A. C. SAVAGE.

INTERLOCKING SWITCH.

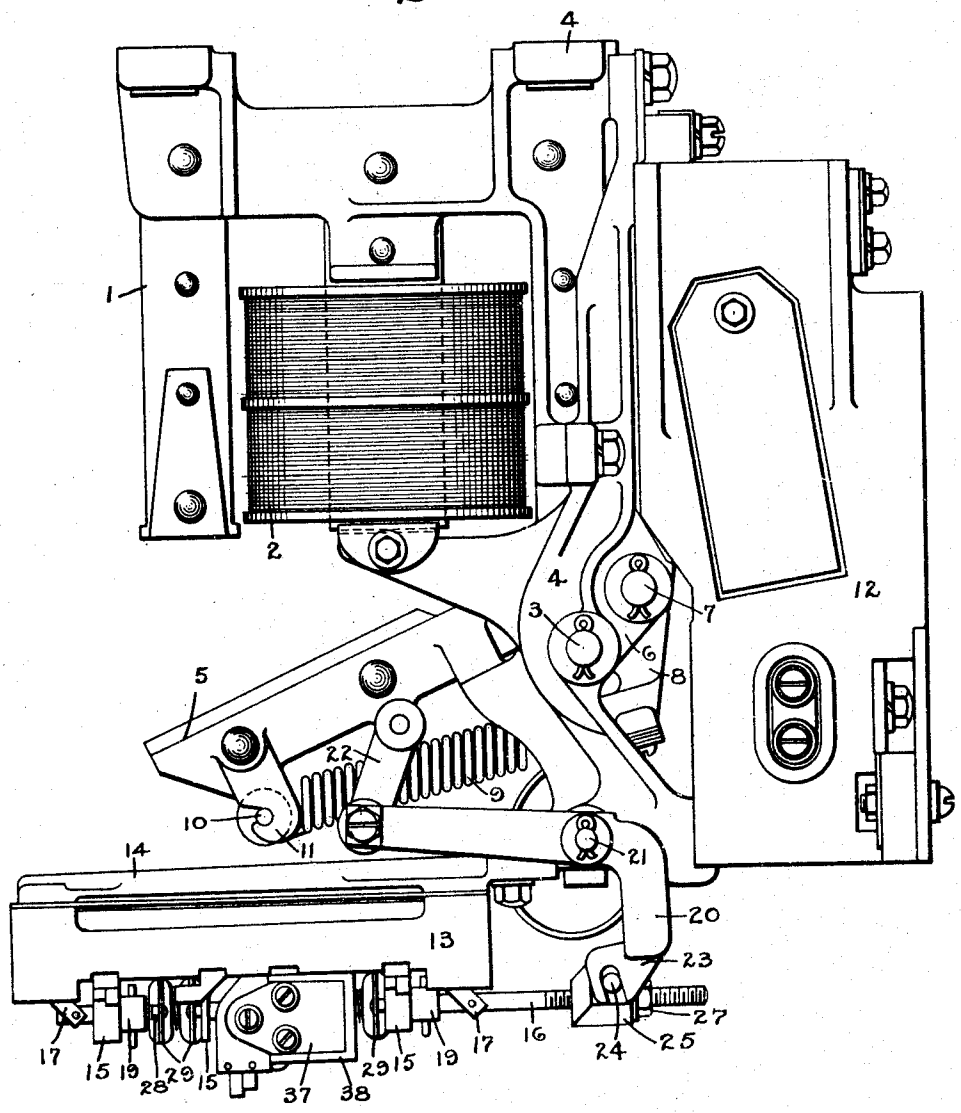
APPLICATION FILED JAN. 28, 1909.

957,262.

Patented May 10, 1910.

2 SHEETS—SHEET 1.

Fig. 1



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2 SHEETS—SHEET 2.

Fig. 2

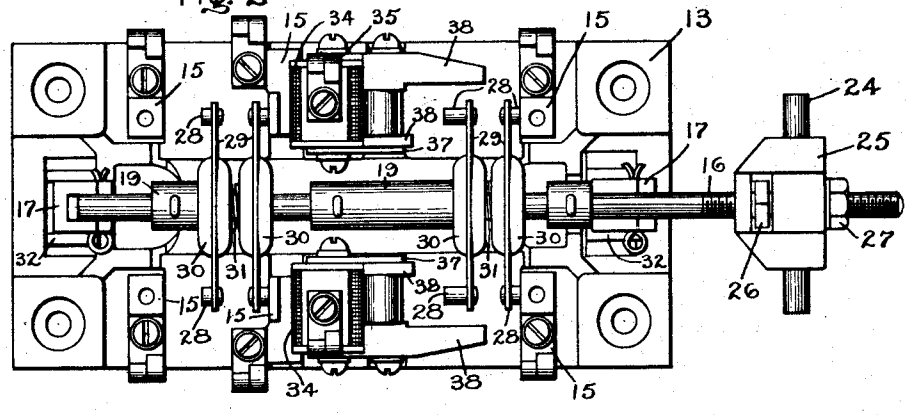


Fig. 3

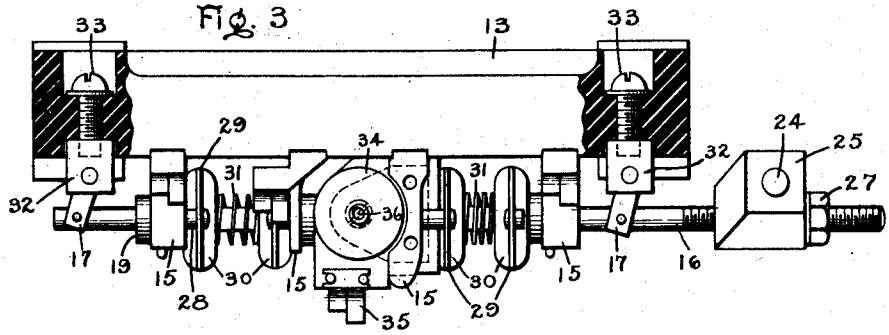
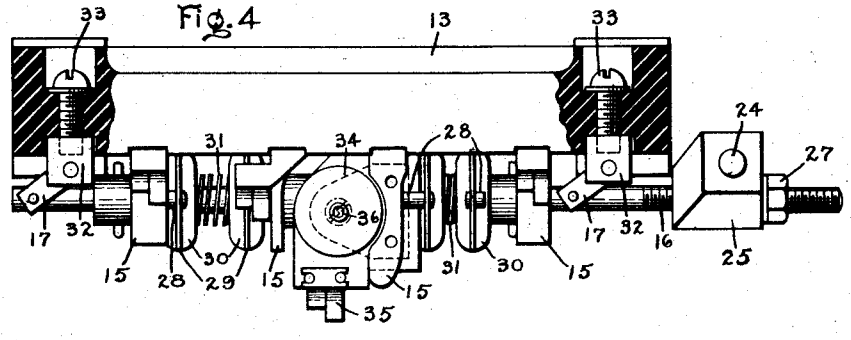


Fig. 4



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UNITED STATES PATENT OFFICE.

ARTHUR C. SAVAGE, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

INTERLOCKING SWITCH.

957,262. Specification of Letters Patent. Patented May 10, 1910.

Application filed January 28, 1909. Serial No. 474,639.

To all whom it may concern:

Be it known that I, ARTHUR C. SAVAGE, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Interlocking Switches, of which the following is a specification.

My invention relates to electric switches, and more particularly to interlocking switches which are operated by automatic means, such as electromagnetically operated switches, and has for its object an improved construction and arrangement of parts, whereby the contacts in the switch make a wiping connection.

Considered in its broadest aspect, my invention consists of a switch having its movable contact yieldingly mounted to slide longitudinally along an actuating member which has a combined longitudinal and sidewise movement whereby the movable contact will first be brought into abutting engagement with the fixed contact and then will be caused to move sidewise over the same with a wiping movement. Such an arrangement is especially useful in connection with the interlocking switches commonly used in controllers of the separately-actuated contact type in which some difficulty has been experienced in securing good electrical connection without undue pressure when the switches are closed.

For a better understanding of my invention, reference may be had to the following description taken in connection with the accompanying drawings, in which—

Figure 1 is a side elevation of an electromagnetically operated switch or contactor provided with my interlocking switch; Fig. 2 is a plan view of my interlocking switch in one extreme position of its movement; Fig. 3 is a side elevation in an intermediate position, parts of the supporting member being broken away; and Fig. 4 is a view similar to Fig. 3, except that the interlocking switch is in the other extreme position.

As is well known, controllers of the separately-actuated contact type comprise a number of independent switches, called "contactors," arranged to be operated from a suitable source of power, generally electric or pneumatic. The particular form of switch or contactor which I have shown is covered by an application of John F. Tritle, for an electromagnetically operated switch, Serial No. 441,292, filed July 1, 1908. My invention, however, is not limited in its use to any particular type of switch, but may be used wherever it is desired to employ interlocking contacts.

Referring particularly to Fig. 1, I have shown a contactor having a field 1, arranged to attract an armature 5, and make connections between contact members contained within the arc chute 12. My interlocking switch is connected to the armature 5 of the contactor by means of a link motion. The particular contactor shown is designed for use with alternating currents. The field structure 1, made of laminations, is E-shaped. The actuating coil 2 is wound around the middle leg of the E-shaped structure. Pivoted upon a pin 3, which passes through holes in the frame 4 of the contactor, is the laminated armature 5. The armature is provided with an extending arm 6, in the end of which on the pin 7 are pivoted movable contact members 8, only one of which is shown. The lower end of each movable contact member 8 is engaged by one end of a spring 9, the other end of which is secured to a pin 10 mounted in a lug 11 extending from the armature near the outer end thereof. The arc chute 12 is fastened to the frame 4, and contains the tips of the movable contact members 8 and the fixed contact members which are not shown in the drawings. When the actuating coil 2 is excited, the armature 5 is attracted by the magnetic field set up between the ends of the E-shaped field structure and the movable contact members will be brought into engagement with the fixed contact members.

The supporting member 13 of my interlocking switch is shown as fastened to an arm 14 extending from the frame 4 of the contactor. Contacts 15, arranged in pairs, are fastened to the supporting member 13. An actuating member or rod 16 is pivotally connected to the supporting member by means of link members 17 so that said rod moves longitudinally and sidewise with respect to the supporting base, and loosely and yieldingly mounted on said rod are arranged movable contact members to connect the fixed contacts 15, and by giving the rod 16 a motion in two directions the movable contact members will first be brought into

abutting engagement with the fixed contacts and then will be caused to move sidewise over the same with a wiping movement. Stops 19 are fastened to the rod 16 to limit the movement of the movable contacts on the rod. A bell crank lever 20 is pivoted on the pin 21 which also passes through holes in the frame 4 of the contactor. The lever 20 is connected to the armature 5 by means of the link member 22. The end 23 of the lever 20 is slotted so as to fit over the pins 24 on the member 25, the member 25 being held in place on the end of the rod 16 by means of the nuts 26 and 27. By means of this bell crank lever the motion of the armature of the contactor is transmitted to the rod of my interlocking switch.

Each movable contact member consists of buttons 28 riveted to metal disks 29. These disks are provided with hubs 30 of insulating material which are preferably molded on the disks. The rod 16 passes through holes in the hubs 30 of the disks. The disks are yieldingly supported on the rod by means of springs 31 surrounding the rod and pressing against the hubs 30. These springs 31 oppose the sliding movement of the contact members on the rod. In the interlocking switch which I have chosen to illustrate, I have shown the disks 29 arranged in pairs, each pair being separated by a spring.

The rod 16 is connected to the supporting member 13, by means of short links 17. Each of these links is preferably U-shaped, as clearly seen in Fig. 2, and is fastened to the rod by means of a cotter pin and to a member 32 made of metal, which in turn is fastened to supporting member 13 by means of a screw 33.

Separate blow-outs are provided at each of the fixed contacts requiring them. I have shown them as being provided at the second pair of contacts, counting from the end of the rod upon which the member 25 is mounted. Each blow-out consists of a coil 34 provided with a terminal 35, the other terminal being grounded upon the iron hub 36. Pole pieces 37 are fastened to this hub, a strong magnetic field is set up between them, and the arc is quickly ruptured. Molded insulation barriers 38 are also assembled on the fixed contacts 15. The coils 34 are identical, but the current through them flows in opposite directions so that the magnetic fields produced by them flow in opposite directions. Since the path of the current across the contacts is from the movable to the fixed contact at one side of my switch and from the fixed to the movable contact at the other side, the arcs at both sets of contacts are blown out in the same direction, which is preferably away from the supporting member 13.

The interlocking switch operates as follows: When the actuating coil 2 of the contactor is not energized, the parts of my interlocking switch are as shown in Figs. 1 and 2, and a circuit is completed across the first and third pairs of fixed contacts 15, counting from the end of the rod upon which the member 25 is mounted. Upon energizing the coil 2 of the contactor, its armature 25 is attracted, the rod 16 is moved and: first,—the circuit across the first pair of contacts 15 is broken; then, circuits are made across the second and fourth pairs of contacts, the movable contacts being first brought into abutting engagement with the fixed contacts when the link members 17 are in a substantially vertical position and, as the actuating member moves farther both longitudinally and sidewise due to the pivotal movement of the link members from the vertical position, the yieldingly mounted movable contacts will move sidewise over the fixed contacts with a wiping movement without undue pressure thereon, as seen in Fig. 3, and finally, the circuit across the third pair of contacts is broken as seen in Fig. 4.

Although I have described in some detail the construction of the particular interlocking switch shown, it is evident to those skilled in the art that any number of pairs of fixed contacts and corresponding movable contact members may be provided and that by suitably arranging the stops and the springs, the circuits across the fixed contacts may be made and broken in any order, and I aim in the appended claims to cover all modifications which do not depart from the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. In a switch, the combination with a fixed contact, of an actuating member having a combined longitudinal and sidewise movement, a movable contact yieldingly mounted to slide longitudinally along said actuating member, whereby the movable contact will first be brought into abutting engagement with the fixed contact and then will be caused to move sidewise over the same with a wiping movement.

2. In a switch, the combination with a fixed contact, of an actuating member, a movable contact mounted to slide longitudinally along said actuating member, a spring opposing the sliding movement of said movable contact, and means for giving the said actuating member a combined longitudinal and sidewise movement, whereby the movable contact will first be brought into abutting engagement with the fixed contact and then will be caused to move sidewise over the same with a wiping movement.

3. In a switch, the combination with a fixed contact, of an actuating member, a

movable contact mounted to slide longitudinally along said actuating member, a spring opposing the sliding movement of said movable contact, and a link motion for giving the said actuating member a combined longitudinal and sidewise movement, whereby the movable contact will first be brought into abutting engagement with the fixed contact and then will be caused to move sidewise over the same with a wiping movement.

4. In combination, a supporting member, a pair of fixed contacts fastened to said supporting member, a rod arranged to move longitudinally and sidewise with respect to said supporting member, a contact member yieldingly mounted on said rod and arranged to complete the circuit across said fixed contacts, stops on said rod to limit the movement of the movable contact member, and automatic means for moving said rod.

5. In combination, a supporting member, a pair of fixed contacts fastened to said supporting member, a rod, a link motion for connecting said rod to said supporting member so that said rod moves longitudinally and sidewise with respect to the supporting member, a contact member yieldingly mounted on said rod and arranged to complete the circuit across said fixed contacts, stops on said rod to limit the movement of the movable contact member, and automatic means for moving said rod.

6. In combination, a supporting member, a pair of fixed contacts fastened to the supporting member, a rod, a member fastened to said supporting member, a link fastened to said second mentioned member and also to said rod so that said rod moves longitudinally and sidewise with respect to said supporting member, a contact member yieldingly mounted on said rod and arranged to complete a circuit across said fixed contacts, stops on said rod to limit the movement of the movable contact member, and automatic means for moving said rod.

7. In combination with the armature of an electromagnetically operated switch, of an interlocking switch comprising a supporting member, a pair of fixed contacts fastened to said supporting member, a rod arranged to move longitudinally and sidewise with respect to said supporting member, a bell crank lever for transmitting the motion of said armature to said rod, a contact member yieldingly mounted on said rod and arranged to complete the circuit across said fixed contacts, and stops on said rod to limit the movement of the movable contact member.

8. In combination with the frame and armature of an electromagnetically operated switch, of an interlocking switch comprising a supporting member fastened to said frame, a pair of fixed contacts fastened to said supporting member, a rod arranged to move longitudinally and sidewise with respect to said supporting member, a bell crank lever for transmitting the motion of said armature to said rod pivotally mounted on said frame, a contact member yieldingly mounted on said rod and arranged to complete the circuit across said fixed contacts, and stops on said rod to limit the movement of the movable contact member.

9. In combination, a supporting member, fixed contacts fastened thereto and arranged in pairs, a rod, automatic means for moving said rod, two contact members yieldingly mounted on said rod, one contact member making a wiping connection on one pair of fixed contacts as the rod approaches one extreme position of its movement and the other contact member making a wiping connection on the second pair of fixed contacts as the rod approaches the other extreme position of its movement, and stops on said rod to limit the movement of the movable contact members.

In witness whereof, I have hereunto set my hand this 26th day of January, 1909.

ARTHUR C. SAVAGE.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.