May 8, 1962 D. F. FLEGEL 3,033,950

ELECTRICAL TIMER SWITCH CONTROL

Filed April 17, 1959

FIG. 1.

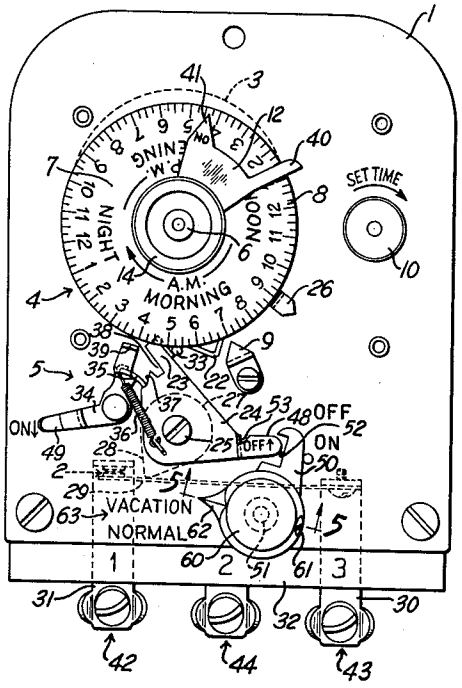


FIG. 3.

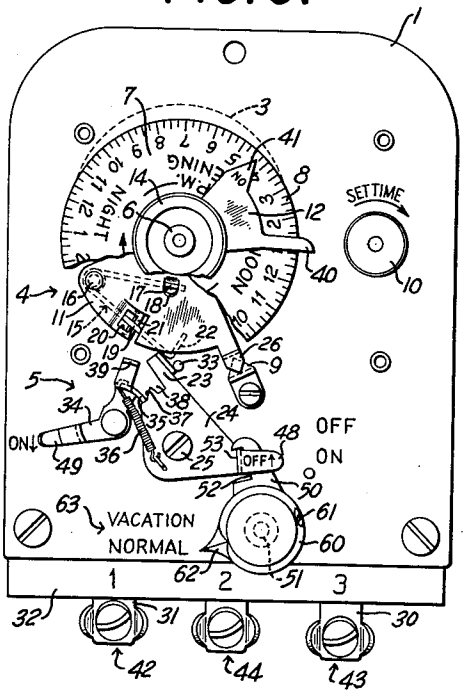


FIG. 2.

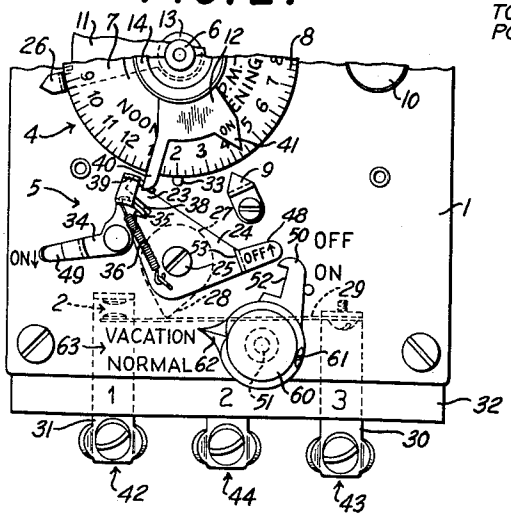


FIG. 4.

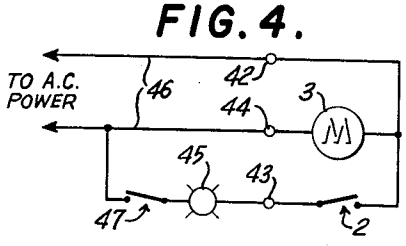
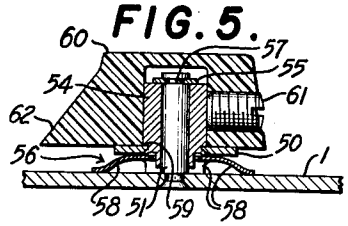


FIG. 5.



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United States Patent Office 3,033,950 Patented May 8, 1962

3,033,950

ELECTRICAL TIMER SWITCH CONTROL

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Filed Apr. 17, 1959, Ser. No. 807,136
7 Claims. (Cl. 200—39)

This invention relates to an electrical timer switch control and particularly to a latch mechanism which is adapted to be selectively engaged with the switch operating mechanisms to prevent operation of the switch by an electrical timing mechanism.

Automatic timing controls in interval operating applications normally employ electrically driven timers which are adapted to establish automatic timing by periodically opening and completing electrical control circuits for the various operating components in a predetermined manner.

In certain applications, the timer is disconnected to allow some other form of control, such as manual control. For example, in conventional domestic lighting systems normally manual control of the various circuits is established. However, during periods of absence from the home, particularly during vacations and the like, it is desirable to automatically turn the lights in the home on and off at certain times in the evening and/or the night by suitable electrical timers. Burglars and the like locate places to burglarize by checking homes at which the lighting systems are not turned on during the evening and night. Consequently, if the lights are turned on and off at certain intervals, burglars and the like are discouraged from entering the home.

The timer is preferably of a type which does not require electrical disconnection of the timer in order to make it inoperative when it is not being employed. This is particularly true in domestic applications because the average person does not have the required experience and skill with respect to connecting electrical apparatus and relatively dangerous electrical shocks can be obtained. Further, from a practical standpoint, unless the timer is easily and readily operatively connected and disconnected it would be extremely difficult to profitably market the product.

The present invention provides a simple and readily operated timer mechanism including a simple latch controlling the operative connection of the timer.

In accordance with the present invention a timer is provided having a switch-lever which is automatically operated in timed relation by a resilient timing tripper. A simply positionable latch is provided which is adapted to be operatively coupled to the switch lever to hold the lever against operating movement by the resilient tripper.

In accordance with another aspect of the invention, the resilient actuator is driven by a suitable clock motor and a timer switch which are connected in parallel with each and are adapted to be continuously connected in the power circuit under conventional non-timing operation. The control latch is adapted to hold the timer switch in a closed position such that it may be permanently connected in the circuit with an over-riding manual control of the load, such as found in the domestic home lighting system. By simply releasing the latch the timer goes into operation and establishes automatic energization and de-energization of the load. Once the timer mechanism is connected in the circuit, no further electrical connections or disconnections have to be made. The readily positionable latch provides complete control of the circuit.

The present invention thus provides a very reliable timer control which may be economically provided to the consuming public. The control allows operations by the relatively inexperienced public without danger of any kind

and without any particular training or education in the use of the device.

The drawings furnished herewith illustrate the best mode presently contemplated for carrying out the invention.

In the drawings:

FIGURE 1 is a front view of a time switch and latch with the time switch shown in a closed circuit position;

FIG. 2 is a fragmentary front view generally corresponding to a portion of FIGURE 1 with the time switch in an open circuit position;

FIG. 3 is a view similar to FIGURE 1 with parts broken away to show the action of the latch employed in the embodiment of the present invention;

FIG. 4 is a simple schematic circuit diagram of the timer connection in circuit with a lamp load; and

FIG. 5 is a cross-sectional view of the latch control taken on line 5—5 of FIGURE 1.

Referring to the drawing and particularly to FIGURE 1 thereof, a suitable mounting plate **1** is shown having a pair of timing contacts **2** mounted on the underside thereof. A clock motor **3** is secured or mounted on the underside of the mounting plate **1** and is adapted to drive a clock timing mechanism **4** to periodically actuate a switch actuating mechanism **5** which is coupled to open and break the contact **2**.

The timing apparatus shown for purposes of illustration is generally similar to that shown in United States Patent No. 2,242,517 to B. F. Flegel and is subsequently described in such detail as to clearly illustrate the present invention.

The clock motor **3** is preferably of the conventional self-starting synchronous variety which is adapted to provide accurate timing movement. The clock motor **3** is mounted on the underside of the plate **1** in any suitable manner, not shown in the drawings, and is adapted to continuously drive a timing shaft **6** through a precision gear train, not shown. The timing shaft **6** extends upwardly through the mounting plate **1** and carries a clock dial **7** at its upper end.

The clock dial **7** is releasably secured to the upper end of the timing shaft **6** for simultaneous rotation therewith and is provided with circumferentially spaced time markings **8** which are graduated successively for the periods 1–12 A.M. and 1–12 P.M.

A time indicating pointer **9** is secured adjacent the periphery of the clock dial **7** and in circumferentially spaced relation to the switch actuating mechanism **5**. The pointer **9** in cooperation with the time markings **8** indicates the time of day.

A manual time setting knob **10** is connected to the precision gear train, in a manner not shown, to allow manual turning of the clock dial **7** with respect to the pointer **9** and thereby allow setting of a correct time reading. Once the correct time has been set and the motor **3** suitably energized, the timing shaft **6** revolves the clock dial **7** to maintain accurate reading of the time.

Referring particularly to FIG. 3, the clock dial is located on the shaft **6** between a time-off actuating plate **11** and a time-on actuator plate **12** with suitable spacing washers, not shown, axially separating the interfaces of the elements.

The clock dial **7** and the actuating plates **11** and **12** are releasably clamped to the motor driven shaft **6** for simultaneous movement therewith in the following manner. A shoulder **13** is provided on the shaft **6** immediately above the level of the mounting plate **1**. The time-off actuating plate **11** rests on this shoulder. A clamp knob **14** threads onto the outer end of the timing shaft **6** which is correspondingly threaded. When the knob is threaded downwardly onto the shaft **6**, the dial **7** and the actuating plates **11** and **12** are clamped together

to the timing shaft 6. By releasing the knob 14 the actuating plates 11 and 12 can be angularly located with respect to each other and with respect to the clock dial 7 to establish predetermined operation of the switch actuating mechanism 5.

Referring particularly to FIGURE 3, the time-off actuating plate 11 is generally arcuately shaped and radiates outwardly from shaft 6 with the periphery thereof terminating within the circumference of the clock dial 7.

A U-shaped or hairpin spring 15 is mounted on the time-off actuating plate 11 with the base of the spring coiled about a depending pin 16 which is rigidly secured to the arcuate actuating plate 11. The hairpin or U-shaped spring 15 extends circumferentially from the pin 16 and the one arm 17 is positioned within a slot 18 in the timing plate 11 closely adjacent the timing shaft 6. The opposite arm 19 of the U-shaped spring 15 extends outwardly through a radial slot 20 which is formed in a downwardly projecting tab 21 in the outer peripheral portion of the actuating plate 11. The arm 19 is tensioned to spring outwardly and extends outwardly past the periphery of the clock dial 7 and has its extended end bent back under the clock dial 7 forming a resilient actuating projection 22 which is angularly arranged with respect to the rotational movement of the lever.

The radial slot 20 is of a radial length which allows movement of the spring 19 and the attached projection 22 beneath the dial 7, as subsequently described.

The actuating projection 22 is adapted to engage a projecting finger 23 which is integrally formed on a pivotally mounted switch lever 24 of the switch actuating mechanism 5. The switch lever 24 is rigidly secured to a rotatable central pivot support 25 to pivotally position the support 25 in response to engagement between the projecting finger 23 and the actuating lever 22 and to thereby open the normally closed contacts 2.

A presetting projection 26 is integrally formed on the trailing edge of the time-off plate 11 and extends outwardly of the periphery of the clock dial 7. The projection 26 is bent upwardly with respect to the clock dial 7 immediately adjacent the periphery of the clock dial to pass over the indicating pointer 9 and certain other components of the switch actuating mechanism 5, as hereinafter described.

The projection 26 is angularly spaced from the actuating projection 22 in accordance with the spacing between the projecting finger 23 of the switch lever 24 and the time pointer 9. To set the actuating time for automatic opening of contacts 2, the knob 14 is released and the actuating plate 11 positioned relative to the clock dial 7 with the presetting projection 26 aligned with the time on the clock dial at which the contacts 2 are to be opened. The knob 14 is tightened onto the timing shaft 6 to establish simultaneous movement with the clock dial 7 and the actuating plate 11. Subsequently, when the projection 26 is aligned with the time indicating pointer 9, the actuating projection 22 engages the projecting finger 23 and pivotally moves the switch lever 24 to effect opening of the contacts 2 in the following manner.

The switch lever 24 and the central pivot support 25 constitute a part of the switch actuating mechanism 5. A teardrop shaped switch cam 27 is secured to the pivot support 25 to the underside of the mounting plate 1 in any suitable manner, such as shown in the previously referred to United States Patent 2,242,517. The tip 28 of the switch cam 27 is disposed in engagement with a leaf spring 29 which carries one of the contacts 2.

The leaf spring 29 is mounted at the opposite end to a relatively stationary terminal bracket 30 and extends therefrom past the switch cam 27.

The opposite contact 2 is mounted upon a relatively stationary terminal bracket 31 to dispose the contacts 2 in opposed relation to each other.

An insulating plate 32 is secured to the underside of the mounting plate 1 and insulates the contacts 2 and the terminal brackets 30 and 31, from each other and from the mounting plate 1.

Referring particularly to FIGURES 1 and 2, the switch cam 27 is mounted with the cam tip 28 angularly arranged with respect to the leaf spring 29. The tension in the leaf spring 29 biases the contacts 2 to the closed position and also biases, through the engagement with the cam tip 28, the cam 27 in a corresponding position. The switch lever 24 which is secured to the cam 27 through the shaft pivot support 25 is consequently biased into a corresponding position into engagement with a stop pin 33.

The stop pin 33 is secured to the upper face of the mounting plate 1 immediately adjacent the periphery of the clock dial 7 and in the path of the projecting finger 23 of the lever 24. The stop pin 33 is mounted to the incoming side of the actuating projection 22 and in the path of the actuating projection 22. The pin 33 thus acts to collapse or close the spring arm 19 of the hairpin coil spring 15. The tension in the spring arm 19 is consequently slowly increased as the actuating projection 22 moves past the stop pin 33. Immediately after it moves past the stop pin 33, the tension is suddenly released and the actuating lever 22 snaps outwardly and strikes the projecting finger 23 to operatively move the lever 24 and open the contacts 2 to the position shown in FIGURE 2.

The switch contacts 2 are held in the open position of FIGURE 2 by a latch lever 34 which is pivotally mounted adjacent the lever 24. The latch lever 34 includes detent lug 35 which extends circumferentially therefrom towards the adjacent switch lever 24. A small coil spring 36 is secured at one end to the lever 34 and at the opposite end to the lever 24. The spring 36 biases and holds the end of the detent arm 35 in engagement with a cam surface 37 on the adjacent peripheral edge of lever 24. The cam surface 37 terminates in a slot 38 which is adapted to receive the detent lug 35 when the switch lever 24 is pivoted to the time-off position, as shown in FIG. 2.

In operation, the detent lug 35 rides along the cam surface 37 and then into the slot 38 incident to the pivotal movement of lever 24. It holds the contacts 2 open until positive pivotal movement of the latch lever 34 effects a disengagement of the lug 35 and the slot 38.

The latch lever 34 extends toward and terminates adjacent the periphery of the clock dial 7 and includes a vertically upstanding release projection 39 on its outermost end. The release projection 39 and the adjacent portion of the lever 34 is vertically offset with respect to the switch actuation projection 22 to allow the latter to pass thereunder as it rotates with the clock dial 7. The release projection 39 is adapted to be engaged by a radially extending arm 40 on the time-on actuating plate 12.

The time-on actuating plate 12 is generally arcuately shaped with the periphery thereof terminating within the time markings 8 on the face of the clock dial 7. The arm 40 extends integrally from the leading edge of the arcuate plate 12 and outwardly of the periphery of the clock dial into the path of the upstanding vertical projection 39. Therefore, as the arcuate time-on plate 12 is rotated through the driving of the timing shaft 6, the arm 40 rides past the projection 39 at a predetermined time and in so doing pivots the lever 34 in a counterclockwise projection as viewed in the drawings. The pivotal movement of lever 34 disengages the detent lug 35 from the latching slot 38 in lever 24 and allows free pivoting of the lever 24. As the lever 34 pivots, the spring 36 is extended and the tension in the springs increases. The spring tension in the contact leaf spring 29 and in the spring 36 rapidly returns lever 24 to the time-on position and the contacts 2 to a closed contact position, as shown in FIG. 1. The projecting finger 23 of the switch lever 24 is then again disposed in engagement with the stop pin 33.

The switch actuating mechanism 5 is maintained in the time-on position until subsequent actuation by the

spring actuator 15 through establishment of engagement of actuating projection 22 and the projecting finger 23 of the switch lever 24.

A time-on setting pointer 41 is integrally formed with the trailing edge of the time-on plate 12. The pointer 41 terminates inwardly of the periphery of the clock dial 7 to allow accurate positioning on the dial and is spaced from the release arm 40 in accordance with the spacing between the time reading pointer 9 and the position of the release projection 39 with the switch mechanism 5 in the time-off position as shown in FIG. 2. Consequently, the time at which the release projection 39 is engaged and actuated is accurately set in the dialing mechanism by releasing the knob 14 and positioning the time-on actuating plate 12 with the pointer 41 set at the time desired for the operation of the release arm 39.

To connect the timer into circuit three electrical terminals 42, 43 and 44 are provided. The terminals 42 and 43 are integrally connected to the contact mounting brackets 30 and 31 respectively. The terminal 44 is secured to the insulating plate 32 and is connected directly to one side of the drive motor 3 through a suitable electrical connection, not shown.

Referring particularly to FIG. 4, a schematic circuit diagram of the timer connected to a lamp load 45 is shown.

The motor 3 has one side connected directly to the motor terminal 44 and the opposite side to the terminal 42 within the timer.

The incoming power lines 46 are connected to the terminals 42 and 44 and consequently motor 3 is connected directly for continuous operation.

A single lamp load 45 is shown having one side connected to the load terminal 43 and the opposite side connected directly to the incoming power line 46 which is connected to the motor contact 44 in series with a manual control switch 47.

The lamp load 45 is therefore connected in parallel with the motor 3 and in series with the timing contacts 2. The continuous operation of the motor 3 drives the actuating plates 11 and 12 to open and close the timing contacts 2 in a manner previously described and consequently establishes energizing and de-energizing of the lamp load 45.

To allow an overriding control of the timing mechanism 4, a manual trip arm 48 is provided on the switch lever 24 and a manual trip arm 49 is also provided on the latch lever 34. The trip arms 48 and 49 allow manual control of the position of the contacts 2.

The operation of the timing mechanism may be discontinued without affecting the electrical connections of the timing device in the following manner.

A latch lever 50 is pivotally mounted at one end upon a stationary shaft 51 immediately adjacent the switch lever 24. The outer portion of the latch lever 50 is provided with a notch 52 which is adapted to be positioned in latching relationship to the manual trip arm 48 on the lever 24.

The trip arm 48 includes a vertically upstanding portion 53 integrally joining the trip arm 48 and the main body of the switch lever 24. The shaft support 51 for the latch lever 50 is positioned such that the latch lever 50 may be suitably angularly positioned to dispose the vertically upstanding portion 53 of lever 24 within the notch 52 with the switch lever 24 in the time-on position. When so positioned, pivotal movement of the switch lever 24 to the time-off position is prevented by engagement between the outer edge of the notch 52 and switch lever portion 53, as shown in FIG. 3.

Referring particularly to FIG. 5, the shaft 51 is riveted to the mounting plate 1. A bearing and clamping member 54 is rotatably secured about the shaft 51 between a snap ring 55 and a flat spring 56. The snap ring 55 is disposed within a groove 57 in the upper end of the shaft 51.

The flat spring 56 is disposed in sliding engagement with a shoulder on the lower end of the bearing member 54. The outer periphery of the spring 56 is slotted to form a plurality of legs 58 which extend radially of the shaft 51 and downwardly into the engagement with the mounting platform. The latch lever 50 is clamped resiliently and tightly between the upper surface of the spring 56 and a shoulder 59 which is formed on the bearing member 54. Therefore, movement of the bearing member 54 is transmitted to the latch lever 50.

A plastic knob 60 is rigidly secured over and to the bearing member 54 by a set screw 61 or the like to allow easy movement of the switch lever latch arm 50.

A pointed protrusion 62 is integrally formed on the outer peripheral surface of the plastic knob 60 and is aligned with suitable indicia 63 which shows the correct location for the knob for operative connection and disconnection of the timing mechanism.

In the illustrated embodiment of the invention, the indicia 63 includes a vacation position and a normal position.

The normal position is shown in FIGURE 3 wherein the latch lever 50 is disposed to engage the manual trip arm 48 of lever 24 and prevent operation of the timing mechanism. In this position, the switch mechanism 5 is in the on-position and the contacts 2 are held closed. Consequently, the lighting circuit, schematically shown by lamp 45, is manually controlled with the switch 47. During normal occupation of the home or the like, the switch actuating mechanism 5 is arranged in the normal position shown in FIG. 3 to prevent operation of the timing control.

The vacation position is shown in FIGS. 1 and 2 wherein the latch lever 50 is disengaged from the trip arm 48 and allows the timing mechanism to operatively control the lighting circuit or the like. The owner adjusts the timing mechanism prior to leaving in the following manner:

The manual switches, corresponding to switch 47 in FIG. 4, in the lighting circuit which is to be controlled by the automatic timing mechanism are turned on in accordance with the lights, within the circuit which are to intermittently and automatically be operated by the timing mechanism.

The lighting time schedule is predetermined. The clamping knob 14 is loosened to release the actuating plates 11 and 12. The actuating plate 11 is positioned with respect to the clock dial 7 until the pre-setting pointer 26 is aligned with the time on the clock dial at which the lights are to automatically turn off. The actuating time-on plate 12 is positioned with respect to the clock dial 7 with the pre-setting pointer 41 aligned with the time that the corresponding lights are to automatically turn on. The knob 14 is then firmly tightened onto the shaft 6 to establish simultaneous movement of the clock dial 7 and the actuating plates 11 and 12.

The time setting knob 10 is then actuated to accurately set the time of day by aligning the pointer 9 with the correct time reading on dial 7.

The control knob 60 is then moved to the vacation position to operatively couple the timing mechanism 4 and the switching mechanism 5.

To check the circuit, the switch lever 24 is released and the trip arm 48 actuated to see whether all the desired lights on the circuit go out. Any lights which do not is indicated by continuous brilliance and adjustment can be made by operation of the manual switch 47 used for normal control.

The time mechanism then operates to periodically turn the lights on and off in the preselected manner set up by the angular positioning of plates 11 and 12 with respect to clock dial 7.

Upon returning, the protective lighting circuit is restored to its normal operation by movement of the latch lever into engagement with the manual trip arm 48 on the switch actuating lever 24.

If the switch lever 24 is not in the correct position for the latching operation, that is, the position of FIG. 1, the trip lever 49 on the release lever 34 is actuated to return the switching mechanism to that position.

The pivot knob 60 may then be positioned to dispose the notch 52 about the vertically upstanding portion 53 of the manual trip arm 48.

Although the illustrated embodiment is described as including a domestic lighting circuit, the invention is applicable to any other load which is intermittently subject to interval operation.

Further, any other resilient actuating means may be employed in place of the illustrated spring actuator or tripper.

The present invention provides a very reliable and easily controlled timer which is particularly adapted because of its simplicity to domestic applications.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

I claim:

1. In an automatic time switch including a yielding tripper member and a switch member adapted to be selectively actuated thereby, latch means adapted to engage said switch member and prevent movement thereof by the engagement with said tripper member, and means to selectively position said latch means into engagement with said switch member.

2. An automatic time switch, which comprises a switching means biased to a closed circuit position, a motor driven clock mechanism adapted to be energized independently of said switching means, actuating means including a resilient member operatively connecting said switching means to said motor driven clock mechanism, and latch means adapted to hold said switching means in said closed circuit position with said resilient member absorbing the normal operative movement of said actuating means.

3. An automatic timing switch control for intermittently actuating a switch, which comprises a clock mechanism including a spring actuator, a switch lever operatively connected to said switch to selectively open and close the switch, means biasing said switch lever to a position disposed in the path of said actuator, said last named means having substantially less force than said spring actuator, and a mechanical latch member adapted to engage said switch lever and hold the switch lever in the path of said spring actuator against the force of said spring actuator, said spring actuator being compressed and passing over said switch lever with the latter engaged by said latch member.

4. An automatic timing switch control for periodically opening and closing a switch, which comprises a clock mechanism adapted to rotate a cantilever spring member about an axis, a switch lever disposed within the path of the outer end of said spring member, means to pivotally support said switch lever for movement out of said path incident to engagement by the spring member, a mechanical latch adapted to engage said lever and positively restrain said lever against said last named movement whereby said spring member pivots about the point of mounting and rides past the lever, and means to selectively position said mechanical latch into and out of engagement with said lever.

5. In an automatic time switch, a yielding tripper member, a pivotal switch member having an arm adapted to be selectively engaged by said tripper member to pivot said switch member and having a manual trip arm, latch means adapted to engage said manual trip arm and prevent movement of the switch member incident to engagement between said tripper member and said first named arm, and means to selectively position said latch means into engagement with said manual trip arm.

6. An automatic timing switch control for intermittently actuating a switch, which comprises a clock mechanism including a spring actuator, a switch lever operatively connected to said switch having a first circuit position and a second circuit position to selectively open and close the switch, means biasing said switch lever to a predetermined position, said switch lever having an actuating projection disposed in the path of said actuator in said predetermined position, said biasing means having substantially less force than said spring actuator, whereby said switch lever is moved to said second circuit position incident to movement of said actuation past said projection, means to hold said switch lever in said second position, means to release said holding means, a trip arm on said switch lever, a mechanical latch having a notch adapted to be disposed about said trip arm and hold the switch lever in the path of said spring actuator against the force of said spring actuator, said spring actuator being compressed and passing over said switch lever with the trip arm arranged within the notch of said latch lever, and means to support said lever for selectively positioning said notch relative to said trip arm.

7. An automatic time switch, which comprises contact means biased to a closed circuit position, a switch lever adapted to position said contact means and having first and second control arms, a motor drive clock mechanism adapted to be energized independently of said contact means, actuating means including a resilient member adapted to engage said first control arm and connected to said motor drive clock mechanism to move said resilient member past the first control arm, and a latch to hold said switch lever with the contact means in closed circuit position, said resilient member yielding and moving around said first control arm with the second control arm engaged by the notch.

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