April 19, 1966 J. BERGMAN ETAL 3,247,336

ELECTRIC TIMER

Filed July 25, 1963

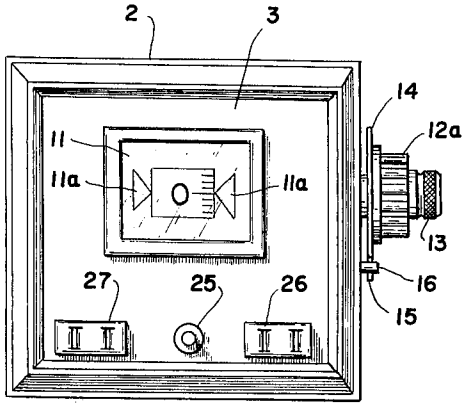

Fig. 1.

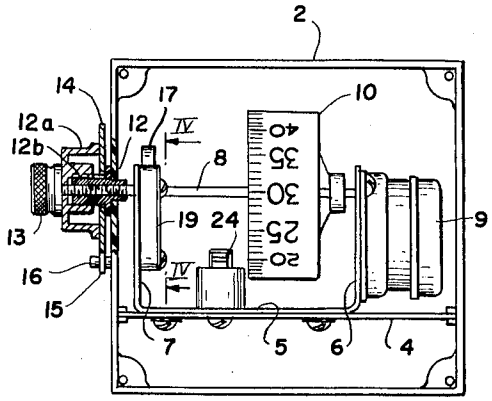

Fig. 2.

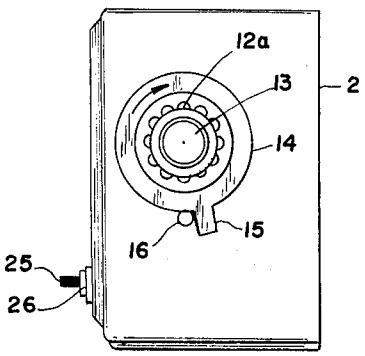

Fig. 3.

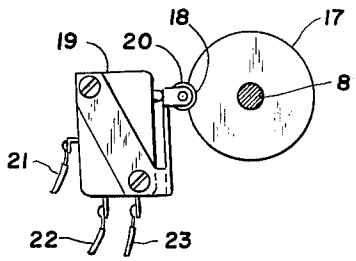

Fig. 4.

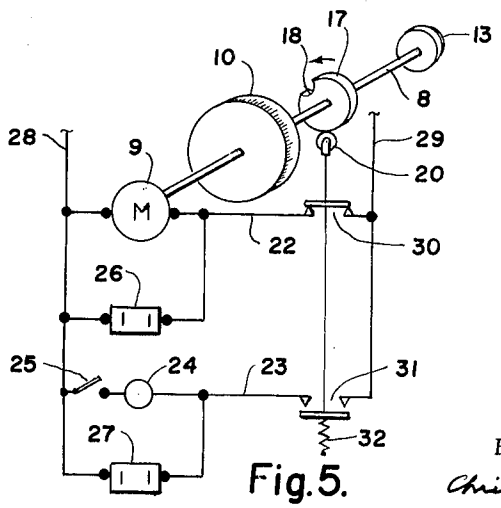

Fig. 5.

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ELECTRIC TIMER

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This invention relates to electrically-operated time switches and is for a direct reading count-down timer of simple and unique construction.

Essentially the timer comprises a casing in which is a horizontally-extending shaft having one end projecting through a side wall of the casing with a reset knob and an adjustable reset indexing element on the projecting end. The shaft is driven through a synchronous motor that is plugged into an ordinary commercial A.C. current outlet through gearing that rotates the shaft at a predetermined rate, as for example once a minute, once an hour, or once a day. The shaft has a dial thereon which is correspondingly calibrated on its periphery with marks and numerals starting with "zero" and reading up to 59 in the case of a time switch where the shaft rotates at the rate of once a minute or once an hour, or reading in hours up to 23 hours and 59 minutes when the shaft rotates at the rate of one revolution in 24 hours. This dial is visible through a window in the casing, and there is a fixed pointer at the side of the window directed toward the calibrations on the dial. When the timer is operating, the dial rotates toward the "zero" marking, to indicate the remaining time until "zero" is reached, that is, a "count-down" reading. On the same shaft there is a cam disk and a micro-switch is mounted on the casing with a follower that rides on the cam disk with the cam so positioned that at one point on the cam corresponding to the "zero" reading the circuit to the clock motor is opened to stop the motor when this point is reached. When the knob is turned manually from the "zero" position the micro-switch energizes the motor. A signal such as a lamp or a buzzer may be provided which is energized when the motor stops at the "zero" mark, indicating the end of the time interval. Two electric outlet receptacles are provided in the casing also operated by the micro-switch, one of which is energized only during the count-down, and one which is energized only after the "zero" position is reached. An appliance or instrument plugged into the first receptacle will thus be energized only during the count-down, as for example, a lamp used in photographic work, and if an electric appliance is plugged into the second receptacle, it will be energized only after a given time lapse, as for example, a radio or cooking appliance may be turned on at the end of the count-down, or even a second similar time could be activated from the first.

The invention has for its principal object the provision of a simple direct-reading count-down timer and switch unit, while a further object is to provide a timer of this type with an indexing reset for rapidly resetting the instrument for a predetermined count-down interval. A further object of the invention is to provide a timer which may energize a load circuit either during or after a preset time interval, or both.

The invention may be readily understood by reference to the accompanying drawings, in which:

FIG. 1 is a front elevation of the timer constructed in accordance with this invention;

FIG. 2 is a view looking into the rear of the timer with the back cover of the casing removed;

FIG. 3 is an end elevation;

FIG. 4 is a transverse section on a larger scale in the plane of line IV—IV of FIG. 2; and

FIG. 5 is a schematic wiring diagram.

Referring to the drawings in more detail, 2 designates a box-like casing of generally rectangular form having a front panel 3 and having closed top, bottom and end walls with a removable back cover. Inside the casing as shown in FIG. 2 there is a horizontal supporting plate 4 that extends from one end wall to the other. Secured to this plate is a generally U-shaped bracket 5 having upstanding plate portions or wings 6 and 7. These upstanding wings 6 and 7 provide bearing supports for a horizontal shaft 8. The shaft 8 is driven by a synchronous clock motor unit 9 mounted on the wing 6, this unit being a standard unit including a motor and speed reducing gear forming no part per se of the present invention.

Fixed to the shaft 8 there is a dial 10, the periphery of which is calibrated with numbers at regular intervals starting with "zero." As explained above, the shaft 8 may be rotated at the rate of once a minute, or once an hour, or once every 24 hours, or even at a slower rate, but assuming that it revolves once a minute or once an hour, the dial has 60 calibrations with a number at 5 and each multiple of 5 so that it reads from "zero" to 55 and back to "zero." The front panel 3 has a window 11 through which only a small arc of the periphery of the dial 10 is visible, and alongside this window at the middle thereof is a fixed pointer, such as an arrow or arrows 11*a* to facilitate reading the instrument by providing a reference or datum means past which the calibrations move to indicate at all times the unelapsed portion of a preselected time interval.

The end of the shaft 8 projects through one end wall of the casing and the projecting end portion is threaded. Between the threaded end portion and close to the end face of the casing there is a friction disk and sleeve member 12 which is fast on the shaft 8. There is also a knob 12*a* which is keyed to the sleeve portion 12*b* beyond the disk portion, but which is slidable endwise along the sleeve. Outside the knob at the far end of the shaft there is a knurled nut 13. Between the knob 12*a* and the disk 12 there is provided an indexing ring 14 having a radial extension 15 thereon. By loosening the nut 13 on the shaft 8 the indexing ring 14 may be turned freely relative to the shaft 8 and the knob 12*a*, but when the nut 13 is tightened against the knob 12*a* the ring 14 is frictionally gripped between the inner face of the knob and the outer face of the disk portion of member 12 so that it must rotate with the shaft and the knob.

There is a stop pin 16 projecting from the end wall of the casing in the path of rotation of the extension 15 on the ring 14 against which the extension 15 abuts when the knob is turned in a clockwise direction, i.e., in the direction of the arrow in FIG. 3, if, when the knob is turned, the nut 13 has been tightened in the manner above described.

The shaft 8 also has affixed thereto a cam disk 17 which rotates with it. This disk has a generally circular periphery concentric about the shaft 8, but which has a follower tripping portion on its periphery such as a notch 18 that is in predetermined relation to the "zero" position on the dial 10. It is here shown at about 180° from the "zero" position of the dial. There is a micro-switch 19 carried on the vertical web 7 with a follower 20 in the form of a small roller that is urged by a spring against the periphery of the cam. This switch is of a known construction and it has a current lead-in wire 21 and two outlet wires 22 and 23. The arrangement is such that when the roller is in the notch 18 as shown in FIG. 4 the wire 22 is deenergized and the wire 23 is energized.

Mounted on the base of the bracket 5 is a signal device here shown as a buzzer 24. In the front wall of the casing at the center is a small switch 25 which is in series with the buzzer and with the wire 23 of the micro-switch.

There are two conventional two-prong outlet receptacles 26 and 27. Outlet 26 has one side connected to a wire 22, and one side of the outlet 27 is connected to the wire 23 of the microswitch.

FIG. 5 is a general diagram of the wiring. The current input lines are designated 28 and 29. Micro-switch contacts which are normally closed when the follower 20 is riding on the periphery of the cam but which are opened when the follower drops into the notch 18, are indicated at 30. Contacts which are normally open but are closed when the follower 20 is in the notch 18 are indicated at 31. Thirty-two indicates a spring which urges the follower against the periphery of the cam 17. In the diagram shown in FIG. 5 the contacts 30 are closed and the current path is from line 29 through wire 21, switch contacts 30, wire 22, to the motor 9, and from there to the line 28. The outlet receptacle 26 is shunted around the motor 9 so that during the time that the motor is energized a circuit may be completed by plugging an instrument or appliance into the receptacle 26. When the cam follower moves into the notch 18 the "zero" position on the dial will be visible through the window 11 exactly opposite the arrow 11*a*. At this time contacts 30 will be open and contacts 31 will be closed, establishing a circuit from wire 29 through contacts 31, wire 23, buzzer 24, and buzzer manual switch 25 so that the buzzer will sound at the instant that the "zero" mark comes opposite the arrow at the front of the instrument. The receptacle 27 is shunted around the buzzer so that when the contacts 31 are closed an instrument or appliance plugged into the receptacle 27 would be energized. Since the contacts 31 open as the contacts 30 close, the motor will stop with the dial at the "zero" position. The notch is of such dimension that it will not admit the follower except at the "zero" position, and when the follower enters the notch it will exert sufficient pressure to prevent any overtravel of the rotating shaft. The notch should be of small arc, not more than six degrees, or one second of time on a minute dial or a minute of time on an hour dial. This is the same number of degrees of arc as the distance between two adjacent calibrations on the dial.

The numbers on the dial are arranged with respect to the direction of rotation of the dial so that they decrease from the highest number toward the "zero" position when the shaft 8 is being driven by the motor.

Assume that the timer is one used to measure intervals of time in seconds up to 59 seconds and the dial is at the "zero" position and the instrument is plugged into a source of current, nothing will happen until the operator rotates the knob 12*a* in a clockwise direction as viewed in FIG. 3. Assume that the interval to be timed is 30 seconds, the operator will turn the knob in this direction until the number 30 appears opposite the arrow in FIG. 2. As soon as he releases the knob the motor will start to turn the shaft, rotating the shaft in a counter-clockwise direction as viewed in FIG. 3, and the numbers will read in a downwardly-descending order from 30 to "zero." When the "zero" position is again reached, the instrument will stop.

If the operator wants to repeatedly reset the instrument for the same interval of time, assume for example, repeated intervals of 30 seconds, he turns the knob in a clockwise direction until the numeral 30 is opposite the arrows at the front of the instrument. Then he rotates the indexing ring 14 in a clockwise direction as viewed in FIG. 3 until the extension 15 engages the abutment 16. Then he tightens the clamping nut 13 so that the clamping nut, the knob and the ring 14 all rotate together with the shaft. He then operates the instrument for the first time cycle, and when he is ready for the next operation he simply turns the knob 12*a* until the extension 15 again abuts the pin 16 when he can turn it no further. The instrument will thus be reset for the next operation at the 30 second marking. He can of course select any interval between "zero" and 59 on the dial.

The same arrangement would be followed if the instrument were set to rotate the shaft 8 at a speed of once an hour instead of once a minute, or once every 24 hours instead of once a minute.

The instrument as thus constructed is simple insofar as its mechanism is concerned, and simple to operate. It has few moving parts and no clock springs to wind each time the timer is set. By plugging the appliance into the receptacle 26, as for example a photographer's lamp used in making photographs, repeated operations for a few seconds may be made. However, if it is desired that an appliance of some kind be operated only after a given lapse of time, it is plugged into the receptacle 27 instead of the receptacle 26.

It will of course be understood that while we have shown a preferred embodiment of our invention, various detailed changes and modifications may be made within the scope of the appended claims.

We claim:

1. An electric timer comprising a generally rectangular casing having a front panel, opposing end walls and a top, a horizontal supporting plate in the casing having spaced upright wings thereon, a shaft passing through and rotatably supported in said wings, the shaft projecting through one of the end walls of the casing with threads on the outer projecting end, a synchronous clock motor supported on one of said wings and geared to the shaft for rotating it at a predetermined rate, a cam disk on the shaft adjacent the other wing with a periphery that is concentric with the shaft, the disk having a notch therein, a micro-switch supported on said other wing with a cam follower for operating the same resiliently urged against the periphery of said disk, a calibrated dial on said shaft with calibrations about its periphery reading upward from a "zero" mark, the front panel having a window in which a portion only of the dial is visible at one time and which has an indicating pointer at the window to register with calibrations on the disk, the "zero" mark on the dial being aligned with the pointer when the cam follower of the micro-switch is engaged in the notch of said disk, a pair of outlet receptacles mounted in and accessible at the exterior of the casing, one of said receptacles and the synchronous motor being connected with the micro-switch to be energized when the follower is against the periphery of the disk but de-energized when the follower is in said notch, the other receptacle being connected with the micro-switch to be energized only when the follower is in said notch, a friction disk on the shaft, a knob keyed to the outer end of the shaft outside the casing but slidable therealong, an indexing ring loose on the shaft between the friction disk and the knob, a nut on the threaded end of the shaft for moving the knob toward the friction disk to releasably clamp said ring immovably between the friction disk and the knob, the ring having a radial projection thereon, and a pin on the end wall of the casing in the path of rotation of said projection when it turns with the shaft and knob whereby the ring may be adjusted to a predetermined position to contact the pin after the knob has been turned to rotate the shaft a predetermined arc from the position where the "zero" is aligned with the pointer at the window in the front panel.

2. An electric timer comprising a casing, a shaft rotatably mounted in the casing having one end projecting through the casing, an electric motor connected with the shaft for rotating the same at a predetermined rate, a dial on the shaft having time calibrations on its periphery, the casing having a panel with a window therein through which only a small arc of the dial is visible at a time and past which the calibrations move as the shaft rotates, a cam disk on the shaft, rotated by the shaft and having a concentric periphery with a follower tripping portion at one location thereon, a micro-switch with a follower supported in the casing with a follower yieldably urged against the cam, the calibration on the dial

having a "zero" reading, said follower tripping portion being located to operate the follower and micro-switch when the "zero" reading on the dial is centered in said window, said micro-switch being in series with the motor and serving to open a circuit to said motor when it is tripped by the follower tripping portion and to close said circuit when the shaft and cam are rotated to move said follower tripping portion away from engagement with the follower, an electric outlet receptacle in the casing in parallel with the motor to be de-energized when the motor is de-energized, and a knob on the end of said shaft for rotating it manually, the shaft having a friction disk near the said knob, the knob being axially movable on the shaft but keyed thereto, an indexing ring about the shaft interposed between the friction disk and the knob, the ring having a radial projection thereon, a clamping nut screwed onto the projecting end of said shaft for releasably clamping the indexing ring against relative rotation between the knob and the friction disk, and a projecting pin on the casing in the path of rotation of the indexing ring whereby the arc through which the shaft may be rotated from the "zero" reading position of the dial by manually turning the knob is selectively fixed by the contact of the radial projection with said pin.

3. An electric timer, comprising,

(a) a clockwork mechanism,

(b) an electric motor for driving the clockwork in one direction,

(c) a shaft rotatable with the clockwork,

(d) a cam carried by the shaft,

(e) a two-position switch positioned adjacent the cam and adapted to be operatively engaged by the cam to change the switch position when the shaft is rotated through a predetermined arc corresponding to a time interval, the switch having a first set of contacts which are normally closed but open when engaged by the cam, and a second set of contacts which are normally open but are closed when engaged by the cam,

(f) a first circuit comprising the first set of contacts, and the electric motor and a receptacle in parallel with each other and in series with the first set of contacts,

(g) a second circuit in parallel with the first circuit, comprising the second set of contacts, a second outlet receptacle in series with the second set of contacts, and a manual switch and a signal device, in series with each other and with the second set of contacts and in parallel with the second outlet receptacle,

(h) a source of electric power connectable to the first and second circuits through their respective series switch contacts, and

(i) means separate from the motor for rotating the shaft in another direction through a predetermined arc corresponding to an unelapsed time interval, and to a position wherein the switch contacts are in their normal positions,

whereby the first circuit is energized during the time interval while the second circuit is de-energized, and vice versa at the expiration of the time interval.

4. An electric timer comprising,

(a) a clockwork mechanism,

(b) an electric motor for driving the clockwork in one direction,

(c) a shaft rotatable with the clockwork,

(d) a cam carried by the shaft,

(e) a two-position switch positioned adjacent the cam and adapted to be operatively engaged by the cam to change the switch position when the shaft is rotated through a predetermined arc corresponding to a time interval, the switch having a first set of contacts which are normally closed but open when engaged by the cam, and a second set of contacts which are normally open but are closed when engaged by the cam,

(h) a source of electric power connectable to the first and second circuits through their respective series switch contacts,

(i) means separate from the motor for rotating the shaft in another direction through a predetermined arc corresponding to an unelapsed time interval, and to a position wherein the switch contacts are in their normal positions,

whereby the first circuit is energized during the time interval while the second circuit is de-energized, and vice versa at the expiration of the time interval,

(j) a dial mounted on the shaft and having time indicia calibrations thereon, and

(k) datum means, past which the calibrations move, arranged so as to indicate the unelapsed portion of the time interval.

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