

March 27, 1945.

L. W. COREN

2,372,253

TIMER

Filed Aug. 26, 1941

3 Sheets-Sheet 1

Fig. 1.

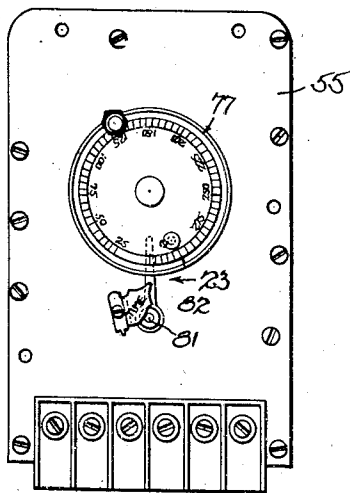


Fig. 2.

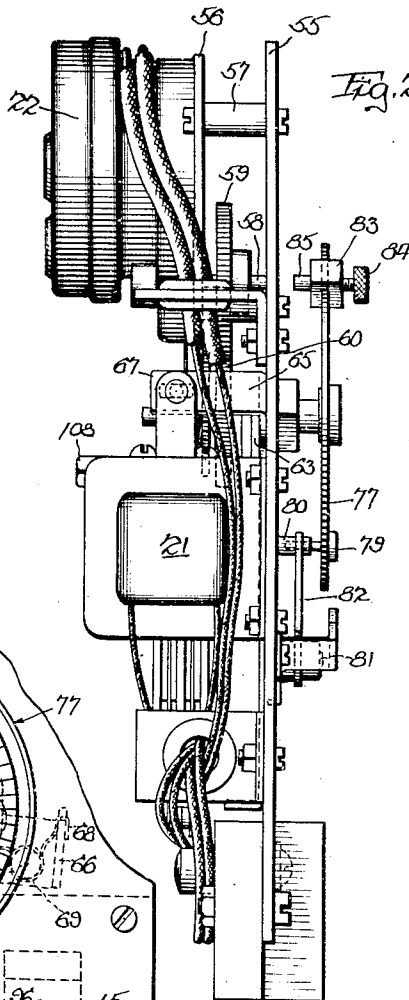


Fig. 3.

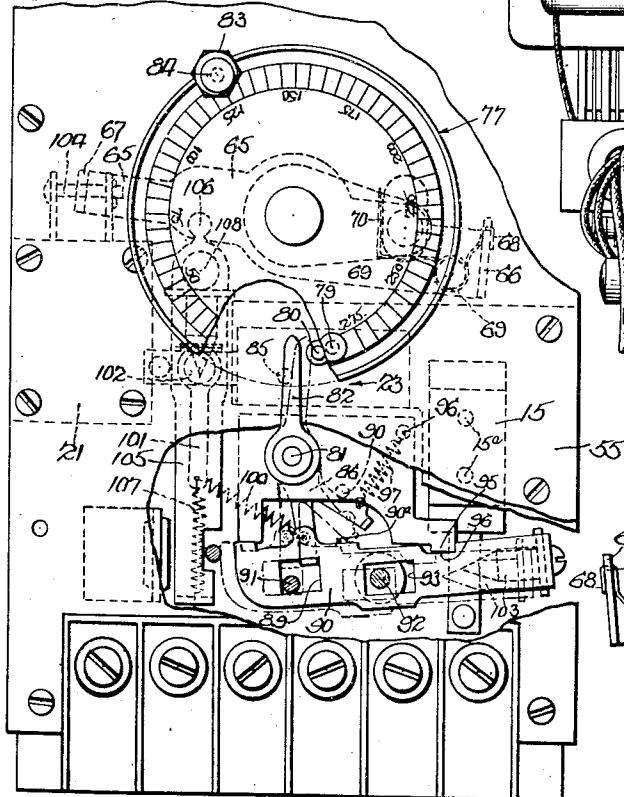
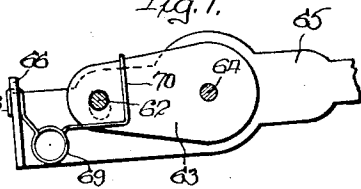


Fig. 7.



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Fig. 4.

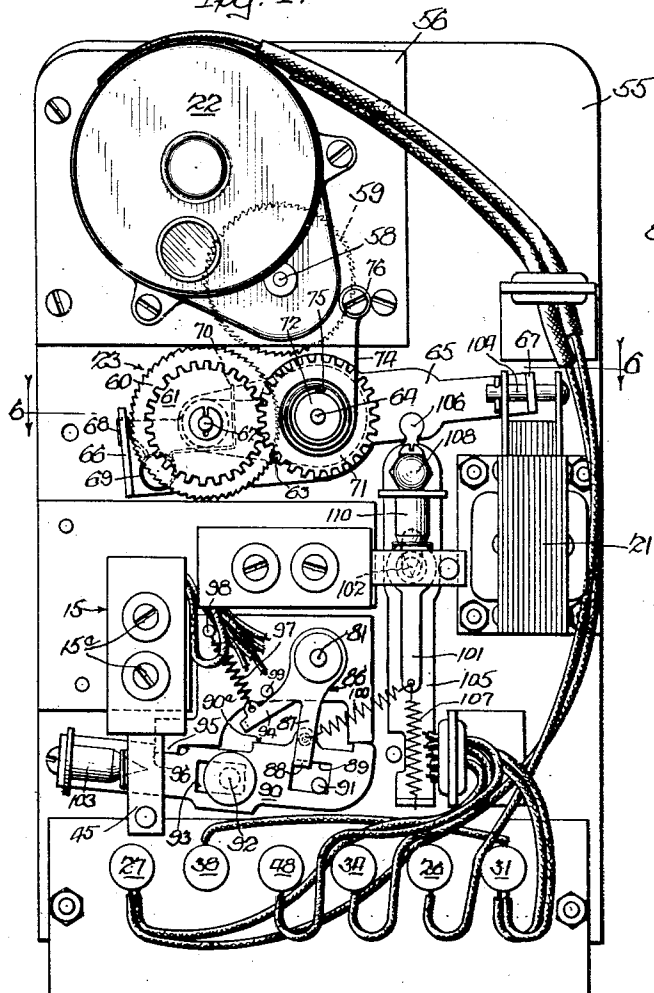
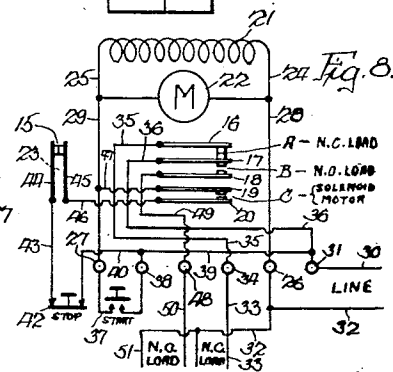
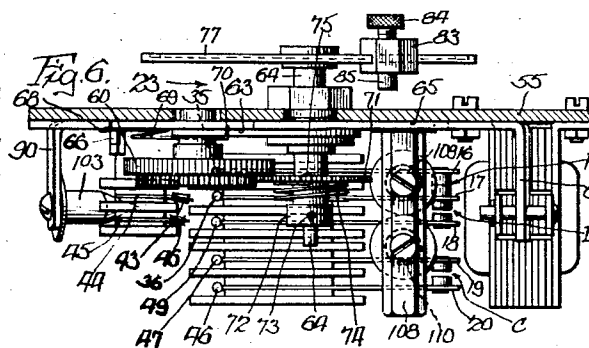
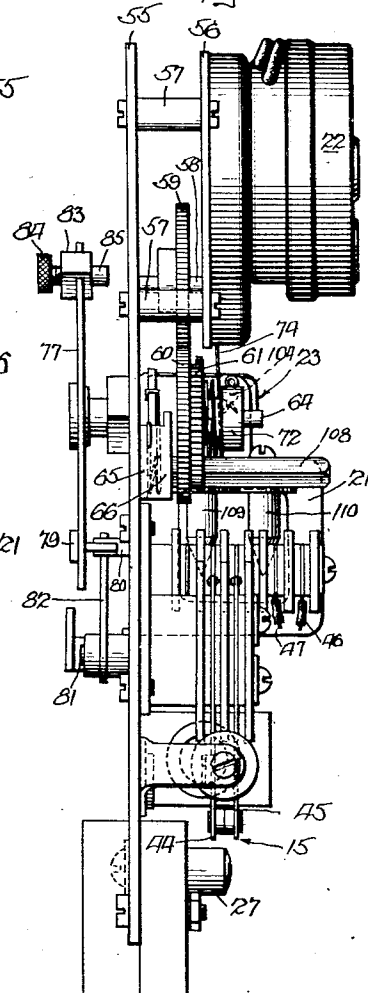


Fig. 5.



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Fig. 9.

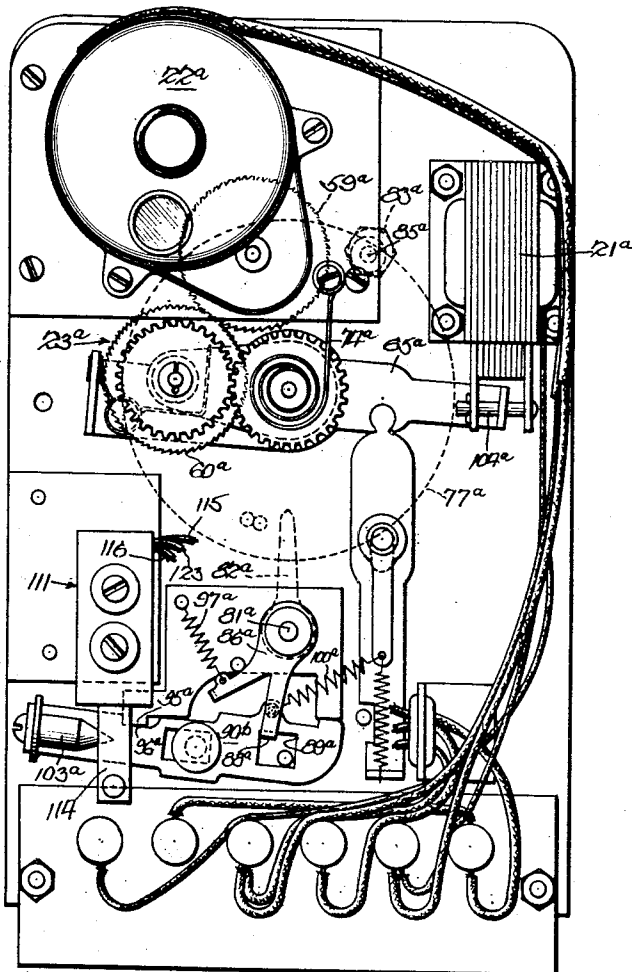


Fig. 10.

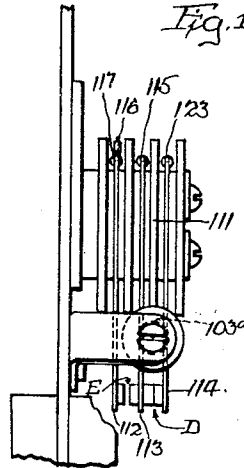
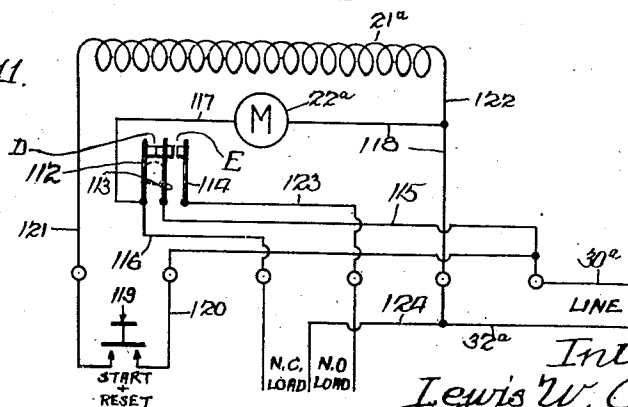


Fig. 11.



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UNITED STATES PATENT OFFICE

2,372,253

TIMER

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Application August 26, 1941, Serial No. 408,308

5 Claims. (Cl. 161—1)

The present invention relates to circuit control apparatus, and is more particularly directed to an improved control device for controlling the current flow and the making and breaking of the circuit at predetermined periodic intervals.

The invention disclosed herein is an improvement over the invention disclosed and claimed in my Patent No. 2,086,995, and has for an object the provision of improved means under the control of a solenoid for effecting its engagement and disengagement with a driving means which drives a time control device that is adjustable to control the circuit at predetermined intervals whereby the controlled circuit may be completed or interrupted at variable predetermined intervals, or selectively interrupted.

Another object of the present invention is the provision of an improved control device which may be automatically reset, whereby the completion or interruption of the circuit may be repeated in accordance with preset time intervals.

A further object is the provision of a positive drive between the drive means and the time control device and the ability to stop and reset the time control device to zero position during its operation.

And a further object is the ability to reset the time control device to zero position without interrupting contacts and to continue for preset time.

Other objects and advantages of the invention include the novel arrangements and combination of elements as hereinafter described and claimed, and as illustrated in the accompanying drawings, in which:

Figure 1 is a front elevation of a time control device embodying the features of the present invention.

Figure 2 is an enlarged side elevation of the device shown in Figure 1.

Figure 3 is a fragmentary front elevation with parts broken away, showing the timer control switch and its operative parts in full line position, and in changed position in dot and dash lines.

Figure 4 is a rear elevation of the device showing the parts in their normal positions.

Figure 5 is a side elevation of the device as viewed from the other side of that shown in Figure 2.

Figure 6 is a plan sectional view taken substantially on line 6—6 of Figure 4, illustrating the driving means of the timer mechanism.

Figure 7 is a detail view of the rockable arm and the spring-urged swingable arm carried thereon.

Figure 8 is a schematic wiring diagram of the time control device.

Figure 9 is a rear elevation of a modified form of device illustrating the driving means of the

timer mechanism constantly engaged and disengageable under the control of a solenoid.

Figure 10 is a fragmentary end elevation illustrating the three contact circuit control switch.

Figure 11 is a schematic wiring diagram of the time control device illustrated in Figures 9 and 10.

The invention is exemplified in preferred and modified forms, in which the wiring circuits are illustrated in Figs. 8 and 11.

Referring now to Fig. 8, the wiring circuit of the preferred form is shown in which a maintaining circuit switch 15 and five contact members 16, 17, 18, 19 and 20 are employed and arranged to form contacts A, B and C. Contact A, which is normally closed, controls the current flow to the N. C. load, and contact B controls the current flow to the N. O. load, while contact C controls the current flow to a solenoid 21 and motor means 22 which operates a timer mechanism 23 associated with the maintaining circuit switch 15, and which timer mechanism is adjustable for operating to open the maintaining circuit switch at predetermined intervals. For that purpose, the motor means 22 and solenoid 21 are connected in parallel by conductors 24 and 25, and the parallel connected solenoid and motor means are connected across terminals 26 and 27 of a supply of electrical energy by a conductor 28 to the terminal 26 and a conductor 29 to the terminal 27.

The normally closed or N. C. load is connected with the supply of electrical energy, which has one side 30 connected to terminals 31 and 32, and its other side 32 is connected to one side of the N. C. load and to terminal 26. The other side 33 of the N. C. load is connected to a terminal 34 and has a conductor 35 connected to the contact member 16 of contact A, which has its other contact member 17 connected by a conductor 36 to terminal 31.

A starting switch 37 is connected between terminals 27 and 38, and a conductor 39 connects terminal 38 to terminal 31. A conductor 40 connects terminal 38 with one side of a stop switch 42 which has a conductor 43 that connects its other side with a contact member 44 of the maintaining circuit switch 15, which has its other contact member 45 connected with a conductor 46 to contact C, and a conductor 47 connects other contact member 19 of contact C with conductor 29. Contact B has its contact member 18 connected with terminal 48 by a conductor 49, and terminal 48 is connected to one side 50 of the normally open or N. O. load, which has its other side 51 connected to side 32 of the line.

As thus far described, it will be noted that after the timer mechanism 23 has been preset or adjusted for a predetermined interval of travel, the starting switch 37 is actuated, which energizes

the solenoid 21 and motor 22. The movement of the solenoid when energized, effects engagement of the timer mechanism 23 with the motor means 22 to be driven thereby, and this movement of the solenoid operates mechanism which breaks the circuit through contact A and simultaneously connects the circuit through contacts B and C. This breaking of contact A and the making of contact B, disconnects the N. C. load and connects the N. O. load by reason of contact members 17 and 18 of contact B being connected with terminals 31 and 48 through the conductors 36 and 49, respectively. During this time, contact C is connected to the N. O. load and the current flows through contact member 19 and conductors 47 and 29 which is connected to conductor 25 and terminal 27, and through contact member 20 of contact C and conductor 46 to one side of the maintaining circuit switch 15, which remains closed to complete the circuit through the stop switch 42 and to terminal 31 to which one side of the supply line 30 is connected. The other side 32 of the line is connected to the N. O. load through conductor 51, terminal 26 and conductor 28 through the parallel connected solenoid 21 and motor 22, and through conductors 29 and 47 to contact C.

After the timer mechanism 23 has reached its preset interval, it effects the opening of the maintaining circuit switch 15 to break the circuit through contact C, which de-energizes the motor 22 and solenoid 21 and also breaks contact B to the N. O. load and makes contact A to N. C. load.

Referring now, more particularly to Figs. 1 to 7, inclusive, of the preferred form, the device comprises a substantially rectangular panel 55 on the back of which a small plate 56 is carried in spaced relation by means of spacers 57, and on which plate, the motor 22 is mounted. The motor 22 is of the reduction gear type and drives a shaft 58 extending therefrom and journaled in plate 56 and panel 55. Intermediate the plate 56 and panel 55, the shaft 58 has a ratchet wheel 59 secured thereto, which is adapted to be engaged by a companion ratchet wheel 60 carried on the timer mechanism 23, and which ratchet wheel 60 has a gear wheel 61 fixed thereto and are both journaled on a stud shaft 62 carried at one end of a swingable arm 63 (Fig. 7), which is pivoted on the main timer shaft 64. The swingable arm 63 is carried adjacent a relatively long rocker arm 65 which is also pivoted on the main timer shaft 64 and has each end thereof provided with inwardly directed right angle formations 66 and 67, respectively, and the formation 66 receives one end 68 of a spring 69, which has its other end 70 engaging the rockable arm 63 to yieldingly retain the same in raised position for a yielding engagement of ratchet wheel 60 with ratchet wheel 59, and formation 67 is connected to solenoid 21 fixed to panel 55 and which effects rocking movement of arm 65.

The gear wheel 61 has a companion gear wheel 71 constantly in mesh therewith, and which gear wheel is carried on the main timer shaft 64 and has a hub 72 that is fixed to the main timer shaft 64 at 73. The gear wheel 71 has a coiled spring 74 fixed thereto at 75 and coiled around hub 72 of gear wheel 71 and its other end is fixed at 76 to plate 56. This spring 74 is arranged to be coiled during a counterclockwise movement of the main timer shaft 64 and to cause a clockwise movement of shaft 64 during its uncoiling movement. This shaft 64 is journaled in and extends through panel 55 and has a calibrated disc 77 fixed there-

to in spaced relation with the front face of panel 55 and provided with indicia to provide an indicating dial.

The ratchet wheel 60 is normally out of engagement with the motor driven ratchet wheel 59, and is engageable therewith by the rocking movement of the rocker arm 65 under the influence of the solenoid 21, and when thus rocked, the spring 69 is tensioned to exert a yielding meshing engagement of ratchet wheel 60 with the motor driven ratchet wheel 59.

The disc or dial 77 carries a fixed pin 79 near its periphery which is normally in abutting engagement with a stop 80 fixed to and extending outwardly of the panel 55 below the main timer shaft 64. This stop 80 serves to limit the return movement of disc 77 to zero position and permits of its free movement in a counterclockwise direction, as viewed in Figs. 1 and 3.

Immediately below the stop 80 and centrally of the panel 55, is a shaft 81 which carries a pointer 82 that is vertically directed under disc 77 and normally spaced from stop 80 but movable into engagement therewith. This pointer 82 is engageable for movement against the stop 80 by a settable member 83 arranged to be carried at the periphery of disc 77 and adjustably secured thereto by means of a thumb screw 84. The member 83 is provided with an inwardly directed reduced portion 85 which is engageable with the pointer 82 to rock the same against the stop 80 at preset distances of travel of disc 77, and this rocking movement of the pointer 82 effects the rocking movement of shaft 81 which has a substantially Y-shaped member 86 fixed thereto. This Y-shaped member has one of its legs 87 formed as at 88 to extend into an opening 89 of a loosely mounted slidable member 90 carried on the rear face of panel 55 and guided by a stud 91 extending through opening 89 and a stud 92 extending through an opening 93 of the slidable member. The other leg 94 of the Y-member 86 is formed to engage the top edge 90a of the slidable member 90 to effect a downward movement thereof and its release from a stop 95 which is normally engaged by a notch 96 provided in the slidable member. The leg 94 of the Y-member 86 has a relatively strong spring 97 fixed thereto, which has its other end anchored to panel 55 as at 98, and this spring 97 normally retains the Y-member 86 against a fixed stop 99 which is also fixed to the panel. The slidable member 90 has a relatively light spring 100 fixed thereto and which spring has its other end attached to a depending arm 101 fixedly carried on a stud 102 secured to and extending inwardly of the panel 55. This spring 100 exerts a tension in one direction on the slidable member 90 to cause its sliding movement when the Y-member 86 is moved by the movement of the shaft 81 under the control of the timer mechanism 23 at the limit of its movement when the reduced portion 85 of the settable member 83 on the disc 77 engages the pointer 82. The slidable member 90 carries a conically shaped fiber member 103 which is normally spaced from and adapted to extend between contact members 44 and 45 of the maintaining circuit switch 15 for breaking the same. The maintaining circuit switch is secured to the panel 55 as at 15a.

When the Y-member 86 is rocked, end 88 of leg 87 thereof is freely moved in the opening 89 of the slidable member 90 and the leg 94 is brought into engagement with the top edge 90a, which causes a slight downward movement of the slidable member 90 and carries the notch 96 there-

of out of engagement with the stop 95 and releases the slidable member to be impelled by its spring 100 which causes the conical fiber member 103 to break the contact in the maintaining circuit switch 15. This breaking of the contact of the maintaining circuit switch 15 occurs at the limit of movement of the preset time of travel of disc 77.

As above described, the solenoid 21 which is also carried on the back of the panel 55 is operatively connected to the formation 67 of the rocker arm 65 by means of a pin 104, and the movements of the rocker arm 65 under the influence of the solenoid also effects a vertical sliding movement of a slide member 105 which is operatively attached to the rocker arm 65 as at 106. The slide member 105 has a spring 107 fixed to its lower end portion and to the depending arm 101, and which spring has sufficient tension to restore the slide 105 and rocker arm 65 to their normal positions (Fig. 4). The slide member 105 carries a rearwardly directed member 108 which has two spaced-apart downwardly directed conical fiber members 109 and 110 which are normally in spaced relation with the contacts and movable with slide member 105 so that member 109 will extend between contact members 16 and 17 of contact A, and member 110 is adapted to extend between contact members 18 and 19 of contacts B and C, respectively. The members 109 and 110 serve to break the circuit through contact A and make the circuit between contacts B and C upon a downward sliding movement of the slide 105.

In the operation of the device, the source of electrical energy is attached to terminals 31 and 26 and the N. C. load is attached to terminals 26 and 34, while the N. O. load is attached to terminals 39 and 26. The start switch 37 and the stop switch 42 may be in any remote position, with the start switch attached to terminals 38 and 27 of the device and with the stop switch attached to one contact member 44 of switch 15 and to terminal 38, which terminal is attached to terminal 31 through conductor 39.

When the start switch 37 is depressed momentarily, the solenoid 21 is energized which effects movement of rocker arm 65 and slide member 105 to cause fiber members 109 and 110 to make contacts B and C to complete the circuit to the motor means 22 and drive disc 77 through ratchet wheels 59—60 and gears 61—71. This downward movement of slide member 105 which breaks contact A and makes contacts B and C to complete the circuit retains the solenoid energized until the timer mechanism has reached its preset position to break the current through the maintaining circuit switch 15. During the operation of the device, should it be found necessary to stop the device, the stop switch 42 is manually manipulated to break the circuit, which deenergizes the solenoid 21, and under the influence of spring 107, slide member 105 is restored to its normal position to break contacts B and C and make contact A, and the restoring movement of slide member 105 simultaneously restores rocker arm 65 which carries ratchet wheel 60 out of engagement with the motor driven ratchet wheel 59.

When the stop switch 42 is actuated, the timer mechanism 23 is restored to zero position by reason of the de-meshing of ratchet wheels 59—60 and the unwinding movement of the main timer shaft 64 and disc 77 under the influence of spring 74.

In the modified form illustrated in Figs. 9 to

11, inclusive, the device is shown as having the solenoid 21a in a position reverse to that shown in Fig. 4 of the preferred form, and is attached to the rocker arm 65a at 104a. This position of the solenoid permits the timer mechanism 23a to be normally in engagement with the motor means 22a and disengaged therefrom when the solenoid is energized. With this arrangement of parts, the contacts A, B and C of the preferred form are eliminated and the maintaining circuit switch is employed, but is provided with an additional contact member which serves in the same capacity as contact B to the N. O. load, as shown in the preferred form.

The circuit shown in Fig. 11 is arranged with a single manually manipulated start and reset switch, so that the device, when operated, must complete its operation before stopping, or when desired, it is only necessary to manipulate the switch which resets the device to full preset time. Further, this arrangement permits of the resetting of the device during its operation to its preset time without interrupting the contacts whereby it may continue after such interruption for its preset time.

The maintaining circuit switch indicated as 111 is provided with three contact members 112, 113 and 114 which form contacts D and E, with contact D normally closed and controlling the current flow to the N. C. load, and contact E normally open and controlling the current flow to the N. O. load. Contact D has its contact member 113 connected to line 30a by a conductor 115, and the other contact member 112 of contact D is connected to the N. C. load by a conductor 116, and is also connected to the motor 22a by a conductor 117, and a conductor 118 connects the motor 22a with the other side 32a of the line. A start and reset switch 119 is connected to the side 30a of the line by a conductor 120, and which switch has its other side connected to solenoid 21a by conductor 121, and the other side of the solenoid is connected to the conductor 118 by a conductor 122.

The normally open contact E has its contact member 114 connected by a conductor 123 to the N. O. load which has its other side connected by conductor 124 to the side 32a of the line.

When it is desired to start the device, the switch 119 is manually closed momentarily, which connects the circuit to energize the solenoid and effect movement of the rocker arm 65a with the ratchet wheel 60a thereon carried out of mesh with ratchet wheel 59a, which permits dial 77a to return to normal or zero position (Fig. 9) under the influence of spring 74a. The release of switch 119 breaks the circuit to the solenoid 21a which restores the rocker arm 65a and the restoring movement of the rocker arm causes the ratchet wheel 60a to be brought into mesh with the ratchet wheel 59a and driven thereby to drive the dial 77a.

While the dial is being driven, the reduced end 85a of the settable member 33a carried on the dial, will be brought at the limit of its movement into engagement with the pointer 82a to rock the same and shaft 81a with the Y-shaped member 86a, and cause the release of slide member 90b for a spring-impelled movement under its spring 100a which carries the conical fiber member 103a between contact members 113 and 114 to break contact D and make contact E of the maintaining circuit switch 111.

When contact D is broken, it breaks the circuit to the motor 22a and to the N. C. load, and the

making of contact E connects the circuit to the N. O. load or starting position. After the slide member 90b has been released, it will remain in this released position until the start switch 119 is again actuated, which energizes the solenoid to cause the de-meshing of ratchet wheels 60a and 59a which permits the return of dial 77a to zero position. The return of dial 77a carries portion 85a from pointer 82a and permits the pointer and the Y-shaped member 86a to be returned to normal position by spring 97a, and the end 89a of Y-member 86a engages opening 89a in the slide member 90b and restores the same with its notch 96a engaged with stop 95a. This return movement of the slide member 90b carries the fiber member 103a away from contact members 113 and 114 which permits contact D to be closed and contact E to be broken. When in this position, the current in the circuit then flows to the N. C. load or starting position.

After the device has been set for a predetermined interval of travel, and the starting switch 119 is actuated, the device will then operate for the set duration of time, and should it be found necessary to stop or reset the device to zero starting position, the switch 119 is actuated which causes the solenoid to be energized to disengage the driving mechanism 23a from the motor 22a and the return of dial 77a to zero under the influence of spring 74a. During this return movement of the dial 77a, the contacts D and E remain unchanged, so that the device will start immediately for the duration of time for which it has been set. In this manner, the device may be reset to zero position at any point of its travel.

While I have shown and described a preferred and modified embodiment of my invention, I do not wish to be limited to the precise details of construction set forth, but desire to avail myself of all changes and variations as fall within the scope of the appended claims.

I claim:

1. A time limit relay comprising load circuit contacts operable between open and closed circuit positions, timing mechanism for controlling the operation of said load circuit contacts between said positions, said timing mechanism including a graduated rotatable disk and a movable stop on said disk for predetermining the rotation of said disk, a motor for driving said timing mechanism, a driving transmission between said motor and said timing mechanism operable to connect and disconnect said motor and timing mechanism, a momentary contact type starting switch, an electromagnet in circuit with the starting switch for operating said transmission to disengage said timing mechanism from said motor when said starting switch is momentarily closed, means for returning said timing mechanism to starting or zero position when said timing mechanism is so disconnected from said motor, and means effective upon the return of said timing mechanism to said position for energizing said motor to drive said timing mechanism.

2. A time limit relay comprising load circuit contacts operable between open and closed circuit positions, timing mechanism for controlling the operation of said load circuit contacts between said positions, said timing mechanism including a graduated rotatable disk and a movable stop

on said disk for predetermining the rotation of said disk, a motor for driving said timing mechanism, a driving transmission between said motor and said timing mechanism operable to connect and disconnect said motor and timing mechanism, a momentary contact type switch, an electromagnet in circuit with the said switch for operating said transmission to disengage said timing mechanism from said motor when said switch is momentarily closed, means for returning said timing mechanism to starting or zero position when said timing mechanism is so disconnected from said motor, and means effective upon the return of said timing mechanism to said position for energizing said motor to drive said timing mechanism, whereby said switch may be used to start or reset the cycle of operation of the relay.

3. A time limit relay comprising load circuit contacts operable between open and closed circuit positions, means for operating said contacts, said means including a sliding bar and a pivoted tripping lever, a rotatable disc for actuating said tripping lever, means for predetermining the rotation of said disc to actuate said tripping lever, a motor, a gear mechanism driven by said motor for driving said disc, a pivoted lever carrying said gear mechanism and movable to swing said gear mechanism out of driven relation with said motor, an electromagnet for actuating said pivoted lever, a starting switch for said electromagnet, the operation of said starting switch energizing said electromagnet to disconnect said gear mechanism from said motor and thereby disconnect said disc from its driven relation with said motor, and means to return said disc to starting position when it is disconnected from said motor.

4. In combination, a load circuit, a motor circuit and a solenoid circuit all connected in parallel to each other, a pair of contacts adapted when closed to close said load circuit and said motor circuit, mechanism for actuating said contacts, timer mechanism for actuating said contact actuating mechanism, a driving transmission between said timer mechanism and said motor, said timer mechanism actuating said contact actuating mechanism when driven a predetermined distance, a starting switch in said solenoid circuit to energize said solenoid, the energization of said solenoid disconnecting said driving transmission between said motor and said timing mechanism, and means to return said timer mechanism to starting or zero position when so disconnected.

5. In combination, a load circuit, a motor circuit and a solenoid circuit, contacts adapted when closed to close said load circuit and said motor circuit, mechanism for actuating said contacts, timer mechanism for actuating said contact actuating mechanism, a driving transmission between said timer mechanism and said motor, said timer mechanism actuating said contact actuating mechanism when driven a predetermined distance, a starting switch in said solenoid circuit to energize said solenoid, the energization of said solenoid disconnecting said driving transmission between said motor and said timing mechanism, and means to return said timer mechanism to starting or zero position when so disconnected.

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