

July 1, 1952

D. MORRISON

2,602,126

SWITCH AND ACTUATOR THEREFOR

Filed May 16, 1949

2 SHEETS—SHEET 1

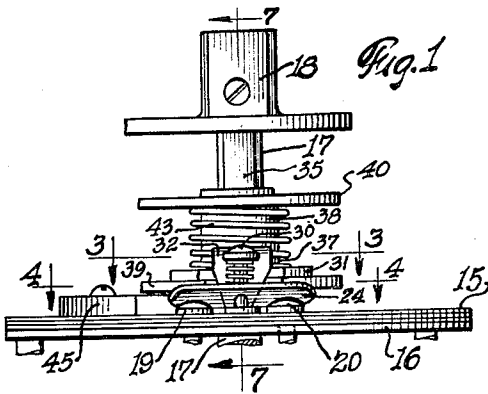


Fig. 1

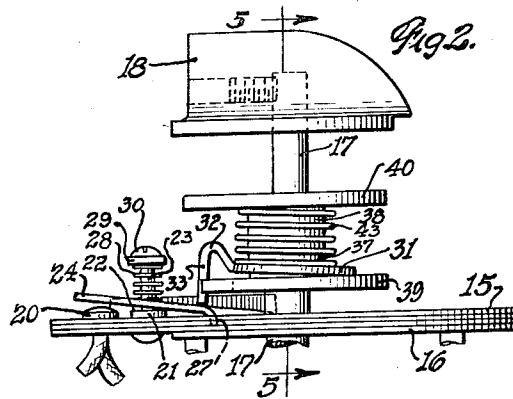


Fig. 2

Fig. 3

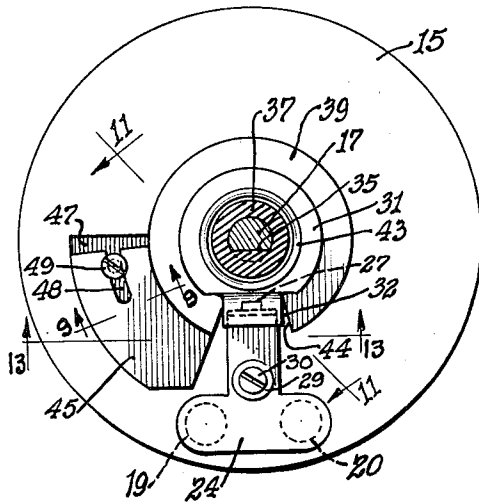


Fig. 4

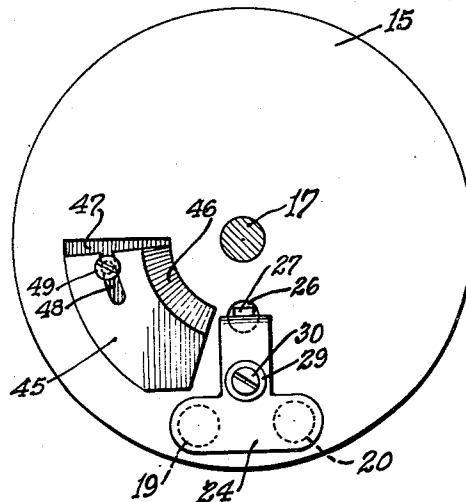


Fig. 5

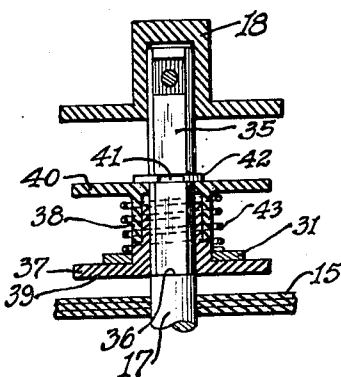
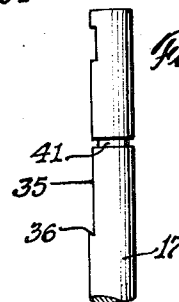


Fig. 6



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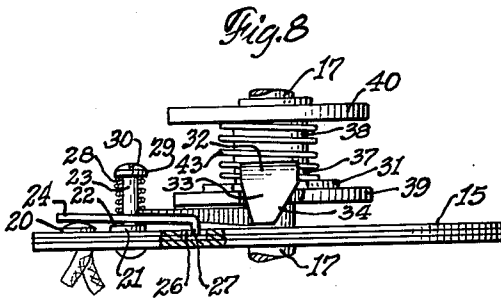
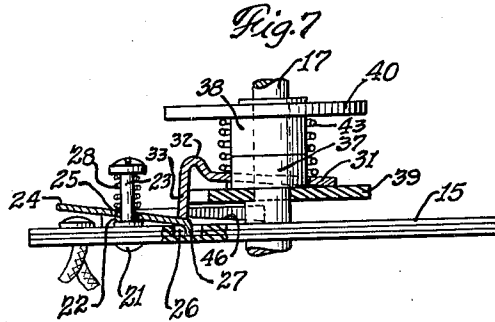
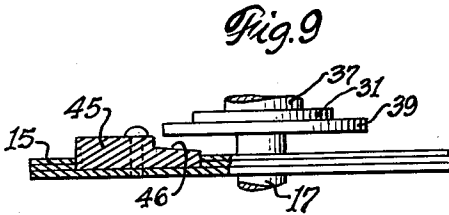
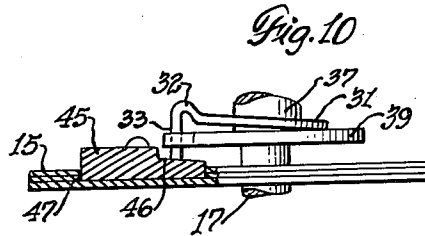
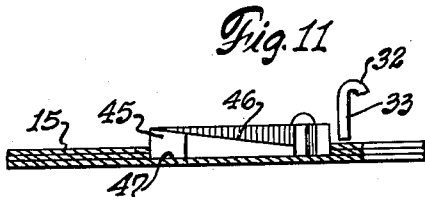
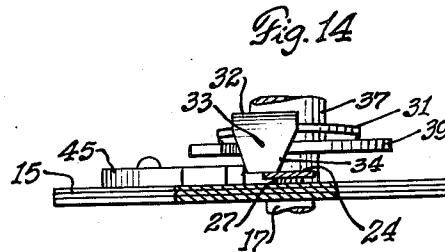
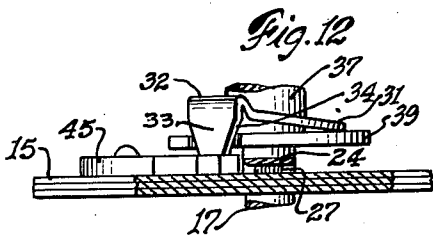
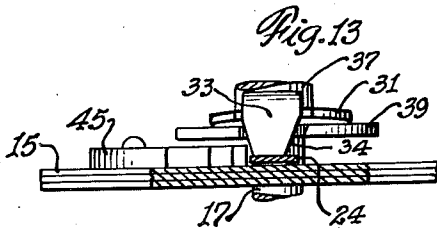
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SWITCH AND ACTUATOR THEREFOR

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2 SHEETS—SHEET 2



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2,602,126

SWITCH AND ACTUATOR THEREFOR

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9 Claims. (Cl. 200—68)

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The present invention has for its primary object to produce a simple and novel electric switch and actuating means, that shall have a wide range of usefulness, be easy to manufacture, be low in cost, and be durable and efficient and reliable in operation.

Viewed in one of its aspects my invention may be said to have for an object the creation of a switch that lends itself satisfactorily to either manual or power operation, to operation in single or multiple switch units, and for operation at will to maintain one or more circuits open or closed for a timed period or for repeated operation at predetermined time intervals.

The various features of novelty whereby the present invention is characterized will hereinafter be pointed out with particularity in the claims, but, for a full understanding of the invention and of its objects and advantages, reference may be had to the following detailed description taken in connection with the accompanying drawings, wherein:

Figure 1 is a front view of a single throw, double pole switch and a preferred actuating means therefor, embodying the present invention; Fig. 2 is a side view of the assembly shown in Fig. 1; Figs. 3 and 4 are sections taken, respectively, on lines 3—3 and 4—4 of Fig. 1; Fig. 5 is a section on line 5—5 of Fig. 2; Fig. 6 is an elevational view of so much of the actuating shaft as appears in Fig. 5; Fig. 7 is a view similar to Fig. 2, but with some parts appearing in section; Fig. 8 is a side view, as in Fig. 2, but showing the switch closed, instead of open as in Figs. 2 and 7, and showing the actuator out of its switch closing position; Fig. 9 is a section on line 9—9 of Fig. 3; Fig. 10 is a view similar to Fig. 9, but showing the actuating shaft in a different angular position; Fig. 11 is a section on line 11—11 of Fig. 3, illustrating the condition which exists after the shaft has made almost three-quarters of a turn in the counterclockwise direction from the position which it occupies in Fig. 3; Fig. 12 is a front view, showing the parts in the positions occupied when the switch actuator is about to open the switch, the switch being omitted except for its movable arm which is shown as a section on line 11—11 in Fig. 3; Fig. 13 is a view similar to Fig. 12 showing the parts in the same positions as in Figs. 1 and 7; and Fig. 14 is a view similar to Fig. 13, illustrating the conditions existing when the shaft is turned in the clockwise direction until the actuating element thereon strikes the blunt end of the lifting cam.

For the sake of brevity I have illustrated in

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the drawings and shall describe in detail only one of the simpler forms which my invention may take. In this particular embodiment there is a supporting table shown as taking the form of a laminated disc 15 of insulating material. This disc is attached to a plate 16 which may, for example, be a part of the frame structure for any conventional means for operating a switch. The only part of such conventional operating means shown is a shaft 17 extending up through the center of the table and having on the upper end thereof a finger piece 18. On top of the disc, spaced apart from each other, located at equal distances from the axis of the shaft, are two stationary, button-like contact pieces 19 and 20. Rising from the disc, behind the stationary contacts and on a radial line between and equally spaced from the contacts, is a little post 21, abruptly reduced in diameter to provide a flat shoulder 22, surmounted by a post section 23 of reduced diameter; the shoulder being closer to the surface of the disc than are the tops of the stationary contacts. Cooperating with the stationary contacts is a movable switch arm 24 in the form of a T, the stem of which contains a hole 25 somewhat larger in diameter than the upper section 23 of the post. The parts are so proportioned that when the stem of the switch arm is resting on shoulder 22, with the post section 23 extending loosely through hole 25, the cross piece of the T may span the distance between the rest on top of the stationary contacts. In order to maintain the switch arm in the proper radial position, I cut a little hole 26 in the support or table, between the post and the shaft, and provide the stem of the arm with a little finger 27 that extends down into the hole. Surrounding the upper section of the post, and resting at its lower end on the switch arm, is a compression spring 28. The spring is held in place by a washer 29 and a screw 30 on the upper end of the post.

When free to do so, spring 28 presses the outer end of the switch arm firmly down against the stationary contacts as shown in Fig. 8. It will be seen that the switch arm does not lie flat on the shoulder 22 at this time, but has contact therewith only at the point in that shoulder that is nearest the shaft; thus insuring good contact between the switch arm and the stationary contacts.

In order to open the switch, the inner or tail end of the switch arm is simply pressed down until the outer end is lifted clear of the stationary contacts. This I accomplish by providing the

shaft with an element projecting radially therefrom and adapted to overlie and force down the inner end of the switch arm whenever the shaft reaches a predetermined angular position. As shown, this element is a ring-like member 31 having a short radial projection 32 the outer end of which is bent down to provide a lip 33 the end edge of which is adapted to engage with the upper side of the switch arm near the inner end of the latter. The side edges of the lip converge in the downward direction. The edge 34 of the lip, namely that which trails when the shaft turns in the clockwise direction, must be at a considerable angle to the vertical, as will hereinafter be explained; whereas the inclination of the opposite edge need not be so great.

Since the switch actuating element is made of metal, it must be insulated from the shaft; and, in one of its aspects, my invention relates to the means, now to be described, for achieving this.

As best shown in Figs. 3, 5 and 6, the upper part of shaft 17 has a flat side 35 that terminates a short distance above the disc or table, where an upwardly facing shoulder 36 is thus created. Surrounding the shaft, and resting on this shoulder, is a sleeve of insulating material made in two sections, 37 and 38, in telescoped relation to each other, section 37 resting on shoulder 36. At the lower end of the sleeve is a wide annular flange 39, while at the upper end is a similar flange 40. As shown in Fig. 3, at least the lower section of the sleeve has a bore to conform to the contour of the flattened portion of the shaft to keep flange 39 from turning on the shaft. The shaft contains a circumferential groove 41 just above the flanged sleeve and a C-shaped key 42, fitted into this groove, holds the two-piece sleeve in place. The opening in the ring portion 31 of the switch actuating element is a little larger in diameter than external diameter of the sleeve, to permit it to lie flat on the lower flange or be tilted upwardly through a small angle. Surrounding the sleeve, between and bearing against the upper flange and the top side of the ring 31, is a strong compression spring 43.

The radii of the flanges 39 and 40 are greater than the radial distance from the axis of the shaft to the lip 34 on the actuating element. The lower flange is therefore provided with a peripheral notch 44, sufficiently wide to allow the lip on the actuating element to extend down through the same.

Normally, with the switch actuating element lying flat on lower washer 39, the lip on that element extends down closer to the surface of the supporting table than does that part of the switch arm, in its closed position, with which the lip engages to open the switch. Therefore, in order to allow the actuating element to drive down on the inner end of the switch arm when brought into switch-opening position, means must be provided to lift up the outer switch engaging end of the actuator and then, when the parts 32 and 33 thereof register with the switch arm, release it abruptly.

The lifting and the release of the actuating element is effected by a cam block 45, mounted on the disc or table a little to one side of the switch in the clockwise direction. This block has on the inner margin an arc-shaped cam face or incline 46, in the path of lip 34 on the switch actuating element as it revolves in the counter clockwise direction with the shaft. The cam block must be sufficiently close to the switch so that, when the

actuating element has travelled the length of the block and passes the high end of the cam, it will drop and land on the switch arm. In so landing, the actuating element, driven by its strong spring, forces the inner end of the switch arm down. If the cam block be made adjustable, the dropping off point may be shifted through a considerable angular distance, either for the purpose of accurately adjusting the zero point or to vary the length of time that the inner end of the switch arm is held depressed during a complete revolution of the shaft. In the arrangement shown, the cam block is arcuate in form and is set in a recess 47, of greater angular length than the block, in the top of the disc or table. The block contains an elongated slot 48 through which extends a screw 49 for securing the block in any position into which it may be adjusted.

When the parts are in the positions occupied by them in Figs. 1, 2 and 3, the switch is open. If the switch is being used simply as a manually operated switch the shaft may be turned, in the counter clockwise direction as viewed in Fig. 3, by means of the finger piece, to shift the actuating element laterally a short distance when the switch is to be closed again. Also, if desired, the shaft may be turned in clockwise direction to close the switch. This follows from the fact that the actuating element is loose on the shaft, whereas flange 39 is fixed to the shaft. Therefore, when the shaft is turned in the clockwise direction, with the switch open as in Fig. 3, the actuating element moves laterally until it strikes the blunt end of the cam block; but the flange 39 continues to exert pressure against inclined edge 34 on lip 33 of the actuating element, and forces the lip upward until it rises above the top of the cam block and can drop down on the same as the shaft continues to turn.

If the switch is being used in connection with a time measuring means that opens a circuit when a predetermined time interval has elapsed after a setting has been made, the finger is simply manipulated to turn the shaft, from the position shown in Fig. 3, through an angle corresponding to such time interval.

If the shaft be one that keeps on rotating indefinitely, the switch will be opened once during each revolution of the shaft and remain open for periods depending on the adjustment of the cam block.

Obviously more than one switch unit may be mounted on the same supporting disc or table and be opened by the same actuating element.

While I have illustrated and described with particularity only a single preferred form of my invention, I do not desire to be limited to the exact details thus illustrated and described, but intend to cover all forms and arrangements that come within the definitions of my invention constituting the appended claims.

I claim:

1. In a switch device, a rotatable shaft, a switch mounted adjacent to the shaft, said switch comprising a stationary contact at some distance from the shaft and a movable member for co-operation with the stationary contact, said movable member being radial to the shaft and mounted between its ends for rocking movements, about an axis at right angles to a plane containing the axis of said shaft and the radial axis of said member, from a position in which its outer end engages the stationary contact to a position in which such end stands clear of

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the stationary contact, a spring tending constantly to hold said movable member in one of its said positions, a spring pressed element projecting from said shaft for engaging with the inner end of said member in a predetermined angular position of the shaft and forcing said member into its second position, and a device engaging said element and holding it under restraint until the shaft reaches said predetermined angular position and then abruptly releasing the element.

2. In a switch device, a rotatable shaft, a switch mounted adjacent to said shaft, said switch comprising two spaced stationary contacts at some distance from the shaft and a switch arm that is radial to the shaft and is widened at its outer end to engage both of the contacts at the same time, said arm being mounted between its ends for rocking movements, about a transverse axis and in a plane containing the axis of the shaft, from a position in which its outer end engages the stationary contacts to a position in which such end stands clear of said contacts, a spring tending constantly to hold the switch arm in one of its said positions, a spring pressed element projecting from said shaft for engagement with the inner end of said arm in a predetermined angular position of the shaft and to force said arm into its second position, and a device engaging said element and holding it under restraint until the shaft reaches said predetermined angular position and then abruptly releasing the element.

3. In a switch device, a rotatable shaft, a switch mounted adjacent to the shaft, said switch comprising a stationary contact at some distance from the shaft and a movable switch arm radial to the shaft for cooperation with the stationary contact, a support between the ends of and underneath the arm on which the arm is rockable, about a transverse axis arranged in a plane at right angles to the shaft, from a position in which its outer end engages the stationary contact to a position in which such end stands clear of the stationary contact, a spring overlying the arm directly above the support and tending constantly to hold the arm in one of its said positions, an element projecting from said shaft for engagement with the inner end of said arm in a predetermined angular position of the shaft to force the arm into its second position, said element being rockable on the shaft about an axis that is parallel to the aforesaid axis when the shaft is in the said predetermined angular position, a stationary cam in position to lift the outer end of said element and then release it when the element is directly above the arm, and a spring thrusting against said element in the direction to hold the outer end of said element down.

4. In a switch device, a rotatable shaft, a switch mounted adjacent to said shaft, said switch comprising a stationary contact at some distance from the shaft and a movable member for cooperating with the stationary contact, said movable member being radial to the shaft and mounted between its ends for rocking movements about an axis at right angles to the radial axis of said member from a position in which its outer end engages the stationary contact to a position in which such end stands clear of the stationary contact, a spring tending constantly to hold the movable member in one of its said positions; an element mounted on said shaft so as to be rotated therewith and rockable in a

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plane containing the axis of the shaft, to engage with the inner end of said members in a predetermined angular position of the shaft and force said member into its second position; a spring, sufficiently strong to overcome the aforesaid spring, pressing said element constantly in the direction to actuate the movable switch member; and a stationary cam adjacent to said switch and in the path of the outer end of said element to cause it to lift that end when the shaft nears said predetermined angular position; said cam terminating at a point so close to the switch that, upon leaving the cam, said element snaps against the inner end of the movable switch member.

5. A switch device as set forth in claim 4, wherein the cam is adjustable angularly of the shaft to vary the point at which the element rockable on the shaft drops off the cam.

6. In a switch device, a rotatable shaft, a switch mounted adjacent to said shaft, said switch comprising a stationary contact at some distance from the shaft and a switch arm that is radial to the shaft, said arm being mounted between its ends for rocking movements about a transverse axis in a plane at right angles to the shaft from a position in which its outer end engages the stationary contact to a position in which such end stands clear of the contact, a spring tending constantly to hold the switch arm in one of its said positions, an actuating element loose on the shaft and projecting therefrom far enough to overlap the inner end of said arm when registering therewith, a member on the shaft to limit the angular movements of the same with respect to the shaft, said element being rockable in a plane that contains the axis of the shaft, a spring acting on said element to cause it to engage the arm and force the same out of the position in which its own spring holds it and into its other position when said element overlaps the arm, a stationary cam in position to lift the outer end of the actuating element when the shaft is revolved, the cam terminating at a point near the switch; and the actuating element and the said member on the shaft having cooperating surfaces that engage with each other, when the shaft is turned to carry the actuating element against the end of the cam nearest the switch, and lift the actuating member to the top of the cam.

7. In a switch device, a rotatable shaft, a switch mounted adjacent to said shaft, said switch comprising a stationary contact at some distance from the shaft and a switch arm that is radial to the shaft, said arm being mounted between its ends for rocking movements about a transverse axis in a plane at right angles to the shaft from a position in which its outer end engages the stationary contact to a position in which such end stands clear of the contact, a spring tending constantly to hold the switch arm in one of its said positions, an actuating element rockable on the shaft in a plane that contains the axis of the shaft and projecting from the shaft far enough to cause its outer end to overlap the inner end of said arm in a predetermined angular position of the shaft, the outer end of said element terminating in a downwardly extending lip, a spring acting on said element to cause the lip to engage the switch arm and force it out of the position in which its own spring holds it and into its other position when said element registers with the arm, and a stationary cam in position to allow said lip to ride up on

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the same and lift the outer end of the actuating element when the shaft is revolved in a forward direction, the cam terminating abruptly at a point near the switch, said actuating element having a limited angular movement around the axis of the shaft, a part fixed to the shaft and engaging the trailing edge of the lip when the shaft is turned backward, said trailing edge being inclined and causing the lip to be lifted when driven by said part on the shaft while the lip is bearing against the abrupt end of the cam.

8. A switch actuator that comprises, a rotatable shaft, a sleeve-like member of insulating material on the shaft and having annular flanges at the ends thereof, at least the lower flange being fixed against rotation relatively to the shaft, a radial actuating element terminating in a washer-like part loosely surrounding said sleeve and resting on the lower flange, the outer end of said element terminating in a downturned lip, a coiled spring surrounding said sleeve and resting at its lower end on said washer-like part and bearing at its upper end against the upper flange, and a stationary cam in the path of the lip as it rotates with the shaft having a face inclined to lift the lip and then, in a predetermined angular position of the shaft, abruptly release the lip.

9. A switch actuator that comprises, a rotatable shaft, a sleeve-like member of insulating

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material on the shaft and having annular flanges at the ends thereof, at least the lower flanges being fixed against rotation relatively to the shaft, a radial actuating element terminating in a washer-like part loosely surrounding said sleeve and resting on the lower flange, the lower flange containing a peripheral notch, the outer end of said element terminating in a downturned lip, narrower than and extending through said notch, a coiled spring surrounding said sleeve and resting at its lower end on said washer-like part and bearing at its upper end against the upper flange, and a stationary cam in the path of the lip as it rotates with the shaft having a face inclined to lift the lip and then, in a predetermined angular position of the shaft, abruptly release the lip.

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