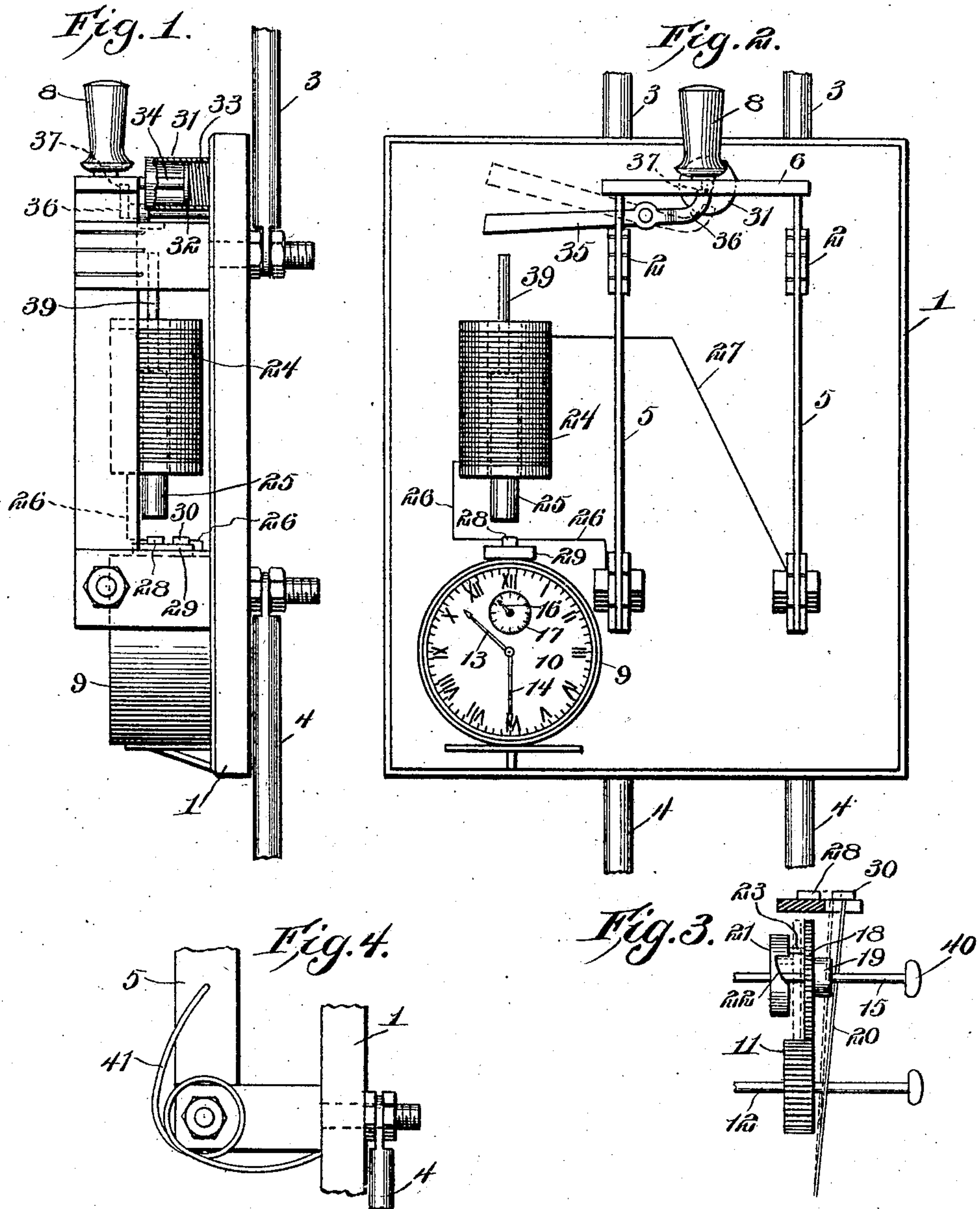


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A. L. EUSTICE.
SWITCH.

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Witnesses

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SWITCH.

No. 847,925.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ALFRED L. EUSTICE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Switches, of which the following is a specification.

The invention relates to an improvement in switches for electric circuits, comprehending specifically a time-switch wherein means are provided for automatically operating the switch proper at a predetermined time.

The main object of the present invention is the production of time-controlled mechanism constructed and arranged to automatically deliver the movable member of the switch proper to the influence of a mechanical actuating means, whereby said movable member may be operated to make or break the circuit.

Another object of the invention is the utilization of a relay connected in the circuit controlled by the switch and containing a circuit-closing means controlled by the time mechanism, the construction of parts providing for the automatic operation of the switch to break the main circuit previous to the operation of the time mechanism to break the relay-circuit, whereby the relay-circuit is dead when broken and arcing at the break is avoided.

The invention will be described in the following specification, reference being had particularly to the accompanying drawings, in which—

Figure 1 is a side elevation of a time-controlled switch constructed in accordance with my invention; Fig. 2, a plan view of the same; Fig. 3, a detail elevation illustrating the time-controlled means for making and breaking the relay-circuit; Fig. 4, a modified means for operating the movable member of the switch proper.

Referring particularly to the drawings, wherein similar reference-numerals indicate like parts throughout the several views, my improved time-controlled switch is mounted upon an insulated base 1, to which is secured points 2 of the line-terminals 3, the service-terminals 4 being in the form of the usual blades 5, pivotally supported on the base 1 and designed to engage the points 2 to complete the circuit, the blades 5 being preferably connected at their relatively upper or free terminals by an insulated cross-bar 6, which is secured to an operating-handle 8.

The parts described constitute the ordinary form of knife-switch and will need no further detail description herein.

The timing mechanism 9 may be of any usual or preferred construction, though in order to provide a simple means for this purpose I arrange within a clock-casing having the usual dial 10 a gear 11, mounted upon an arbor 12, which extends through the face of the dial and carries a hand 13, corresponding to the usual hour-hand of the clock, it being understood that the usual mechanism (not shown) is provided for driving the gear 11 to cause the ordinary movement of the hour-hand—that is, a complete revolution of the clock-dial in each twelve hours. The minute-hand 14 may also be provided, if desired, being suitably driven by the usual clock mechanism, though this is not absolutely essential to the operation of the structure.

Above the main arbor 12 in the time mechanism is mounted the setting-arbor 15, the relatively forward end of which is provided with a pointer 16, arranged for travel on an auxiliary dial 17, also correspondingly numbered to the main dial. Loosely mounted on the setting-arbor is a gear 18, arranged to mesh at all times with the gear 11 on the main arbor. The gear 18 is formed with a relatively fixed sleeve extension 19, against which a leaf-spring 20 is designed to bear. The spring is secured at its lower end in a clock-casing and projects at its upper end in an opening therein for a purpose which will later appear. On the setting-arbor 15 in advance of the gear 18 is a cam-disk 21, formed in the surface adjacent the gear 18 with a recess 22, the gear 18 being provided with a forwardly-projecting pin 23, designed to enter the recess 22 in the cam-disk when in register with said recess. The pin 23 projects from the surface of the gear within the plane of the cam-disk, so that for the greater portion of the revolution of the gear said pin bears upon the plane surface of the disk. The recess 22 is formed with a relatively forward abrupt wall, the bottom wall of the recess curving from said abrupt wall toward and terminating in coincidence with the plane surface of the disk. By this arrangement the pin by entering the recess at the abrupt wall end thereof permits an independent movement of the gear 18 longitudinally of the arbor commensurate with the depth of the recess, the further revolution of the gear 18 serving to gradually space said gear the

normal distance from the disk as the pin 18 rides out of the recess along the curved bottom wall thereof.

The spring 20 is normally—that is, when the gear and disk are spaced apart—under tension and operates to force the gear toward the disk when the pin of the gear registers with the recess in the disk.

In conjunction with the timing apparatus I utilize a relay including an electromagnet 24, having a movable core 25, the electromagnet-conductors 26 and 27 leading, in the instance illustrated, to and arranged in electrical connection with the service-conductors 4. One of the relay-conductors, as 26, terminates above the clock-casing in a carbon contact-block 28, preferably supported on the insulated base 29, secured to the casing. The other section of the conductor 26, which leads to one of the service-conductors 4, is connected to the carbon block 30, similar to the block 28, and connected to the relatively upper or free end of the spring 20 of the timing mechanism. The mechanism so far described, therefore, provides for the normal separation of the relay-circuit terminals 28 and 30, it being understood that the arrangement of parts is such that when the pin 23 of the gear 18 is in contact with the plane surface of the cam-disk 21 said gear is so disposed upon the arbor 15 as to hold the spring 20 at the rearward limit of movement, thereby separating the contact-blocks 28 and 30, and that when the pin 23 registers with the recess 22 in the cam-disk the spring 20 operates to force the gear 18 longitudinally of the arbor, with the effect to move the block 30 into electrical contact with the block 28, thereby closing the relay-circuit at this point.

A cylindrical casing 31 is secured to the base 1 immediately in rear of and in alignment with the cross-bar 6 of the movable switch member when the latter is in operative or closed position. Within the casing is mounted a piston 32, spring-pressed in a relatively outward direction through the medium of a coil-spring 33, disposed between the piston and the base 1. A stem 34 is connected to the piston 32, projecting through the forward wall of the casing and operating in a path traversed by the cross-bar 6 of the switch-blades when the latter is in operative position. The stem 34 is of such length that when the switch-blades are in operative position said stem will be engaged by the cross-bar of the blades and forced inward, with the effect to compress the spring 33. The spring 33 is of such tension as to readily disconnect the blades 5 from their operative engagement with the points 2 in the absence of means for securing said blades in position, and therefore in order to hold switch closed I provide a trip-lever 35, pivotally supported intermediate its ends on the base 1, with the

relative inner end upwardly turned to provide a latch end 36, adapted in the normal position of the trip-lever to engage the recess 37, formed in the lower surface of the cross-bar 6. It will thus be seen that with the switch closed the cross-bar 6 engages the latch end of the trip-lever to prevent disconnection or breaking of the switch, the normal position of said cross-bar operating, as previously stated, to maintain the spring 33 under tension.

The electromagnet 24 is preferably disposed at one side of the movable member of the switch, the core 25 thereof being in alignment with the relatively outer or free end of the trip-lever. The core 25 is provided with a reduced rod-like extension 39, adapted when the core is withdrawn within the field of the electromagnet by the energization thereof to engage and elevate the free end of the trip-lever, with the effect to withdraw the latch end from the recess 37 of the cross-arm of the blades, permitting the spring 33 to operate the piston 32 and stem 34 and force the movable member of the switch from engagement with the points 2, thereby breaking the switch.

The operation of the parts of the improved time-controlling switch will be readily apparent from the above description, taken in connection with the drawings, it being understood that the arbor 15 is manually operated through a handle 40 to set the pointer 16 at the time desired for the automatic operation of the switch. This movement of the arbor properly disposes the recess 21 in the cam-plate. As the gear 11 revolves the pin 23 of the gear 18 will register with the recess 21 when the hand controlled by the gear 11 reaches the time indicated on the auxiliary dial. This movement closes the relay-circuit, energizes the electromagnet, and operates the core 25, with the effect previously stated. After the automatic breaking of the switch, as described, the continued revolution of the gear 11 will gradually space the gear 18 the normal distance from the cam-disk, with the effect to force the spring 20 in a relatively rearward direction, and thereby separate the contact-blocks 28 and 30. The relay-circuit is thus broken. The core 25 drops to normal position, permitting automatic engagement of the trip-lever with the cross-bar of the switch-blade upon the succeeding manual operation of the blade.

As illustrated, the device is arranged for the automatic breaking of the switch at a predetermined time, and in this connection it is to be noted that the relay-circuit is connected with the service-conductors. In this arrangement of the parts the switch is broken some time previous to the breaking of the relay-circuit by the separation of the blocks 28 and 30, so that the relay-circuit at the time of the separation of said contact-blocks

is dead, and therefore no arcing occurs upon the separation of said blocks.

The relay-circuit of the improved switch is placed directly across the main line and is adapted to be energized through current derived directly from the current of the main line, it being understood that in the event of a heavy service the relay-circuit is to include such resistance as will provide just sufficient field strength in the electromagnet to operate the core.

It is of course obvious that, if desired, the switch may be arranged for closing the circuit instead of breaking it, in which event the operating-spring will be connected to move the blades of the switch proper into engagement with the points, the trip-lever being normally disposed to maintain the blades from such movement. In this disposition of the parts the relay-circuit will of course be connected to the line conductors 3.

In Fig. 4 is illustrated a slightly-modified form of blade-throwing means, in which represents a spring terminally secured to one of the blades 5 and to the base 1, the spring being preferably coiled to give the desired tension. In this form the spring of course is tensioned in the closing movement of the blades and is of sufficient force to break the switch when the trip-lever 35 is operated.

While showing and describing the detailed constructions in coöperation with a simple form of knife-switch, it is obvious that the device is readily applicable with obvious mechanical changes to any form of switch including a movable member.

Having thus described the invention, what is claimed as new is—

1. The combination with a switch including a movable member, of spring-actuated means for moving the member in one direction, a locking-lever normally holding the member against the influence of the actuating means, a solenoid having the core thereof operative in the path of the lever, a circuit for energizing the solenoid to project the core into contact with the lever for operating the latter to release the switch member, and time-controlled means for closing the solenoid-circuit,

whereby to operate the core of the solenoid at a predetermined time.

2. The combination with a switch including a movable member, of spring-actuated means for moving the member in one direction, a locking-lever normally holding the member against the influence of the actuating means, a solenoid having the core thereof operative in the path of the lever, a circuit for energizing the solenoid to project the core into contact with the lever for operating the latter to release the switch member, and time-controlled means for closing the solenoid-circuit, said solenoid-circuit being energized from the load side of the switch, whereby said solenoid-circuit is deenergized upon the breaking of the switch.

3. The combination with a switch including a movable member, of spring-actuated means for moving the member in one direction, a pivoted lever having one end arranged to normally engage a recess in the movable member, a solenoid including a movable core arranged in the path of the opposite end of the lever and adapted to engage said end upon energization of the solenoid, conductors leading to the solenoid, one of said conductors including a fixed contact and a movable contact, a time-controlled mechanism including a manually-operable cam-disk formed with a recess, a gear in mesh with the timing-apparatus train and freely movable to and from the cam-disk, a pin carried by said gear and arranged to bear upon the surface of the cam-disk and enter the recess when alined therewith, and a spring-arm holding the gear under tension and carrying at its upper end the movable contact of the solenoid-conductor, whereby said spring operates to force the gear-pin into the recess in the cam-plate and simultaneously effect the engagement of the contacts in the solenoid-circuit.

In testimony whereof I affix my signature in presence of two witnesses.

ALFRED L. EUSTICE.

Witnesses:

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ALBERT L. CAULKINS.