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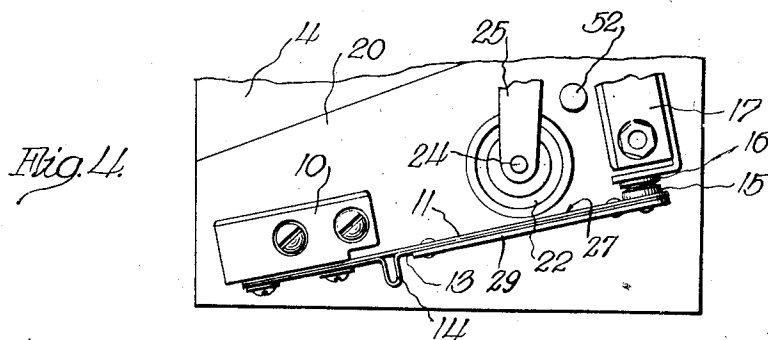
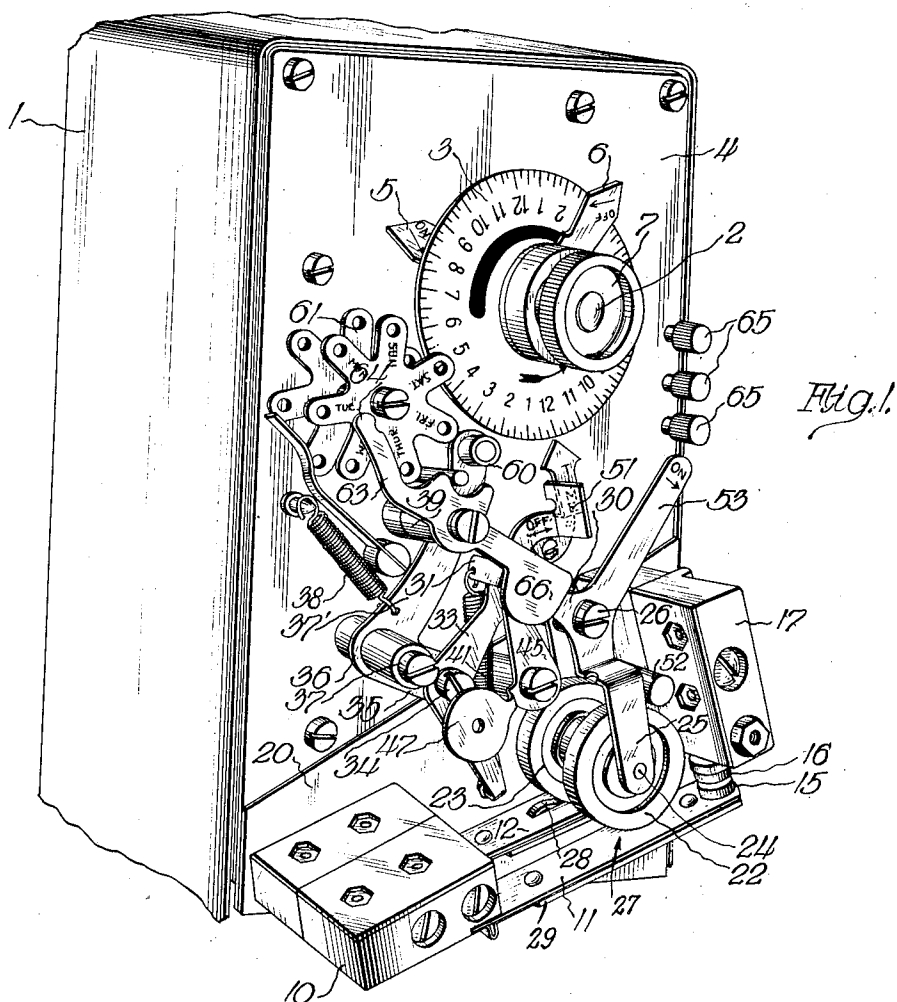
R. H. WILMETH ET AL

1,992,273

TIME SWITCH

Filed June 9, 1932

2 Sheets-Sheet 1



Inventors:
Roscoe H. Wilmeth
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Att'ys

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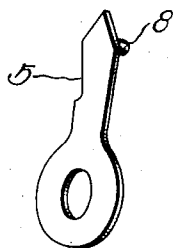
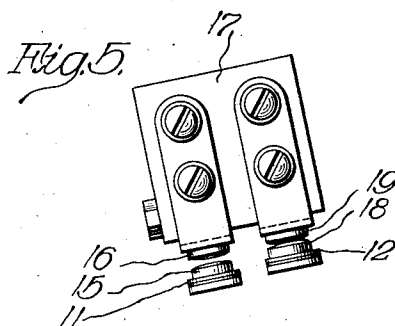
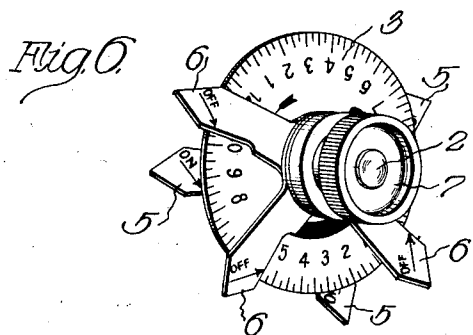
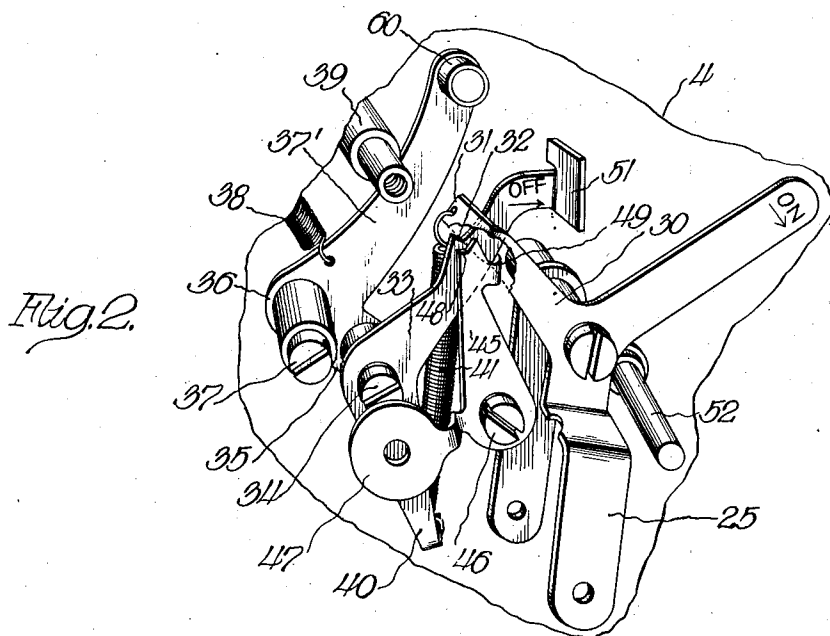
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UNITED STATES PATENT OFFICE

1,992,273

TIME SWITCH

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12 Claims. (Cl. 200—39)

The present invention relates to electric switches in general and more particularly to such switches as are controlled by a clockwork or the like, and known in the art as time switches.

5 The switch of the present invention establishes and interrupts the circuit through a pair of relatively massive silver contact buttons which may be approximately .02 inch apart in the switch open position. Time switches are frequently connected to tungsten lamp loads, these having the characteristics that the initial rush of current when the lamps are cold may be five to ten times normal load current. It is therefore quite possible for a slight amount of weld to occur at the contact buttons. Therefore the mechanism must be such as to forcibly separate the contact buttons when it is desired to open the switch, and not to open them beyond certain fixed limits. The switch of the present invention employs a stationary contact button and a movable contact button mounted upon a flexible leaf spring that is flexed a small amount to cause the buttons to engage or disengage, as desired. The flexible spring is actuated by a pivoted lever that carries a roller at its end, said roller abutting against the spring. The arrangement is such that the spring extends substantially tangent to the path of movement of the abutting roller under the action of the lever. This, therefore, comprises a toggle whereby a comparatively large amount of movement of the lever produces a comparatively small amount of movement of the spring. This results in a forceful opening of the contacts. Also, a limited amount of wear in the various parts that control the lever will result in a negligible change in the amount of opening of the switch contact buttons.

It is another object of the present invention to provide a switch actuating mechanism for a time switch of the class above described which may be manually operated at any time without disabling the time control of the switch and wherein no harm will be produced by the attempt of the automatic mechanism to close the switch after it has been manually closed, or to open it after it has been manually opened, and wherein a simple form of automatic lock-out is provided for automatically blocking the action of the time switch on any predetermined day of the week.

The attainment of the above and further objects of the present invention will be apparent from the following specification taken in conjunction with the accompanying drawings forming a part thereof.

In the drawings:

55 Figure 1 is a perspective view showing the

front portion of a time switch embodying the principles of the present invention;

Figure 2 is a fragmentary perspective view of a portion of the mechanism shown in Figure 1, some of the parts being omitted for the sake of clearness;

Figure 3 is a perspective view of one of the details of the clock control mechanism;

Figure 4 is a front view of the switch blade and the switch contacts;

Figure 5 is an end view thereof; and

Figure 6 is a fragmentary view showing the arrangement for providing a plurality of "on" and "off" periods per day.

Reference may now be had more particularly to Figures 1 and 2. At 1 there is indicated a fragmentary portion of an enclosing box within which there is mounted a clock mechanism that drives a shaft 2 carrying on it a usual disc 3, the arrangement being such that the disc makes one complete revolution in twenty-four hours. The clock mechanism within the casing 1 may be of any desired construction, either a spring clock or the usual type of synchronous motor clock comprising merely a synchronous motor and a suitable gear train whereby the motor drives the disc 3 through one revolution in exactly twenty-four hours. The switch and the various actuating links and levers therefor are mounted upon a cover plate 4 that is removably secured to the box 1 and is provided with an opening through which the clock driven shaft 2 extends. An "on" actuating lever, which is of a construction such as shown more particularly in Figure 3, and a similar "off" lever 6 are mounted upon the shaft 2 in angularly adjustable relation and are locked in adjusted position thereon by a thumb screw 7. The lever 5 differs from the lever 6 only in that it is provided with a pin 8 on its under side, for a purpose to be more fully set forth as this description proceeds. The lever 6 has no such pin.

The switch proper, as illustrated in the drawings of this application, comprises a single pole double throw switch and includes a terminal block 10 of suitable insulation secured to the cover plate 4 and having secured thereto a pair of switch blades comprising leaf springs 11 and 12 of phosphor bronze or other suitable resilient material. Each spring is backed by a strip 13 of copper or the like having a small loop 14 near the point where the phosphor bronze strip flexes, to prevent any substantial change in elasticity of the spring with time. The blade 11 carries a silver contact button 15 at its outer end, said contact button cooperating with a similar contact but-

ton 16 mounted upon a block of insulation 17 secured to the cover plate 4 and constituting a support for one terminal of the switch. The spring 12 carries a similar silver contact button 18 that cooperates with a similar button 19 carried on the block of insulation 17. The arrangement is such that the contacts 15—16 are open when the contacts 18—19 are closed and, conversely, they are closed when the contacts 18—19 are open. Obviously the springs 11—12 could be arranged to simultaneously close and open their respective contacts, in which case the switch would be a single throw double pole switch. Also, one of the switches 11 or 12, and its associated contacts, could be omitted if desired. A suitable sheet of insulating material 20 is provided adjacent the lower end of the metal cover plate 4, thereby reducing the chances of a short circuit during the testing or adjustment of the switch. The switch blades 11 and 12 are biased upwardly by their natural resiliency and are moved downwardly by a pair of insulating rollers 22—23 carried by a pin 24 at the end of a lever arm 25 that is pivoted about a pin 26. When the parts are in the relative positions shown in Figure 1 the roller 22 maintains the spring 11 flexed to separate the contact 15 and the contact 16. At this same time the roller 23 clears the spring 12 so that the contact 18 carried by this spring engages the stationary contact 19. If the switch actuating lever 25 is turned about its pivot 26 in a generally clockwise direction through a small angle the roller 22 clears the spring 11, whereupon this spring causes its contacts to close. At the same time the roller 23 rides upon a small hump 28 in the spring 12 and flexes this spring downward to cause it to open its corresponding contacts 18—19.

The angular movement of the lever 25 from the position shown in Figure 1 to its other extreme position is relatively small. When the switch 11 is open the center line between the center of the pin 26 and the center of the pin 24 is approximately perpendicular to the leaf spring 11 which constitutes the switch blade. This gives a toggle effect which results in a rather small switch opening even at a fairly large angular throw of the lever 25, and such as to produce fairly large forces between the roller and the blade, if for any reason the contacts should fail to open instantly.

The switch actuating lever 25 has an arm 30 formed integrally therewith, said arm 30 having a rearwardly bent portion 31 that cooperates with a detent 32 on a release lever 33 comprising a pawl. The release lever is pivotally mounted on a floating pivot 34 carried by an arm 35 of a bell crank 36 that is pivoted about a stationary pivot 37. The opposite arm of the bell crank 36 is indicated at 37'. A spring 38 biases the bell crank in a counterclockwise direction to the position shown in the drawings, where it bears against a stop pin 39. The lever 33 also comprises a bell crank the opposite arm 40 of which is connected by a spring 41 with the bent back portion 31 of the arm 30.

In Figure 2 we have shown the various links in their relative positions when the switch actuating lever 25 is moved to permit a closure of the contacts 15—16. For the purpose of the present description this may be termed the "on" position. The position of the parts shown in Figure 1 may therefore be termed the "off" position. When the switch is in its "on" position the spring 41 urges the arm 30 against the detent 32, at the same time urging the detent against said arm.

The pivot pin 34 is maintained stationary by the spring 38 which maintains the bell crank 36 against the stop 39. The lever 33 therefore comprises a pawl that holds the actuating lever 25 in its "on" position. It is to be noted that at this time the spring 41 exerts no thrust at the pivot pin 34 to tend to move the bell crank 36. An additional lever 45 is pivoted about a stationary pivot 46 on the cover plate 4 and is gravity biased to the position shown by means of a weighted portion 47. The lever 45 has a detent 48 at its outer end, said detent being immediately under the bent back portion 31 of the arm 30 when the bent back portion 31 is engaged by the detent 32. At this time the detent 48 does not engage the lower side of the bent back portion 31. The lever 45 is provided with a bent back portion 49 that extends to the rear of the lever 33 so that when the lever 33 is pivoted, clockwise, about its pivot 34 it causes the lever 45 to move about its pivot 46 in a clockwise direction to move the detent 48 clear of the lower edge of the bent back portion 31.

An explanation will now be given of the mode of operation of the apparatus thus far described. Assume that the switch is in its "off" position as shown in Figure 1. The clock controlled levers 5 and 6 are set in a given position about the shaft 2 and locked in position by the thumb screw 7. As the shaft 2 is rotated by the clock mechanism within the casing 1 it turns the levers with it. The shaft 2 is arranged to rotate in a generally counterclockwise direction, as is frequently the practice in time switches, rather than in a generally clockwise direction as in the usual time indicating clocks. The lever 37' carries a roller 60 at its end, said roller being in the path of movement of the clock driven lever 5. As the lever 5 advances it first engages the roller 60 and upon continuing its advancement it turns the bell crank 36 about its pivot 37. It is to be noted that at this time the switch actuating lever 25 is in the "off" position; hence, its bent back portion 31 is free of the detent 32 of the lever 33. As the bell crank 36 rotates the pivot 34 clockwise about the pivot 37 it draws the lever 33 downward, said lever being maintained against the bent back portion 31 of the arm 30 by the spring 41. As the lever 33 is drawn downwardly the detent 32 finally comes under the bent back portion 31 and, under the action of the spring, the arm 33 is turned slightly to cause the detent 32 to engage beneath the arm 31. Thereafter any slight continuation of the movement of bell crank 36 is of no effect. As the clock driven lever 5 continues to move it finally clears the roller 60 and the bell crank lever 36 being thereby released is immediately snapped back against the stop 39 to the position shown in Figures 1 and 2. The floating pivot 34 is moved counterclockwise about the pivot 37 and raises the lever 33 which, at its detent 32, moves the arm 30 and therefore the switch actuating lever 25 to the "on" position. It is to be noted that this movement is a snap movement under the action of the spring 38. The switch now remains in its "on" position, which is the position shown in Figure 2, until the clock driven lever 6 is brought into position to actuate the "off" or release lever 33. For this purpose the lever 33 is provided with a projecting portion 51 that is in the path of movement of the end of the lever 6 but out of the path of movement of the lever 5, said lever 5 advancing under the projecting portion 51. The clock driven lever 6 engages the projecting portion 51 of the release lever 33 and moves this lever about

its pin 34 to cause the detent 32 to free the bent back portion 31 of the arm 30. At the same time the lever 33 engages the back portion 49 of the lever 45 and moves this lever about its pivot 46 so that its detent 48 also clears the bent back portion 31 of the lever 30. The lever 30 is immediately snapped, counterclockwise, by the spring 41 to its "off" position, thereby moving the switch blade 11 to open the contacts 15-16. A pin 52 limits the extent of motion of the actuating lever 25. As the clock driven shaft 2 advances it again brings the lever 5 into engagement with the roller 60 whereby the switch is again closed, thus repeating this cycle of operation. It is thus apparent that this cycle of operation will be repeated once every twenty-four hours, the time taken for one complete revolution of the shaft 2.

The switch may be manually actuated to its "on" position by means of a lever 53 which is integral with the levers 25 and 30. Likewise, the release portion 51 of the release lever 33 is readily accessible for manual operation whereby the switch may be tripped to its "off" position manually, independent of the clock lever 6.

The lever 45 performs an important function in connection with the manual operation of the switch. This may be seen from the following consideration. Assume that the clock mechanism has tripped the lever 33 to trip the switch. Assume that the switch is then manually closed before the clock driven lever 5 engages the roller 60 to produce an automatic closing. Thereafter, as the lever 5 engages the roller 60 and swings the bell crank 36 about its pivot, the lever 33 is drawn downward by the clockwise movement of its pivot 34 about the pivot pin 37. In the absence of the lever 45 the bent back portion 31 of the arm 30 would follow the downward movement of the detent 32, thus causing a slow movement of the actuating lever 25 from its "on" position to its "off" position, such slow movement being brought about by the clock driven lever 5 actuating the bell crank 36. This gradual opening of the contacts 15-16 might be objectionable under many conditions. By the present arrangement the downward movement of the lever 33 does not result in a movement of the actuating lever 25, said last mentioned lever being now held against movement by the detent 48 of the lever 45. Thereafter, as the clock driven lever 5 releases the bell crank lever 36 the lever 33 is again brought back to the position shown in Figure 2, all without producing any effect upon the switch 11.

The switch can be blocked to prevent closing on any selected days of the week. For this purpose there is provided a double deck seven arm star wheel 61. The pin 8 on the lower side of the lever 5 (Figure 3) engages the lower deck of the star wheel and advances it one step for each complete revolution of the shaft 2. Thus, the star wheel will make one complete revolution per week. A blocking lever 63 is pivoted about the pin 39 and is gravity biased to its inoperative position. The arm 64 of the block-out lever is immediately above the upper deck of the star wheel 61. Since the star wheel makes one complete revolution per week it is apparent that once the star wheel is set properly each spoke will come under the arm 64 on a fixed day of the week. The spokes are therefore labeled in accordance with the respective days that they come under the lever arm 64. The switch can be blocked to prevent closing on any selected days of the week by taking one or more of the pins 65

and screwing them into openings provided at the ends of the respective spokes. When the corresponding spoke having a pin at its end comes adjacent the lever arm 64 it forces this arm counterclockwise about its pivot, thereby bringing the portion 66 thereof against the bent portion 51 of the lever 33 thus blocking this lever to prevent the detent 32 engaging the bent back portion 31 and thereby preventing actuation of the switch.

While in Figure 1 we have shown only one "on" lever 5 and one "off" lever 6 it is apparent that a plurality of such levers may be provided if desired. When one "on" period per day is desired the levers 5 are stacked one above the other and the levers 6 are stacked one above the other. Only the lowest one of the "on" levers is provided with a pin 8 for actuating the star wheel 61. When a plurality of "on" periods per day are desired the levers 5 and 6 are staggered around the disc 3, as shown in Figure 6, so that the "on" lever 37' and the "off" lever 33 are alternately actuated.

In compliance with the requirements of the patent statutes we have herein shown and described a preferred embodiment of our invention. It is however to be understood that the invention is not limited to the precise construction herein shown, the same being merely illustrative of the principles of the invention. What we consider new and desire to secure by Letters Patent is:

1. A time switch comprising a switch actuator, a combined actuating and releasing device therefor comprising a lever mounted on a floating support, clock controlled means for moving the support and with it the lever to move the switch actuator, clock controlled means for moving the lever with respect to its support for releasing the switch actuator, and means for preventing the release of the switch actuator during the movement of the support.

2. A time switch comprising a switch actuator, a member having two distinct movements, means for actuating the actuator in accordance with one of said movements and releasing the actuator in accordance with the other movement, clock controlled devices for alternately imparting said two movements to said member, independent means for actuating the switch actuator, and means for rendering ineffective the first mentioned movement while the switch actuator is in its actuated position.

3. A time switch including a first movable member having a normal position, a clock driven device periodically moving said member from its normal position and then releasing the same, a pawl movably mounted on the first member and biased to its locking position, said pawl being periodically moved to its release position by the clock driven device, a switch actuator biased to one position and held in another position by the pawl, spring means for snapping the switch actuator to its biased position upon release of the pawl, said pawl being brought into reengagement with said switch actuator upon movement of said first member from its normal position by the clock driven device, spring means for snapping said first member back to its normal position upon release thereof by the clock driven device whereby the pawl snaps the switch actuator from its biased position to its alternate position, means for manually moving the switch actuator from its biased position to its alternate position, and additional means for holding the switch actuator in its alternate position for preventing release

thereof by movement of the pawl with the first mentioned member.

4. A time switch including a first movable member having a normal position, a clock driven device periodically moving said member from its normal position and then releasing the same, a pawl movably mounted on the first member and biased to its locking position, said pawl being periodically moved to its release position by the clock driven device, a switch actuator biased to one position and held in another position by the pawl, spring means for snapping the switch actuator to its biased position upon release of the pawl, said pawl being brought into reengagement with said switch actuator upon movement of said first member from its normal position by the clock driven device, spring means for snapping said first member back to its normal position upon release thereof by the clock driven device whereby the pawl snaps the switch actuator from its biased position to its alternate position, means for manually moving the switch actuator from its biased position to its alternate position, additional means for holding the switch actuator in its alternate position for preventing release thereof by movement of the pawl with the first mentioned member, and means for releasing said additional holding means upon movement of the pawl with respect to the first movable member by the clock driven device.

5. A time switch including a first movable member having a normal position, a clock driven device periodically moving said member from its normal position and then releasing the same, a pawl movably mounted on the first member and biased to its locking position, said pawl being periodically moved to its release position by the clock driven device, a switch actuator biased to one position and held in another position by the pawl, spring means for snapping the switch actuator to its biased position upon release of the pawl, said pawl being brought into reengagement with said switch actuator upon movement of said first member from its normal position by the clock driven device, spring means for snapping said first member back to its normal position upon release thereof by the clock driven device whereby the pawl snaps the switch actuator from its biased position to its alternate position, means for manually moving the switch actuator from its biased position to its alternate position, additional means for holding the switch actuator in its alternate position for preventing release thereof by movement of the pawl with the first mentioned member, means for releasing said additional holding means upon movement of the pawl with respect to the first movable member by the clock driven device, and a pair of switches alternately closed and opened upon movement of the switch actuator to its respective positions.

6. A time switch including a first movable member having a normal position, a clock driven device periodically moving said member from its normal position and then releasing the same, a pawl movably mounted on the first member and biased to its locking position, said pawl being periodically moved to its release position by the clock driven device, a switch actuator biased to one position and held in another position by the pawl, spring means for snapping the switch actuator to its biased position upon release of the pawl, said pawl being brought into reengagement with said switch actuator upon movement of said first member from its normal position by the clock driven device, spring means for snapping

said first member back to its normal position upon release thereof by the clock driven device whereby the pawl snaps the switch actuator from its biased position to its alternate position, and means controlled by the clock driven device for locking out the pawl and rendering said movement of the first member ineffective.

7. A time switch including a clock driven member, a first lever pivoted about a stationary pivot and biased to a given position, said lever being periodically actuated and released by the clock driven member, a second lever pivoted on a floating pivot carried by the first lever, a movable switch actuating member, said switch actuating member and said second lever including cooperating releasable engaging portions whereby the second lever moves the switch actuating member in one direction by movement of the first lever, and spring means for maintaining the releasable engagement when the first lever is returned to its biased position, said spring means extending between the said second lever and said switch actuating member and serving also to bias said switch actuating member for movement in the opposite direction.

8. A time switch including a clock driven member, a first lever pivoted about a stationary pivot and biased to a given position, said lever being periodically actuated and released by the clock driven member, a second lever pivoted on a floating pivot carried by the first lever, a movable switch actuating member, said switch actuating member and said second lever including cooperating releasable engaging portions whereby the second lever moves the switch actuating member in one direction by movement of the first lever, spring means for maintaining the releasable engagement when the first lever is returned to its biased position, and a second clock driven member periodically actuating the second lever to disengage said releasable engaging portions, said spring means extending between said second lever and said switch actuating member for moving said switch actuating member in the opposite direction.

9. Switching means comprising a Y-shaped lever pivoted about a stationary pivot and carrying a roller at one end of one arm, a switch blade mounted at one end and abutting the roller at a point spaced from the mounted end, said roller actuating the blade upon movement of the lever, the radius between the center of the roller and the pivotal center of the lever being substantially at right angles to the switch blade thereby providing a toggle effect upon actuation of the blade, a clock controlled mechanism including a pawl moved into and out of engagement with another arm of the Y-shaped lever for actuating and releasing the same to actuate the switch blade, and spring means for moving the lever upon release thereof by the pawl, said third arm of the Y-shaped lever comprising means for manually actuating the same.

10. In a switch, a switch actuator, a pawl movable into engagement with the actuator and returned to move the actuator, means for holding the actuator in its moved position in the event of a repetition of the first mentioned movement of the pawl, and means controlled by the pawl for releasing the last named means.

11. In a switch, a switch actuator biased to one position and movable to an alternate position against the bias, a member movable into engagement with the actuator and upon return movement moving the actuator to its alternate

position and holding it in said position, and additional means for holding said actuator in its alternate position in the event of a repetition of the first mentioned movement of the member, 5 said member having a second type of movement for releasing said additional means to permit return movement of the actuator to its biased position.

10 12. In a switch, a switch actuator biased to one position and movable to an alternate position against the bias, a member movable into engagement with the actuator and upon return move-

ment moving the actuator to its alternate position and holding it in said position, additional means for holding said actuator in its alternate position in the event of a repetition of the first mentioned movement of the member, said member having a second type of movement for releasing said additional means to permit return movement of the actuator to its biased position, and clock controlled means for imparting the two types of movement to said member. 10

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