E. SCHILDHAUER.

CIRCUIT CONTROLLING MECHANISM.

APPLICATION FILED JUNE 8, 1912.

1,142,847.

Patented June 15, 1915.

2 SHEETS—SHEET 1.

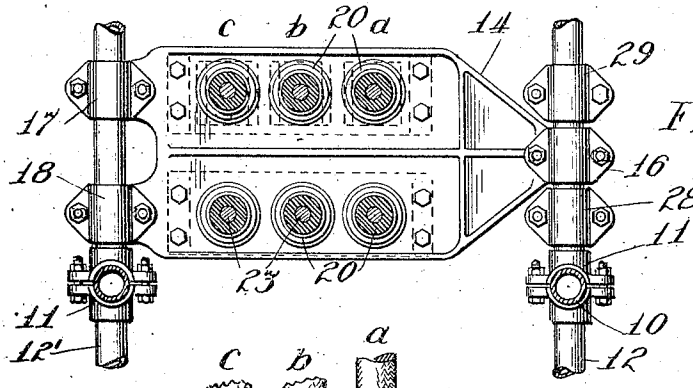


Fig. 2.

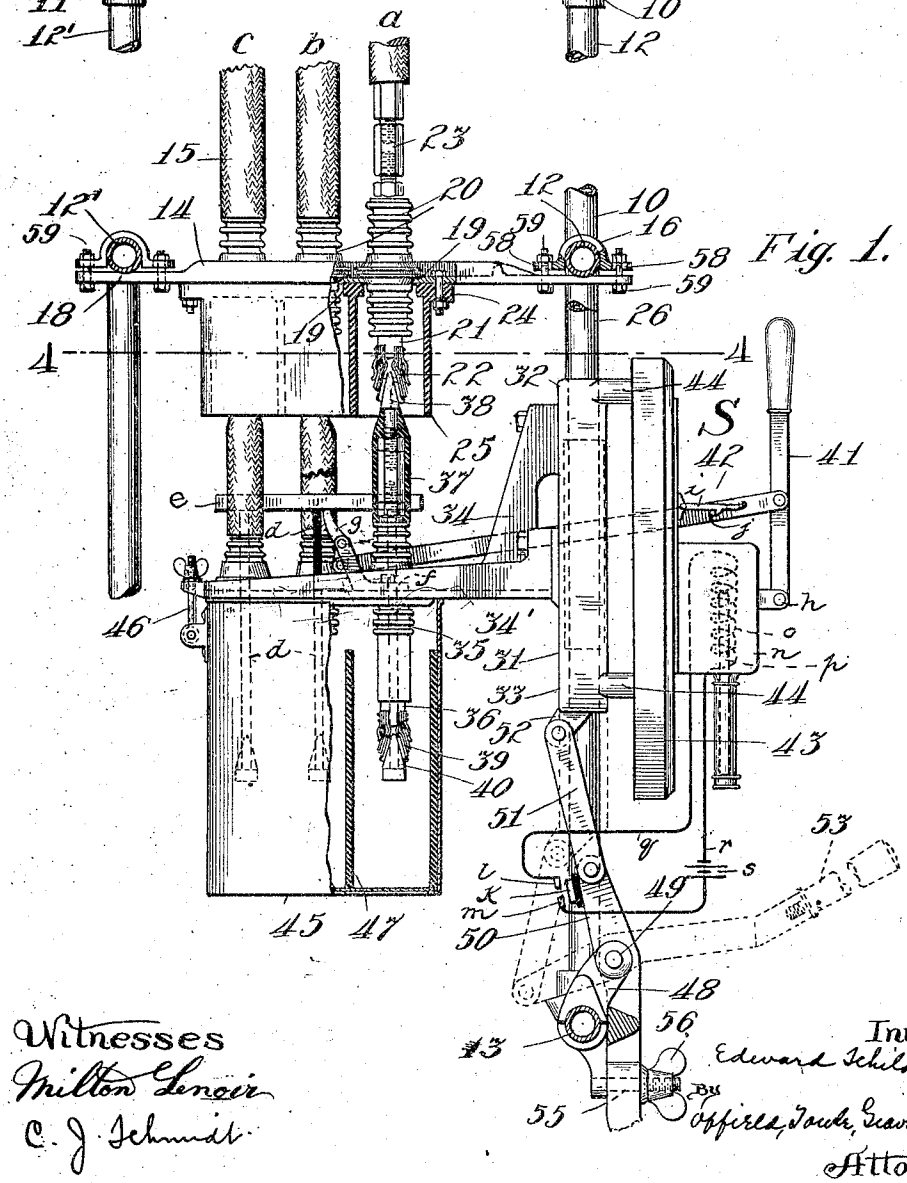


Fig. 1.

Witnesses

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2 SHEETS—SHEET 2.

Fig. 4

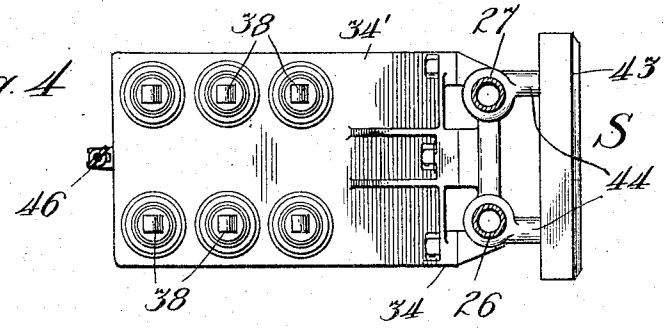
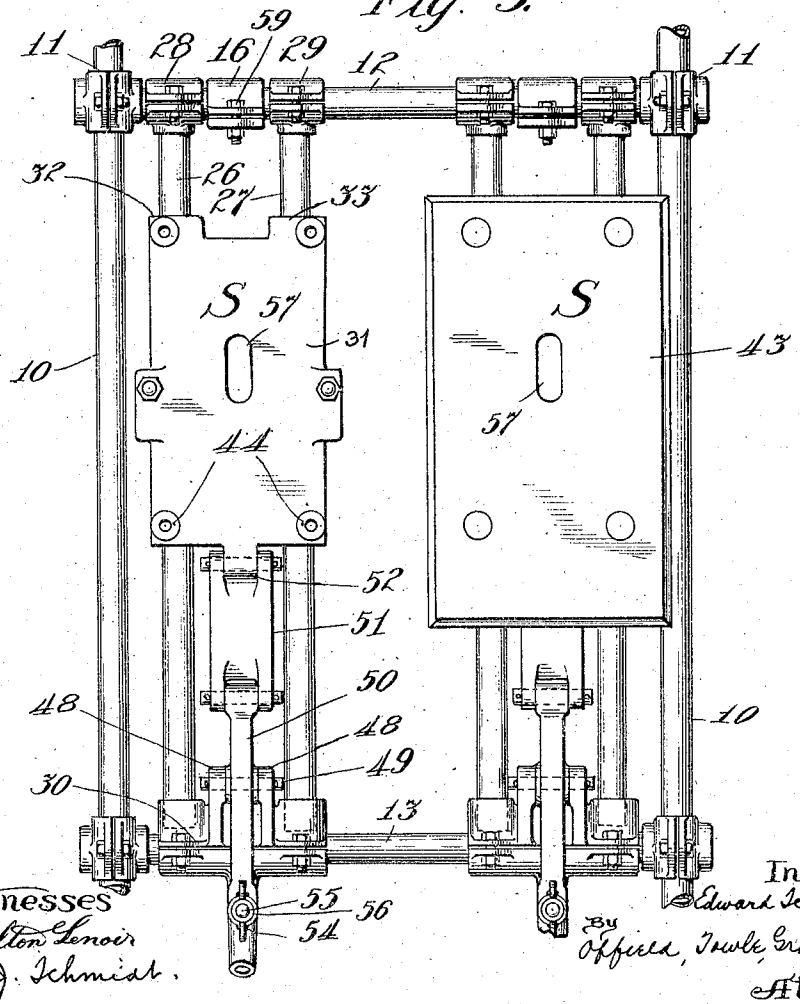


Fig. 3.



Witnesses

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CIRCUIT-CONTROLLING MECHANISM.

1,142,847. Specification of Letters Patent. **Patented June 15, 1915.**

Application filed June 8, 1912. Serial No. 702,411.

To all whom it may concern:

Be it known that I, EDWARD SCHILDHAUER, residing at Culebra, Canal Zone, have invented certain new and useful Improvements in Circuit-Controlling Mechanism, of which the following is a specification.

My invention relates to circuit controlling mechanism and involves an improved construction and arrangement for enabling such mechanism to be manipulated with greater efficiency and safety.

My invention is particularly adaptable to switch mechanisms for controlling high potential circuits where the switch mechanism contacts are apt to become burned and roughened and where such contacts must, therefore, be frequently smoothed and cleaned. This is particularly true in connection with oil switch mechanisms controlling high potential circuits, in which switch mechanisms the oil in time becomes charred and the contacts burned and it becomes necessary to renew the oil and to clean and smooth off or to replace the contact tips. It is often possible that switch contacts, even after opening of the switch, are still in connection with circuits and are charged to an unsafe potential so that manipulation thereof would be unsafe and dangerous. A usual practice heretofore has been to insert ordinary knife blade disconnecting links in each of the leads to the switches. These knife blade switches are opened after the main switches have been opened so that the main switches are isolated to enable safe manipulation thereof for inspection and repair purposes. These individual knife blade switches are satisfactory where the installation is isolated and where inspection and repairs are at rare intervals, but in limited space, as, for example, in transformer rooms, the necessary large number of knife blades assumes very cumbersome dimensions. Furthermore, when such knife blade switches are applied to multiple pole switches, they expose a large amount of uninsulated metal and for this reason are unsafe and undesirable, particularly in limited space, and where the weather conditions are such as to cause rapid corrosion of metallic parts.

Among the important objects of my invention are to provide a safer method for operating switches connected to dangerous high potential electric wires; to provide a construction and arrangement in which individual disconnecting switches are eliminated and wherein uninsulated metallic switch parts are avoided; to provide a construction and arrangement in which the various switch parts of a multiple pole switch mechanism can be simultaneously connected or disconnected and by the use of only a single lever mechanism; to provide such arrangement of circuit terminals and switch mechanism that the circuit terminals and switch mechanism may be relatively displaced to effect entire disconnection of the switch mechanism from circuit; to provide a terminal frame for circuit conductors and a unitary frame for supporting the switch mechanism and to provide means for effecting relative displacement between said frames to disconnect the switch mechanism from circuit; to provide switch mechanism in the form of a unitary structure adapted to be displaced bodily with reference to the circuit conductors so as to effect complete electrical disengagement of the switch mechanism from the conductors; to provide improved contact mechanism for electrically connecting the switch mechanism terminals with main conductor terminals; to provide improved mechanism controllable either manually or by power for effecting relative displacement between the switch mechanism and the main conductor terminals; and in general to provide simple, compact and safe construction and arrangement in which a single operation will effect simultaneous isolation of all the switch mechanism contacts from main circuit conductors.

In the accompanying drawings are clearly illustrated the nature and scope of my invention.

Figure 1 is a side elevational view of main conductor terminal mechanism and switch mechanism together with one form of means for effecting relative displacement between the switch mechanism and main conductors, parts being broken away to more clearly illustrate the construction; Fig. 2 is a plan view showing particularly the terminal structure for the main conductors; Fig. 3 is a front elevational view of two sets of apparatus shown in Fig. 1, the switch mechanism panel being omitted on one side, and Fig. 4 is a plan view of the switch mechanism looking from plane 4—4, Fig. 1.

The supporting frame work for the various parts comprises vertical members 10 which may be in the form of pipes, these

vertical members receiving supporting blocks 11 adapted to be securely clamped thereto after adjustment thereon. Supported by these blocks on adjacent vertical members are uper and lower cross-bars 12 and 13, which may also be in the form of pipes and from which the main conductor terminals and the switch mechanisms are supported. A horizontal frame 14 supports the terminal ends to each set of main conductors 15 and at its front end has a clamping block 16 for receiving a front cross-bar 12 and at its rear end has two clamping blocks 17 and 18 for receiving the corresponding rear cross-bar 12'. The frame 14 has a plurality of openings 19 each receiving an insulating bushing 20 for supporting a terminal bar 21 carrying at its lower end a V shaped contact jaw or socket 22. The upper end of each terminal bar is connected with one of the main conductors 15 as by means of the adjustable connecting mechanism 23 shown in Fig. 1.

As shown, three circuits, *a*, *b* and *c* are to be controlled, as, for example, the three branches of a 3-phase alternating current circuit, the terminal jaws of each branch terminating adjacent each other below the frame 14.

Depending from the frame 14 are one or more guard frames 24 of molded compound or other suitable insulating material, having a number of vertical walls or partitions 25 to form a compartment for each of the terminal jaws, these walls extending downwardly sufficiently to prevent short circuit between adjacent jaws and also to protect the attendants against contact with the terminals.

Each switch mechanism S is supported on two vertical slide rods 26 and 27, extending between upper and lower cross-bars 12 and 13. The upper ends of these slide rods terminate in blocks 28 and 29, respectively, for clampingly engaging the upper cross-bars 12, these heads being at either side of the front block 16 of the terminal supporting frame 14 associated with the particular switch mechanism The slide rods for each switch mechanism terminate at their lower ends in a block 30 having clamping engagement with the lower cross-bars 13, as clearly shown in Fig. 3.

Each switch mechanism S has a supporting cross head 31 having upper and lower bearings 32 and 33 for receiving the slide rods 26 and 27, so that the switch mechanism is vertically reciprocable on said slide rods.

Secured to the back of the cross head and extending rearwardly therefrom is a bracket 34 whose horizontal part 34' forms a supporting shelf for the switch contact mechanism. This supporting shelf has a number of openings each receiving an insulating bushing 35, the various bushings being in vertical alinement with the corresponding bushings 20 which receive the terminal ends of the conductors 15.

Extending through each bushing 35 is a stud 36 to whose upper end is secured by means of an adjustable coupling 37 a wedge shaped contact head 38 for engaging in the contact jaw 22 of the corresponding main conductor terminal. The lower end of each stud 36 terminates in a V shaped contact jaw 39.

For electrically connecting together the adjacent switch mechanism terminal jaws 39 for the various circuits *a*, *b*, and *c*, switch blades 40 are adapted to be simultaneously raised or lowered. As shown, these switch blades are carried at the lower ends of rods *d* extending from a plate *e*.

A bracket *f* on the shelf 34' pivots a bell crank lever *g* whose upper end engages with the plate *e*, and whose lower end is pivoted to the link 42 which extends from the switch lever 41 pivoted at its lower end at *h*.

For supporting the switch lever a panel 43 is mounted on studs 44 extending forwardly from the cross head 31. In the position shown, the switch lever is up and the bell crank lever has been rotated to lift the plate *e* to cause engagement of the switch blades 40 with the contact jaws 39. To lock the parts in this position, a latch *i* is pivoted to the panel 43 and engages a pin *j* on the link 42. To open the switch this latch is raised and the plate *e* together with the switch blades will drop by gravity to open position and the switch lever 41 will be swung downwardly.

Where oil is used for insulation, and arc prevention, the oil receptacle 45 may be suspended from the shelf 34' and held in position by one or more thumb bolt mechanisms 46. The receptacle preferably has partitions 47 for isolating the switch terminals and blades of the various circuits in separate oil compartments.

With the above arrangement, the switch mechanism is in the form of a unitary structure vertically reciprocable on its supporting slide rods. In the ordinary course of circuit control the switch lever 41 will be manipulated to simultaneously raise the various switch blades 40 into the switch terminal jaws 39. or to simultaneously release these switch blades. If, however, these contacts are to be inspected, cleaned or repaired, the blades 40 should first be lowered to break the various circuit branches and then the cross head 31 is lowered to withdraw the switch stud heads 38 from the terminal jaws 22 of the conductors and the switch mechanism will then be entirely disconnected from the various circuits and can be safely handled.

I have shown one form of mechanism for controlling the reciprocation of the switch

mechanism supporting cross head. On the block 30 which receives the lower ends of the slide rods of each switch mechanism, upstanding lugs 48 support a pin 49 for pivoting at an intermediate point a lever 50. At its inner end this lever pivots to the lower end of the link 51 whose upper end is pivoted to the lug 52 extending downwardly from the cross head 31. The outer end of the lever 50 terminates in a removable handle 53. As clearly shown in Fig. 1, when the outer end of the lever is swung downwardly into substantially vertical position, the cross head of the switch mechanism will be up and the switch stud contact heads 38 are forced into the terminal jaws or sockets 22 of the conductors. When the lever 50 is swung into position indicated by dotted lines in Fig. 1, the cross head 30 will be lowered and the switch stud heads 38 disconnected from the conductor terminal jaws and the switch mechanism will be entirely free of any circuit connections and can be readily manipulated without any danger. Suitable means may be provided for locking the switch mechanism in its upper position and as shown the outer end of the lever 50 has a slot 54 for receiving a stud 55 extending from block 30, a wing nut 56 being then applied to the stud to lock the lever in its lower position so that the cross head will be in its upper position and the switch stud heads 38 will be held securely in the conductor terminal jaws 22. The mechanism will usually be locked in this position and the circuits will be opened and closed by manipulation of the switch levers 41, and it is only when the oil is to be changed or when the switch parts 39 and 40 are to be handled, that the switch mechanism as a whole will be bodily displaced and disconnected from the circuit conductors.

I do not desire to be limited to the bodily movement of the switch mechanism away from the circuit conductor terminals, as it is evident that the switch mechanism could be stationary and means provided for raising and lowering the frame supporting the circuit conductor terminals, the broad invention residing in the relative displacement or separation of the switch mechanism and the circuit conductor terminal mechanism, so as to effect electrical disconnection between the conductors and the switch mechanism contacts.

It is of course important that when the circuits are to be broken under normal conditions this should be effected at the oil switch contacts and not at the contacts 21, 22.

To prevent opening of the circuits at contacts 21, 22, either by accident or design, means are preferably provided for automatically causing actuation of the oil switch mechanism before contacts 21, 22 are opened should the lever mechanism be actuated to cause bodily movement of the oil switch before the oil switch itself has been actuated to open the circuit. In the drawings electrical means are shown, the upper end of lever 50 being provided with a switch bar k adapted to wipe over contacts l and m immediately after the lever is started to effect bodily movement of the switch mechanism. In the casing n mounted on the panel is a solenoid winding o and core p and the terminals of this winding are connected by conductors q and r with the contacts l and m, so that when these contacts are connected by the bar k the solenoid will be energized by current from a source s and the core p raised. The latch i is in the path of this core and will be raised to release the link 42 to allow the oil switch contacts to separate. Breaking of the main circuits under normal conditions will thus always be accomplished at the oil switch contacts before the oil switch structure can move sufficiently to break the circuit at contacts 21, 22 and these contacts will always be protected.

In Fig. 3 I have shown two sets of mechanisms placed side by side and each comprising a conductor terminal supporting frame 14, a switch mechanism unit, and mechanism for vertically adjusting the unit. The two sets of mechanisms are supported on common cross bars 12 and 13, and between two adjacent vertical members 10 and constitute one section of an installation. This is desirable arrangement where duplicate installation is provided, or where the service is kept continuous through one switch mechanism while the other switch mechanism has been bodily disconnected and is under inspection or repair. In the mechanism at the left of Fig. 3, the switch panel 43 is removed to show the opening 57 through which the lever mechanism 42 extends from switch lever 41 (Fig. 1) to connect with the mechanism for raising and lowering the switch blades 40.

The frames 14 supporting the circuit conductor terminals are adjustable longitudinally along the cross bars 12 and 12′ by means of their heads 16, 17 and 18. Provision is also preferably made to enable adjustment of these frames at right angles with these cross bars and this may be accomplished by elongating in the caps of the supporting heads the holes 58 through which the clamping bolts 59 pass. With this lateral adjustment provision, the frames 14 may be adjusted to assure accurate entrance of the switch stud heads 38 into the conductor terminal jaws 22. The various metallic coupling members 23 and 37 and other parts of the circuit are suitably covered with insulating material, and suitable insulation is applied so that there will be no bare spots with which other circuits or the attendants

can come into contact during the normal position of the various parts.

I do not desire to be limited to the precise construction and arrangement shown as the invention could be carried out by and embodied in other constructions and arrangements which would also come within the scope of the allowed claims.

I claim the following:

1. In circuit controlling mechanism, the combination of a circuit terminal structure, a unitary switch structure comprising switch contacts and contact connecting members, actuating means for effecting bodily displacement of one of said structures with reference to the other whereby to connect said contact connecting members with the terminal structure or to disconnect said members from said terminal structure, locking means for locking said contact connecting members in connecting engagement with said switch contacts, electro-magnetic means for controlling said locking means, and an electrical circuit for said electro-magnetic means controlled by said actuating means.

2. In circuit controlling mechanism, the combination of a circuit terminal structure, a unitary switch structure comprising switch contacts and switch bars, actuating means for effecting bodily displacement of one of said structures with reference to the other to electrically disconnect said structures, locking means tending to hold said switch bars in electrical engagement with the switch contacts, electro-magnetic means for controlling said locking means, and contacts for the electrical circuit of the electro-magnetic means controlled during primary movement of said actuating means to effect operation of the electro-magnetic means to unlock the locking means before said switch structure is disconnected from the terminal structure during further operation of the actuating means.

3. In circuit controlling mechanism, the combination of a supporting frame, a terminal structure vertically adjustable on said frame and supporting a plurality of contact terminals adapted for connection with circuit conductors, a unitary switch structure mounted on and vertically reciprocable on said frame toward and away from said terminal structure and having switch contacts and movable switch members for connecting said contacts, means on said switch structure for controlling said movable switch members, and actuating mechanism for controlling the vertical reciprocation of said switch structure to bring the switch contacts and terminal contacts into electrical engagement or to separate such contacts.

4. In circuit controlling mechanism, the combination of a supporting frame, a terminal structure adjustable on said frame and supporting a plurality of contact terminals adapted for connection with circuit conductors, a unitary switch structure mounted on said frame and reciprocable thereon toward and away from said terminal structure and having switch contacts and movable switch members for connecting said contacts, means on said switch structure for controlling said movable switch members, and actuating mechanism for controlling the reciprocation of said switch structure to bring the switch contacts and terminal contacts into electrical engagement or to separate such contacts.

5. In circuit controlling mechanism, the combination of a circuit terminal structure, a unitary switch structure comprising switch contacts and switch bars, means for effecting bodily displacement of said entire switch structure with reference to the circuit terminal structure to electrically disconnect said structures, and means for automatically effecting separation of the switch contacts and switch bars before such relative displacement.

In witness whereof, I hereunto subscribe my name this 5th day of June, A. D. 1912.

EDWARD SCHILDHAUER.

Witnesses:
JOYCE M. LUTZ,
C. J. SCHMIDT.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."