Dec. 11, 1951 W. J. BAUROTH 2,577,871

TWO-PART CONNECTOR AND CAM MEANS FOR FORCING THE TWO-PARTS INTO ENGAGEMENT

Filed Dec. 1, 1948 2 SHEETS—SHEET 1

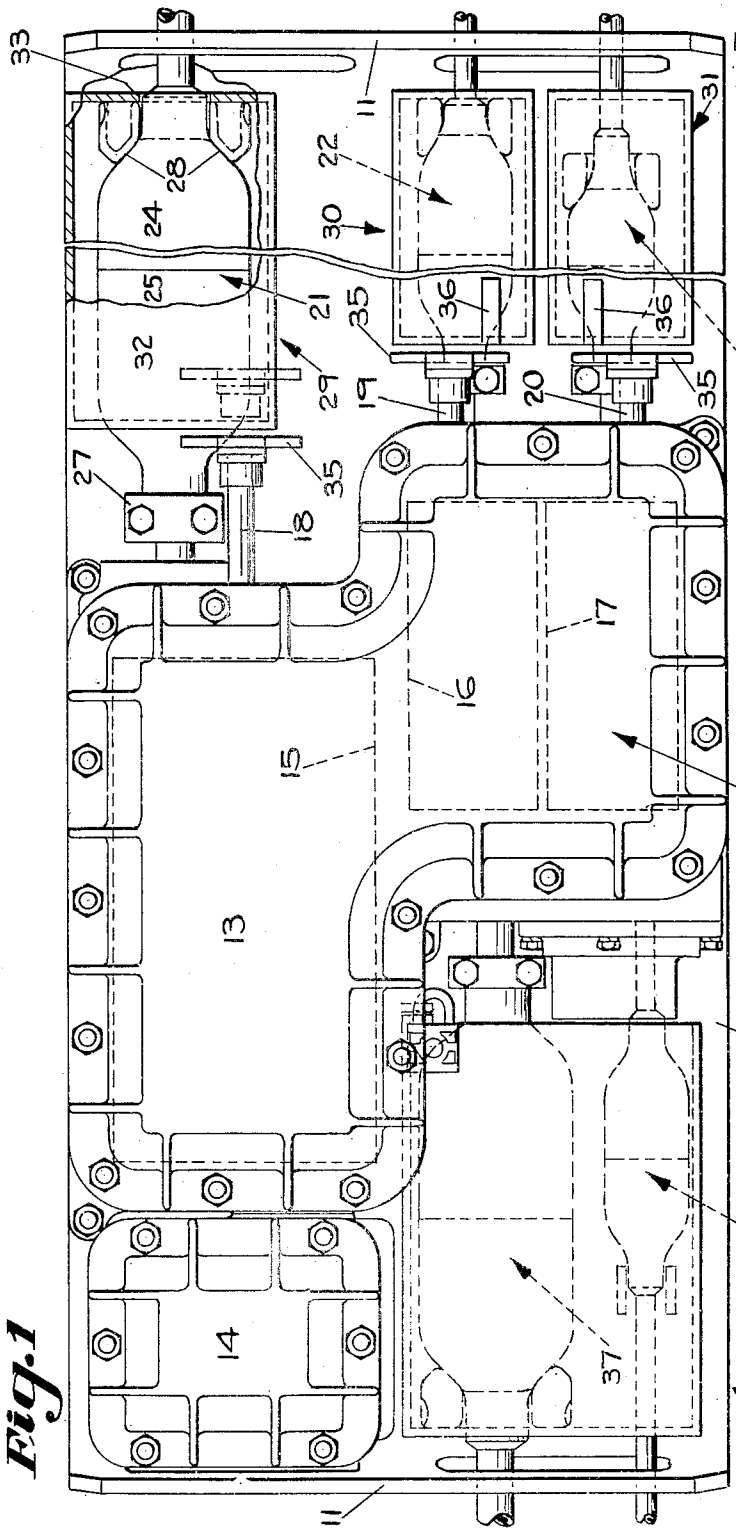


Fig. 1

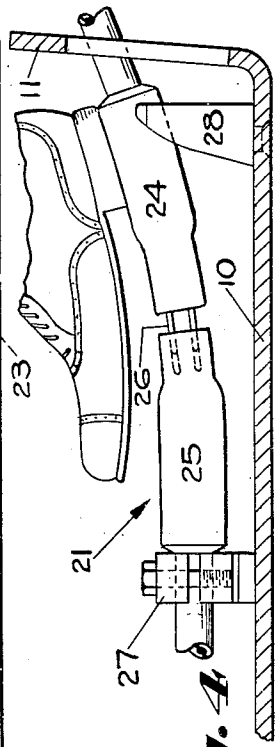


Fig. 4

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Fig. 2

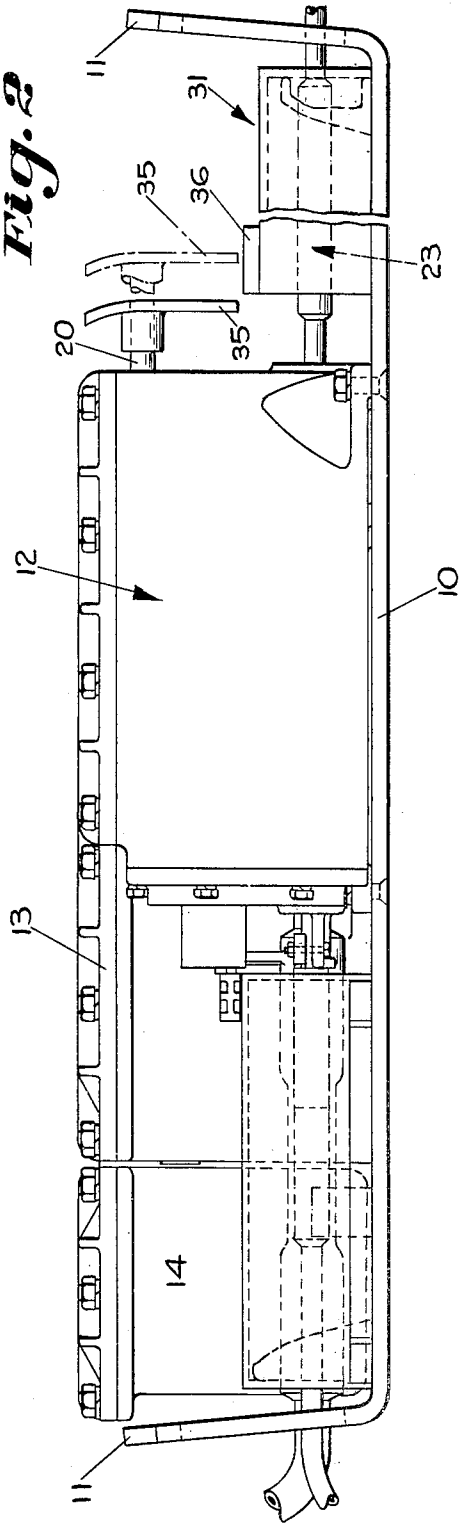
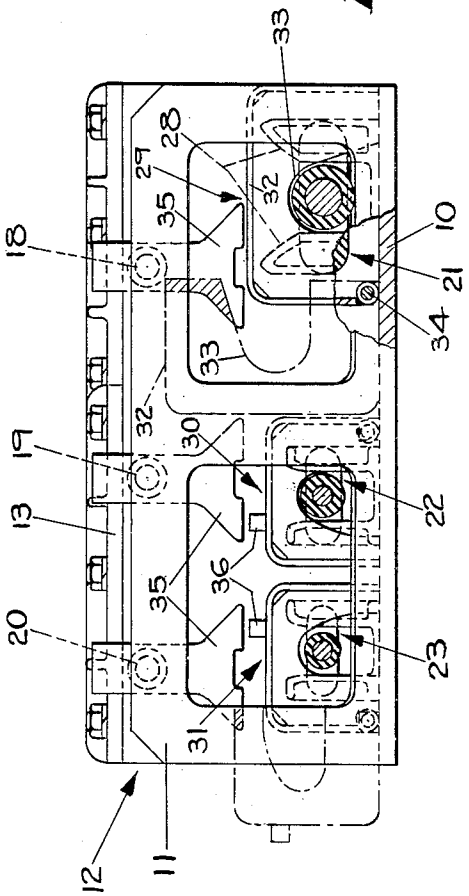


Fig. 3



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TWO-PART CONNECTOR AND CAM MEANS FOR FORCING THE TWO PARTS INTO ENGAGEMENT

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6 Claims. (Cl. 173—328)

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This invention relates to a distribution box assembly and particularly of the type which is designed as "permissible" or flame-proof, which may be used in a gaseous coal mine or the like, in which certain safety interlocks are provided and in which there is a plug and socket or receptacle type of connector.

An object of the invention is to provide improved mechanism of the above mentioned type in which the electrical connector is enclosed in a housing which is not necessarily flame-proof in association with a switch which is within a flame-proof or "permissible" housing or enclosure, there being interlocking means between the actuating mechanism for the switch which extends outside the enclosing flame-proof housing and in such position relative to the enclosure for the connector that the switch must be open in order for access to be had to the connector to disconnect it, and when said connector enclosure is open it is impossible to close the switch in the flame-proof box

A further object of the invention is to provide an electrical connector of the plug and socket or receptacle type, with simple but efficient cam mechanism whereby the two parts of the connector may be readily joined together by the simple expedient of applying a force to one of them while the other is rigidly or otherwise anchored against longitudinal movement, there being cooperating cam means on a stationary abutment and on one of the connector parts to force the connector parts together when said force is applied, such as by an operator applying his weight to one part of the connector by putting his foot on it or pressing it with his hand or otherwise.

Other objects of the invention will appear hereinafter, the novel features and combinations being set forth in the appended claims.

In the accompanying drawings,

Fig. 1 is a plan view showing a distribution box assembly including the features of my invention;

Fig. 2 is a side elevation view of the distribution box assembly of Fig. 1;

Fig. 3 is an end view showing the right-hand end, as viewed in Fig. 2, with parts broken away and in section; and

Fig. 4 is an enlarged sectional view showing particularly the apparatus for and method of attaching the plug part of an electrical connector to a receptacle part thereof.

As best seen in Figs. 1 and 2 of the drawings, the distribution box illustrated includes a generally flat bottom plate or frame 10 which is adapted to sit on the mine floor, said plate 10

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having upstanding end pieces 11 which constitute carrying handles. Rigidly mounted upon the bottom plate or frame 10 is a flame-proof or "permissible" type switch enclosure or housing 12 which has a removable cover plate 13. An explosion-proof or "permissible" conductor housing or casing 14 is also mounted on the plate 10.

Within the enclosure or housing 12 there are three switches or circuit breakers of any standard design which are indicated by the dotted lines 15, 16 and 17. Each of the switches 15, 16 and 17 has an operating mechanism by which it may be operated to its open or closed position, said mechanisms including rods 18, 19 and 20, respectively, which extend through a wall of the housing 12 in flame-proof relation therewith.

Leading to each of the three switches 15, 16 and 17 there is an electrical cable or conductor means including a connector, the three connectors being designated 21, 22 and 23, respectively. Connectors 21, 22 and 23 are of essentially the same construction but different in size. As a consequence, a description of connector 21 and associated mechanism will apply for all of them.

The connector 21 is, per se, of standard construction and design and includes a plug 24 and receptacle or socket 25, the plug 24 having projecting blades or contact members 26 adapted to be received in telescoping frictional electrical contact with clips of the receptacle or socket 25. Socket 25 is, of course, connected to an electrical cable or conductor extending to the switch 15, and plug 24 is connected to electrical cable or conductor extending to a source of power.

Receptacle or socket 25 is preferably rigidly attached to the base 10 by a clamp type abutment 27 which holds it in fixed position. Of particular significance is the fact that this abutment or clamp 27 holds it against longitudinal movement. Spaced opposite the clamp or abutment 27 and in alignment with the longitudinal axis of the connector 21 is a pair of laterally spaced abutments 28 which are rigidly attached to the frame or plate 10 and constitute cam means which cooperate with cam surfaced shoulders on the plug 24 to force the two parts of the connector 21 together by the simple expedient of starting the blades 26 into the slots of the receptacle or socket 25 and then exerting pressure on the top or flat face of the plug 24, forcing it downward or laterally over said abutments 28 so that the cam surfaces of said plug and the two laterally spaced abutments 28 force the plug 24 longitudinally and thereby force the two parts 24 and 25 of said connector together.

This has been found to be a very simple but efficient expedient for connecting heavy electrical connectors which are very difficult to connect by hand. As clearly illustrated in Fig. 4 of the drawings, the pressure to effect the connecting of the two plug parts may be readily provided by an operator or person placing his foot or the heel of his shoe on the upper flat face of the plug 24, forcing it downward against the cam means 26 which, of course, move it longitudinally forward simultaneously with its downward movement. The force applied by the operator is substantially at right angles to the resulting force produced by the cooperating cam means 26 which forces the two parts 24 and 25 together. Disconnection of the two parts of the plug 24 is no particular problem and may be effected by the operator pulling on the plug 24 or on its attaching cable.

Each of the connectors 21, 22 and 23 is housed in an enclosure or housing which is not necessarily explosion-proof but is primarily for the purpose of preventing disconnection of the connector except when the associated switch 15, 16 or 17 is in its open circuit position. Except for the size of the enclosing compartments for the connectors 21, 22 and 23 they are of similar construction and thus only one of them need be described in detail. Said enclosures for the connectors 21, 22 and 23 are designated 29, 30 and 31, respectively.

As clearly illustrated in Figs. 1 and 3 of the drawings, enclosure 29 includes a cap 32 which is generally U-shaped and is closed at its opposite ends by integral end walls. The rear end wall has a U-shaped slot 33 providing for a cable leading to the connector 21 and allowing pivotal movement of said cap 32. Along one edge the cap 32 is pivoted at 34 to the bottom plate 10, said bottom plate 10 constituting the bottom wall of said enclosure 29.

The front wall of the cap 32 is provided with a U-shaped opening through which the front of the receptacle 25 projects. Except for interlocking mechanism as hereinafter described, it is evident that the cap 32 is free to pivot as from the full line position illustrated in Fig. 3 to the dotted line position there illustrated, in the former of which it encloses the connector 21 and in the latter of which said connector is accessible to provide for its disconnection and connection.

Interlocking mechanism is provided between the cap or cover 32 and the operating rod 18 for the switch 15. Said operating rod 18 is provided with a head 35. When the rod 18 is in the switch open position, as illustrated in full lines in Fig. 1 of the drawings (Fig. 2 shows in full lines the similar position of switch operating rod 20 with its head also designated 35), the pivoted cover or cap 32 is free to be swung to its open position, whereupon the two parts 24 and 25 of the connector 21 may be disconnected or subsequently connected.

In this position the cap 32 so overlaps the head 35, as suggested by the shaded portion of Fig. 3, that it is impossible to move the lever 18 to its switch closing position. As a consequence the switch 15 can not close until lid 32 is closed. When lid 32 is closed and rod 18 is operated to its switch closing position, which is the dotted line position illustrated in Fig. 1 (a similar position for a switch operating rod 20 being shown in Fig. 2), it is impossible to swing the cover 32 to its open position. This interlock therefore prevents disconnection of the connector 21 whenever the switch 15 is closed and requires opening of said switch 15 to permit disconnection of the connector 21. Similar interlocking means is provided between the operating levers 19 and 20 of the switches 16 and 17 and the enclosures 30, 31 of the connectors 22 and 23.

The only significant difference between the enclosures 30 and 31 on the one hand and the enclosure 29 on the other is that due to the fact that the former are somewhat smaller there is a built up rib 36 on the top of the cap of each enclosure 30 and 31 which cooperates with a head 35 to prevent opening of said cap when operating rod 19, 20, respectively, is in its switch closing position.

In Fig. 1 of the drawings there is also illustrated another large connector 37 and another small connector 38 which are on the output side of the housing 12. They need no special description. It may be stated that no interlock is provided in connection with them due to the fact that they are on the output side of the distributor unit.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of the invention as defined by the claims hereto appended, and applicant therefore wishes not to be restricted to the precise construction herein disclosed.

Having thus described and shown an embodiment of the invention, what it is desired to secure by Letters Patent of the United States is:

1. In combination, an electrical connector including cooperating plug and socket parts adapted to be placed together by rectilinear movement of one part with respect to the other, each of said parts having an electrical conductor extending from one end thereof and one having a cam surface at each side of the electrical conductor, and means for aiding in placing said parts together and then supporting the said parts against rectilinear separating movement, said last named means including means forming a base, a clamp means on said base clamping the electrical conductor of one of said parts thereby mounting the said part to said base, and two abutment means on said base spaced from said clamp means adapted to straddle the electrical conductor of the other of said connector parts, said abutments having cam means thereon adapted to cooperate with the cam means on said other connector part to force said connector parts together when said connector member is moved in a direction transverse to the direction in which said connector parts are moved to place them together.

2. In combination, an electrical connector including cooperating plug and socket parts adapted to be placed together by rectilinear movement of one part with respect to the other, each of said parts having an electrical conductor extending therefrom and one having a cam surface, and means for aiding in placing said parts together and then supporting the said parts against rectilinear separating movement, said last named means including means forming a base, a clamp means on said base mounting one of said conductor parts thereto, and an abutment means on said base spaced from said clamp means, said abutment having cam means thereon adapted to cooperate with the cam means on the other connector part to force said connector parts together when said connector member is moved in a direction transverse to the direction in

which said connector parts are moved to place them together.

3. In combination, an electrical connector including cooperating plug and socket parts adapted to be placed together by rectilinear movement of one part with respect to the other, each of said parts having an electrical conductor extending therefrom and one having a cam surface, and means for aiding in placing said parts together, said last named means including means forming a base, means on said base removably mounting one of said conductor parts thereto, and an abutment means on said base spaced from said means, said abutment having cam means thereon adapted to cooperate with the cam means on the other connector part to force said connector parts together when said connector member is moved in a direction transverse to the direction in which said connector parts are moved to place them together.

4. An electrical connector attaching device including a base, spaced aligned abutments carried thereby adapted to hold the two parts of a plug and socket electrical connector against relative longitudinal separating movement when said electrical connector is positioned between said spaced aligned abutments, one of said abutments having cam means thereon adapted to force the connector parts together when a cooperating cam surface of one of said connector parts is forced laterally over said cam means and produces longitudinal movement of said one connector part.

5. An electrical connector attaching device including a base, spaced aligned abutments carried thereby adapted to hold the two parts of a plug and socket electrical connector against relative longitudinal separating movement when said electrical connector is positioned between said spaced aligned abutments, one of

said abutments having cam means thereon adapted to force the connector parts together when a cooperating cam surface of one of said connector parts is forced laterally over said cam means and thereby moved longitudinally, the other of said abutments constituting a rigid anchor for attaching the other of said connector parts to said base.

6. An electrical connector attaching device including a base, spaced aligned abutments carried thereby adapted to hold the two parts of a plug and socket electrical connector against relative longitudinal separating movement when said electrical connector is positioned between said spaced aligned abutments, one of said abutments having cam means thereon adapted to force the connector parts together when a cooperating cam surface of said plug part is forced laterally over said cam means and thereby moved longitudinally, the other of said abutments constituting an anchor for the socket of said connector.

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