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2,489,098

PROCESS TIMER

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Fig. 1.

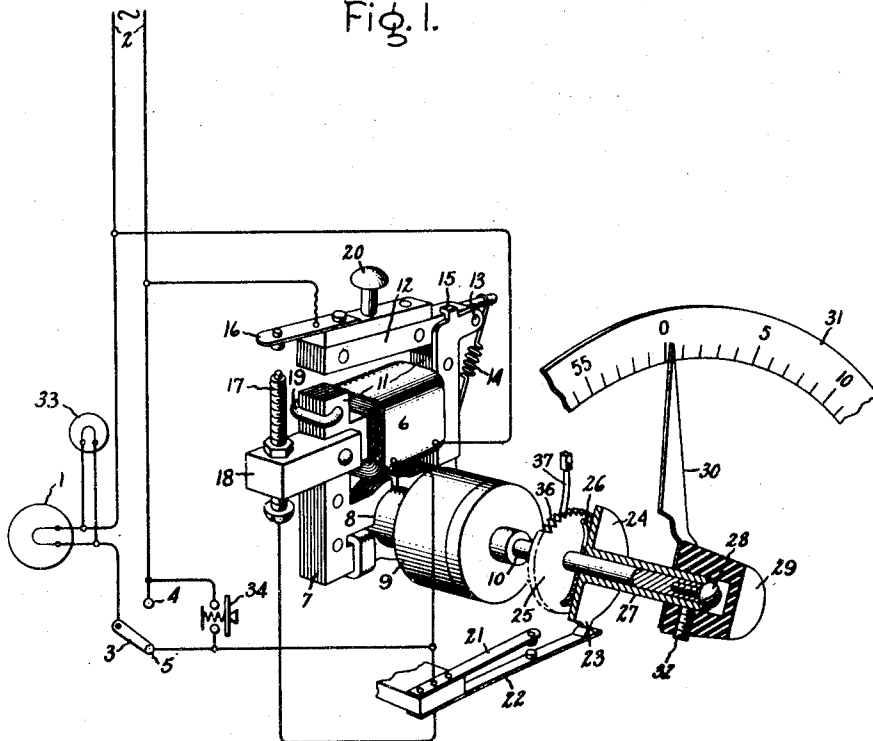
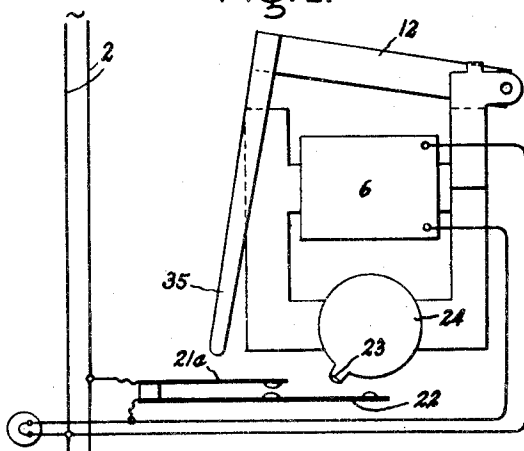


Fig. 2.



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UNITED STATES PATENT OFFICE

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PROCESS TIMER

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4 Claims. (Cl. 161—1)

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My invention relates to an interval timer for timing processes such, for example, as photograph printing time, and its object is to provide a simple, reliable, electrically driven timer, adjustable as to the process time, and in which the circuit of the driving motor and the circuit of the process timer are made and broken simultaneously such that the driving motor is energized only during a process timing operation. In carrying my invention into effect, the field of the timing motor is employed as a relay which will hold a normally open switch closed when the motor is energized. Closing of this switch energizes the motor and starts a process timing operation. At the end of the timing interval this switch or another switch in series relation with the motor is opened, thereby stopping the motor and allowing the relay switch to open. Fig. 1 shows the two-stretch arrangement and Fig. 2 the single-switch arrangement.

Referring to the drawing, Fig. 1, the process circuit to be controlled is represented as containing an incandescent lamp 1 supplied from an alternating current source 2. For convenience in using the lamp at times when a timing operation is not called for, the lamp may be connected to the source of supply by a double-throw manual switch 3 when moved to contact 4. When the lamp or other process circuit is to be time-controlled, the switch 4 is moved to a contact 5 so as to connect the lamp to the source of supply 2 through the process timer represented at the right in the drawing.

The timer is driven by a self-starting synchronous motor having a field winding 6, and a magnetic field core 7 containing a shaded pole rotor gap at 8 into which gap there is inserted the reduced end portion of a rotor and gear casing 9. Within this casing there are a suitable rotor for the motor rotatively mounted in the gap 8 of the field core and suitable reduction gearing with sealed-in lubrication. The terminal or low speed end of the gearing is connected to drive a shaft 10 extending through a bushing in the larger end of the gear casing. In the example to be described it will be assumed that the shaft 10 is driven at the rate of one revolution per minute in a counterclockwise direction by the motor when the motor is in operation. As thus far described, the motor in question may be similar to the timer motor unit described in United States Patent No. 1,495,936—May 27, 1924.

For the purposes of my invention the motor core has core parts 11 extending from the coil section away from the gap 8 and forming with a

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magnetic armature 12 a branch magnetic circuit employed as a relay. The armature 12 is pivoted at 13, and is biased about such pivot by a spring 14 to open magnetic circuit position against a stop at 15 as shown. The armature carries a contact 16, preferably insulated from the armature, and which in the energized position of the armature engages a contact 17 secured to the motor core structure by insulation 18. The contact 17 is preferably adjustable toward and away from contact 16 for convenience in obtaining the proper adjustment during assembly. At least one of the relay pole pieces is preferably provided with a shading coil 19 to reduce chatter of the armature core when energized with alternating flux from the motor magnetic circuit. The armature may be provided with a button 20 for convenience in pushing it to a closed position. In the energized position of the armature the magnetic circuit formed thereby which is in shunt to the motor flux circuit does not necessarily need to be fully closed, and in any event, may be so designed in relation to the field coil as to accomplish the intended purpose without shunting the motor operating magnetic circuit flux to a point when the motor is unreliable in operation.

My improved timer includes another switch formed by contacts 21 and 22 normally biased to a closed position by the resiliency of contact member 22 but held in an open position as shown by a cam projection 23 at one point on the periphery of a disk 24 which disk is connected in driving relation with the timer shaft 10 through a friction clutch consisting of the disk 24 and a disk 25 secured to shaft 10 with a saucer-shaped spring 26 compressed between such disks. The shaft 10 extends forward through the center of the friction clutch parts as shown. Disk 24 has a hollow shaft extension 27 rotatively mounted on shaft 10 and secured thereon by a screw 28. A knob 29 having a pointer 30 is secured to the hollow shaft extension 27 by a setscrew 32. The pointer 30 indicates on a stationary time scale 31 which in the example given is graduated in seconds from 0 to 60, reading in a clockwise direction or in the direction opposite to that in which the pointer 30 will be driven by the motor.

The motor field coil 6 is connected in series relation through the two switches described across the source of supply 2, and for a process timing operation the lamp 1 is likewise generally connected in series relation through the two switches described across the source of supply when both of such switches are closed. The switch formed by contacts 21 and 22 is open only when the

pointer 30 is in the zero indicating position on scale 31, since only at this time does the cam hump or tooth 23 on disk 24 hold these contacts open.

The switch formed by contacts 16 and 17 is normally open. It may be closed manually by pushing down on button 20. When pressure is removed, this switch will remain closed only if the motor is energized.

Starting with the apparatus in the normal, inactive condition represented in the drawing, it is used as follows: The unit consisting of knob 29, pointer 30, and cam disk 24 is turned from the zero time position shown until the pointer 30 indicates the number of seconds desired for a process timing period. The knob may be turned in either direction for this purpose. For instance, if the period is to be 10 seconds, pointer 30 ordinarily would be turned clockwise and if 55 seconds, the pointer 30 ordinarily would be turned counterclockwise, or the shortest distance to indicate on dial 31 the number of seconds or other time units in the desired timing interval period. In this operation the friction clutch at 26 slips. Such setting operations close the switch comprising contacts 21 and 22. The circuits of lamp 1 and motor coil 6 are of course open at contacts 16 and 17, so that nothing else happens as a result of this time setting operation.

To start the timing operation, the armature 12 is closed as by pushing down on knob 20. This closes contacts 16 and 17 and completes the circuit of both the motor coil 6 and lamp 1. Because the motor field is now energized, the armature 12 remains energized and its switch closed after pressure on knob 20 is removed. The motor starts instantaneously and drives the pointer 30 and its connected disk 24 counterclockwise toward the zero time position on scale 31 at a constant rate of speed; and at the end of the time interval the pointer reaches the zero position, contacts 21 and 22 are opened by cam lobe 23, the motor and lamp are deenergized, the motor stops and armature 12, being no longer attracted, moves to the deenergized position, opening the contacts 16 and 17 and thus preventing any further energization of the load circuit due to arcing, etc., across the small gap openings at contacts 21 and 22 or by resumption of contact at these contacts. The apparatus is now ready for another process timing operation such as just described.

Additional circuits or signal devices such as represented at 33 may be connected in parallel with lamp 1. The armature 12 when energized may easily be designed to give a slight buzzing sound if that is desired, so as to act as an audible signal to indicate to a person near the same when a processing timing operation is completed without looking at or being able to observe the pointer 30.

In case the motor terminal shaft 10 operates clockwise, the dial 31 would be graduated in the counterclockwise direction. The terminal shaft 10 may of course be geared to operate at any desired speed such, for example, as one revolution per hour in which case the dial 31 would have a 60-minute graduation instead of being graduated in seconds. It is of course relatively immaterial whether the graduated scale part or the pointer part of the time indicating system be made rotatable.

While the process circuit which is controlled by the timer has been shown as being energized from the same source as the motor, this is not

essential; nor is it essential that the normally closed switch comprising contacts 21 and 22 be included in the process circuit controlled by the timer. Where remote control starting is desired, the relay apparatus may be so designed as to close contacts 16 and 17 as well as to keep them closed when the motor coil is energized. For this purpose a normally open push button switch 34 may be momentarily closed and thus used in place of button 20 to start a timing operation.

If desired, the two switch means of Fig. 1 may be combined in a single switch means as represented in Fig. 2, where the armature 12 is shown as provided with an arm 35 extending from its free end to the vicinity of resilient contact member 21a such that when the armature is pushed down to energized position, the arm 35 pushes contact member 21a down where it will make contact with contact member 22 only when the latter is in the raised position shown. The parts are shown in the position they will assume following a time setting operation but before the armature 12 is pushed down to energized position. At the end of a process timing operation the switch is opened by hump 23 pushing down on contact member 22. The operation is otherwise the same as in Fig. 1.

The periphery of the disk 25 may be provided with evenly spaced ratchet teeth 36 to oscillate a resilient member 37 for the purpose of making an audible click at spaced time intervals. For instance, where the disk 25 is driven at the rate of one revolution per minute, the disk could have 60 teeth so that during a timing operation the member 37 would produce an audible click at one-second intervals or "tick" off seconds. The member 37 is resilient and its free end is biased against the periphery of disk 25, and is so arranged in relation to the shape of the ratchet teeth as to snap over the teeth as the disk rotates as to make an audible click. This is of value during a photographic printing exposure in a dark room where the operator desires to shade a portion of the image for a part of the total timed interval. The member 37 may be lifted from the disk 25 during a setting operation or when the audible click is not desired.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. A timer comprising a constant speed electric motor having a magnetic field core with a motor armature gap and a relay armature gap in parallel magnetic relation, and energizing coil on said field core for producing operating flux across both gaps, a magnetic relay armature pivoted on said core adjacent the relay gap and biased to de-energized position, said relay parts being adjusted such that the armature will be held in attracted position when the motor coil is energized, a switch closed by said relay armature only when in attracted position, a motor armature in the motor armature gap, time indicating parts including a time graduated scale and a pointer cooperating with said scale one of which is stationary and the other of which is rotatively mounted and adapted to be driven by said motor but which is rotatively adjustable relative to said motor for time setting purposes, a normally closed switch adapted to be opened by said rotary part only when said time indicating parts indicate zero on the time scale, said two switches being connected in series circuit relation with said energizing coil.

2. A timer comprising a self-starting synchronous motor, a time graduate scale, a pointer indicating on said scale and adapted to be driven by

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said motor in a down scale direction, means whereby said pointer may be manually rotatively adjusted relative to the motor for setting the pointer to any desired time graduation mark on said scale, a normally closed switch in series relation with said motor, means moved with said pointer for opening said switch only when the pointer is in a zero time indicating position relative to said scale, a normally open switch also in series relation with said motor, means for manually closing said normally open switch when the pointer has been set away from a zero time indicating position relative to the scale thereby starting a timing operation, and means operated by flux from the motor to maintain the normally open switch closed only when the motor is energized, and a circuit to be time connected through said normally open switch.

3. A time comprising a constant speed electric motor having a magnetic core with a motor armature gap and a relay armature gap in parallel relation, an energizing coil on said field core for producing operating flux across both gaps, a magnetic relay armature pivoted on said core adjacent the relay gap and biased to detracted position, said relay parts being adjusted such that the armature will be held in attracted position when the motor coil is energized, a motor armature in the motor armature gap, time indicating parts including a time graduated scale and a pointer cooperating with said scale, one of which is stationary and the other of which is rotatively mounted and adapted to be driven by said motor but which is rotatively adjustable relative to said motor for time setting purposes, an energizing circuit for said motor and switching means in said circuit associated with said relay armature

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and said motor driven time indicating part such that the motor energizing circuit is closed only when the armature is in attracted position and the time indicating parts indicate other than zero on the time indicating scale.

4. A timer comprising a self-starting synchronous motor, a time graduated scale, a pointer indicating on said scale and adapted to be driven by said motor, means whereby said pointer may be manually rotatively adjusted relative to said motor for setting the pointer to any desired time graduation mark on the scale, a relay armature member associated with the field of said motor normally biased to a detracted position but capable of being held in an attracted position when the motor is energized, and switching means including a contact moved by said armature and a contact moved with said pointer when the latter moves to and from a zero time indicating position said contacts being in series relation in the energizing circuit of said motor, said contacts closing the motor circuit only when the pointer is in other than a zero time indicating position and said armature is in attracted position.

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REFERENCES CITED

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

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Certificate of Correction

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November 22, 1949

CHESTER B. MARBLE

It is hereby certified that errors appear in the printed specification of the above numbered patent requiring correction as follows:

Column 2, line 26, for the word "when" read *where*; column 4, line 53, for "and" read *an*; column 5, line 17, for "time" read *timed*;

and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 25th day of April, A. D. 1950.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.