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Sweeney

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[54] **TIME DELAY SWITCHING SYSTEM WITH IMPROVED TWENTY-FOUR HOUR CONTROLLER**

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[52] **U.S. Cl.**.....**307/141**, 200/38 DA, 307/141.4

[51] **Int. Cl.**.....**H01h 43/20**

[58] **Field of Search** ...335/65; 200/38, 166 J, 38 DA, 200/172 A; 307/141, 141.4, 141.8

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Primary Examiner—J. R. Scott
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[57] **ABSTRACT**

A direct current operated timer including means to apply said direct current to a device at a remote location to activate the same in accordance with a preset schedule and for a predetermined period of time.

6 Claims, 8 Drawing Figures

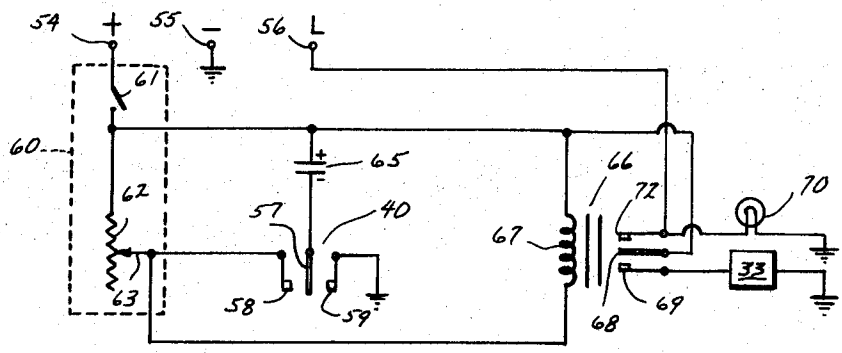
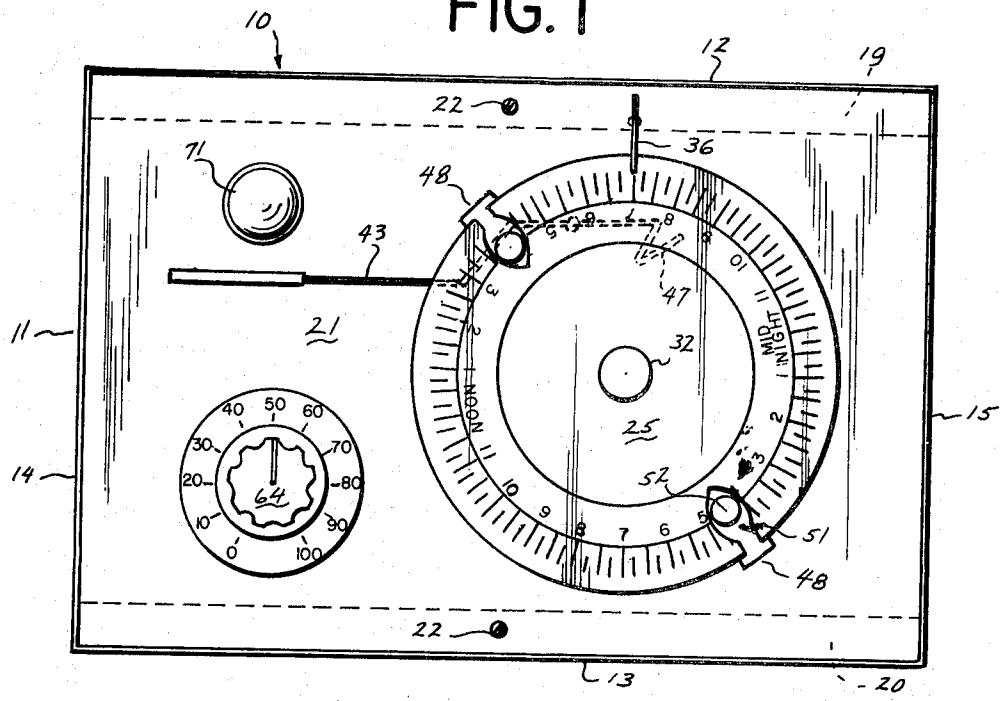


FIG. 1



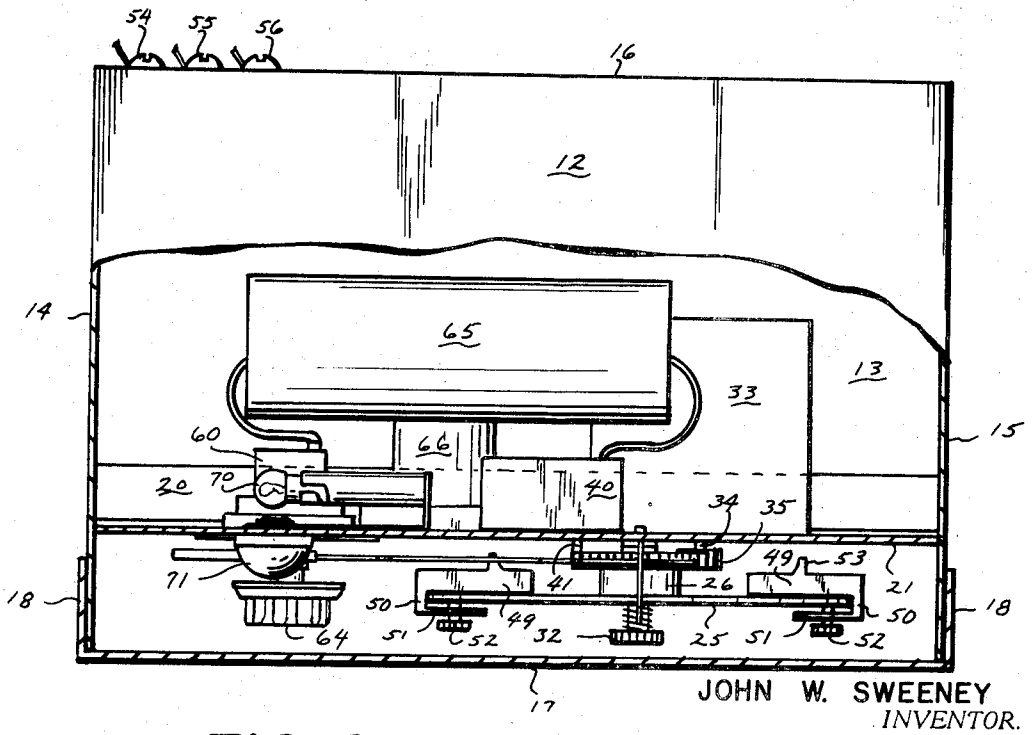


FIG. 2

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FIG. 3

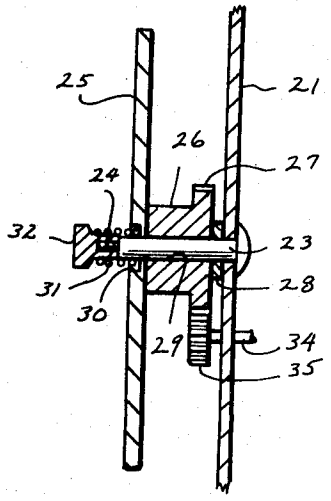


FIG. 4

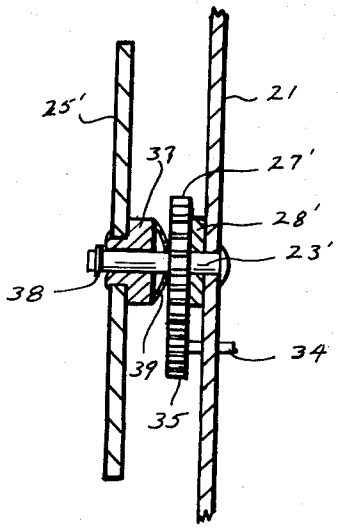


FIG. 5A

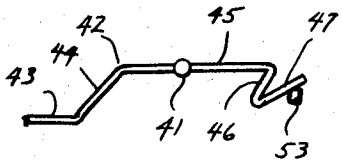


FIG. 5B

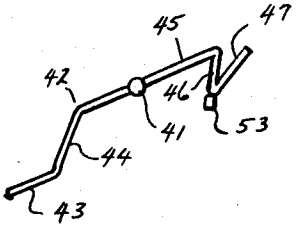
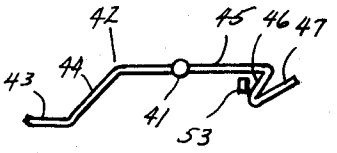


FIG. 5C



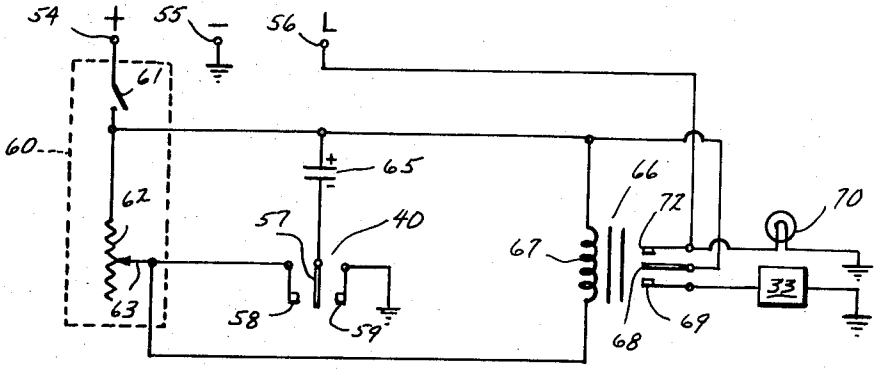


FIG. 6

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TIME DELAY SWITCHING SYSTEM WITH IMPROVED TWENTY-FOUR HOUR CONTROLLER

BACKGROUND OF THE INVENTION

Numerous timers have heretofore been used in combination with various devices such as feeders, motors and solenoids to activate said devices at a predetermined time on a given day or days. These prior art timers generally utilize a 12 hour clock wherein the hands of the clock make two revolutions during each 24 hour period and said hands trigger or initiate the activating cycle for the said device. Separate power supplies are often required for such timers and remote devices, respectively.

In the present invention, a direct current operated clock drives a disc which completes one cycle every 24 hours; at least one tripper is detachably secured to the said disc at a selected time designation whereby direct current from a single power source is applied to said remote device. Means are provided to indicate and adjust the period of time that the said direct current is applied to said remote device.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a direct current operated timer adapted to activate a device at a remote location for extended periods of time in accordance with a preset schedule and for a predetermined period of time.

Another object is the provision of a triggering mechanism which is capable of fine adjustment so as to permit the remote device to be operated for very short periods of time.

A still further object is the provision of such a timer which is extremely simple to set, or reset, and wherein the duration of the actuating cycle may be very simply and accurately determined.

A final object is to provide a timer which is of extremely rugged construction and capable of maintenance-free operation over long periods of time.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a front elevational view of the timer of the subject invention.

FIG. **2** is a top plan view, partly broken away and partly in section, of the embodiment of FIG. **1**.

FIG. **3** is a vertical sectional view, transverse to the longitudinal axis, through one embodiment of rotatable disc utilized in the practice of the invention.

FIG. **4** is a vertical sectional view, transverse to the longitudinal axis, through another embodiment of rotatable disc utilized in the practice of the invention.

FIGS. **5A–5C** are diagrammatic views showing the relationship of the activating means on the disc to the microswitch arm during the actuating cycle.

FIG. **6** is a wiring diagram of the electrical circuit utilized in the timer of the subject invention.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring now to the drawings, wherein like reference characters designate like or corresponding parts throughout the several views, there is shown in FIGS. **1** and **2** of the drawings a preferred embodiment of timer **10** of the subject invention, said timer is mounted in a casing **11** comprising top **12**, bottom **12**

and sides **14–15**, which elements terminate forwardly in the same vertical plane, and back **16**. Cover **17** includes perpendicularly inwardly extending flanges **18** which are adapted to pass outwardly of the foremost portions of the top, bottom and sides of said casing and secured thereto in a friction fit. It is understood that casing **11** and its coacting cover **17** may be of any desired composition, size and shape.

Vertically aligned and longitudinally extending angles **19–20** are conventionally secured to the inner surface of top **12** and bottom **13** rearwardly of the foremost edges thereof. Vertically extending plate **21** inserts inside casing **11** thus formed and is secured to angles **19,20** by means of screws **22** or other fastening means which pass through bores in said plate and insert into aligned bores in the respective angles.

Referring now to FIG. **3** of the drawings, one end of shaft **23** is fixedly secured to plate **21** approximately midway between the top and bottom edges thereof and laterally of the center point of said plate, said shaft terminates forwardly in a reduced diametral threaded portion **24**. Disc **25**, hereinafter to be more fully described, has conventionally secured to the rear surface an axially extending collar **26** which terminates rearwardly in gear **27**. Shaft **23** carries washer **28** and is journaled in axial bore **29** in at least said collar; bore **30** in at least said disc is of greater diameter than bore **29** and communicates therewith; bore **30** accommodates one end of spring **31** which is carried on the foremost end of shaft **23** with the other end of said spring abutting nut **32** on threaded portion **24**.

A 12 volt, direct current operated clock **33** (see FIG. **2**) is conventionally secured to the rear surface of plate **21**; shaft **34** of said clock passes through a bore (not shown) in said plate with gear **35** secured to the foremost end thereof. Gear **35** meshes with gear **27** carried on shaft **23** whereby disc **25** is driven. It is understood that in the practice of the subject invention clock **33** is of the type which would normally rotate disc **25** 2 times per day; when gear **27** has a 2 to 1 ratio relative to gear **35**, however, disc **25** completes one cycle of rotation every 24 hours.

Pointer **36**, secured at one end to plate **21**, is preferably vertically aligned with shaft **23** and extends forwardly of disc **25** whereby said disc may be rotated or removed. More specifically, the user may conveniently rotate disc **25** in either a clockwise or counterclockwise direction merely by exerting an outward force on disc **25**; at such time spring **31** is compressed, gear **27** is disengaged from gear **35**, and disc **25** may be rotated to any desired setting without damage to the gear teeth of clock **33**. Upon release of such outward force, gears **27,35** again mesh.

There is shown in FIG. **4** a modification of the invention whereby disc **25'** may be rotated without disengaging gears **27',35**. In such embodiment shaft **23'** is fixedly secured to plate **21**, said shaft carries washer **28'** and gear **27'**. Collar **37**, fixedly secured to disc **25'**, is carried in a relatively loose fit on the foremost end of shaft **23'** and maintained thereon by means of ring **38** or the like. Outwardly flexed annular spring **39** butts gear **27'** with the peripheral edge portions bearing against the rear surface of collar **37**. In normal operation, spring **39** transmits rotary motion to disc **25'**. If the user desires to reset the timer, disc **25'** may be

rotated in either direction merely by applying a slight inward and rotational force to disc 25'; release of such force causes spring 39 abutting gear 27' and collar 37, respectively, to again drive disc 25'.

Microswitch 40, such as is well known in the art, is secured to the inner surface of plate 21 with shaft 41 thereof passing through a bore (not shown) in said plate. Bent wire arm 42, hereinafter to be more fully described in connection with FIGS. 5A–5C of the drawings, comprises an elongated, horizontally extending portion 43 which extends substantially outward of disc 25, an angularly upwardly extending portion 44, medial portion 45 secured to shaft 41 of said microswitch, downwardly and inwardly extending portion 46, and angularly upwardly extending terminal portion 47. It is to be understood that the arm is not to be restricted solely to such configuration but also includes any configuration whereby the microswitch may be activated by a tripper 48 selectively positioned on rotating discs 25,25'.

As best seen in FIGS. 1 and 2 of the drawings, any desired number of trippers 48 are detachably secured circumferentially about disc 25 corresponding to selected time designations. Each tripper comprises a base 49 adapted to be positioned rearwardly of disc 25, connecting portion 50 which passes outwardly of the edge of disc 25, and an inturned portion 51 which generally parallels base 49 and is spaced outwardly of the front surface of disc 25. Female threaded portions are provided in inturned portion 51 to accommodate screw 52 the end of which is adjusted to bear against the face of said disc. A rearwardly extending projection 53 on base 49 is adapted to coact with terminal portion 47 of arm 42 to activate microswitch 40.

In the preferred embodiment of the invention, disc 25 rotates in a counterclockwise direction and completes 1 cycle every 24 hours. Accordingly, the face of disc 25 may be divided into any desired number of increments to indicate the hours of the day and night. Alternatively, the face of disc 25 may be graduated to provide a 24 hundred hour clock wherein the graduations range from 0,000 to 2,400. As illustrated in FIG. 1 of the drawings, one tripper 48 is secured to disc 25 at approximately 4:30 o'clock in the morning whereas a second tripper is set for 4:00 o'clock in the afternoon.

There is shown in FIGS. 5A–5C the relationship of projection 53 on a selected tripper 48 relative to portion 47 of arm 42 during the actuating cycle. As viewed in FIGS. 1 and 5A, projection 53 contacts terminal portion 47 prior to the preselected time indicated by tripper 48 on disc 25. Projection 53 bearing against the undersurface of the said terminal portion 47 raises the same causing rotation of arm 42 in a counterclockwise direction. Continued advancement of projection 53 in a counterclockwise direction results in raising arm 42 to the position illustrated in FIG. 5B which occurs just prior to the preselected time indicated on disc 25 at which time condenser 65 (see FIG. 6) is charged. As shown in FIG. 5C of the drawings, disc 25 has rotated to a position whereby projection 53 clears terminal portion 47 permitting arm 42 to rotate in a clockwise direction at which time condenser 65 is discharged and power is applied to the load circuit.

Referring again to FIG. 2 of the drawings, terminals 54–56 are provided on back 16 of the casing whereby electrical connections may conveniently be made to the electrical circuitry of the timer. A 12 volt, direct current power supply (not shown) connects to terminals 54, 55; casing 11, which is electrically grounded, connects to terminal 55.

Microswitch 40 heretofore mentioned comprises flexible arm 57 and points 58–59. Shaft 41 of the microswitch connects to flexible arm 57, said arm 57 normally contacts point 58; point 59 is grounded. Potentiometer 60, conventionally secured to the rear surface of plate 21, comprises switch 61 connected in series with resistor 62, and a variable arm 63. Point 58 of the microswitch connects to variable arm 63 of said potentiometer. Control knob 64 on the front surface of plate 21 connects to variable arm 63; switch 61 is open when knob 64 is rotated in a counterclockwise direction until stopped. Graduations are desirably provided circumferentially about knob 64 (see FIG. 1) to indicate the period of time that power is applied to the load circuit, such period of time being adjustable and ranging from 0 to 30 seconds. It is understood that such range may be increased or decreased by changing the values of the electrical circuit components.

One terminal of switch 61 connects to positive terminal 54; the positive terminal of condenser 65 connects intermediate switch 61 and resistor 62 whereas the negative terminal of said condenser connects to flexible arm 57 of microswitch 40.

A d.c. relay 66 is secured to the rear surface of plate 21; one end of coil 67 of said relay remotely connects to positive terminal 54 while the other end of said coil connects to variable arm 63 of potentiometer 60. Flexible arm 68 of said relay connects to terminal 54; arm 68 normally contacts point 69 of relay 66. One terminal of clock 33 connects to point 69 of relay 66, the other terminal of said clock is grounded. Test bulb 70, conventionally secured to the rear surface of panel 21, includes a reflector 71 mounted in panel 21 adjacent thereto. Point 72 of d.c. relay 66 connects to positive load terminal 56 and one terminal of test bulb 70, respectively, the other terminal of said bulb being grounded.

In operation, when knob 64 is rotated in a counterclockwise direction until stopped, switch 61 is open and timer 10 is inoperative. Rotation of knob 64 in a clockwise direction closes switch 61 and 12 volt, direct current is applied to clock 33. As heretofore described in connection with FIG. 5B, when flexible arm 57 of microswitch 40 contacts point 59 the condenser 65, connected across terminals 54–55, is charged. When projection 53 clears terminal portion 47 of arm 42, as viewed in FIG. 5C, flexible arm 57 contacts point 58 and the charge on condenser 65 is applied to coil 67. Potentiometer 60, connected across coil 67, controls the rate that condenser 65 discharges through coil 67 and the period of time that 12 volt, direct current is applied to the load circuit connected to terminal 56 and ground, respectively.

The user may conveniently use test bulb 70 to determine the length of time that power is applied to the load circuit. By manually depressing and then releasing portion 43 of arm 42, the user may observe the length of time that test bulb 70 is energized and adjust the duration thereof by means of control knob 64.

In the circuit of FIG. 6, potentiometer 60 ranges from 5,000 to 10,000 ohms; 12 v.d.c. relay 66 ranges from 2,000 to 5,000 ohms; and a 12 v.d.c., 5,000 microfarad condenser **65** provide satisfactory results.

It should be understood, of course, that the foregoing disclosure relates to only preferred embodiments of the invention and that it is intended to cover all changes and modifications of the examples of the invention herein chosen for the purposes of the disclosure which do not constitute departures from the spirit and scope of the invention.

What is claimed is:

1. In combination, a timer and a remote device operable by a single direct current power source, said timer comprising

a clock operable by said direct current,

said clock including a shaft,

a disc connected to said shaft,

said disc adapted to make one revolution during each 24-hour period of time,

indicia associated with said disc to indicate the time,

first means secured to said disc corresponding to a selected time,

circuit means activated by said first means,

a switch comprising an arm and first and second terminals,

said arm adapted to be activated by said first means,

a condenser charged when said arm contacts said second terminal,

a relay comprising a field coil, flexible arm, and first and second points,

said clock electrically connected to said first point of said relay and ground,

said flexible arm normally contacting said first point of said relay,

said condenser discharged through said coil when said arm contacts said first terminal whereby said direct current is applied to said remote device for a predetermined period of time.

2. The invention of claim **1** including means to reset said disc.

3. The invention of claim **1** including means to adjust the duration of time that said direct current is applied to said remote device.

4. The invention of claim **1** including means to adjust the period of time that direct current is applied to said remote device.

5. The invention of claim **1** further including a test bulb connected to said second point of said relay and ground.

6. In combination, a timer and a remote device operable by a single direct current power source, said timer comprising

a clock operable by said direct current,

said clock including a shaft,

a disc connected to said shaft,

said disc adapted to make one revolution during each 24 hour period of time,

indicia associated with said disc to indicate the time,

first means secured to said disc corresponding to a selected time,

switch means consisting of a shaped arm and first and second terminals,

said shaped arm adapted to be activated by said first means,

a condenser charged when said shaped arm contacts said second terminal,

a relay comprising a field coil, flexible arm, and first and second points,

said condenser connected across said coil,

said clock electrically connected to said first point of said relay and ground,

a test bulb connected to said second point of said relay and ground,

said remote device connected to said second point of said relay and ground,

said condenser discharged through said coil when said shaped arm contacts said first terminal whereby said flexible arm of said relay contacts said second point of said relay and said direct current is applied to said remote device.

* * * * *