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TIME CONTROLLED ELECTRIC SWITCH

Filed May 27, 1927

Fig. 1.

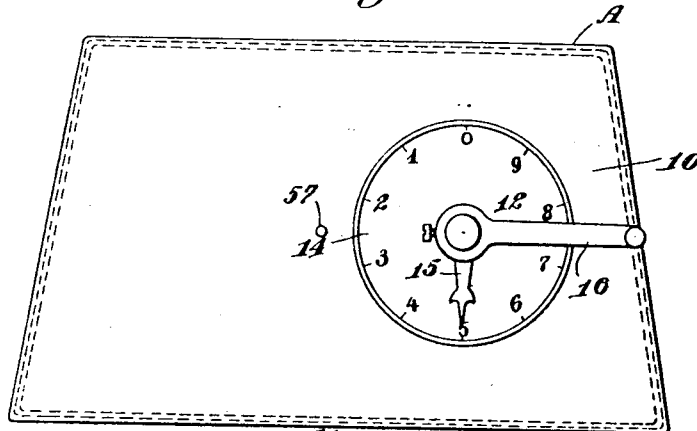


Fig. 2.

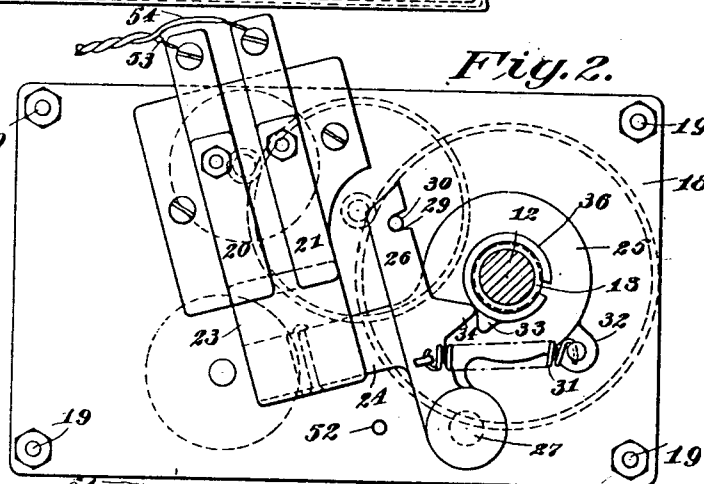


Fig. 3.

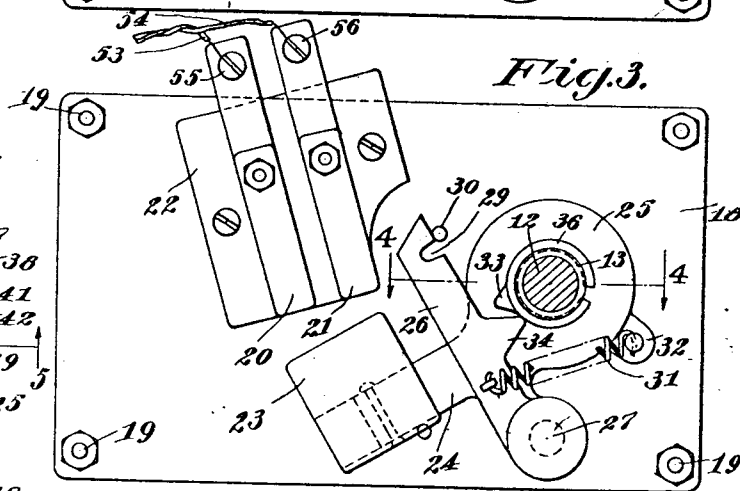
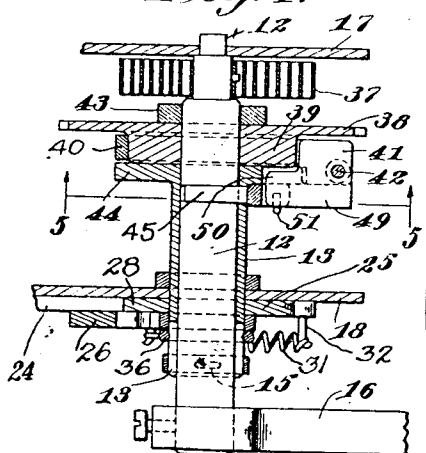


Fig. 4.



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TIME-CONTROLLED ELECTRIC SWITCH.

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The invention relates to improvement in time controlled electric switches. One object of the invention is to provide means whereby at a single operation the time mechanism may be wound and started, the switch closed and the pointer set to the time at which the switch is desired to be opened.

The invention will be more 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 side elevation of a casing in which is mounted a mechanism embodying the invention, the dial and setting lever being shown on the outside of the case.

Fig. 2 is a side elevation, partly in section, of the switch operating mechanism, the outside casing being removed and showing the switch closed and the setting lever being removed.

Fig. 3 is a view similar to Fig. 2 showing the switch open.

Fig. 4 is a section on line 4—4 of Fig. 3.

Fig. 5 is an enlarged section on line 5—5 of Fig. 4.

Referring to the drawings there is shown at A the casing for the mechanism, one or both of the side walls being removable to permit installing the mechanism within the casing. The wall 10 has a hole through which the main shaft 12 extends as also the sleeve 13 mounted on the shaft and on which the index hand is mounted and which will be more particularly described hereinafter.

A dial 14 graduated to indicate minutes or any other intervals of time is attached to the outer face of the wall 10 of the casing of the dial may be marked on the face of the casing itself co-axially with the shaft 12.

An index hand 15 is mounted on said sleeve 13. As shown in the drawings the dial is marked off into 10 divisions which may represent minutes or any other units of time.

A crank handle 16 is mounted on one end of said shaft 12 for winding the clock mechanism and setting the index hand. The said shaft is journaled in the two parallel side plates 17, 18 spaced apart from each other and rigidly held in spaced relation by bolts 19. Said plates form a supporting frame for the entire mechanism which is enclosed in the outer casing A.

Mounted on the outer face of the frame plate 18 are the fixed switch members 20, 21 insulated from the frame plate 18 by insulating member 22. A movable switch member 23 is mounted on a switch lever 24 having a hub 25 mounted loose on sleeve 13.

A locking lever 26 for locking the movable switch member 23 in closed position is carried by the movable switch lever 24 and is pivoted at one end thereof at 27 to an arm 28 projecting from the movable switch lever. (Said lever is concealed by the lever 26 as viewed in Figs. 2 and 3.) Said locking lever is formed with a notch 29 in one side thereof near the free end which engages a pin 30 projecting from the frame plate 18 when the movable switch is in closed position. A spring 31 is connected at one end to a projection 32 on the hub 25 of the movable switch lever and is connected at its other end to the locking lever 26. Said spring is adapted to move the switch lever to close the switch and to turn the locking lever to snap the notch into engagement with the pin 30 when the switch is closed, and is also adapted to turn the said switch lever on its fulcrum to open the switch when unlocked, and it yields to allow the switch lever to be unlocked.

A cam 33 mounted on a sleeve 13 is adapted to engage with a tooth projection 34 on the locking lever to turn the said lever back on its pivot in opposition to the power of the spring 31 at the proper time in the rotation of the shaft 12 to disengage the notch from the locking pin 30 and when the said cam projection rides past the tooth 34 the lever will be snapped back into position to re-engage the notch with the pin at the proper time in the rotation.

The sleeve 13 is split for a short distance near its outer end (not shown) to permit easy assembly of the sleeve with the shaft 12 and a split ring 36 around the split portion of the sleeve prevents the split portion of the sleeve from spreading open too widely.

A main spring 37 is mounted on the shaft 12, one end of said spring being fast to said shaft and the other end being fast to the frame so that the main spring is wound up by rotating the shaft in counter-clockwise direction.

A gear 38 mounted fast on shaft 12 has driving connection with a train of clock gears shown in dotted lines in Fig. 2 constituting time controlling mechanism.

A gear 38 has a hub 39. A split brake band 40 engages said hub to form a friction drive connection with the shaft as will be described. The ends of said brake band are bent to form ears 41, 41 in planes parallel with each other. An adjusting screw 42 passes through both of said ears and is adapted to be set up or let out to tighten or loosen the grip of the brake band on the hub 39. The shaft 12 has a collar 43 between the gear 38 and the main spring 37. The sleeve 13 also has an annular flange 44 and forms a side guard for the brake band. A pin 45 is secured to the shaft 12 and projects outwardly through a hole 46 in the sleeve 13, said hole 46 being sufficiently large to allow a slight rotary movement or slip of the shaft with relation to the sleeve. The outer end of said pin 45 has a forked head 47 having two branches or ears 48, 48. A thin block 49 lies between the ears 41, 41 of the brake band and is apertured for the passage of the screw 42 so that said block is securely but loosely held between said ears and then connected with the brake band. Said block 49 has a finger 50 which extends into the slot between the ears 48, 48 of the pin 45, the distance between said ears being slightly greater than the thickness of the block 49 and finger 50 so as to allow a slight play of the ears of the pin with relation to the block 49 and finger 50 during the rotation of the shaft 12. A U-shaped guard 51 bridges the finger 50 and its legs are secured to the ears 48, 48 of the pin head 47 to hold the finger in the slot between said ears. The brake band normally grips the hub 39 of gear 38 sufficiently tight to make driving connection.

When the shaft 12 is rotated counter-clockwise to wind up the main spring the pressure of one of the ears 48 on one face of the head 49 of the finger 50 will open the brake band to release the friction drive operation on the hub of the gear 38 so that the gear and clock mechanism will not rotate, although the brake band 40 will rotate with the sleeve. When the spreading pressure is released the friction between the brake band and the hub 39 will cause the gear 38 to be rotated with the shaft. The play between the finger 50 and the ears 48, 48 of the pin 47 allows a slight initial rotary movement of the shaft before the sleeve will be rotated.

When the sleeve 13 is rotated the index hand 15 mounted thereon will be moved with it. The cam 33 mounted on the sleeve will also be rotated with the sleeve.

The shaft may be rotated by the crank 16. By turning the crank and shaft counter-clockwise the main spring is wound up and the index hand is moved counter-clockwise at the same time. After it is wound up and set and the hand is released from the crank, the clock mechanism will cause the sleeve and the shaft to rotate clockwise carrying

the index hand with it. The train of gears is so geared that the shaft 12 will make a complete rotation during a predetermined time. In the drawings the dial is graduated to a ten minute rotation. The mechanism may, however, be geared to any other timing desired.

Assuming the switch is open and the tooth 34 of the locking member on the movable switch is on the underside of the cam tooth 33 nearly in engagement with the cam tooth as will be the case after the switch has been tripped or opened by a previous operation, if now the shaft is rotated counter-clockwise to wind up and set the mechanism the cam tooth 33 will engage the tooth 34 on the locking lever during this movement and will turn the locking lever 26 to the left on its fulcrum as viewed in Fig. 3 and expand the spring 31, the notch 29 then being out of engagement with the pin 30. As soon as the shaft has continued its rotation in the setting movement far enough for the cam tooth 33 to pass to the under side of the tooth 34 the locking lever will be free to turn back to the right and will be so turned back by the contraction of spring 31 and will snap the notch 29 into engagement with the pin 30. At the same time the spring 31 being connected at one end with the hub 32 of the switch lever will cause said hub and the switch lever to rotate around toward the left and cause the arm 24 to swing up and carry the switch member 23 into contact with the fixed switch members 20, 21. The switch will at that time be locked in closed position by the locking lever. The shaft should be continued in its backward rotation until the pointer indicates on the dial the length of time desired for the switch to remain closed and then the setting handle should be released so that the shaft and sleeve can be rotated forward by the clock mechanism.

During the backward rotation of the shaft in the setting operation the pressure of one of the ears of the forked pin will press the block 49 against one of the ears of the brake band and slightly spread apart the ends of the brake band to loosen the grip of the brake on the sleeve so that the sleeve and shaft may be rotated without actuating the gear.

Now when the handle is released the brake will again grip the hub of the gear 38. The clock mechanism will drive the gear 38 which by means of the brake band will rotate in a clockwise direction. As soon as the cam tooth 33 comes around into engagement with the underside of tooth 34 and rides up onto its high part the locking lever will be turned to the left again as viewed in Fig. 3 and disengage the notch 29 of the locking lever from the pin 30. The spring 31 will turn the locking lever and switch lever down to disengage the switch. A stop 52 is provided on the frame to limit the opening movement of the

movable switch. At 53 and 54 are shown the wires connected with the opposite poles of an electric circuit (not shown) said wires being respectively connected by binding screws 55 and 56 respectively with the stationary switch members 20, 21.

When the shaft is rotated counter-clockwise by means of the handle to set the indicator and wind up the main spring, the switch then being open, the spring 31 exerts a pull on the locking lever to hold the tooth 34 in contact with the periphery of the cam and to hold that part of the edge of the lever 26 which is beyond the notch 29 in engagement with the pin 30 thereby exerting an elastic pressure to prevent the locking lever from being moved on its pivot further away from the shaft as it would have to do in order to permit the switch lever to be moved in a direction to close the switch.

When the shaft is turned counter-clockwise in the winding far enough for the cam tooth 33 to ride under the tooth 34 of the locking lever it will positively turn the locking lever on its pivot and expand the spring 31 because the hub of the switch is held from rotating on account of the backward pressure of the cam tooth 33 on the lever tooth 34. This positive pressure on the tooth of the locking lever prevents said locking lever from moving bodily upward and as it is pivoted to the switch lever the switch lever is also thereby prevented from turning up in a direction to close the switch. As soon as the cam tooth rides off of the locking lever tooth during the setting rotation of the shaft the locking lever is free to move up and this also leaves the switch lever and hub free to move upward under the pull of the spring as it contracts and in moving upward it closes the switch.

In the setting movement of the shaft, it should be rotated far enough back to set the pointer at a point on the dial from which can be determined the time necessary for the mechanism to run on the forward movement under the action of the time mechanism to open the switch. As shown in the drawings the mechanism is so adjusted that the indicator will point to 0 when the switch is open. If it is desired to have the switch closed for three minutes the shaft should be turned backward in the setting operation far enough so that it will take three minutes rotation of the shaft in a clockwise direction to open the switch. That is, as shown in the drawings the pointer should be set at 3, Fig. 1, and the switch will be tripped when the indicator points to 0.

It is obvious that the mechanism may be arranged so that the shaft has to be turned clockwise to wind it up and the hand will move counter-clockwise when the clock mechanism is in operation.

It is desirable that the clock mechanism should be stopped immediately after the

switch is opened. For that purpose a stop pin 57 is provided so located that when the hand points to 0 and the switch is opened, the crank handle 16 will engage the under side of the pin 57 and thereby stop the further running of the clock mechanism. When the crank is turned backward to wind up the clock mechanism the pin 57 will limit the winding movement to a single full turn.

What I claim is:

1. A time controlled switch having a fixed switch member, a lever carrying a cooperating switch member, a rotary shaft, said lever being loosely journalled on said shaft, a locking lever pivoted at one end to said switch lever, a stationary member with which the other end of the locking lever is adapted to engage to lock the switch member when the switch is closed, a spring which holds the locking lever in locking position, a cam carried by the shaft, which during the rotation of the shaft in one direction engages the locking lever and releases it thereby allowing the spring to turn the switch lever in a direction to close the switch, a dial, a pointer carried by the shaft which, when the shaft is rotated in a direction to set the pointer indicates on the dial the length of time the shaft will turn in the reverse direction to open the switch, time controlled mechanism for rotating the shaft in the reverse direction after the pointer is set, means whereby the rotating of the shaft in the setting direction winds up the clock mechanism and means whereby the clock mechanism controls the forward movement of the shaft in a direction to open the switch.

2. A time controlled switch having a fixed switch member, a lever carrying a cooperating switch member, a rotary shaft, said lever being loosely mounted on said shaft, a locking lever pivoted at one end to said switch lever, a stationary member with which the other end of said locking lever is adapted to engage to lock the switch lever when the switch is closed, a spring which holds the locking lever in locking position, a cam carried by the shaft which during the rotation of the shaft in one direction engages the locking lever and releases the lock thereby allowing the spring to turn the switch lever in a direction to close the switch, a dial, a pointer carried by the shaft which indicates on the dial the length of time the shaft must turn in the reverse direction to open the switch and time controlled mechanism for rotating the shaft which is wound up by the turning of the shaft to set the pointer and which becomes operative to turn the shaft in a reverse direction and move the pointer when the shaft is left free to turn after the winding-up operation.

3. A time controlled switch having a train of clock mechanism, a rotary shaft, a main spring which is wound up by the rotation of

said shaft in one direction, a sleeve loose on said shaft, a gear having a hub mounted loose on said sleeve, said gear having driving connection with the train of clock mechanism, a spit brake band engaging with said hub, a pin projecting from said shaft, the said sleeve having a slot through which said pin projects thereby forming driving connection between the shaft and sleeve, said slot being of sufficient size for permitting a slight rotary movement of the shaft with relation to the sleeve, said pin having a bifurcated head, a finger having at one end a head which is embraced between the two ends of the brake band and is secured thereto in such manner as to permit a slight spreading movement of the two ends of the brake band from each other and from said finger head, the other end of the said finger extending between the branches of the head of the pin which projects from the shaft through the sleeve, means for independently rotating the shaft in the direction to wind up the spring, said independent rotation of the shaft causing the said finger head to spread the brake band open and release the grip on the gear sufficiently to permit rotation of the shaft without rotating the gear, the clock mechanism being operative to rotate the sleeve and shaft in a forward direction after the spreading pressure on the brake band is released.

4. A time controlled switch having a fixed switch member, a lever carrying a cooperating movable switch member, a rotary shaft on which said lever is mounted, a locking lever pivoted to said switch lever, a stationary member with which said locking lever is adapted to engage to lock the switch closed, a spring which holds the locking lever in locking position, and means carried by the shaft which during the rotation of said shaft in one direction releases the locking lever and allows said spring to turn the switch lever in a direction to close the switch.

5. An electric switch having a fixed contact member, a lever carrying a cooperating movable contact member, a rotary shaft, a locking lever pivoted to said contact carrying lever, a member with which said locking lever is adapted to engage to lock the contact lever in its respective open and closed positions, a spring which tends to engage the locking lever with said engaging member and means whereby the rotation of the shaft after the switch is locked turns the lever out of engagement with the lock.

6. A time controlled switch having a fixed switch member, a lever carrying a cooperating movable switch member, a rotary shaft on which said lever is mounted, a locking lever pivoted to said switch lever, a stationary member with which said locking lever is adapted to engage to lock the switch closed, a spring which holds the locking lever in locking position, means carried by the shaft

which during the rotation of said shaft in one direction releases the locking lever and allows said spring to turn the switch lever in a direction to close the switch, a dial, a pointer carried by the shaft which when the shaft is rotated in a direction to set the pointer indicates on the dial the length of time the shaft will turn in the reverse direction to open the switch, time controlled mechanism for rotating the shaft in said reverse direction, means whereby the rotation of the shaft in the setting direction winds up the time mechanism, and means whereby the time mechanism controls the forward movement of the shaft in a direction to open the switch.

7. A time controlled electric switch having a fixed contact member, a lever carrying a cooperating movable contact member, a rotary shaft, a dial, a pointer carried by the shaft which is adapted to indicate on the dial the length of time for movement of the shaft to open the switch, a locking lever pivoted to said contact carrying lever, a member with which said locking lever is adapted to engage to lock the contact lever in its respective open and closed positions, a spring which tends to engage the locking lever with said engaging member, means whereby the rotation of the shaft in the direction to set the pointer releases the locking means and which when the lock is released closes the switch, time controlled mechanism for rotating the shaft to open the switch, and means whereby said time mechanism is wound up by the turning of the shaft to set the pointer.

8. An electric switch having a fixed contact member, a lever carrying a cooperating movable contact member, a rotary shaft, a locking lever pivoted to said contact carrying lever, a fixed member with which said locking lever is adapted to engage to lock the contact lever in its respective open and closed positions, a spring having one end connected with said contact lever and at its other end connected with said locking lever which tends to hold the said locking lever in engagement with said fixed cooperating member, said locking lever having a cam surface and said shaft having a cam surface which is adapted to engage with the cam surface on the locking lever to release the locking lever from engagement with its cooperating member.

9. A time controlled switch having a train of clock mechanism, a rotary shaft, a main spring which is wound up by the rotation of said shaft in one direction, a sleeve loose on said shaft, a gear having a hub mounted loose on said sleeve, said gear having driving connection with the train of clock mechanism, a spring brake band engaging the said hub, a pin projecting from said shaft, the said sleeve having a slot through which said pin projects thereby forming driving connection between the shaft and sleeve, said slot being of sufficient size to permit a slight ro-

tary movement of the shaft with relation to the sleeve, means for independently rotating the shaft in the direction to wind up the spring and means whereby said independent
5 rotation of the shaft spreads the brake band and releases the grip on the gear sufficiently to permit rotation of the shaft without ro-

tating the gear, the clock mechanism being operative to rotate the sleeve and shaft in a forward direction when the spreading pres- 10 sure on the brake band is released.

In testimony whereof I affix my signature.

DANIEL L. CHANDLER.