June 27, 1944. C. L. ANDERSON 2,352,156

TIMING MECHANISM

Filed July 31, 1941 2 Sheets-Sheet 1

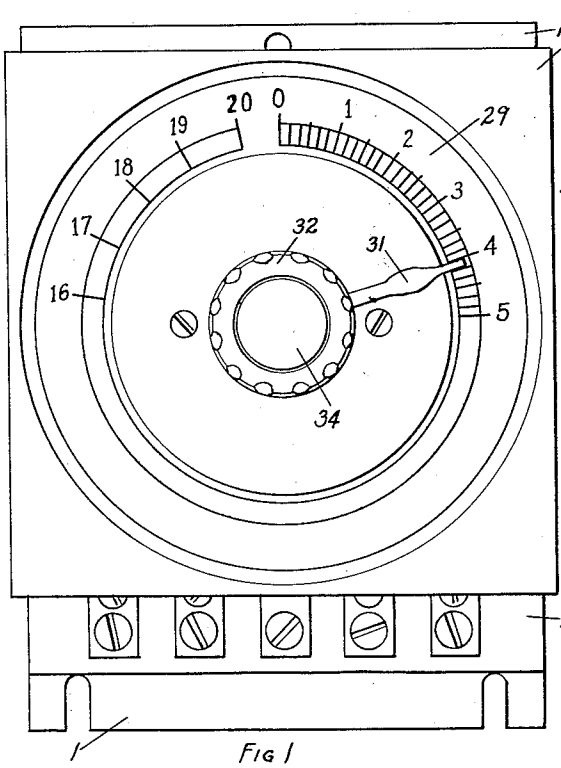


FIG 1

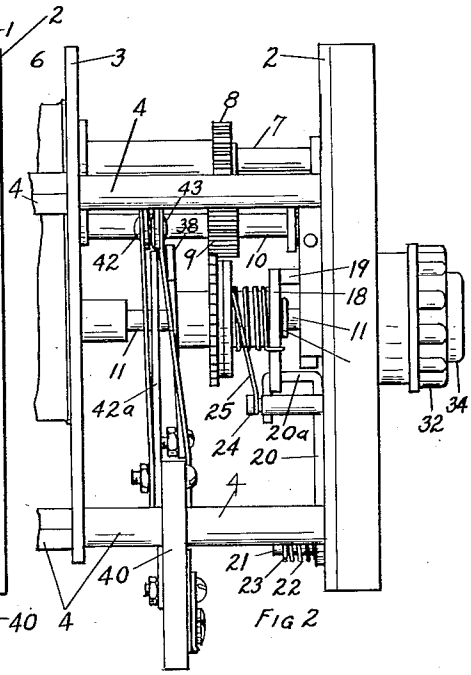


FIG 2

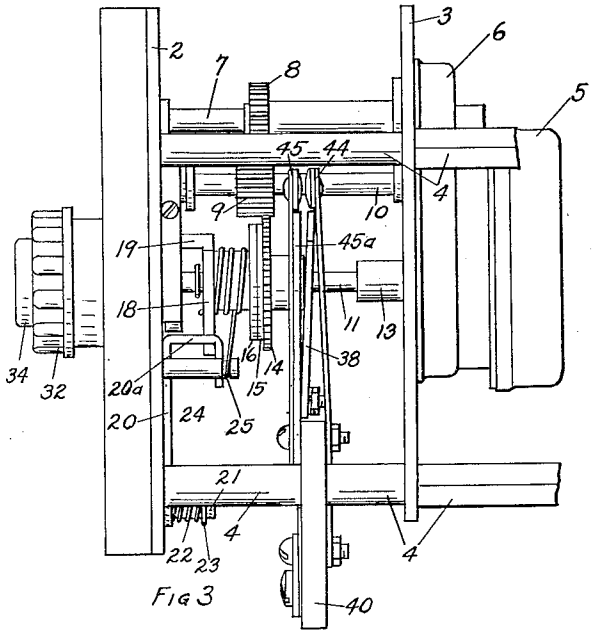


FIG 3

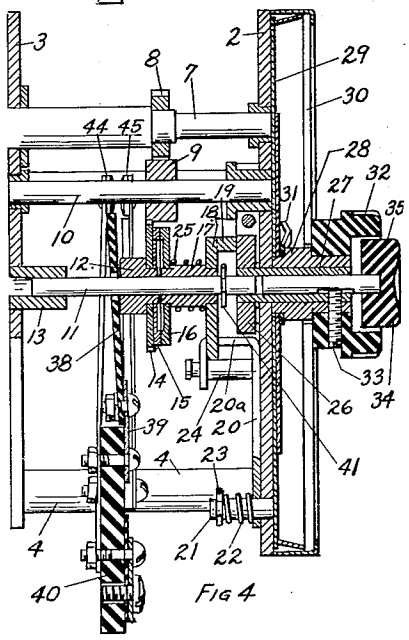


FIG 4

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TIMING MECHANISM

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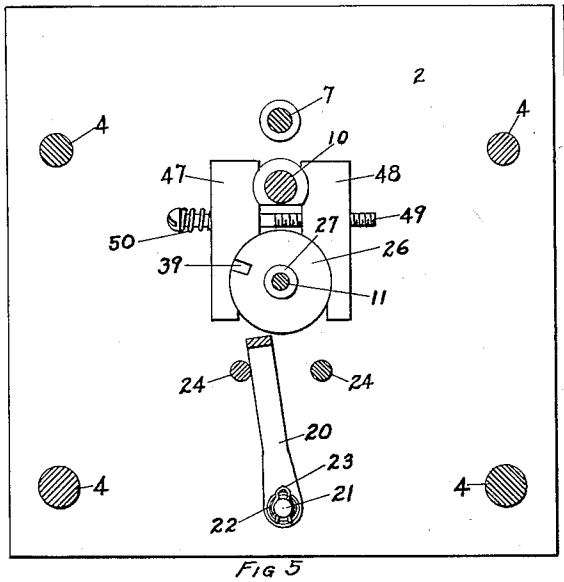


FIG 5

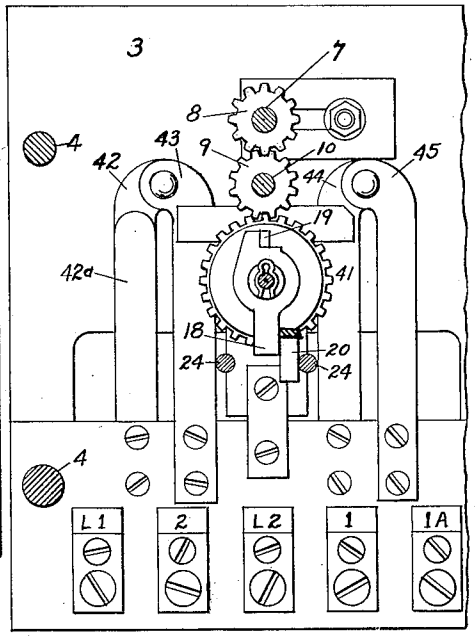


FIG 6

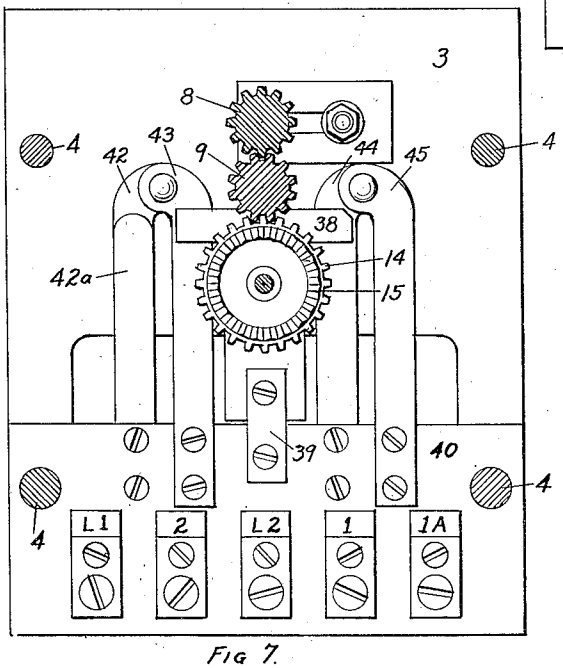


FIG 7

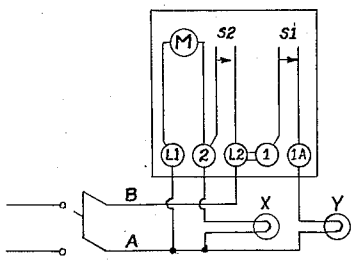


FIG 8

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Patented June 27, 1944 2,352,156

UNITED STATES PATENT OFFICE

2,352,156

TIMING MECHANISM

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Application July 31, 1941, Serial No. 404,847

8 Claims. (Cl. 161—1)

The present invention relates to an electric timer for accurately timing a period of load-on or load-off without making any changes in the timing mechanism, other than changing the connection of the load to the timer.

Among the objects of this invention are the provision of an accurate timer of the nature stated; the provision of a timer in which the period of function of the mechanism is initiated by a push button, whether the timed interval be a load-on interval or a load-off interval; the provision of a timer of the character indicated which will be inexpensive to manufacture and will require very little servicing; and such further objects, advantages, and capabilities as will hereafter appear and as are inherent in the construction disclosed herein. My invention further resides in the combination, construction, and arrangement of parts illustrated in the accompanying drawings, and, while I have shown therein what is now regarded as the preferred embodiment of this invention, I desire the same to be understood as illustrative only and not to be interpreted in a limiting sense.

In the drawings annexed hereto and forming a part hereof,

Fig. 1 represents a front elevation of a timer embodying my present invention;

Fig. 2 represents a left side elevation, and

Fig. 3 represents a right side elevation of the structure shown in Fig. 1;

Fig. 4 represents a vertical, substantially central section of the structure shown in Figs. 1, 2, and 3;

Fig. 5 represents a vertical, transverse section, back of the timing disc, looking forwardly;

Fig. 6 represents a similar section, looking backwardly;

Fig. 7 represents a vertical transverse section between the clutch faces, looking backwardly; and

Fig. 8 is a wiring diagram showing the various connections within the mechanism and the connections of the power line to the timer.

Reference will now be made in greater detail to the annexed drawings for a more complete description of this mechanism. Broadly, this comprises a mounting plate 1, a face plate 2, and a motor mounting plate 3, connected to a plurality of posts 4 which hold the plates rigidly connected. As best shown in Fig. 3, a driving motor 5 is mounted on the rear of the plate 3, spaced therefrom by a gear housing 6 containing gearing through which a shaft 7 is driven by the motor. This shaft has a gear 8 secured thereto to be driven thereby.

The gear 8 meshes with a gear 9 secured to the shaft 10 mounted in bearings in the plates 2 and 3. In Fig. 7, the gears 8 and 9 are shown as being integral with the shafts 7 and 10, but it will be understood that these may be separated from the shafts and secured thereto in any desired way, as by means of a screw or keys or by fitting the same tightly enough to require a press or drive fit. These are merely stated to show that there are various ways in which the gears may be mounted and that the particular mode of mounting is unimportant.

A shaft 11 has a sleeve 12 secured thereto, as best shown in Fig. 4, and has a bearing at one end in a sleeve 13, mounted in the plate 3 or suitably attached thereto. The shaft 11 may reciprocate in the sleeve 13 for a purpose to be presently disclosed. A gear 14 is fixedly secured to the sleeve 12 and therefore reciprocates and rotates therewith, the shaft 11 being driven through the gear train 8, 9, 14 from the motor 5.

The gear 14 has a clutch element 15 secured to one face thereof and this cooperates with a clutch element 16 rigidly mounted on the sleeve 17. A crossarm 18, provided with a finger 19, is also rigidly secured to the sleeve 17, and one end thereof, as shown in Fig. 4, cooperates with a stop member 20, pivoted at its lower end on a pin 21 projecting rearwardly from the plate 2. Surrounding this pin 21 is a spring 22 which presses at one end against the stop member 20 and at its other end against a key 23 which holds the spring in place. At its upper end, the stop member 20 has a rearwardly projecting arm 20a which extends into the path of the crossarm 18. The spring 22, pressing the member 20 against the plate 2, prevents this from inadvertently turning about its pivot but permits it to turn quite freely about this pivot when the shaft 11 and crossarm 18 are rotated, if necessary, when setting the instrument for a timing interval.

The stop member 20 may oscillate between a pair of pins 24 which serve as means to limit its lateral swinging. As shown in Fig. 3, one of the pins 24, circumferentially grooved at its rearward end, receives a hooked end of a spring 25 which surrounds the sleeve 17 and tends to rotate the crossarm 18 about the shaft 11 until the lower end of the crossarm strikes the stop member 20 and is limited thereby from further rotation. The diagonal pull of the spring 25 tends to open the clutch 15, 16, when these two parts are not definitely held together.

A disc 26 is rigidly mounted on the rearward end of a sleeve 27 which furnishes a bearing for the forward end of the shaft 11. A sleeve 28 is rigidly secured to the sleeve 27 by a set screw, extending through an enlarged portion of this sleeve and located between the dial 29 and the crystal 30. A pointer 31 (see Figs. 1 and 4) is rigidly mounted on one end of the sleeve 28 and therefore turns with it. The set screw, securing the sleeve 28 to the sleeve 27, is not shown in any of the figures.

A knob 32 is removably secured to the sleeve 28 and the sleeve 27 by the screw 33, as shown in Fig. 4. A push button 34 is rigidly secured to a short shaft 35, loosely mounted in the sleeve 27 for reciprocation therein. As shown in Fig. 4, this shaft 35 is notched upon one side to receive the inner end of the set screw 33 whereby to limit reciprocation of the shaft and prevent its withdrawal from the sleeve 27. Naturally, when it is necessary to dismantle this part of the apparatus, the screw 33 may be backed out of its opening far enough to clear the shaft 35 and permit it to be withdrawn. If the screw 33 is withdrawn still farther, so that it clears the sleeve 28, then the knob 32 may be removed, thus enabling the removal of the crystal 30.

Since, when the parts are secured together, as shown in Fig. 4, turning of the knob 32 will turn the sleeve 27 and any part or parts rigidly connected therewith, it is obvious that turning the knob 32 will turn the pointer 31, and it will thus be possible to set this pointer at any desired point within the limits of the machine. It will be understood that the normally inoperative position of the machine is with the motor shut off. This means that, when the motor circuit is closed, the motor operates and drives the gear train, thus rotating the crossarm 18, if the clutch 15, 16 is closed.

The disc 26 is provided, as shown in Fig. 5, with a notch 37 for the reception of the finger 19 on the crossarm 18. This notch permits the finger to drop therein under the influence of the spring 25 when the gear train 8, 9, 14 has driven the sleeve 17 and crossarm 18, with the clutch 15, 16 closed, until the finger 19 is in alignment with the notch 37. When this condition is reached, the finger snaps into the opening, permitting the clutch to open, and the driving ceases because the motor switch is simultaneously opened. The actuator for the switches is the T-shaped insulation member 38 carried by the spring 39 mounted on the insulating panel 40. This panel 40 is mounted between sections of posts 4, as clearly shown in Fig. 3.

The insulation member 38, under the influence of the spring 39, presses against the end of sleeve 12 and forces this and all parts carried by the shaft 11 toward the right, as viewed in Fig. 4. However, movement of the shaft 11 toward the right is limited by the key 41 striking the face of disc 26 and the end of sleeve 27. There is a slight space between this key 41 and the end of sleeve 17, and this permits the assembly 16, 17, 18 to move far enough to the right, after the shaft 11 has stopped, so that the clutch 15, 16 is opened. This, therefore, disconnects the drive between the motor and the crossarm 18. Wherever the finger 31 is positioned by turning the knob 32, the disc is positioned correspondingly so that the position of the notch 37 corresponds to the position of the finger 31.

The dial, as illustrated in Fig. 1, is calibrated for a total cycle of twenty minutes, divided into ten-second periods. The machine is also built to cover a two-minute total time, divided into one-second intervals, but this is not illustrated in the drawings, since it is believed that it will be obvious from the illustration of Fig. 1. The time interval illustrated in this figure would be approximately four minutes and five seconds. Let us assume that the knob 32 is turned until the finger 31 indicates the setting shown in Fig. 1. Then, in order to set the timer into operation, the push button 34 is pushed inwardly until the finger 19 is released from the notch 37. When this happens, the spring 25 turns the crossarm 18 until its lower end strikes the crossbar 20a of the stop member 20. When the push button 34 is pushed inwardly, the switch 42, 43 is closed and the switch 44, 45 is opened. When the push button is pushed in, the shaft 35 engages the end of shaft 11 and pushes this inwardly to cause the key 41 to engage the crossarm 18 and push the finger 19 away from the disc 26. When the pressure is released from the push button 35, then shaft 11, gear 14, clutch 15, 16, sleeve 17, and crossarm 18 move to the right. However, engagement of the end of the finger 19 with the disc 26 stops movement of parts 16, 17 and 18 and allows the clutch member 15 to engage member 16, thus putting these parts in driving relation. Now, as the motor operates, the gear train rotates the crossarm 18 and moves the finger 19 toward the notch 37. When they come into alignment, the finger 19 drops into the notch 37 and switch 42, 43 is opened, while switch 44, 45 is closed.

Member 42a is a rigid bar to prevent contact 42 from following contact 43 beyond a certain position, thus making it possible to have the circuit broken between 42 and 43 with considerable certainty, and yet have strong contact pressure between these two contacts when the insulation member 38 forces contact 43 toward 42. A similar bar 45a performs a similar function in conjunction with the contact 45.

In connection with Fig. 5, it is noted that the friction block 47, 48, connected by the screw 49, serves to place the needed pressure upon the edge of disc 26 to keep this from inadvertently turning out of adjusted position. However, it is not difficult to turn the knob 32 and disc 26 when it is desired to adjust the setting of the machine. A spring 50, between the head of the screw 49 and the block 47, makes possible a certain amount of yielding, if this is necessary, and yet keeps a substantially constant pressure upon the disc 26.

It is noted that when the push button 35 is pushed inwardly, the left end of member 38, as viewed in Figs. 6 and 7, pushes the contact member 43 into contact with member 42, while, at the same time, pushing contact 44 away from contact 45. Thus, it is certain that one or the other of these switches will be closed when the push button is at rest.

Connections denoted as L1, 2, L2, 1, and 1A are mounted on the insulator 40 and serve as means for connecting the power lines and the load lines to the timer. As is clear from Fig. 8, the motor is connected to L1 and 2, to which, also, is connected one of the power lines. The other power line is connected to L2, and a switch S2 is connected to 2 and L2. It should perhaps be explained that connector 2 is connected to contact 42 while L2 is connected to contact 43. Similarly, connector 1 is in circuit with contact 44 while 1A is in circuit with contact 45. The power lines are designated by the letters A and B, merely for the purpose of distinguishing them. When the

line switch is closed and the timer is put into operation, the load between line A and connector 2 being designated as X and shown for illustrative purposes only as an incandescent lamp, the motor circuit will be closed from A through L1, M, 2, switch S2, and the connector L2 to line B. Current also flows from line A through load X, connector 2, switch S2, and connector L2 to line B. From this it is seen that both the motor M and the load X are in series with the switch S2, the motor and load being in parallel. Therefore, until this switch is opened by the motor M driving the arm 18 until the finger 19 drops into the notch 37, the current will flow through both the motor M and the load X. However, as soon as the switch S2 is opened, then the circuit is broken and "time-in" for load X is discontinued. If, on the other hand, it is desired to time "load-off"; this is done by connecting load Y to line A and connector 1A and bridging between L2 and 1. The circuit is then between lines A and B through load Y, connector 1A, switch S1, connector 1, and connector L2. However, it is seen that this connection does not disturb the running of the motor, the circuit of which is the same as previously described. If the load X is not connected to the circuit, then nothing will happen except that the motor will run for the time period set, and then, at the end of this period, the switch S1 will be closed to turn the current on the load Y. It is thus seen that the switch S2 furnishes current to the load X during a measured period of time while the switch S1 operates to turn the current on to function with the load Y after a predetermined time. If both loads are connected in, as described, then load X will be on the line for a measured period of time and load Y will be off for the same period of time. Then, when the timer reverses the switches, current will be cut off from the load X and furnished to load Y.

The operation of the timer will now be described briefly. We will first assume that there is no load Y connected to the circuit and that the load X, whether this be a light, a group of lights, a valve, or an operating machine, is connected in the circuit, as shown in Fig. 8. Now let us assume that it is desired to operate the load X for one minute and thirty seconds and then cut off the load. The knob 32 is turned until the finger 31 points to the long line mid-way between the numbers 1 and 2 on the dial. Now, in order to start the functioning of the timer, the push button 35 is pushed inwardly to release the finger 19 from the notch 37. The spring 25 now causes the crossarm 18 to rotate until its lower end engages cross-bar 20*a* of arm 20 which engages post 24 at the right, as illustrated in Fig. 6. At once, upon pressure being released from the push button 34, the parts move as far to the right as possible, as viewed in Fig. 2, the finger 19 engaging the disc 26 and insuring that clutch 15, 16 will be engaged and switch 42, 43 closed, which starts the timer motor into operation. This operation causes rotation of the crossarm 18 about the shaft 11, and this rotation continues until the finger 19 drops into the notch 37, opening the clutch and the switch 42, 43, that is, the switch S2. This shuts off current from the motor and from the load X, and all operation is stopped. If a "load-on" period of a different length is required, the knob 32 is turned until the finger 31 indicates the time period desired which, in the embodiment illustrated, may be anything up to twenty minutes.

If it is desired to have a "load-on" period of indefinite length with a "time-out" period of definite length, this can be accomplished by connecting the load in the Y position, illustrated in Fig. 8, the pointer 31 being set to indicate the interval of time of "load-off."

As will be evident from the foregoing description, the motor 5 should be of the synchronous type and may be any one of several now on the market and well known.

It will of course be understood that the specific description of structure set forth above may be departed from without departing from the spirit of this invention as set forth in this specification and the appended claims.

Having now described my invention, I claim:

1. In a timing mechanism having a supporting framework, a time-interval indicating dial supported thereby, a terminal supporting panel supported by said framework, a set of load circuit terminals mounted thereon, a set of power circuit terminals also mounted on said panel, means for indicating, in cooperation with said dial, duration of a time interval in or out of circuit, sets of circuit controlling contacts mounted on said panel and connected with said terminals, and a synchronous motor for governing the operation of said circuit contacts; the combination of a rotary reciprocable shaft supported by said framework, a clutch on said shaft, one part of said clutch being rigidly connected to said shaft and the shaft and one clutch part being manually movable together, rotatively and longitudinally, an actuator for said contacts carried by said framework, said actuator being functionally associated with said shaft to be actuated thereby when the shaft is moved longitudinally, whereby to close one set of contacts and open the other, driving connections between said motor and said clutch to cause driving of the shaft when the motor operates, and clutch-holding means connected with said shaft for holding the clutch closed a predetermined period of time and then allowing it to open after said period of time, said holding means being movable independently of said shaft.

2. A structure as defined by claim 1 having a knob rotationally adjustable about the clutch shaft for setting the circuit interval indicating means for a desired period of time, and actuator means connected with the shaft for moving the clutch shaft and clutch longitudinally whereby to close the clutch and the motor circuit to start operation of the motor.

3. A structure as defined by claim 1 in which the contact actuator extends between the two sets of contacts and is arranged to be moved manually and, when so moved, causes one set of contacts to be opened and the other to be closed.

4. An electric timer comprising, in combination, a time interval indicating face-plate, an indicator cooperating therewith to indicate periods of time, a plural piece shaft extending through said plate, one piece of the shaft being hollow and receiving within itself a second piece thereof, said hollow piece having a disc at its inner end, turning with the hollow piece of the shaft when that is rotated and having a recess therein for reception of a finger, a crossarm mounted on said shaft to rotate thereabout when free to move, a finger on said cross-arm to engage in said recess, a clutch on said shaft to transmit rotary motion to one section thereof, and to said crossarm when the clutch is closed, power means to transmit rotary motion to the clutch and crossarm until the finger on the crossarm engages in

said recess to release the clutch, and a circuit controlling switch actuated to open or closed position upon longitudinal motion of the shaft.

5. In a timing mechanism having electrical contacts, a first member mounted on a shaft and spring biased for rotational movement in one direction and spring biased for axial movement in another direction, a stop for limiting the spring biased rotational movement, a timing motor, a clutch and gears through which said motor rotates the first member against its rotational spring bias, a second member mounted concentric with the first member, one of said members having a projection and the other member having a cooperating surface and notch whereby the first member is held against its axial spring bias by the projection riding on the surface until said motor rotates said first member to the position where the projection is in alignment with the notch to permit the spring biased axial movement of the first member, means operable to move said first member against its axial bias to disengage said projection from said notch and also to disengage said clutch permitting spring urged rotational movement of said first member until limited by said stop, said last named means, when released, permitting reengagement of said clutch while said first member is held in its axially displaced position by the second member, and means for closing and opening said electrical contacts upon axial movement of said first member.

6. An electric timer comprising, in combination, a shaft mounted for rotational and longitudinal movement and yieldably urged in one longitudinal direction, means for causing rotary motion of said shaft, including as a part thereof a clutch, one element of which is secured to said shaft, said clutch being engageable by longitudinal movement of said shaft, a rotatably adjustable hollow shaft surrounding part of said first shaft, a disc surrounding and secured to said hollow shaft to rotate therewith, said disc having an aperture therein, a cross-arm on the first mentioned shaft, said cross-arm being provided with a finger to rest against the face of said disc and to engage in said aperture to permit longitudinal movement of said first shaft and thereby release the clutch parts for driving engagement, the finger being disengageable from said aperture upon longitudinal movement of said first shaft in one direction and, when resting against the face of the disc, holding the clutch parts in engagement, and switch parts controlled in accordance with the positioning of the clutch parts.

7. In a timing mechanism having a supporting framework, a time interval indicating face supported thereby, an interval indicator mounted in front of said face and cooperating therewith in indicating a time interval, a composite shaft, projecting through said face, upon which said indicator is mounted, a clutch mounted upon said shaft, a circuit terminal supporting panel carried by said framework, circuit terminals mounted upon said panel, a power circuit connected to some of said terminals, a load circuit connected with said power circuit to be energized thereby, a motor circuit and motor connected to said power circuit in parallel with said load circuit, and a switch in series with said motor and load circuits; the combination of a manual actuator for said indicator, connected thereto, whereby the indicator may be adjusted with respect to the indicating face to indicate a time period, an actuator for said clutch and shaft, connected to the shaft, whereby the clutch may be put into functionally operative condition after the interval indicator has been adjusted to indicate a period of time, and an actuator to cooperate with said switch in the actuation thereof when the clutch actuator is moved longitudinally.

8. An electric timer comprising, in combination, a time-interval indicating face, an indicator carried adjacent said face to cooperate therewith in indicating periods of time, a compound shaft comprising at least two connectible and disconnectible sections, at least one of which is longitudinally movable to place the sections in cooperative relation, one section of said compound shaft carrying said indicator in front of said face, a clutch comprising two relatively movable parts for connecting two sections of the shaft in cooperative relation, one of which parts is connected to a section of said shaft for movement therewith, the second part of said clutch being capable of rotary and longitudinal motions relatively to the first mentioned part of the clutch and to the section of the shaft by which the first mentioned part of the clutch is carried, a stop on one section of said shaft movable relatively thereto to cause closing of the clutch upon longitudinal actuation and release of the shaft, and a switch contact actuator adjacent the clutch to be moved thereby upon longitudinal actuation of the shaft and clutch.

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