

June 13, 1950

J. W. LAWSON ET AL

2,511,069

SWITCH

Filed July 27, 1946

2 Sheets-Sheet 1

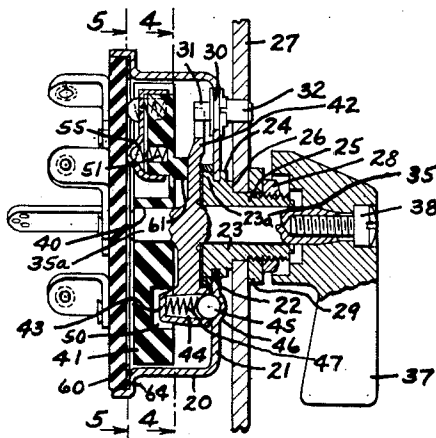


Fig. 2

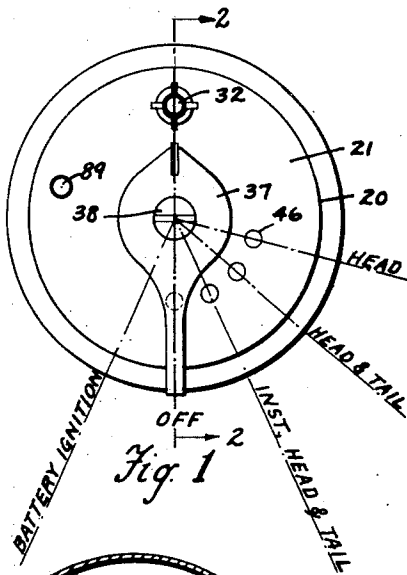


Fig. 1

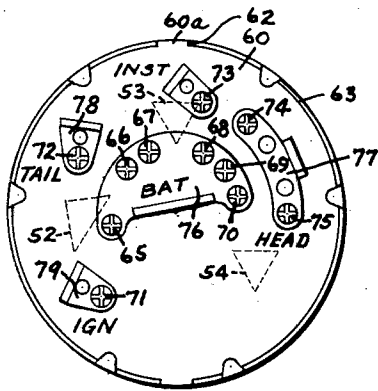


Fig. 3

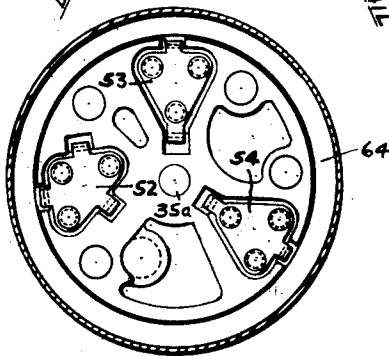


Fig. 5.

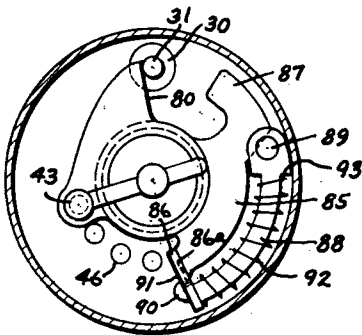


Fig. 4.

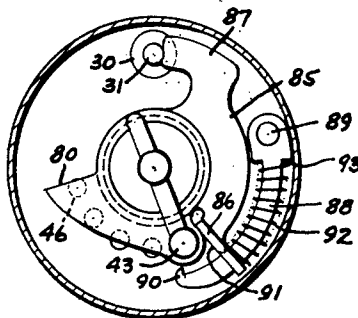


Fig. 6

INVENTORS

JOHN W. LAWSON

AND WILLIAM E. BROWN

BY

Spencer Hardman and Fehr
their ATTORNEYS

June 13, 1950

J. W. LAWSON ET AL
SWITCH

2,511,069

Filed July 27, 1946

2 Sheets-Sheet 2

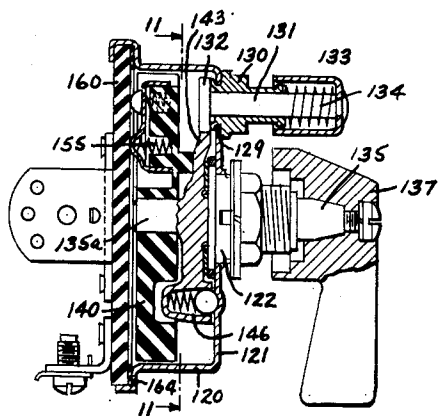


Fig. 8

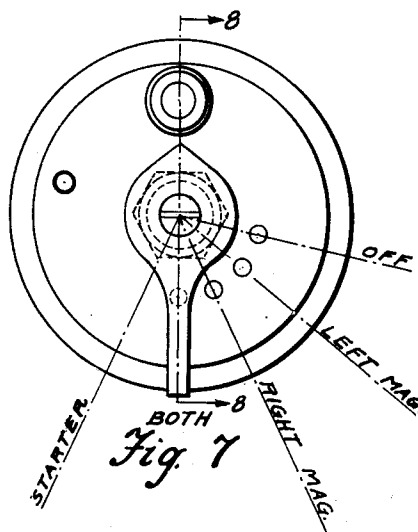


Fig. 7

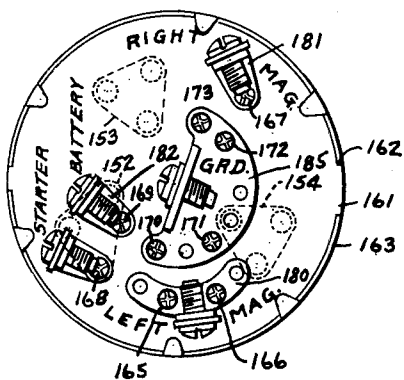


Fig. 9

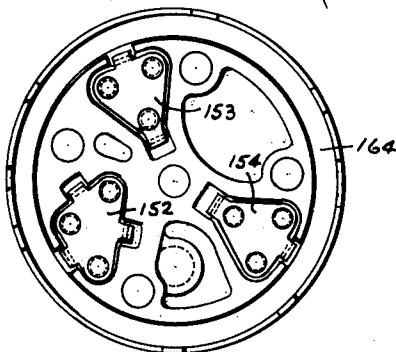


Fig. 10

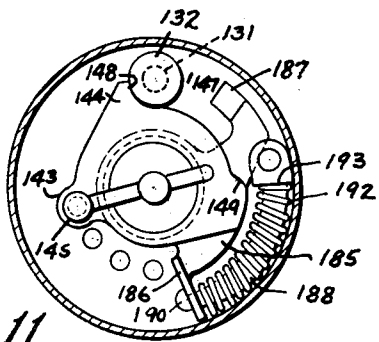


Fig. 11

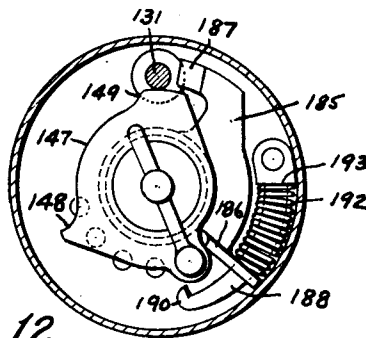


Fig. 12

INVENTORS
JOHN W. LAWSON
AND WILLIAM E. BROWN
BY *Spencer Hardman & Tink*
their attorneys

UNITED STATES PATENT OFFICE

2,511,069

SWITCH

John W. Lawson and William E. Brown, Anderson, Ind., assignors to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Application July 27, 1946, Serial No. 686,608

7 Claims. (Cl. 200—6)

1

This invention relates to electric switches and more particularly to the operating mechanism for controlling the actuating means for the electric switches.

The general object of the present invention is to provide an improved control switch which is particularly adapted for use upon tractors, airplanes or automotive vehicles for controlling a plurality of circuits.

Another object of the present invention is to provide a switch construction which has an intermediate position and side position on each side of the intermediate position which is adapted to be manually moved in one direction to one or more operating positions and wherein the switch is yieldingly retained in said position until manually released and when the switch is moved in the opposite direction said switch must be manually held in said position and when released said switch will automatically return to the intermediate position.

In the disclosed embodiments of the invention these objects are accomplished by providing a two-way switch having an intermediate position and "on" position on each side of the intermediate position attained by moving bridging means in either direction from the intermediate position. The movable bridging means is yieldingly retained by detent means in the intermediate position and the "on" positions on one side of the intermediate position but the bridging means must be manually held in an "on" position when the switch is moved in the opposite direction from the intermediate position against the energy stored in resilient means. Thus when the manual means is released the stored energy in the resilient means will cause the resilient means to expand and automatically return the bridging means to the intermediate position of the switch. The bridging means is prevented from moving past the intermediate position by the force of the resilient means by stop means.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

Fig. 1 is a plan view of the switch embodying the present invention.

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1.

Fig. 3 is a rear view of the switch.

Fig. 4 is a sectional view taken on line 4—4 of Fig. 2.

2

Fig. 5 is a sectional view taken on line 5—5 of Fig. 2.

Fig. 6 is a view similar to Fig. 5 showing the relative position of certain switch elements when the switch is actuated to one of its "on" positions.

Fig. 7 is a plan view of a modified form of the present invention.

Fig. 8 is a sectional view taken on line 8—8 of Fig. 7.

Fig. 9 is a rear view of the switch shown in Figs. 1 and 2.

Fig. 10 is a rear view of the switch with the closure and movable contact assembly removed.

Fig. 11 is a sectional view taken on line 11 of Fig. 8 and showing certain switch elements in one of its "on" positions.

Fig. 12 is a view similar to Fig. 11 showing the certain switch element when the switch is actuated to another of its "on" positions.

Referring to Figs. 1 to 6, inclusive, 20 designates a cup-shaped housing or casing having a bottom wall 21 provided with an opening 22 through which a bushing or bearing 23 extends, said bushing having a collar 23a engaging the inner face of the wall 21. The bushing 23 is held in a fixed relation with the bottom wall 21 by upsetting the bushing 23 at several places, as at 24, over the outer face of the wall 21, see Fig. 2. This bushing 23 is also provided with a reduced portion 25 to form a shoulder 26. The reduced portion has a close sliding fit in an opening of an instrument panel 27. A nut 28 having threaded engagement with the reduced portion clamps a washer 29 between the nut and panel and draws the shoulder 26 firmly against the panel to hold the bushing in position.

A stop member or pin 30 is secured intermediate its ends to the bottom wall 21, said pin having one end thereof forming a stop 31 within the housing and having the other end 32 extending beyond the bottom wall which is received by an opening in the panel. In this manner the housing is located correctly and prevented from turning with respect to the panel when the nut 28 is threaded home.

The bushing 23 rotatably supports a shaft 35 having one end provided with tapered flats fitting into corresponding flats provided in a recess formed in a handle 37. The handle is secured to the shaft by a screw 38. The flat surfaces in the recess of the handle and those of the shaft co-operating to prevent the handle from turning relative to the shaft. The other end of the shaft 35a is journaled in an opening 40 provided by a movable contact carrier 41 floatingly supported

3

within the housing 20. The shaft 35 carries a lateral flange 42 one portion of which is provided with a driving projection 43 having a recess or pocket 44. In order that the shaft may be rotated into four positions and yieldingly maintained therein, indexing means in the form of a spring-pressed ball 45 housed in the pocket 44 is provided. The ball 45 is adapted to seat in depressions 46 formed in the inner face of the bottom wall 21. The ball 45 is normally pressed outwardly of the pocket 43 by a compression spring 47.

The shaft 35 slidably supports and drives the movable contact carrier 41. In this instance the carrier is axially slidable on an end 35a of the shaft and is driven by the projection 43 which extends into a recess 50 formed in the carrier 41. The carrier 41 supports a plurality of contact plates 52, 53 and 54 of triangular formation. Since each of the plates is constructed and mounted on the carrier in a like manner, plate 52 will only be described. This plate 52 is provided with bosses arranged in a triangular formation and each boss extends over a recess 51 each of which houses a compression spring 55 all of which cooperate to urge the contact plate 52 from the carrier to be described. At points intermediate the bosses of the plate 52 is a tongue or projection punched therefrom. These tongues are bent out of the plane of the plate and extend into suitable notches provided by the carrier 41. The arrangement and dimensions of the tongues and notches are so proportioned and arranged that the contact plate 52 will have a relatively loose engagement with the carrier 41 and capable of axial movement relative to the carrier. The compression springs 55 interposed between the contact plate 52 and the bottom of the recesses 51 have a dual purpose, namely, to urge the carrier toward the flange 42 of the shaft and also urge the contact plate 52 toward a closure 60 for the housing.

The carrier 41 is provided with arcuate extensions or suitable flanges 61 disposed about the axis adapted to engage the flange 42 of the carrier to limit the axial movement of the carrier to the right as viewed in Fig. 2. The closure 60 of non-conducting material is provided with a lug 60a extending into a notch 62 in a peripheral flange 63 of the housing 20. The notch 62 cooperates with the lug 60a to locate definitely the correct position of the closure with respect to the housing. The closure is rigidly secured to the housing in a well known manner as by tangs which are bent over the exterior of the closure 60 to clamp the closure against a ledge or shoulder 64 provided by the housing.

The closure 60 supports a plurality of stationary contacts 65, 66, 67, 68, 69 and 70 arranged in an inner circular row. The closure 60 also supports stationary contacts 71, 72, 73, 74 and 75 arranged in an outer circular row. The contacts 65 through 70 are connected together by a strap 76 which is adapted to be connected with a storage battery by a suitable lead, not shown. The contacts 74 and 75 are connected together by a strap 77 adapted to be connected with a suitable translating device, not shown, for example, head lamps of a vehicle. The contacts 72 and 73 are connected with brackets 78 and 79 respectively which are in turn connected with other translating devices, not shown.

The general operation of the switch thus far described may be briefly summarized as follows: When the handle 37 is in the position shown in

4

Fig. 1, the switch will be in its normal "off" or intermediate position. However, when the switch is moved in a counterclockwise direction to its first "on" position so that handle is opposite legends "Inst.," "Head" and "Tail" the movable contact 52 will bridge stationary contacts 72, 66 and contact 53 will bridge 73, 68 and 74. When the handle is moved further in a counterclockwise direction to its second "on" position designated by legends "Head" and "Tail" the contacts 52 and 53 will bridge contacts as follows: 52 (67-72); 53 (69-74). When the switch is moved still further in the counterclockwise direction to the third "on" position, designated by "Head," on the contact 53 will engage stationary contacts, namely 70 and 75 to close a circuit. The handle is prevented from being moved further in a counterclockwise direction by an abutment 80 provided by the flange 42 which engages the stop 31. It is to be understood that when the switch is in either its "off" position or any of the three "on" positions the switch will be yieldingly held in such position by the detent mechanism including any one of the four depressions 46 each capable of receiving the spring pressed ball 45 located in the pocket or recess 44.

The novel feature of the invention resides in the use, in connection with the switch thus far described and illustrated, means for automatically returning the handle to its normal "off" position upon release of the handle 37 by the operator from a fourth "on" position. This fourth "on" position is designated by the legend "Battery ignition," see Fig. 1. In Figs. 5 and 6 the automatic return means for the handle or lever 37 is shown. In this instance the return means comprises a lever return plate 85 pivotally supported on the collar 23a. The plate 85 is provided with an ear 86 bent out of the normal plane of the plate. This ear has a slot 86a. The plate is also provided with an arm 87. A guide member 88 is pivotally supported on a rivet or pin 89. The guide 88 is of arcuate formation and is provided with a hook portion 90 at its free end. The free end of the guide member extends through the slot 86a with the hook 90 overlying a keeper surface 91 provided by the ear 86. A spring 92 surrounds the guide member and is interposed between a shoulder 93 provided by the guide member and the ear 86. The pivoted end of the guide is so dimensioned that it will engage the annular wall of the casing 20 to prevent the hook end of the guide member from coming out of the slot 86a.

As previously stated the handle or lever 37 can be manually moved in a counterclockwise direction as viewed in Fig. 1, to various "on" positions and yieldingly held in said position by the spring pressed ball 45, but when the lever 35 is moved in a clockwise direction the handle must be manually held in the fourth "on" position otherwise the handle will automatically return to its normal "off" position by the automatic return means. This movement is obvious from the showing in Fig. 6 which shows the spring compressed between the shoulder 93 and the ear 86.

The compression of the spring is accomplished by moving the lever 35 in a clockwise direction as viewed in Fig. 1 or in a counterclockwise direction as viewed in Fig. 6. When lever 37 is so rotated one side of the driving projection 43 will engage the ear 86 to move the plate 85 about its pivot while the plate 85 is being rotated the ear 86 will compress the spring 92 between the ear 86 and the shoulder 93 until arm 87 engages the pin 31. When the arm 87 engages the pin the

5

6

movable contact 54 will be in position to bridge stationary contacts 70 and 75 to close a circuit. Upon release of the lever 37 by the operator the spring 92 will expand to move the ear 86 and driving projection 43 in a clockwise direction as viewed in Fig. 6 until the ball 45 seats itself in the recess representing the normal "off" position of the switch. The plate 85 is prevented from moving beyond the "Battery ignition" position by the heel of the projection 87 of plate 85 which contacts the pin 89, see Fig. 5.

In Figs. 7 to 12 inclusive a modified form of the invention is shown wherein the switch structure is adapted for use with airplanes using two magnetos, namely, a right magneto and a left magneto. In this event a cup-shaped housing 120 is provided having a bottom wall 121 provided with an opening through which a bearing or bushing 122 extends. Since the bushing 122 is identical with bushing 22 in Fig. 2 further description of construction and assembly thereof with the bottom wall 121 is deemed unnecessary.

The bottom wall 121 is provided with an opening 129 which is adapted to accommodate a reduced portion of a bushing 130, said reduced portion being upset over the inner surface of the bottom wall 121. The bushing slidably supports a plunger 131 having a head 132 at one end and located within the housing 120. The other end of the plunger 131 carries a cup-shaped push button 133. The head 132 is normally held against the upset portion of the bushing by a compression spring 134 having one end abutting the outer end of the bushing 130 and having the other end engaging the bottom of the button 133.

The bushing 122 rotatably supports a drive shaft 135 having one end thereof attached to a handle or lever 137. The other end of the shaft 135 is journaled in an opening provided by a movable contact carrier 140 which is floatingly supported on the shaft end 135a. The shaft 135 carries a lateral flange 142 having arms 143 and 144 with the arm 143 having a projection 145 provided with a recess 146. The arm 144 is provided with a peripheral notch 147 to provide abutments 148 and 149.

The movable contact carrier 140 supports a plurality of contact plates 152, 153 and 154 of triangular formation. As these plates are similar in construction and arrangement as set forth for contacts 52, 53 and 54 further description as to their formation and mounting is deemed unnecessary. The contact plates are urged against a closure 160 by compression springs 155 disposed between the contact plates and the bottom of recesses formed in the carrier 140. The closure 160 of insulating material is provided with a lug 161 extending into a notch 162 formed in a peripheral flange 163 of the housing 120. The lug 161 and notch 162 cooperating to locate the closure in the correct position with respect to the housing 120. The closure 160 is clamped against an insulating shoulder 164 provided by the housing 120 by tangs on the periphery flange 163 which are bent over exterior of the closure.

The closure 160 supports a plurality of stationary contacts 165, 166, 167 and 168 arranged in an outer circular row and a plurality of stationary contacts 169, 170, 171, 172, and 173 arranged in an inner circular row. The contacts 165 and 166 are connected by a strap 180 which is in turn adapted to be connected with a "Left" magneto. The contact 167 is connected with a strap 181 adapted to be connected with a Right magneto and contact 168 is connected with a strap 182

adapted to be connected with a "Starter" device. The inner row of contacts are connected as follows: contact 169 is connected with a strap 182 which is adapted to be connected with a storage battery while contacts 170, 171, 172, and 173 are connected together to a ground strap 185.

Referring to Fig. 7 the switch shows the switch in one of its "on" positions in which both magnetos are in use. When the lever 137 is moved in a counterclockwise direction as viewed in Fig. 1 the lever will be directly over the legend "Right mag." When in said position only the right magneto will be in use while the left magneto will be grounded. On further movement of the lever 137 in a counterclockwise direction to the position indicated by "Left mag." the left magneto will be in use and the right magneto will be grounded. When the handle is moved to the position "off" both the Right and Left magnetos will be grounded.

To prevent any further movement of the lever 137 in the counterclockwise direction the abutment 149 will engage the head 132 of a plunger rod 131, said head being received by the notch 147 between the abutments 148 and 149. When the switch is in the position shown in Fig. 7 the lever is prevented from moving in a clockwise direction by the abutment 144. When it is desired to move the handle in a clockwise direction as viewed in Fig. 1 to connect a starter with the battery the plunger button 133 is moved to the left as viewed in Fig. 8 against the tension of spring 134. When this happens the head 132 is moved beyond the path of abutment 149, thus permitting the handle to move in a clockwise direction. As the lever is moved in the clockwise direction the projection 146 will cooperate with an automatic return means to return said handle to the position shown in Fig. 8.

The automatic return means is identical with that described in Figs. 5 and 6 but one hundred has been added to the reference numbers. Thus, when the handle is moved in a clockwise direction from the position shown in Fig. 7 and the plunger is pushed inwardly the handle will drive the shaft 135 which in turn will drive the carrier 140 to move the contact 150 to bridge contacts 169, 168 to connect the starter with the battery. When the handle is operated one side of the driving projection 143 will engage the ear 186 to move the plate 185 about its pivot against the bias of the spring 192. While the plate 185 is being rotated the ear 186 will compress the spring 192 between the ear 186 and the shoulder 193 until the arm 187 engages the plunger rod 131. When the arm 187 engages the plunger rod 131 the spring 192 will be compressed as shown in Fig. 12. After the starter has started the engines the operator releases the handle 137 and the spring 192 will expand to return the handle automatically to the position shown in Fig. 7. When this happens the plunger head 132 will return to its normal position between the abutments 148 and 149, thus preventing accidental turning of the lever 137 in a clockwise direction. The plate 185 is prevented from moving beyond the intermediate positions by the projection of the plate when it contacts the plunger 131. Thus, it makes it necessary to operate manually the plunger 131 before the handle 137 can move from the position where both magnetos are in use to the position where the starter is connected with the battery.

While the embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms

might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. In an operating mechanism for effecting the movements of a switch means having at least three positions, one on each side of an intermediate position; a shaft for rotating the switch means in either direction from the intermediate position; a flange carried by the shaft having a pair of abutments; a biased plunger having a head and normally located in the space between the abutments so that head will prevent accidental angular movement of the shaft in one direction from the intermediate position but permitting angular movement in the other direction until the other abutment engages the head, said plunger capable of being actuated to move the head out of the path of the abutments and thereby permit angular movements of the shaft in either direction from the intermediate position, said head riding on the flange upon release of the plunger; and spring controlled means for resisting the movement of the shaft in said mentioned one direction, said means including a plate rotatable about the same axis as said shaft and having an ear provided with a slot, a member capable of swinging movement about a pivot and having one end received by the slot, said end having a hook overlying a marginal wall of the slot to limit angular movement of the plate in one direction; a compression spring for urging the ear against the hook portion; and a driving element provided by the switch means for engaging the ear to drive the plate relative to the guide member; and means for maintaining said one end of the guide member within the slot.

2. In an operating mechanism for effecting the movements of a switch means having at least three positions, one on each side of an intermediate position in combination; a housing for enclosing the switch means; means journaled in the housing for actuating the switch means from its intermediate position to one side of the side positions without restraint; and means for resisting movement of the actuating means when the switch means is moved from the intermediate position to the other side position, said means including a plate pivoted on the housing and coaxially with the actuating means and having an ear provided with a slot; means provided by the switch means for engaging the ear to rotate the plate in one direction; a guide member pivoted for swinging movement on the housing toward and from the plate, the lower end of the guide member extending loosely in the slot of the ear and having a hook portion overlying a marginal edge of the slot to limit the rotation of the plate in the opposite direction; a spring about the guide member confined between shoulders on the guide member and the ear to hold the latter normally against the hook portion; and means including portions of the housing cooperating with the guide member for preventing the guide member from leaving the slot.

3. In an operating mechanism for effecting the movements of switch means having at least three positions, one on each side of an intermediate position in combination; a support; a shaft journaled in the support for actuating the switch from the intermediate to one of the side positions without restraint; a stop provided by the support; a flange attached to the shaft and having an abutment for engaging one side of the stop to limit angular movement of the shaft in one direction; and biased means for resisting movement of the

shaft when rotated in the opposite direction from the intermediate position, said biased means including a plate journaled coaxially about the shaft having an arm adapted to engage the other side of the stop to limit angular movement of the plate and having an ear provided with a slot; projecting means provided by the switch means adapted to engage the ear to rotate the plate when the shaft is rotated in the opposite direction from the intermediate position; a guide member pivoted for swinging movement relative to the support the lower end of said guide member extending loosely in the slot of the ear and having a hook portion engaging a marginal portion of the slot to limit the rotation of the plate toward the intermediate position of the shaft; resilient means bearing against the ear to hold same normally against the hook; and means associated with the support and cooperating with the guide member for maintaining guide member within the confines of the slot.

4. An electric switch comprising, a housing; switch means located within the housing; a manual operating member rotatably mounted in the housing for actuating the switch means in either direction; a stop provided by the housing, an abutment provided by the operating member for engaging the stop when the operating member is rotated in one direction a predetermined angular distance; a plate rotatably mounted on the housing independently of and coaxial with the operating member, said plate having an ear provided with a slot; a guide member pivotally mounted on the housing and having its free end extending into the slot, said end having a projection adapted to engage the ear to limit the rotation of the plate in one direction; resilient means for urging the ear against the projection means associated with the switch means for moving said ear to a position at which it is out of engagement with the projection thereby permitting said resilient means to resist movement of the operating member and plate when they are rotated in the opposite direction, said resilient means rotating the plate and the operating member in the said mentioned one direction upon manual release of said member until the ear engages the projection; and means including a portion of the housing cooperating with the guide member to hold guide member within the slot so that the projection will be in the path of movement of the ear.

5. In an operating mechanism for effecting the movements of a switch means having an "on" position on each side of an "off" position in combination; a housing for enclosing the switch means; a manual operating member journaled in the housing for driving the switch means in either direction of rotation; a plate rotatably supported on the housing and coaxial with the operating member and having an ear provided with a slot; an arcuate guide member pivotally supported on the housing from the axis of the plate and having its free end projecting through the slot, said pivot for the guide member providing stop means to limit the movement of the plate at least in one direction; resilient means carried by the guide member and engaging the ear to urge a portion of the plate against the stop; means associated with the switch means adapted to engage the ear upon movement of the operating member from the "off" position in one direction only to move the plate so that the portion will leave the stop in opposition to the spring means, said spring means returning the plate,

switch means and the operating member to the "off" position upon manual release of the operating member; and means including a portion of the housing cooperating with the guide member to hold the free end of guide member within the slot of the ear.

6. An electric switch comprising in combination; a housing; a pair of stops provided by the housing; a rotatable carrier within the housing having a normal position on an "on" position on each side of the normal position; contact elements supported on the carrier and adapted to bridge stationary contacts supported by the housing; an actuator journaled on the housing for driving the carrier in either direction of rotation; an abutment provided by the actuator adapted to engage one of the stops to limit rotary movement of the actuator in one direction from its normal position; yieldable means for holding the carrier at an "on" position on one side of the normal position; a plate pivoted within the housing independent of and coaxial with the actuator and having an arm disposed between the stops to limit the rotary movement of the plate in either direction and having an ear spaced angularly from the arm; resilient means bearing against the ear to urge the plate in one direction of rotation to hold the arm against one of the stops and resisting the movement of the plate in the opposite direction means carried by the carrier for engaging the ear only when the carrier is moved in the opposite direction from the normal position to drive the plate against the force of the resilient means until the arm engages the other stop; whereby certain contact elements bridge certain stationary contacts, said resilient means returning the plate, carrier, and actuator to their normal positions upon release of the actuator.

7. In an operating mechanism for effecting movements of switch means having at least three positions, one on each side of an intermediate

position the combination including, a support; a manual operating member journaled on the support for actuating the switch means from the intermediate position to one side without restraint and to the other side position with restraint; a pair of stops provided by the support; an abutment carried by the operating member for engaging one of the stops to limit the angular movement of the operating member when moved in one direction of rotation; biased means for resisting movement of the operating member in the opposite direction of rotation, said means including a plate journaled on the support independently of the operating member, said plate having a radial arm disposed between the stops to limit the angular movement of the plate in both directions and having an ear spaced from the arm; resilient means bearing against the ear to urge the arm against one of the stops; means associated with the switch means adapted to engage the ear upon movement of the operating member in the opposite direction of rotation from the intermediate position to move the arm toward the other stop in opposition of the resilient means, said resilient means returning the plate, switch means, and the operating member to the intermediate position upon manual release of the operating means.

JOHN W. LAWSON.
WILLIAM E. BROWN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,299,163	Fleming	Apr. 1, 1919
1,324,819	Hickling	Dec. 16, 1919
2,242,167	Bentley et al.	May 13, 1941
2,427,277	Hasselbaum	Sept. 9, 1947