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2,559,910

ELECTRIC TIMER

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FIG. 1.

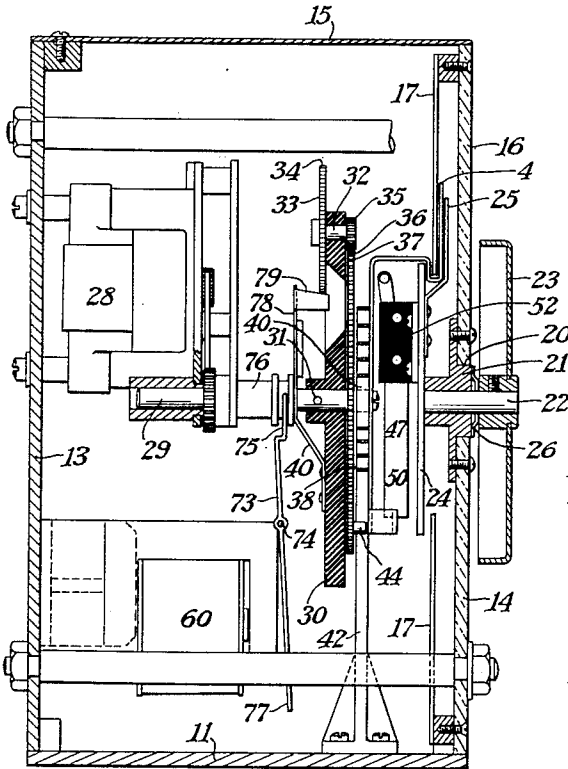


FIG. 4.

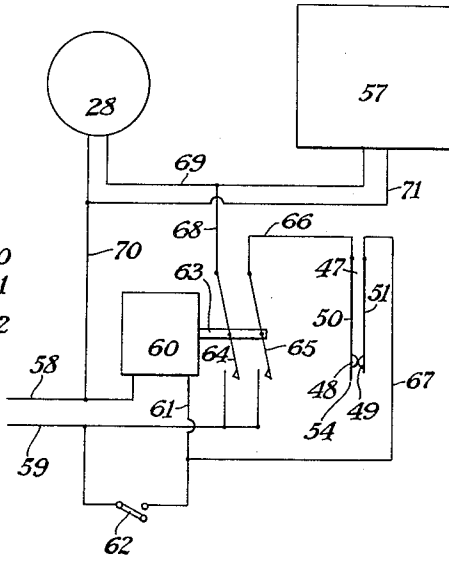
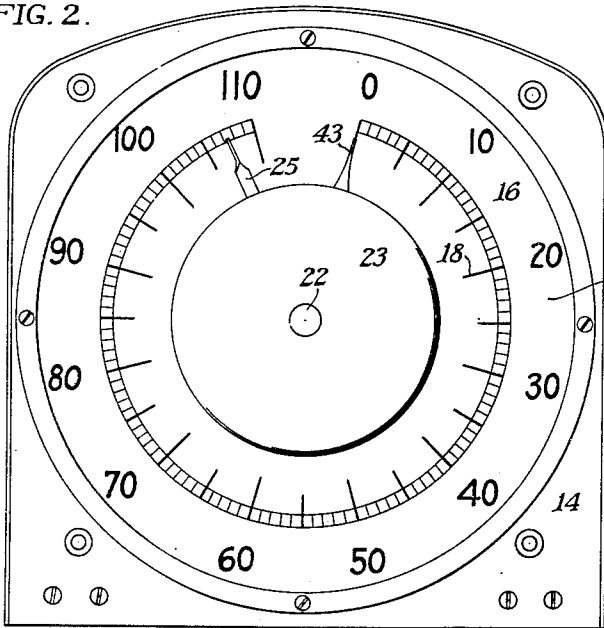


FIG. 2.



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ELECTRIC TIMER

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The present invention relates to timers, and more particularly to exposure timers for use in connection with photographic printers.

The purpose of such a timer is to provide electrical actuation as well as synchronous motor operation for the controls of printer lamps. A presetable pointer is movable over the timer scale to a position to indicate a desired or predetermined time interval. A self-starting synchronous clock motor is directly connected to and is adapted to drive a shaft on which a second or timing pointer is loosely mounted. The timer is started by momentarily closing a switch of a self-energizing relay. When the relay is thus energized, it serves to close a switch in a circuit to the motor and printer and simultaneously connect the second pointer to the drive shaft. The presetable pointer carries a switch arranged in the relay circuit and positioned to be engaged and opened by the second pointer at the completion of the interval to open the circuit to the relay to disconnect the second pointer from the drive shaft and to open the switch to the motor and printer circuit. Thus the closing of the starting switch turns on the printer lamp and starts the timer. At the completion of the predetermined time, the timer motor is automatically stopped, and the printer lamps are extinguished.

The present invention has, therefore, as its principal object, the provision of a timer which may be adjusted selectively for various time intervals.

Still another object of the invention is the provision of a timer which automatically cuts off the printing lamps at the expiration of a predetermined time.

Yet another object of the invention is the provision of an arrangement for automatically connecting the timing pointer to the timing mechanism when the latter is started and for automatically disconnecting the pointer when the timing interval has elapsed.

A further object of the invention is the provision of an arrangement by which the moving timing pointer is utilized to open the motor and printer circuits at the end of the time interval.

And another object of the invention is the provision of a timer constructed of few parts of rugged construction, and which is accurate, simple, and highly effective in use.

To these and other ends, the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

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In the drawings:

Fig. 1 is a side view of the timer of the present invention with the side plate removed, parts in section, and showing the arrangement of the various parts;

Fig. 2 is a front view of the timer showing the relation of the presetable pointer and the timing pointer and the scale plate of the timer;

Fig. 3 is a front view of a portion of the mechanism illustrated in Fig. 1 and taken just behind the timer scale plate, showing the switch carried by the presetable pointer and the relation of the timing pointer thereto as well as a portion of the drive and return means for the timing pointer; and

Fig. 4 is a wiring diagram of the electrical circuits of the timer.

Similar reference numerals throughout the various views indicate the same parts.

The timer mechanism itself will first be described after which the operation of the parts in the control of the printer lamps will then be set forth. The timer mechanism is positioned in a suitable housing which may comprise, for example, a bottom or support plate 11, side walls 12, back and front walls 13 and 14 respectively, and a top 15. The front wall 14 may be transparent or may be provided with a transparent section or opening 16 through which an annular scale plate 17 is visible, as best shown in Fig. 2. The scale plate is mounted on the front 14, in any suitable manner, and is provided with a circular scale 18 which is divided to represent seconds of time.

The front wall 14 is provided with an opening 20 in which is positioned a bearing plate 21 for rotatably supporting a shaft 22, the outer end of which has secured thereto a manually-operated control or setting knob 23. The inner end of shaft 22 has mounted thereon a plate 24 which carries a presetable pointer 25 adapted to be moved across the scale 18 to indicate a predetermined or pre-selected time interval, as illustrated in Fig. 2. The position of pointer 25 is controlled by the rotation of knob 23 so that by moving the knob the pointer may be adjusted to any desired position on the scale 18 to designate the time interval of a definite number of seconds. A flat spring member or disk 26 is positioned intermediate knob 23 and the outer end of the bearing 21 to retain the knob and associated parts frictionally in any position of adjustment. The operator may thus set the time of operation of the printer merely by turning the knob to position the pointer

25, the latter being shown in Fig. 2 positioned to indicate a time of 107 seconds.

A self-starting synchronous electric clock motor 28 is operatively connected to a drive shaft 29 to drive or rotate the latter at a constant and uniform speed, for example $\frac{1}{2}$ R. P. M., in a clockwise direction, as viewed in Fig. 2. A radially extending arm 30 is connected to shaft 29 by means of a pin 31, or other suitable means, so that the arm will rotate as a unit with the shaft 29. One end of arm 30 has journaled therein a shaft 32 on one end of which is mounted a disk 33 having a roughened or serrated surface 34, the purpose of which construction will be later described. The other end of shaft 32 carries a pinion 35 which engages a large gear 36 loosely mounted on the shaft 29. It will now be apparent from an inspection of Fig. 3 that if the shaft 29 is rotated and the gear 36 is held stationary, the pinion 35 will roll around on periphery of the gear 36. If, however, the shaft 32 is held against rotation, by means to be later described, the pinion 35 will be locked to the gear 36, and the gear will then rotate as a unit with the arm 30 and the pinion will not rotate relative to the gear.

The right face 37 of the gear 36, as viewed in Fig. 1, has mounted thereon a coil spring 38, one end 39 of which is anchored to a sleeve or collar 40 carried by gear 36 while the other end 41 is anchored to a bracket 42 carried by and extending upwardly from the bottom 11, as shown in Figs. 1 and 3. The collar 40 has secured thereto a timing pointer 43 of the shape best shown in Fig. 1 adapted to overlies the scale 18, as best shown in Fig. 2. Thus, as the gear 36 is rotated at a constant speed by the shaft 29, the pointer 43 will progressively move over the scale 18 to indicate a lapse of the time in seconds. Such rotation of the gear 36 also serves to wind up or tension the spring 38. When, however, the gear 36 is disconnected from the shaft 29, in a manner to be later described, the gear is free and is then rotated in a counter-clockwise direction, under the action of the tensioned spring 38, to return the pointer 43 to an initial or starting position, such as the "zero" position shown on the scale 18 in Fig. 2. Thus the pointer 43 will indicate the lapse of time so long as the gear 36 is connected with shaft 29, but when the gear is disconnected, the pointer 43 will be automatically returned to the "zero" position. In order to limit such return movement and to bring the pointer 43 to the "zero" position, the gear 36 is provided with an axially-extending pin 44 which is adapted to engage the bracket 42 when the pointer 43 reaches the "zero" position, thus limiting the movement of the pointer, as will be apparent from an inspection of Fig. 3.

With the above-described arrangement, the knob 23 may be rotated to adjust the pointer 25 to the time interval desired, such as 107 seconds as shown in Fig. 2. Then, when the motor 28 is started and the gear 36 is connected with drive shaft 29, the pointer 43 will progressively move over the scale 18, as is apparent. When, however, the pointer 43 registers with the preset pointer 25 to indicate the lapse of the predetermined time, a switch 47 is automatically opened to stop the motor and to open the circuit to the printer lamps. The switch 47 comprises a pair of contacts 48 and 49 carried by the free ends of a pair of metal strips 50 and 51, the other ends of which are mounted in insulating relation in a block 52 secured to the back of the plate 24, as best shown in Fig. 1. When the

pointer 25 is in a "zero" position, the strips 50 and 51 lie just to the left of the lower portion 53 of the pointer 43.

Now as the knob 23 is rotated in a clockwise direction to adjust the pointer 25, the switch 47 is similarly rotated so that when the pointer 25 is, for example, in the position shown in Fig. 2, the switch 47 will be in the position shown in Fig. 3. Now when the gear 36 and timing pointer 43 are rotated in a clockwise direction, the lower end 53 of the pointer 43, at the lapse of the time interval and when the pointers 25 and 43 register, will engage finally with an extension 54 of the strip 50 to move the latter to the left, as viewed in Fig. 3, to open the contacts 48 and 49 of the switch 47 to stop the motor and extinguish the printer lamps as will be presently described.

In order that the opening of the switch 47 may be utilized to stop the motor 28 and turn off the lights in the printer 57, the various elements are electrically interconnected as illustrated in Fig. 4 which shows a pair of lead-in wires 58 and 59 adapted to be connected to an electric circuit to supply power for the timer. The wires 58 and 59 may, therefore, be broadly considered as a source of power for the timer mechanism. A relay 60 has one side connected directly to the lead-in wire 58 and the other side connected to wire 59 through a connection 61 in which is positioned a normally-opened switch 62. It will now be apparent that if the switch 62 is closed, the relay 60 will be connected to the wires 58 and 59, and will be energized.

As the relay 60 is thus energized, the armature 63 thereof will be drawn inwardly or to the left, as viewed in Fig. 4 to close a pair of switches 64 and 65, the latter being connected, in turn, by lead 66 to the normally-closed switch 47 above mentioned, which, in turn, is connected by lines 67 and 68 to the lead-in wire 58. Thus as soon as the switch 62 is closed, a parallel circuit is established through the relay 60, and the switch 62 may be immediately opened, but the circuit through the relay will be maintained so long as switch 47 remains closed, as will be apparent from an inspection of Fig. 4. The switch 62 need therefore be operated only momentarily.

The other switch 64 is connected by a wire 68 to a wire 69 which, in turn, is connected both to the motor 28 and to the printer 57, as shown in Fig. 4 to energize the motor and turn on the printing lamps. A return line 70 connects the motor to the lead-in 58, and is, in turn, connected by a line 71 to the printer 57. Thus the printer and the motor are arranged in a parallel relation but in series with the switch 64 so that the opening of the latter will disconnect automatically both the motor and printer circuits, as will be apparent from an inspection of Fig. 4.

Thus, the closing of the switch 62 will start the motor 28 and turn on the lights of the printer. In order, however, that the timing may be in proper relation to the lighting of the printer lamps, means is provided for connecting the gear 36 to the drive shaft 29 substantially simultaneous with the closing of switch 62. To this end, a lever 73 is pivoted at 74 to the relay and has the upper end 75 thereof bifurcated to engage a collar or sleeve 76 slidably mounted on the shaft 29.

It will be apparent from inspection of Fig. 1 that when the relay 60 is energized by the closing of switch 62, as mentioned above, the lower end 77 of lever 73 will be drawn to the left by the magnet of the relay. Such movement will

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pivot the lever in a clockwise direction about its pivot 74 to shift the collar 76 to the right. A Z-shaped arm 78 has the lower end rigidly secured to the arm 30 so that the two arms will rotate as a unit with shaft 29. The upper end of arm 78 is provided with a member 79 adapted to engage the serrated surface 34 of disk 33, as shown in Fig. 1. Thus as the collar 76 is shifted to the right by lever 73, the arm 78 will be flexed to the right to bring the member 79 into holding relation with the disk 33 to lock the latter, as well as shaft 32 and pinion 35, against rotation. Such locking serves to connect the gear 36 to the arm 30 and hence to the shaft 29. Thus the lever 78, member 79, disk 33, shaft 32 and pinion 35 constitute, in effect, a clutch mechanism for connecting the gear 36 detachably to the drive shaft 29 whenever the switch 62 is closed. When however, the relay 60 is de-energized by the opening of switch 47, the lever 73 will be moved in a counterclockwise direction by reason of the flexible arm 78 to withdraw the member 79 out of holding relation with the serrated surface 34 to unlock the pinion 35. Such unlocking releases gear 36 and as the latter is now free, it will rotate in a counter-clockwise direction, as viewed in Fig. 3, under the action of the spring 38 until the pin 44 engages bracket 42, at which time the timing pointer 43 has been returned to its "zero" or initial position as shown in Fig. 2.

Thus the momentary closing of switch 62 serves to connect or clutch the gear 36 automatically to the drive shaft 29 so as to rotate the gear and pointer 43, and also to energize the drive motor 28 and to turn on the printer lights. As the relay 60 is self-energizing, by reason of the switches 65 and 47, the switch 62 need be closed only momentarily. However, at the completion of the time interval the timing pointer 43 has moved into register with the preset pointer 25 so that the end 53 of the pointer 43 would then open switch 47 to thus de-energize the relay and to open switch 64 to interrupt or cut off the motor and printer circuits. Thus the timer may be preset for a desired or predetermined time at the completion of which the circuit to the printer lamps is interrupted automatically to extinguish the lamps.

While one embodiment of the invention has been disclosed, it is to be understood that the inventive idea may be carried out in a number of ways. This application is, therefore, not to be limited to the precise details described, but is intended to cover all variations and modifications thereof formed within the scope of the appended claims.

I claim:

1. An exposure timer comprising, in combination, a scale, a presettable pointer movable relative to said scale to indicate a predetermined time interval, a drive shaft, an electric motor for driving said shaft at a uniform speed, a second pointer freely mounted on said shaft, clutch means for connecting said second pointer in driven relation with said shaft to move said second pointer from an initial position over said scale at a uniform rate, a switch carried by said first pointer for controlling the circuit of said motor, and means controlled by said second pointer for opening said switch at the completion of said interval to open the circuit of said motor to stop the movement of said second pointer.

2. An exposure timer comprising, in combination, a scale, a presettable pointer movable rela-

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tive to said scale to indicate a predetermined time interval, a drive shaft, an electric motor for driving said shaft at a uniform speed, a second pointer freely mounted on said shaft, clutch means for connecting said second pointer in driven relation with said shaft to move said second pointer from an initial position over said scale at a uniform rate, a switch movable with said presettable pointer for controlling the circuit of said motor, means controlled by said second pointer for opening said switch at the completion of said interval to open the circuit of said motor to stop the movement of said second pointer and to disengage said clutch means to disconnect said second pointer from said shaft, and means to return the disconnected pointer to said initial position.

3. An exposure timer comprising, in combination, a scale, a presettable pointer movable relative to said scale to indicate a predetermined time interval, a drive shaft, an electric motor for driving said shaft at a uniform speed, a second pointer freely mounted on said shaft, clutch means for connecting said second pointer in driven relation with said shaft to move said second pointer from an initial position over said scale at a uniform rate, a relay, means for controlling the circuit of said motor from said relay, a normally-open, momentarily-operated switch arranged in the circuit of said relay so that the momentary closing of said switch will serve to energize said relay and simultaneously to operate said controlling means to close the circuit of said motor, said switch being then opened upon the closing of the motor circuit, a normally closed switch adjustable with said presettable pointer and arranged in the circuit of said relay and rendered operative upon the closing of said first switch to complete the circuit through said relay to retain the motor circuit in a closed condition, and means controlled by said second pointer for opening said second switch at the completion of said interval to open the circuit of said relay to render said control means inoperative so as to open the circuit of said motor to stop the latter.

4. An exposure timer comprising, in combination, a scale, a presettable pointer movable relative to said scale to indicate a predetermined time interval, a drive shaft, an electric motor for driving said shaft at a uniform speed, a second pointer freely mounted on said shaft, clutch means including a slideable member on said shaft for connecting said second pointer in driven relation with said shaft to move said second pointer from an initial position over said scale at a uniform rate, a relay, a source of power, a normally-open switch arranged in the circuit of said relay and momentarily closable to energize said relay, a pair of switches operatively connected to said relay and moved to closed position when said relay is energized, one of said pair of switches being arranged in the circuit of said motor to connect the latter to said source of power when said relay is energized, a normally closed switch adjustable with said presettable pointer and arranged in series with the other of said pair of switches and connected into the circuit of said relay when said pair of switches are closed to close the circuit through said relay upon opening of said first switch, and means controlled by said second pointer for opening said normally-closed switch upon the completion of said interval to simultaneously open the circuits to said relay and motor.

5. In a photographic apparatus, the combination with a photographic printer, of an exposure timer, said timer comprising a scale, a presettable

pointer movable relative to said scale to indicate a predetermined time interval, drive means including a constant-speed electric motor, a second pointer, a source of power, a relay, a normally-open switch adapted to be closed momentarily to connect said relay to said source of power, means controlled by said relay for connecting said second pointer to said drive means, a pair of switches operatively connected to and adapted to be closed when said relay is connected to said source of power, one of said switches being arranged in the circuit of said motor and printer to connect the motor and printer to said source of power, a normally-closed switch carried by said presettable pointer and arranged in series with the other of said pair and adapted to complete the circuit through said relay when said first switch is reopened, and means controlled by said second pointer for opening said normally closed switch at the completion of said interval to open the circuit to said motor and printer.

6. In a photographic apparatus, the combination with a photographic printer, of an exposure timer, said timer comprising a scale, a presettable pointer movable relative to said scale to indicate a predetermined time interval, drive means including a constant-speed electric motor, a second pointer, a source of power, a relay, a normally-open switch adapted to be closed momentarily to connect said relay to said source of power, means controlled by said relay for connecting said second pointer to said drive means, a pair of switches operatively connected to and adapted to be closed when said relay is connected to said source of power, one of said switches being arranged in the circuit of said motor and printer to connect the motor and printer to said source of power, a normally closed switch operatively connected to and movable as a unit with said presettable pointer and arranged in series with the other of said pair to maintain the circuit and said relay in closed position when said first switch is reopened, and means movable with said second pointer for engaging and opening said normally-closed switch at the completion of said interval to open the circuit to said motor and printer.

7. In a photographic apparatus, the combination with a photographic printer, of an exposure timer, said timer comprising, a scale, a presettable pointer movable relative to said scale to indicate a predetermined time interval, drive means including a constant-speed electric motor, a second pointer, an electric circuit, a switch for connecting said circuit to said motor and printer, a control circuit in parallel relation to said first circuit, a relay in said second circuit, means operated by said relay for connecting said second pointer to said drive means to be moved thereby, a normally-open, momentarily-operated switch adapted to be closed to energize said relay, means controlled by said relay for closing said first switch to complete the circuit to said motor and printer, another switch adapted to be connected in series with said relay when the latter is energized, a normally-closed switch carried by and movable with said presettable pointer and arranged in series with said other switch to complete the circuit through said relay to maintain the latter operative when said normally-open switch is reopened, and means carried by said second pointer adapted to engage and open said normally-closed switch at the completion of said

interval to open said other switch to de-energize said relay to disconnect said second pointer from said drive means and to open the switch in the motor and printer circuit.

8. In a photographic apparatus, the combination with a photographic printer, of an exposure timer comprising a scale, a presettable pointer adjustable relative to said scale to indicate a predetermined time interval, drive means including an electric motor and a drive shaft connected to said motor, a gear loosely mounted on said shaft, a timing pointer connected to said gear for rotation as a unit therewith, a radially extending arm fixed to said shaft adjacent said gear, a shaft rotatably carried by said arm adjacent the outer end thereof, a pinion fixed on said second shaft and meshing with said gear, said pinion being adapted to roll on said gear when said arm is moved upon rotation of said first shaft, means for holding said second shaft against rotation to lock said pinion to said gear so that the latter will rotate with said arm to move said timing pointer over said scale, a switch carried by said presettable pointer and arranged in the circuit of said motor, and means on said timing pointer for opening of said switch at the end of said interval to open the circuit to said motor to stop the latter.

9. In a photographic apparatus, the combination with a photographic printer, of an exposure timer comprising a scale, a presettable pointer adjustable relative to said scale to indicate a predetermined time interval, drive means including an electric motor and a drive shaft connected to said motor, a gear loosely mounted on said shaft, a collar carried by said gear, a timing pointer connected to said collar for movement as a unit with said gear, a radially extending arm fixed to said drive shaft adjacent said gear, a shaft journaled in said arm adjacent the outer end thereof, a pinion fixed to said second shaft and engaging said gear for rolling movement thereon, a disk fixed to said second shaft, means controlled by the starting of said motor for engaging said disk to hold said second shaft against rotation relative to said arm to lock said pinion to said gear so that the latter and said timing pointer will rotate as a unit with said arm to move said timing pointer over said scale, a switch mounted on said presettable pointer and arranged in the circuit of said motor, means on said timing pointer for engaging and opening said switch at the end of said interval, means operative upon the opening of said switch for releasing said disk to unlock said pinion from said gear to disconnect the latter and said timing pointer from said arm, and means for returning the disconnected timing pointer to an initial position.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,157,300	Dempster	Oct. 19, 1915
2,053,143	Frederick	Sept. 1, 1936
2,143,692	Haar	Jan. 10, 1939
2,163,419	Warren	June 20, 1939
2,459,876	Gibson	Jan. 25, 1949