Dec. 2, 1947. M. VAN VALKENBURGH 2,431,849

ELECTRIC SWITCH

Filed Nov. 22, 1944 2 Sheets-Sheet 1

Fig. 1.

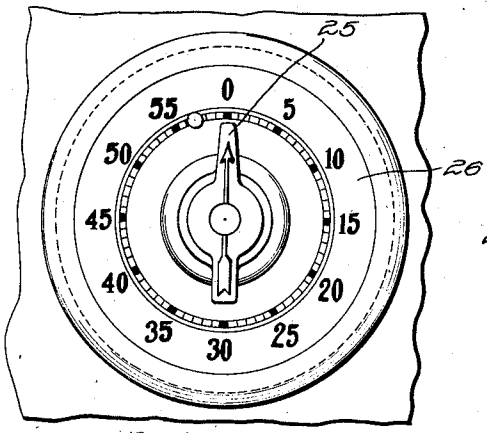


Fig. 2.

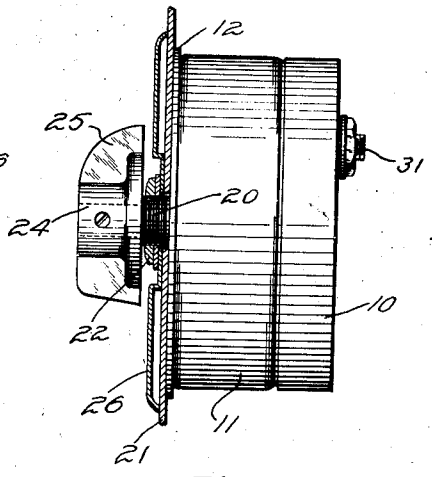


Fig. 3.

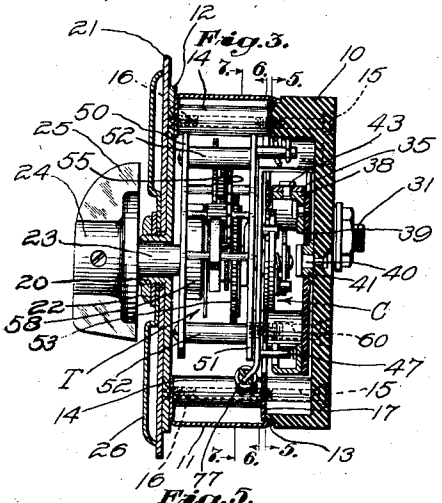


Fig. 4.

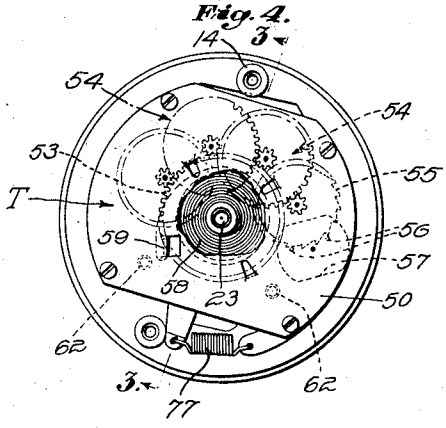


Fig. 5.

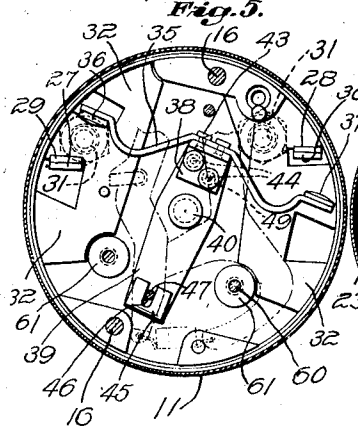


Fig. 6.

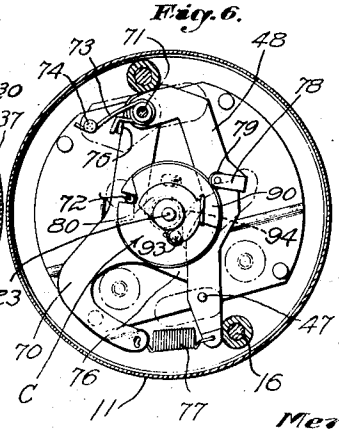
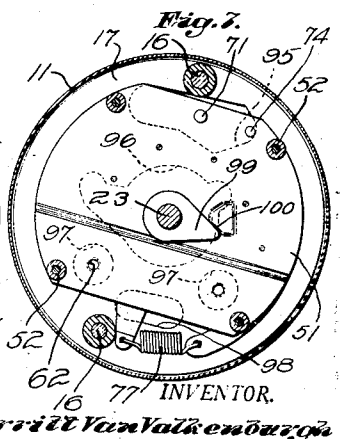


Fig. 7.



INVENTOR.

Merrill VanValkenburgh

BY

Lindsey and Gillard

Attorneys

Dec. 2, 1947. M. VAN VALKENBURGH 2,431,849

ELECTRIC SWITCH

Filed Nov. 22, 1944 2 Sheets-Sheet 2

Fig. 8.

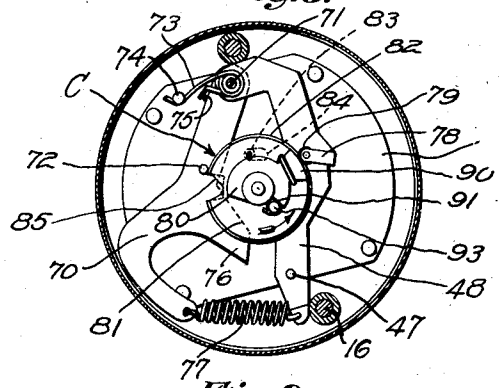


Fig. 9.

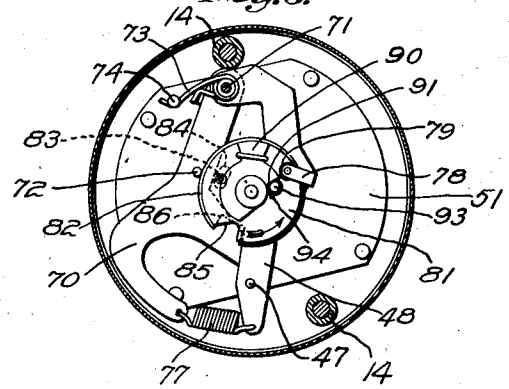


Fig. 10.

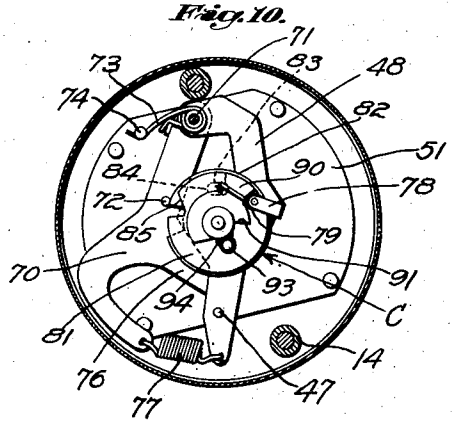
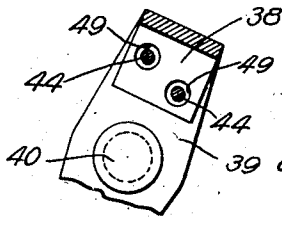


Fig. 11.



INVENTOR.
Merritt VanValkenburgh
BY
Lindsey and Robillard
Attorneys

Patented Dec. 2, 1947

2,431,849

UNITED STATES PATENT OFFICE

2,431,849

ELECTRIC SWITCH

Merritt Van Valkenburgh, Upper Nyack, N. Y., assignor to M. H. Rhodes, Incorporated, Hartford, Conn., a corporation of Connecticut

Application November 22, 1944, Serial No. 564,570

8 Claims. (Cl. 200—39)

1

This invention relates to electric switches and, with respect to certain features, to time-delayed action switches.

The aim of the invention is to provide an improved electric switch having various features of novelty and advantage and which is particularly characterized by its effectiveness and accuracy in operation and by its rugged construction, the arrangement being such that my improved device has an unusually long and useful life.

A further aim of the invention is to provide an improved arrangement of this character which is very simple in construction, which may be economically manufactured, which is compact in arrangement, and which requires a minimum amount of adjustment and care.

A further aim of the invention is to provide an improved switching means wherein the contacts are uniformly made and broken, and sticking, burning, and fouling are practically avoided, with the result that the possibility of switch failure is minimized even under most severe operating conditions.

A further object of the invention is to provide an improved mechanism of simple and effective construction for actuating the switching means to effect a quick make and a quick break between the contacts thereof.

It is also the object of the invention to provide an improved arrangement of this sort which is flexible in use in that my improvements may be incorporated in switches of various sorts such as single pole single throw, single pole double throw, double pole single throw, and double pole double throw switches, and the arrangement may be modified to meet specific requirements and prescribed current arrangements.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereafter set forth and the scope of the application of which will be indicated in the appended claims.

In the accompanying drawings wherein I have shown, for illustrative purposes, one embodiment which the present invention may take:

Figure 1 is a front view of my improved switch;

Fig. 2 is a side view thereof;

Fig. 3 is a cross sectional view taken centrally and longitudinally through the switch substantially on the line 3—3 of Fig. 4;

Fig. 4 is a front view of the switch with the front plate and metal case removed and with the central portion of the upper timer plate 50 broken away;

2

Fig. 5 is a transverse sectional view taken substantially on line 5—5 of Fig. 3 and shows, in front elevation, the base and the switching means carried thereby;

Fig. 6 is a transverse sectional view taken on line 6—6 of Fig. 3 and shows, in rear view, the cam operated mechanism through which the switching means is actuated, with the parts in their normal position at rest;

Fig. 7 is also a sectional view taken on line 7—7 of Fig. 3 and looking in the direction of the arrows;

Fig. 8 is a view similar to Fig. 6 but shows the parts in the position which they take during the initial setting movement of the cam assembly;

Fig. 9 is a view similar to Fig. 8 but shows the parts in the position which they have after the cam assembly has been set in accordance with the desired time interval between the setting operation and the restoration of the parts to the position shown in Fig. 6;

Fig. 10 is a view similar to Fig. 9 but shows the cam assembly as having been rotated by the clock mechanism just short of its final normal position shown in Fig. 6; and

Fig. 11 is a detail view showing the connection between the bracket 38 and the carrier 39.

Referring to the drawings in detail, my improved device is shown as having a housing which includes a base 10 of insulating material, such as Bakelite, a metal ring-like case 11, and a front closure plate 12. The base is formed hollow and its peripheral wall has at its forward edge a rabbet 13 in which the rear edge of the metal case engages. The parts of the housing are secured together by the pillars 14 and the screws 15 and 16 cooperating therewith. Within the housing and engaging the front face of the peripheral wall of the base is a baffle disk or partition member 17 of insulating material which divides the housing into two chambers, one for the switching means shown in Fig. 5 and the other for the timing device designated generally by the letter T. This baffle plate serves to prevent the current from jumping from the switch contacts to the parts of the timing device. The baffle plate has openings through which extend certain of the elements carried by the timing device assembly, as hereinafter explained more in detail. The front closure plate 12 may have a central, forwardly extending, externally threaded sleeve portion 20 which may be employed for mounting the device on a panel 21.

The sleeve extends through an opening in the panel and is secured in place therein by a nut 22. The arbor 23 of the timing device extends through the sleeve 20 and has, at its forward end, a handle or knob 24 provided with a pointer 25. The pointer cooperates with a dial 26 which may be clamped against the panel 21 by the nut 22.

Referring now to the switching means, as shown most clearly in Fig. 5, mounted within the base are two poles 27 and 28 respectively provided with fixed contacts 29 and 30. The poles are secured to the base by studs or inserts 31 which extend through the rear wall of the base so that the line connections (not shown) may be connected thereto. The poles, except for the portions which carry the contacts, are covered by insulator plates 32.

The numeral 35 designates a contactor blade having on its opposite ends contacts 36 and 37 adapted to respectively engage the fixed contacts 29 and 30. The contacts 36 and 37 are located on opposite sides of the blade. The contactor blade is carried through the medium of a bracket 38 by a pivoted arm or carrier 39. The carrier, which is in the form of a thin, rigid strip of insulating material, is pivoted on a stud 40 which is centrally located in the rear wall of the base and in axial alignment with the arbor 23. Between the stud and the carrier is a bushing 41. The bracket 38 is in the form of a right angled metal piece to the forwardly extending arm of which is secured the contactor blade 35 as by means of rivets 43. The bracket is connected to the carrier in such manner that there is a limited lost motion between the two so that, when the movable contacts are brought into engagement with the fixed ones, there is provided a small amount of self adjustment in the alignment of the contact carrying blade to afford relative equalization of contact pressure between contacts 36 and 29 and contacts 37 and 30 which, at the same time, provides a slight sliding movement therebetween which keeps the contacts clean, whereby fouling, burning, and inadequate contact conditions are largely avoided. To this end, the contactor blade may be connected to the carrier in various ways but, by way of illustration, I have shown in Fig. 11 and on a somewhat exaggerated scale the bracket 38 as being connected to the carrier by studs 44, the shanks of which are of slightly lesser diameter than the openings 49 in the bracket through which they extend. The studs, for example, may have a diameter of .062 inch, and the openings in the bracket which accommodate these studs may have a diameter of .067 inch. Secured to the other, in the present instance, the lower end of the carrier is a U-shaped bracket 45 the forward arm of which is provided with a notch or slot 46 which accommodates an actuating pin 47 carried by a lever 48. The lever 48 is actuated, as hereinafter described more in detail, by the cam assembly designated generally by the letter C and which is mounted on the rear end of the spindle or arbor 23.

Referring now to the timing device, the same is shown, for purposes of exemplification, as comprising a clock mechanism having the arbor 23 journaled in bearings provided in frame plates 50 and 51 maintained in spaced relation by pillars 52. Fixed to the arbor is a main gear 53 which is connected through a gear train 54 to an escapement wheel 55. Cooperating with the teeth of this escapement wheel are the pins 56

of the usual pallet wheel 57 whereby the speed at which the clock arbor is driven in one direction is controlled. The arbor is driven during the timing operation (in the present instance in a counterclockwise direction, referring to Fig. 1) by a spring 58, one end of which is connected to the arbor and the other end of which is connected to a lug 59 struck rearwardly from the front frame plate 50. This spring, of course, is wound up when the knob is turned clockwise to set the mechanism in accordance with the desired time interval. The clock mechanism is secured to the base by means of screws 60. These screws pass forwardly through bosses 61 provided on the base 10, and the forward ends of the screws are received by threaded openings 62 provided in the rear frame plate 51. The bosses 61 straddle the lower end of the carrier 39, as will be seen most clearly from Fig. 5, but are sufficiently spaced apart so as not to interfere with the pivotal movement of the carrier.

The contactor blade 35 of the switching means is operated with a quick make movement and a quick break movement by the cam assembly C acting through a cam actuated lever 70 and the switch operating lever 48. These levers are pivoted on a pin 71 carried by and extending rearwardly from the back frame plate 51 of the clock mechanism. The levers are positioned between this back plate and the baffle plate or disk 17 and they straddle the arbor 23 forwardly of the cam assembly C. The lever 70 has between its ends a follower pin 72 which is resiliently urged towards the periphery of the cam assembly C by a spring 73 coiled about the pin 71 and having one end engaging against an anchor pin 74 and the other end hooked about a lug 75 projecting rearwardly from the lever 70 adjacent its point of pivot. The lever 70 has a laterally extending arm 76 against the end of which the lever 48 is adapted to engage, as shown most clearly in Fig. 6. The levers are urged towards each other by a tension spring 77, the opposite ends of which are respectively connected to the free or lower ends of the levers. As previously stated, the lever 48 has a pin 47 which engages in the notch 46 in the bracket 45 which is fixed to the carrier 39. The lever 48 has between its ends a rearwardly offset arm or bracket 78 which carries a pin 79 adapted to cooperate with a hold-back member 80 associated with the cam assembly, as will be later described.

The cam assembly comprises a cam disk 81 fixed to the arbor and a supplemental disk 82 journaled on the arbor for limited rotary movement relative to the disk 81. In order to permit of limited lost motion between the disks 81 and 82, the former has a pin or teat 83 which extends into an arcuate slot 84 provided in the disk 82. The cam disk 81 has a notch in its periphery, and this notch has a cam or sloping edge 85. The disk 82 is of slightly larger diameter than the disk 81 and it has a notch 86, both edges of which may be generally radially disposed. Normally, the follower pin 72 engages in these notches, as shown in Fig. 6. With this arrangement, when the arbor is manually turned to set the device for operation for a predetermined time period, the cam assembly is turned therewith, clockwise with respect to Fig. 1 and counter-clockwise with respect to Fig. 6, with the result that the cam edge 85 of the disk 81 will cam the pin outwardly thereby moving the lever 70 to the position shown in Fig. 8. The device having been set, the arbor will now be rotated in the opposite direction by the clock spring 58 and, due to the engagement of the follower pin

72 against the periphery of the disk 82, the latter will remain stationary until the teat 83 engages the leading end of the slot 84 and then the two disks will rotate together until the pin rides off of the periphery of the disk 82 and into the notches in the disks 81 and 82.

The hold-back member 80 serves to prevent the switch operating arm from moving on initial setting movement of the device and then allow the switch operating arm to operate with a quick movement whereby it will snap the switching means from one position to another, in the present instance, from an "off" position to an "on" one. This hold-back member is loosely mounted on the inner end of the arbor 23, rearwardly of the cam assembly. It has a lug 90 adapted to cooperate with the pin 79 carried by the switch operating lever 48. It also has a shoulder 91 which is normally urged into engagement with an abutment 93, here shown as being in the form of a pin carried by the cam disk 81. The hold-back member is resiliently urged into the position shown in Figs. 6 and 9 by means of a spring 94 which is coiled about the arbor and has its opposite ends respectively anchored to the lug 90 and the pin 93.

The baffle disk 17, as shown in Fig. 7, has openings 95, 96, 97 and 98 which respectively accommodate the pivot pin or post 71, the cam assembly C, the bosses 61, and the pin 47 which cooperates with the carrier 39. In order to positively prevent the arbor from being turned past zero position, the arbor has a stop arm 99 (see Fig. 7) fixed thereto which cooperates with the raised shoulder 100 provided on the back frame plate 51 of the clock mechanism.

The operation of the device is briefly as follows: Starting with the parts in the positions shown in Figs. 1 to 7, to set the device the knob 24 is turned clockwise with respect to Fig. 1 into registry with the numeral on the dial corresponding to the desired time interval during which it is desired that the switch be "on" (or "off" as the case may be). In Figs. 8 and 9 the arrows on the disk 81 indicate the direction of setting when the device is viewed from the rear. Upon initial setting movement of the knob, the cam edge 85 of the disk will cam the follower pin 72 outwardly thereby moving the actuating lever 70 from the normal position shown in Fig. 6 to that shown in Fig. 8. When this is done, the spring 77 is placed under increased tension. At the same time that the pin 72 is being cammed outwardly, the abutment pin 93, due to its engagement with the shoulder 91 of the hold-back member, moves the hold-back member to a position (see Fig. 8) where the lug 90 thereof lies in the path of movement of the pin 79 so that the switch operating lever 48 cannot at this time follow the lever 70. However, on continued setting movement of the arbor, the hold-back member is moved out of the path of movement of the pin 79 whereupon the switch operating lever 48, under the influence of the spring 77, will quickly move from the position shown in Fig. 8 to that shown in Fig. 9, and upon such movement, the switch will be closed with a snap action. The device having thus been set to operate for a predetermined interval of time, the clock spring 58 will now drive the arbor 23 and the cam assembly C counterclockwise with respect to Fig. 1 and clockwise with respect to Figs. 6, 8, 9 and 10. Due to the engagement of the follower pin 72 against the periphery of the disk 82, the latter remains stationary until the pin 83 comes up against the now leading edge of the slot 84 in the disk 82. Then the two disks 81 and 82 will continue to rotate in unison until the follower pin 72 rides off of the periphery of the disk 82 into the notches in these disks. When the follower pin thus rides into the notches, the spring 73 moves the cam actuated lever and the switch operating member with a quick movement from the positions shown in Fig. 10 to their normal positions shown in Fig. 6 with the result that the switch is broken with a quick break movement. During at least a portion of the timing operation, the leading edge of the hold-back lug 90 will engage the pin 79 carried by the switch operating lever, as shown in Fig. 10. When the switch is closed at the end of the timing cycle, this pin is moved out of the path of movement of the lug so that the hold-back member, under the influence of the spring 94, will move from the position shown in Fig. 10 to that shown in Fig. 6. Obviously, if desirable to reduce friction, rollers might be substituted for pins 72 and 79 in levers 70 and 48, respectively.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

I claim as my invention:

1. In a time-controlled switch mechanism, a switch, timing means having an arbor manually rotatable in one direction to set the mechanism for the desired time cycle and driven in the opposite direction in a time-controlled manner, cam means on said arbor, a cam actuated member movable by said cam means in one direction upon initial setting operation of the timing means and movable in the opposite direction with a snap action at the end of the time cycle, a switch operating member movable in one direction with a snap action by said cam actuated member at the end of the time cycle, and means on the arbor for preventing movement of the switch operating member in the opposite direction upon initial setting movement of the arbor and then permitting the same to move in said last-mentioned direction with a snap action.

2. In a time-controlled switch mechanism, a switch, timing means having an arbor manually rotatable in one direction to set the mechanism for the desired time cycle and driven in a time-controlled manner in the opposite direction, a cam assembly on said arbor comprising a disk provided with a notch, a cam actuated member having a follower adapted to engage in said notch and to be cammed thereoutof upon initial setting of the arbor, a spring urging said cam actuated member in a direction to engage said follower with said cam assembly, a switch operating member movable in one direction with a snap action by said cam actuated member at the end of the time cycle, and a latch on said arbor for preventing the said switch operating arm from moving in the opposite direction upon initial setting movement of the arbor and then permitting the same to move with a snap action.

3. In a time-controlled switch mechanism, a

switch having a member movable between two positions, timing means including an arbor manually rotatable in one direction to set the mechanism for the desired time cycle and driven in a time-controlled manner in the opposite direction, a cam actuated member alternately movable between a first position and a second position, cam means on said arbor arranged to move said cam actuated member from the first position to the second one during the setting operation of the timing means and to permit said cam actuated member to move back to the first position with a snap action at the end of the time cycle, a switch operating member connected to said switch member and movable in opposite directions, and means on said arbor for delaying movement of said switch operating arm in one direction upon initial setting movement of the arbor and then permitting the same to move in said direction with a snap action, said switch operating arm being moved with a snap action in the opposite direction by said cam actuated member at the end of the time cycle.

4. In a time-controlled switch mechanism, a switch having a member movable between two positions, timing means including an arbor manually rotatable in one direction to set the mechanism for the desired time cycle and driven in a time-controlled manner in the opposite direction, cam means on said arbor, a pivoted cam actuated lever associated with said cam means and arranged to be moved thereby in one direction during the initial setting operation of the timing means, a spring associated with said cam actuated lever for moving the same in the opposite direction with a snap action at the end of the time cycle, a pivoted switch operating lever operatively connected to said switch member, a spring between said levers and normally urging them together, and latch means on the arbor for preventing movement of the switch operating arm upon initial setting movement of the arbor.

5. In a time-controlled switch mechanism, a switch, timing means having an arbor manually rotatable in one direction to set the mechanism for the desired time cycle and driven in a time-controlled manner in the opposite direction, a cam assembly on said arbor and comprising a disk having a notch in its periphery, a cam actuated lever having a follower, a spring normally urging said lever in a direction to maintain said follower against said disk, said cam means being arranged to cam the follower out of said notch upon the initial setting operation of the arbor and to permit said follower to fall into said notch with a snap action at the end of the time cycle, a switch operating lever operatively connected to said switch and maintained by said cam actuated lever in position in one direction when said follower is engaged in said notch, and a latch carried by said arbor for temporarily, during initial setting operation of said cam means, holding said switch operating lever and then permitting said switch operating lever to move toward said cam actuated lever with a snap movement.

6. In a time-controlled switch mechanism, a switch, timing means having an arbor manually rotatable in one direction to set the mechanism for the desired time cycle and driven in a time-controlled manner in the opposite direction, cam means on said arbor, a cam actuated lever movable by said cam means to one position upon initial setting operation of the timing means and movable in the opposite direction with a snap action at the end of the time cycle, a switch operating lever movable in one direction with a snap action by said cam actuated lever at the end of the time cycle, a latch journaled on said arbor for limited movement relative thereto and having a lug for preventing movement of the switch operating arm in the opposite direction upon initial setting movement of the arbor and then permitting the same to move in said last-mentioned direction with a snap action and toward engagement with said first-mentioned lever, and a spring associated with said latch.

7. In a time-controlled switch mechanism, a switch, timing means having an arbor manually rotatable in one direction to set the mechanism for the desired time cycle and driven in a time-controlled manner in the opposite direction, cam means on said arbor having a disk provided with a notch, a cam actuated lever disposed to one side of said arbor and normally urged towards the same, said lever having a follower adapted to be cammed out of said notch upon initial setting movement of the timing means and to move into said notch with a snap action at the end of the time cycle, a switch actuating lever disposed to the other side of said arbor and engageable with said first-mentioned lever, a spring normally urging said switch operating lever into engagement with said switch actuated lever, and means associated with said cam means for preventing movement of said switch operating lever while said follower is being cammed out of said notch and then permitting said switch actuating lever to move with a snap action toward engagement with said cam actuated lever.

8. In a time-controlled switch mechanism, a switch, timing means having an arbor manually rotatable in one direction to set the mechanism for the desired time cycle and driven in a time-controlled manner in the opposite direction, cam means on said arbor having a disk provided with a notch, a cam actuated lever disposed to one side of said arbor and normally urged towards the same, said lever having a follower adapted to be cammed out of said notch upon initial setting movement of the timing means and to move into said notch with a snap action at the end of the time cycle, a switch actuating lever disposed to the other side of said arbor and engageable with said first-mentioned lever, a spring normally urging said switch operating lever toward engagement with said cam actuated lever, a latch on said arbor for preventing movement of said switch operating lever while said follower is being cammed out of said notch and then permitting said switch actuating lever to move with a snap action toward engagement with said cam actuated lever, said latch having limited oscillatory movement with respect to said cam means, and a spring for normally urging said latch to an operative position.

MERRITT VAN VALKENBURGH.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
453,572	Bauman	June 2, 1891