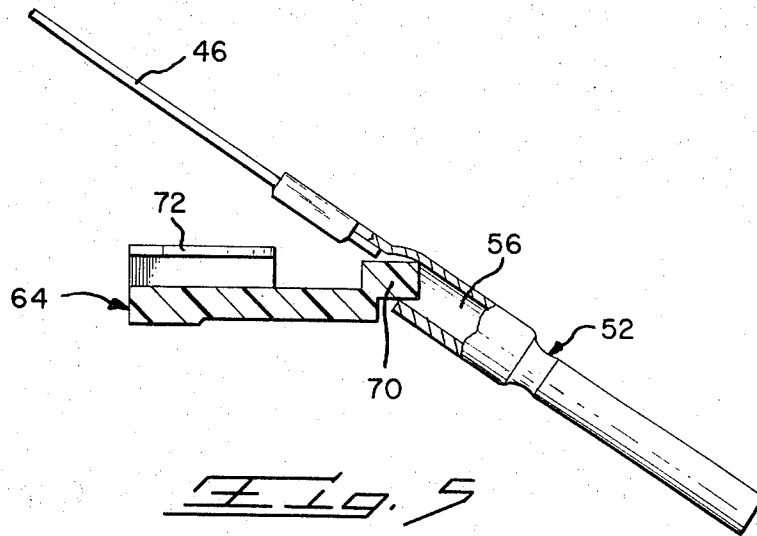
2 Claims, 11 Drawing Figures

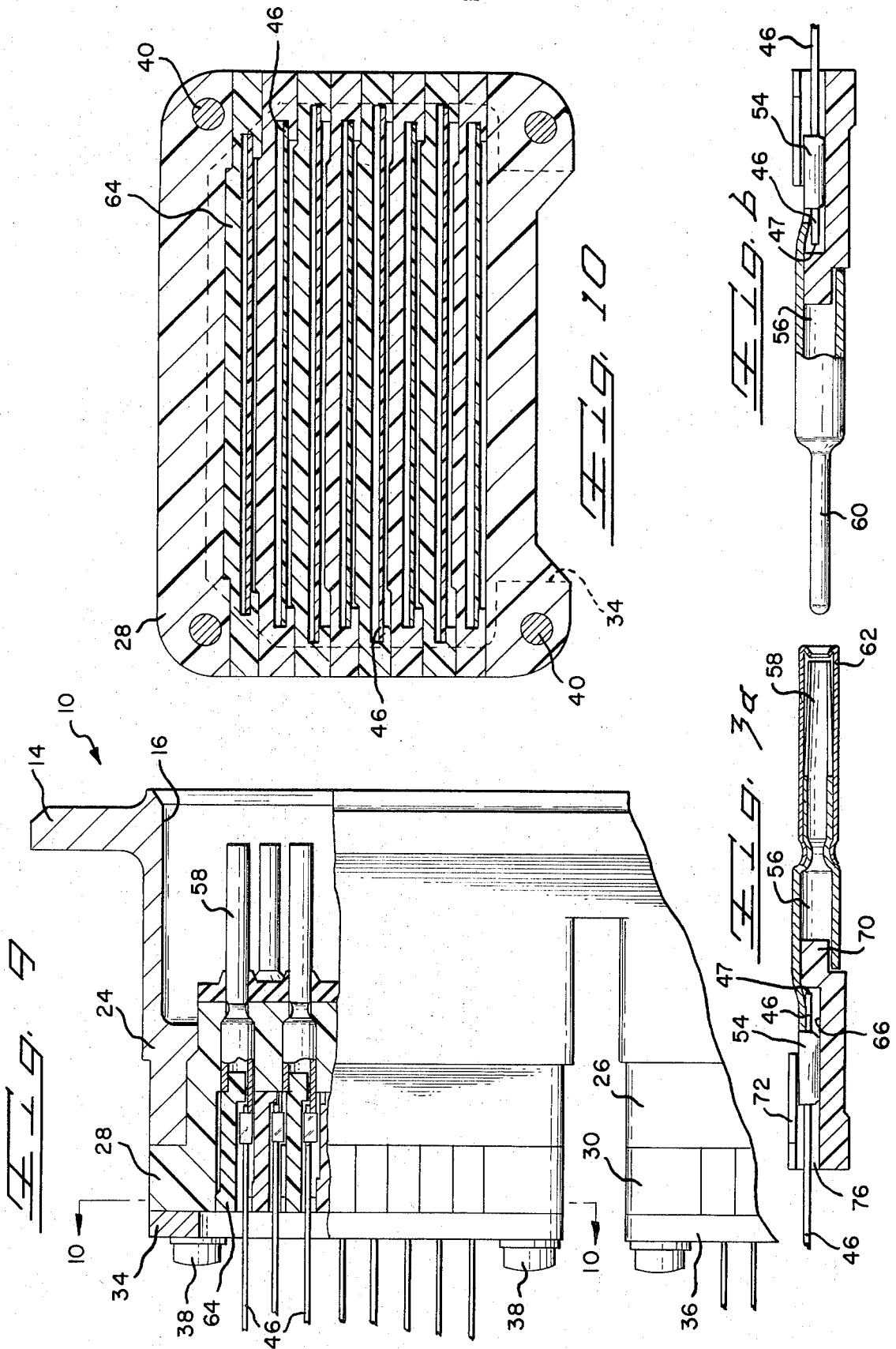


SHEET 1 OF 4









FLAT MULTI-CONDUCTOR CABLE HOLDER

This is a continuation of application Ser. No. 209,208, filed Dec. 17, 1971 abandoned.

BACKGROUND OF THE INVENTION

Modern aircraft contain a multitude of communication equipment requiring electronic circuits for signal generating and transmission. These circuits, generally of the printed circuit board variety, are contained within boxes commonly referred to as "black boxes". Currently, small diameter wire connects the circuit boards to the outlet receptacle. As the number of wires in any one box may well exceed one hundred, several problems are present. One is obviously a space problem. Another is tracing one wire among many when required, as for example when a failure occurs. In an effort to relieve or eliminate these and other problems, black-box manufacturers would like to replace the wires with flat, flexible conductor cable. However, heretofore serious problems have deterred the more widespread use of such cable. One such problem was that of connecting the cable to the standardized electrical connectors used by all aircraft and black box manufacturers. Another problem was how to lock the cable into the connector. Yet another problem involved maintaining space between the several cables attached to a connector. Easy and positive connect to and disconnect from the electrical connector presented another serious obstacle.

Accordingly, the present invention provides a sub-assembly useful to connect flat multi-conductor cable to a connector, which comprises a cable holding means for holding the cable and a plurality of fingers projecting therefrom, and a plurality of terminal contacts having crimping means for crimping onto the cable and receptacle means for receiving the fingers on the cable holding means.

BRIEF DESCRIPTION OF THE DRAWINGS

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

FIG. 2 is a perspective view of the components of the instant invention;

FIGS. 3a and 3b are cross-sectional views showing details of the assembled invention of FIG. 2;

FIG. 4 is a frontal view of one component of FIG. 2;

FIGS. 5, 6, 7 and 8 illustrate assembly of the present invention;

FIG. 9 is a partially sectioned side view of the assembled present invention positioned in an electrical connector; and

FIG. 10 is a rear view taken along the lines 10-10 of FIG. 9.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to FIGS. 1 and 9, the several components of the present invention assembled in an electrical connector are shown. The connector, a commonly known type of rack and panel connector, includes mateable connector parts 10 and 12. Part 10 comprises a metallic frame portion including a mounting flange 14 on its mating side and a pair of spaced-apart recesses 16 and 18 extending inwardly from its mating side, these recesses being separated by web portion 20 on which is mounted key system 22. Rearwardly extending

stepped housing portions 24 and 26 are integral with the frame and are in alignment with recesses 16 and 18. Housing portions 24 and 26 receive inserts 28 and 30 respectively as can be more readily seen in FIG. 9. Inserts 28 and 30 receive one or more sub-assemblies 32 of which the elements thereof will be described below. Retainers 34 and 36 lock sub-assemblies 32 into connector 10 via bolts 38 passing thru bores 40 in retainers 34 and 36 and inserts 28 and 30 and into appropriate threaded apertures (not shown) in housing portions 24 and 26.

The connector part 12 is similar in many respects to connector part 10 and its structural features are therefore identified with the same reference numerals, differentiated by prime marks, as are used with reference to part 10. The part 12 is the plug portion of the connector assembly and differs from part 10 in that shell portions 42 and 44 extend forwardly from flange 14', these shell portions 42, 44 being adapted to enter recesses 16, 18 of part 10.

Referring now to FIGS. 2, 3a, 3b, and 4, the components of subassembly 32 are shown. As is well known, flat multi-conductor cable 46 contains a plurality of conductors 48 spaced apart and embedded between two layers of insulation. Electrical contact with conductors 48 are made via terminal contacts 52 which may be crimped or otherwise fastened thereon. Contacts 52 are characterized by having a crimp portion 54 which may be of the type disclosed in U.S. Pat. No. 3,395,381, a receptacle 56 opening rearwardly, and a contact portion which may be socket assembly 58 (FIG. 3a) or a pin 60 (FIG. 3b). Socket assembly 58 may be encased by a steel sleeve 62. The cable and its attached terminal contacts will hereinafter be referred to as terminated cable 63.

Completing sub-assembly 32 is cable holder 64. Holder 64 contains a planar surface 66 having a front end beveled at the top as seen at 68 and a straight portion at the base as seen at 69. Integral with and projecting forward from the front of the planar surface are a plurality of fingers 70 having flat ends and a domed top. The surface 66 is cut back at the front of either side to define a pair of studs 72 having substantial thickness relative to the planar surface. The inwardly-facing sides of the top surface of the studs are oblique except for a straight portion at the rear as shown at 74 and 76 respectively. The top of the studs and surface 66 define grooves as seen at 78. The opposite surface of cable holder 64 is flat except for a projecting ridge 80 positioned at the rear of the holder and running transverse thereto. The length of the ridge is slightly less than the distance between the straight portions 76 on ears 72.

Referring to FIG. 5, assembly of sub-assembly 32 will now be discussed:

Terminated cable 63 is held at an oblique angle to cable holder 64 so that fingers 70 mate with receptacles 56. Rotating the two toward each other and pressing holder 64 forward pushes fingers 70 into receptacles 56 so that forward end 47 of cable 46 is behind the ends of the fingers. Terminated cable 63 and cable holder 64 are now joined together in parallel relation. Note that holder 64 cannot move forward as the straight portion 69 of the front end abuts the lower part of the terminal contact 52 and that the holder cannot move backwards because of the interference of end 47 of cable 46 with the backs of fingers 70. Thus disassembly can only

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occur by rotating the two elements away from each other, i.e., the reverse procedure to assembly.

FIG. 7 shows the positioning of fingers 70 in receptacles 56 and 46 in grooves 78. FIG. 8 illustrates the method of inserting the sides of cable 46 into grooves 78 by flexing the cable upwardly. The terminal contacts 52 have been omitted for clarity.

FIGS. 9 and 10 illustrate the assembly of subassembly 32 into connector part 10. Each of the several subassemblies 32 are placed into part 10 by pushing the sockets 58 (or pins 60) thru inserts 28 and 30. In the case of housing 16, the sub-assemblies 32 are positioned in insert 28 with studs 72 facing downwardly. In the case of housing 18, the sub-assemblies 32 are positioned in insert 30 with studs 72 facing upwardly. Insertion and withdrawal of the sub-assemblies are accomplished by grasping the sides of studs 72. Spacing between each sub-assembly is built in via the thickness of surface 66 and studs 72. Ridge 80, which fits in between straight portions 76 on studs 72 of the adjacent sub-assembly, serves to confine the conductor cable 46 therein. This relation can be seen in FIG. 10.

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.

What is claimed is:

1. A terminated flat multi-conductor cable and cable holder comprising:
 - a. a flat cable having a plurality of parallel, spaced apart conductors contained in insulating material;
 - b. a cable holder having a cable-receiving surface with an end of the cable positioned thereon, guide means being positioned on either side for locating the cable and a plurality of spaced fingers projecting forwardly from the surface, each finger having front and back ends; and
 - c. a plurality of terminals each having crimping means on the underside of one end, said means being crimped onto the conductors of the cable at a distance removed from the cable end, each terminal further having a rearwardly opening receptacle on the underside and spaced adjacent to the end of

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the cable, said receptacles being positioned on said fingers with the end of the cable abutting the back end of the fingers thereby preventing axial movement of the cable.

2. An electrical connection comprising:
 - a. a pair of face to face, matable frame portions each having a pair of insert receiving apertures there-through, said apertures separated one from the other by a web portion;
 - b. inserts of insulating material adapted to be positioned in said apertures, said inserts further adapted to receive a plurality of terminals there-through;
 - c. a plurality of flat, multi-conductor cables entering into the back of each of said frame portions;
 - d. a plurality of terminals the front of which contain either pin contacts or socket assemblies, said pin contacts being received into said socket assemblies when said frame portions are mated together, said terminals having crimping means on the back which mechanically and electrically engage the conductors in said multi-conductor cables, said terminal further having, intermediate the ends thereof, rearwardly opening receptacles, said terminals being positioned in said inserts so that the pin contacts are in one frame portion and the socket assemblies are in the opposing frame portion, the pin contacts being telescopically received by the socket assemblies when the two frame portions are joined;
 - e. a plurality of cable holders positioned behind each of the inserts in vertical fashion, said holders having longitudinal grooves along each side for retaining the edges of said multi-conductor cables, and further having forwardly projecting spaced fingers positioned across the front edge of the holders and which are received in said rearwardly opening receptacles on said terminals so that each of said terminated multi-conductor cables are retained on said holders; and
 - f. a plurality of frame-shaped retainers which are removably secured to the rear face of said frame portions so as to retain said cable holders against said inserts.

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