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D. L. CHANDLER
ELECTRIC TIME SWITCH

1,761,652

Filed July 13, 1926

2 Sheets-Sheet 1

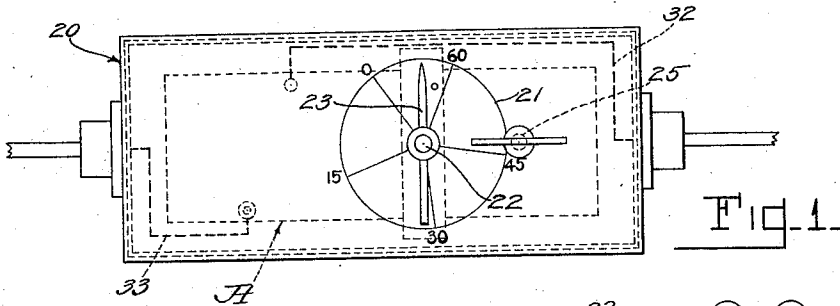


Fig. 2

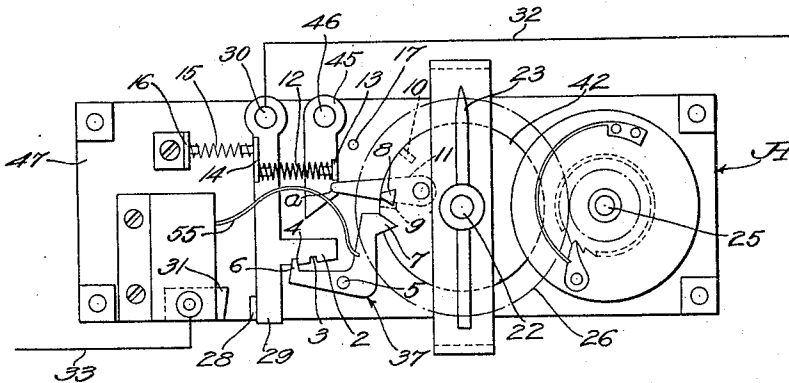
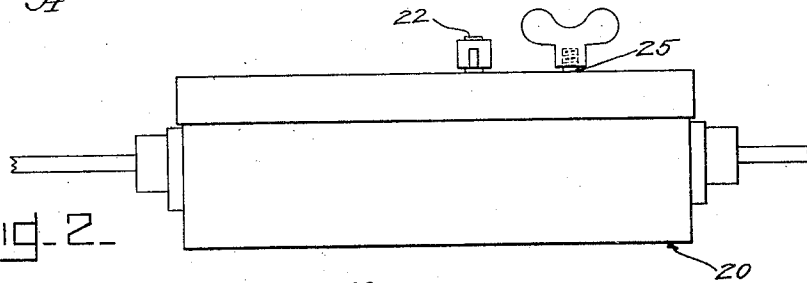


Fig. 3

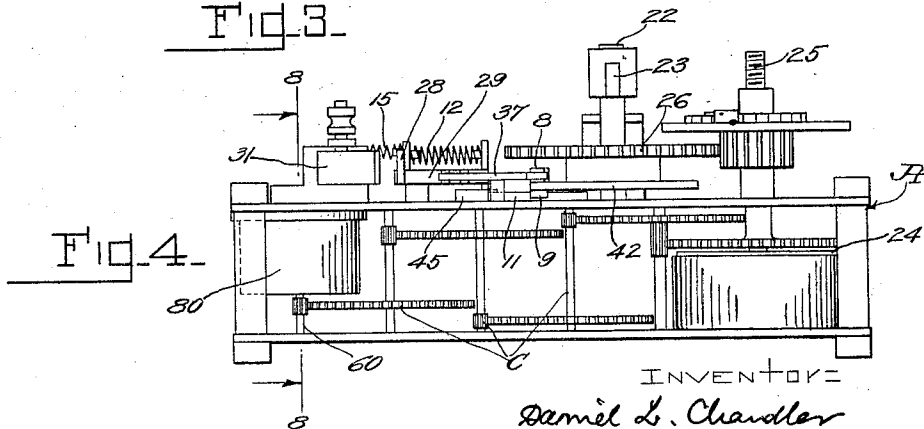


Fig. 4

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2 Sheets-Sheet 2

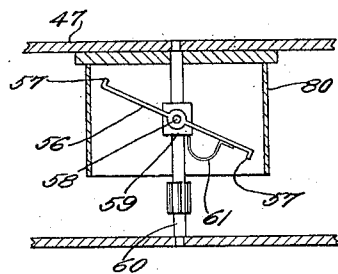
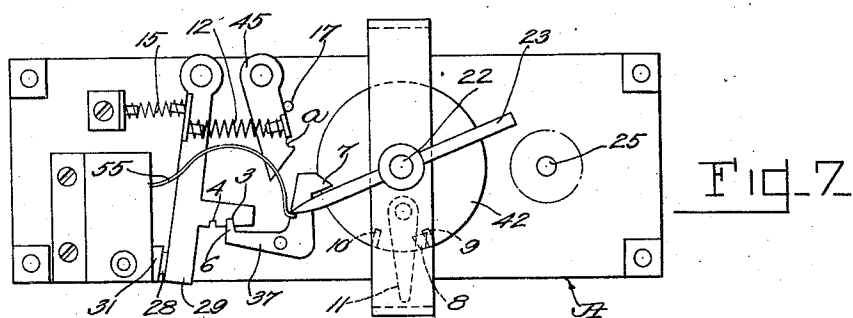
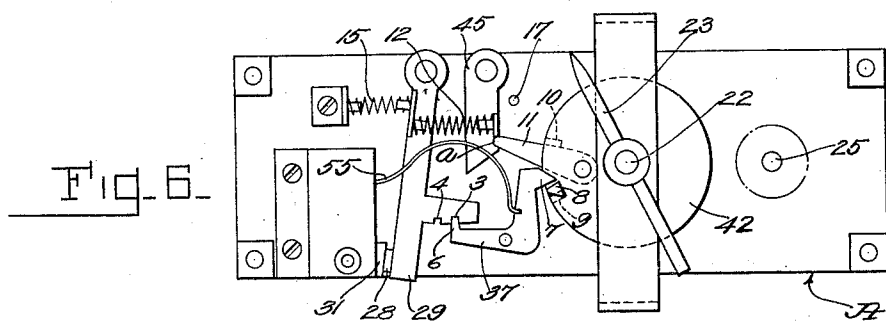
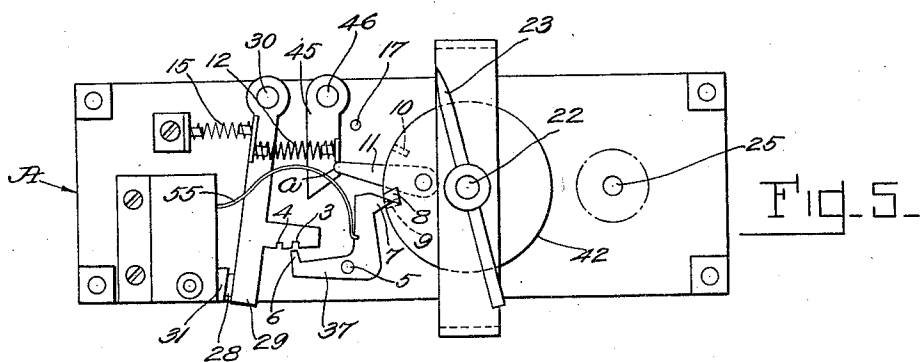


Fig. 8.

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UNITED STATES PATENT OFFICE

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ELECTRIC TIME SWITCH

Application filed July 13, 1926. Serial No. 122,131.

The invention relates to a new and useful improvement in a time switch for use in electrical apparatus. The object of the invention is to provide a switch whereby the circuit will be automatically broken after a predetermined period of time from the time that the circuit is closed by the switch and to provide means whereby the switch will be automatically and positively locked in closed position until the predetermined time has elapsed; also to provide means whereby the length of time during which the switch will be maintained closed may be varied at will. Other features of the invention will be set forth hereinafter.

The invention will be fully understood from the following description when taken in connection with the accompanying drawings and the novel features thereof will be pointed out and clearly defined in the claims at the close of this specification.

In the drawings:

Fig. 1 is a plan view of a time switch embodying the invention.

Fig. 2 is a side elevation thereof.

Fig. 3 is a plan view of the interior mechanism removed from the casing.

Fig. 4 is a side elevation of the parts shown in Fig. 3.

Figs. 5, 6 and 7 are views similar to Fig. 3, but showing the parts in different positions.

Fig. 8 is an enlarged section taken on the line 8—8, Fig. 4.

Referring to the drawings, there is shown at 20 the case in which the apparatus A is mounted, and having on its outer face a dial 21 graduated to indicate different periods of time for which the apparatus is to be set. For simplicity of illustration, the drawings show the dial marked with graduations 15, 30, 45 and 60, which might be minutes or seconds.

Mounted on the end of the arbor 22 which projects through the center of the dial is a pointer 23 which serves not only to indicate on the dial the period of time for which the switch is set, and moves with the clock mechanism, but it also serves as a lever to rotate the arbor and thereby actuate the

connected mechanism for closing the switch and for adjusting the time controlled mechanism and the mechanism for opening the switch at the predetermined time.

In Fig. 3 the mechanism is shown at rest, with the parts in normal or retracted position, the switch being open.

There is provided a train of clock mechanism generally indicated at C in Fig. 4, of which the main spring is shown at 24 connected with an arbor 25 which actuates gear wheel 26 mounted on the arbor 22 which carries the pointer 23. The clock mechanism is geared up with the gear 26 on arbor 22 in such manner as to be adapted to rotate the said arbor and therefore move the pointer through any given arc in a certain period of time whether minutes, hours or days, according to the desired variations in length of time for keeping the switch closed and then open. The movable member of the switch comprises a contact member 28 carried by an arm 29 pivoted at 30. At 31 is shown the fixed contact member of the switch. One wire 32 of the circuit connects with the movable switch member 28 and the other wire 33 is connected with the fixed switch member 31.

The arm 29 has a lateral projection 2 formed with two notches 3, 4. A bell crank lever 37 pivoted at 5 has one arm formed with a tooth 6 which is adapted to engage with one or the other of said notches 3, 4, according as the switch is closed or open. The other arm of said bell crank is provided with a cam faced tooth 7 which is adapted to be engaged by a cam faced projection 8 on the upper face of a disk 42 mounted on the arbor 22 in such manner as to move therewith. A spring 55 maintains the tooth 6 in engagement with either one of the notches 3, 4, except when the bell crank is acted on by the projection 8. When the pointer 23 is moved counter-clockwise it turns the disk 42 in a direction to cause the projection 8 to engage the tooth 7 on the bell crank (see Fig. 5) and rock the bell crank in a direction to cause its tooth 6 to be disengaged from the notch 4 in the projection 2 of the arm 29. In the continued rotation

of the disk 42 in the counter-clockwise direction the projection 8 will ride past the tooth 7 (see Fig. 6) and permit the tooth 6 under the action of the spring 55 to snap into the notch 3 of the arm 29 after said arm has been moved to bring the notch 3 into the path of movement of the tooth 6 as will be hereinafter described. When the said arbor 22, pointer 23 and disk 42 reverse their movement and move in a clockwise direction, the cam projection 8 will, in the course of its movement again engage tooth 7 on the bell crank and turn the bell crank to release the tooth 6 from the notch 3 in the arm 29 and the spring 55 will snap the tooth 6 into the notch 4.

A pawl 11 is pivoted to the lower face of the disk 42, that is on the opposite face from the projection 8 and its free end is adapted to engage a notch *a* in an arm 45 pivoted at 46 to the frame 47. The pawl is carried by the said disk and moves with it, and it is also free to turn on its pivot a limited distance between the stop pins 9, 10, fixed to the face of the disk for the purpose to be hereinafter described. A spring 12 at one end presses against an ear or bracket 13 on the pivoted arm 45 and at its other end presses against an ear 14 on the pivoted arm 29. When the parts are in normal position, as in Fig. 3, the spring 12 is compressed. As the arm 29 is then locked against movement by reason of tooth 6 on the bell crank being engaged in the notch 4 in said arm, the tendency of the spring to expand presses the said arm 45 against the end of the pawl and holds the pawl in engagement with the notch *a* until the tooth of the bell crank is released from engagement with the notch 4 in the arm 29 as will be hereinafter described.

A spring 15 of less power than spring 12 at one end presses against the ear 14 on the arm 29 and at its other end presses against an ear 16 fixed to the frame. This spring has a tendency to push the arm 29 to the right (see Fig. 5) to open the switch but is normally prevented from so doing by the more powerful oppositely acting spring 12 until said spring 12 is rendered less effective as will be hereinafter described.

The spring 12 is so located that it has greater leverage than spring 15, thereby making it still more effective than the mere difference in the normal power of the spring. By making the difference in leverage sufficient, the desired result could be obtained without making the springs 12 of greater normal power than spring 15.

Assuming that the parts are at rest and in normal position as shown in Fig. 3, the switch is open and the point of the pawl 11 is engaged in the notch *a* on the arm 45. The pawl holds the arm 45 from swinging to the right under the pressure of spring

12 and prevents said spring from expanding as it tends to do. The less powerful spring 15 is in expanded form. The tooth 6 of the bell crank lever 37 is engaged in the notch 4 of the projection 2 on the arm 29 which carries the movable contact member of the switch and holds the switch open.

In setting the device for a predetermined period of time the pointer is moved around the dial in a counter-clockwise direction until the division indicating the desired period of time for the switch to remain closed is reached. The initial movement of the pointer in the counter-clockwise direction closes the switch (see Fig. 5) by first disengaging the tooth 6 of the bell crank from the notch 4. This action is caused by the cam faced projection 8 on the disk 42 engaging the tooth 7 of the bell crank. This allows the spring 12 to expand, as shown in Fig. 5, and swings arm 29 to the left and closes the switch, thereby making the circuit. The movement of the arm 29 to the left compresses the spring 15. This leaves the movable switch member unlocked until the pointer and disk have been moved far enough for the cam projection 8 to ride past the tooth 7 of the bell crank, when the spring 55 will cause the tooth 6 to engage with notch 3 to lock the switch closed (see Fig. 6). This still leaves the pawl 11 in engagement with the notch *a* in the arm 45 until further movement of the disk 42, when it is tripped by engagement with the pin 10 (see Fig. 7). When the pawl is tripped, the arm 45 is swung to the right, by the further expansion of spring 12, against the stop pin 17 on the frame which limits the movement of said arm. It is now in a position to be engaged by the pawl on the return movement of the disk.

When the pointer has been moved in counter-clockwise direction far enough to reach the desired division on the dial as shown for instance in Fig. 7, and is released from the backward pressure by the operator, the clock mechanism will be effective to rotate the arbor 22 and pointer 23 in clockwise direction. As the disk 42 moves in this direction the cam projection 8 thereon will engage the tooth 7 on the bell crank and turn it so as to disengage the tooth 6 from the notch 3 in the arm 29. This action will permit the spring 15 to turn the arm 29 back to its normal position, thus moving the movable contact member 28 away from the fixed contact member 31 thereby opening the switch. In the continued rotation of the disk 42 in the clockwise direction the projection 8 will ride past the tooth 7 of the bell crank 37 and permit the tooth 6 under the action of the spring 55 to snap into the notch 4 of the arm 29, which has now been brought into the path of movement of said

tooth by the opening of the switch. Still further movement of the disk 42 in this direction causes the pawl 11 to engage the cam shaped end *b* of the arm 45 thus turning said arm to the left and compressing spring 12. The pawl 11 snaps into the notch *a* in the arm 45 and remains there, holding the spring 12 compressed and ready to again close the switch when the device is re-set.

While the invention is especially intended for breaking the circuit after a predetermined period of time, it is obvious that by reversing the arrangement of some of the parts, it may be adapted for closing the circuit after a predetermined period of time instead of opening it and it is intended herein to cover the use of the apparatus whether it is applied to apparatus whereby the circuit is either opened or closed after a predetermined period of time.

What I claim is:

1. A device of the character described having a fixed contact member, a pivotally mounted switch arm carrying a contact member, a spring tending to move the said pivoted arm to bring the contact member carried thereby into engagement with the fixed contact member, a second spring of less power than the first spring tending to actuate the movable arm to break the contact, a pivoted locking lever and a spring adapted to actuate said locking lever, said movable switch arm having two separate locking portions with one of which said locking lever is adapted to engage when the switch is closed and with the other of which the locking lever is adapted to engage when the switch is open and thereby to lock the switch in its respective closed and opened positions.

2. A device of the character described having a fixed contact member, a pivotally mounted switch arm carrying a contact member, a spring tending to move the said pivoted arm to bring the contact member carried thereby into engagement with the fixed contact member, a second spring of less power than the first spring tending to actuate the movable arm to break the contact, a pivoted locking lever and a spring adapted to actuate said locking lever, said movable switch arm having a plurality of notches with which respectively said locking lever is adapted to engage to hold the switch in its respective closed and open positions.

3. A device of the character described having a fixed contact member, a pivotally mounted switch arm carrying a contact member, a spring tending to move the said pivoted arm to bring the contact member carried thereby into engagement with the fixed contact member, a second spring of less power than the first spring tending to actuate the movable arm to break the contact, a pivoted locking lever, said movable switch arm

having two separate locking portions with one of which said locking lever is adapted to engage when the switch is closed and with the other of which the locking lever is adapted to engage when the switch is open and thereby to lock the switch in its respective closed and opened positions, clock mechanism, means controlled by the clock mechanism to trip the locking lever from the movable switch arm at a predetermined time and allow it to yield to the action of the stronger spring to open the switch and a spring which actuates the locking lever to engage with the respective locking portions of the switch lever and thereby to lock the switch lever in its open and closed positions.

4. A device of the character described having a fixed contact member, a pivotally mounted switch arm carrying a contact member, a spring tending to move said pivoted arm to bring the contact member carried thereby into engagement with the fixed contact member, a second spring of less power than the first spring tending to actuate the movable arm to break the contact, a pivoted bell-crank locking lever, said movable switch arm having two separate locking portions with one of which said locking lever is adapted to engage when the switch is closed and with the other of which the locking lever is adapted to engage when the switch is open, clock mechanism, an arbor rotated by the clock mechanism and a disk mounted on said arbor to move therewith, said disk having a portion adapted to engage the bell-crank locking lever at a predetermined point in the rotation of said disk and thereby rock the bell-crank to disengage the locking lever from the movable switch arm.

5. An electric circuit having in combination with a fixed contact member a movable switch member, said switch member consisting of an arm pivoted to a support and carrying a contact member adapted to make contact with the fixed contact member, a support for said arm, said arm having a projection formed with two notches, a pivoted bell crank lever having one arm formed with a tooth adapted to engage with either of said notches to hold said switch in its respective open and closed positions, the other arm of said crank having a cam faced tooth, a rotary disk carrying a cam projection adapted to be engaged by said cam faced tooth, a spring which engages said bell crank lever and tends to hold the said first tooth of said lever in engagement with one or the other of the notches in the arm of said switch lever, said cam on the rotary disk being adapted during its rotation to turn the bell crank in a direction to disengage said first tooth of the bell crank from the notch in the switch lever with which it may be engaged.

In testimony whereof I affix my signature.

DANIEL L. CHANDLER.