Dec. 29, 1959 H. W. SCHOLIN ET AL 2,919,333

ELECTRICAL SWITCH MECHANISM

Filed Nov. 4, 1957 2 Sheets-Sheet 1

FIG. 1

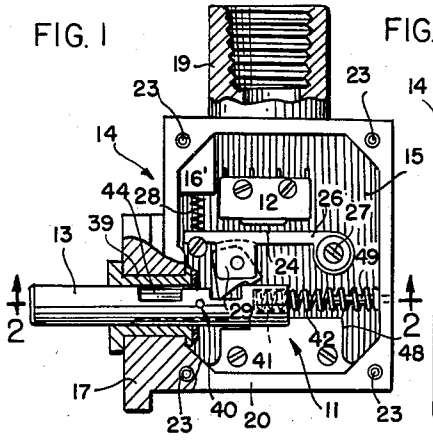


FIG. 3

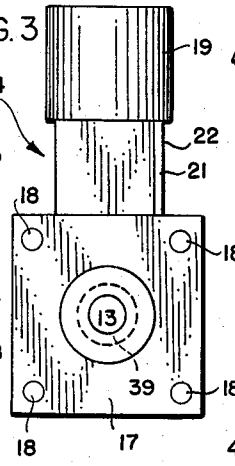


FIG. 5

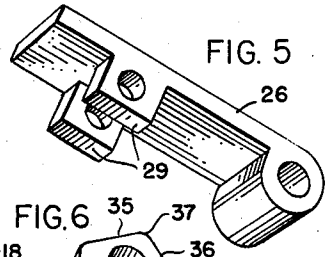


FIG. 6

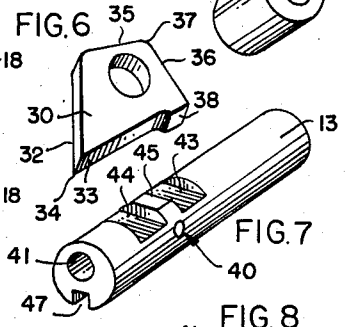


FIG. 7

FIG. 2

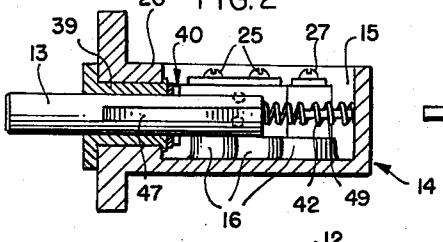


FIG. 4

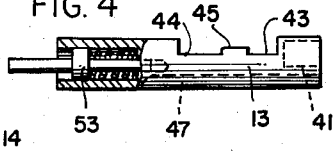


FIG. 8

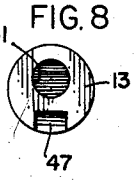


FIG. 9

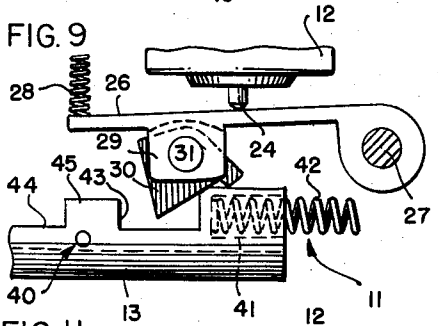


FIG. 10

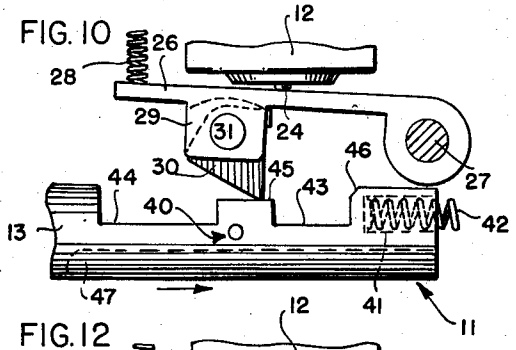


FIG. 11

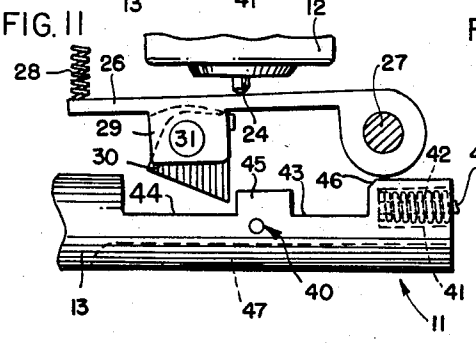
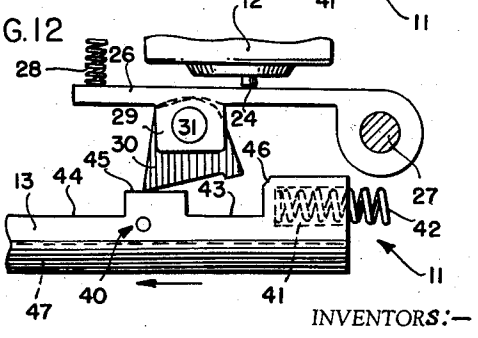


FIG. 12



INVENTORS:—

HAROLD W. SCHOLIN

CARL W. SCHOLIN

BY:—

Marzall, Johnston, Cook & Root

ATTORNEYS

Dec. 29, 1959 H. W. SCHOLIN ET AL 2,919,333

ELECTRICAL SWITCH MECHANISM

Filed Nov. 4, 1957 2 Sheets-Sheet 2

FIG. 13

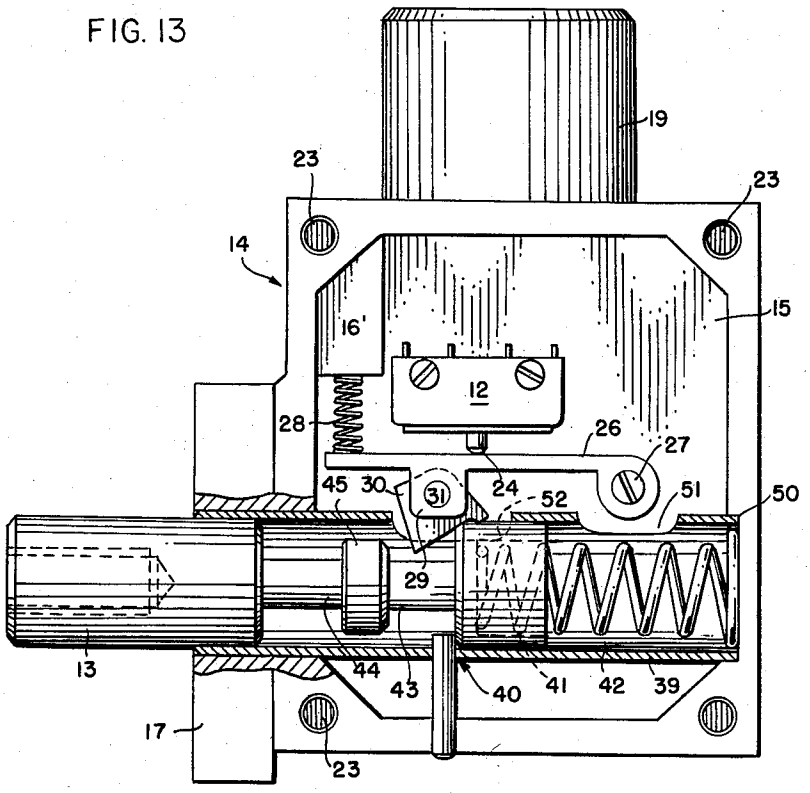


FIG. 14

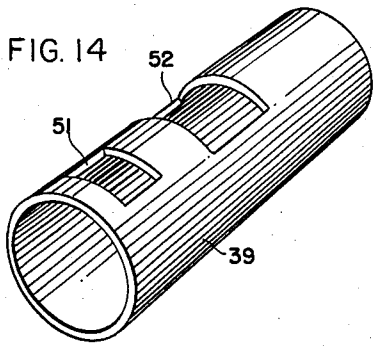


FIG. 15

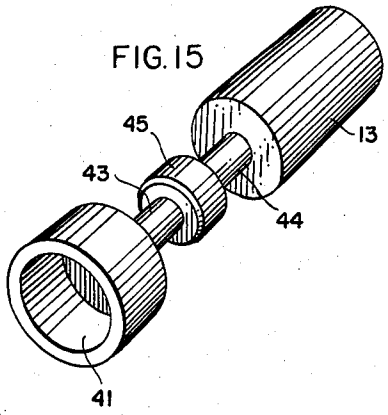
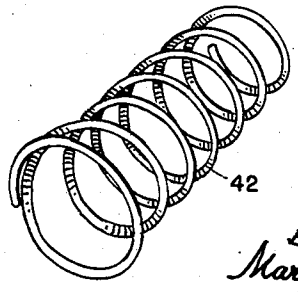


FIG. 16



INVENTORS:-
HAROLD W. SCHOLIN
CARL W. SCHOLIN

BY:-
Marzall, Johnston, Cook & Root
ATTORNEYS

United States Patent Office 2,919,333 Patented Dec. 29, 1959

2,919,333

ELECTRICAL SWITCH MECHANISM

Harold W. Scholin and Carl W. Scholin, Chicago, Ill.

Application November 4, 1957, Serial No. 694,391

6 Claims. (Cl. 200—160)

The present invention relates in general to electrical switches, and has more particular reference to an improved make and break switch mechanism, the invention pertaining especially to mechanism operable to actuate the switch through a complete operating cycle in response to the movement of a switch actuating member in one direction only, the mechanism being disabled or otherwise rendered inactive during movement of the actuating member in the reverse direction.

Current machine tool practice utilizes control devices which require a momentary pulse of electrical power for the actuation of the device for the performance of its control function. Such devices are commonly operated in response to the movement of a machine tool part in one direction so as to make physical contact with the actuating mechanism of the control switch. Very rarely is it possible to arrange the switch and its actuating mechanism so that the moving component of the controlled machine may reverse and retract itself immediately after making contact with the actuating mechanism.

It is therefore highly desirable to provide a switch mechanism which may be actuated to open or close, and thereafter close or open, the switch at a desired interval during the movement of the switch actuating machine component in one direction, that is to say, the switch should be arranged to perform a complete switching cycle to make and thereafter break a switch controlled circuit, or vice versa, before the motion of the switch actuating machine component is reversed.

An important object of the present invention is to provide a one-way make and break switch mechanism of the character mentioned; a further object being to provide switch mechanism operable to actuate switch contacts through a complete switching cycle in response to movement of a switch actuating member continuously in one direction, the switch mechanism being disabled or inactive during reverse movement of the member.

Another important object is to provide a switch of the character mentioned in which the switch will be held in closed position for an appreciable interval during the operating cycle of the switch.

Another important object is to provide a switch of the character mentioned having a rockable or tiltable switch operating element adapted to operatively engage a shiftable switch actuating member in order to drive the associated switch through its complete switching cycle in response to projecting movement of the actuating member in one direction with respect to the operating element, the member being adapted to tilt the element to a position in which it is incapable of operating the switch during return or retracting movement of the actuating member; a further object being to form the actuating member as a longitudinally movable rod or bar formed with spaced recesses and an intermediate cam portion in position to drivingly engage the tiltable switch operating element to cause the same to drive the switch in desired fashion and to rock the switch between switch

actuating and disabled positions, respectively in response to projecting and retracting movement of said rod or bar.

The foregoing and numerous other important objects, advantages, and inherent functions of the invention will become apparent as the same is more fully understood from the following description, which taken in connection with the accompanying drawings, discloses preferred embodiments of the invention.

Referring to the drawings:

Fig. 1 is a sectional view through switch actuating mechanism embodying the present invention, and operable in response to longitudinal or axial movement of a switch actuating rod or bar component;

Fig. 2 is a sectional view taken substantially along the line 2—2 in Fig. 1;

Fig. 3 is an end view of the device shown in Figs. 1 and 2;

Fig. 4 is a partially sectionalized side view of a modified form of a longitudinally movable switch actuating rod or bar component;

Figs. 5, 6 and 7 are perspective views, respectively of a pivoted switch actuating arm, a rockable switch operating element adapted to be tiltably supported on and carried by the arm, and a longitudinally or axially movable switch actuating rod or bar, embodied as components in the mechanism shown in Fig. 1;

Fig. 8 is an end view of the components shown in Figs. 4 and 7;

Figs. 9, 10, 11 and 12 are enlarged views of the switch actuating mechanism shown in Fig. 1, illustrating the same in various relatively shifted positions thereof during a complete switch actuating cycle;

Fig. 13 is an enlarged view similar to Fig. 1 and showing a modified switch actuating mechanism; and

Figs. 14, 15 and 16 are enlarged perspective views, respectively illustrating components of the mechanism shown in Fig. 13.

To illustrate the invention the drawings show one-way make and break switching mechanism 11 adapted to operate an electrical switch 12 through its complete switching cycle in response to the projecting movement of a switch actuating member in one direction only, the switch remaining inactive during retracting movement of the member 13 in the opposite direction. As shown, the actuating mechanism 11 and its associated switch 12 may be assembled and secured in operative position in an enclosing housing 14, which may conveniently comprise an open sided metal casting forming a chamber 15 adapted to contain the mechanism 11 as well as the switch 12, embossments 16 being provided for supporting the switch and one or more of the components of the actuating mechanism.

At one side, the housing may be formed with a preferably integral mounting flange 17, which may be provided with four holes 18 positioned at the corners of a square and adapted for the reception of switch mounting studs or bolts, whereby the switch mechanism can be mounted directly upon a machine with which the mechanism is to be used, the switch being mountable in any one of four positions relatively displaced by 90 degrees. The housing may also be provided with an integral internally threaded collar 19 for the connection of the housing with conductor conduit for enclosing conductor wires connected with the switch 12. The open side of the housing may be formed as a peripheral seat 20 upon which a cover plate 21 may be detachably secured, as by suitable fastening screws 22 extending in screw holes 23 formed preferably at the corners of the housing.

Any suitable or preferred switch structure 12 may be employed. As shown, the switch 12 may conveniently embody suitable make and break switch contacts en-

closed in a suitable housing and actuated by a depressible stem or button 24. The switch 12 may be mounted within the housing 14, as on embossments 16, by means of anchoring screws 25. The switch actuating mechanism 11 as shown comprises a switch actuating lever 26 pivotally mounted, as on a support pin 27 anchored in the housing, as on an embossment 16, the lever 26 extending in position overlying the switch actuating stem or button 24 to depress and release the same in response to rocking movement of the lever 26 on its pivot pin 27. A spring 28 supported in an embossment 16' formed in the housing 14 may be provided for normally urging the lever 26 in a direction on its pin to release the switch button 24. The lever 26 may be provided with a pair of spaced apart lugs or ears 29, and a switch actuating cam element 30 may be tiltably carried by the lever 26, as on a pin 31 extending through an opening in the element 30 and mounted at the opposite ends of the pin in suitable openings formed in the ears 29.

The switch actuating element 30 preferably comprises a plate of wear resisting metal, such as steel, having trapezoidal peripheral shape, including a pair of adjacent sides 32 and 33 intersecting at an acute angle to form a sharp corner 34 and a pair of sides 35 and 36 meeting at an obtuse angle to form a rounded corner 37 opposite the sharp corner 34, the opening for receiving the pin 31 being adjacent the rounded corner 37 and spaced from the sharp corner 34. The element 30 is also formed with a projecting toe 38 on the side 33 at the junction thereof with the side 36, as shown more particularly in Fig. 6 of the drawings. The element 30 is freely rockable on the pin 31 between limit positions in which either the side 35 or the side 36 engages with the supporting lever 26, to thereby limit the rocking movement of the element on the pin.

The switch actuating member 13 preferably comprises a cylindrical pin or stem supported preferably for axial or longitudinal movement in a sleeve 39 secured in a seat in the mounting flange 17, said bushing or sleeve opening into the chamber 15 and also outwardly of the housing. Stop means 40 may be provided for limiting axial movement of the member 13 in the sleeve 39 in a direction outwardly of the housing to determine the normal or stand-by position of the switch actuating member 13, the inner end of the member 13 being provided with a pocket 41 sized to seatingly receive one end of a biasing spring 42, the opposite end of which extends to and bears upon the wall of the chamber 15 which faces the inner end of the member 13. The spring 42, accordingly, will normally urge the member 13 yieldingly in a direction outwardly of the chamber 15, movement of the member 13 under the influence of the spring 42 being limited by the stop means 40. The member 13, however, may be caused to move axially against the influence of the spring 42 by applying pressure upon the end of the member 13 which extends outwardly of the flange 17, as by disposing the switching mechanism in position presenting the outwardly extending end of the member 13 in the path of a switch actuating member driven in response to the movement of the machine with which the switch mechanism may be cooperatively associated.

The member 13 is disposed in position to move adjacent and in engagement with the switch operating element 30, the member 13 being provided with a pair of spaced apart lateral cavities 43 and 44 defining an intermediate cam portion 45 therebetween. The cavity 43 is disposed in position to receive the corner 34 of the operating element 30 when the member 13 is in its normal or stand-by position as determined by the stop means 40, as shown more particularly in Figs. 1 and 9 of the drawing. As the member 13 is moved away from its stand-by position against the influence of the spring 42, its cam portion 45 comes into engagement with the side 32 of the operating element 30, thereby rotating it on its pin 31 to the limit position shown in Fig. 10. Continued movement of the member 13 against the influence of the spring 42 will cause the side 32 of the element to ride upwardly upon the cam portion 45 of the member 13. Eventually the corner 34 will be disposed in sliding engagement with the cam portion 45, as shown in Fig. 10 of the drawings.

Movement of the member 13 against the influence of the spring thus causes the lever 26 to tilt sufficiently to depress the switch actuating stem 24 and thereby operate the switch 12 from its normal to its shifted or thrown position. Continued movement of the member 13 against the influence of the spring 42 will eventually present the lateral cavity 44 in registration with the switch operating element 30, as shown more particularly in Fig. 11 of the drawings, thereby permitting the spring 28 to shift the lever 26 in a direction to release the switch button 24. The switch 12 will thus be permitted to return to its normal or stand-by condition, thereby completing its switching cycle during projecting movement of the member 13 in one direction only from its normal, retracted or stand-by position to its fully projected position, in which the element 30 is received in the cavity 44.

Upon release of the member 13, the spring 42, of course, will return it from the projected position shown in Fig. 11 to the normal or stand-by position shown in Figs. 1 and 9. During such movement, the cam portion 45 of the member 13 will first engage the surface 33 of the element 30 and tilt the same on its pivot 31 to the limit position, as shown in Fig. 12, in which the side 35 of the element seats upon the facing surface of the lever, the element 30 being so formed and arranged that, when in such limit position, the side 33 and corner 34 of the element 30 may ride over the cam portion 45 of the member 13 without tilting the lever 26 sufficiently for the actuation of the switch 12.

The switch 12, accordingly, will remain in its normal or stand-by condition throughout the retracting movement of the actuating member 13. When the member 13 is in its normal or stand-by position, it will be noted that the surface 33 of the element 30 will engage a chamferred portion 46 of the member 13 at the edge of the cavity 43, the toe 38 of the element 30 being provided to ride up upon the side of the member 13, outwardly of the cavity 43, in order to cock or locate the element 30 in position assuring that the corner 34 of the element 30 will engage the side of the cam portion 45 when the member 13 is again moved against the influence of the spring 42 for the actuation of the switching mechanism.

As shown more particularly in Figs. 1, 2, 7 and 8–12, the lateral cavities 43 and 44 may be formed by cutting away the member 13 on one side thereof only, in which case the opposite side of the member may be formed with a spline groove 47 in position to slidingly receive a spline member 48, which may conveniently comprise a plate secured in the housing 14, thereby permitting the member 13 to move axially while presenting the cavities 43 and 44 and the cam portion of the member in facing relationship with respect to the switch operating element 30. The stop means 40 also may conveniently comprise a diametral pin mounted in a transverse bore formed through the member 13, as opposite the cam portion 45 thereof, the opposite ends of such pin projecting outwardly of the member 13 in position to engage the inner end of the sleeve 39 and thereby form a stop for limiting axial movement of the member 13 in one direction through the sleeve 39 under the influence of the spring 42. The housing mounted end of the spring 42 also may be supported upon a pin 49 secured on the housing in coaxial alinement with the spring seating cavity 41 in the member 13, the unanchored end of the pin 49 being adapted to engage the bottom of the cavity 41 to thereby provide stop means for limiting the movement of the member 13 against the influence of the spring 42, and thus determine the projected position of the member 13 that is shown in Fig. 11.

As shown more particularly in Figs. 13–16, the member 13 may comprise a cylindrical pin in which the cavities 43 and 44 comprise spaced apart circular grooves formed on the pin to define the cam portion 45 as a cylindrical part of the pin disposed between said circular grooves. In such arrangement it is unnecessary to spline the member 13 against turning movement in the housing 14. It is desirable, however, to form the sleeve 39 as a tubular element extending across the chamber 15, said tube being anchored at its opposite ends in the flange 17 and in a mounting seat 50 formed in the wall of the housing 14 opposite from the flange. The sleeve 39 slidingly receives the member 13 and is formed with lateral openings 51 and 52, adapted respectively to accommodate the pivoted hub of the lever 26 and the element 30 in position to cooperatively engage the sleeve enclosed cylindrical cam portion 45 and extend in the cavities 43 and 44.

The end of the spring 42 remote from the member 13 may be received in the sleeve mounting seat 50, thereby eliminating the necessity of providing a pin like the pin 49 of the Fig. 1 embodiment. The stop means 40 also may comprise a single pin extending through the sleeve 39 in position to engage the spaced apart facing walls defining the remote sides of the cavities 43 and 44, when the member 13 is in normal and fully depressed positions, respectively.

If desired, as shown more particularly in Fig. 4 of the drawings, the end of the member 13 which projects outwardly of the flange 17 may be provided with a spring pressed plunger 53 for yielding engagement with the shiftable switch actuating member of the machine or device with which the mechanism is operatively associated.

It will be seen from the foregoing that switch mechanism embodying the herein disclosed features will operate switching components through a complete switching cycle during movement of a switch actuating member from normal or stand-by position in one direction only, that is to say, the controlled switch may be opened and closed, or vice versa, during movement of the switch actuating member in one direction only; but the switch components will remain inactive during return of the switch actuating member in the reverse direction to stand-by position.

It is thought that the invention and its numerous attendant advantages will be fully understood from the foregoing description, and it is obvious that numerous changes may be made in the form, construction and arrangement of the several parts without departing from the spirit or scope of the invention, or sacrificing any of its attendant advantages, the forms herein disclosed being preferred embodiments for the purpose of illustrating the invention.

The invention is hereby claimed as follows:

1. In an electrical switch mechanism, the combination, with a switch having contacts adapted to move through a switch operating cycle from a normal switch position to a thrown position and back to said normal position, after remaining in said thrown position during an interval of finite duration, and a driving member for so moving said contacts, of a dog tiltable on said driving member between switch actuating and inactive positions, and an actuating member movable in one direction from one limit position to another and back in the opposite direction, said actuating member having a cam portion of selected length in the direction of movement of said actuating member, said cam portion being disposed in position successively to engage and tilt said dog to switch actuating position, thereafter to shift said dog in one switch actuating direction and then in the reverse direction, to move the switch contacts through a complete switching cycle during movement of the actuating member in one direction, said cam portion during movement of the actuating member in the opposite direction being operable to tilt the dog to inoperative position to thereby prevent actuation of the switch contacts during movement of the actuating member in such opposite direction, so that the interval during which the switch remains in thrown position is determined by said selected length of the cam portion.

2. In an electrical switch mechanism, the combination, with a switch having contacts adapted to move through a switch operating cycle from a normal switch position to a thrown position and back to said normal position, after remaining in said thrown position during an interval of finite duration, and a driving member for so moving said contacts, of a dog tiltable on said driving member between switch actuating and inactive positions, and an actuating stem movable in one direction from one limit position to another and back in the opposite direction, said stem having a lateral cam formed thereon in position successively to engage and tilt said dog to switch actuating position, thereafter to shift said dog and said switch driving member in one direction and then in the opposite direction to thereby move the switch contacts through a complete switching cycle during axial movement of the stem in one direction, said cam being of selected length in the axial direction of said stem, said cam during movement of the stem in the opposite direction being operable to tilt the dog to inoperative position on said driving member to thereby prevent actuation of the switch contacts during movement of the stem in such opposite direction, so that the interval during which the switch remains in thrown position is determined by said selected length of the cam.

3. In an electrical switch mechanism, the combination, with a switch having contacts adapted to move through a switch operating cycle from a normal switch position to a thrown position and back to said normal position, after remaining in said thrown position during an interval of finite duration, and a driving member for so moving said contacts, of a dog tiltable on said driving member between switch actuating and inactive positions, and an actuating stem movable in one direction from one limit position to another and back in the opposite direction, said stem having a pair of longitudinally spaced cavities formed laterally thereon and defining a cam on the stem between said cavities in position successively to engage and tilt said dog to switch actuating position, thereafter to shift said dog and driving member in one switch actuating direction and then in another to move the switch contacts through a complete switching cycle during movement of the stem in one direction, said cam being of selected length in the axial direction of said stem, said cam during movement of the stem in the opposite direction being operable to tilt the dog to inoperative position on said driving member to thereby prevent actuation of the switch contacts during movement of the stem in such opposite direction, so that the interval during which the switch remains in thrown position is determined by said selected length of the cam.

4. In an electrical switch mechanism, the combination, with a switch having contacts adapted to move through a switch operating cycle from a normal switch position to a thrown position and back to said normal position, after remaining in said thrown position during an interval of finite duration, of a dog tiltable between switch actuating and inactive positions, said dog being shiftable to actuate said contacts through a complete switching cycle, when in switch actuating position, and a stem movable axially in one direction from one limit position to another and back in the opposite direction, said stem having a pair of spaced apart lateral cavities for receiving said dog, when the stem is in said limit positions, said cavities defining a cam therebetween in position successively to engage and tilt said dog to switch actuating position, thereafter to shift said dog in one switch actuating direction and then in another to move the switch contacts through a complete switching cycle during axial movement of the stem in one direction, said cam being of selected length in the axial direction of said stem, said cam during move-

ment of the stem in the opposite direction being operable to tilt the dog to inoperative position to thereby prevent actuation of the switch contacts during movement of the stem in such opposite direction, so that the interval during which the switch remains in thrown position is determined by said selected length of the cam.

5. In an electrical switch mechanism, the combination, with a switch having contacts adapted to move through a switch operating cycle from a normal switch position to a thrown position and back to said normal position, after remaining in said thrown position during an interval of finite duration, and a switch driving member movable in opposite directions to so move said contacts, of an operating dog tiltable on said driving member between switch actuating and inactive positions, said dog and said driving member being shiftable to actuate said contacts through a complete switching cycle, when said dog is in switch actuating position on said member, a guide sleeve supported adjacent said member and dog and having a lateral opening in which said dog extends, and a stem supported in said sleeve for axial movement in one direction from one limit position to another and back in the opposite direction, said stem having a lateral cam of selected length in the direction of the axis of the stem, said cam being disposed in position successively to engage and tilt said dog to switch actuating position on said member, thereafter to shift said dog and member in one direction and then in the opposite direction, to thereby move the switch contacts through a complete switching cycle during axial movement of the stem in one direction in said sleeve, said cam, during movement of the stem in the opposite direction, being operable to tilt the dog to inoperative position on said member to thereby prevent actuation of the switch contacts during movement of the stem in such opposite direction, so that the interval during which the switch remains in thrown position is determined by said selected length of the cam.

6. In an electrical switch mechanism, the combination, with a switch having contacts adapted to move through a switch operating cycle from a normal switch position to a thrown position and back to said normal position, after remaining in said thrown position during an interval of finite duration, a switch driving member movable in opposite directions to so move said contacts and yielding bias means normally urging said member in one direction, of an operating dog tiltable on said driving member between switch actuating and inactive positions, a guide sleeve supported adjacent said member and dog and having a lateral opening in which said dog extends, an actuating stem supported in said sleeve for axial movement in one direction from one limit position to another and back in the opposite direction, said stem having a lateral cam of selected length in the direction of the axis of the stem, said cam being disposed in position successively to engage and tilt said dog to switch actuating position on said member, thereafter to shift said dog and said member in one direction against the influence of said bias means and then in the opposite direction, to thereby move the switch contacts through a complete switching cycle during axial movement of the stem in one direction, and resilient means disposed within said guide sleeve and yieldingly urging said stem in the opposite direction, said cam, during movement of the stem in such opposite direction, being operable to tilt the dog to inoperative position on said member to thereby prevent actuation of the switch contacts during movement of the stem in such opposite direction, so that the interval during which the switch remains in thrown position is determined by said selected length of the cam.

References Cited in the file of this patent

UNITED STATES PATENTS

2,648,234 Lester ---------- Aug. 11, 1953