

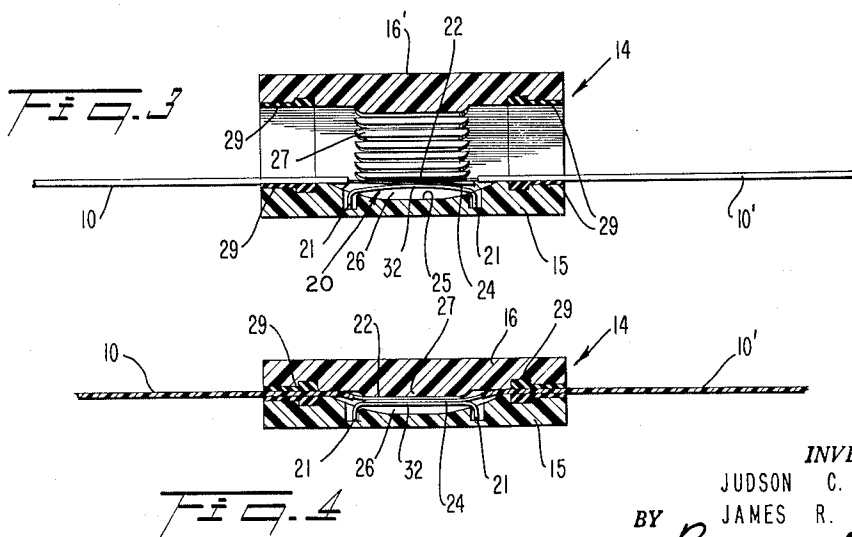
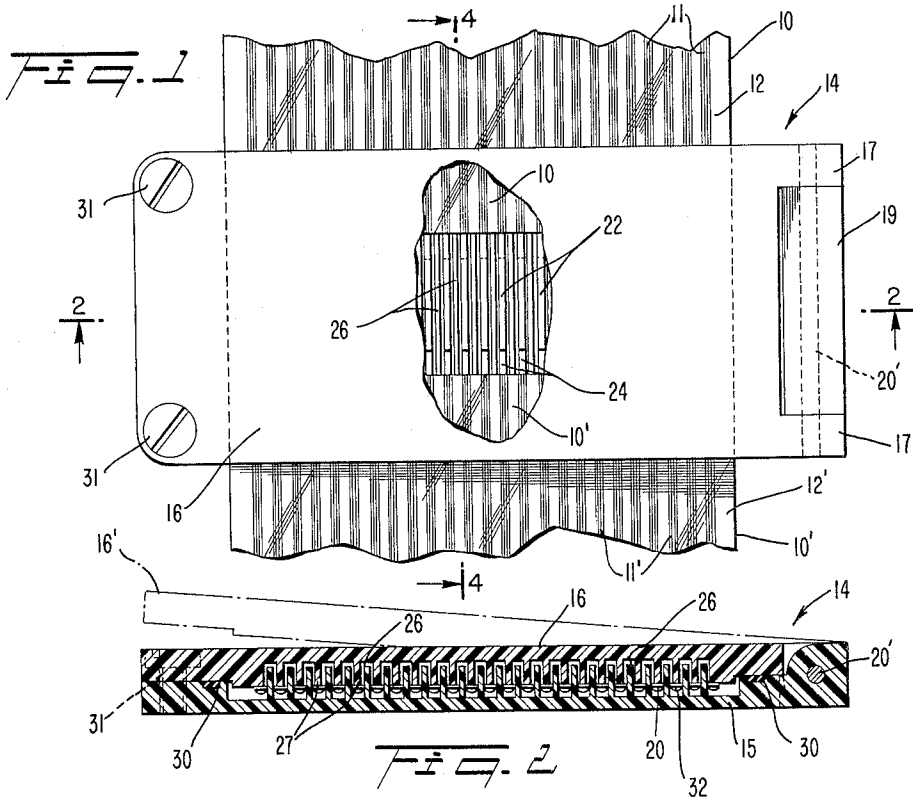
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ELECTRICAL CONNECTOR

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ELECTRICAL CONNECTOR

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This invention relates to an electrical connector, and in the embodiment thereof illustrated herein particularly relates to a connector for multi-conductor cables in flattened, tape form.

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

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

A further object of the invention lies in the provision of a connector of the type indicated which is quickly and easily operated, which is rugged and compact, and which adds but comparatively little to the weight of an assembly in which it is used.

Still a further object of the invention lies in the provision of an electrical connector for multi-conductor cables of the flat or tape type which may with little or no modification be employed to connect two, three, or more cables of such type together, and with which one or more of such cables or parts thereof may extend completely through the connector.

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 view in plan of an illustrative embodiment of electrical connector made in accordance with the invention employed in the joining together of two multi-conductor cables of the flat or tape type, such two cables being shown fragmentarily, a portion of the upper body member of the connector being shown broken away to illustrate the manner of connection between the overlying ends of the conductors of the respective cables;

FIG. 2 is a view in longitudinal vertical section through the connector of FIG. 1, the section being taken along the line 2-2 of FIG. 1, an alternative partially open position of the upper main part of the connector being shown in phantom lines;

FIG. 3 is a view in vertical section through the connector taken generally along line 4-4 of FIG. 1 in the direction from left to right in FIG. 2, the connector being shown in partially open condition as during the operation of connecting the cables by the connector; and

FIG. 4 is a view in transverse vertical section through the connector with the main parts thereof in closed position and connecting the ends of two flat cables, the view being taken along line 4-4 of FIG. 1.

In the illustrative embodiment, the connector is shown used with a multi-conductor 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 may also be used advantageously with cables of other types.

In FIGS. 1, 3, and 4 there are shown portions of flattened or ribbon-type cables joined end-to-end by the illustrative embodiment of connector. Such cables are designated generally 10 and 10', respectively. Each has a plu-

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rality of thin, ribbon-like conductor strips 11, 11', respectively, which are sealed in spaced parallel relationship between upper and lower electrically insulated layers of material bonded to each other to form an insulating body 12, 12', respectively. The illustrative cable shown may, for example, be one manufactured by the Tape Cable Company, Rochester, New York. The conductors 11, 11' may be made of thin copper strips, and the bodies 12, 12' may be made of clear, transparent thermoplastic material such as a polyester resin.

The connector shown is generally designated by the reference character 14. Such connector has a bottom and a top main part 15 and 16, respectively, of generally similar rectangular overall shape. Body parts 15 and 16 are made of strong rigid electrically insulating material such as a suitable molded synthetic resin. The right hand ends of parts 15 and 16 are hinged together, as shown in FIGS. 1 and 2, by means of ears 17 on part 16, such ears fitting into slots on the end of body 15. An elongated pintle pin 20' extends through ears 17 and the resulting central portion 19 of body 15. By reason of such construction, body 16 may be hinged upwardly from body 15 to present a clear opening therebetween when cables are being assembled in the connector. A partially open position of part 16 is shown at 16' in FIGS. 2 and 3.

Centrally of its width, the lower body 15 is provided with a plurality of spaced parallel resilient support members 20, the spacing between successive members 20 being generally equal to that between successive conductors 11 in the cables to be joined. Supports 20 have a shallow broad inverted U form, are made of broad wire stock having generally the same width as conductors 11, and are made of springy material such as beryllium-copper. The supports 20 have such initial, relaxed configuration, as shown in FIG. 3, that the central portion thereof is bowed upwardly somewhat. In such condition, the central portion of each support 20 lies approximately at the level of the upper surfaces of sealing inserts 29, to be described, in body 15 of the connector. Supports 20 are retained on body 15 by having their short depending legs 21 snapped into generally vertical holes in the body, as shown in FIGS. 3 and 4. Separating successive supports 20 are a plurality of parallel upstanding partition members 26 integral with body 15, one such partition member being disposed between each support 20 and its neighbor. As shown in FIGS. 3 and 4, the device thus far described receives the bared inner ends of the conductors of cables 10 and 10', such bared ends overlying each other as shown at 22 and 24 and lying along support 20. Preferably, as shown, the cables 10 and 10' are stripped of insulation at only the portions thereof overlying the supports 20, thereby in effect forming longitudinally extending slots through the cables at the connecting zones thereof. The forward ends of the cables beyond supports 20 are left unstripped for a short distance, whereby to maintain the ends of the conductors 11 in spaced parallel relationship. The unstripped ends of the cables have the further function of being engaged by the ends of the presser members 27, to be described, on connector member 16 when the latter is in the closed operative position shown in FIG. 4, whereby positively to prevent withdrawal of the cables from the connector in directions longitudinally of the cables.

The upper or cover portion 16 of the connector has a plurality of depending presser members 27 integral therewith, such presser members being parallel to each other and spaced longitudinally of part 16 so that they fit fairly accurately and substantially fill the space between successive partition members 26. Presser members 27 have such vertical dimension that, when the connector parts are closed, as shown in FIGS. 2 and 4, their lower surfaces forcibly engage the upper bared conductors and thrust

them downwardly upon the upper surfaces of supports 20. In order to allow the supports to flex downwardly somewhat, a shallow recess 25 is provided in body 15 beneath the upper elongated portion 32 of the support. As a consequence, support 20 in the fully assembled operative connector constantly urges the superimposed conductors together to maintain good electrical contact therebetween at all times.

In order to maintain the interior of the connector sealed from the atmosphere, there are provided opposed sealing means 29 extending along the upper and lower edges of the connector parts 15 and 16, as the connector is shown in FIG. 1, and further sealing means 30 disposed in recesses on part 15 disposed along the left and right hand edges of the connector as shown in FIG. 2. Sealing means 29 and 30 may be in the form of rubber-like strips which are held under appreciable compression when the parts 15 and 16 are held closed as by the machine screws 31 extending through part 16 and threaded into part 15 at the edge of the connector remote from the hinge. Sealing means 29 have the further function of strongly engaging the cables 10 and 10', thus adding to the cable-retaining effect above described, which is produced by engagement of the ends of presser members 27 with the insulating bodies of the cables at their unstripped ends.

Although the illustrative connector shown connects two cables together, it will be obvious that with no more than slight modifications as regards clearances between sealing means 29, 29 and the like, the connector may be employed to a plurality of superimposed cables extending thereto on each side. Further, the device may be used in connection with one or more cables in which some or all of the conductors are continuous, since to allow connection to be made to such conductors it is merely necessary to remove the insulation from those zones of the conductors which overlie supports 20 and the bared portions of other conductors to be connected thereto.

Although only one embodiment of the invention has 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. An electrical connector adapted to connect a plurality of cables in the form of laterally extended flexible insulating tapes having a plurality of generally parallel spaced flat ribbon-like conductors mounted therein, the respective conductors of each of the cables being bared at a connecting zone and superimposed at the connector to make electrical connection with each other, comprising a generally flat connector body adapted to lie across the cables to be connected, the body having a broad recess therein at a cable-connecting zone of the body, a plurality of separate resilient first presser members mounted in spaced relationship in said recess and secured to the body, means to insulate and isolate at least some of the first presser members from the others comprising spaced parallel electrically insulating partitions having root portions in the recess and secured to the body, said partitions defining spaces receiving the first presser members and the bared portions of the superimposed conductors of the cables to be joined which overlie the presser members, and means to press the bared portions of the respective conductors of the cables downwardly into said spaces so that the bared portions of the conductors of the lower cable engage the presser members and the confronting bared portions of the respective conductors make secure electrical contact with each other, said last named means comprising a cover positioned on the body so as to span the recess in the latter, substan-

tially rigid second conductor-pressing members mounted on the inner surface of the cover and spaced to lie between the partitions when the cover lies in closed operative position with respect to the body, and means to retain the cover on the body in said closed position.

2. An electrical connector as claimed in claim 1, wherein the body at said connecting zone has upstanding edge portions around the border of the recess, and the cover has surfaces closely confronting the said upstanding edge portions on the body when the cover is closed, and comprising gasket means extending along the confronting surfaces of the portions of the body and cover surrounding the recess in the body and secured to one of said body and cover, said gasket means cooperating with the body, cover, and the cables entering the cavity through the ends of the cavity to seal the space within the recess in the body when the cover is closed.

3. An electrical connector as claimed in claim 1, wherein the body at said connecting zone has upstanding edge portions around the border of the recess, said edge portions having substantial width and lying generally in a common plane, and wherein the cables to be joined are aligned parallel to each other, the second presser members, on the cover, are elongated in the direction of the conductors of the cables and have free lower end portions projecting markedly beyond the surfaces of the cover which border the recess in the body, the upper end portions of the partitions being adapted to extend through parallel slots in the cables between successive conductors at the connecting zones of the respective cables when the cables lie superimposed and supported by the inner and outer edges of the body bordering the recess therein so as positively to retain the cables from withdrawal from the connector when the cover thereof is in closed position.

4. An electrical connector as claimed in claim 1, wherein the first presser members, on the body, are in the form of inverted broad U-shaped springs, said springs having broad base portions disposed parallel to the partitions, said base portions being bowed upwardly somewhat when the springs are in relaxed condition, and means supporting said springs on the body so that said broad base portions of the springs are substantially spaced from the surface of the recess in the body to permit downward flexure thereof by the presser members on the cover, acting through the superimposed conductors, when the cover is closed.

5. An electrical connector as claimed in claim 4, wherein the bottom wall of the recess is concave in a direction longitudinally of the connector and of the cables connected thereby, the ends of the springs are in the form of generally vertical short tangs thereon, the bottom wall of the recess is provided in each space thereof with an upwardly open vertical hole at raised zones adjacent the inner and outer edges of the recess at opposite ends thereof, and wherein the presser members on the body are retained thereon by having their tangs snapped into the respective holes in the bottom wall of the recess of the body.

6. In combination, a plurality of cables in the form of laterally extended flexible insulating tapes having a plurality of generally parallel spaced flat ribbon-like conductors mounted therein and an electrical connector connecting said cables together, the conductors of each of the cables having portions positioned at the connector bared and superimposed at a connecting zone and thrust together by the connector so as to establish electrical connection between the respective conductors of the cables, the connector having a generally flat connector body with a broad recess therein at a cable-connecting zone thereof, said cable-connecting zone of the body spanning the width of and lying across the superimposed cables at the connecting zone, a plurality of elongated upstanding parallel electrically insulating partitions projecting from the bottom of the recess in the body, a first

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resilient presser member mounted on the body between each successive pairs of partitions, the partitions defining spaces receiving the first presser members and the bared portions of the superimposed conductors of the connected cables which overlie the first presser members, means to press the bared portions of the respective conductors of the cables downwardly into said spaces so that the bared portions of the conductors of the lower cable engage the presser members and the confronting bared portions of the respective conductors make secure electrical contact with each other, said last named means comprising a cover positioned on the body so as to span the recess in the latter, second conductor-pressing members mounted on the inner surface of the cover and adapted to lie between the partitions when the cover is in closed position closely confronting and overlying the body, and means to retain the cover in closed position.

7. A combination as claimed in claim 6, wherein the cables each have a plurality of parallel slots through the insulating material thereof between the conductors at its connecting zone, the portions of each of the cables on both sides of the said connecting zone being unslotted, the second presser members, on the cover, are elongated in the direction of the conductors and have free lower end portions projecting markedly beyond the surfaces of the cover which border the recess in the body, the upper end portions of the partitions extending through said parallel slots in the cables between successive conductors at the connecting zone of the respective cables with the superimposed cables lying supported by the end edges of

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the body bordering the recess therein so as positively to retain the cables from withdrawal from the connector when the cover thereof is in closed position.

8. A combination as claimed in claim 7, wherein the body has edge portions thereon surrounding the recess, and wherein the cover has surfaces closely confronting the said edge portions on the body when the cover is closed, and comprising gasket means extending along the confronting surfaces of the portions of the body and cover surrounding the recess in the body and secured to one of said body and cover, said gasket means cooperating with the body, cover, and the cables entering the cavity through the ends of the cavity to seal the space within the recess in the body when the cover is closed.

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