Oct. 13, 1925. 1,556,829

C. W. WYMAN

INTERLOCKING MECHANISM

Filed May 28, 1920

Fig. 1.

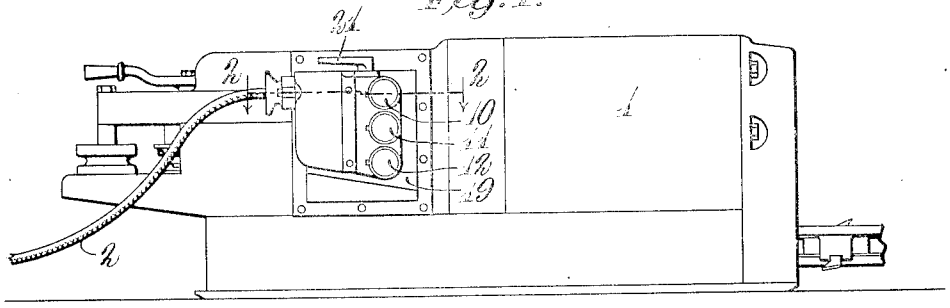


Fig. 2.

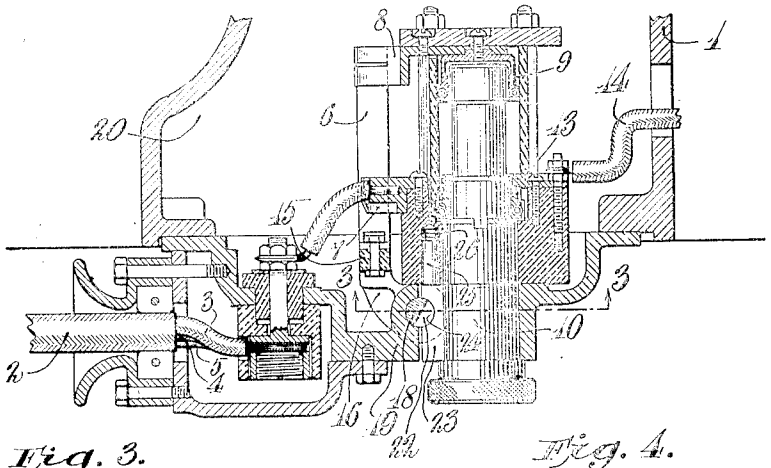


Fig. 3.

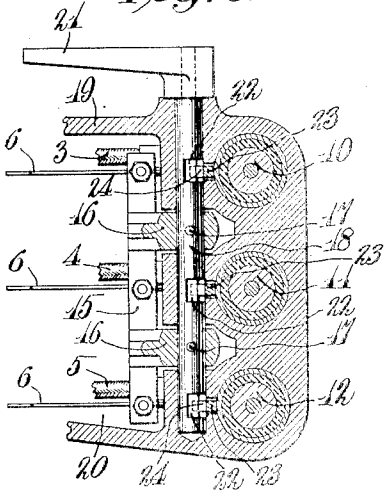
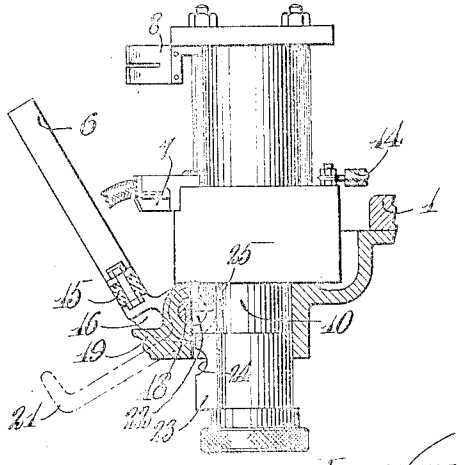


Fig. 4.



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UNITED STATES PATENT OFFICE.

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INTERLOCKING MECHANISM.

Application filed May 28, 1920. Serial No. 385,012.

To all whom it may concern:

Be it known that I, CHARLES W. WYMAN, a citizen of the United States, residing at Claremont, in the county of Sullivan and State of New Hampshire, have invented certain new and useful Improvements in Interlocking Mechanism, of which the following is a full, clear, and exact specification.

My invention relates to interlocking mechanism.

It has for its object to provide an improved interlocking mechanism especially adapted to the control of an electric switch and one or more cooperating connector elements whereby the switch is controlled by said elements and the latter are controlled by the switch. More particularly, my invention has for its object to provide an improved interconnected controlling mechanism controlling a switch and a plurality of cooperating connectors or fuse plugs such as are used in alternating current systems, the same finding a special adaptation in connection with mining machines adapted to use in gas laden atmospheres and functioning to prevent the ignition of the gas during movement of said switch or said connector or fuse plugs.

While my invention may be embodied in various forms, in the accompanying drawings I have shown for purposes of illustration one embodiment which the same may assume in practice, illustrating this form of the same as applied to a mining machine.

In these drawings:

Fig. 1 is a side elevation of a mining machine equipped with my improvement.

Fig. 2 is an enlarged detail sectional view on line 2—2 of Fig. 1, the switch and plug being shown in closed position.

Fig. 3 is a similar sectional view on line 3—3 of Fig. 2, the switch however being shown in open position.

Fig. 4 is a similar detail view showing the switch and plug in open position.

In this illustrative construction, I have disclosed a mining machine 1 of standard construction and suitably supplied with three phase alternating current through a cable 2 having component leads 3, 4, and 5. The current flow through these several leads of the three-phase circuit illustrated is controlled by a suitable main line switch, herein a knife switch carried on the machine and distinct from the controller (not shown), the switch comprising a plurality of, herein three, movable switch contacts 6 each in turn cooperating with a pair of cooperating fixed contacts 7 and 8, of which the contacts 8 are each electrically connected to one of three socket contacts 9 adapted to receive a plurality of, herein three, connector and fuse plugs 10, 11, and 12 which in turn are electrically connected to plug receiving ring contacts 13 from which the current flows to the motor of the mining machine through the usual conductors 14.

In my improved construction, it will be observed that the three movable switch contacts 6 are attached to a movable element or cross bar 15 operatively connected through lugs 16 and pins 17 to an operating rock shaft 18 journaled in a removable cover 19 of a suitable switch and plug recess 20 formed in the side of the mining machine frame. This rod 18 is disposed at right angles to the axes of the plugs 10, 11, and 12, herein near the outer ends thereof, and, as illustrated, is provided with a laterally extending controlling handle 21 on its outer end so that in a single operation the operator may make or break the current flow through each of the three phases. In my improved construction this switch is also operatively connected to the plugs, the shaft 18 thereof, as illustrated herein, preferably being provided with laterally disposed grooves or cut-out portions 22 opposite the outer end of each of the plugs. These grooves 22 are each adapted to receive a laterally extending fin or web 23 formed on the neck of each plug when the switch is in the open position thereof illustrated in Fig. 4. Further, the shaft 18 is also adapted to cooperate with semi-circular cut-away portions 24 formed in each of the fins, the shaft when rotated to circuit closing position after the plugs have been inserted, interlocking with the walls of the portions 24 in such a manner as to lock the plugs in their "in" position, and render removal of the plugs or any of them impossible after the switch has been moved to closed position and while the switch occupies that position. I have also provided adjacent the plugs and likewise adapted to be received in the grooves 22 of the shaft 18, a plurality of spring pressed plungers 25 disposed parallel to the plugs and each adapted to be engaged by the fin or web 23

of its plug and depressed thereby when the plug is in position and released thereby when the same is removed. Thus, any plunger spring 26 may project its plunger into a groove 22 when the switch is in open position and thereby prevent a rotary movement of the switch shaft 18 toward closed position.

In considering the operation of my improved controlling mechanism, it will be observed that when the parts are located in their circuit closing position, shown in Fig. 2, current may flow through the leads 3, 4, and 5, through the switch contacts 7, 6, 8, and 9, the plugs 10, 11, and 12, the ring contacts 13, and the conductors 14, to the mining machine motor, the switch being freely operable whenever desired so long as the plugs remain in position. Further, it will be noted that when the parts are in this position, each of the plugs 10, 11, and 12 is locked in, the member 18 being so turned in the cut-away portion 24 in the fins on the plugs, as to hold the latter securely against withdrawal. Thus, to remove a plug, it is first necessary to move the switch from the closed position shown in Fig. 2 to the open position shown in Fig. 4, and then the plug may be withdrawn by a simple longitudinal movement. When this occurs, however, it will be observed that the previously compressed spring 26 acting on the plunger of that particular plug, will be released, so that its plunger will simultaneously spring outward into the groove 22 in the switch shaft in such a manner as to prevent any movement of the switch to closing position, while the plug is removed. In other words, it will be noted that the switch is automatically locked in open position upon the removal of any one of the plurality of plugs and is retained in that position until the missing plug is returned to its full-in or operative position.

As a result of my improved construction, it will be observed that it is possible to lock or unlock the parts and control the same through a movement of the switch and a simple longitudinal movement of a single plug. It will further be evident that the mechanism provided is of an exceedingly simple and rugged character and so constructed and housed within the casing as to be well protected and relatively fool proof.

While I have in this application specifically described one embodiment which my invention may assume in practice, it will be understood that this form of the same is used for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure from Letters Patent is:

1. In an interlocking mechanism, a switch, a plurality of separately removable cooperating connectors, and plunger mechanism locking said switch releasable upon insertion of all of said connectors,

2. In an interlocking mechanism, a switch, a plurality of separately removable cooperating connectors, and plunger mechanism for locking said switch upon removal of any connector.

3. In combination, a switch including a rock shaft, a plurality of independently removable cooperating connectors, and means between each connector and said shaft for automatically locking the latter upon longitudinal withdrawal of any connector.

4. In combination, a switch having a movable and a stationary contact, a stationary connector element connected to said stationary contact, a removable connector element adapted to make connection with said stationary connector element, and interlocking connections controlled by said removable connector element preventing engagement of said contacts except when said connector elements are connected.

5. In combination, a switch having movable and stationary contacts, a stationary connector element connected to one of said contacts, a removable connector element adapted to make connections with said stationary connector element, and interlocking connections controlled by longitudinal movement of said removable connector element preventing engagement of said contacts except when said connector elements are connected.

6. In combination, a switch having movable and stationary contacts, said movable contact supported upon a pivot member, a stationary connector element connected to one of said contacts, a removable connector element adapted to make connection with said stationary connector element, and interlocking connections controlled by longitudinal movement of said removable connector element and coacting with said pivot member to prevent engagement of said contacts except when said connector elements are connected.

7. In an interlocking mechanism, a switch having a grooved rotatable member, a connector relative to which said member is rotatable, and a plunger movable relative to and controlled by said connector and receivable in said groove.

8. In an interlocking mechanism, a switch having a rotatable member provided with a plurality of grooves therein, a plurality of cooperating connectors, and a plurality of plungers, one receivable in each of said grooves and each controlled by one of said connectors.

9. In an interlocking mechanism, a switch having a rotatable shaft provided with a plurality of grooves, a plurality of cooperat-

ing connectors each having a portion movable through one groove and a recess permitting free rotation of said shaft, and plungers controlled by said connectors and receivable in said grooves.

10. In an interlocking mechanism, a switch having a rotatable operating shaft, a plurality of separately movable connector plugs disposed parallel to each other and perpendicular to a line parallel to the axis of said rotatable operating shaft, and interlocking means between said shaft and said connector plugs operative to prevent rotation of the former except when all the latter are in operative position.

11. In an interlocking mechanism, a switch having a rotatable operating shaft, a plurality of separately movable connector plugs disposed parallel to each other and perpendicular to a line parallel to the axis of said rotatable operating shaft, and interlocking means between said shaft and said connector plugs operative to prevent removal of any of the latter except when the former is in a position in which said switch is in open circuit position and to prevent movement of said shaft to a position in which said switch is in circuit closing position except when all said plugs are in place.

12. In an interlocking mechanism, a switch member having a rotatable operating shaft, a connector plug insertable and removable by movements in the plane of rotation of said switch member, and means having a direction of movement parallel to the movement of said plug during insertion or removal of the latter for locking said switch member when said connector plug is removed.

13. In an interlocking mechanism, a plurality of switch members, a single rotatable operating shaft for all of said switch members, a plurality of connector plugs equal in number to said switch members and each removable by movement in a direction parallel to a plane which is parallel to the plane of movement of said switch members, and means controlled by each of said connector plugs for locking said switch member when any of said connector plugs is removed.

14. In combination, a switch comprising a rotating operating shaft, a connector plug adapted to constitute a part of the circuit which is controlled by said switch, said shaft being provided with a lateral notch through which a portion of said plug may move in one position of said shaft and said plug having a lateral notch to receive in one position of said plug the arcuate periphery of said shaft, and means controlled by said plug and operative to enter said first mentioned notch on removal of said plug whereby said switch is held immovable on removal of said plug.

15. In an electrical apparatus, longitudinally spaced contacts adapted to receive a longitudinally insertable connector, and a knife switch having a blade swingable in a plane parallel to the direction of insertion of said connector and stationary contacts adapted to cooperate with said blade and each adjacent one of said longitudinally spaced contacts.

16. In an electrical apparatus, longitudinally spaced contacts adapted to receive a longitudinally insertable connector, and a knife switch having a blade swingable in a plane parallel to the direction of insertion of said connector and stationary contacts adapted to cooperate with said blade and each adjacent one of said longitudinally spaced contacts, said knife being disposed parallel to the path of insertion of said connector when in closed position.

17. In an electrical apparatus, longitudinally spaced annular contacts adapted to receive a longitudinally insertable connector comprising cooperating spaced contacts connected by a fuse, and a knife switch having a blade swingable in a plane parallel to the direction of insertion of said connector and stationary contacts adapted to cooperate with said blade and each adjacent one of said longitudinally spaced contacts.

18. In an electrical apparatus, spaced coaxial fuse engaging contacts adapted to receive a longitudinally insertable fuse, a knife switch adapted when closed to be disposed parallel to the longitudinal axis of said plug and having its knife contact rotatable about an axis adjacent said plug, and means rotatable about said latter axis to lock said plug in position.

19. In an electrical apparatus, a fuse plug, a stationary contact adapted to receive said plug longitudinally upon insertion of the latter, and a knife switch contact, said contacts having a common immediate support and said second contact being adapted to cooperate with a switch blade moving in a plane parallel to the direction of insertion of said plug.

In testimony whereof I affix my signature.

CHARLES W. WYMAN.