United States Patent [19]

Schumacher

[11] **3,711,816**

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[54] MEANS HAVING OPERATING MEANS FOR CONNECTING MULTICONDUCTOR CABLE MEANS

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[73] Assignee: **AMP Inc.**

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Related U.S. Application Data

[62] Division of Ser. No. 807,198, March 14, 1969.

[52] **U.S. Cl.**.....**339/91 R,** 339/45 M

[51] **Int. Cl.**.....**H01r 13/54,** H01r 13/62

[58] **Field of Search**.....339/45, 46, 75, 91, 273, 108

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Assistant Examiner—Terrell P. Lewis
Attorney—William J. Keating, Ronald D. Grefe, Gerald K. Kitts and Jay L. Seitchik

[57] **ABSTRACT**

An electrical connector comprises a housing member housing electrical terminals disposed in dielectric blocks. Latching arms are movably mounted in guide slots along opposing sides of the housing member. Cam means are provided in the slots and on the latching arms to cause latching sections of the latching arms to be moved into and out of latching engagement with a complementary housing member when eccentric operating means operate the latching arms so that the mating electrical terminals are connected and operate the latching arms. Polarizing means are provided on the housing members to assure proper engagement therebetween.

1 Claim, 9 Drawing Figures

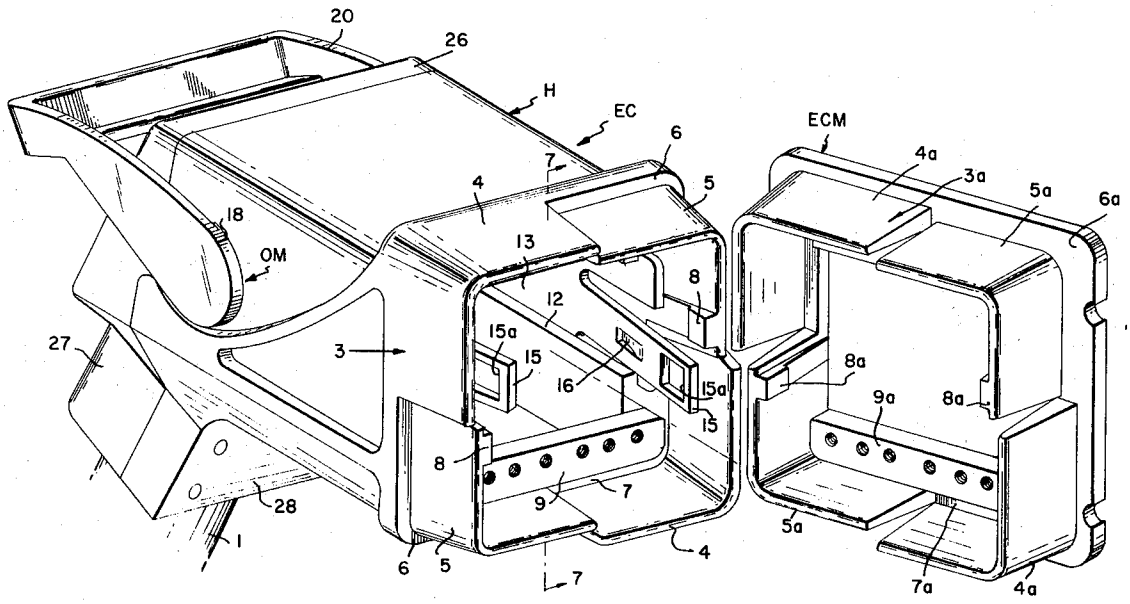
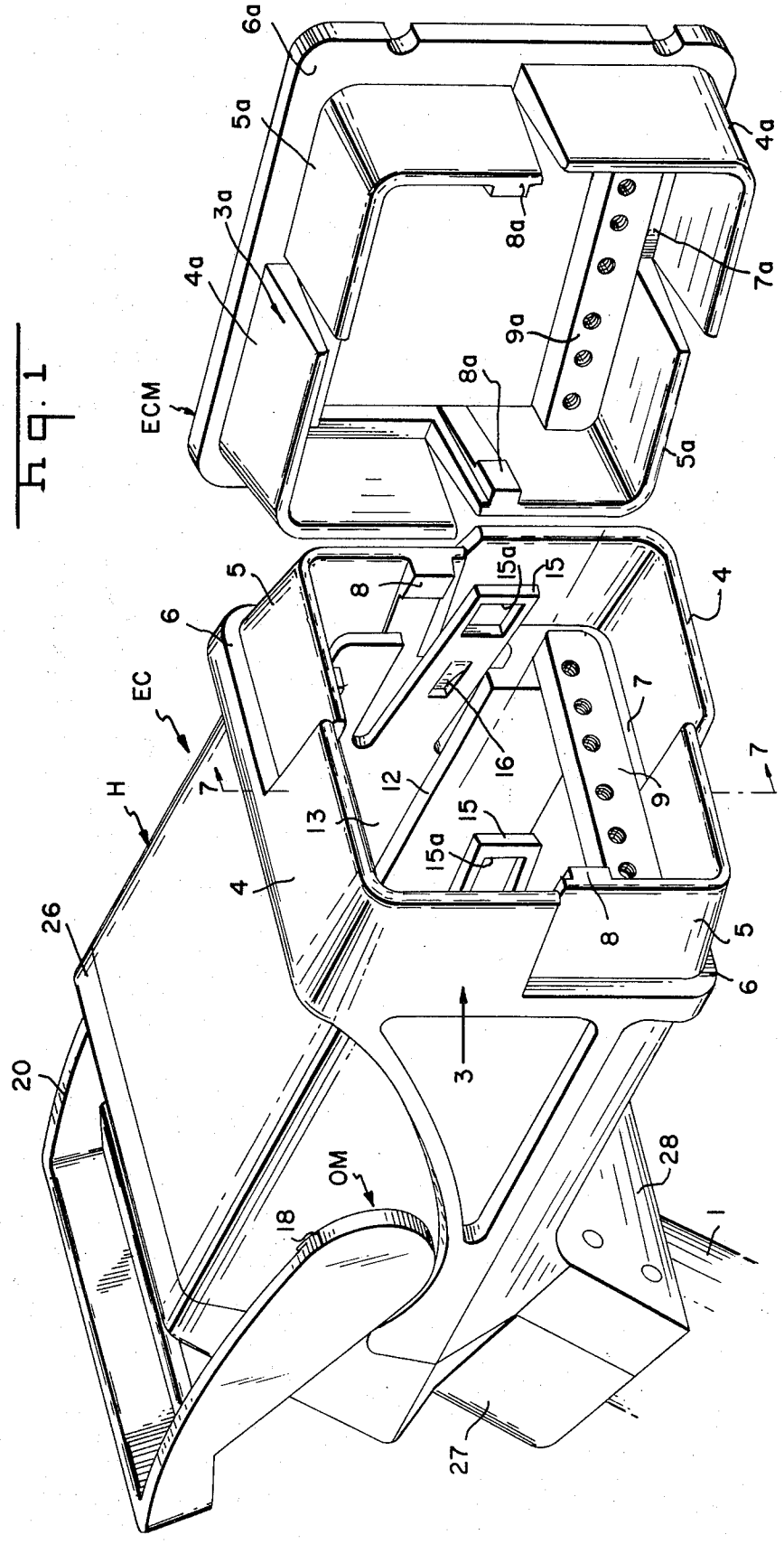


Fig. 1


6a
5a
4a
3a
4a
8a
7a
9a
8a
ECM
5a
5
8
15a
15
4
6
EC
7
16
12
7
H
7
13
15
15a
4
9
7
26
8
5
6
3
20
OM
18
28
1
27

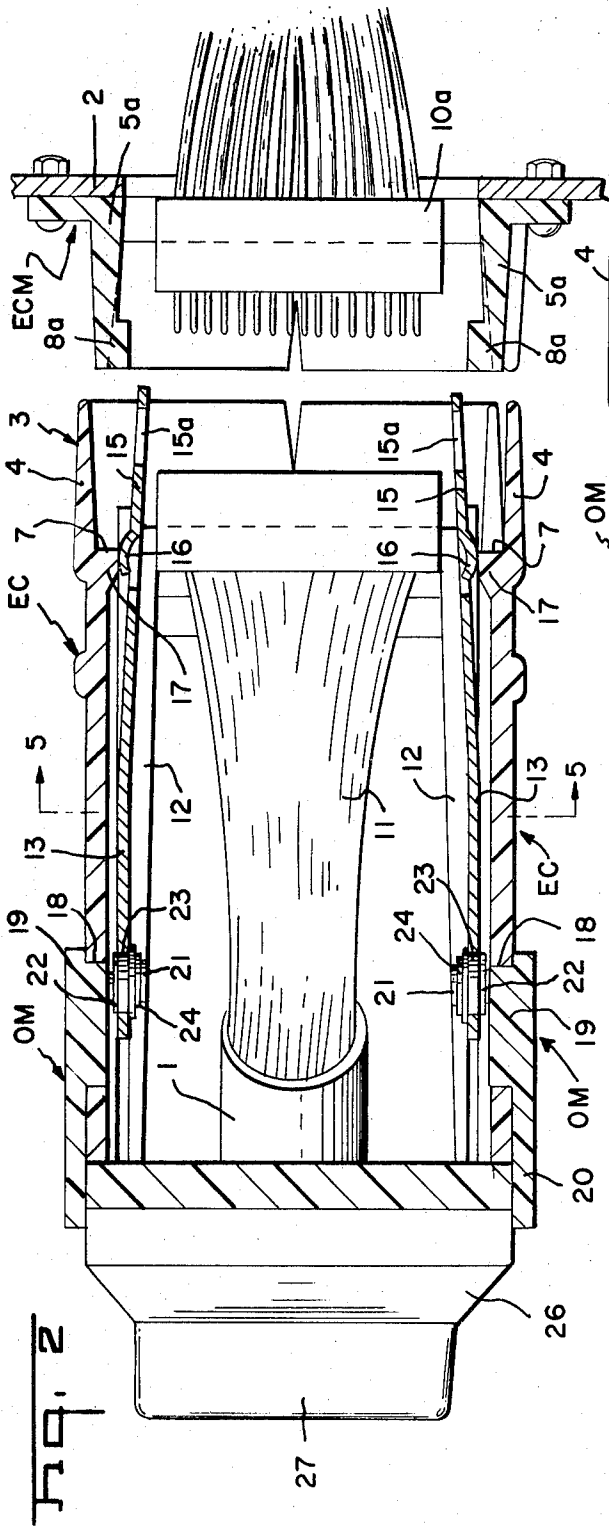

2
5a
10a
ECM
8a
5a
8a
3
4
15
15a
15a
4
7
16
15
16
7
EC
17
17
5
12
11
12
13
5
13
EC
18
19
23
24
23
22
21
21
22
OM
24
19
1
OM
20
26
27

Fig. 2

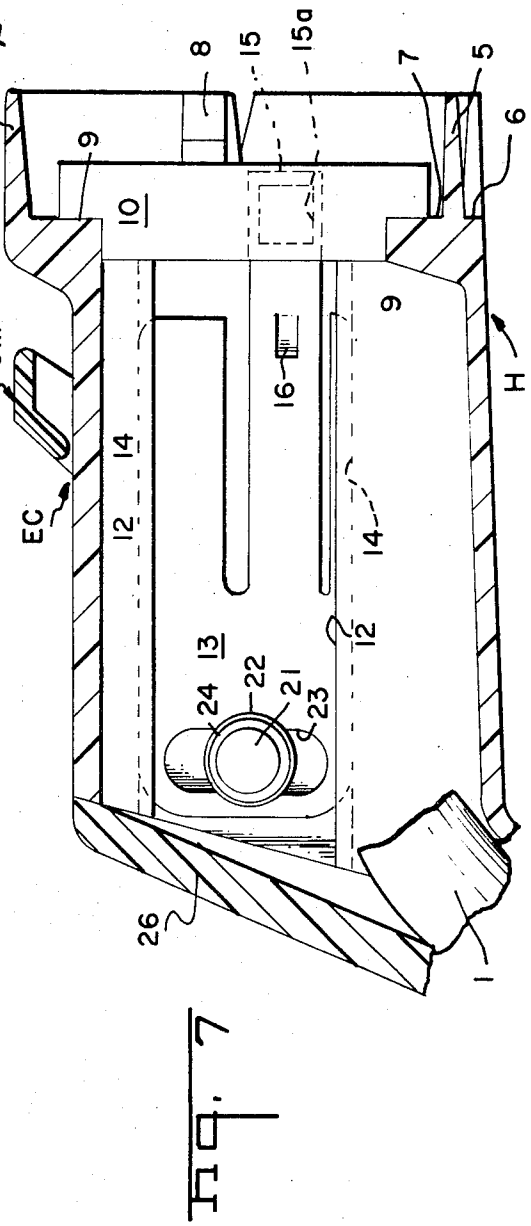

8
15
15a
7
5
4
6
9
10
9
OM
16
H
EC
14
12
14
13
22
21
24
23
12
26
1

Fig. 1

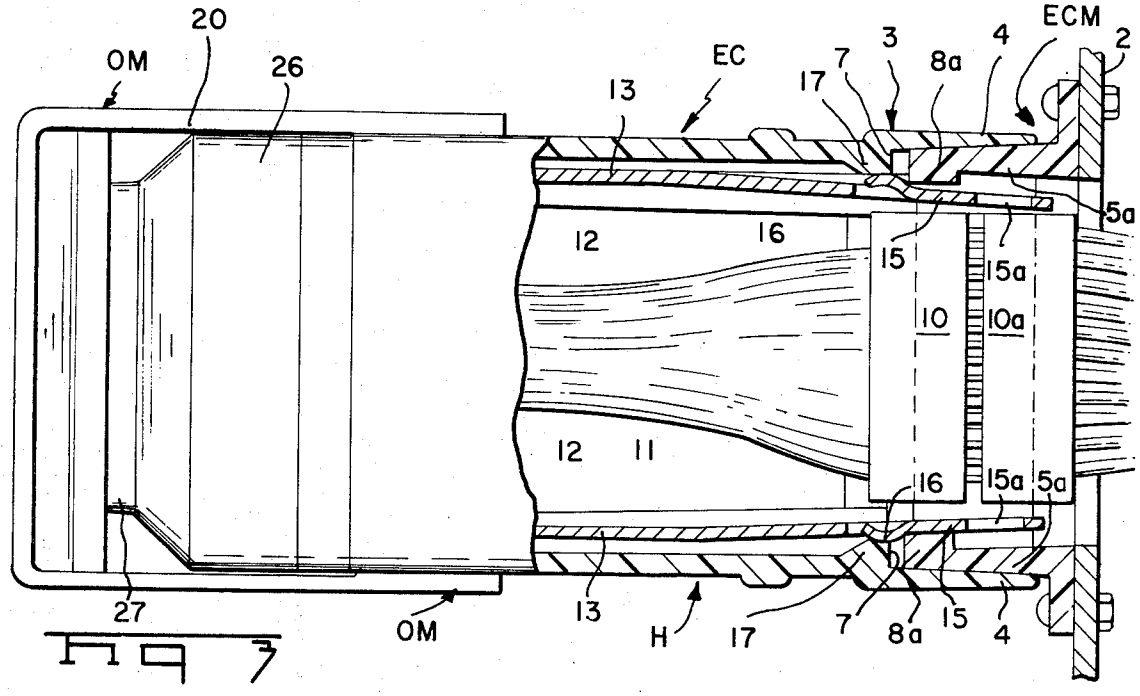

20
OM
26
EC
13
17
7
3
8a
4
ECM
2
5a
12
16
15
15a
10
10a
12
11
16
15a
5a
27
OM
13
H
17
7
8a
15
4

FIG 3

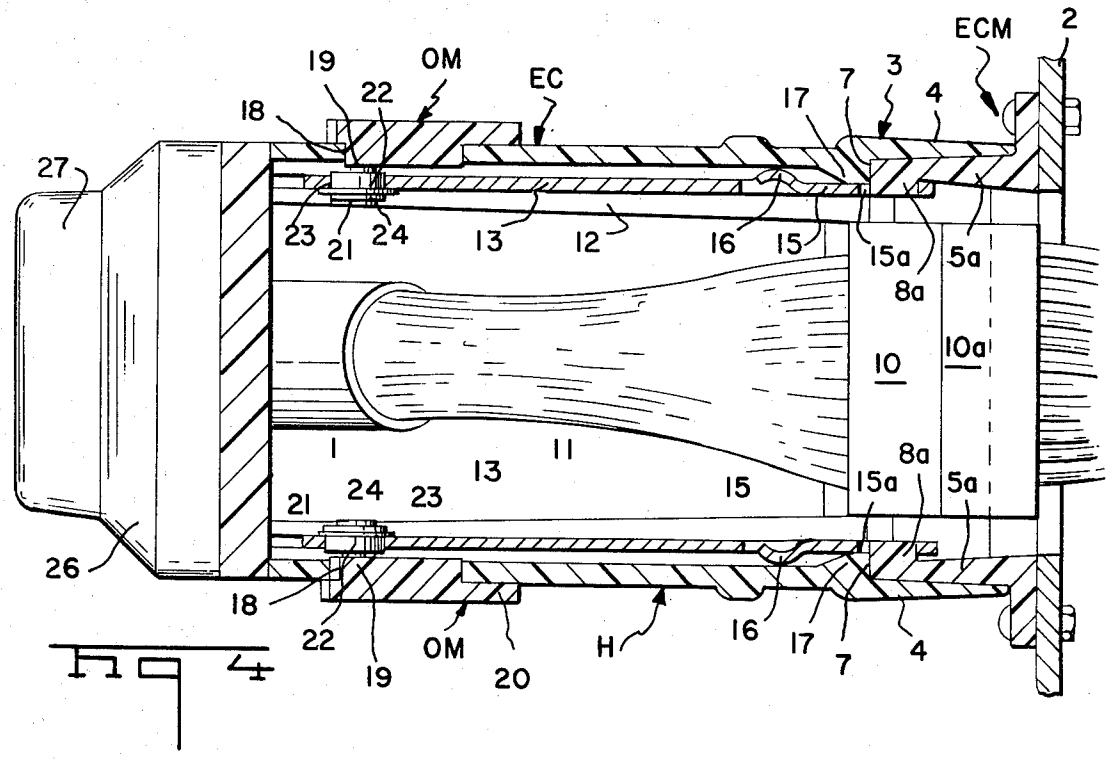

ECM
2
19
OM
EC
22
18
17
7
3
4
27
23
21
24
13
12
16
15
15a
5a
8a
10
10a
1
11
13
8a
21
24
23
15
15a
5a
26
18
22
OM
H
16
17
7
4
19
20

FIG 4

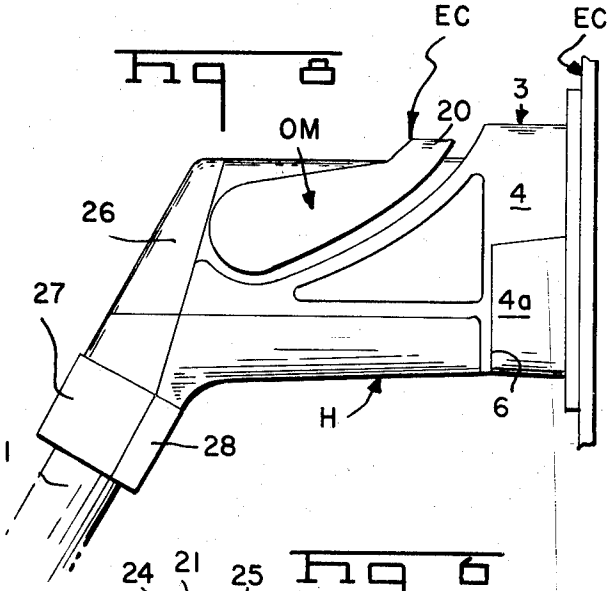


Fig 8

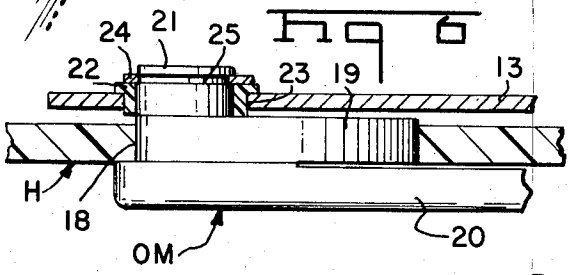


Fig 6

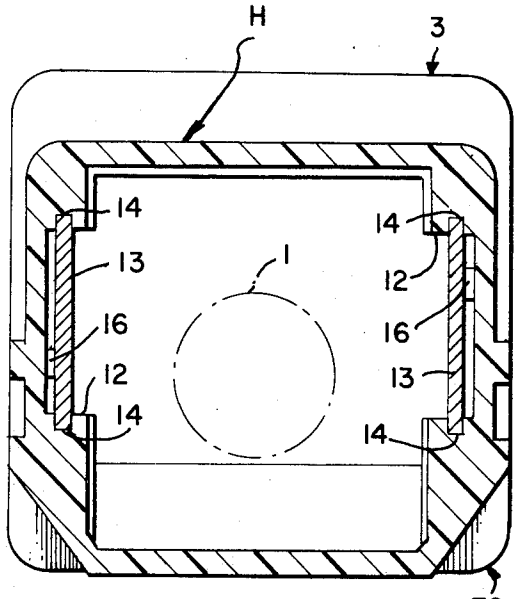


Fig 5

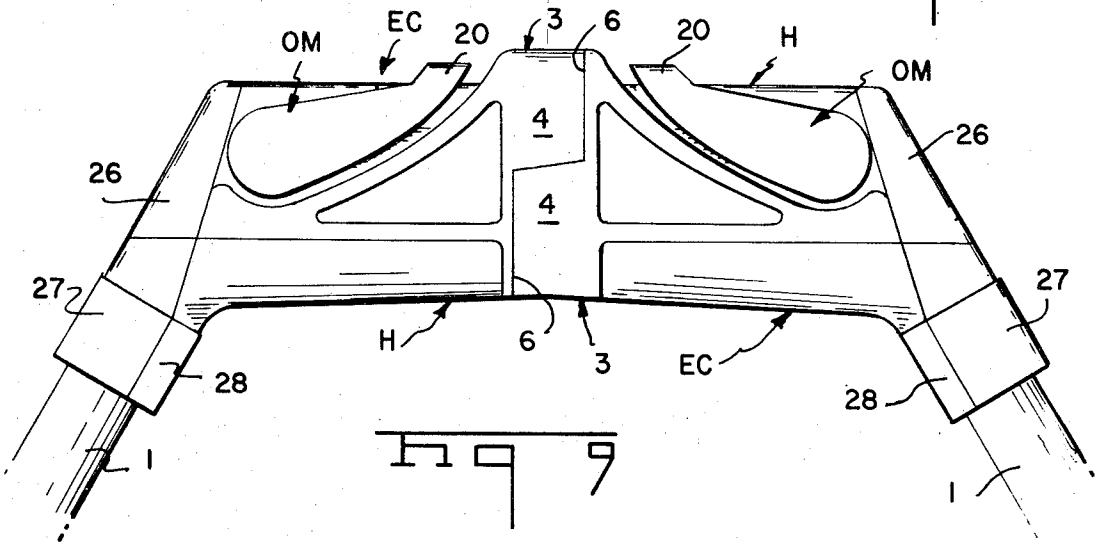


Fig 9

MEANS HAVING OPERATING MEANS FOR CONNECTING MULTICONDUCTOR CABLE MEANS

CROSS REFERENCE TO RELATED APPLICATION

This application is a divisional application of application Ser. No. 807,198, filed Mar. 14, 1969.

This invention is directed to electrical connectors and more particularly to operating means for connecting complementary electrical connectors for multiconductor cables.

Electrical equipment, especially of the computer or communications type, uses input and output cables having large numbers of conductors. It is essential that the cables and conductors be connected to electrical connectors which should have a long life under hard usage, be simple, inexpensive, easy to connect and disconnect without the use of any tools and no tolerance problems. The parts of the connectors should mate with precision and be foolproof in operation.

An object of the invention is to provide an electrical connector means that is simple to operate in connecting and disconnecting mateable electrical terminals.

Another object is the provision of an electrical connector means having camming means for moving latching means into and out of latching engagement during linear movement of the latching means.

A further object is to provide an electrical connector means provided with eccentric means to operate the linearly movable latching means.

An additional object is the provision of an electrical connector means having polarizing means to assure the proper connecting orientation when the connector means is being latched to a like or other electrical connector means.

A still further object is to provide an electrical connector means which is connectable with a like electrical connector means.

Still an additional object is the provision of an electrical connector means wherein latching means thereof has one section slidably movable in a plane while another section is movable at right angles with respect to the plane when the latching means is moved in a reciprocatory manner.

A still another object is to provide an electrical connector means wherein latching sections of latching means are disposed in parallel planes.

Other objects and attainments of the present invention will become apparent to those skilled in the art upon a reading of the following detailed description when taken in conjunction with the drawings in which there is shown and described an illustrative embodiment of the invention; it is to be understood, however, that this embodiment is not intended to be exhaustive nor limiting of the invention but is given for purposes of illustration in order that others skilled in the art may fully understand the invention and the principles thereof and the manner of applying it in practical use so that they may modify it in various forms, each as may be best suited to the conditions of a particular use.

In the drawings:

FIG. 1 is a perspective and exploded view of an electrical connector means with a mateable electrical connector means exploded therefrom;

FIG. 2 is a cross-sectional view of FIG. 5 with the electrical connector means in alignment for engagement;

FIG. 3 is a view similar to FIG. 2 showing the electrical connector means in engagement with the latching means out of engagement;

FIG. 4 is a view similar to FIG. 3 with the electrical connector means in a latched condition;

FIG. 5 is a view taken along line 5—5 of FIG. 2;

FIG. 6 is a part cross-sectional view illustrating a detail of the operating means;

FIG. 7 is a view taken along line 7—7 of FIG. 1;

FIG. 8 is a side elevational view of an electrical connector means connected to panel mounted electrical connector means; and

FIG. 9 is a side elevational view of like electrical connector means connected together.

In the drawings, electrical connector EC is connectable with electrical connector ECM as illustrated in FIGS. 1 through 5 and 7. Electrical connector Ec is connected to a multiconductor cable 1 whereas electrical connector ECM is mounted onto a panel 2 of a piece of electrical equipment such as, for example, computer, communications equipment or some other electrical equipment requiring a large number of electrical conductors.

Electrical connector EC is provided with a housing H which is molded from a suitable electric material such as, for example, polycarbonate or other suitable dielectric material or metal if it is necessary. The front of housing H is provided with a hood 3 having angular diagonal sections 4 and 5 with diagonal sections 5 being offset closer to the longitudinal axis of housing H with respect to diagonal sections 4. The exterior surfaces of diagonal sections 5 are tapered from the front ends thereof to shoulders 6 and the inside surfaces of diagonal sections 4 are tapered to shoulders 7. Latching projections 8 are disposed on the inside surfaces of diagonal sections 5 and they are offset vertically with respect to one another in parallel planes which are parallel with respect to a plane containing the longitudinal axis of Housing H. Mounting sections 9 are provided in housing H so that connector blocks 10 can be mounted thereon, the connector blocks 10 carrying electrical terminals electrically connected to respective conductors 11 of multiconductor cable 1.

Channels 12 are provided in the sides of housing H and latching members 13 are positioned within channels 12 and maintained therein via depressions 14 in communication with channels 12 as illustrated in FIG. 5 so that latching members 13 can move within channels 12 in a reciprocatory and linear manner. Latching members 13 are provided with latching arms 15 which are stiffly-flexible and movable transversely with respect to latching members 13 by struckout projections 16 engaging camming members 17 located at the outer ends of channels 12. Openings 15a are provided in latching arms 15 and latching arms 15 are offset vertically like latching projections 8 so that each latching arm 15 is disposed opposite and in alignment with a respective latching projection 8 as illustrated best in FIG. 1.

Openings 18 are provided in the sides of housing H for operating means OM for operating latching members 13. Operating means OM is provided with circular sections 19 rotatably disposed in openings 18. A U-shaped handle member 20 extends between circular sections 19 to operate the operating means. A round section 21 extends outwardly from each of circular sec-

tions 19 and round sections 21 define eccentrics having metal bearing means 22 disposed thereon and located in oblong openings 23 of latching members 13. Retaining rings 24 are positioned in grooves 25 to secure bearing means 22 in position on round sections 21 and within openings 23 so that operating means OM can linearly move latching members 13 along channels 12 in a reciprocatory manner via the eccentric attitudes of round sections 21 moving in oblong openings 23 when handle member 20 is reciprocably operated.

An end cap 26 is secured onto housing H to enclose same and a cable retaining member 27 provided with spaced projections (not shown) on the inside surfaces thereof is also secured to extension 28 of housing H to provide strain relief for the multiconductor cable 1.

Electrical connector Ec is mateable with electrical connector ECM such that diagonal sections 4 of hood 3 of electrical connector EL mate with diagonal sections 5*a* of hood 3*a* of electrical connector ECM while diagonal sections 5 of hood 3 of electrical connector EL mate with diagonal sections 4*a* of hood 3*a* of electrical connector ECM. Latching projections 8*a* are provided on the interior surfaces of diagonal sections 5*a* and they are in alignment with respective latching arms 15 so as to be engaged by openings 15*a* thereof to electrically connect and disconnect the mateable electrical terminals in connector blocks 10 and 10*a*.

In operation to connect electrical connectors EC and ECM, handle 20 of electrical connector EC is moved to the position illustrated in FIGS. 1, 2, and 3 which moves latching members 13 in an outer direction along channels 12 whereupon projections 16 engage camming members 17 causing latching arms 15 to be moved inwardly toward one another. Hood 3 of electrical connector EC is mated with hood 3*a* of electrical connector ECM such that diagonal sections 4 mate with diagonal sections 5*a* and diagonal sections 5 mate with diagonal sections 4*a* and latching arms 15 are disposed in alignment with respective latching projections 8a, as illustrated in FIG. 3, such that the electrical terminals in connector blocks 10 and 10*a* are partly mated. Forward movement of handle 20 moves latching members 13 in a rearward manner causing openings 15*a* to engage latching projections 8*a* thereby moving electrical connector EC into latched position with electrical connector ECM with the leading ends of diagonal sections 4, 4*a*, 5, 5*a* engaging or near engaging respectively shoulders 6, 6*a*, 7, 7*a* when handle member 20 has been moved to its forwardmost position, as illustrated in FIG. 8, thereby maintaining the electrical connectors EC and ECM in a securely latched position until handle member 20 is moved toward its rearwardmost unlatching position whereupon a reverse operation takes place. Shoulders 6, 6*a*, 7, 7*a* define stop means to limit engagement between the connectors and the electrical terminals.

Force applied to handle 20 is in the same direction and therefore aids the latching arm 15 to engage electrical connector EC to electrical connector ECM or a like electrical connector EC.

During the latching operation with latching members 13 being moved in a rearward direction while handle member 20 is being moved to a forward position, projections 16 move along camming members 17 causing latching arms 15 to move in an outer direction until latching projections 8*a* are seated within openings 15*a* which occurs when projections 16 are completely free of camming members 17, whereupon latching arms 15 move in the same plane with latching members 13 and they are guided by camming members 17 during their movement in the same plane with latching members 13 thereby drawing electrical connectors EC and ECM to their fully seated positions and at the same time moving the electrical terminals of connector blocks 10 and 10*a* into fully connected positions.

With respect to disconnecting the electrical connectors, rearward movement of handle member 20 causes latching members 13 to move forward and in so doing latching arms 15 assist in disconnecting the electrical terminals in connector blocks 10 and 10*a* until projections 16, while engaging camming members 17, move latching arms 15 inwardly and free of latching projections 8*a*, whereupon electrical connector EC can be readily removed from electrical connector ECM. The force direction to rearwardly move the handle member 20 aids in the force that the latching arm 15 exerts to disconnect connector EC from electrical connector ECM or like electrical connector EC.

Diagonal sections 4, 4*a*, 5 and 5*a* of hoods 3 and 3*a* define polarizing and guiding means to polarize and guide the mating engagement between the electrical connectors as well as protection for the connector blocks and electrical contacts therein and the latching projections are provided thereon to latchably secure the electrical connectors together.

As illustrated in FIG. 9, electrical connectors EC can be electrically mated together since the diagonal sections of the hoods are arranged in such a manner that mateable engagement therebetween is obtained. Moreover, mateable engagement between electrical connectors EC is such that the latching members of each electrical connector are latchably engageable with respective latching projections so that a double latching arrangement is provided. Of course, each electrical connector EC of FIG. 9 is provided with the proper connector block so that mateable engagement therebetween can be accomplished. The mateable engagement between electrical connector EC and electrical connector ECM, as illustrated in FIG. 8, is to connect a multiconductor cable to a piece of equipment whereas the mateable engagement between electrical connector EC and a like electrical connector EC, as illustrated in FIG. 9, is to connect multiconductor cables together. The latching means serves to provide a dual function of connecting the terminals completely together during a latching operation and disconnecting the terminals during an unlatching operation. This is an important feature because it is difficult, if not impossible, to manually connect and disconnect a large number of gauged electrical terminals.

While the latching mechanism of the present invention has been described in conjunction with latching separable electrical connectors together, it is obvious that the latching mechanism can be used to latch other units together.

It will, therefore, be appreciated that the aforementioned and other desirable objects have been achieved; however, it should be emphasized that the particular embodiment of the invention, which is shown and described herein, is intended as merely illustrative and not as restrictive of the invention.

What is claimed is:

1. A latching mechanism for latching mateable units together, said units consisting of a first unit having longitudinal, linear paths along either internal side and a camming surface positioned on said linear path, and a second unit having inwardly facing projections on either side, said projections aligned with said linear path in said first unit where said units are in mateable position said latching mechanism comprising:

a. a pair of elongated latching arms, each positioned on opposite sides of said first mateable unit and operable for reciprocal movement along a linear path parallel to the longitudinal axis of said mateable units, each of said arms having an opening adjacent one end adapted to engage said inwardly facing projections of said second mateable unit; and

b. operating means connected to another end of said latching arms for reciprocably moving said latching arms along said linear path so that said camming surface provided along said linear path engages and moves said latching arms transversely with respect to said linear path.

* * * * *