Oct. 17, 1933. J. D. WOOD 1,930,962

ELECTRIC SWITCH AND OPERATING MECHANISM THEREFOR

Original Filed April 24, 1928 2 Sheets-Sheet 1

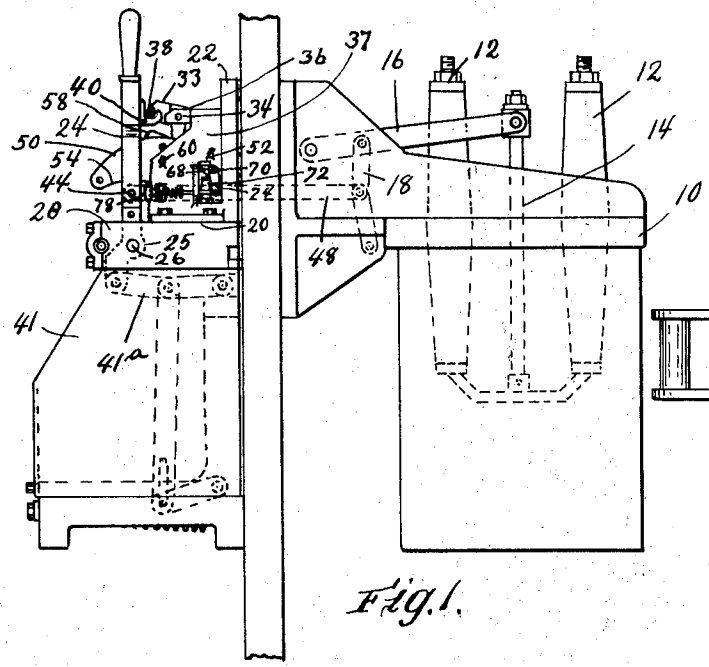


Fig. 1.

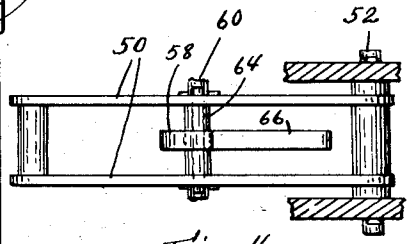


Fig. 4.

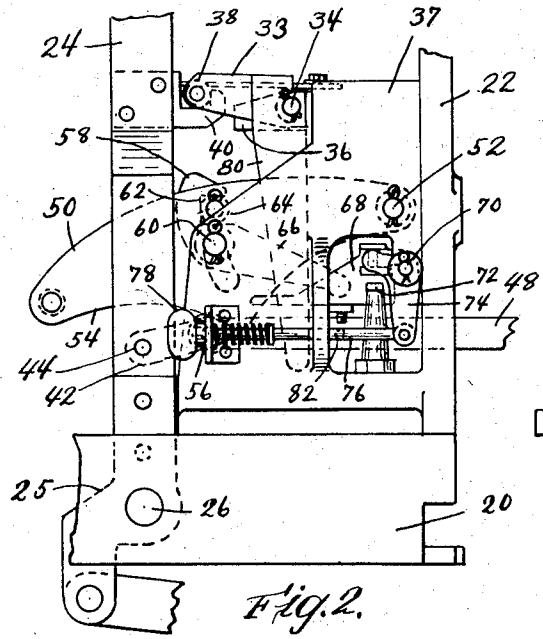


Fig. 2.

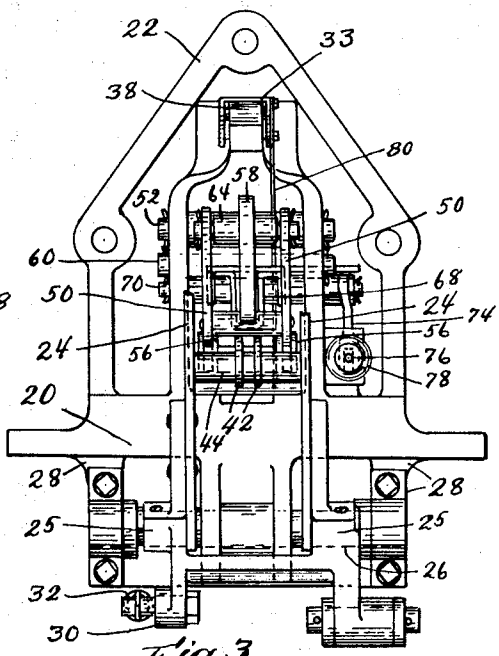


Fig. 3.

Inventor.
Joseph D. Wood
by Drummond
atty

Oct. 17, 1933. J. D. WOOD 1,930,962

ELECTRIC SWITCH AND OPERATING MECHANISM THEREFOR

Original Filed April 24, 1928 2 Sheets-Sheet 2

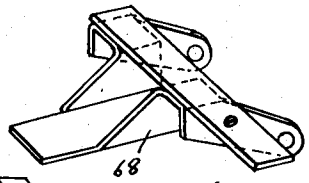


Fig. 8.

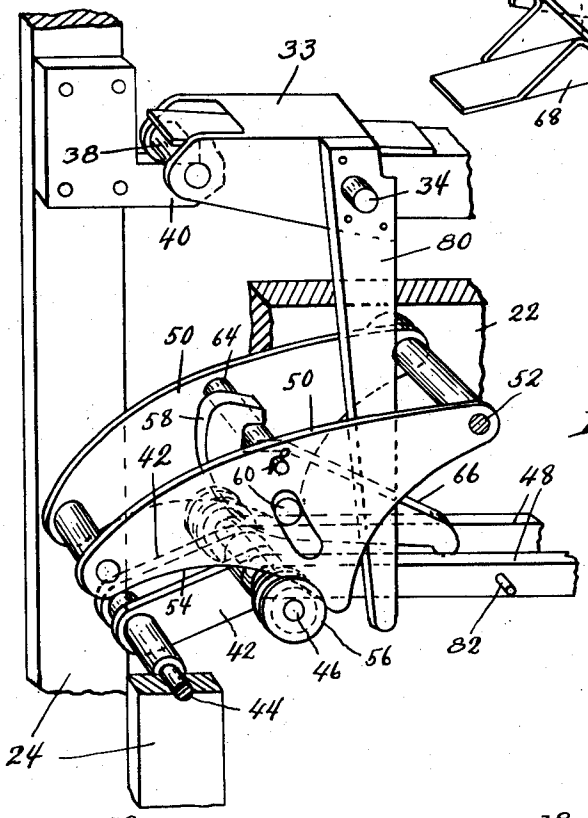


Fig. 5.

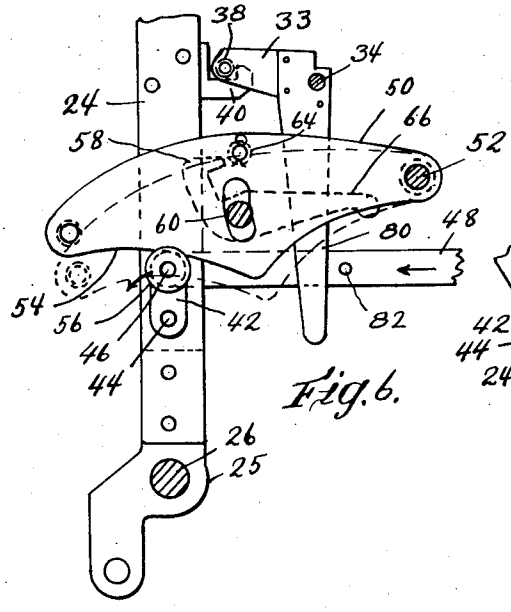


Fig. 6.

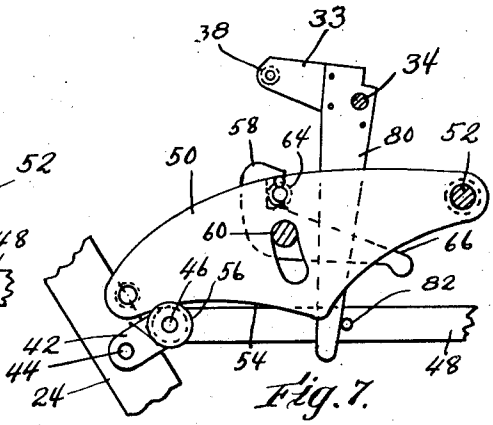


Fig. 7.

Inventor.
Joseph D. Wood
by L. J. Freemont
Atty

Patented Oct. 17, 1933

1,930,962

UNITED STATES PATENT OFFICE

1,930,962

ELECTRIC SWITCH AND OPERATING MECHANISM THEREFOR

Joseph D. Wood, Bethlehem, Pa., assignor to Condit Electrical Manufacturing Corporation, South Boston, Mass., a corporation of Massachusetts

Original application April 24, 1928, Serial No. 272,532, now Patent No. 1,825,738, December 8, 1931. Divided and this application January 24, 1929. Serial No. 334,809

10 Claims. (Cl. 200—89)

This invention relates to electric switches and switch operating mechanisms therefor and particularly to power-operated switches.

One of the objects of the present invention is an improved form of mechanism which connects the switch actuating member with the switch operating mechanism and permits the switch to be operatively disconnected from the actuating member and to move into open position independently of a corresponding movement of said member.

A further object of the present invention is the provision of an electric switch and actuating mechanism therefor having means including a toggle that connects an actuating member with the switch mechanism and latching mechanism for permitting the toggle to be broken during switch opening movement and for holding the toggle against breaking during switch closing movement.

Another object of the invention is the provision of a switch and switch actuating mechanism including an actuating handle which is adapted to be releasably locked in switch closed position, and mechanism so arranged as to permit the switch to open independently of corresponding movement of the handle and subsequently to unlock the handle and permit it to move independently into switch open position.

A yet further object of the invention is generally to improve the construction and operation of electric switches and operating mechanisms therefor.

This application is a division of my copending application Serial No. 272,532, filed April 24, 1928, now Patent No. 1,825,738, dated Dec. 8, 1931.

Fig. 1 is a side elevation of a power operated switch embodying the invention.

Fig. 2 is an enlarged detail, in side elevation, of the actuating mechanism of the switch.

Fig. 3 is a front elevation of the mechanism of Fig. 2.

Fig. 4 is a plan view of the cam plates and latch of the actuating mechanism.

Fig. 5 is a perspective view of the actuating mechanism.

Fig. 6 is a detail view in side elevation of the actuating mechanism of Fig. 5 in partly switch open position and just prior to the release of the actuating handle.

Fig. 7 is a view similar to Fig. 6 but with the actuating mechanism and actuating handle in full switch open position and with the mechanism locked for reclosing.

Fig. 8 is a perspective view of the latch tripping frame.

The invention here shown is applied to a bracket-mounted electric switch 10 of the oil immersed type having the fixed terminals 12 and the movable switch member 14. Said movable switch member is raised to and lowered from bridging relation with the fixed switch terminals by operating mechanism including the pivoted lever 16 which is operated by a toggle 18.

As here shown, the actuating mechanism for the switch has its component parts mounted upon a frame consisting of a base plate 20 and a vertical back plate 22.

The actuating member for the switch includes a bifurcated switch handle 24 which is located in front of the back plate 22 and is attached to a hub 25 which is fixed on a rod 26 journalled in lugs 28 which project forwardly of the back plate 22. Said hub has a depending ear 30 which is connected to one end of a tensile spring 32, the other end of which is connected to the back plate. The arrangement of the spring is such as to cause the handle to swing into a switch open position, illustrated in Fig. 7, when the switch is opened and the handle is released.

The normal or switch closed position of the handle is upright as shown in Fig. 1 and the handle is releasably latched in such position when the switch is closed. To this end, a latch frame 33 is pivoted at its rear end on a pin 34 carried by a forwardly projecting lug 36 of the housing 37 of the back plate. Said latch frame has a latching roller 38 that normally engages a latch 40 carried by the switch handle thereby to hold the switch handle releasably in upright position. The actuating mechanism is so arranged that when the switch handle is locked in the above described position, the switch is locked in closed position.

The switch here shown is adapted to be closed by power mechanism contained in a frame 41 disposed beneath the switch handle and connected thereto by means including a toggle 41*a*.

The closing mechanism is described and claimed in my original application and forms no part of the present invention.

The present invention is equally applicable to power operated closing mechanism or to a manually closed switch; and when the switch is adapted for manual closing solely, the toggle 41*a* will not be connected to the switch handle.

The switch handle is connected to the operating mechanism of the switch by means constituting a toggle mechanism. To this end, the

switch handle is provided with a pair of rearwardly extended short links 42 which are pivoted in spaced relation on a pin 44 carried by the switch handle and constitute members of a toggle. The rear ends of said links are connected, by a pin 46, with a pair of rearwardly extended long switch rods 48 which extend through an opening in the back plate 22 and are pivotally connected with the toggle 18 of the switch operating mechanism.

Latch controlling mechanism is provided to prevent the toggle comprising the links 42, 48 from breaking and also to permit it to break. Said mechanism includes a pair of spaced cam plates 50 which are disposed above said toggle and are pivoted at their rear ends on a pin 52 carried by the back plate. Said cam plates extend forwardly over the path of movement of the toggle joint and are provided with lower arcuate faces 54 which are struck about a center coincident with the turning axis of the switch handle. Said cam plates control the collapsing of the toggle 42, 48 and to this end the arcuate faces 54 thereof are arranged for rolling engagement with rollers 56 journalled on the toggle pin 46. Since toggle 42, 48 tends to break or collapse in an upward direction, it is apparent that when said cam plates 50 are held in the position shown in Fig. 2 they will prevent such breaking of the toggle. When, however, the lock on the cam plates is released, the action of the switch mechanism is such as to collapse the toggle, the cam plates rising to an elevated position as shown in Fig. 6.

The cam plates are held releasingly in toggle restraining position by a latch member 58 which is pivoted on a pin 60 carried by the face plate, and has a notch 62 in which the latch roller 64 of the cam plates is received. The latch is arranged by its weight to remain in normal latching engagement with the cam plates 50 thereby to hold them latched in their lowermost position as shown in Fig. 2 but when the latch is raised, the plates will be released.

The latch is provided with a rearwardly extended depending arm 66 the weight of which serves to maintain the latch in releasable engagement with the cam plates 50 and also constitutes a tripping arm for the latch. Said arm 66 is disposed above a tripping frame 68, see especially Fig. 8, which is pivoted at the rear thereof on a pin 70 carried by the back plate 22. Said tripping plate is disposed above the usual electro-magnetically raised tripping pins 72 of the face plate, one of which pins is here shown in Fig. 2, and is adapted to be raised by any one or all three of said pins into engagement with the arm 66 of the latch whereby to trip the latch.

The tripping frame 68 can also be operated manually by means of a bell crank lever 74 which is pivoted on the pin 70 and is adapted to be rotated in a counter clockwise direction into engagement with the frame. The lower arm of said bell crank lever is pivotally connected with a rod 76 that terminates in a knob 78 located in front of the face plate. By pulling the knob forwardly the bell crank lever can be operated to raise the tripping frame and trip the latch.

After the latch 58 has been tripped and when the switch is in the last part of its opening movement, it is desirable to release the latch on the actuating handle 24, whereby to permit it to swing outwardly into switch open position as shown in Fig. 7. To this end, the latch frame 33 is provided with a depending arm 80, the lower end of which is disposed close to one of the operating rods 48. Said rod carries a pin 82 which projects laterally therefrom and is arranged during the latter part of the switch opening movement to engage said depending arm 80 and consequently raise the tripping frame whereby to release the handle, which handle will thereupon move outwardly and downwardly by its weight and also by the action of the spring 32.

The switch closed position of the actuating mechanism is illustrated in Fig. 2.

The operation of the mechanism is essentially as follows:

When the latch frame 68 is raised either by an electrically actuated tripping pin 64 or by the manual tripping mechanism, the toggle holding cam plates 50 are released. The weight of the switch acting on the toggle 42, 48 is such as to collapse it and the toggle thereupon moves into some intermediate position as shown in Fig. 6 wherein the short toggle links 42 are momentarily in a generally vertical position.

During the latter part of the opening movement of the operating rods 48, the pin 82 thereof engages the arm of the tripping frame 32 and releases the operating handle which then moves into a full switch open position as shown in Fig. 7. In this position, the toggle 42, 48 has become straightened into about its normal position as illustrated in Fig. 2. Since the latch 58 is held up but momentarily it will be released by the time the switch is fully opened and thus will again engage the cam plates 50, as illustrated in Fig. 7, and will hold them against upward movement. Thus, when the switch handle 24 is moved inwardly to close the switch, the cam plates will prevent the toggle from collapsing and the switch will thus be closed, the latch frame 33 locking the handle in upright position and the switch in closed position.

I claim:

1. Switch operating mechanism including a pivoted vertical handle, a horizontally movable switch operating rod, a collapsible toggle connection between said rod and handle, means including a cam member which releasably holds said toggle set, means to release said cam member and permit the breaking of said toggle, a pivoted latch arranged to hold said handle releasably in switch closed position, said operating rod having a projection and said latch having a projection adapted to be engaged and operated by said rod-projection, whereby to trip said latch and release said handle subsequent the release of said cam member.

2. Switch operating mechanism including a switch actuating member including a pivoted handle, a switch operating member, a link the opposite ends of which are pivoted on said handle and operating member, respectively, said operating member and link constituting a toggle connection with said handle, a latch which holds said handle releasably in switch closed position, and latching mechanism controlling the collapse of said toggle having stationary supporting means therefor which is independent of said toggle.

3. Switch operating mechanism including an actuating member, latching means which holds said actuating member releasably in switch closed position, an operating member having a toggle connection with said actuating member, a movable cam member overlying the path of movement of and traversed by the set toggle and arranged to hold said toggle set during such movement, means releasably holding said cam member

in a position to prevent the collapse of said toggle, means to trip the cam member and effect the collapsing of the toggle and the opening of the switch, and means operated by the opening movement of said operating member following the collapse of said toggle to trip said latching means and to permit the independent opening movement of said actuating member.

4. Switch operating mechanism including the combination of a face plate, a vertical switch actuating handle pivoted to said plate, a horizontal movable switch operating rod having a link which is pivoted on said rod and also on said handle and constitutes a toggle connection with said handle, a roller on the pivoted connection between said rod and link, a toggle-controlling cam-member pivoted to said face plate and extending forwardly therefrom over the entire path of movement of said toggle and having a lower arcuate face which is engaged by said roller to hold the toggle set, and latch mechanism for holding said cam-member releasably in a position which prevents the collapse of said toggle, said toggle being movable between switch open and switch closed positions with its rolls in engagement with the arcuate face of said cam-member.

5. Switch operating mechanism including the combination of a face plate, a switch actuating member pivoted to said plate, a switch operating rod having a toggle connection with said actuating member, a toggle-controlling cam-member pivoted to said face plate and extended forwardly therefrom over the entire path of movement of and traversed by said toggle, and latch mechanism for holding said cam-member releasably in a position which prevents the collapse of said toggle during such movement thereof, said set toggle being movable between switch open and switch closed positions in engagement with said latched cam-member and being held in set condition thereby, means releasably holding said actuating member in switch closed position, and means actuated by the opening movement of said switch operating rod to release the holding means for said actuating member.

6. Switch operating mechanism including a face plate, an actuating handle pivoted to said face plate and upstanding in front thereof, an operating rod extended through said face plate, a pair of toggle links pivoted to said actuating handle and to said rod, said links and rod constituting a collapsible toggle, rollers carried by said links and rod at the pivotal connection therebetween, a pair of connected cam plates pivoted at their rear ends to said face plate and extended forwardly therefrom and overlying the path of movement of said toggle, said cam plates having lower arcuate faces which are engaged by said rollers, and a latch located between said cam plates for releasably holding them in a position to prevent the collapsing of said toggle, said rollers being engageable with the cam faces of said cam plates during movement of the toggle between switch open and switch closed positions, whereby to prevent the collapse of the toggle.

7. Switch operating mechanism including a face plate, an actuating handle pivoted to said face plate and upstanding in front thereof, an operating rod extended through said face plate, a pair of toggle links pivoted to said actuating handle and to said rod, said links and rod constituting a collapsible toggle, rollers carried by said links and rod at the pivotal connection therebetween, a pair of connected cam plates pivoted at their rear ends to said face plate and extended forwardly therefrom and overlying the path of movement of said toggle, said cam plates having lower arcuate faces which are engaged by said rollers, and a latch located between said cam plates for releasably holding them in a position to prevent the collapsing of said toggle, said rollers being engageable with the cam faces of said cam plates during movement of the toggle between switch open and switch closed positions, whereby to prevent the collapsible of the toggle, a latch for holding said actuating member releasably in switch closed position having a projection which is adapted to be engaged by a part of said switch operating rod during its movement to switch open position, whereby to release said actuating member and permit it to move to switch open position.

8. Switch operating mechanism comprising a face plate, an actuating handle pivoted at its lower end to said face plate and extended normally vertically in front thereof, a switch actuating member comprising a pair of horizontally disposed rods which extend through said face plate and terminate in confronting relation with said handle, a pair of links which are pivoted at their outer ends to said handle and at their inner ends to said rods, rolls on the pivotal connections between said links and rods, said links and rods constituting a switch closing toggle, mechanism for controlling the condition of said toggle comprising a pair of spaced and conjointly movable cam plates which have pivotal connections with said face plate above said rods and extend forwardly thereabove and above said rolls, said plates having lower cam faces that are adapted to be engaged by said rolls during the switch closing movement of said toggle, a latch member located between said plates having a releasable engagement therewith which holds said plates in toggle holding position, whereby said plates hold said toggle in straightened condition during switch closing movement of said handle and rods, and means for tripping said latch and releasing said plates, thereby permitting said toggle to collapse and said rods to move in a switch opening direction.

9. Switch operating mechanism comprising a face plate, an actuating handle pivoted at its lower end to said face plate and extended normally vertically in front thereof, a switch actuating member comprising a pair of horizontally disposed rods which extend through said face plate and terminate in confronting relation with said handle, a pair of links which are pivoted at their outer ends to said handle and at their inner ends to said rods, rolls on the pivotal connections between said links and rods, said links and rods constituting a switch closing toggle, mechanism for controlling the condition of said toggle comprising a pair of spaced and conjointly movable cam plates which have pivotal connections with said face plate above said rods and extend forwardly thereabove and above said rolls, said plates having lower cam faces that are adapted to be engaged by said rolls during the switch closing movement of said toggle, a latch member located between said plates having a releasable engagement therewith which holds said plates in toggle holding position, whereby said plates hold said toggle in straightened condition during switch closing movement of said handle and rods, means for tripping said latch and releasing said plates, thereby permitting said toggle to collapse and said rods to move in a switch opening direction, and a latch for holding said handle releas-

ably in switch closed position having an extension which is engaged and moved by the movement of said rods in a switch opening direction following the collapse of said toggle whereby to permit said handle to move into a switch open position and effect the straightening of said toggle following the switch opening movement of said rods.

10. Switch operating mechanism comprising a normally vertical switch actuating lever which has a pivotal support for its lower end, a switch operating member having a toggle connection with said actuating lever, latching means which engages said lever and holds it normally in switch closed position, a pivoted cam plate which overlies said toggle and is adapted to hold said toggle in straightened position during movement thereof in a switch closing direction, means including a latch which holds said cam plate normally in position to be engaged by said toggle and restrains said toggle from collapse, tripping means for said latch which releases said cam plate and effects the collapse of said toggle and the switch opening movement of said operating member, and means which trips said latching means following the collpase of said toggle and effects the movement of said lever into a switch opening position and the automatic straightening of said toggle.

JOSEPH D. WOOD.