

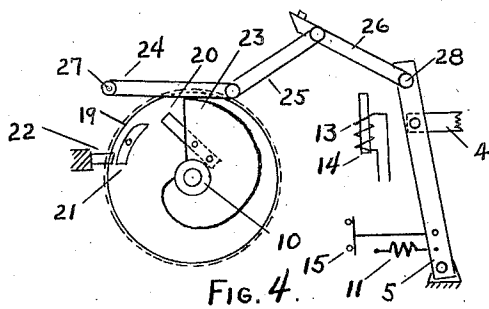
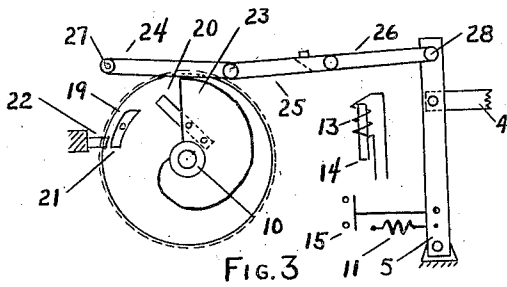
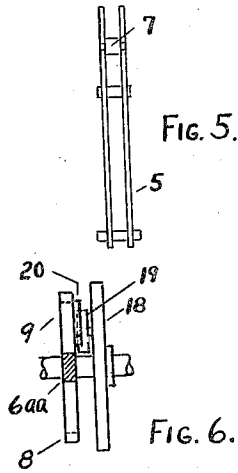
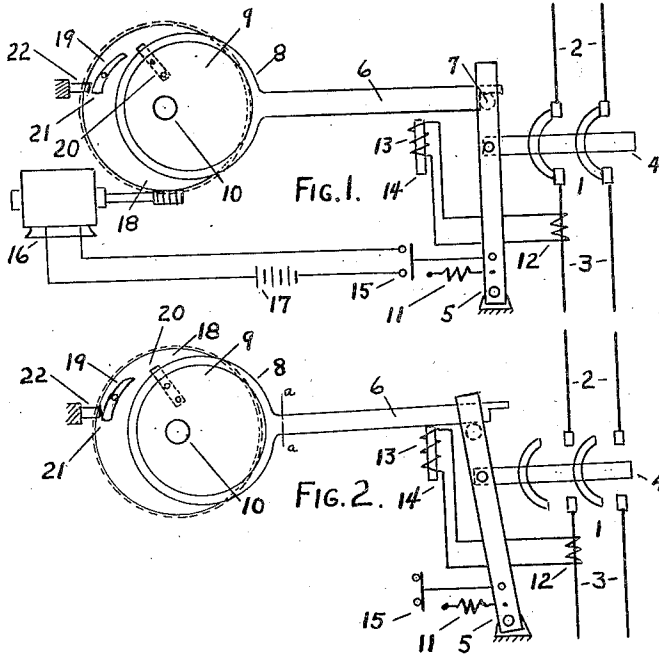
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2,401,801

SWITCH OPERATING MECHANISM

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WITNESSES.

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SWITCH OPERATING MECHANISM

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10 Claims. (Cl. 200—92)

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My invention relates to switch operating mechanisms, and more especially to power-operated switch operating mechanisms, wherein the operation of a switch or circuit breaker is controlled by power as regards the closing of the switch, and by overload tripping means as regards the opening of the switch.

The object of my invention is to provide a simple, inexpensive and reliable device for opening a switch protecting a circuit, in case of overload or abnormal conditions in the circuit, and for closing the switch by power means upon the application to the device of an impulse produced either manually, or automatically by a suitable timing device, which timing device may be driven either independently, or by the same or other driving means which drives the switch operating mechanism, the switch closing operation being made promptly and reliably upon the application of such impulse.

Other objects of my invention will appear in the further and more detailed description which follows.

It is common practice to provide a switch or circuit breaker with a power-operated mechanism having a motor or solenoid which, when energized, operates to close the switch. It is also common practice to provide a switch with a power-operated mechanism in which the driving motor is energized immediately when the switch opens, and in which suitable devices interposed between the motor and the switch are held ineffective until it is desired to close the switch, one instance of such practice being described in my U. S. Patent 1,954,849. The advantage of starting the motor immediately upon opening of the switch is, that the motor will have attained substantially full speed by the time the closing impulse is received by the closing mechanism, and hence, maximum torque is therefore immediately available to close the switch. An additional advantage is, that the motor may be used for other purposes, such as the operation of a timing device, during the interval between the opening of the switch and the time when it is desired to effect a closure. The continuous operation of the motor during switching operations, however, makes possible faulty operation, or rather successive operations known as "pumping" if the switch is closed into a faulty circuit, and it is the primary object of this specification to describe a mechanism not subject to such faulty or repeated operation when an impulse, either from a timing device or from a manual source has been transmitted to the mechanism.

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Reference is had to the accompanying drawing in which

Fig. 1 represents a side elevation, semi-diagrammatic, of a switch-closing mechanism embodying the features of my invention, the switch being shown in closed position;

Fig. 2, a similar view, with certain parts omitted, the switch being in open position;

Fig. 3, a similar view, differing from the preceding figures principally in the mechanical linkage between the switch-closing instrumentality and the switch, the latter being shown in closed position;

Fig. 4, a view similar to Fig. 3, with switch in open position;

Fig. 5, an end view of the switch lever;

Fig. 6, an end view, in third angle projection, of the switch-closing instrumentality shown in Figs. 1 and 2.

Referring to Fig. 1, a switch 1 is connected between supply circuit 2 and load circuit 3, the switch contacts being controlled by the movement of a switch rod 4 and attached switch lever 5. One end of a bar 6 is adapted to engage a pin or roller 7 on the end of lever 5, the other end of bar 6 terminating in an eccentric strap 8 enclosing eccentric 9 which is mounted on shaft 10. With the switch closed as in Fig. 1, and tending toward an open position thru biasing means represented by spring 11, bar 6 is therefore interposed between switch lever 5 and concentric 9, and holds the switch in closed position. The eccentric 9 may be maintained in this position by friction with its strap 8, or a suitable retaining means, not shown herein, may be employed.

Upon the occurrence of an overload of predetermined intensity in load circuit 3, current from current transformer 12 energizes trip coil 13, whose plunger 14 rises and strikes bar 6, forcing its notched end out of engagement with pin 7, allowing switch 1 to open. The opening action of the switch lever 5 closes motor switch 15, energizing motor 16 thru a suitable motor power source 17, thus rotating disc 18 thru suitable gearing, here represented by a worm on the motor shaft, and worm wheel teeth on the periphery of disc 18.

To close the switch, an impulse, either manual, or automatic from an associated timing device depresses the leading end of pawl 19 just prior to its arrival at the lug 20, which is attached to eccentric 9, so that pawl 19 engages lug 20, thereby causing disc 18 to carry eccentric 9 around with it, both disc 18 and eccentric 9 being mounted independently on shaft 10. The first

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portion of the rotation of eccentric 9 withdraws the notched end of bar 6 sufficiently to permit its re-engagement with pin 7; the remainder of its rotation, completing one revolution, forces switch lever 5 back into its original position, closing switch 1. At the completion of the revolution just described, end 21 of pawl 19 engages fixed stop 22, bringing pawl 19 with a wiping action out of engagement with lug 20, thereby stopping the eccentric 9. This method of causing one complete revolution of eccentric 9 by a single impulse directed at pawl 19 is analogous to the motion ordinarily found in punch press mechanisms, and no invention is claimed for this action per se. It will be noted also that the closing of switch 1 also causes simultaneous opening of motor switch 15, the inertia of moving parts being sufficient to complete the revolution of eccentric 9. A motor switch having a snap action, which would remain closed until eccentric 9 had fully completed its revolution could obviously be used to replace the type of switch indicated at 15, and it is equally obvious that if any associated mechanism, such as a resetting device for the timing mechanism required motor power after the closing of switch 1, a suitable switch could be provided at 15 which would be closed by the opening action of switch 1, and opened by some other instrumentality at a later time.

In the modification of this switch operating mechanism shown in Figs. 3 and 4, the action is similar, except that a cam 23 is used instead of eccentric 9, and a three-part joined bar assembly 24-25-26 is used instead of bar 6. In this device, bar 24 turns about a fixed shaft 27, its free end being attached to toggle members 25-26, the other end of the toggle assembly being attached to a pin 28 on switch lever 5. In Fig. 3, which represents the mechanism in a closed position, the assembly 24-25-26 is in compression, bar 24 resting on cam 23, switch 1 being held closed. The action of trip coil plunger 14 breaks toggle 25-26, allowing switch 1 to open. Upon depressing pawl 19, lug 20 is engaged, causing cam 23 to make one complete revolution, in the same manner as previously described for eccentric 9, the first portion of such revolution permitting lever 24 to fall, straightening out toggle members 25-26, the latter portion raising lever 24 back into the position indicated in Fig. 3, the corresponding pressure serving to force switch lever 5 back into its closed position by pressure thru the straightened toggle members, thus closing switch 1. In this case, as in the structure shown in Figs. 1 and 2, the pawl 19 is wiped out of engagement with lug 20 upon the completion of one revolution, preventing further rotation of cam 23 until another impulse has been received by pawl 19.

The word "impulse" as used herein means the application of pressure to pawl 19, whether by manual, automatic or remote control means, sufficient to cause engagement of pawl 19 with lug 20. According to the structures shown, such impulse must be effective in so depressing pawl 19 when the pawl is between fixed stop 22 and lug 20, in order that the pawl may be out of reach of either at the time it is depressed, and so effect proper engagement of the pawl with lug 20.

I do not desire to restrict this invention to the particular construction herein disclosed, as it is obvious that other forms may be employed without departing from the spirit of the invention.

What I claim is:

1. In switch operating mechanism, the com-

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ination of movable switch contacts, a switch lever connected thereto, a thrust member arranged to move said switch lever to and to maintain it in circuit closed position, means for rendering the thrust member inoperative to maintain the switch lever in circuit closed position, means for actuating the thrust member comprising a rotatable element directly engageable with the thrust member, said rotatable element in its initial movement being effective to restore effectiveness of said thrust member and then move the thrust member to close said contacts and maintain the switch lever in circuit closed position, a motor, means for connecting the motor with the rotatable element for rotating said element including a clutch member engageable with the rotatable element, and means located in the path of movement of the clutch member for moving the same out of engagement with the rotatable element when the latter has made substantially a single revolution, whereby the switch lever will be maintained in circuit closed position and continued operation of the motor will not produce repeat operations of the switch lever.

2. In switch operating mechanism, the combination of movable switch contacts, a switch lever connected thereto, a thrust member arranged to move said switch lever to and to maintain it in circuit closed position, overload responsive means for rendering the thrust member inoperative to maintain the switch lever in circuit closed position, means for actuating the thrust member comprising a rotatable element directly engageable with the thrust member, said rotatable element in its initial movement being effective to restore effectiveness of said thrust member and then move the thrust member to close said contacts and maintain the switch lever in circuit closed position, a motor, means for connecting the motor with the rotatable element for rotating said element including a clutch member engageable with the rotatable element, and means located in the path of movement of the clutch member for moving the same out of engagement with the rotatable element when the latter has made substantially a single revolution, whereby the switch lever will be maintained in circuit closed position and continued operation of the motor will not produce repeat operations of the switch lever.

3. In switch operating mechanism, the combination of a switch, a switch lever connected thereto, a thrust member arranged to move said switch lever to and to maintain it in circuit closed position, overload responsive means for rendering the thrust member inoperative to maintain the switch lever in circuit closed position, means for actuating the thrust member comprising a rotatable element directly engageable with the thrust member, said rotatable element in its initial movement being effective to restore effectiveness of said thrust member and then move the thrust member to close said switch and maintain the switch lever in circuit closed position, means for rotating the rotatable element including a motor, gearing connected with the motor, a clutch member carried by the gearing and engageable with the rotatable element, whereby said rotatable element is actuated by the motor, and a fixed stop located in the path of movement of the clutch member and arranged to disengage the clutch member from the rotatable element when the latter has made substantially a single revolution, whereby the switch lever will be maintained in circuit closed position and repeat operations of

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the switch lever prevented should the motor continue running.

4. In switch operating mechanism, the combination of a switch, a switch lever connected thereto, a rotatable element, thrust means releasably connecting said switch lever to said element, overload responsive means for releasing the switch lever, a motor, means for connecting the motor with the rotatable element including a clutch member engageable with the rotatable element, and means located in the path of movement of the clutch member and arranged to effect disengagement of the same from the rotatable element when said element has moved the switch lever to circuit closed position, whereby continued operation of the motor will be ineffective to produce repeat operations of the switch lever.

5. In switch operating mechanism, the combination of a switch, a switch lever connected thereto, a rotatable element, switch lever actuating means releasably connecting the switch lever and the rotatable element, actuating means for the rotatable element including a motor, said actuating means being normally free of each other, a clutch member carried by the actuating means and engageable with the rotatable element, and means located in a fixed position in the path of movement of the clutch member for effecting disengagement of the clutch member from the rotatable element when the switch lever has been moved to circuit closed position, whereby continued operation of the motor will be ineffective to produce repeat operations of the switch lever.

6. In switch operating mechanism, the combination of a switch, a switch lever connected thereto, a rotatable element, switch lever actuating means releasably connecting the switch lever and the rotatable element, actuating means for the rotatable element including a motor, said actuating means being normally free of each other, a clutch member carried by the actuating means and engageable with the rotatable element, overload responsive means for releasing the switch lever, and means located in a fixed position in the path of movement of the clutch member for effecting disengagement of the clutch member from the rotatable element when the switch lever has been moved to circuit closed position, whereby continued operation of the motor will be ineffective to produce repeat operations of the switch lever.

7. In switch operating mechanism, the combination of movable switch contacts, a switch lever connected thereto, a thrust member adapted to move said switch lever to and to maintain it in circuit closed position, means for rendering said thrust member inoperative to maintain said switch lever in circuit closed position, means for actuating said thrust member comprising a rotatable element, said rotatable element in its initial movement being effective to restore the effectiveness of said thrust member in closing said contacts and maintaining the switch lever in circuit closed position, a motor, and means for connecting the motor with the rotatable element including a clutch member engageable with the rotatable element, and means located in a fixed

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position in the path of movement of the clutch member and effective to disengage the same from the rotatable element when the switch lever has been moved to circuit closed position, whereby continued operation of the motor will be ineffective to produce repeat operations of the switch lever.

8. In switch operating mechanism, the combination of a switch lever, a rotatable element, thrust means comprising a bar releasably connected at one end to said switch lever and connected at the other end to said rotatable element, overload responsive means for disconnecting said thrust means from said switch lever, actuating means effective to produce a predetermined rotative movement of the rotatable element in a portion of which movement the thrust means is engaged with said switch lever and in another portion said switch lever is advanced to circuit closed position, a motor, and means for connecting the motor with the rotatable element including a clutch member engageable with the rotatable element, and means located in a fixed position with relation to the path of movement of the clutch member to effect disengagement of the same from the rotatable element when the switch lever has been moved to circuit closed position.

9. In switch operating mechanism, the combination of a switch lever, a rotatable element, thrust means comprising a bar releasably connected at one end to said switch lever and connected at the other end to said rotatable element, overload responsive means for disconnecting said thrust means from said switch lever, actuating means effective to produce a predetermined rotative movement of the rotatable element in a portion of which movement the thrust means is engaged with said switch lever and in another portion said switch lever is advanced to circuit closed position, a motor, and means for connecting the motor with the rotatable element including a pivoted pawl engageable with the rotatable element, and a fixed stop located in the path of movement of the pawl and arranged to effect disengagement of the same from the rotatable element when the switch lever has been moved to circuit closed position.

10. In switch operating mechanism, the combination of a switch lever, a rotatable element, thrust means comprising a bar releasably connected at one end to said switch lever and connected at the other end to said rotatable element, overload responsive means for disconnecting said thrust means from said switch lever, actuating means effective to produce a predetermined rotative movement of the rotatable element in a portion of which movement the thrust means is engaged with said switch lever and in another portion said switch lever is advanced to circuit closed position, a motor, and means for connecting the motor with the rotatable element including a clutch, and means for operating the clutch to disconnect the motor from the rotatable element when the switch lever has been moved to circuit closed position.

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