FLAT CABLE TERMINATING

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Filed: May 17, 1974
Appl. No.: 470,812

Foreign Application Priority Data
June 21, 1973 United Kingdom........... 29501/73

U.S. Cl. .......................... 339/97 C; 174/84 C
Int. Cl. .......................... H01R 11/20
Field of Search ................... 339/95, 97–99;
174/84 C, 94 R

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UNITED STATES PATENTS
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ABSTRACT
An electrical termination arrangement for flat cables which includes a generally U-shaped metallic member for each conductive track of the cable. Each metallic member has barbs formed on its legs which pierce the insulation and make electrical contact with the conductive track when the legs of the member are crimped to the flat cable. The U-shaped member may carry a pin or socket contact. Alternatively, the U-shaped member may be provided with an additional leg forming a Z-shaped member which interconnects the tracks of two flat cables.

4 Claims, 8 Drawing Figures
FLAT CABLE TERMINATING

BACKGROUND OF THE INVENTION

The present invention relates generally to flat cable terminating and, more particularly, to electrical termination arrangements for flat cables and the method of terminating such cables.

The present invention has special utility in the termination of conductive tracks of flexible flat electrical cables commonly known as strip cables wherein the tracks are covered with insulation. The invention is also applicable of joining of a pair of flat cables together.

The use of electrical terminals for terminating conductive tracks of flat cables has heretofore required stripping of the insulation material from the cable in order to expose the tracks. Thereafter, the terminals were clamped or soldered to the conductive tracks of the cable. Such a procedure was not only expensive, but time consuming, and not completely reliable. To overcome the requirement of stripping, as well as soldering, or gripping of the conductor, improved termination devices were developed utilizing conductive track-gripping jaws. The jaws were typically flat metal plates which were disposed vertically with respect to the cable. Teeth were formed on the opposing edges of the jaws. When the jaws were crimped, the teeth would pierce the insulation and engage the conductive tracks of the cable. U.S. Pat. Nos. 3,201,744 and 3,259,873 disclose terminating devices of this type.

The purpose of the present invention is to provide an electrical termination arrangement and method for terminating flat cables which is less expensive and easier to perform than the aforementioned prior art flat cable terminating techniques.

SUMMARY OF THE INVENTION

According to the principal aspect of the invention, there is provided an electrical termination arrangement for a flat cable which includes a generally U-shaped deformable metallic strip member for each conductive track of the cable to which contact is to be made. Each metallic member has a pair of flat, generally parallel legs. The cable is inserted between the legs of the metallic member with its conductive track aligned therewith. The legs of the metallic member are formed with barbs. The legs are crimped together so that the barbs pierce the insulation of the cable and make contact to the conductive track therebetween. The U-shaped member also includes means for making contact to a further conductor. Such means may be either a pin contact or socket contact on one of the legs, or a third leg parallel to the first two legs forming a Z-shaped member for interconnecting two flat cables, each cable being inserted between a pair of adjacent legs of the Z-shaped member.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the Z-shaped electrical termination device of the present invention with the ends of two flat cables shown in position to be inserted into the device;

FIG. 1a is a transverse vertical sectional view taken along line 1a—1a of FIG. 1 illustrating the details of the structure of one of the flat cables, the thickness of the cable being somewhat exaggerated for purposes of illustration;

FIG. 1b is a vertical sectional view taken along line 1b—1b of FIG. 1 showing the barbs on the termination device;

FIG. 2 illustrates the Z-shaped termination device of FIG. 1 crimped to the ends of the flat cables with the portions of the termination device between the conductive tracks of the cables removed;

FIG. 3 is a perspective view of a U-shaped termination device having socket-type contacts thereon and crimped to the end of a flat cable in accordance with the present invention, with the device shown positioned to be inserted into an electrical connector housing;

FIGS. 4 and 5 are perspective views showing the two forms of socket-type termination devices utilized in the termination arrangement illustrated in FIG. 3; and

FIG. 6 is a perspective view of a pin contact termination device suitable for use in the arrangement illustrated in FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGS. 1 and 2 in detail, there is illustrated one embodiment of the termination arrangement of the present invention, generally designated 10. The arrangement includes a termination device 12 for electrically connecting the conductive tracks 14 of a pair of flat cables 16 and 18 arranged with their respective tracks aligned with each other. As well known in the art, the conductive tracks are covered by insulation 20. The termination device 12 comprises a deformable flat metallic sheet bent to a Z-shaped configuration providing three generally parallel legs 22, 24 and 26. The metal sheet may be copper or aluminum, plated or unplated as desired. The width of the termination device 12 is such as to embrace all the conductive tracks of the flat cables 16 and 18. Prior to bending the sheet to form the Z-shaped member 12, the sheet is stamped to provide parallel spaced apart rows 28 of barbs, one for each conductive track on the flat cables. The rows 28 of barbs are spaced apart a distance corresponding to the spacing of the tracks 14. In addition, the pair of adjacent legs of the termination device 12, namely, legs 22, 24 and legs 24, 26, are spaced apart a distance sufficient to allow the ends of the flat cables 16 and 18 to be inserted therebetween. The barbs 28 may be V-shaped, as shown, and are designed to be able to pierce the insulation 20 of the flat cables 16 and 18.

To join the two flat cables, the cable 16 is inserted between the legs 24 and 26 of the termination device 12, with each of its conductive tracks 14 aligned with the rows 28 of barbs on the device. The second flat cable 18 is inserted between the legs 22 and 24 with its conductive tracks aligned with the rows of barbs on the termination device 12. The legs of the Z-shaped termination device are then crimped or squeezed together, so that the barbs on each row pierce the insulation 20 of the flat cables to make contact with the respective conductive tracks thereof.

Next, the superfluous metal material of the termination device 12 between the conductive tracks crimped between the legs is removed, as by piercing or stamping out, to provide a final form as illustrated in FIG. 2. It will be seen that there is now a plurality of separate Z-shaped metallic members 30 each of which interconnects two flat cable conductive tracks with gaps between the Z-shaped members. These areas which are
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thus slightly weakened physically, can be reinforced with a polytetrafluorethylene glass cloth, not shown.

The arrangement illustrated in FIG. 3 is similar to that illustrated in FIGS. 1 and 2, and like members primed are used to indicate like or corresponding parts. In this embodiment, the termination members 30', 30'a are U-shaped in configuration and are crimped over the conductive tracks 14' of a single flat cable 16'. The areas between the termination members are removed to electrically isolate the conductive tracks of the flat cable as in the embodiment illustrated in FIG. 2. However, in this embodiment the termination members 30' and 30'a are integrally formed with socket contacts 40. Alternate termination members are inverted. As seen from FIGS. 4 and 5, the termination member 30' differs from the member 30'a by the inclusion of a relatively wide base section 42. The termination members 30' are utilized at the edge of the flat cable 16'.

FIG. 3 also illustrates a plastic electrical connector housing 44 having a plurality of alternately staggered openings 46 therein which are arranged to slidably receive the ends of the termination members 30' and 30'a. The portions of the housing 48 between the openings 46 provide walls between the termination members. The electrical connector housing 44 contains pin contacts, not shown, for making electrical engagement with the socket contacts 40 on the termination members.

FIG. 6 illustrates an alternate form of a termination member, designated 30'b, which is identical to the termination member 30'a except that the contact member therein is an integrally formed pin contact 50 rather than a socket contact. This termination member may be utilized in the same manner as the termination members illustrated in FIGS. 4 and 5, and would be utilized with an electrical connector housing containing socket contacts.

What is claimed is:
1. A method of terminating a flat cable having a plurality of parallel, spaced conductive tracks thereon covered with insulation comprising the steps of:
   a. providing a termination device comprising a deformable flat metallic sheet bent to a U-shaped configuration providing a pair of flat spaced legs, said legs having generally parallel rows of bars thereon, said rows being spaced apart a distance corresponding to the spacing of said conductive tracks;
   b. inserting the end of said cable between said legs with said tracks aligned with said rows of bars;
   c. crimping said legs onto said cable end so that said bars pierce said insulation and contact said conductive tracks; and
   d. removing the metal of said termination device between said tracks to electrically isolate said tracks from each other.
2. An electrical connection arrangement comprising:
   a. a pair of generally longitudinally aligned elongated flat cables each having a plurality of laterally spaced parallel conductive tracks covered with insulation, the tracks of said flat cables being generally longitudinally aligned with each other providing a plurality of aligned pairs of said tracks;
   b. a plurality of spaced generally Z-shaped deformable metallic strip members one for each of said aligned pairs of conductive tracks of said flat cables, each of said Z-shaped metallic members providing three flat, generally parallel legs;
   c. insulation piercing bars on each of said legs extending toward the next adjacent leg;
   d. one end of one of said flat cables being positioned with its conductive tracks located between two adjacent legs of each of said metallic members;
   e. one end of the other of said flat cables being positioned with its conductive tracks located between the third leg of each said metallic member and the next adjacent leg thereof; and
   f. said legs of said metallic members being crimped together to electrically connect said aligned conductive tracks of said cables.
3. An electrical connection arrangement as set forth in claim 2 wherein:
   a. said ends of said flat cables are devoid of insulation between said metallic members.
4. A method of connecting the ends of a pair of flat cables each having a plurality of parallel, spaced conductive tracks thereon covered with insulation comprising the steps of:
   a. providing a connecting device comprising a deformable flat metallic sheet bent to a Z-shaped configuration providing three flat spaced generally parallel legs, said legs having generally parallel rows of bars thereon, said rows being spaced apart a distance corresponding to the spacing of said conductive tracks;
   b. inserting the end of one of said cables between two of said legs of said connecting device with the tracks of said cable aligned with said rows of bars;
   c. aligning said other cable with said one cable;
   d. inserting the end of said other cable between the third leg of said connecting device and the next adjacent leg with the tracks of said other cable aligned with said rows of bars so that the tracks in said two cables are aligned;
   e. crimping said three legs onto said cable ends so that said bars pierce the insulation on said cables and contact the conductive tracks thereof to electrically connect said tracks; and
   f. removing the metal of said termination device between said aligned tracks to electrically isolate said aligned tracks from each other.