Nov. 3, 1942. B. E. LENEHAN 2,300,513

TIME SWITCH MECHANISM

Filed Sept. 17, 1941 2 Sheets-Sheet 1

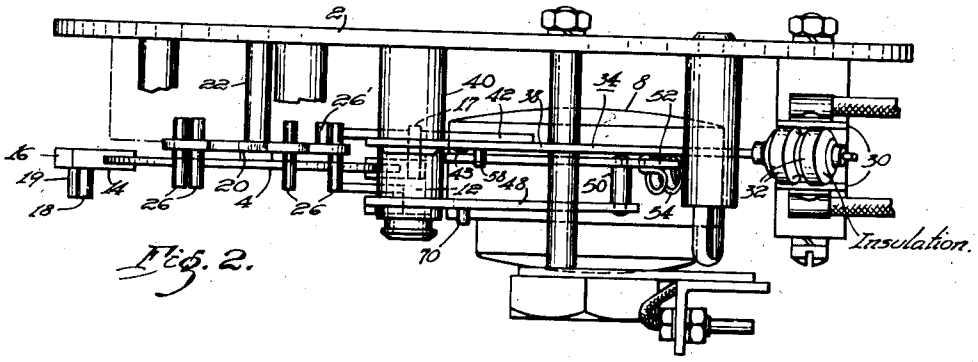
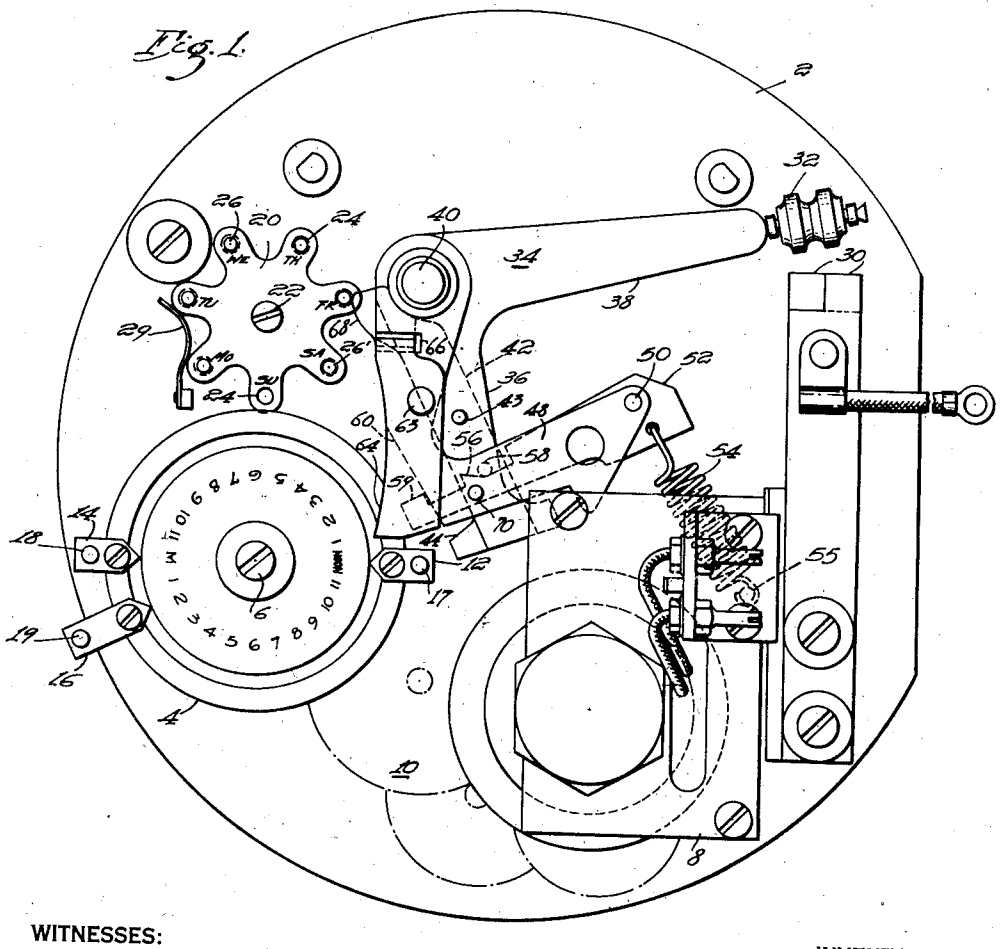


Fig. 2.

Fig. 1.



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TIME SWITCH MECHANISM

Filed Sept. 17, 1941 2 Sheets-Sheet 2

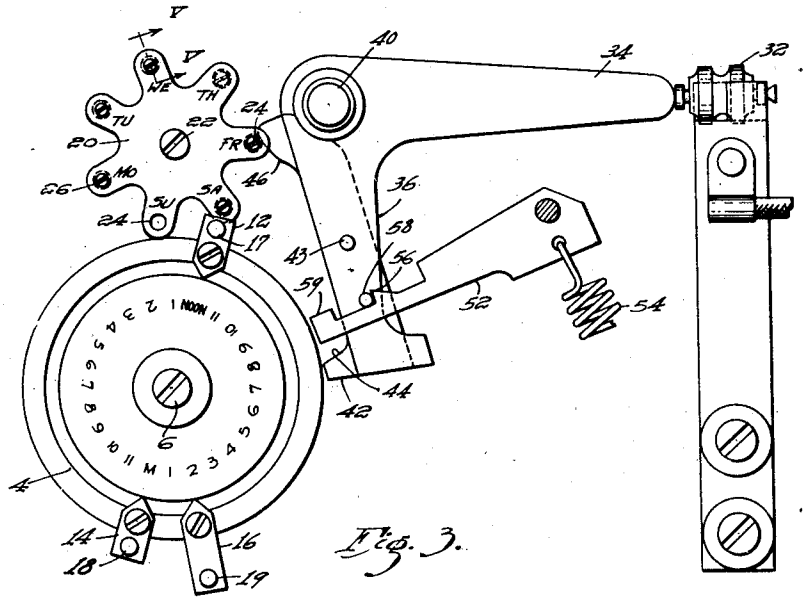


Fig. 3.

Fig. 4.

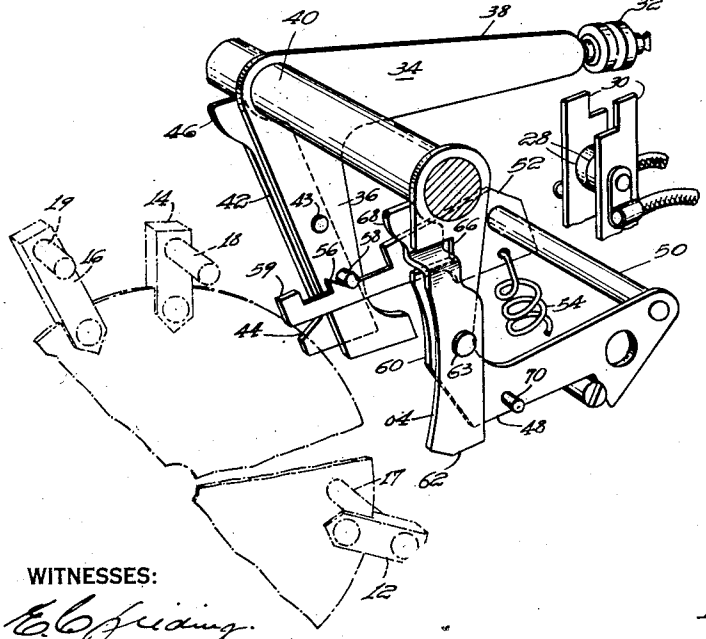
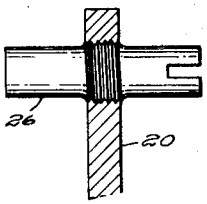


Fig. 5.



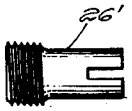


Fig. 6.

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UNITED STATES PATENT OFFICE

2,300,513

TIME SWITCH MECHANISM

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Application September 17, 1941, Serial No. 411,123

7 Claims. (Cl. 200—38)

The present invention relates to time switches of the type driven by clockworks or constant speed motors and arranged to open and close electrical circuits at predetermined times of the day. These switches are normally used for controlling street lighting circuits, advertising display circuits, and off-peak heater apparatus. The invention has particular relation to switches of this type which are adapted to omit operation on selected days of the week or to provide operation at a different time on selected days.

It is essential in many cases that these switches operate by quick positive movements in order to satisfactorily control circuits carrying heavy loads, and a device particularly suitable for such work is described and claimed in my Patent No. 2,217,414, issued October 8, 1940. While means have been provided in the prior art for omitting operation on selected days these arrangements are generally complicated and frequently have other disadvantages. The present invention not only provides a time switch mechanism which is especially suitable for use with this particular type of switch but it also provides improved operation over various other such devices because of its simplicity and its quick positive operation.

It is accordingly an object of the present invention to provide a novel and improved time switch mechanism.

Another object of the invention is to provide a simple and compact time switch mechanism which is adapted to omit operation on selected days of the week.

A further object of the invention is to provide such a simple time switch mechanism which may be adjusted to provide operation at a different time on selected days.

Other objects and advantages of the invention will appear from the following detailed description read in connection with the accompanying drawings in which;

Figure 1 is an elevational view of apparatus embodying the invention removed from its casing (not shown) and having certain parts omitted for simplicity;

Fig. 2 is a plan view of the apparatus of Fig. 1;

Fig. 3 is a front elevational view of the apparatus similar to Fig. 1 but having parts broken away and omitted to more clearly show the operating lever and its cooperating parts;

Fig. 4 is a perspective view of the operating and resetting levers of the device with various other parts omitted for the sake of simplicity;

Fig. 5 is an enlarged sectional view taken along the line V—V of Fig. 3 to more clearly show the construction of a control member; and

Fig. 6 is an elevational view of a modified form of control member for use where it is desired to have an operation performed at a different time upon a selected day.

Referring principally to Figs. 1 and 2, the time switch comprises a base plate 2 upon which is mounted a time dial 4 by any suitable means 6. This time dial may be driven by a suitable constant speed motor or clock device so as to rotate a complete revolution in the clockwise direction in twenty-four hours, and, as shown in the drawings by way of example, is driven from a constant speed electric motor 8 through reduction gearing 10 for this purpose. Disposed around the periphery of the time dial are operating members designated as 12, 14 and 16. These operating members are preferably adjustably secured to the time dial in any suitable manner such as by means of the construction described in U. S. Patent No. 2,186,250 to B. E. Lenehan et al. As illustrated, the member 12 is arranged to perform the switch closing function and includes a pin 17 extending to the rear in Fig. 1. The member 14 carries a forwardly extending pin 18 for initiating the switch closing or resetting operation while operating member 16 is somewhat longer than the others and carries a forwardly extending pin 19 at a greater radius from the center of dial 4 for a purpose which will hereinafter be described.

A star wheel 20 having seven spokes or arms is secured to the base 2 in back of and above the time dial 4 by means of a post 22. The wheel is rotatable with respect to the post and each of the arms is provided with a screw threaded opening 24 for engaging operating pins 26 and 26' as shown in Figs. 5 and 6, respectively. The star wheel is disposed so as to be engaged by the pin 17 of the resetting control member 12 during a portion of each revolution so as to be moved 1/7 of a revolution. The wheel thus rotates through a complete revolution in a week and since each arm is adapted to control the operation of the device for a particular day the arms are designated as MO, TU, WE, etc. in sequence. A spring 29 is secured to the base 2 so as to fit between a pair of adjacent arms while the wheel is stationary to maintain one of the arms in a predetermined position as will be more fully described later.

The switch or circuit closing mechanism per se may be similar to that described in the aforementioned Patent 2,217,414 and thus includes a

pair of contacts 28 (Fig. 4) each of which is mounted on one of a pair of resilient bronze springs 30. A pair of rollers 32 of insulating material are secured to an end of operating lever 34 which is adapted to move them in and out of a position between the springs. This particular construction has been found to provide a quick positive movement such as will prevent arcing across the contacts 28 when a heavy current is controlled thereby. It will be understood, however, that the invention is applicable to various other types of circuit closing mechanism although it offers particular advantages where quick positive movements are required.

The operating lever 34 is of the bell crank shape and is rotatably mounted upon a pivot 40 secured to the base 2. It includes an arm 36 as well as an operating arm 38 which carries the contact controlling rollers 32. The arm 36 is disposed so as to be completely out of the path of movement of the operating member 17 but has an auxiliary arm 42 of somewhat similar shape pivotally attached thereto at 43. This arm 42 includes at its outer end a cam portion 44 which is disposed within the path of movement of the pin on member 12 when disposed in substantial alignment with the arm 36. At its other end adjacent the pivot 40 the auxiliary arm 42 includes another cam portion 46 which is substantially in the form of an arc of a circle concentric with the pivot and is disposed so as to be engaged by the rearwardly extending portion of a control pin disposed in an opening 24 at a predetermined position in its movement.

Also pivotally secured about the member 40 is one end of a resetting lever 48 of substantially L-shape. This resetting lever has secured to its other end in the same manner as described in my aforesaid patent a floating pivot 50 rotatably attached to an end of a latch member 52. The latch 52 is biased by means of a spring 54 attached to a stationary portion of the apparatus such as the point 55 on the motor casing. This latch includes near its other end a catch portion 56 adapted to engage a pin 58 on the arm 36 of the operating lever 34 when the switch member is in open position and the end itself forms a cam at 59 for engagement by the pin in operating member 12.

Like the arm 36 of the operating lever, an arm 60 of the resetting lever connected to the pivot 40 is displaced from the path of the pin 18 in the operating member 14 so as not to be engaged thereby. However an auxiliary arm 62 is pivotally secured thereto as at 63 and includes a curved cam portion 64 at its outer end. At its other end the arm 62 is offset to pass through an opening or slot 66 in the arm 60 and is provided with a cam portion 68 of similar shape to the portion 46 of arm 42. The curved cam 64 is adapted to fall within the path of movement of the operating pin 18 while the arm is in substantial alignment with the arm 60. In addition the cam 68 is arranged to be engaged by the forwardly extending portion of a control pin disposed in the arm of the wheel 20 which is at the particular position previously mentioned. A pin 70 extends forwardly from the second arm of the resetting lever as shown best in Fig. 4 to limit pivotal movement of the auxiliary arm 62 about the pivot 63 on the arm 60. Since the operating member 16 is somewhat longer than member 14, its pin 19, upon engaging the end of the cam portion 64, will push the arm 62 into engagement with this pin 70 and cause counterclockwise movement of the resetting lever.

Referring particularly to the star wheel 23, it will be seen that the arm marked SU for Sunday is not provided with any operating pin while that marked SA for Saturday is provided only with a rearwardly extending pin or member 26'. The remaining arms are provided with members 26 which extend both forwardly and to the rear to provide normal operation of the remaining days of the week.

The operation of the mechanism just described may be set forth as follows: Referring to Fig. 3, the operating lever 34 is in a position maintaining the contacts 28 open and the arm marked FR for Friday is disposed in such a position that the rearwardly extending portion of the operating pin therein engages the cam portion 46 of the arm 42 and the forwardly extending portion of the pin engages the cam surface 68. Continued movement of the time dial 4 is in a clockwise direction brings the pin 17 of the operating member 12 to engagement with the cam portion or face 59 of the latch 52 and moves the catch portion 56 thereof away from the pin 58 on the arm 36. Further movement of this operating lever brings the pin 17 into engagement with the cam surfaces 44 of the auxiliary arm 42 and tends to pivot it about its connection 43. Since, however, an operating member 26 is in engagement with the cam portion 46 of this auxiliary arm the movement is transferred to the lever 34 which acts as a unit with the arm 42 to move the rollers 32 outwardly to switch closing position. Because of the curved configuration of the cam 46 it remains in contact with the control member in the arm FR during the entire movement to cause this action.

After this operation is performed the catch 56 on the latch 52 is disposed free of the pin 58 and the entire mechanism is in the position shown in Fig. 1. Upon further movement of the time dial the operating member 14 moves by the star wheel without displacing it since its operating pin 18 extends upwardly therefrom. The pin 18 then engages the curved cam surface 64 of the auxiliary resetting arm pushing it out of its path and tending to rotate it about its pivotal connection 63. However the cam surface 68 of this arm is in engagement with the forwardly extending portion of the pin 26 in arm FR so that the resetting lever and its auxiliary arm moves as a unit in a counterclockwise direction about the pivot 40. This movement of the reset arm acts through the member 50 to bring the catch 56 on the latch 52 to a point below the pin 58 on the operating arm. Upon the pin 18 releasing the cam surface 64, the spring 54 acts rapidly to return the latch 52 to its original position with its catch 56 engaging the pin 58. As a result the switch is returned to its open position with the roller 32 disposed between the resilient springs 30.

During the next rotation of the time dial the downwardly extending pin 17 on the operating member 12 engages the arm SU of the star wheel to bring the arm SA into the position previously held by the arm FR while the spring 29 maintains it in this new position. Since the arm for controlling operation on Saturdays has only a rearwardly extending control member 26' therein, the cam portion 46 of the operating lever is engaged by this control member while the cam 64 on the resetting mechanism is free. As a result the circuit closing operation is per-

formed by the operating member 12 in the same manner as previously described for operation on Friday. However, when the upwardly extending pin 18 on the operating member 14 engages the cam surface 64 of the auxiliary reset arm 62 this arm rotates about its pivot 63. Because of the restricted length of the operating member 14, however, the arm 62 either fails to engage the pin 70 or else moves the lever 48 an insufficient distance to permit latch 52 to engage the pin 58 in lever 34. However, further movement of the time dial brings the pin 19 of the operating member 16 into engagement with the end of cam 64 forcing lever 62 against pin 70 and moving the resetting lever 48 far enough to cause catch 56 of latch 52 to engage this pin 58. In this manner the member 16 moves the resetting lever in an operative manner to open the switch at a later time on Saturdays than on the days for which there is a forwardly extending control pin in the arm of wheel 20.

While the pin on this operating member 16 will, of course, cause a similar movement of the resetting lever on days in which the circuit has already been opened by the operating member 18 it will readily appear that this will in no way effect the condition of the controlled circuit.

During the next revolution of the time dial on Sundays the operating member 12 will again displace the star wheel and this time bring the arm marked SU adjacent the cams 46 and 68. Since there is no control member at all in the opening in this arm the auxiliary operating arm 42 will merely pivot about its pin 43 without effecting movement of the operating lever 34 while the auxiliary resetting arm 62 will likewise move in the manner previously described without effecting the condition of the switch. While these auxiliary arms are thus displaced from their normal aligned positions it will appear that they will be moved back to those positions by means of the operating member 26 in the arm MO when this arm is being driven to controlling position by the operating member 12.

It will be understood that the location and type of control members shown has been chosen by way of example only to illustrate the invention and that the apparatus may be readily adjusted to provide any of the types of operation described on other or different days of the week.

It will also appear that various other modifications may be made in the apparatus shown and described without departing from the spirit and scope of the invention. It is consequently intended that the invention shall be limited only by the appended claims interpreted in view of the prior art.

I claim as my invention:

1. In a time switch, a timing device, operating members moving with said device, a rotatable member adapted to support a plurality of control members at spaced positions thereon, means for intermittently moving said rotatable member to bring each of said spaced positions in sequence to a predetermined location, control members supported in at least some of said positions, a switch, an operating lever for said switch, an arm pivotably secured to said lever to normally move thereabout in response to engagement by one of said operating members, said arm including means engageable by a control member in the spaced position at said predetermined location to cause the movement thereof to be transferred to said lever to operate said switch, and means responsive to engagement by another of said operating members to restore said switch to its original condition.

2. In a time switch, a timing device, operating members moving with said device, a rotatable member adapted to support a plurality of control members at spaced positions thereon, means for intermittently moving said rotatable member to bring each of said spaced positions in sequence to a predetermined location, control members supported in at least some of said positions, a switch, an operating lever for said switch, an arm pivotably secured to said lever and having a portion extending in the path of a first of said operating members for displacement thereby, means on said arm for engagement by a control member in a position at said predetermined location to prevent relative movement of said arm about said lever whereby the displacement of said arm moves said lever to operate said switch, and means responsive to engagement by a second of said operating members to restore said switch to its original position a predetermined time after its operation.

3. In a time switch, a timing device, operating members moving with said device, a rotatable member adapted to support a plurality of control members at spaced positions thereon, means for intermittently moving said rotatable member to bring each of said supporting positions in sequence to a predetermined location, control members supported in at least some of said supporting positions, a switch, an operating lever for said switch, an arm pivotably secured to said lever and having a portion extending in the path of a first of said operating members for displacement thereby, means on said arm for engagement by a control member in a supporting position at said predetermined location to prevent pivotable movement thereof about said lever in response to such displacement to cause a switch operating motion of the lever, means including a second lever movable to actuate said switch in an opposite direction, an arm pivotably secured to said second lever and including a portion extending in the path of a second of said operating members for displacement thereby, and means on the second said arm for engagement by a control member in the supporting position at said predetermined location to cause actuating movement of said second lever in response to such displacement of the arm.

4. In a time switch, a timing device, operating members moving with said device, a rotatable member adapted to support a plurality of control members at spaced positions thereon, means for intermittently moving said rotatable member to bring each of said supporting positions in sequence to a predetermined location, control members supported in at least some of said supporting positions, a switch, a pivotable lever including a first arm movable to operate said switch and a second arm, a member pivotably secured to said second arm and including first and second cam portions, said first cam portion extending into the path of said operating members for displacement thereby to tend to move the cam member about its pivotal connection with said second arm, said second cam portion being disposed for engagement by a control member in a supporting position at said predetermined location to cause the cam member and lever to act as a unit in response to displacement of the first cam portion to operate the switch, and means responsive to engagement by a second of said operating members while a control member is in a supporting posi-

tion at said predetermined location to restore said switch to its original condition.

5. In a time switch, a time disc, a plurality of operating members moving with said disc, a switch operating lever, an arm pivotably secured to said lever and having a portion extending in the path of a first of said operating members for displacement thereby, a lever for resetting said operating lever, a second arm pivotably secured to said resetting lever and having a portion extending into the path of a second of said operating members for displacement thereby, each of said arms having cam portions operable while engaged by a control member to cause its associated lever to move as a unit therewith in response to its displacement by its respective operating member, a plurality of control members, a rotatable member adapted to support said control members at spaced positions thereon, means for intermittently moving said rotatable member to bring each of said supporting positions in sequence to a predetermined location at which a control member therein will operatively engage at least one of said cam portions, and means operable in response to movement of a third of said operating members through a predetermined position to operatively displace said resetting lever independently of said control members.

6. In a time switch, a time disc, at least three operating members moving with said disc, the third of said operating members extending further from the center of said disc than the second thereof, a switch, a lever for operating said switch, an arm pivotably secured to said lever and including a portion extending in the path of the first of said operating members for displacement thereby tending to pivot it about said lever, a lever for resetting said operating lever, a second arm pivotably secured to said resetting lever and including a portion extending into the path of the second and third of said operating members for displacement thereby tending to pivot it about said resetting lever, each of said arms having cam portions operable while engaged by a control member to cause its associated lever to move as a unit therewith in response to the displacement by its associated first or second operating member to perform its respective operation, a plurality of control members, a rotatable member adapted to support said control members at spaced positions thereon, means moving said rotatable member a predetermined amount once during each revolution of said time disc to bring each of said supporting positions in sequence to a predetermined location at which a control member therein will operatively engage at least one of said cam portions, and means responsive to displacement of said second arm a predetermined amount about its pivot on said resetting arm by said third operating member when no control member is in said predetermined location to cause a resetting movement of said resetting lever.

7. In a time switch, a timing disc, a plurality of operating members moving with said disc, a switch, a pivot, a lever secured to said pivot and including a first arm movable to operate said switch and a second arm angularly disposed with respect thereto, a movable arm pivotably secured to said second arm intermediate its ends and normally lying along substantially the same axis, said movable arm including a first cam portion normally in the path of a first of said operating members for displacement thereby, a second cam portion on said movable arm adjacent said pivot for engagement by a control member to cause said operating lever to move as a unit therewith to operate said switch, a plurality of control members, a rotatable member adapted to support said control members at spaced positions thereon, means moving said rotatable member a predetermined amount once during each revolution of said time disc to bring each of said supporting positions in sequence to a predetermined location at which a control member therein will operatively engage said second cam portion, and resetting means responsive to engagement by a second of said operating members to reset said switch to its original position.

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