Nov. 22, 1955 W. J. SEARS 2,724,276

CAM AND LEVER MECHANICAL MOVEMENT

Filed Oct. 10, 1952

Fig. 1.

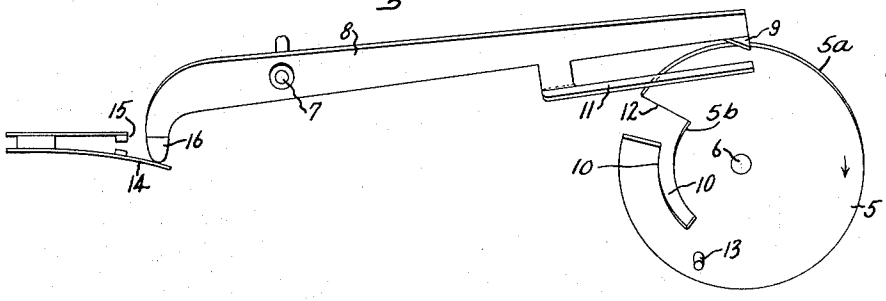


Fig. 3.

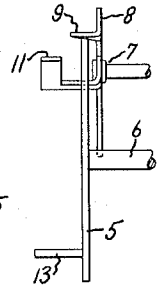


Fig. 2.

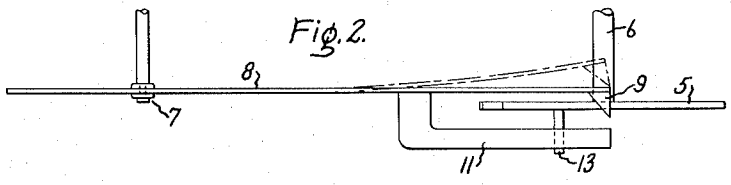


Fig. 4.

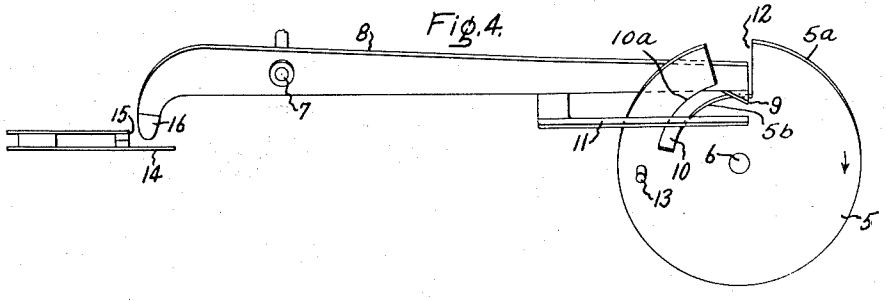


Fig. 5.

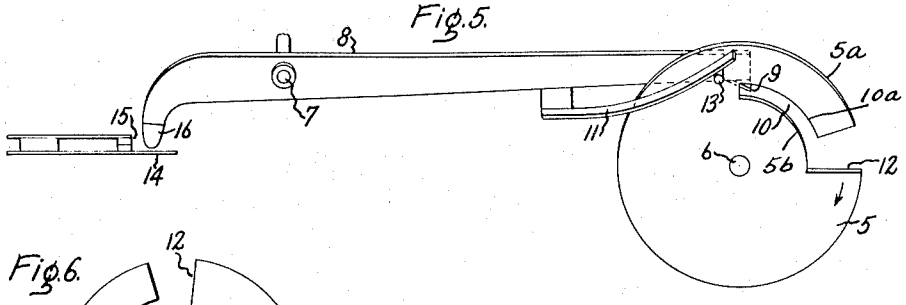
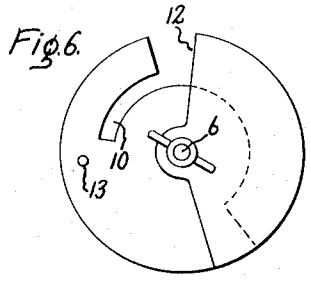


Fig. 6.



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CAM AND LEVER MECHANICAL MOVEMENT

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3 Claims. (Cl. 74—54)

My invention relates to cam-operated devices such, for example, as a cam-operated switch lever, and the object of my invention is to provide a relatively simple low-cost cam-operated lever mechanism of the type described in which there is a snap action movement of the lever by the cam in opposite directions. Where, for example, the mechanism is used to operate a switch, both the switch closing operation and the switch opening operation are accompanied by a snap action desirable from the point of view of trouble-free positive action.

The features of my 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 in which Fig. 1 is a perspective view of a cam-operated switch lever mechanism embodying my invention, the mechanism being shown in a switch open condition. Fig. 2 is a plan view of Fig. 1. Fig. 3 is a view of the cam and cam follower parts of Fig. 1 as viewed from the right. Figs. 4 and 5 are views similar to Fig. 1 but with the parts in different switch closed positions, and Fig. 6 shows an adjustable cam.

Referring now to Fig. 1, **5** represents a disk shaped cam mounted on a shaft **6** and driven in a clockwise direction as indicated by the arrow thereon. The cam may be driven in any suitable manner as, for example, by clockwork and may be adjustable relative to clock time so as to perform its operations at predetermined selected times of day as is common in the time switch art. A movable member **8** shown as a lever pivoted at **7** has a cam follower end **9** resting on the outer cam surface **5***a* of cam **5**. The lever **8** is of relatively thin resilient material such that it may be flexed sidewise at its cam follower end as indicated in dotted lines in Fig. 2. The laterally extending cam follower portion **9** of this lever is a triangular-shaped section bent at right angles to, and to one side from, the bottom edge of the lever. An important feature of this section **9** is that the leading edge which faces toward that part of the cam which is moving towards it is beveled or cut at an angle such that if it meets with an abrupt rise in the cam, it will flex the lever sidewise as indicated in dotted lines in Fig. 2. The engaging surfaces of cam and cam follower may be otherwise shaped to obtain this result. Another important feature of the cam follower **9** is that when engaged in the undercut portion **10** of cam **5**, it cannot be raised from the inner cam surface **5***b* to the upper cam surface of the cam until the cam follower lever is flexed sidewise.

The lever **8** is also provided with an integral spring finger branch **11** extending from the bottom edge of the lever at right angles to its plane on the same side as the follower part **9**. However, finger **11** is fastened to **8** some distance away from part **9** towards pivot **7**, and has a section extending parallel to lever **8** to the vicinity of cam follower **9**, but spaced therefrom so that the branched end of the lever, that is, the parts carrying part **9** and the finger **11**, can straddle the cam in the manner indicated in Figs. 4 and 5 under certain conditions to be explained.

The cam **5** has a drop at **12** extending between cam surfaces **5***a* and **5***b* and leading into the undercut slot or recess **10** formed as shown. The cam also contains a pin **13** extending from the side on which finger **11** is located near the periphery of the cam and, for the arrangement shown, near the end of depression **10**. The purpose of pin **13** is to engage the underside of finger **11** as the cam rotates to provide a resilient restraining force for quickly lifting lever **8** and moving its cam follower **9** from the depression to the outer surface **5***a* of the cam.

The lever is shown for operating a switch consisting of a lower resilient movable contact **14** and a stationary upper contact **15**. The lever **8** is preferably insulated from the switch as by means of an insulating extension of the lever at **16**. The switch or other means to be operated by the mechanism may take a variety of forms, but in the example shown the lever **8** presses down on the lower resilient contact **14** to hold the switch open when cam follower **9** is riding on the outer surface of the cam as shown in Fig. 1, and when **9** drops into the depression of the cam, the switch closes as shown in Fig. 4. Where a quick snap switch closing operation is desired, as is usually the case, the drop **12** of the cam is made radial as shown, so that the cam follower **9** will drop all the way into the depression without contacting the face of the drop at **12**. This switch closing movement of lever **8** is caused by its own weight aided by the resiliency of contact **14**. Fig. 4 shows the position of the parts just following a switch closing operation.

The switch remains closed while the cam **5** is rotating from the position of Fig. 4 to just beyond the position shown in Fig. 5. During this period of switch closure the cam follower **9** rides into the undercut portion **10** of the cam. Pin **13** rotates under and engages finger **11** and raises it. This tends to raise the entire lever **8** but this is prevented by reason of the follower **9** engaging the outer surface **10***a* of the undercut and holding lever **8** down to the switch closing position until the part **9** reaches the end of the slot **10**, at which time the sloping surface of **9** engages the end of the slot and flexes lever **8** to the rear as shown in dotted lines in Fig. 2 until part **9** is forced sideways out of the slot **10** entirely. By this time finger **11** is well flexed upwardly as seen in Fig. 5, and as a result, when **9** rides sideways out of slot **10**, the stored up tension in finger **11** snaps the lever **8** to switch open position and follower **9** to the outer surface of the cam, at which time it springs back over the outer surface of the cam due to the straightening of lever **8** from dotted line to full line position, Fig. 2.

In the usual cam action a gradual rise is required and the raising of the cam follower is slow, making the exact time of switch operation indefinite and sluggish, which may result in poor contact pressure, arcing, sticking contacts, and the like. With my invention both movements of the cam operated lever or other member are quick and positive. The parts are few and relatively simple to manufacture, assemble, and adjust. The duration between the two switching operations will depend upon the total length of slot **10** from drop **12** to the other end. Where it is desired to make this time readily adjustable, an adjustable two-section cam such as shown in Fig. 6 may be used in place of cam **5**.

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

1. A cam-operated device comprising a rotary cam having outer and inner cam surfaces connected by a drop, the inner cam surface leading from the drop into a recess in the cam which permits lateral but not radial removal of a cam follower therefrom, a movable member having a laterally extending cam follower resting on said cam so as to drop from the outer to the inner cam surface as the cam is rotated, the engaging surfaces of

said cam and cam follower being shaped to force the cam follower laterally out of the recess from the inner cam surface as the cam is rotated and the said movable member being flexible to permit such operation, resilient means adapted when restrained to move said cam follower to the outer cam surface when said cam follower is forced laterally out of said recess, and means operated with the rotary movement of said cam for restraining said resilient means only during the time that said cam follower is in said recess whereby the cam follower is returned to the outer cam surface with a snap action.

2. A cam operated device comprising a rotary cam having outer and inner cam surfaces connected by a drop, the inner cam surface leading from the drop into an undercut recess in the cam, a member movable in a plane parallel to and adjacent to said cam, a cam follower extending laterally from said member and resting on said cam so as to drop from the outer to the inner cam surface and to ride into said undercut recess as the cam is rotated, the contacting surfaces of the cam and cam follower being shaped to force the cam follower laterally out of said recess towards said movable member as the cam is rotated and said movable member being flexible to permit such lateral movement, resilient means for moving said cam follower from the inner to the outer cam surface by a snap action when energy stored in said resilient means is released, and means operated with the rotary movement of said cam only while said cam follower is in said recess for storing energy in said resilient means, the lateral movement of said cam follower out of said recess serving to release such energy.

3. A cam-operated device comprising a disk-shaped rotary cam having outer and inner cam surfaces connected by a drop, the inner cam surface leading from the drop into an undercut slot in the cam, a movable member having first and second branches in parallel straddling relation to said cam, the first branch being flexible in a direction at right angles to, and the second branch being flexible in a direction parallel with the plane of the cam, a cam follower on said first branch extending laterally therefrom towards the cam and resting on the cam surface thereof so as to drop from the outer to the inner cam surface and to ride into the undercut slot of the cam as the cam is rotated, said cam follower being beveled so as to be forced sidewise of the cam and out of the slot therein and to flex said first branch away from the cam as the cam follower rides against the closed end of the cam slot, and a projection extending laterally from the cam towards the second branch which projection engages beneath the second branch to flex it towards the periphery of the cam as the cam is rotated when the cam follower is in the slot, whereby the cam follower is returned outwardly to the outer cam surface with a snap action.

No references cited.