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Rault

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[54] **CONNECTOR FOR INSULATED FLAT CABLE**

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[52] **U.S. Cl.** ..... **339/99 R,** 339/14 R, 339/17 F

[51] **Int. Cl.** **H01r 9/08**

[58] **Field of Search** 339/14, 17, 97–99

[56] **References Cited**

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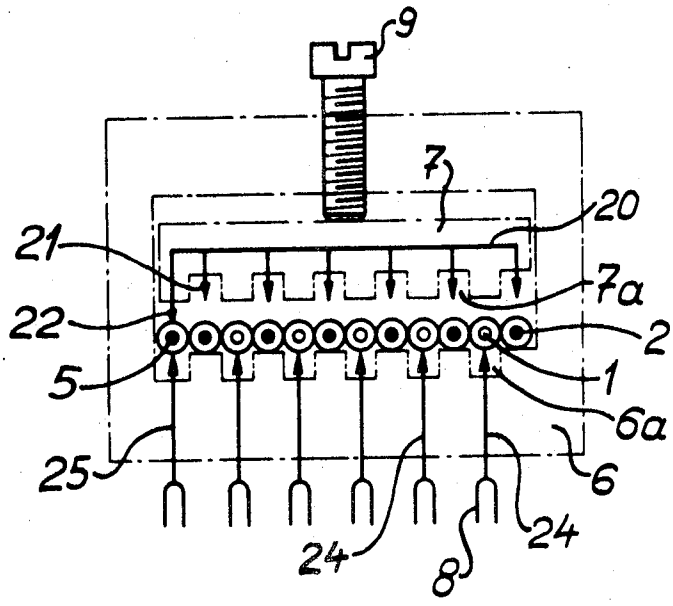
Primary Examiner—Joseph H. McGlynn

Attorney—Robert E. Burns et al.

[57] **ABSTRACT**

A connector for flat cable including parallel spaced apart elongate conductors in a dielectric sheath comprises a body including two relatively movable parts defining therebetween a channel adapted to receive the flat cable. The parts include sets of spaced apart parallel grooves and ribs, the ribs of one part facing the grooves of the other and vice versa, with conducting teeth disposed in the grooves of both parts and one additional conducting tooth protruding from a rib. The teeth of one part are electrically interconnected and those of the other part are individually connected to output contacts. When the parts are brought together, the teeth penetrate the sheath of the cable and contact respective conductors, one set of alternate conductors being connected together and to one grounding contact and the other alternate conductors being individually connected to respective contacts.

7 Claims, 7 Drawing Figures



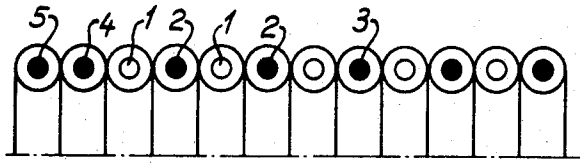


FIG.1

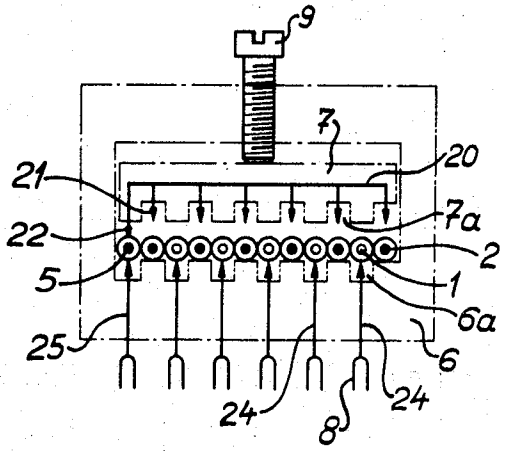


FIG.2

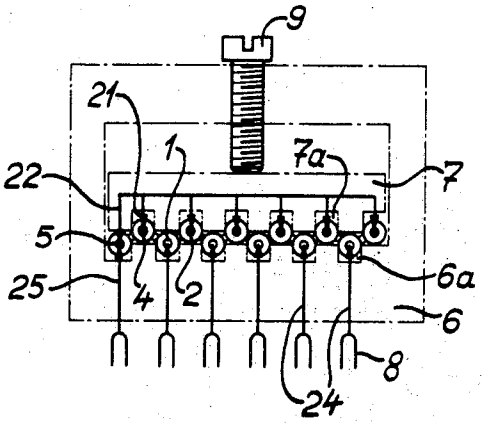


FIG.3

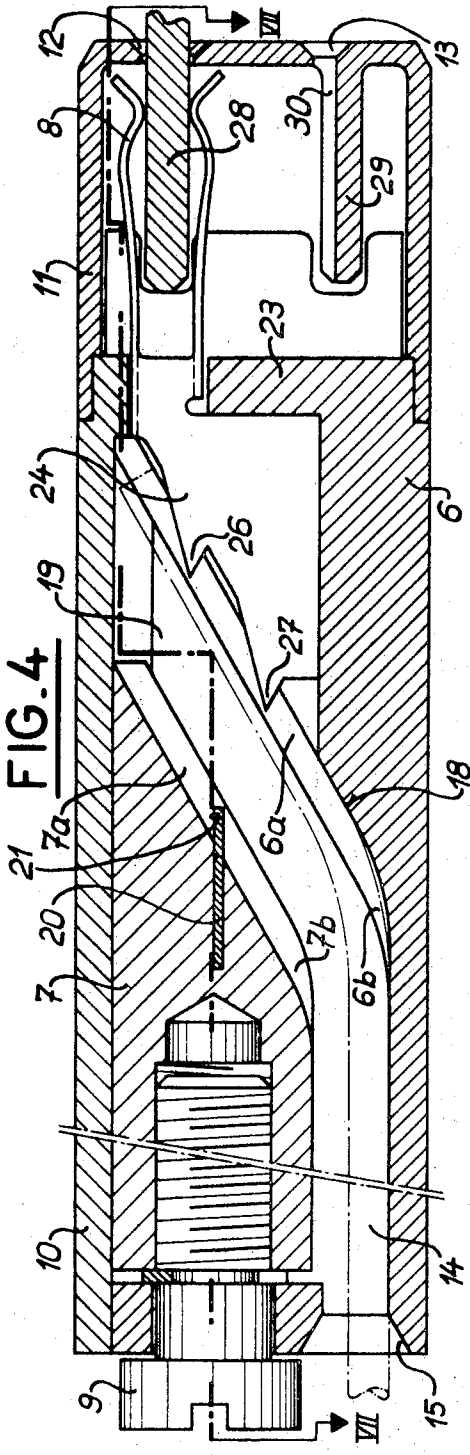


FIG.4

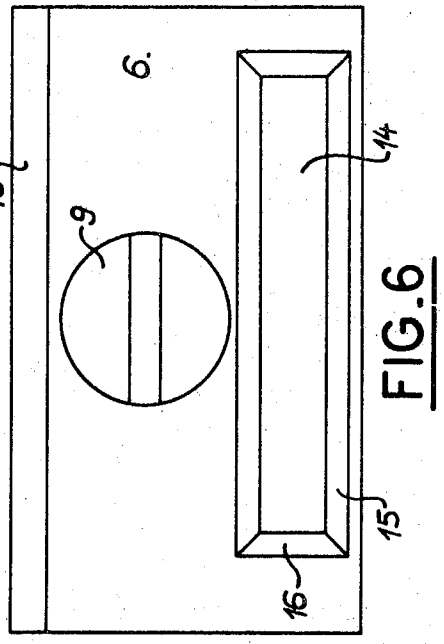


FIG.6

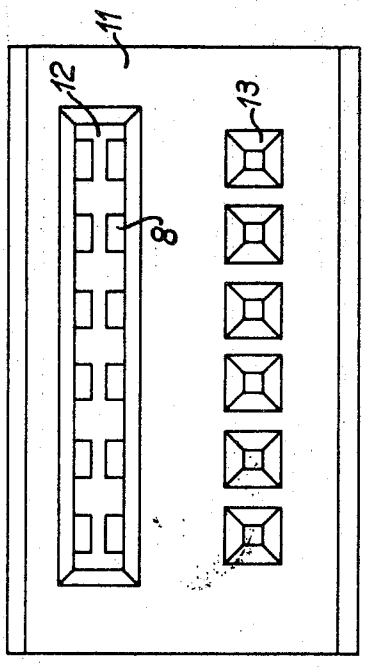
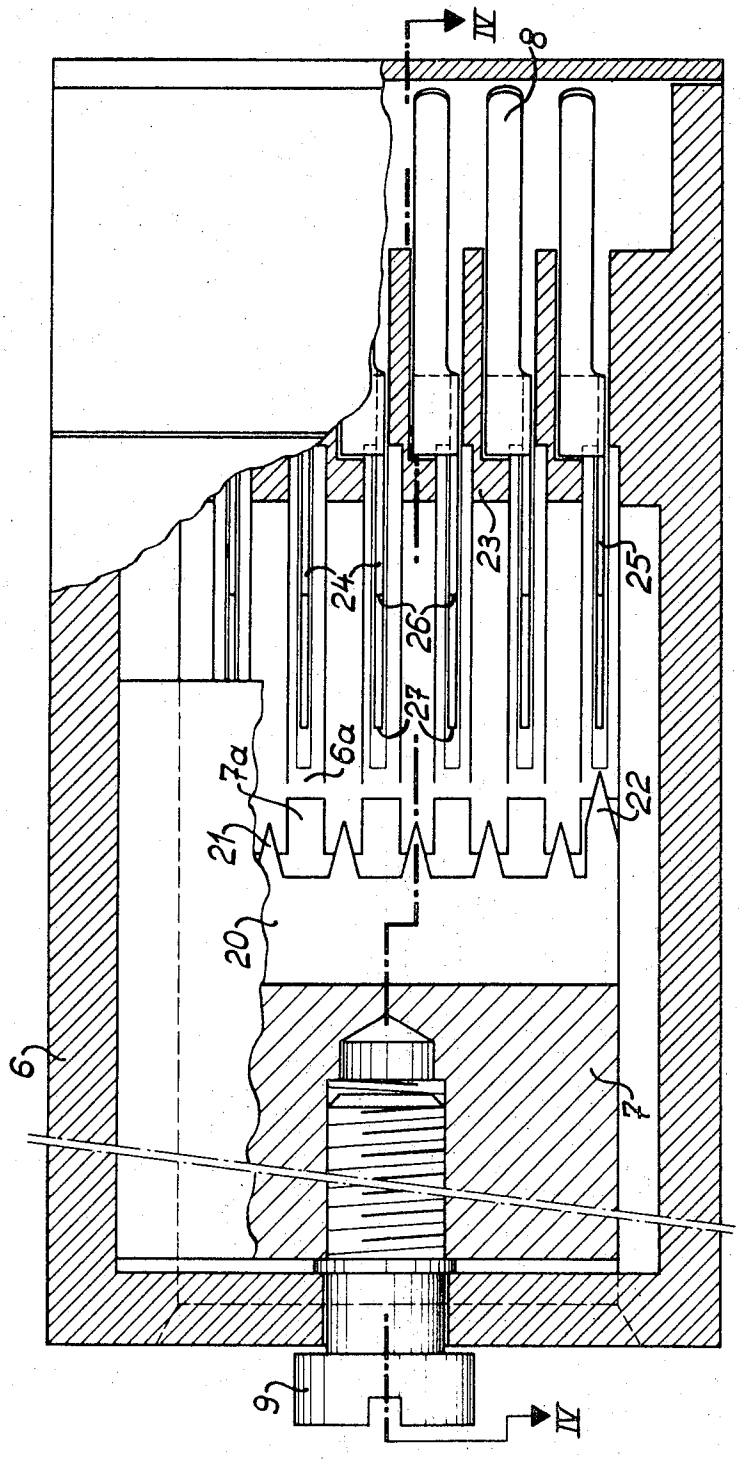


FIG.5

FIG.7



CONNECTOR FOR INSULATED FLAT CABLE

The invention relates to connectors for flat cable of the type including a plurality of spaced apart parallel conductors within a flexible dielectric sheath.

The increasing complexity of electrotechnical and electronic apparatus and the desired reliability of operation of these assemblies necessitate the use of sophisticated cables which must meet up to a large number of requirements. In particular, these cables must have a minimum sensibility to internal and external influences, and must enable compact assemblies to be provided in which the increased density of cables remains compatible with a certain ease of connection without risk of error. All of these requirements lead to the necessity of avoiding, as far as possible, uncontrollable reflection effects due to the proximity of different conductors, and to enable a correct shielding of the circuit as well as a rational control of the connections.

In order to meet up to these needs, flat cables of the above indicated type are employed, alternate conductors being active and passive (i.e., grounded). However, the use of such cables generally requires numerous operations of stripping, connection and intermediary cabling. Thus, the connection of a standard electronic component to a circuit requires intermediary cables, in particular when it is necessary to place interface components between the electronic component and the circuit.

The present invention aims to provide a connector for flat cable which can be adapted directly either onto a printed circuit for example, enabling an automatic cabling of the grounded conductors between themselves and towards the output, requiring no stripping, nor a particular precision of the spacing between the conductors of the cable, and enabling interface components to be interconnected without intermediary cabling.

According to the invention, there is provided a connector for flat cable of the type including a plurality of parallel spaced apart elongate conductors within a flexible dielectric sheath, comprising a dielectric body including two parts defining therebetween a channel adapted to receive a flat cable, the parts being movable relative to one another between a first position in which a flat cable can be introduced into the channel and a second position in which a flat cable in the channel is gripped between the parts, each part carrying a row of spaced apart electrically conducting teeth adapted when the parts are moved from the first position to the second position to pierce the dielectric sheath of a flat cable gripped therein and come into contact with the conductors, a pair of teeth of the two parts being aligned so as to come into contact with a common conductor and the other teeth being non-aligned with the teeth of the opposite part so as to each come into contact with a respective one of the conductors, the teeth of one part being electrically interconnected together and the teeth of the other part being individually connected to externally accessible contacts.

The invention will now be fully described, by way of example, with reference to the accompanying drawings in which:

FIG. 1 is a schematic cross-section of a flat cable to be connected;

FIGS. 2 and 3 are schematic explanatory diagrams of a connector according to the invention prior to and after setting up a connection;

FIG. 4 is a cross-section taken along line IV—IV of FIGS. 7 of a specific embodiment of a connector according to the invention;

FIG. 5 is an elevational view looking from the right-hand side of FIG. 4;

FIG. 6 is an elevational view looking from the left-hand side of FIG. 4; and

FIG. 7 is a partial cross-section taken along line VI—VI of FIG. 4.

The flat cable shown in FIG. 1 includes a plurality of parallel spaced apart elongate electrical conductors 1 and 2 within a flexible dielectric sheath 3, the five conductors 1 being intended to be "active" and the seven conductors 2 being intended to be passive, i.e., grounded. The active and passive conductors are disposed alternately, with the exception of two passive conductors 4 and 5 placed side by side at one edge of the cable.

The connector according to the invention is schematically shown in FIGS. 2 and 3. The connector comprises a case 6 and a mobile part 7 slidably mounted inside the case 6. The case 6 and the mobile part 7 include sets of facing parallel apart grooves and ribs, the ribs of the case 6 facing the grooves 7*a* of the part 7, and the ribs of the part 7 facing the grooves 6*a* of case 6. The part 7 has a transverse conducting plate 20 provided with pointed teeth 21 protruding in the grooves 7*a* and one particular pointed tooth 22 extending beyond the other teeth and protruding from a rib. The case 6 includes conducting parts 24 and 25 insulated from one another and provided with pointed teeth protruding in the grooves 6*a*. The conducting parts 24 and 25 are individually connected to contacts 8 accessible from outside the case 6.

When part 7 is moved from the position of FIG. 2 to that of FIG. 3 by means of a screw 9, the flat cable is pinched between the grooves 6*a* and 7*a* and their opposite ribs and the conductors of the cable are alternately staggered. The active conductors 1 are pressed into the grooves 6*a* where they come to meet the teeth of the conducting parts 24 which pass through their insulating sheaths and set up contacts with the conductors. The passive conductor 5 is also pressed into a groove 6*a* and meets the tooth of conducting part 25, but its sheath is also pierced by the tooth 22 of the part 7.

The other passive conductors 2 and 4 are pressed in the grooves 7*a* where they come to meet the teeth 21 of the conducting plate 20, so that all of the passive conductors are electrically connected to the conducting part 25 through the point 22, the conductor 5, and the tooth of part 25. Of course, in operation, the part 25 is grounded.

A specific embodiment of the connector schematically shown in FIGS. 2 and 3 will now be described with reference to FIGS. 4 to 7.

A substantially rectangular case is formed of two parts 6 and 10 in which a wedge-like mobile part 7 is longitudinally slidably movable and can be moved by means of a screw 9. A cover 11, which can be clipped onto a rear end of part 6, includes orifices 12 and 13 adapted to face electrical output contacts 8 of the connector.

Between the parts 6 and 7 is provided a guide channel 14 of rectangular section adapted to receive an end of a flat cable.

The outer portion of the channel 14 leads to an elongate opening chamfered at 15 and 16 so as to facilitate

the introduction of a cable, this outer portion of the channel **14** being disposed parallel to the general direction of elongation of the case **6** and to the axis of screw **9.** An inner portion of channel **14** is disposed obliquely to the general direction of elongation of case **6** and is defined between sets of facing parallel spaced apart grooves and ribs, the grooves **6***a* of part **6** being disposed opposite the ribs of part **7,** and vice-versa, and the width of each groove and rib being equal to the spacing between adjacent conductors of the flat cable. The grooves **6***a* and **7***a* are tapered at **6***b* and **7***b* to smoothly join with the outer portion of channel **14,** so that a flat cable can be easily inserted along the channel, the part of the cable in the oblique portion bearing against the outer surfaces of the facing ribs.

The part **7** carries a transversal conducting metal plate **20,** disposed parallel to the base of the outer portion of channel **14,** provided with a set of teeth **21** each protruding in a groove **7***a* and one particular tooth **22,** longer than the others, protruding from a rib and facing a groove **6***a*. The number of teeth of plate **20** is equal to the number of conductors of the flat cable which are to be grounded, namely seven in the illustrated example.

The part **6** of the case has a shoulder **23** in which planar conducting plates **24** are disposed perpendicular to the base of the outer portion of channel **14** and parallel to the axis of movement of part **7,** and being of a number equal to the number of conductors of the cable which are to be active, namely five in this example. A sixth conducting plate **24,** identical to the plates **24,** is disposed parallel to the plates **24.** The plates **24** and **25** each have two cutting teeth **26** and **27** protruding in the grooves **6***a*, these teeth having cutting ends spaced apart on either side of the plane of plate **20.**

The conducting plates **24** and **25** are electrically insulated from one another and are individually electrically connected to an equal number of contacts, for example clips such as **8,** accessible from the exterior of the case through openings **12** of the cover **11.** If the connecting pins of a circuit or plug adapted to be plugged into the connector have a smaller section than that of the pins **28** shown, as is the case for example with a printed circuit, the openings **13** may be used. To do this, the cover **11** is removed, turned by 180° and fitted back on, the extension **29** coming to engage the clips **8** and thus reducing the gripping space in the clips **8,** the pins being guided by a channel **30** provided between extensions **29** and the lower arm of clips **8.**

To connect a flat cable to an electrical circuit by means of the connector according to the invention, one first ensures that the mobile part **7** is in the withdrawn position, i.e., that the screw **9** is fully screwed in, and the cable is then introduced into the channel **14** until it penetrates into the oblique portion of the channel. The thus engaged cable is precisely positioned in relation to the opposed ribs and grooves. The screw **9** is then unscrewed, which results in the ribs and grooves of the mobile part **7** being moved towards the ribs and grooves of the case. The cutting ends of teeth **21, 22, 26** and **27** penetrate into the dielectric sheaths and come into contact with the respective conductors. The cable is thus connected to the output contacts of the connector, the active conductors being individually connected to contacts **8,** and the passive conductors being connected together to one contact **8.**

What is claimed is:

1. A connector for flat cable of the type including a plurality of parallel spaced apart elongate conductors within a flexible dielectric sheath, comprising a dielectric body including two parts defining therebetween a channel adapted to receive a flat cable, the parts being movable relative to one another between a first position in which a flat cable can be introduced into the channel and a second position in which a flat cable in the channel is gripped between the parts, each part carrying a row of spaced apart electrically conducting teeth adapted when the parts are moved from the first position to the second position to pierce the dielectric sheath of a flat cable gripped therein and come into contact with the conductors, a pair of teeth of the two parts being aligned so as to come into contact with a common conductor and the other teeth being non-aligned with the teeth of the opposite part so as to each come into contact with a respective one of the conductors, the teeth of one part being electrically interconnected together and the teeth of the other part being individually connected to externally accessible contacts.

2. A conductor according to claim **1,** in which said interconnected teeth of said one part are integral with and connected together by a metal plate.

3. A conductor according to claim **1,** comprising a screw forming means for moving the plates between the first and second positions.

4. A connector according to claim **1,** adapted for use with a flat cable including a plurality of equally spaced apart conductors, in which the teeth of each part except for one tooth of said aligned pair of teeth are spaced apart by an amount equal to the spacing between alternate conductors of the flat cable.

5. A conductor according to claim **4,** in which the two parts comprise facing sets of parallel spaced apart grooves-and ribs disposed longitudinally of said guide channel, the width of each groove and rib being substantially equal to the spacing between adjacent conductors of the flat cable, the ribs of each part being disposed facing the grooves of the other part and vice versa.

6. A conductor according to claim **5,** in which the teeth of each part are disposed in the grooves, except for one tooth of said aligned pair of teeth which protrudes from a rib.

7. A conductor according to claim **6,** in which said other part of the body is a substantially rectangular case, said one part of the body being slidably mounted in the case along a given direction, the case including an elongate opening for receiving an end of the flat cable, the channel including a first portion in continuation of the opening along said given direction and a second portion inclined to said given direction, and said teeth being disposed along the second portion of the channel.

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