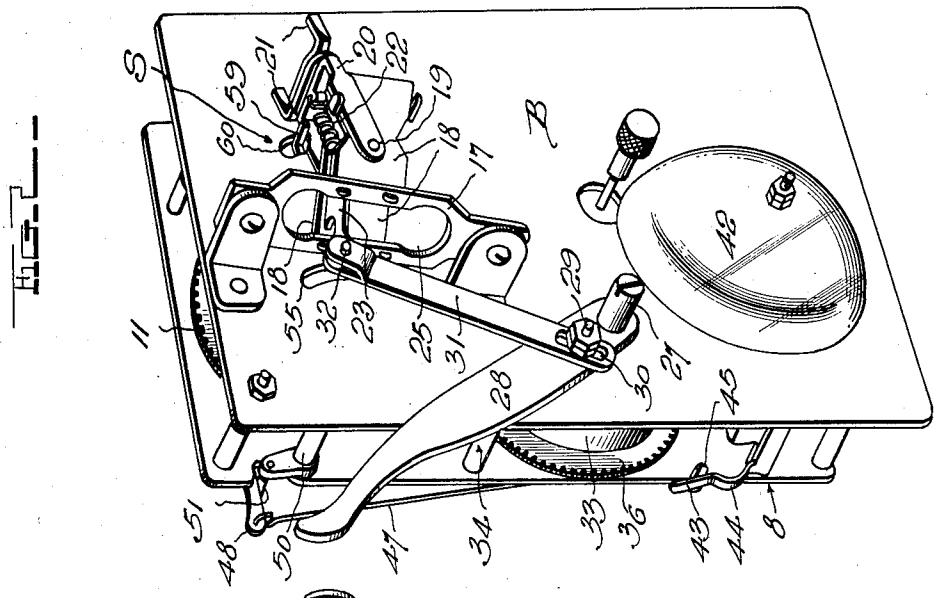
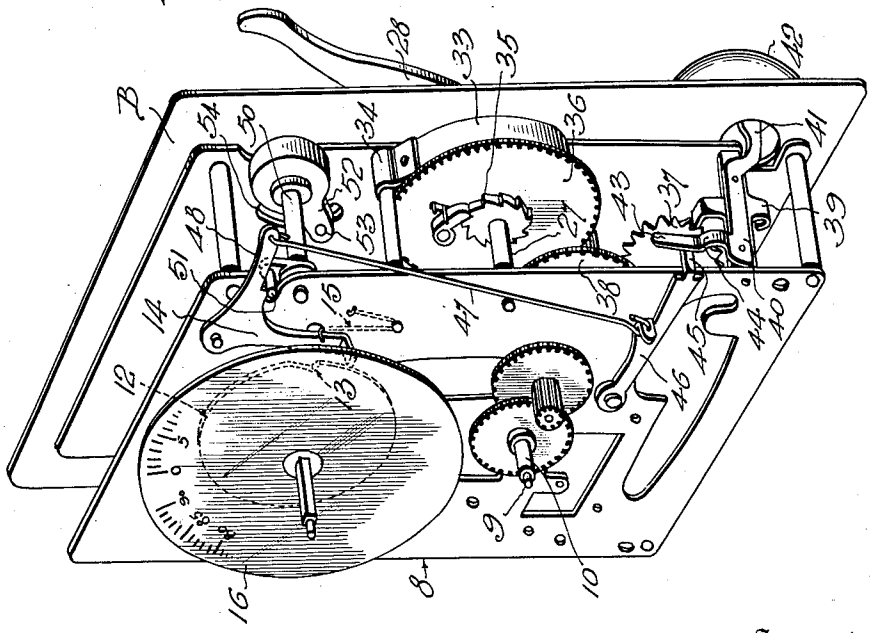
Sept. 1, 1931. C. R. GAINS 1,821,629

TIME CONTROLLED SWITCH

Filed April 29, 1929 3 Sheets-Sheet 1





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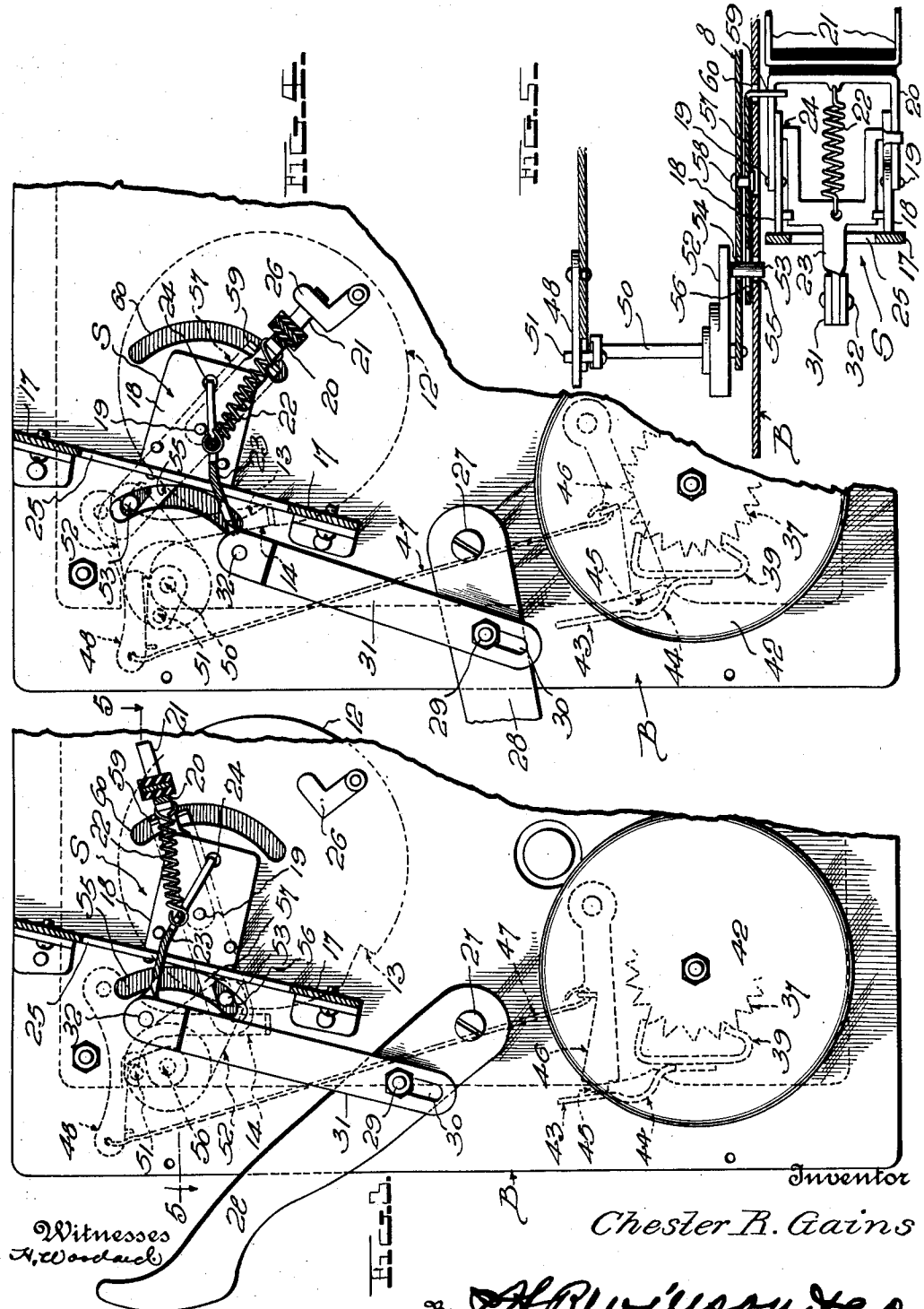
TIME CONTROLLED SWITCH

Filed April 29, 1929 3 Sheets-Sheet 2



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TIME CONTROLLED SWITCH

Filed April 29, 1929 3 Sheets-Sheet 3

Fig. 7.

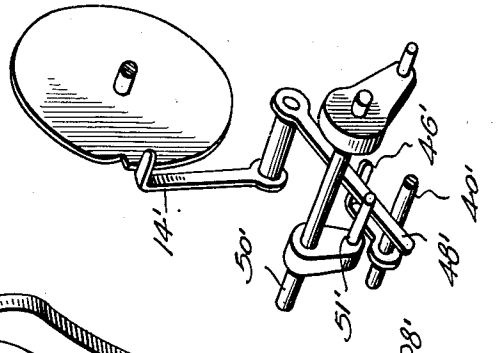
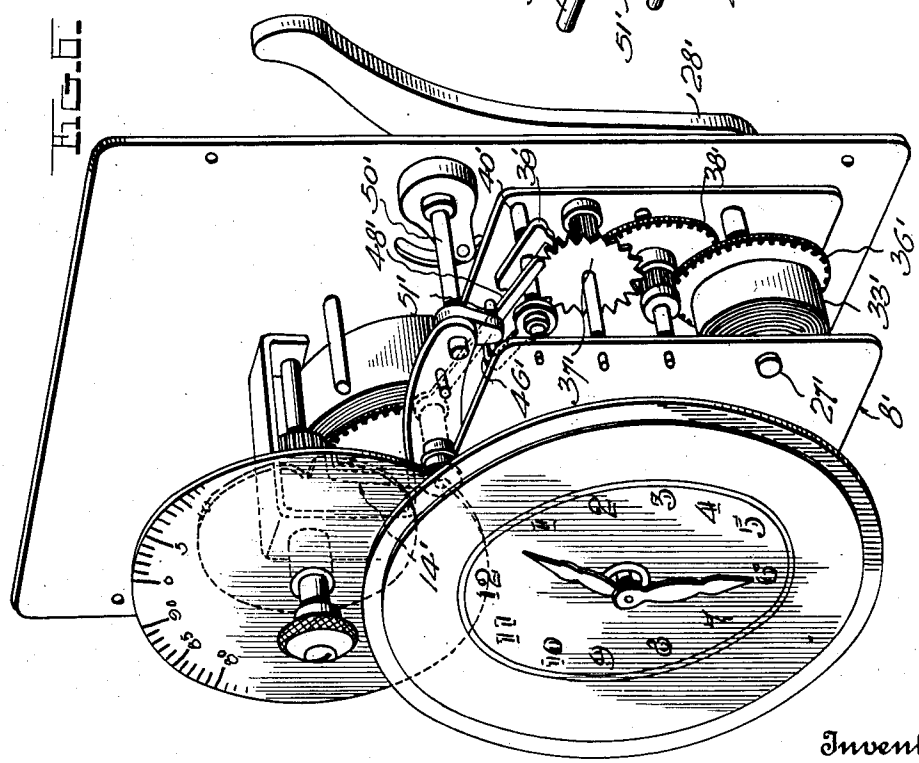


Fig. 6.



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UNITED STATES PATENT OFFICE

CHESTER R. GAINS, OF MUSCATINE, IOWA

TIME CONTROLLED SWITCH

Application filed April 29, 1929. Serial No. 358,963.

The invention relates to a time-controlled circuit controller embodying a snap switch and manually set, normally held, self-acting means releasable at the expiration of any desired period for imparting the pre-snap movement to said switch, whereupon the snap action of said switch will take place in the usual way.

One object of the invention is to provide a novel construction in which the snap movement of the switch again applies the means which normally holds the above-mentioned self-acting means against operation so that said self-acting means need not function any longer than necessary.

Another aim is the provision of a unique construction in which manual setting of the aforesaid self-acting means at its normal position in readiness for operation, moves the switch to one position and tensions a spring which is to later operate said self-acting means to effect movement of the switch to the other position.

A still further object is to provide a comparatively simple and inexpensive, yet an efficient, durable and reliable construction usable to advantage in a great number of fields for either automatically completing or breaking a circuit to cause or discontinue operation of any apparatus, machine, etc., as may be desired.

With the foregoing in view, the invention resides in the novel subject matter hereinafter described and claimed, description being accomplished by reference to the accompanying drawings.

Fig. 1 is a perspective view of the invention associated with a clock, certain parts of the clock mechanism and the casing of the entire device being omitted, with the exception of the back plate of said casing.

Fig. 2 is a rear perspective view of the parts shown in Fig. 1.

Fig. 3 is a fragmentary rear elevation partly in section showing one position of parts.

Fig. 4 is a duplicate of Fig. 3 with the exception that it illustrates the various parts set in condition for operation.

Fig. 5 is a horizontal sectional view substantially on line 5—5 of Fig. 3.

Fig. 6 is a perspective view showing a different form of construction.

Fig. 7 is a detail perspective view of a number of the associated parts shown in Fig. 6.

The construction shown in Figs. 1 to 5 will first be described and the variations of the second form of construction will then be explained. In describing both forms of the invention, even though the descriptive matter will be rather specific, it is to be understood that within the scope of the invention as claimed, variations may be made.

A clock frame 8 is shown and upon it a conventional clock train is mounted for driving the usual hand shafts 9—10. Driven from a suitable portion of the clock train, is a gear 11 (Fig. 2). This gear frictionally drives a control disk 12 having a peripheral notch 13 with which the free end of a control member 14 is co-operable. Said free end of the member 14 normally abuts the periphery of the disk 12 but a spring 15 is operatively associated with said member and whenever the notch 13 arrives at the proper position, after setting of the entire device by hand, said spring moves the member 14 and effects switch-throwing as hereinafter explained. 16 denotes a dial which is instrumental in setting the disk 12 so that its notch 13 is spaced any desired distance from the free end of the control member 14, so that the length of the period in advance of automatic throwing of the switch, may be of any desired duration. Preferably the disk 16 is graduated in minutes and when zero on said disk is spaced say "five minutes" from a pointer on the casing (not shown), "five minutes" will be required for the notch 13 to move to the position at which it permits movement of the control member 14 under the action of the spring 15. When such movement of the member 14 takes place, automatic throwing of the switch is effected.

A snap switch S of conventional form is shown mounted upon the back plate B of the casing for the entire structure. In order that a better understanding of the way in which this switch is operated, may be obtained, its construction will be briefly explained.

17 denotes a substantially vertical plate suitably mounted upon the back plate B and provided with two brackets 18 spaced from each other and mounted parallel with said back plate. Pivoted to the outer sides of these brackets at 19, is a U-shaped yoke 20 carrying contacts 21 which are insulated from said yoke. A tension spring 22 is shown for snapping the yoke 20 in one direction or the other after it has first been tensioned and moved to a predetermined position. A spring-tensioning device 23 is pivoted at 24 to the brackets 18 and passes through the elongated aperture 25 of the plate 17. When member 23 is in alinement with the spring 22, the latter is under full tension and the parts are on dead center. Movement of member 23 upwardly from this position causes spring 22 to act and snap the yoke 20 upwardly, while movement of said member 23 downwardly from said position, causes said spring 22 to similarly snap the yoke 20 downwardly. Member 23 when at rest is either above or below the neutral line and hence it will be seen that before the switch can operate under the snap action of the spring 22, predetermined movement must be imparted to the member 23, and I have herein referred to this movement as the pre-snap movement.

Obviously, the contacts 21 may co-operate with any desired stationary contacts such as indicated at 26 in Figs. 3 and 4 and while in the construction illustrated a circuit will be completed only when said contacts 21 are lowered, it will be obvious that the reverse might be provided for, or that said contacts might complete one circuit when lowered and another circuit when raised. Furthermore, it is to be understood that while I have shown one form of snap switch S for illustrative purposes, any other desired type of similar switch could be employed.

Rotatably mounted upon the clock frame 8 and extending rearwardly beyond the back plate B, is a shaft 27 on the rear end of which is secured a manually set arm 28. This arm is provided with a rearwardly projecting stud 29 slidably received in a slot 30 in a link 31, the upper end of said link being pivoted at 32 to the spring tensioning member 23 of the switch S. The stud 29 and slot 30 constitute a lost-motion connection between arm 28 and link 31 for a purpose to appear.

A spring 33 surrounds the shaft 27, is anchored at one end to this shaft and is fixed at its other end 34 to the frame 8, and said shaft 27 has a ratchet connection 35 with a gear 36 mounted upon it. This gear is part of a train for driving a verge wheel 37. Parts of this train are hidden in the drawings but a portion of it is shown at 38 in Fig. 1. A verge 39 on a verge shaft 40 is co-operable with the verge wheel 37 and a clapper 41 is mounted on said verge shaft for co-action with a bell 42. The verge shaft 40 is provided with a lateral arm 43 having an outwardly bowed portion 44, said arm being co-operable with a lateral finger 45 on a pivoted arm 46 carried by the frame 8. Arm 46 is connected by a link 47 with an arm 48 secured to the control member 14. When finger 45 is bearing against arm 43 as shown in Fig. 1, the verge shaft 40 is held against oscillation and consequently the verge wheel 37 and the gear train 38 are held, so that gear 36 is in turn held against rotation. This relation of parts is shown in Figs. 1 and 2, and it is the relation which exists immediately after automatic throwing of the switch has been effected. The parts remain in these positions until the mechanism is to be again set for automatic operation.

When it is desired to set the switch mechanism, the dial 16 is turned to the proper extent to set the notch 13 of the disk 12 the proper distance from the co-acting end of the control member 14. Then the arm 28 is pulled downwardly. At this time, the gear 36 is held against rotation by the associated gear train, the verge wheel 37, the verge 39, the arm 43 and the finger 45 as seen in Fig. 1. Consequently, the downward swinging of the arm 28 causes shaft 27 to rotate to wind the spring 33, the ratchet connection 34 then idling and finally serving to again operatively connect shaft 27 with gear 36. As this gear is now held against rotation as above explained, shaft 27 is also held against rotation under the action of the wound spring. The downward swinging of the arm 28 in addition to tensioning the spring 23, pulls downwardly upon link 31 (see Fig. 4) thereby imparting the necessary pre-snap movement to the spring-tensioning member 23 of the switch S, with the result that spring 22 functions to downwardly shift the contacts 21.

Summarizing the immediately preceding explanation, downward swinging of arm 28 by hand winds the spring 33 and effects movement of the switch S in one direction, the arm being held in its lowered position due to the fact that shaft 27 is held against rotation by the verge wheel 37, verge 39 and associated parts. The switch will remain in this condition until notch 13 of the control disk 12 permits movement of the control member 14 under the influence of the spring 15. When this movement takes place, arm 48 and link 47 swing the holding arm 46 downwardly opposite the outwardly bowed portion 44 of the arm 43, with the result that this arm is freed so that the verge 38 may oscillate. Consequently, the verge wheel 37, the gear train 38, the gear 36, the shaft 27 and the arm 28 are all now moved under the action of the previously wound spring 33, and at the same time the clapper 41 operates

the alarm. As arm 28 is raised under the action of spring 33, it pushes upwardly against link 31, thereby giving the necessary pre-snap movement to the spring-tensioning member 23 of the switch S, so that when this member reaches the proper position, said spring 22 acts to upwardly snap the contacts 21. Provision is made whereby this snap action of the switch S again effects movement of arm 46 so that its finger 45 will co-act with arm 43, thereby locking the verge 39 and the verge wheel 37, so that gear 36 and shaft 27 will not further move. Before describing this provision, it may be explained that upon the snap action of the switch when the contacts 21 are being either moved upwardly or downwardly, the necessary movement of the member 23 and the link 31 with respect to the arm 28, is permitted by the lost motion connection 29—30.

Near the arm 48, a shaft 50 is mounted upon the frame 8, said shaft being provided with a crank pin 51 for co-action with the arm 48 projecting from the control member 14. Shaft 50 is also provided with a crank arm 52 having a crank pin 53 passing rearwardly through a slot 54 in the back plate of the frame 8 and a similar slot 55 in the back plate B. Pin 53 is received in a slot 56 in one end of a lever 57, said lever being fulcrumed at 58 between the plate B and the back plate of the frame 8. The end of lever 57 remote from the slot 56, is provided with a lateral finger 59 which passes through an arcuate slot 60 in the back plate B, said finger being connected with the yoke 20, preferably by giving said finger a forked form and placing the fork arms astride one side member of said yoke.

When arm 28 is pulled downwardly and the switch occupies the position shown in Fig. 4, lever 57, pin 53 and arm 52 turn the shaft 50 to the position shown in said figure, in which position, crank pin 51 is out of contact with arm 48, as shown. Consequently, at the proper time, the control member 14 may move under the influence of the spring 15 to effect upward swinging of arm 28 under the influence of spring 33 and consequent shifting of the switch S again to the position shown in Figs. 1, 2 and 3. As soon as the upward snap action of the switch takes place, yoke 20 swings lever 57, so that pin 53 and arm 52 turn shaft 50 and cause its crank pin 51 to raise arm 48. Such raising disengages the control member 14 from the notch 13, pulls upwardly upon the link 47 and positions the finger 45 of the arm 46 in the path of the arm 43 on the verge shaft 40. Consequently, the verge mechanism is again held with the result that shaft 27 is held against further movement under the action of the spring 33. The entire mechanism is thus in readiness for setting again to operate at the expiration of any desired time.

Before going on to an explanation of Figs. 6 and 7, it may be well to briefly explain that the dial 16 is set according to the time at which the switch is to be automatically operated and the arm 28 is pulled downwardly. This downward movement of arm 28 effects shifting of the switch S to one position and also effects winding of the spring 33. At the expiration of the predetermined time when member 14 is released by the notch 13 of the disk 12, shaft 27 starts to rotate and the alarm is sounded, and the rotation of said shaft swings arm 28 upwardly so that it imparts the pre-snap movement to the switch and finally the snap action of the latter takes place to affect the circuit as desired. This snap action operates lever 57 and associated parts to turn the shaft 50 to a position at which its crank pin 51 again effects application of the means for holding the shaft 27 against rotation. The entire mechanism is then in readiness for re-setting whenever required.

Figs. 6 and 7 show a construction in which the verge wheel 37′ and the verge 39′ are at the upper portion of the clock frame 8′. The gear train 38′ drives the verge wheel 37′ when permitted to do so, being in turn driven by a gear 36′ corresponding to the gear 36. Gear 36′ is loose upon a shaft 27′ corresponding to shaft 27, and upon this shaft is a spring 33′ correspoonding to spring 33. The rear end of shaft 27′ carries an arm 28′ which operates a switch mechanism in the same manner as above described, said arm acting also as winding means for the spring 33′ when swung downwardly.

Upon the shaft 40′ of the verge 39′ is an arm 46′ which is directly co-operable with an arm 48′ with which the control member 14′ is provided. 50′ denotes a transverse shaft controlled in the same manner as the shaft 50 above described, said shaft 50′ having a crank pin 51′ directly co-operable with the arm 48′. When arm 28′ is pulled downwardly to condition the mechanism for later operation, shaft 50′ rotates and moves the crank pin 51′ away from the arm 48′ so that the control member 14′ may operate at the proper time. When automatic throwing of the switch is effected however, shaft 50′ is automatically turned to a position at which its crank pin 51′ forces the arm 48′ downwardly upon the arm 46′, thereby holding the verge shaft 40′ against oscillation and consequently preventing further rotation of the shaft 27′.

Shaft 40′ may or may not operate an alarm, as may be desired.

I claim:—

1. A time-controlled circuit controller comprising a snap switch, a manually set member having a lost-motion connection with said switch for imparting pre-snap movement to said switch when said member is moved from its set position, a spring opera-

tively connected with and tensioned by movement of said member to set position, releasable means for holding said manually set member and the tensioned spring against all movement following winding of the latter by means of the former, time-controlled means independent of said spring for releasing said holding means at the expiration of a given period after winding said spring, thereby allowing the spring to move said member from its set position and effect pre-snap movement of said switch, and means operatively connected with and actuated by said switch for utilizing the snap movement thereof to again apply said holding means, preventing further movement of said spring after it has effected switch operation.

2. A circuit controller comprising a support, a snap switch mounted thereon and having a quick-moving switch member, manually actuated means for effecting snap movement of said switch member in one direction, spring driven means for effecting snap movement of said switch member in the other direction, holding means for said spring-driven means, and control means for said holding means, said control means being directly connected with said quick-moving switch member and actuated thereby to apply said holding means when said switch member snaps in said other direction.

3. A circuit controller comprising a support, a snap switch mounted thereon and having a quick-moving switch member, manually actuated means for effecting snap movement of said switch member in one direction, spring driven means for effecting snap movement of said switch member in the other direction, holding means for said spring-driven means, an element mounted on said support and directly connected with said quick-moving switch member to be actuated thereby, and connecting means between said element and said holding means, said element and said connecting means co-operating to apply said holding means when said switch member snaps in said other direction.

4. A circuit controller comprising a support, a snap switch mounted thereon and having a quick-moving switch member, manually actuated means for effecting snap movement of said switch member in one direction, spring driven means for effecting snap movement of said switch member in the other direction, holding means for said spring-driven means, a lever fulcrumed on said support for movement uni-directionally with said quick-moving switch member, said lever being directly connected with said quick-moving switch member and actuated solely thereby, and connecting means between said lever and said holding means, said lever and said connecting means co-operating to apply said holding means when said switch member snaps in said other direction.

5. A circuit controller comprising a support, a snap switch mounted thereon and having a quick-moving switch member, manually actuated means for effecting snap movement of said switch member in one direction, spring driven means for effecting snap movement of said switch member in the other direction, holding means for said spring-driven means, a lever fulcrumed between its ends on said support for movement uni-directionally with said quick-moving switch member, said lever having a laterally projecting forked end straddling a portion of said quick-moving switch member, whereby said switch member will move said lever and connecting means to apply said holding means when said switch member snaps in said other direction.

6. A time-controlled circuit controller comprising a frame, a snap switch of spring-actuated type mounted on said frame and embodying a member for tensioning its spring, spring-driven means mounted on said frame, said spring-driven means having a shaft which winds the spring of said spring-driven means when rotated in one direction and is thereafter rotatable in the other direction under the influence of this spring, a manually set arm secured to said shaft for rotating it in said one direction, and a link pivoted at one end to said spring-tensioning member of said snap switch, the other end of said link having a slidable and pivotal connection with said arm, whereby said link establishes a lost-motion connection between said arm and said spring-tensioning member of said snap switch for imparting pre-snap movement thereto when said arm is rotated in said other direction by said spring of said spring-driven means.

In testimony whereof I have hereunto affixed my signature.

CHESTER R. GAINS.