Oct. 10, 1961 J. C. COLE ET AL 3,004,237

ELECTRICAL CONNECTOR FOR MULTI-CONDUCTOR CABLES

Filed Aug. 6, 1959 3 Sheets-Sheet 1

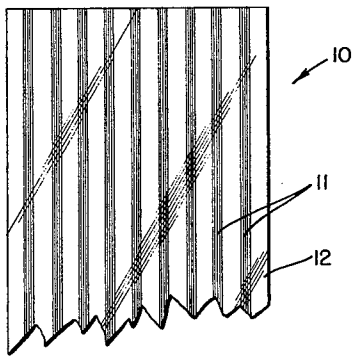


Fig. 1

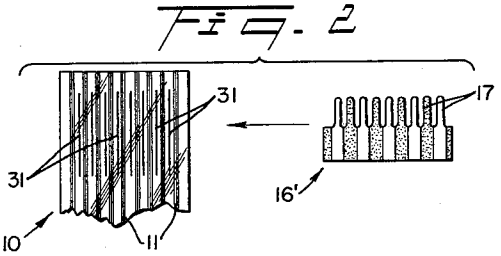


Fig. 2

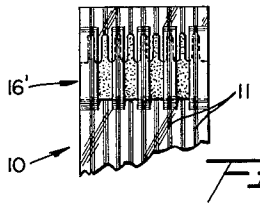


Fig. 3

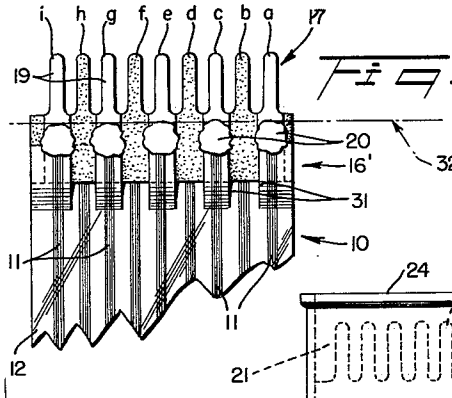


Fig. 4

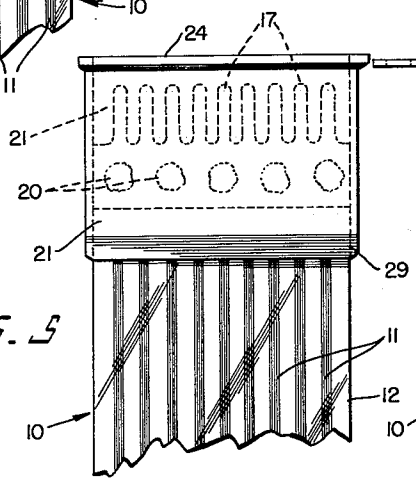


Fig. 5

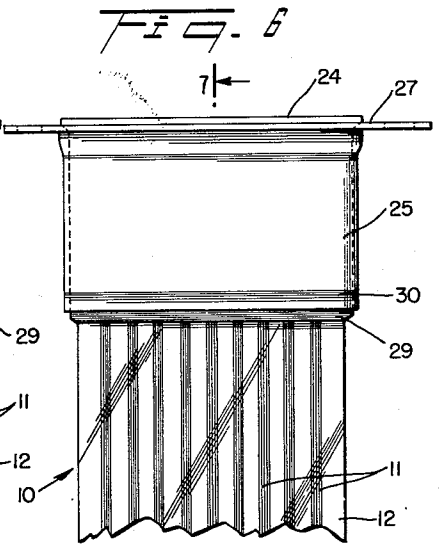


Fig. 6

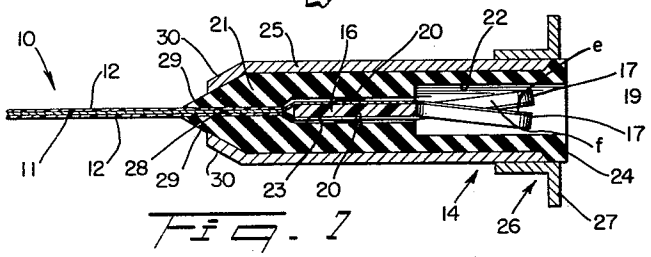


Fig. 7

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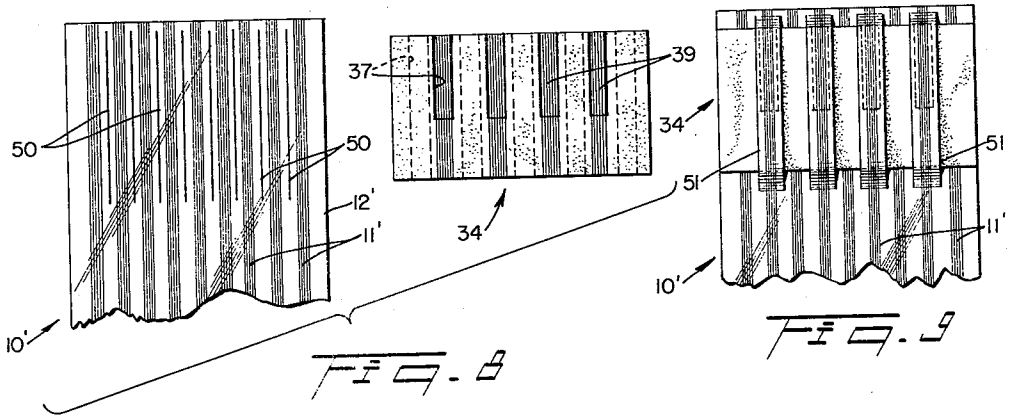


Fig. 8 Fig. 9

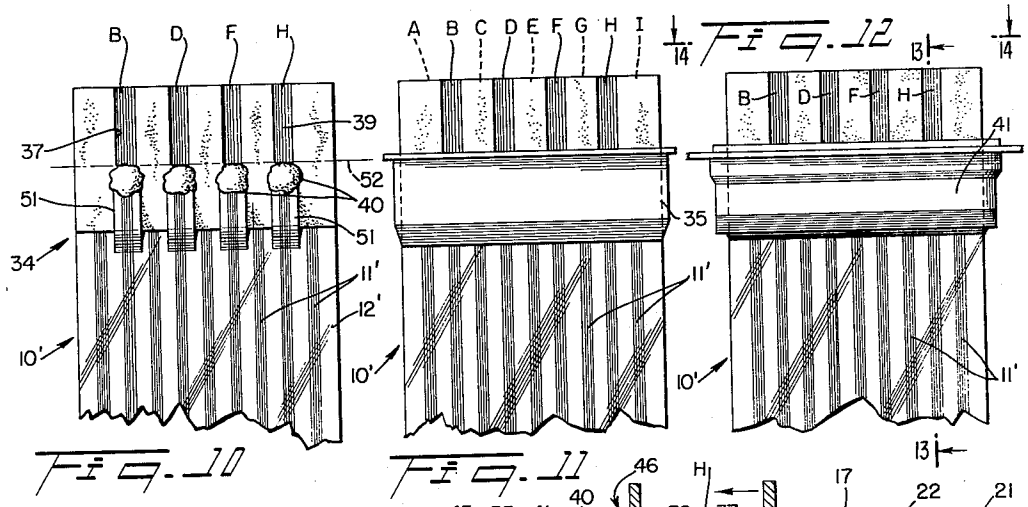


Fig. 10 Fig. 11 Fig. 12

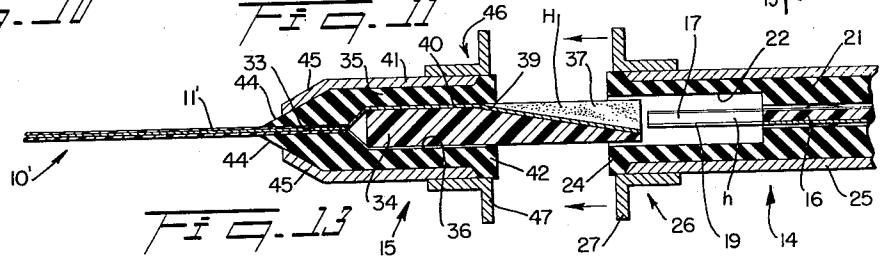


Fig. 13

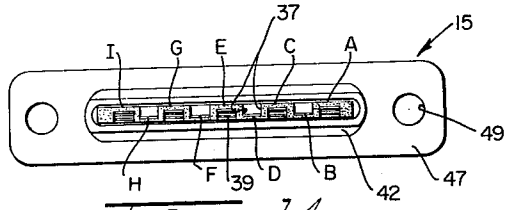


Fig. 14

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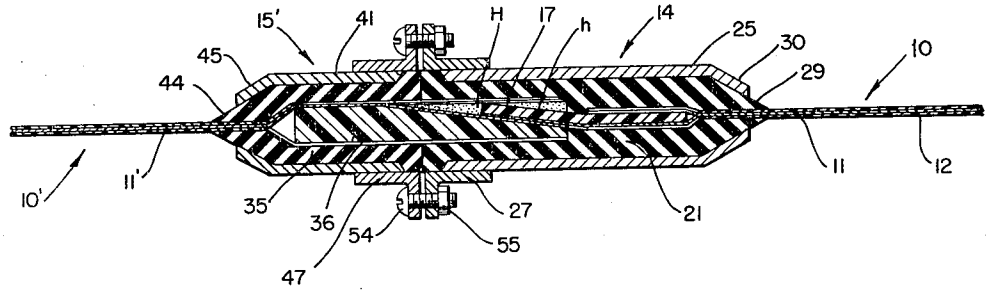
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ELECTRICAL CONNECTOR FOR MULTI-CONDUCTOR CABLES

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Fig. 15



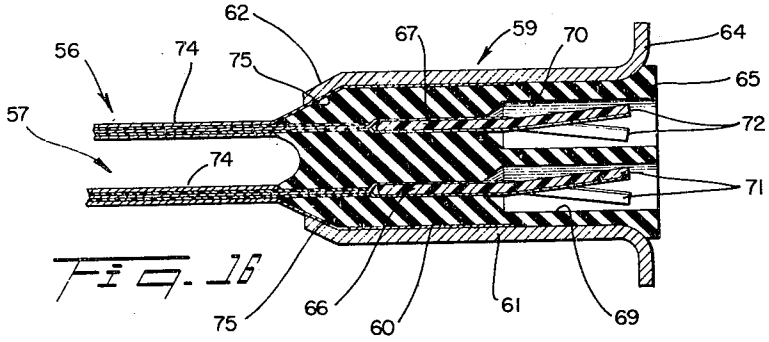


Fig. 16

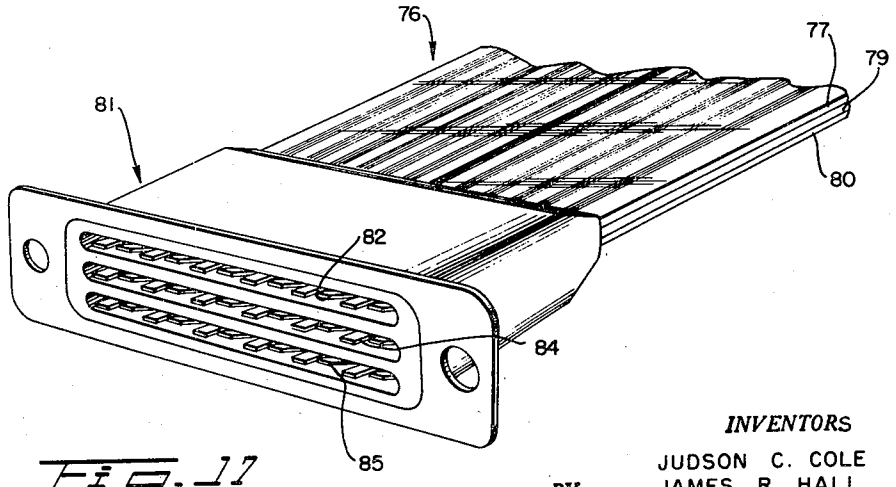


Fig. 17

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United States Patent Office

3,004,237

Patented Oct. 10, 1961

3,004,237

ELECTRICAL CONNECTOR FOR MULTI-CONDUCTOR CABLES

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Filed Aug. 6, 1959, Ser. No. 831,996
15 Claims. (Cl. 339—176)

This invention relates to a separable connector, and, in the embodiments thereof illustrated herein, particularly relates to a separable connector for cables in flattened, tape form.

The invention has among its objects the provision of a novel separable connector for multiple conductor cables.

A further object of the invention is an improved separable electrical connector which may be used to advantage with multiple conductors of the flat or tape type.

Yet another object of the invention lies in the provision of a separable connector for tape cables, such connector being particularly characterized by the fact that the conductors are completely insulated and covered outside as well as within the housings of the connector parts, that there is an effective insulating barrier between each pair of adjacent conductors, and that the connector parts are uniquely positioned relative to each other by the interengaging contacts of the respective connector parts.

Yet another object of the invention lies in the provision of a separable electrical connector of the type indicated which is rugged and compact, and which adds but comparatively little to the weight of an assembly in which it is used.

The above and further objects and novel features of the invention will more fully appear from the following description when the same is read in connection with the accompanying drawings. It is to be expressly understood, however, that the drawings are for the purpose of illustration only, and are not intended as a definition of the limits of the invention.

In the drawings, wherein like reference characters refer to like parts throughout the several views,

FIG. 1 is a fragmentary view in plan of a 9-conductor tape cable, such as that shown connected by the illustrative embodiments of electrical connector;

FIG. 2 is a schematic view in plan illustrating a step in the assembly of the first, finger-bearing connector part, shown in FIGS 6 and 7;

FIG. 3 is a view in plan showing the parts illustrated in FIG. 2 after they have been assembled;

FIG. 4 is a further fragmentary view in plan of the inner operative portion of the connector of FIG. 7 in a later stage of its assembly;

FIG. 5 is a view in plan of the connector part of FIG. 4 after it has had its insulating mounting insert telescoped thereover;

FIG. 6 is a view in plan of the finally assembled, finished first part of the connector;

FIG. 7 is a view in longitudinal section through the connector part shown in FIG. 6 and the portion of the tape cable attached thereto, the section being taken along the line 7—7 of FIG. 6;

FIG. 8 is a schematic view showing a preliminary step in the assembly of the second, socket-bearing part of the electrical connector, shown in FIGS. 12 and 13;

FIG. 9 is a view in plan of the parts shown in FIG. 8 after they have been preliminarily assembled;

FIG. 10 is a view in plan of the parts shown in FIG. 9 at a later stage of assembly of the inner, operative portion of the connector part shown in FIGS. 12 and 13;

FIG. 11 is a view in plan of the inner operative connector part shown in FIG. 10 after it has had its electrically insulating mounting insert member telescoped thereover;

FIG. 12 is a view in plan of the finally assembled, finished second, socket-bearing part of the connector;

FIG. 13 is a view in longitudinal section through the second connector part, the section being taken along the line 13—13 of FIG. 12, such figure showing a fragmentarily illustrated, as yet incompletely formed, first connector part being applied to the second connector part for the first time;

FIG. 14 is a view in end elevation of the second connector part, the view being taken from along the line 14—14 of FIG. 12;

FIG. 15 is a view in longitudinal section through an assembled electrical connector having the described first and second connector parts;

FIG. 16 is a view in longitudinal section through a first, finger-bearing connector part of a second illustrative embodiment of connector; and

FIG. 17 is a view in perspective of a second, contact finger bearing connector part of a third illustrative embodiment of separable electrical connector made in accordance with the invention.

As will be apparent from the above, there are illustrated herein three embodiments of separable electrical connectors made in accordance with the invention:

(1) FIGS. 1–7, inclusive, illustrate a first, finger-bearing connector part, and a preferred method of making such part, of a first embodiment of connector; FIGS. 8–14, inclusive, show the second, socket-bearing connector part of such first embodiment of connector and a preferred method making such part; and FIG. 15 shows the asembled first and second connector parts of the first embodiment.

(2) FIG. 16 shows the first part of a second embodiment of connector.

(3) FIG. 17 shows the second part of a third embodiment of connector of the present invention.

In each of the illustrative embodiments the connector is shown used with a multiple connector cable of the flattened or tape type. Whereas the connector of the invention displays perhaps its maximum advantages when used with such type of cable, it is to be understood that the connector of the invention, and the method of making same, may also be used advantageously with cables of other types.

In FIG. 1 there is shown a portion of a flattened or ribbon type cable with which the connector of the invention is illustrated. Such cable, generally designated **10**, has a plurality of thin, ribbon-like conductor strips **11** which are sealed in spaced parallel relationship between upper and lower electrically insulating layers **12**. In the illustrative cable shown, which may, for example, be one manufactured by the Tape Cable Company, Rochester, New York, the conductors **11** are made of thin coper strips, and the layers **12** are made of clear, transparent, thermoplastic material such as a polyester resin.

In FIG. 7 there is shown a first, prong or finger-bearing connector part, generally designated **14**, which is connected to an end of cable **10**. Part **14** of the connector is adapted to cooperate with a complementary second, socket-bearing connector part designated **15**, shown in FIGS. 12, 13, and 14, and to be described hereinafter. Connector part **14** has an inner, prong or finger-bearing plate **16** from the forward end of which extends a plurality of spaced parallel similar fingers **17**, in this instance nine in number. In the illustrated embodiment, the plate **16** and fingers **17** are made integral, and are formed from a sheet of epoxy resin reinforced with glass fibers.

An electrically conductive thin metal layer **19** extends

along one broad surface of each of fingers 17 and rearwardly in spaced relationship across the main extent of plate 16. As shown in FIG. 4, there are five alternate fingers 17 (pins *a, c, e, g,* and *i*) thus provided with layers of metal 19 on the side of plate 16 which faces the reader in that figure. The other four fingers 17 (pins *b, d, f, and h*) have the thin metal layer 19 on the side thereof away from the reader in FIG. 4. Fingers 17 have a center-to-center spacing which equals the center-to-center distance of the conductors 11 in tape 10. Five alternate conductors 11 are, therefore, connected to the five fingers 17 whose coatings 19 face the reader in FIG. 4, the other four conductors being connected to the other four fingers whose coatings 19 face in the opposite direction. The manner of formation of the plate 16, fingers 17, and coatings 19, and the manner of connection of parts 16 to the conductors of cable 10 will be explained hereinafter.

Cable 10 extends into a laterally elongated, vertically central passage 28 in the rear of a rubber-like insert 21. Such insert has a recess 22 in the forward end thereof into which the fingers 17 project, and a recess 23 centrally thereof, which receives plate 16. Insert 21 fits snugly within a correspondingly shaped metal shell 25 which has a flanged structure 26 secured, as by welding, to the forward end thereof. Element 26 is so positioned on the shell that the plane of its forward transverse flange 27 lies somewhat rearwardly of the forward outwardly flanged end 24 of insert 21. The rear edge of flange 24 bears against the forward edge of shell 25, as shown. The rear end of insert 21 has rearwardly and centrally converging upper and lower surfaces 29, the forward ends of which are engaged by the complementary, inwardly converging portions 30 at the rear of shell 25. It will be apparent that when insert 21 is thrust rearwardly (to the left, FIG. 7) relative to shell 25, as by engagement of the forward end of flange 24 with a similar flange 42 of the insert of the connector part 15 (FIGS. 13 and 15), sealing engagement between insert 21 and shell 25 results both between the forward end of the insert and the shell, and between slanting portions 30 of the shell and surfaces 29 of the insert. Such latter engagement will also produce an inward squeezing and sealing engagement between cable 10 and the broad surfaces of the central passage 28 in insert 21 through which the cable extends. It will be understood that, if desired, the engaging surfaces of cable 10 and insert 21, and of the insert and shell 25, may be provided with a suitable adhesive so that, upon final assembly of the elements of the connector part, such elements will become integrally bonded to each other.

The above described first finger-bearing connector part 14 may be made and connected to the tape cable 10 as follows. Plate member 16 may first be cut as a flat blank 16', having the shape shown in FIG. 2, from a suitable sheet of insulating material such as glass fiber reinforced epoxy resin. The blank 16' may then be coated over its entire extent, as by being electroplated, with a thin layer of electrically conducting metal such as copper. Thereafter, the faces of the fingers 17 which are to have a conductive layer thereon, and the zones on the rear main extent of the blank aligned with such fingers are coated with a suitable resist. The thus coated blank 16' is then subjected to a suitable acid which etches away all of the conductive metal coating except that which is located beneath the layer of resist. The resist may thereafter be removed to expose the zones of electrically conducting metal on the pins and the main body of the blank. Preferably, the portion of the conducting metal on the body of the blank is heavily tinned as by providing it with a spot of solder 20, as shown in FIGS. 4, 5 and 7.

The end of the tape cable 10 to which connector part 14 is to be attached is provided with a series of longitudinally extending parallel slits 31 extending between successive conductors 11, as shown in FIG. 2. Slits 31

have a length somewhat exceeding the total length of blank 16 in the direction of fingers 17. With the blank 16' suitably oriented so that the respective fingers 17 will make electrical connection with the desired conductors 11, the blank 16' is threaded through the slits 31 so that it lies above alternate conductors at the slits and below the other conductors at such location. The conductors 11 are now soldered to the electrically conducting coatings on the respective fingers. Since the plastic material 12 forming the body of tape cable 10 is thermoplastic, it is necessary only to contact the portion of the tape cable above a solder spot 20 with a hot soldering iron. This causes the plastic material 12 to melt locally away from the conductor, thereby to expose it for contact with and adherence to the solder 20. After such operation has been carried out for each of the conductors of the cable, the projecting forward end of the tape cable is cut off, for example, along lines 32 on both sides of the plate member 16'. The initial attachment of the forward ends of the conductors 11, by leaving the forward end of tape cable 10 unslit, insures the retention of the conductors 11 with the proper lateral spacing until they have been soldered to the plate member 16'.

The resulting inner assembly, shown in FIG. 4, is then telescoped within the electrically insulating rubber-like insert 21, as shown in FIG. 3. Such insert member will either have been primarily assembled upon the tape cable from the end thereof shown in the drawings, or may be pulled onto the cable from the other end thereof, assuming that such other end of the cable is unencumbered. Finally, the metal shell 24 which is assembled upon the cable in the same manner as the insert, is pulled over the insert into the fully assembled portion shown in FIGS. 6 and 7.

The second, socket-bearing part of the first illustrative shell connector is shown in FIGS. 12, 13, and 14. Such second connector part includes an electrically insulating plate member 34, which may be made, for example, of the same material as plate member 16. Plate member 34 has a thickness which substantially exceeds the thickness of plate member 16. The forward end of plate 34, which confronts and interacts with the fingers 17 on plate member 16, has a plurality of forwardly sloping, parallel grooves 37 therein, such grooves having a width slightly exceeding the width of fingers 17. Grooves 37 have a center-to-center spacing which equals the spacing between adjacent fingers 17 on plate member 16. Successive grooves 37 lie on opposite sides of plate member 34; thus, as shown in FIGS. 10, 11, and 14, four alternate grooves B, D, F, H are upwardly open (FIG. 14) and five alternate grooves A, C, E, G, and I, are downwardly open (FIG. 14).

In the embodiment shown the length of the protruding forward end of plate member 34 and the slope of grooves 37 are such that the forward ends of the ramps which form the bottoms of the respective grooves cross the horizontal central plane through plate member 34 and emerge at the forward end of such member on the opposite side of such plane. As shown more clearly in FIG. 13, the forward end of each such ramp lies at least slightly beyond the respective broad surface of plate member 16 with which it is generally aligned. The bottoms or ramps of each of the grooves 37 and the zones of the rear, ungrooved portion of plate member 34 in alignment therewith are provided with thin adherent coatings of conductive metal such as copper. Conveniently such metal may be supplied in the form of thin preformed strips of metal which may be secured to plate member 34 by a suitable adhesive. At the rear of each groove such strip of conductive metal is tinned or provided with a suitable glob of solder 40 by means of which the respective conductors 11' of the tape cable 10' are attached to the conductive strips 39 at the grooves or sockets 37.

The rear or ungrooved portion of plate member 34 is

snugly held within a recess 36 in a rubber-like insert 35. The tape cable, in this instance designated 10', extends into the insert through a laterally extended central passage 33, successive conductors being divided from the tape cable and being led to the opposite sides of the plate member 34, where they are secured to the respective strips of conductive metal 39 by solder 40. Connector part 15 is provided with an outer metal shell 41 within which insert 35 is snugly engaged. Beyond the forward edge of the main body of shell 41, and forwardly of the lateral flange 47 on flange member 46, which is secured to the shell, insert 35 is provided with a forward flange or bead 42. The rear end of insert 35 is provided with opposite symmetrically, rearwardly inclined surfaces 44 which are sealingly engaged with similarly inclined rear portions 45 on the shell 41. As in the case of connector part 14, the tape cable 10', the insert 35, and the shell 41 may, if desired, be connected by the use of a suitable adhesive interposed therebetween.

Connector part 15 may conveniently be assembled and connected to the tape 10' in the following manner. The end of the tape cable, which is to be attached to the connector, is provided with a plurality of longitudinally extending slits 50 located between adjacent conductors 11' of the tape cable. The plate member 34 may be made by cutting out a blank of suitable size from a sheet of suitable electrically insulating material, and thereafter forming the inclined grooves 37 therein by cutting the blank as with a gang miller. The strips of conductive metal 39 are then applied to the bottoms or ramps of the grooves and to the portions of the main body of member 34 in alignment therewith, as by being secured to the plate by a suitable adhesive. Metal portions 39 are then locally tinned or provided with spots of solder 40, as shown.

The thus prepared plate member 34 is threaded through the slits 50 in tape cable 10' so that successive conductors 11' lie on opposite sides of plate member 34. The plastic material 12' is then removed from the respective conductors 11' in the zones thereof overlying the solder spots 40, and the conductors are soldered to the respective metal members 39. Following this, the forward end of the tape cable is removed by two cuts along opposite sides of plate member 34 along lines such as that shown at 52. Completion of the assembly of connector part 15 may now be carried out, the insert upon 35 being first telescoped over plate member 34, as shown in FIG. 11, following which the metal shell 41 is telescoped over the insert, as shown in FIG. 12.

The above-described second connector part presents nine ramps or sockets, four of which are open to the reader in FIG. 10 and five of which are open in a direction away from the reader in that figure. Such sockets, designated A–I, inclusive, are adapted to be assembled with the first connector part in such manner that the sockets receive and make contact with the fingers which are designated by the same, lower case, letters. In the embodiment of connector shown, the construction of the connector parts is such that upon the initial engagement of the parts and their movement together into fully assembled position alternate fingers are bent in opposite directions, so that they extend generally parallel to the ramps and so that the electrically conducting means 19 on the fingers make electrical contact with the electrically conducting means 39 on the ramps of the sockets. The manner in which this is accomplished will be apparent in FIG. 13, wherein connector parts 14 and 15 are shown in a preliminary stage of the initial assembly of such two parts.

As is there apparent, when the forward portion of plate member 34 is inserted in recess 22 of connector part 14, the outer surface of metal layer 19 on finger 17 lies at such level as to engage metal layer 39 on the bottom of groove 37 somewhat rearwardly of the forward edge of the latter. Continued approach of parts 14 and 15 toward each other causes the forward ends of the pins 17 to climb the ramps of the respective sockets, thereby causing the fingers to lie in positions corresponding to that of finger *h* shown in FIG. 15. In such figure, connector parts 14 and 15 are shown firmly held together in operative aligned position by bolts 54, which extend through holes in the confronting flanges 27 and 47 on the shells of the connector parts, there being nuts 55 on the bolts to retain the connector parts in place. When the parts are mounted as in FIG. 15, the flanges or beads 24 and 42 on inserts 21 and 35 have forcible sealing engagement with each other, and the slanting portions at the rear ends of the respective shells have sealing engagement with the slanting rear ends of the inserts, as well as causing such rear ends of the inserts sealingly to grip the cable parts 10 and 10'. Thus the connector of the invention presents a fully sealed structure. If desired, the forward end of plate member 34 may snugly engage the recess 22 of insert 21, as with an interference fit, whereby the parts of the connector are still further sealed to each other.

In order that the fingers of connector part 14 shall make secure electrical contact with the ramps of connector part 15 over extended periods of time, despite repeated engagements and disengagements of the connector parts, and despite the subjection of the connector to a wide variation in temperature, it is preferable that the ramps and/or the fingers be made of springy material which retains substantial "restorative resilience" when fully engaged with the contact of the other connector part. By "restorative resilience" is meant the tendency to restore, at least to an appreciable degree, the original unbent shape of the part. The fingers 17 of the illustrative embodiment of connector, which are made of a base plate of glass fibers bonded with an epoxy resin and an overlying layer of copper, exhibit restorative resilience to a satisfactory degree. The described initial bending of the fingers 17 results in their being given a bent configuration which they retain sufficiently for the group of bent fingers to function to key the connector parts uniquely together, in the manner to be described. The fingers do not, however, assume a fully bent stable configuration. Upon disengagement of the connector parts the fingers spring back toward their original shape to an appreciable extent; there is thus assured a firm and secure electrical contact between the fingers and ramps upon the next full engagement of the connector parts.

It will be apparent that when the connector parts have an odd number of sockets and fingers, no further means is required, after the initial correct assembly of the parts and the bending of the fingers, to prevent the connector parts from subsequent incorrect assembly. This follows from the fact that the two sides of the socket-bearing and finger-bearing plate members have different numbers of sockets and fingers, respectively, which allows the connector parts to be assembled in only one manner. If desired, of course, additional unique-positioning keying means may be employed between the two main parts of the connector.

In FIG. 16 there is shown a first part of a second embodiment of separable electrical connector made in accordance with the invention. Such connector is designed to be interposed between the parts of two divided multiple conductor tape cables such as those shown at 56 and 57. The connector part, generally designated 59, has a rubber-like insert 60, and a metal shell 61, the shell having rearwardly sloping upper and lower surfaces on insert 60. The shell 61, in this instance, has a radially outwardly extending flange 64, integrally attached to its forward edge. Insert 60 has a forward sealing bead portion 65, which projects somewhat forwardly of the forward surface of flange 64.

Within vertically spaced recesses in insert 60 are plate members 66 and 67, each of which is similar to the plate member 16 of the first connector part of the first described embodiment of connector. Insert 60 has two pin-bearing recesses 69 and 70 in the forward end there-

of, such recesses having sufficient height freely to receive the oppositely bent fingers 71 and 72 on the forward ends of plate members 66 and 67, respectively.

It will be understood that the connector of the second embodiment will be completed by a second, socket-bearing connector part (not shown) having a shape generally complementary to that of connector part 59, and having a rubber-like insert carrying two socket-bearing plate members, similar to the above-described plate member 34, and positioned to cooperate with fingers 71 and 72, respectively.

The connector of the present invention lends itself admirably to the provision, if desired, of a radio shielding metallic layer upon the one or more tape cables. Thus, in FIG. 16 the two cables 56 and 57 are provided with a shielding layer of conducting metal 74 which may, for example, be in the form of a foil. To preserve the continuity of shielding an elongated tab 75 is brought from the forward end of each of shielding layers 74 and makes electrical connection with the shell by being forcibly pinched between the rear end of the shell 61 and the rear end of insert 60.

In FIG. 17 there is shown a second connector part 81 of a third embodiment of connector made in accordance with the invention. In such figure there is shown a multiple conductor cable 76 made up of three superimposed tape cables 77, 79, and 80. The superimposed tape cables are brought into the second connector part 81, wherein the conductors of the respective tape cables are connected to the multiple contact finger devices 82, 84, and 85, respectively. Such multiple contact pin devices are, as shown, substantially similar to those provided on the plate member 34 of the second connector part of the first described connector of the invention. It will be understood that the connector of the third embodiment will be completed by a second, finger-bearing connector part (not shown) having a shape generally complementary to that of connector part 81, and having a rubber-like insert carrying three finger-bearing plate members, similar to the above-described plate member 16, and positioned to cooperate with the multiple contact finger devices 82, 84, and 85.

Although only a limited number of embodiments of the invention have been illustrated in the accompanying drawings and described in the foregoing specification, it is to be especially understood that various changes, such as in the relative dimensions of the parts, materials used, and the like, as well as the suggested manner of use of the apparatus of the invention, may be made therein without departing from the spirit and scope of the invention as will now be apparent to those skilled in the art.

What is claimed is:

1. A multi-contact separable electrical connector comprising a pair of cooperating insulating plates adapted to be positioned in general coplanar alignment with their forward edges confronting each other, the first one of said plates having a plurality of fingers projecting longitudinally from the forward edge thereof, the second of said plates having a series of parallel ramps inclining forwardly from the broad surfaces of such plate each to emerge adjacent the central plane of the second plate at its forward edge, alternate ramps on the second plate lying on opposite sides of the plate, the two plates being positionable in juxtaposition with alternate fingers in contact with the bottoms of the ramps on opposite sides of the second plate, the surfaces of the fingers and of the ramps which contact each other having electrically conducting means thereon, and means to urge the thus engaged plates toward each other, whereby to make secure electrical contact between the electrically conducting means on the fingers and the respective ramps.

2. An electrical connector as defined in claim 1, comprising a first rubber-like sheath telescoped about the first plate and the fingers thereon, said first sheath having a recess therein of appreciable size into which the fingers project, a second rubber-like sheath telescoped about the rear end portion of the second plate, the second sheath being of such size that the forward, ramp-containing portion of the second plate protrudes therefrom, the recess in the first sheath being of such size as to receive the forward portion of the second plate therewithin.

3. An electrical connector as defined in claim 2, comprising a metal shell telescoped over each of the respective sheaths, the forward ends of the sheaths protruding from the shells, and means to secure the two shells together in alignment with the forward ends of the sheaths in forcible, sealing abutment.

4. An electrical connector as defined in claim 1, comprising means to prevent sidewise displacement of the assembled plates relative to each other.

5. An electrical connector as defined in claim 1, wherein the ramps in the second plate constitute the bottoms of grooves in the forward portion of such plate, and wherein successive ramps on the second plate are separated by webs integral with the second plate and extending transversely to the broad extent thereof.

6. An electrical connector as defined in claim 5, wherein the fingers fit substantially snugly laterally within the grooves.

7. An electrical connector as defined in claim 1, wherein the forward ends of the ramps on the second plate cross and emerge beyond the central broad plane of the second plate at the forward edge of the second plate.

8. An electrical connector as defined in claim 7, wherein the second plate has a thickness markedly exceeding the thickness of the first plate, and the forward ends of the ramps on the second plate lie at levels approximating the levels of the corresponding opposite surfaces of the main extent of the first plate.

9. An electrical connector as defined in claim 8, comprising a first rubber-like sheath telescoped about the first plate and the fingers thereon, said first sheath having a recess therein of appreciable size into which the fingers project, a second rubber-like sheath telescoped about the rear end portion of the second plate, the second sheath being of such size that the forward, ramp-containing portion of the second plate protrudes therefrom, the recess in the first sheath being of such size as to receive the forward portion of the second plate therewithin.

10. An electrical connector as defined is claim 9, comprising a metal shell telescoped over each of the respective sheaths, the forward ends of the sheaths protruding from the shells, and means to secure the two shells together in alignment with the forward ends of the sheaths in forcible, sealing abutment.

11. In combination, a flat tape cable having a plurality of conductors therein, said cable comprising two parts having a separable connector connected to and interposed therebetween, said electrical connector comprising a pair of cooperating insulating plates adapted to be positioned in general coplanar alignment with their forward edges confronting each other, the first one of said plates having a plurality of fingers projecting longitudinally from the forward edge thereof, the second of said plates having a series of parallel ramps inclining forwardly from the broad surfaces of such plate each to emerge adjacent the central plane of the second plate at its forward edge, alternate ramps on the second plate lying on opposite sides of the plate, the two plates being positionable in juxtaposition with alternate fingers in contact with; the bottoms of the ramps on opposite sides of the second plate, the surfaces of the fingers and of the ramps which contact each other having electrically conducting means thereon, and means to urge the thus engaged plates toward each other, whereby to make secure electrical contact between the respective fingers and ramps, the electrically conductors at the end of one cable part being electrically connected to the conducting means on the fingers of the first connector part, and the conductors at the con-

fronting end of the other cable part being electrically connected to the conducting means on the ramps of the other connector part.

12. An electrical connector as defined in claim 11, comprising a first rubber-like sheath telescoped about the first plate and the fingers thereon, said first sheath having a recess therein of appreciable size into which the fingers project, a second rubber-like sheath telescoped about the rear end portion of the second plate, the second sheath being of such size that the forward, ramp-containing portion of the second plate protrudes therefrom, the recess in the first sheath being of such size as to receive the forward portion of the second plate therewithin each of the sheaths having a thin slot-like passage through the rear thereof receiving and making a seal with the respective part of the cable passing therethrough.

13. A multi-contact separable electrical connector comprising a pair of cooperating plates adapted to be positioned in general coplanar alignment with their forward edges confronting each other, the first one of said plates having a plurality of fingers projecting longitudinally from the forward edge thereof, the second of said plates having a series of parallel finger-receiving ramps inclining forwardly each to emerge adjacent the central plane of the second plate at its forward edge, alternate ramps on the second plate lying on opposite sides of the plate, the two plates being positionable in juxtaposition with alternate fingers in contact with the bottoms of the ramps on opposite sides of the second plate, the surfaces of the fingers and of the ramps which contact each other having electrically conducting means thereon each electrically insulated from the others.

14. An electrical connector as defined in claim 13, wherein at least one of each of the two electrical contact members of each engaging pair is resilient and is elastically deformed to an appreciable extent when the members are in fully engaged position.

15. An electrical connector as defined in claim 13, wherein the fingers on the first said plate are resilient and are elastically deformed to an appreciable extent when the fingers and ramps are in fully engaged position.

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