Sept. 5, 1933. H. C. BECK 1,925,974

CAM MECHANISM

Filed Nov. 21, 1929

Fig. 1

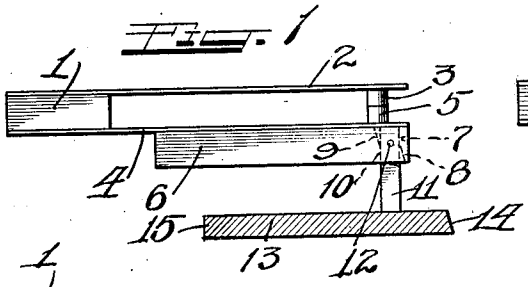


Fig. 2

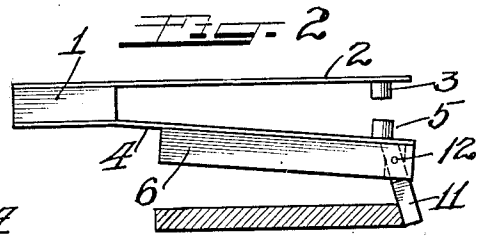


Fig. 3

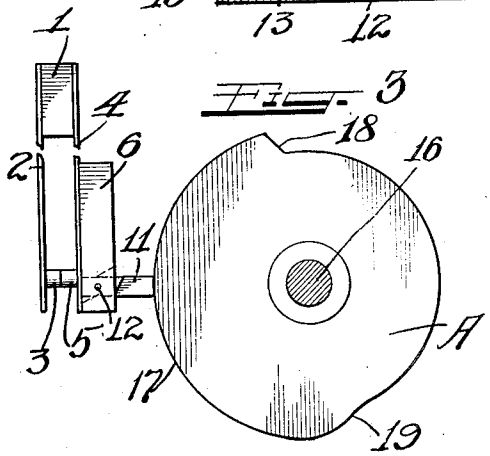


Fig. 4

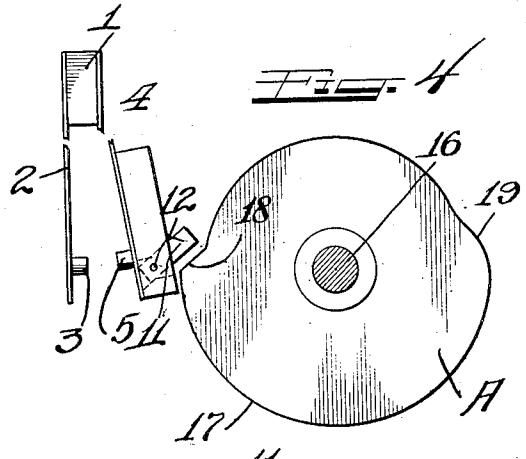


Fig. 5

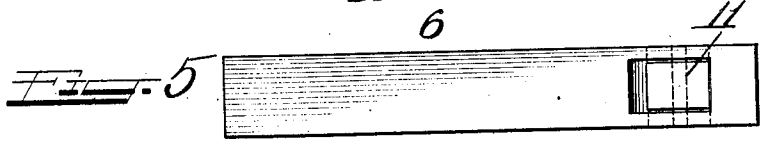


Fig. 6

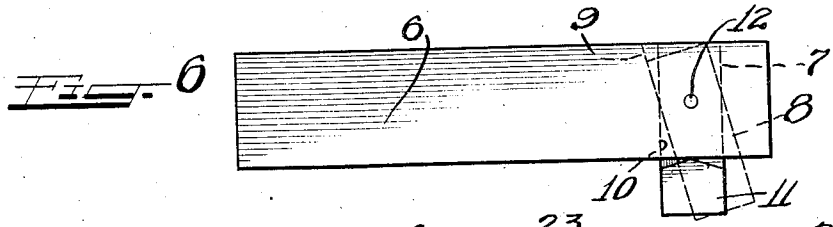
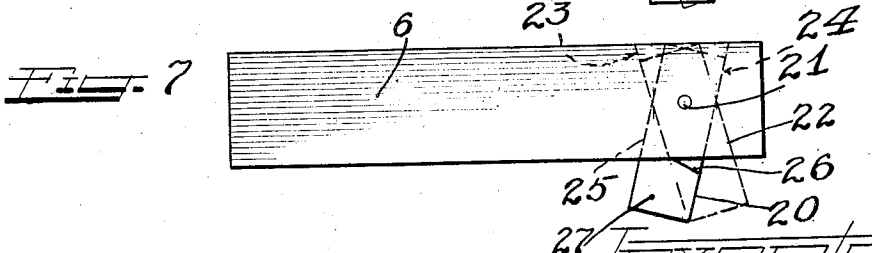


Fig. 7



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CAM MECHANISM

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Serial No. 408,916

5 Claims. (Cl. 74—14)

This invention relates to a swinging cam follower and has particular reference to a cam actuated control mechanism wherein a spring arm is actuated by a cam through the instrumentality of a follower pivotally associated with the arm in such a manner as to cause movement of the arm in one direction and to allow movement of the arm in the opposite direction with a snap action, the follower having relative pivotal movement with respect to the arm during the last mentioned movement.

An object of this invetion is to provide an arm with a swinging cam follower which is especially useful in make and break switch mechanisms wherein snap action of the arm is allowed in one direction, and where movement of the tripping portion of the cam is allowed to pass the follower in both directions.

Another object of the invention is to provide a cam mechanism wherein a supported cam follower member and a supported cam member are relatively movable and wherein one of said members is also movable with respect to its support to allow snap action in one direction of movement.

A further object of the invention is to provide a mechanical movement including a movable arm carrying a swinging follower which follower is actuated by a cam having oscillating movement so as to move the arm in one direction when the cam is operated in a certain direction and to allow movement of the arm in the opposite direction with a snap action resulting from a swinging movement of the follower with respect to the arm when follower engages a certain portion of the cam.

A still further object of the invention is to provide a mechanical movement wherein an arm is actuated by a follower which in turn is actuated by a cam having a shoulder so arranged as to allow swinging of the follower with respect to the arm so that the arm may drop suddenly with a snap action.

The above, other and further objects of the invention will be apparent from the following description, accompanying drawing and appended claims.

Generally speaking, the invention contemplates a swinging or movable arm or preferably a spring arm having one free end and a follower pivoted near the free end of the arm and so associated with the arm as to have limited movement about its pivotal connection so that such pivotal movement may be limited in one direction when said follower is engaged by a cam for moving the arm in a certain direction and whereby pivotal movement in the opposite direction results in snap action of the arm in the reverse direction.

Embodiments of the invention are illustrated in the accompanying drawing wherein certain of the parts are somewhat diagrammatically exaggerated for the sake of clearness and the views thereof are as follows:

Figure 1 is a fragmental portion of an electric switch involving the present invention showing the use of a flat sliding plate as the cam member.

Figure 2 is a view similar to Figure 1 showing the parts when the cam has been moved in the opposite direction with the arm swung away out of contact with its mating member and with the cam ready to move in its opposite direction.

Figure 3 is a fragmental view of a switch embodying the mechanical movement of this invention showing the parts with the switch contact in closed position as effected by means of a circular cam.

Figure 4 is a view similar to Figure 3 showing the parts as the same appear with the switch open.

Figure 5 is an enlarged top plan view of an exaggerated arm showing one way of arranging the pivoted follower in the same.

Figure 6 is a side elevational view of an arm showing a follower pivoted near the free end thereof and illustrating in full lines the position of the follower when in active position to raise the arm and in dotted lines the position of the follower which it occupies when the cam is moving in the opposite direction, and also the position to which it is moved to allow snap action of the arm in one direction.

Figure 7 is a view similar to Figure 6 showing a follower arranged in the free end of an arm in such manner as to allow angular movement thereof on each side of a vertical plane through the pivotal axis of the follower.

The invention is susceptible of embodiment in various and sundry ways and only a few of such ways are illustrated in the accompanying drawing.

This invention is useful in connection with electrical make and break contact switches where a snap action is desired in opening the contact member by cam means and is especially useful where an oscillating cam is employed.

Figures 1 and 2 illustrate a schematic electric switch actuated by the mechanical movement of this invention wherein the movable member or

swinging arm is actuated by a flat plate sliding back and forth and serving as a cam.

The form of the invention illustrated in Figures 1 and 2 includes a support 1 which may be affixed to any suitable mechanism or structure and which supports in turn carry an arm 2 having an electrical contact point 3 on the same. A spring arm 4 is attached to the support 1 and also carries a contact point 5.

A bar 6 is secured to the spring arm 4 in any suitable manner and for convenience will be referred to herein as the swinging arm.

The bar 6 which is illustrated larger than in actual use for clearness is provided with an aperture therethrough from top to bottom which aperture has angular front and back walls. The front wall consists of a vertical surface 7 extending downwardly part way of the height of the bar 6 and an angular surface 8 inclined toward the free end of the bar 6 as shown in Figures 1 and 6. The rear wall of the aperture is provided at its upper rear portion with an incline 9 corresponding to the inclined front wall 8 but above and backward with respect to the front wall 8, and a lower vertical wall 10.

A follower 11 has an end in the aperture just described and is pivotally supported in the free end of the arm 6 by means of a pivot pin 12 extending through the sides of the arms defining the aperture and through the follower 11 so that the follower may have limited angular or pivotal movement about the pin 12 as limited by the vertical walls 7 and 10 of the aperture and the inclined walls 8 and 9 of the same.

The arrangement just described limits the movement of the follower 11 in clockwise direction to a position perpendicular to the arm 6 and in counter-clockwise direction to a position out of perpendicular and making an obtuse angle between the follower and the arm 6 when in the angular position determined by the inclined walls 8 and 9 of the aperture.

A cam 13 consisting in the present instance of a flat plate is oscillated in any suitable manner to and fro from right to left and reverse. One edge of the cam plate 13 is beveled at 14 so that when the cam is moved to the left as viewed in Figures 1 and 2 and the bevel engages the lower end of the follower 11, the follower will spring counter-clockwise and allow snap action of the spring arm 4 away from the position shown in Figure 1; that is, allow movement of the arm towards the cam thus opening the contact between the points 3 and 5. It should be noted that while the cam is moving to the left prior to the switch opening, the cam follower is maintained in vertical position, as shown in Fig. 1, by virtue of its frictional engagement with the cam. Movement of the cam 13 to the right stops before the end, shown herein as the left end, passes under the follower 11, so that the follower rides on the top side of the cam plate 13 throughout the travel of the cam except for an instant when the follower 11 swings away as soon as the lower end thereof encounters the inclined end 14 of the cam. When the cam 13 is again moved to the right the follower 11 will ride up the bevel edge 14, thus raising the spring arm 4 to such a position as to bring the contact point 5 in engagement with the contact point 3 and thus close the switch controlled by these points.

Figure 2 shows the relationship of the parts when the switch has been opened by the cam follower 11 dropping down over the bevelled edge 14 of the cam 13. When the cam 13 is moved to the right the follower will ride on top of the same moving the arm upwardly a sufficient distance to bring the contact point 5 in engagement with the contact point 3.

Figures 3 and 4 illustrate the same type of switch actuated by a circular cam A which is oscillated by a shaft 16 or any other well known means. The cam is also provided with a shoulder 19 so that movement of the cam may be limited by a stop, not shown, when the stop engages the shoulder. The circular cam A has an active cam face 17 which terminates in an abrupt shoulder 18.

The arrangement of the parts in Figure 3 shows the switch controlled by the swinging arm 6 closed as described with reference to Figure 1 which is the position occupied by the parts as the circular cam A is oscillating in counter-clockwise direction. The switch remains closed during counter-clockwise movement of the cam until the follower 11 drops down over the shoulder 18 thereupon the follower 11 swings on its pivot allowing snap action opening of the spring arm 4.

The only difference in arrangement of the parts of Figure 3 over that shown in Figure 1 is that the inclination of the inclined portions of the follower aperture extend in opposite directions from that shown in Figure 1, otherwise the parts are the same.

When the follower has dropped down over the shoulder 18 as shown in Figure 4, the switch has opened. Clockwise movement of the cam causes the follower 11 to ride on the cam surface 17 with the follower in inclined position until the cam starts in the opposite direction whereupon friction between the follower and cam surface 17 will move the follower into perpendicular relation to the arm 6.

It will be observed that the cam follower action of this invention is one in which the cam controlled arm is opened with a snap action. That is, the movement of the arm controlled by the cam is snapped toward the cam when the follower engages the shoulder or release position of the cam. The follower being pivoted in the arm swings out of perpendicular relation quickly.

Figures 5 and 6 illustrate the construction of the parts of the swinging arm 6 and the pivoted follower 11 where a single swing type of follower is used.

The single swing action just mentioned is one in which the swinging arm is moved into active or switch engaging position by the follower when the cam is oscillated in other direction and opened when the follower engages a dwell or shoulder or recess in the cam.

Should, however, it be desired to provide a switch of this character having a double swing follower action, then the arm 6 would be provided with an aperture such as that shown in Figure 7.

The arrangement of the follower 20 in Figure 7 is such that the pivotal action thereof is allowed to each side of a vertical plane passing through the pivot pin 21 of the same. The pivotal movement of the follower 20 is controlled by the inclined walls 22 and 23 governing its inclination in one direction and the inclined walls 24 and 25 of the aperture controlling its inclination in the opposite direction.

The swinging arm arrangement illustrated in Figure 7 may be used with the sliding cam plate 13 of Figures 1 and 2 as well as with the circular cam of Figures 3 and 4 in which event

the follower would be swung from one inclined position to opposite inclined position with respect to the arm 6 by the cam as the same rides on the cam engaging surface which is the top side of the plate 13 or the cam surface 17 of the circular cam A.

The follower 20 may, if desired, be provided with lateral shoulders 26 and 27 engaging the under side of the arm 6 at the sides of the vertical aperture through the same.

The invention has been described herein more or less precisely as to details, yet it is to be understood that it is not to be limited thereby as changes may be made in the arrangement and proportion of parts and equivalents may be substituted without departing from the spirit and scope of the invention.

The invention is claimed as follows:

1. In combination, a movable member, an oscillable cam member having a working point, and means influenced by said cam for effecting movement of said movable member in opposite directions at substantially the instant said working point of the cam is reached in both its back and forth movement and for effecting snap action of said movable member is one direction of its movement.

2. In combination, a movable member, an oscillable cam member having a shoulder, and means influenced by said cam for effecting movement of said movable member in opposite directions at substantially the instant said shoulder of the cam is reached in both its back and forth movement and for effecting snap action of said movable member in one direction of its movement, said means comprising a cam follower pivotally carried by said movable member so as to swing away from said shoulder to permit the snap action.

3. In combination, a movable member, an oscillable cam member having an abrupt shoulder, and means influenced by said cam for effecting movement of said movable member in opposite directions at substantially the instant said shoulder of the cam is reached in both its back and forth movement and for effecting snap action of said movable member in one direction of its movement, said means comprising a cam follower having a flat end engaging said cam and pivotally carried by said movable member so as to swing away from said shoulder to permit the snap action.

4. In combination, a movable member, an oscillable cam member having an abrupt shoulder with a sharp edge, and means influenced by said cam for effecting movement of said member in opposite directions at substantially the instant said shoulder of the cam is reached in both its back and forth movement and for effecting snap action of said movable member in one direction of its movement, said means comprising a cam follower having a sharp edge engaging said cam and pivotally carried by said movable member so as to swing away from said shoulder when said sharp edges engage to permit the snap action.

5. In combination, a movable member having an aperture therein, an oscillable cam member having a shoulder, and means influenced by said cam for effecting movement of said movable member in opposite directions at substantially the instant said shoulder of the cam is reached in both its back and forth movement and for effecting snap action of said movable member in one direction of its movement, said means comprising a cam follower pivotally mounted in said aperture so as to have limited pivotal movement and to swing away from said shoulder to permit the snap action.

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