

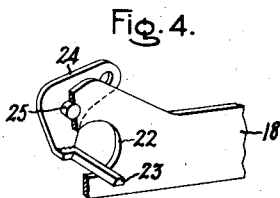
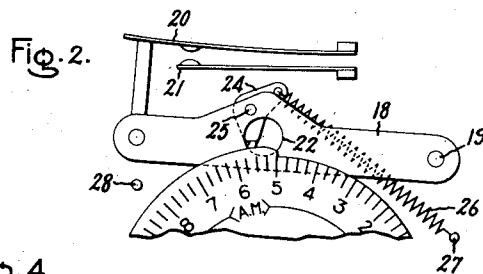
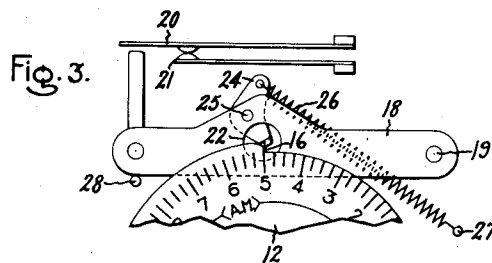
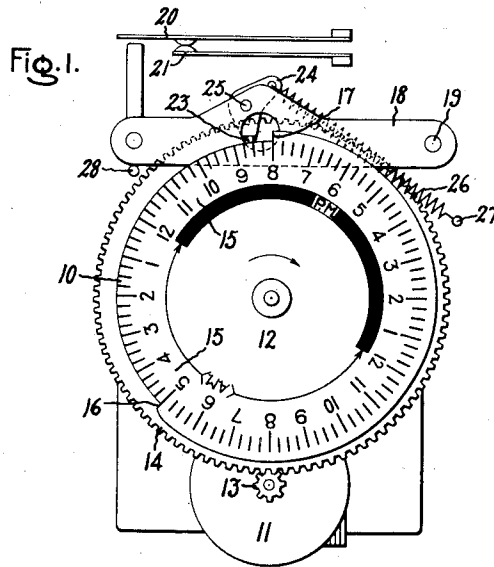
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TIME SWITCH

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TIME SWITCH

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My invention relates to time switches and its object is to provide a simple time switch in which both the switch-opening and switch-closing operations are performed quickly with a snap action.

In a common form of time switch, a switch-actuating lever is raised and lowered by a cam having two reversely inclined steps. The cam is rotated by a timing device and the step in the cam may be adjustable to cause operation of the switch-actuating lever and the opening and closing of the switch controlled thereby at different desired times. As usually built, this simple form of time switch is subject to the difficulty that the switch operation caused by the raising of the switch-actuating lever by the cam is slow, making it difficult to set the timing thereof accurately as well as causing arcing contact conditions detrimental to the switch itself and objectionable from the standpoint of radio interference.

It is the object of my invention to overcome the above mentioned difficulty and provide a simple form of cam actuated switch mechanism which moves in both the switch-closing and switch-opening directions quickly and with a snap action. I accomplish this result by providing what may be considered as a spring-biased auxiliary cam on the switch-operating lever serving as a cam follower for the main operating cam, which cam follower when acted upon by a rise in the main operating cam, is cocked and released thereby to suddenly instead of slowly lift the switch-operating lever.

The features of the invention which are believed to be novel and patentable will be pointed out in the claims appended hereto. For a better understanding of my invention, reference is made in the following description to the accompanying drawing showing in Fig. 1 the essential elements of a cam operated switch equipped with my invention with the switch-operating lever in a lowered position opposite a depression in the operating cam; Fig. 2 shows the relation of the parts associated with the switch-operating lever when the latter is opposite the raised portion of the cam and in its raised position; Fig. 3 represents the cocking action of the auxiliary cam mechanism occasioned by a rise in the cam just before the lever is snapped from its lower position represented in Fig. 1 to its upper position represented in Fig. 2; and Fig. 4 shows a detail of the auxiliary cam mechanism in perspective.

Referring now more in detail to the drawing, I have represented in Fig. 1 a time switch which,

except for the addition of an auxiliary cam member 10 thereon, is of a well known form. The device embodies a timing motor 11 which may be a clock mechanism or a small synchronous motor used for rotating the timing disc 12 in a clockwise direction once in twenty-four hours through suitable speed-reducing gears here represented at 13 and 14. The disc 12 has a 24-hour day time scale 15 thereon, as is customary.

For the sake of simplicity, I have shown the main cam parts non-adjustable and integral with the time dial 12. These cam parts here comprise the raised portion extending about the right of the dial and the depressed portion of the periphery at the left side of the dial as viewed in Fig. 1, the two portions being separated by the steps at 16 and 17. These abrupt steps face in opposite directions. Since the dial rotates clockwise, the step 16 may be called a "rise" and the step 17 a "drop".

The cam operates on a switch-actuating lever 18 which is pivoted at 19 and operates on the movable member 20 of a switch having a relatively stationary contact member 21. In the opening and closing operations of the switch the lever 18 moves away and towards the axis of rotation of cam disc 12. The central portion of lever 18 has a circular opening 22 through which a pin 23 extends. This pin is secured to a member 24 which is pivoted on the back side of lever 18 at 25 (see Fig. 4). A spring 26 secured between the upper end of the pivoted member 24 and some stationary part of the switch structure at 27 normally resiliently biases the pivoted member 24 in the position shown in Figs. 1, 2 and 4 with the pin 23 forced against the left-hand edge of opening 22, said edge serving as a stop to limit further clockwise rotation of the member 24 about its pivot point 25 on arm 18. The pin 23 extends out over and rests against the periphery of the cam on disc 12. When the pin 23 rests against the depression in the cam, the lever 18 is in its lower position and the switch 20—21 is closed as shown in Fig. 1. At this time, the lever 18 also rests against a stationary stop 28. When the pin rests against the raised portion of the cam, the switch is open as shown in Fig. 2.

It will be evident that when the cam disc 12 is rotated in a clockwise direction to cause the pin 23 to drop over the step 17 from the upper to the lower part of the cam, the pivoted member 24 does not rotate on its pivot and the pin 23 is held against its stop at the left edge of opening 22. Thus, for this operation, which is here a switch-closing operation, the parts func-

tion just as if pin 23 were an integral part of lever 18, and the cam follower maintains a definite maximum space relation between the switch-actuating lever 18 and the cam surface. Since the "drop" 17 is abrupt, this operation is quick, the tension in spring 26 aiding gravity to snap lever 18 down as the pin 23 rides over the drop 17 in the cam. The switch is, therefore, closed quickly and positively.

When the rise 15 in the cam is rotated past the pin 23, the operation pictured in Fig. 3 takes place. The rise 15 is abrupt except that the upper corner is sloped off slightly and the pin 23 has a sharp lower corner which comes against the steep part of the rise 15. As the cam plate 12 continues to rotate in a clockwise direction, member 24 is rotated about its pivot 25 in a counter-clockwise direction, stretching spring 26. The lever 18 cannot move downward or towards the cam surface as it is resting against the limit stop 20 and is held against such stop by spring 26. Since the pivot point 25 does not move downward, the pin 23 must move upward as it is rotated into the cocked position represented in Fig. 2, thereby decreasing the space relation between the lever 18 and the adjacent cam surface until pin 23 is lifted over the rise, its edge clears the steep rise 15, and it snaps from the position shown in Fig. 3 to the position shown in Fig. 2. At this instant, the member 24 rotates clockwise until stopped by pin 23 coming against the left surface of opening 22 and in so doing wipes over the nose of the rise and produces a secondary cam action to push lever 18 upward very quickly, resulting in a quick positive opening of the switch 20-21. The pin 23 and pivoted member 24 in which the pin is secured thus comprise a cam follower which in itself produces a secondary cam action when cocked and released as above described. This secondary cam action occurs only when the cam follower is acted upon by the rise in the main cam. At other times, the cam follower acts just as if it were an integral part of lever 18. The same spring 26, which is used to supply the snap action of auxiliary cam 23-24, also serves to bias the switch lever 18 downward and keep the cam follower in contact with the main cam surface. The device is thus not dependent upon gravity for its operation and may be used in any angular position desired.

It will be understood that various changes may be made in the details of construction of the time switch and the manner of incorporation of my invention therein and I do not wish to be limited to the particular arrangement illustrated and described.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. A time switch having rotary cam means, a timing motor for rotating said cam means, said cam means having a cam surface including abrupt "rise" and "fall" steps facing in opposite directions, a switch-actuating member movable towards and away from the axis of rotation of said cam means, a cam follower pivoted to said switch actuating member and resting upon said stepped cam surface, said cam follower comprising an auxiliary cam between said switch-actuating member and said cam surface, a stop on said switch-actuating member for limiting the rotation of said cam follower in the direction of

rotation of said cam means, resilient means for biasing said cam follower against said stop means other than said cam follower for limiting the movement of said switch-actuating member towards said cam surface, the rise in said cam serving when opposite said cam follower to rotate said cam follower away from its stop against the tension of said resilient means without moving said switch-actuating member, whereby the cam follower is lifted over said rise and then rotates back against its stop and moves the switch-actuating member away from said cam surface with a snap action.

2. In a time switch, a rotary cam member, a timing motor for rotating said cam member, a switch-actuating member movable towards and away from the axis of rotation of said cam member, a cam follower secured to said switch-actuating member and resting upon said cam surface, said cam follower serving to normally maintain a definite maximum space relation between said switch-actuating member and the cam surface in contact with said cam follower and to move the switch-actuating member in accordance with the contour of said cam, said cam follower, however, being movable with respect to said switch-actuating member in a manner to decrease the space relation between said switch-actuating member and the cam surface in contact with said cam follower, a spring for opposing such movement of said cam follower with respect to the switch-actuating member, said cam having an abrupt rise in its cam surface which, when moved against and past said cam follower, causes the aforesaid movement of the latter with respect to said switch-actuating member, and other means for preventing movement of the switch-actuating member towards the cam at this time, whereby the cam follower is lifted over the rise in said cam and then quickly returns to its normal condition to quickly move the switch-actuating member away from said cam.

3. In a time switch, a rotary main cam, a timing motor for rotating said cam, a movable switch-operating member, a cam follower between said switch-operating member and the surface of said cam to normally move the switch-actuating member in accordance with the contour of said cam as it is rotated past said cam follower, said cam follower comprising an auxiliary cam pivoted to said switch-actuating member, a stop on said switch-actuating member for limiting rotation of said auxiliary cam in one direction, a spring for biasing said auxiliary cam against said stop, said spring also serving to bias said switch-operating member with its cam follower against the surface of said main cam, said main cam having an abrupt rise which, when rotated in contact with and past the cam follower, causes the latter to turn on its pivot against the bias of said spring to lift the cam follower over the rise in said main cam without moving said switch-operating lever until the cam follower has cleared said rise, said auxiliary cam then returning against its stop and wiping over the nose of the rise in said main cam to quickly move the switch-actuating member away from said main cam, and means for preventing movement of the switch-actuating member towards said main cam while the cam follower is being lifted over said rise.

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