Jan. 13, 1942. E. H. TAYLOR 2,270,150

ELECTRIC SWITCH

Filed Oct. 3, 1938 2 Sheets-Sheet 1

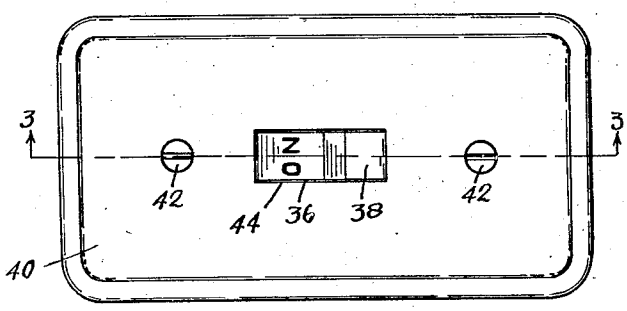

Fig. 1.

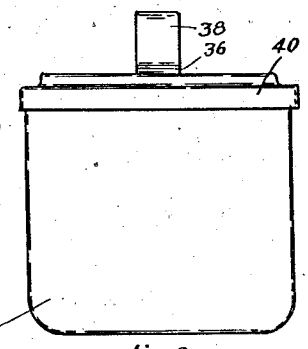

Fig. 2.

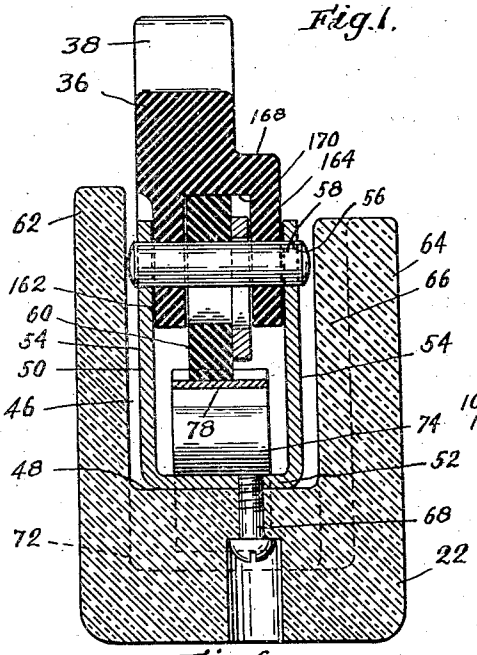

Fig. 6.

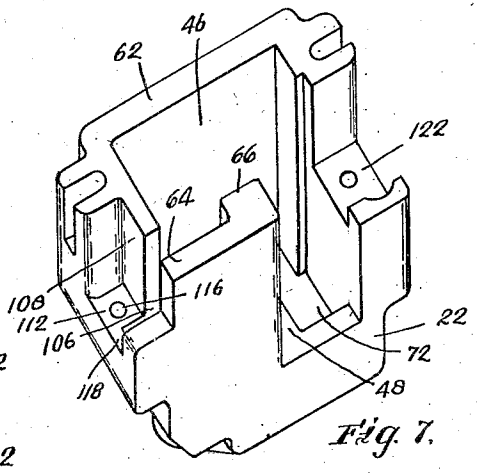

Fig. 7.

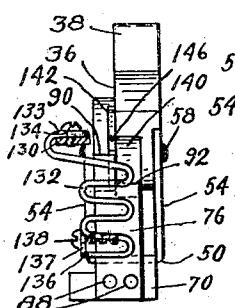

Fig. 8.

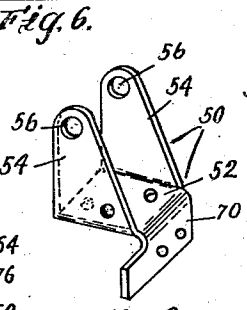

Fig. 9.

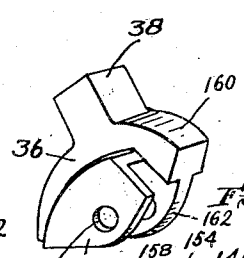

Fig. 10.

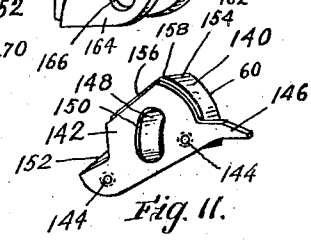

Fig. 11.

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ELECTRIC SWITCH

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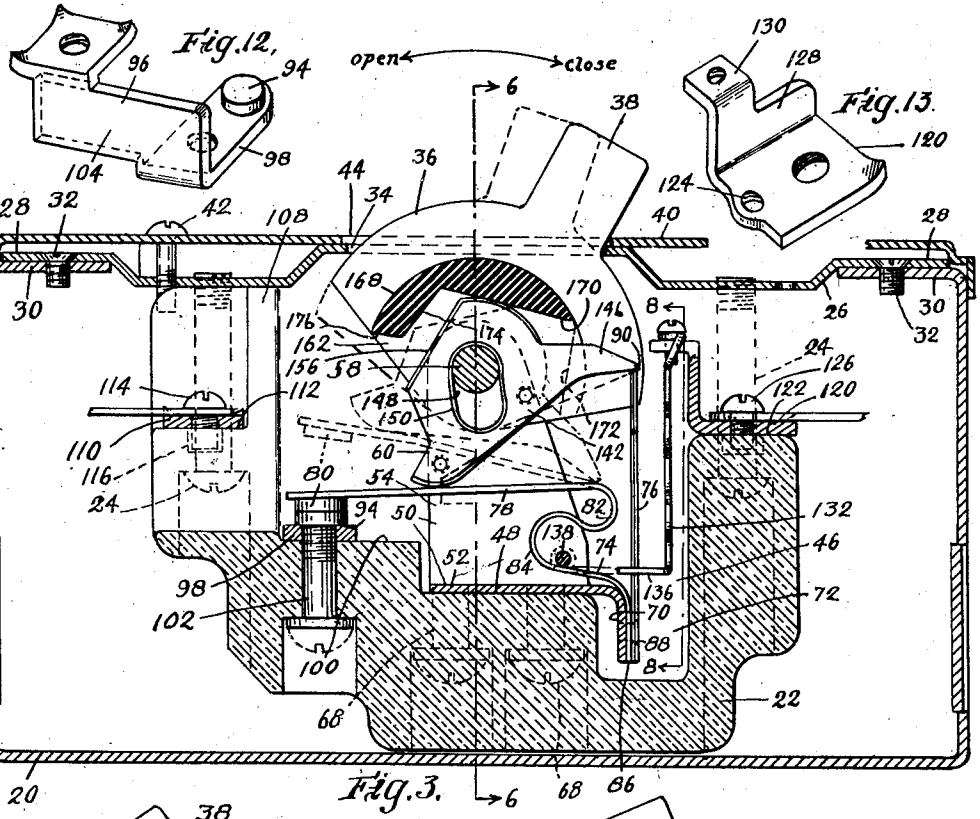

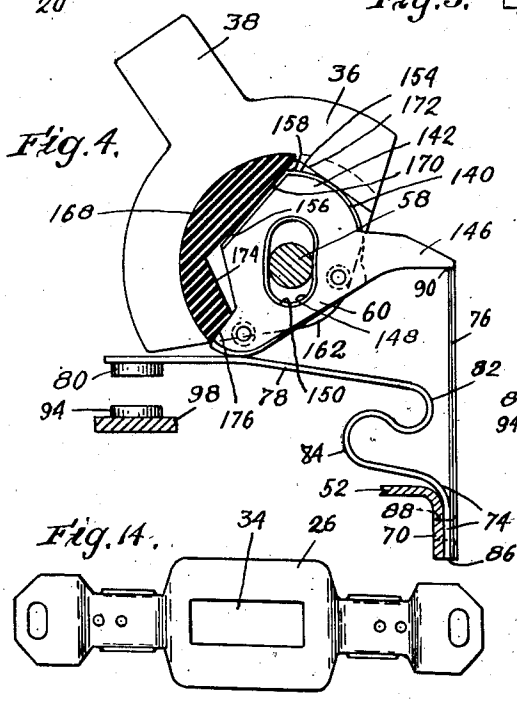

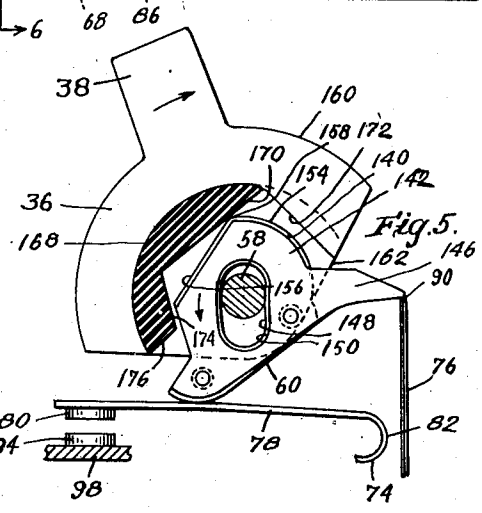

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Patented Jan. 13, 1942 2,270,150

UNITED STATES PATENT OFFICE

2,270,150

ELECTRIC SWITCH

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Application October 3, 1938, Serial No. 233,006

21 Claims. (Cl. 200—116)

This invention relates to electric switches or circuit controllers of the manually opened and closed and overload responsive opening type especially designed for the control and protection of motors and circuits of moderate power but not restricted to this type of service.

The present invention is in the nature of an improvement on the invention disclosed and claimed in my copending application Serial No. 132,735, filed March 24, 1937, now Patent No. 2,160,236, issued May 30, 1939.

The circuit controller or interrupter of the present invention includes an actuator normally pivotal or movable about a center on an electro-responsive removable pivot or fulcrum for effecting opening and closing movements of the movable switch member under manual control and movable about a second center upon removal of the electro-responsive fulcrum to effect automatic overload opening of the interrupter free from control by a manually operable operating member.

Objects of the present invention are to improve and simplify the construction and improve the operation of the interrupter; an improved form of actuator and movable switch member; an improved construction of the actuator and manual operating member by which the initial movement of the operating member in a circuit closing direction is relatively strongly opposed for a part of the movement of the operating member and thereafter the resistance to movement is reduced so that the interrupter is caused to be closed rapidly; an improved construction and disposition of the parts insuring long operating life relatively free from wear; and an improved and economical construction and arrangement of the thermoresponsive elements and associated parts.

Fig. 1 is a plan view of the circuit interrupter embodying the present invention within its enclosing casing.

Fig. 2 is an end elevation of the interrupter of Fig. 1.

Fig. 3 is an enlarged sectional elevation taken along line 3—3 of Fig. 1 and illustrating in full lines the circuit closed position of the parts and in dotted lines the electrically tripped circuit open condition of the parts.

Fig. 4 is a view similar to Fig. 3 of the essential elements of Fig. 3 in the manually circuit opened position thereof.

Fig. 5 is a view of the parts of Fig. 4 in a partially manually displaced position towards circuit closed position.

Fig. 6 is a transverse sectional elevation taken along line 6—6 of Fig. 3.

Fig. 7 is a perspective view of the insulating supporting block for the current conducting and operating elements of the interrupter.

Fig. 8 is an end elevation particularly illustrating the electro-responsive tripping mechanism taken along line 8—8 of Fig. 3.

Fig. 9 is a perspective view of the pivotal supporting bracket for the manually operating member.

Fig. 10 is a perspective view of the manually operating member.

Fig. 11 is a perspective view of the actuator.

Fig. 12 is a perspective view of the stationary contact terminal.

Fig. 13 is a perspective view of the terminal associated directly with the tripping elements.

Fig. 14 is a plan view of the block supporting strap.

The circuit interrupter embodying the present invention is contained within an enclosing casing 20 and includes an insulating block 22 secured by screws 24 to the under face of a supporting strap 26 which has end extensions 28 seated upon inwardly directed ears 30 of the casing and secured removably thereto by screws 32. The strap 26 has a longitudinally elongated opening or slot 34 in which a part of the manual operating member 36 of the interrupter is located and through which the operating handle 38 thereof projects. The engagement between the handle and the end walls of the slot 34 define the circuit open and closed positions of the operating member.

The casing is provided with a cover 40 secured to the strap 26 by screws 42 and having a slot 44 therethrough which registers with the slot 34 of the strap.

The insulating block 22 supports the circuit interrupter. The block has a relatively deep well or chamber 46 containing the major portion of the interrupter elements. The bottom or floor 48 of the well supports a bracket 50, Figs. 3, 6 and 9, comprising a flat bottom plate 52, the integral sides of which are upturned to provide parallel spaced upstanding arms 54 having aligned holes 56 therethrough adapted loosely to receive a pivot pin 58 on which are disposed the operating member 36 and an actuating member or actuator 60, Figs. 3, 6 and 11. The side wall 62 of the block closely confronts one end of the pin and the opposite side wall 64 of the block has an inwardly directed vertical rib 66 which closely confronts the other end of the pin so that the pin cannot

escape from its supporting bracket when the bracket is in place within the block. The bracket is secured to the block by screws 68 screw-threaded into the bottom plate 52 of the bracket. Said bottom plate has a vertically downwardly directed extension or ear 70 located in a recess 72 below the floor 48 and adapted to support the movable switch member 74 and an electro-responsive element 76.

The movable switch member consists of a resilient metal strip having a straight flat portion 78 disposed generally horizontally between the arms 54 of the bracket and over the floor of the recess in the block and provided on its under face at its free end thereof with a contact member 80. The strip at the other end of the flat straight portion 78 is reflexed into S configuration or is provided with a pair of oppositely reflexed resilient loops 82 and 84, respectively, which underlie the flat portion of the strip. The end part 86 of the strip is reflexed vertically downward and is positioned against the vertical face of the downwardly directed ear 70 of the bracket to which it is secured by suitable means as rivets 88.

The electro-responsive member 76 comprises a bimetal strip consisting of two metals of dissimilar coefficients of expansion secured together. The bimetal strip is secured at its lower end against the end 86 of the movable switch member by the aforesaid rivets 88 and projects vertically upwardly thereabove and is terminated in a horizontal latch engaging face 90, see especially Fig. 8. A part of the strip beside the face 90 may be cut away below the face to provide a notched portion 92 into which a part of the operating member 36 can move without engagement with the bimetal strip.

A stationary contact member 94, Figs. 3 and 12, cooperates with the movable contact member 80 and is disposed thereunder and in line therewith. Said stationary contact member is carried by a terminal structure 96 having a flat ear 98 to the upper face of which the contact member 94 is secured. Said ear 98 is disposed upon a ledge 100 in the well 46 elevated above the floor 48, the ear being clamped onto said ledge by suitable means as the screw 102.

Said ear 98 is integral with and cutstands laterally from the bottom edge of a vertical plate 104 of the terminal structure. Said plate extends into the well 46 through a narrow vertical slot 106 in the end wall 108 of the block and is provided at its outer end part with a laterally outstanding conductor receiving ear 110 parallel with the ear 98. Said plate 110 is seated upon a horizontal external shelf 112 of the block 22 and has a conductor clamping screw 114 screw-threaded thereinto, the shelf 112 having a recess 116 in its top face into which the end of the screw can project freely. The outer end of the slot 106 in the block 22 is provided with an end wall 118 against which the outer end of the plate portion 104 of the terminal structure is adapted to abut; and the inner face of the conductor receiving ear 110 is adapted to abut against the outer face of the wall 108. Thus the location of the terminal structure in the block is defined and the terminal structure needs only to be fixed in position by the screw 102.

The block is provided at the opposite end thereof with a second terminal comprising a conductor receiving plate 120, Figs. 3 and 13, seated upon the shelf 122 of the block disposed approximately at the level of the shelf 112 and secured to said shelf by suitable means as a screw, not shown, passed upwardly through the block and screw-threaded into a screw-threaded hole 124 of the plate 26. A conductor is adapted to be clamped onto said plate by a terminal screw 126. Said plate at the side facing the well 46 of the block is integrally provided with an upstanding intermediate part 128 having a horizontally reflexed end part 130 projecting into the well.

A current-traversed heating grid or resistor 132 for the bimetal member 76 has one end 133 clamped upon the part 130 by the screw 134 and is disposed parallel with and suitably close to the bimetal member. Said heater grid has a lower end part 136 that extends forwardly to the bracket 50 and is secured mechanically and electrically thereto by a screw 138 passed through the looped end 137 of the part 136 and screw-threaded removably into an upstanding side ear or arm 54 of the bracket. Thus the circuit is completed between the two terminal structures and the heater element or grid is removably connected in series with the circuit through the interrupter and can be removed and replaced by one of different characteristics when desired.

While the bimetal member is here shown as receiving energy for operation by an external heater the bimetal member can be caused to operate in any other desired way now well known in the art.

The actuating member or actuator 60, Figs. 3 and 11, comprises a cam plate 140 formed of insulating material, preferably molded of an artificial resin, and a thinner metal latch plate 142. The two plates are disposed side by side in engagement and are secured fixedly together by suitable means as rivets 144. The actuator is interposed between the operating member 36 and the movable switch member and is adapted to be engaged with both; and the faces of the cam plate 140 that engage said members are adapted to project outwardly beyond the metal latch plate sufficiently so that the latch plate does not engage the members.

The latch plate 142 is provided with an endwise extended latch arm 146 which is adapted normally to overlie and be seated upon and fulcrum in contact with the top edge or latch engaging face 90 of the bimetal member 76 in the manual opening and closing movements of the switch. The bimetal member thus constitutes a fulcrum for the actuator and defines the center about which the actuator pivots during the manual operation of the switch. The cam and latch plates of the actuator are provided with aligned passages 148 and 150 therethrough through which the pivot pin 58 is passed loosely. The passages are vertically elongated and the opposite side walls thereof are arcuate, being struck from the top face 90 of the bimetal member as a center and thus permit unrestrained vertical swinging movement of the actuator about the face 90 as a center while maintaining the actuator in engagement with the bimetal member in its normal or unwarped position.

The cam plate 140 of the actuator is provided at its end opposite the latch extension 146 with a cam projection 152 which overlies the intermediate portion of the flat part 78 of the movable contact member and is adapted to press downwardly thereupon and also to slide somewhat over the face thereof to move the switch member from circuit open to circuit closed position. In the switch closed position the cam projection 152 lies on the side of the pivot pin 58 opposite the bi-

metal member. The vertical movement of the actuating member is effected by movements of the manual operating member as will be explained hereinafter.

The S curve of the movable switch member provided by the loops 82, 84 is particularly effective in obtaining circuit control through the actuator as the loops not only provide a long resilient part to the movable switch member but the movable switch member can swing angularly about the loops and also can be moved bodily downwardly by fulcruming on the stationary contact member 94 through the flexing of the loops and during the final part of the movement of the actuator into fully closed position.

The cam plate 140 of the actuator is provided on one side with an arcuate or circular face 154 suitably struck from the center of the pin 58 when the actuator is in its lowermost switch closed position, and on the other side with a flat inclined face 156. The flat and the arcuate faces intersect at a relatively sharp angle thereby providing a relatively sharp cam point or edge 158. Said cam point preferably is located about in the vertical line through the pivot pin 58 when the switch is in manually open position, as illustrated in Fig. 4. This position of the cam point and the inclination of the flat face 152 causes considerable effort to be placed initially upon the manual operating member in a switch closing direction and thereby compels the rapid closing of the switch. This action will be explained further on in connection with the description of the operating member.

The operating member 36 is generally sectoral in shape and has the arcuate portion 160 from which the handle 38 rises and the two spaced triangularly shaped depending plates or legs 162, 164, having aligned passages 166 therethrough in which the pivot pin 58 is located loosely. The plate or leg 164 is offset from the arcuate body 160 by an arcuate connecting member or wall 168, all parts being integral and preferably molded from an artificial resin.

The actuator is located loosely on the pivot pin 58 in the space or recess between the plates or legs 162, 164. Said recess is formed with a straight top wall 170 having a camming engagement with the straight and circular portions 156, 154 of the actuator and the cam point 158 thereof. Said cam face 170 is inclined somewhat away from perpendicular relation with a radial line drawn between the center of the pivot pin 58 and the center of the handle 38 so that, when the operating member is in the switch closed position, the face slopes in a direction to provide a rapid or snap action to the circuit opening movement of the parts. The right hand end wall 172 of the recess is slightly inclined to the right away from perpendicular relation with the top wall 170. The opposite wall 174 is spaced sufficiently away from the actuator to clear it in its movements. The left hand end of the arcuate portion 168 is provided with an end face 176 which confronts a face of the switch operating cam 152 of the actuator and forms an abutment assisting in limiting movement of the actuator in a circuit opening direction as illustrated in Fig. 4.

The operation of the device is essentially as follows:

With the operating member in the left hand position illustrated in Fig. 4 and with the latch projection 146 in engagement with the bimetal strut 76 the relation between the actuator and the operating member is such that the arcuate portion 140 of the actuator is engaged with the end wall 172 of the operating member while the flat face 156 of the actuator is engaged with the top wall 170 of the actuating member, the inherent spring action of the movable switch member maintaining the parts yieldingly in the aforesaid relation with the actuator in an uppermost position or with the pivot pin 58 in the lower portion of the passage 148 of the actuator. On moving the operating member in a clockwise direction or toward the right, as illustrated in Fig. 5, to close the switch the cam wall 170 of the operating member is so displaced as to reduce its inclination with respect to the actuator and at the same time the point of contact between it and the cam point 158 of the actuator is lowered so as to move the actuator downward, thereby ultimately effecting the closing of the switch when the operating member reaches a final switch closed position, as illustrated in Fig. 3. In this position the cam face 170 of the actuator has passed over the cam point and into engagement with the circular portion 154 of the actuator.

The inherent spring action of the movable switch member maintains the operating member in its switch closed position since the cam face 170 of the operating member is now oppositely inclined so that the pressure of the actuator acting on said cam face tends to urge the operating member further into a switch closed position. Thus the line of pressure between the actuator and the operating member shifts from an initial position where the pressure opposes the closing movement of the operating member to a second position where the line of pressure assists the closing movement of the operating member.

The initial inclination of the cam face 170 of the operating member is relatively great so that on the first part of the movement of the operating member into switch closed position considerable force has to be exerted on the operating member but since the opposite to such movement becomes reduced rapidly on further displacement of the operating member the result is that the force on the operating member becomes excessive and the member is caused to be moved rapidly into switch closed position.

On manual switch opening movement the operating member is moved in the opposite direction. The pressure on the operating member required for manual opening is relatively slight and when the angularity of the cam face 170 of the operating member shifts to the other side of the horizontal the pressure of the actuating member thereon assists in the opening movement with a rapid or snap action.

The constant engagement between the movable switch member, actuator and operating member due to the inherent spring action of the movable switch member, in combination with the guiding action of the pivot pin 58 maintains the latch projection of the actuator in engagement with the bimetal strut.

When the parts are in the circuit closed position and an overload traverses the device the heater grid 132 imparts sufficient heat to the bimetal strip 76 to cause it to warp out from under the latch projection 146 of the actuator. The actuator then is unsupported against the pressure of the movable switch member since the cam projection 152 of the actuator engages the movable switch member on the side of the pivot

pin 58 opposite the bimetal strip. The pressure exerted between the switch member and the actuator causes the actuator to move in a clockwise direction, initially pivoting about the pivot pin 58 with the arcuate face 154 moving over the cam face 170 of the operating member and subsequently moving somewhat upwards or laterally on the pivot pin into the final circuit open dotted line position of Fig. 3, where the latch projection 146 engages the movable switch member close to the upper bend 82. This action takes place free from restraint by the operating member and either without effecting a movement of the operating member or by causing a movement of the operating member into the dotted line position as illustrated depending upon the inclination of the cam face 170 of the operating member.

The actuator is reset into engagement with the cooled bimetal strip by movement of the operating member into a switch open position. This movement causes the engagement of the flat face 156 of the actuator and the cam face 170 of the operating member or the engagement of the abutment 176 of the operating member with the cam projection 152 of the actuator to rotate the actuator in a counterclockwise direction so that the latch projection 146 rides upwardly over the inner face of the bimetal strip, flexing the strip into a position above the top thereof whereupon the strip will snap into its normal position under the latch projection.

The positioning of the bimetal strip 76 so that it is in proper relation with the latch projection 146 of the actuator to disengage the projection at the intended current traversing the interrupter is effected by bending the depending ear 70 of the mechanism-supporting bracket 50 slightly to one side or the other of the vertical. This is a convenient, economical and accurate manner of calibrating the device.

I claim:

1. In an electric circuit interrupter, a movable switch member, spring means urging said switch member constantly in a circuit opening direction, a pivotally supported actuator free to move relatively to said contact member acting on said switch member, and a pivoted operator for said actuator arranged to move the latter in a circuit closing direction against the action of said spring means, said operator and said actuator having cooperating cam faces shiftable relatively to each other to oppositely inclined positions to effect circuit opening and closing movement of said actuator by said operator and to hold said operator releasably in both circuit closed and circuit open positions.

2. In an electric circuit controller, a movable contact member, spring means biasing said contact member for movement toward a circuit open position, a pivoted actuator free to move relatively to said contact member for moving said contact member toward switch closed position against the bias of said spring means, and a pivoted operating member for moving said actuator between circuit open and closed positions, said actuator having a cam projection and said operating member having a cam face cooperating with said projection to move said actuator between circuit open and closed positions in response to corresponding movement of said operating member, said cam face being shiftable in position on movement of said operating member from a position where said actuator exerts pressure in a circuit opening direction on said operating member to an oppositely inclined position where said actuator exerts pressure on said operating member in a circuit closing direction.

3. In an electric circuit controller, a spring urged movable switch member, an actuator bearing on said switch member, a pivotal support for said actuator, an operating member having a pivotal support between the pivotal support for said actuator and the point of contact between said actuator and movable switch member, said actuator having a cam projection and said operating member having a cooperating cam face arranged to effect movement of said actuator between circuit open and closed positions on corresponding movements of said operating member.

4. In an electric circuit controller, a spring urged movable switch member, an actuator bearing on said switch member, a pivotal support for said actuator, an operating member having a pivotal support between the pivotal support for said actuator and the point of contact between said actuator and movable switch member, said actuator having a cam projection and said operating member having a cooperating cam face arranged to effect movement of said actuator between circuit open and closed positions on corresponding movements of said operating member, the inclination of said cam face being relatively reversed on movements of said operating member between circuit open and circuit closed positions to cause said actuator to exert pressure on said operating member in a circuit opening direction for one inclination of said cam face and in a circuit closing direction for an opposite inclination of said cam face.

5. In an electric circuit controller, a spring biased movable switch member, a pivoted actuator bearing thereon having a cam projection, and a pivoted operating member having a cam face engageable with said projection, said cam face having a sharp inclination with respect to said projection when said operating member is in switch open position and a lesser angularity in an intermediate position.

6. In an electric circuit interrupter, a spring biased movable switch member, a pivoted actuator bearing on said switch member and having a cam projection, a pivoted operating member having a cam face disposed on the side of its pivot opposite said movable switch member and there engageable with said cam projection and cooperating therewith to move said actuating member in switch closing and opening directions in response to corresponding movements of said operating member, said cam face having relatively reversed inclinations in circuit open and circuit closed positions of said operating member to effect application of pressure in opposite directions on said operating member in said positions by said actuator.

7. In an electric circuit controller, a switch member movable in opposite directions to effect closing and opening of the circuit, a spring acting constantly on said switch member tending to move it in one of its two directions of movement, an actuator bearing on said spring-urged switch member and movable in directions corresponding to circuit opening and closing movements of said switch member, a removable pivotal support for said actuator, and a pivoted operating member, said operating member and said actuator having cooperating cam surfaces shaped and disposed to effect movements of said actuator about its pivotal support upon movement of said operating member between circuit open and closed positions thereof, said spring being responsive to the

removal of said removable pivotal support to effect movement of said actuator and said operating member in a circuit opening direction.

8. In an electric circuit controller, a spring urged movable switch member, an operating member, a pivotal support for said operating member including a pivot pin, an actuator having pressure engagement with said spring urged switch member and with said operating member and also having a cam engagement with said operating member by which movement of said operating member between circuit open and closed positions thereof effect a corresponding movement of said actuator and switch member, a removable pivotal support for said actuator, said actuator having an elongated passage therethrough in which said pivot pin is disposed, said pivot pin being disposed between the point of engagement between said actuator and said switch member and said removable support and constituting a center about which said actuator can turn upon removal of said removable support.

9. In an electric circuit controller, a movable spring urged switch member, an actuator bearing at one end on said switch member and at its other end having a removable pivotal support, a pivot pin passed loosely through said actuator, an operating member pivoted on said pivot pin, said actuator having an arcuate cam face terminated in a cam projection, said operating member having a cam face engageable with said arcuate cam face and said projection and being reversible in inclination upon movements of said operating member between circuit open and closed positions thereof to effect corresponding movements of said actuator and switch member, and means guiding said actuator for movement in a circuit opening direction in engagement with said operating member upon withdrawal of said removable pivotal support.

10. In an electric circuit controller, a spring urged movable switch member, an actuator disposed above said switch member having cam engagement therewith at one end and having at its other end a removable pivotal support, said actuator having on that side opposite said switch member an arcuate cam face and a cam projection, a pivoted operating member having a flat cam face engageable with said cam projection and arcuate cam face, said operating member being movable between circuit open and closed positions to effect relative reversal of the inclination of said cam face, and means for guiding said actuator for movement in contact with said operating member in a switch opening direction independently of corresponding movement of said operating member upon removal of said removable support.

11. In an electric circuit controller, a pivot pin, an operating member having spaced arms pivoted on said pin and providing a recess between them, said recess having a flat bottom cam face, an actuator loose on said pin having a projection confronting and engaged by said cam face, said actuator having a removable pivotal support therefor on one side of said pin and said cam projection and a cam on the other side of said pin and cam projection, a spring urged movable switch member engaged with said cam, said operating member being movable between circuit open and circuit closed positions to reverse the inclination of said cam face and effect movements of said actuator between circuit closed and circuit open positions and when in circuit closed position to position said cam face to cause said actuator to maintain said operating member in circuit closed position at least during an initial part of the independent circuit opening movement of said actuator in response to the removal of said removable pivotal support.

12. In an electric circuit controller, a supporting frame having upstanding arms, a pivot pin extended between said arms, a spring urged movable switch member located between said arms under said pin, a movable operating member having spaced side plates forming a recess between them pivoted on said pin and upstanding thereabove, an actuator in said recess loose on said pin having in said recess an arcuate cam face and a cam projection, said actuator also having a cam bearing on said switch member on one side of said pin and cam projection and a removable pivotal support for said actuator on the other side of said pin and cam projection, said actuator having a flat cam face in the bottom of said recess confronting said arcuate cam face and cam projection of said actuator and cooperating therewith to effect movements of said actuator between circuit closed and open positions upon corresponding movements of said operating member, said operating member also having a part engageable with said actuator to support it for movement independently of said operating member into switch closed position upon the removal of said removable support.

13. In an electric controller, a spring urged movable switch member, a pivoted operating member for effecting movement of said switch member between circuit open and closed positions, an actuator interposed between said operating member and switch member for transferring movement of one to the other, said actuator comprising combined metal and insulating plates, said insulating plate and said operating member having cooperating cam faces for transferring movement between said switch member and operating member, said metal plate having a latch projection and a pivotal support for said actuator removably engageable with said latch projection.

14. In an electric circuit interrupter, a stationary contact, a movable switch member comprising a resilient strip having a contact-carrying part and a resilient compressible part having upper, intermediate and lower generally parallel sections constituting an S-bend underlying the contact-carrying part and also having an anchored end, and operating mechanism including means disposed and arranged to exert pressure on said switch member at one side of said S-bend and in a direction to compress it and effect bodily movement of the movable switch member about said stationary contact as a pivot.

15. In an electric circuit interrupter, a bracket comprising a plate having upstanding spaced arms and an intermediate downturned ear, a movable switch member comprising at least in part a resilient strip having an end anchored to said ear and an intermediate reflexed compressible resilient part and a contact-carrying part disposed between said arms, operating mechanism including a member disposed between said arms and bearing directly on said contact-carrying part, and means for reciprocating said member in a direction to compress said intermediate resilient part.

16. In an electric switch, a supporting bracket comprising a plate having spaced upstanding

arms and an intermediate downturned ear, a movable switch member comprising at least in part a resilient strip having an end part anchored to said ear, a reflexed spring-part and a contact-carrying part disposed above said plate between said arms, a bimetal strip fixed to said ear and extended thereabove, an actuator located between and supported by said ears having a latch part engaged removably by said bimetal strip and a cam part bearing on the contact-carrying part of said movable switch member, an operating member pivoted on said arms and independent of said actuator and having cam surfaces engageable with said actuator for reciprocating it about said bimetal strip to open and close the switch, and means for effecting the current-responsive warping of said bimetal strip and remove it from supporting relation with said actuator to effect automatic opening of the switch.

17. In an electric switch, an insulating block having a well, a bracket on the floor of the well having spaced arms extended upwardly above the floor, a movable switch member carried by and having a resilient connection with said bracket and a movable arm disposed between said arms having a contact on the free end thereof, said well having a ledge elevated above said floor under said contact member, a fixed contact member on said ledge under and cooperating with said movable contact member, and operating mechanism carried by said arms for operating said movable switch member.

18. In an electric switch, an insulating block having a well, a bracket on the floor of the well having spaced arms extended upwardly above the floor, a movable switch member carried by and having a resilient connection with said bracket and a movable arm disposed between said arms having a contact on the free end thereof, said well having a ledge elevated above said floor under said contact member, a fixed contact structure comprising a plate located edgewise in a slot in said block having a lateral contact carrying ear at one end disposed on said ledge and a lateral terminal ear at the other end external of said block, and operating mechanism carried by said arms for operating said movable switch member.

19. In an electric circuit interrupter, the combination of an actuator having a part movable in opposite directions to effect opening and closing movements of the interrupter, operating means for moving said actuator having an over-center action which permits a slight movement of said actuator away from extreme interrupter-closed position in the movement of the operating means to the full interrupter-closed position thereof while maintaining the interrupter closed, a stationary contact, and a cooperating movable switch arm operated by the actuator having a contact and a part engaged and moved by the actuator and spring means urging said arm against said actuator and bearing on a part of said arm located with respect to the contact and actuator that the arm can fulcrum on said stationary contact by flexing said spring means while maintaining its engagement with the stationary contact on the aforesaid slight over-center retraction movement of the actuator.

20. An electric circuit interrupter comprising a stationary switch member, a movable switch member having spring means urging it constantly for movement in a circuit-opening direction, an actuator having a lower part bearing on said movable switch member and an upper part, and an operator having a flat cam face engaged by said upper part, said operator having a pivotal support on which the operator is movable to tilt the flat cam face in opposite directions in engagement with said upper part for moving said actuator in circuit opening and closing directions.

21. In an electric switch, a supporting bracket, a movable switch member attached to said bracket, operating mechanism for said switch member including an operating handle having a pivotal connection with said bracket, an actuator carried by said bracket interposed between said handle and switch member and having means by which it is actuated by movements of said handle to open and close the switch member, and a current responsive bimetal member carried by said bracket and normally engaged with said actuating member to permit movements of said handle in opposite directions to move said actuating member in switch closing and opening directions, said bimetal member being warpable away from engagement with said actuating member to permit said actuating member to move independently of control of said handle to open the switch.

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