July 3, 1956 U. TUCHEL 2,753,408

COUPLING FOR ELECTRIC CABLES

Filed Oct. 29, 1953

FIG. 4

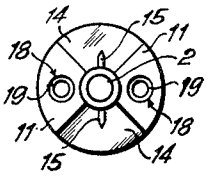


FIG. 7

FIG. 2

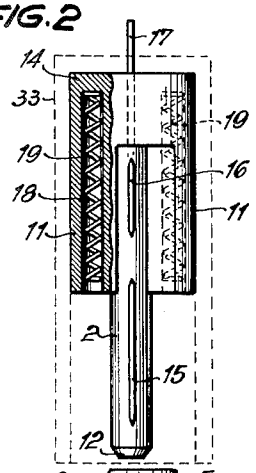


FIG. 8

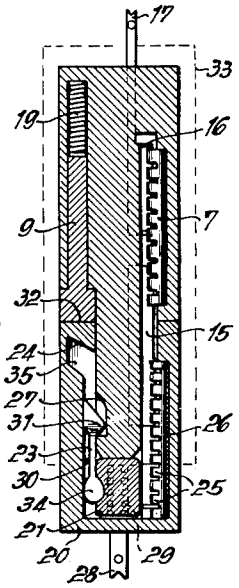


FIG. 1

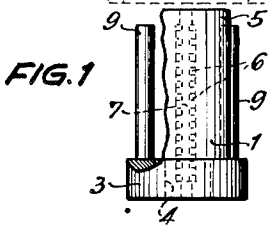


FIG. 6

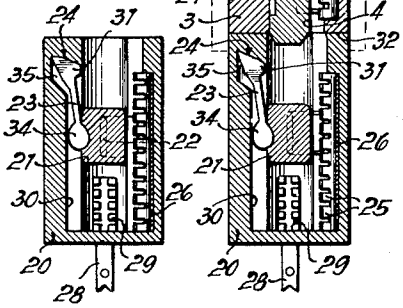


FIG. 3

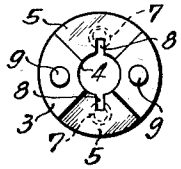
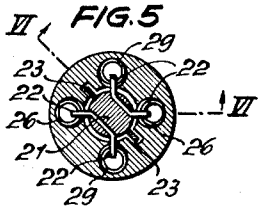


FIG. 5



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COUPLING FOR ELECTRIC CABLES

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9 Claims. (Cl. 200—51.09)

This invention relates to a coupling for electric cables particularly for use in mines.

It is therefore an object of the present invention to provide a coupling which comprises a pair of coupling half members and a switch arranged in at least one of said half members and closable by coupling engagement of the said half members.

Preferably each coupling half member has a built-in switch and means for closing the switches at the end of the movement of the coupling half members to engage the coupling.

In order to avoid danger of igniting explosive gas mixtures by electric sparks, safety regulations for mines usually prescribe that the electrical contacts of the coupling must be disconnected from the voltage during the engagement movement of the coupling half members. Heretofore this obejct was achieved by providing a switch separate from the coupling and by means of which the contacts of the coupling could have tension applied to them after engagement of the coupling halves. The switches and the closed coupling therefor each had to be separately weatherproof enclosed.

By means of the present invention such a separate enclosed switch can be dispensed with. The electrical contacts enclosed cannot have tension applied to them before the coupling half members are engaged with weatherproof sealing. On disengaging the coupling the electrical contacts are first automatically deenergized, and only then can the coupling half members be separated from each other with opening of the weatherproof seal. The coupling according to the present invention therefore is not only completely reliable with regard to safety from the danger of explosion due to the presence of explosive gas mixtures, but it is also absolutely safe to handle.

In a preferred embodiment of the invention the built-in switches are slide switches actuated by the movement of the coupling half members when these are engaged and disengaged.

The coupling may be of the plug and socket type with the socket half member having a slide switch therein comprising a slide, and a pair of contacts arranged to be bridged by said slide, one of said contacts being connected to an electrical cable and the other contact being arranged to co-operate with an electrical contact in the other coupling half member. According to a further feature of the invention one of the coupling half members, preferably the plug half, has therein a switch comprising a plug of insulating material carrying electrical contacts, said plug being slidable against the action of springs relatively to a sheath forming part of the plug coupling half member.

Preferably the plug and the slide carry blade contacts co-operating with slotted multi-spring tongued sleeve contacts.

Further features of the invention, some of which are capable of being used separately as well as in combination with any of the above-mentioned features, will be pointed out in the following description of a preferred embodiment of the present invention, illustrated in the accompanying drawings, in which:

Figure 1 is an elevation of a part of one coupling half member, partly in section,

Fig. 2 is an elevation of the other part of the coupling half member, partly in section,

Fig. 3 is a front elevation of Fig. 1,

Fig. 4 is a rear elevation of Fig. 2,

Fig. 5 is a cross section through the other coupling half member,

Fig. 6 is a section taken on line VI—VI of Fig. 5,

Fig. 7 is a diagrammatic section through the coupling in disengaged condition, and

Fig. 8 is a corresponding section with the coupling in engaged condition.

The two halves of the coupling are of the plug and socket type, Figs. 1 and 2 showing the plug element or half comprising a head carrying the plug 2 and sheath 1 which is always on the plug 2 and is shown separate therefrom in Figs. 1 and 2 only for clearness. The plug head with its plug 2, and the sheath 1 are of insulating material in which the metal parts are inserted. The sheath 1, Figs. 1 and 3, has a collar 3 at one end, with a central bore 4, which collar carries two guide parts 5 of quadrant shaped crpss-section through which extend longitudinal bores inside which bores are inserted contact sleeves 7 slotted to form thereon a plurality of tongues 6. Corresponding contact blades can engage slits in guide parts 5 and extend through these slits into the sleeves 7. Between the quadrant shaped guide parts 5, two guide pins 9 are arranged on the collar 3.

The plug head 14 carrying the plug 2 has two longitudinal ribs 11, also of quadrant shaped cross section. The plug 2 is bevelled at its front end and it has two contact blades 15, and a separate pair of contact blades 16 aligned with the blades 15. The blades 16 are connected to terminals 17 to which electrical conductors can be soldered. The ribs 11 of the plug head 14 are bored longitudinally and coiled springs 19 are inserted in the bores 18, said springs being of beryllium steel or other metal not liable to fatigue.

The sheath 1 has two positions on the plug 2, an initial position in which the coupling is open (upper part of Fig. 7) and an end position in which the coupling is closed (Fig. 8). In the initial position the guide parts 5 of the 1 already engage to a certain extent between the longitudinal ribs 11 of the plug head 14. The front end of the plug 2 then has its bevel projecting through the bore 4. The contact blades 15 of the plug 2 are in engagement with the contact sleeves 7 (Fig. 7 upper part). Both elements of the coupling half, namely the plug head 14 of insulating material and the sheath 1 engaging said plug element are arranged preferably within a housing 33 preferably of metal which, in the aforesaid initial position of the sheath 1 projects slightly beyond the latter.

The sheath 1, by means of the second coupling half 20 hereinafter described, can be shifted from the initial position shown in Fig. 7 further on to the plug 2 until it arrives in the end position shown in Fig. 8, in which the contact sleeves 7 in the socket 1 are moved partly downwards from the blades 15 of the plug 2 and on to the blades 16 so that they bridge these blades and apply tension from the terminals 17 to the blades 15. The front parts of the blades 15 on the plug 2 now project out of the bore 4 and the coil springs 19 are compressed.

The other or socket coupling half comprises a tubular casing of insulating material, closed at one end and containing a safety switch comprising a slide 21 carrying four contact blades 22 arranged in pairs. This slide can assume two positions in the tubular casing, an initial position when the coupling is open and in which the slide is spaced from the bottom of the casing, Fig. 7 and an end posi-

tion when the coupling is closed and in which the slide is near the bottom of the casing, Fig. 8. The switch is controlled by claws 23 which are loose and not connected to either the slide 21 nor to parts fixed to the casing. At one end each claw has a curved projection 31, and at the other a round head 34. The heads 34 engage in corresponding rounded depressions in the slide and are lodged between these depressions and the bottom of guide slots 30 formed in the casing wall. The projections 31, in the initial position of the slide, Fig. 7, lodge in recesses 35 formed in the wall of the casing, which recesses have curved walls 24 corresponding to the curvature of the projections 31. With the projections in this position the plug 2 can be inserted without obstruction into the coupling half 20 when the latter is shifted from the position of Fig. 7 into that of Fig. 8. As soon as the plug 2 encounters the slide 21 and drives the same, the projections 31 of the claws 23 move out of the recesses and rock into a position in which they engage notches 27 in the front end of the plug 2.

Two long contact sleeves 26 are mounted in the casing of the coupling half 20, said sleeves 26 being arranged one opposite the other and being slotted and formed with a plurality of tongues 25 like the sleeves 7. The said casing also has two shorter contact sleeves 29, also slotted and provided with spring tongues to which terminals 28 similar to the terminals 17 are connected, said terminals being sealed gas-tight. The pairs of sleeves 26, 29 are arranged in cross formation. In the initial position of the slide 21 one of the two associated blades 22 engages in one of the long contact sleeves 26 while the other of these blades is not engaged. When the slide 21 is driven by the plug 2 into the end position, corresponding to closed coupling, Fig. 8, the blades engaging the sleeves 26 remain in engagement and finally the second blades, of the pairs come into engagement with the contact sleeves 29 whereby the sleeves 26 have tension applied to them from the terminals 28. By the pressing back of the sheath 1 of the plug coupling half and the corresponding insertion of the second coupling half of the plug 2, the front parts of the contact blades on the plug are exposed. The contact sleeves 26 engage the same and shortly after they have tension applied to them by the engagement of the second blades 22 with the contact sleeves 19. Such engagement occurs only after the socket coupling half has entered far into the tightly surrounding housing 33, and thereby sealed from the atmosphere. Thus the coupling is closed and electrical connection established between either terminal 17 of the plug coupling half and a terminal 28 of the socket coupling half. Obviously the coupling can be designed for more than two conductors.

In the closed position the coupling halves may be held together by any suitable mechanical locking means, for example, a bayonet joint between the housings of the coupling halves, screw-thread or screw lug connections, etc.

To reopen the coupling, the mechanical locking means is first released, allowing the springs 19 to push out the sheath 1 and disengage the socket coupling half 20 from the plug 2. Owing to the engagement of the claw projections 31 in the notches 27 of the plug the slide 21 at first remains in contact with the front end of the plug 2, while the bottom of the insulating casing in which the slide is guided moves away from the slide. Finally the curved walls 24 engage the oblique surfaces of the projections 31 and guide the latter into the recesses 35 whereby the plug 2 is freed and the coupling half 20 can be further disengaged from said plug until it returns to the initial position of Fig. 7. During this movement the second blades 22 issue from the sleeves 29 whereby the sleeves 26 are de-energized, the blades 15 withdrawn from said sleeves 26, and simultaneously with the disconnection of the sleeves 29, also the sleeves 7 are disengaged from the blades 16 and the connection between the terminal 17 and the blades 15 is broken.

At the joint 32 between the coupling halves a gasket, not shown, is preferably provided.

The invention can be applied not only to coupling halves but also to many kinds of electrical connecting and switching devices comprising elements provided with electrical contacts and adapted to be connected and disconnected. For example a plurality of the plug members and a plurality of the socket members according to the present invention could each be mounted on a common support and the two supports provided with suitable means for engagement and disengagement. Also separate outer housings have a plurality of plug and socket members arranged therein.

I claim:

1. A coupling for electric cables, especially for use in mines, comprising a pair of coupling half members, and a switch arranged in at least one of said half members and closable by coupling engagement of said halves, the switch being a slide switch, and a switch in the other coupling half member comprising a plug and sheath, the plug being the operating means for the slide switch when the coupling half members are engaged, a front contact for the plug providing electrical connection between a contact in the same coupling half member and the other coupling half member, a rear contact connected to one of the cables, the sheath having a bridging contact arranged to connect said cable contact and front contact in the closed position of the coupling, and means connected to the slide switch and cooperating with both coupling half members to operate the slide switch upon relative sliding motion of the coupling half members.

2. A coupling for electric cables, especially for use in mines, comprising a pair of coupling half members, and a switch arranged in at least one of said half members and closable by coupling engagement of said halves, the switch being a slide switch, and a switch in the other coupling half member comprising a plug and sheath, the plug being the operating means for the slide switch when the coupling half members are engaged, the plug and the slide carrying blade contacts cooperating with slotted multi-spring tongued sleeve contacts.

3. A coupling for electric cables, especially for use in mines, comprising a pair of coupling half members, and a switch arranged in at least one of said half members and closable by coupling engagement of said halves, the switch being a slide switch, and a switch in the other coupling half member comprising a plug and sheath, the plug being the operating means for the slide switch when the coupling half members are engaged, the plug having longitudinal ribs and the sheath corresponding recesses, the ribs being quadrant shaped in cross-section.

4. A coupling for electric cables, especially for use in mines, comprising a pair of coupling half members, and a switch arranged in at least one of said half members and closable by coupling engagement of said halves, the switch being a slide switch, and a switch in the other coupling half member comprising a plug and sheath, the plug being the operating means for the slide switch when the coupling half members are engaged, the plug having longitudinal ribs and the sheath corresponding recesses, the ribs being quadrant shaped in cross-section, the plug ribs having bores therein retaining springs and the sheath having pins slidable in said bores against the force of said springs.

5. A two-part coupling for electric cables comprising a plug head and a socket casing forming the two halves of the coupling, the plug head and the socket casing having contacts which are non-energized and safe if manually contacted when the two coupling halves are uncoupled, a slide contact sleeve in each coupling half within the respective plug head and the socket casing, and a sliding switch part in one of the coupling halves, said coupling halves cooperating with each other and the sliding part

whereby a series contact is completed when the coupling halves are in interengagement with each other.

6. A two-part coupling for electric cables according to claim 5, in which means are provided in the one part of the coupling in which the sliding switch part is operative and having means to contact the other part of the coupling so that they become automatically linked together when the coupling halves are engaged together.

7. A two-part coupling for electric cables according to claim 5, in which each coupling half is provided with an insulated cover so that before the contacts contact each other they are enclosed and protected against inflammable gases.

8. A two-part coupling for electric cables according to claim 5, in which the switch is arranged in at least one of said half members and closable by coupling engagement of said halves, the coupling being of the plug and socket type and the socket half member sliding switch comprising a slide and a pair of contacts arranged to be

bridged by said slide, one of said contacts being connected to a cable and the other contact being arranged to co-operate with a contact on the plug half member.

9. A two-part coupling for electric cables according to claim 5, in which the switch is arranged in at least one of said half members and closable by coupling engagement of said halves, a plug half switch comprises a plug of insulating material carrying contacts slidable in its coupling half member.

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