

May 16, 1933.

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1,909,138

CONTACTOR

Filed Dec. 19, 1930

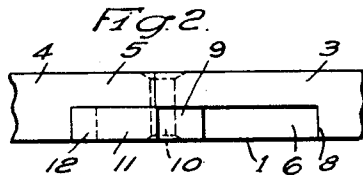
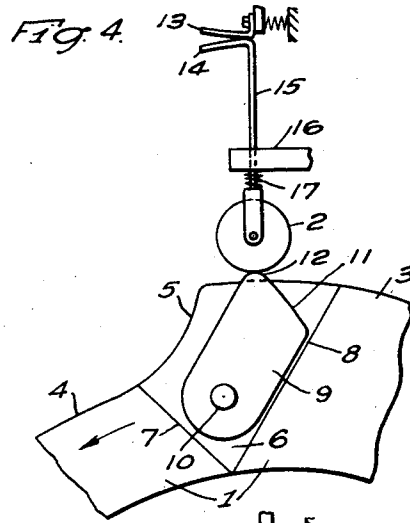
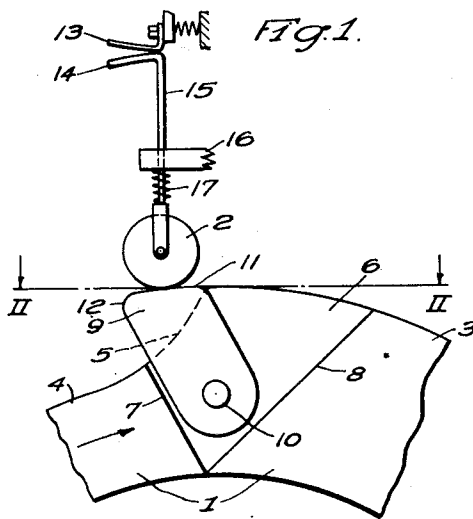
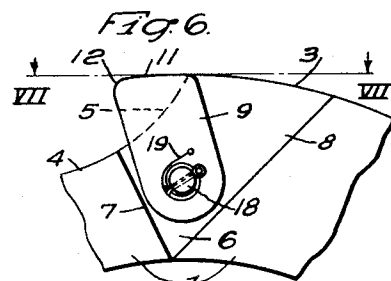
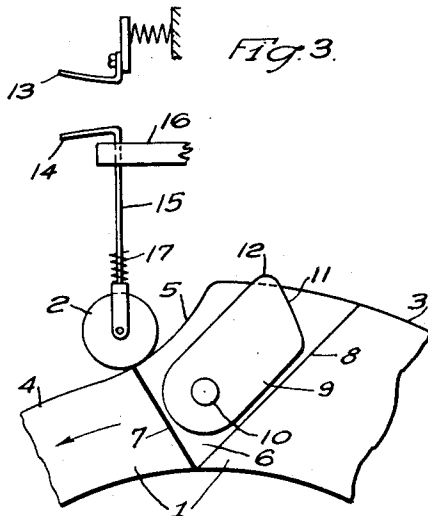
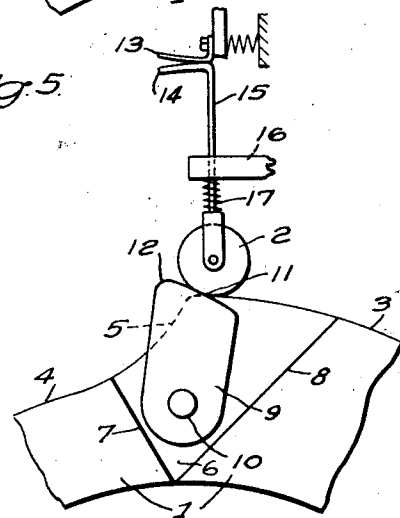
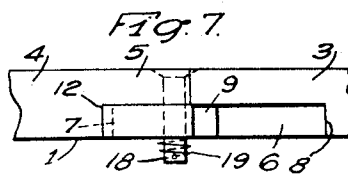


Fig. 5.



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Application filed December 19, 1930. Serial No. 503,394.

My invention relates to switch-operating devices and more specifically to means comprising cam surfaces for mechanically operating electric switch contactors.

5 One object of my invention is to provide means for opening a switch with a snap action, thereby reducing arcing between the switch contacts, with a resulting longer life for the switch parts.

10 Another object of my invention is to provide a device of the above-described character which comprises a minimum number of parts and which is simple and economical to manufacture, as well as effective and reliable
15 in operation.

Further objects of my invention will become apparent from the following description, when taken in connection with the accompanying drawing.

20 This invention is particularly applicable to a switch operator of the limit type wherein use is made of a cam surface cooperating with the switch to open and close it.

In prior art disclosures, it has been the
25 practice to provide a rotatable switch-operating means, including a cam surface in contact with a roller or like device, which, in turn, is connected to the switch. Relative
30 movement of the cam surface and the roller in one direction will displace the roller gradually in a direction to close the switch connected thereto, while movement in the reverse direction will permit the roller to
35 return to its former position to open the switch. In such devices, the switch is opened with a slow dragging action, resulting in excessive arcing and wear on the contacts.

To avoid such undesirable operation, the present invention contemplates the use of an
40 auxiliary cam surface or trip member pivotally mounted upon the main operating cam adjacent to the raised cam portion. When the cam is moved in a direction to open the switch, the roller, in passing from the high
45 to the low point on the cam surface, is caused to ride over the face of the trip member which is movable to form an extension of the high cam surface. The trip member
50 functions to maintain the roller out of contact with the cam surface until it is posi-

tioned directly above the low surface of the cam, at which time, the roller passes from the trip and is dropped directly upon the low surface to provide a snap action in opening the switch.

Figure 1 is a view, in side elevation, of one form of my invention, showing the members in the relative positions to which they are actuated just prior to the opening of the
55 switch;

Figure 2 is a view taken along the line II—II in Fig. 1 in the direction of the arrows;

Figure 3 is a view showing the elements as positioned just prior to the closing of the
60 switch;

Figs. 4 and 5 are views showing the elements as positioned during the actual closing operation of the switch;

Figure 6 is a view, in side elevation, of a
65 modification of the invention; and

Figure 7 is a view taken along the line VII—VII of Fig. 6 in the direction of the arrows.

Referring to Fig. 1, an arcuate switch-operating cam 1 is rotatably mounted in position to engage a switch-operating element
70 2, preferably of the roller type. The cam 1 is provided with a raised portion 3 and a depressed portion 4, which portions are connected by an inclined portion 5.

The cam 1 is provided, on one side, with
80 a lateral recess 6, the edges of which form a pair of shoulders or stops 7 and 8. Within this recess, a trip element 9 is mounted to so oscillate on a pin 10 as to engage, in its extreme positions, the stops 7 or 8.

The upper face 11 of trip 9 has a radius of curvature equal to that of the raised portion 3 and forms an extension of this portion when the trip 9 is rotated in a counter-clockwise direction, about the pin 10, into position
85 against the stop 7. It will be noted in Figs. 3 and 4 that the tip 12 of the trip 9 projects slightly above the surface 3 when the trip occupies a position against the stop 8, for a purpose which will be described
90 later. When rotated in a counter-clockwise direction, the trip 9 overlaps the curved portion 5, and its tip 12 is located above the depressed portion 4.

A switch, to be operated, is shown conven- 100

tionally as having a fixed contact 13 and a movable contact 14, the latter being disposed to be operated by the upper end of a rod 15, which is slidably mounted in a guide 16 and connected, at its lower forked end, to a roller 2. A spring 17 is provided to bias the rod 15 downwardly during opening of the switch. A clockwise rotation of cam 1 will permit the roller 2 to pass from surface 3 to surface 4, to separate the switch contact members 13 and 14, while a counter-clockwise rotation of the cam will restore the roller 2 to a position on the surface 3, to cause the switch to close.

Referring to Figs. 6 and 7, showing a modification, a pin 18 carried by the trip member 9 is pivotally mounted on the arcuate cam 1. A coil spring 19 is mounted on the pin 18. As shown, one end of the spring is attached to the pin, while the other end is attached to the trip 9, to bias the latter against the shoulder 7. In this modification, the shoulder 8 is located to allow the tip 12 of the trip 9 to fall below the surface 3, when the trip 9 rests against the shoulder 8, so that the roller 2, in passing from surface 4 to the raised surface 3, is not raised above the surface 3.

In the operation of the switch, assuming that the contact members are separated, as shown in Fig. 3, with the switch roller 2 supported by the surface 4, a counter-clockwise movement of the cam 1 will cause the roller 2 to engage the trip element 9 and rotate it clockwise until the roller 2 strikes the inclined surface 5 and rises thereon to a position adjacent to the tip 12 of the element 9, which has moved against the shoulder 8. Further movement of the cam 1 causes the roller 2 to pass over the tip 12 of the element 9 and descend to the surface 3, in which position the switch is closed. As the roller 2 passes the tip 12, the pressure of the spring 17 moves the element 9 slightly in a counter-clockwise direction about the pin 10.

The rotation of the tip 12 is essential to operate the trip upon the return of the roller 2. The added movement of the roller 2, in passing the tip 12, is compensated for by spring-mounted contact members 13 and 14.

With the roller 2 in position on the surface 3 and the switch closed, clockwise movement of the cam 1 causes the roller 2 to engage the trip element 9 and move it against shoulder 7. The trip element 9, in this position, serves as an extension to the surface 3, over which extension the roller 2 passes. When the roller 2 passes beyond the tip 12, the spring 17 snaps the roller to a position on surface 4 to open the switch.

In the modification shown in Fig. 6, the operation is substantially the same. The movement of the roller 2 to actuate the contact members 13 and 14 into engagement causes the trip element 9 to be retracted

against the shoulder 8. The spring 19 returns the trip element to the tripping position against the shoulder 7 when the roller 2 is supported on the surface 3 of the cam 1.

While I have shown two embodiments of my invention, it is apparent that further modifications may be made in the arrangement of parts employed without departing from the spirit of my invention. Therefore, I do not wish to limit my invention to the specific apparatus illustrated, but desire that only such limitations shall be imposed as are indicated in the appended claims.

I claim as my invention:

1. In a switch-operating device, a switch-operating cam rotatable in either direction, said cam comprising a raised portion and a depressed portion, a switch-operating element movable over, and relative to, said portions, a trip element carried by said cam and disposed adjacent to said raised portion and movable by said switch-operating element to form an extension to said raised portion to permit said element to pass over said raised portion and said trip element to a position above said depressed portion.

2. In a switch-operating device, a switch-operating cam rotatable in either direction and comprising a raised surface, a depressed surface and an intermediate surface, a switch-operating element movable relative to said surfaces, a trip element carried by said cam and disposed adjacent to said intermediate surface, said trip element being movable by said switch-operating element to form an extension to said raised surface beyond said intermediate surface to a position above the depressed surface.

3. In a switch-operating device, a switch-operating cam rotatable in either direction and comprising a raised surface, a depressed surface and an intermediate surface, a switch-operating element movable relative to said surfaces, a trip element carried by said cam and disposed adjacent to said intermediate surface, said trip element being movable by said operating element upon operation of said cam and moving over said raised surface and said trip element to a position above the depressed surface.

4. In a switch-operating device, a switch-operating cam rotatable in either direction and comprising a raised surface, a depressed surface and an intermediate surface, a switch-actuating element operably associated with said surfaces, a trip element mounted on said cam adjacent to said intermediate surface and movable from a retracted position to form an extension to said raised surface, said actuating element being movable over said intermediate surface to close the switch, with said trip element in retracted position, and movable over said trip element, in its extended position, to a position above said depressed surface.

5. In a switch-operating device, a switch-operating element, an operating cam rotatable in either direction comprising an inclined surface, said element being movable over said surface during movement of said cam in one direction to move said element to switch-closing position, and means on said cam adjacent to said inclined surface for maintaining said element out of contact with said surface during movement of said cam in an opposite direction.

6. A switch-operating device comprising a switch-operating roller, a cam rotatable in either direction for actuating said roller, a spring for maintaining said roller in contact with said cam, raised and depressed surfaces on said cam for contacting with said roller, a trigger pivotally mounted on said cam intermediate and adjacent to said surfaces, said cam being movable to permit said roller to pass over said raised cam surface and said trigger to a position above said depressed surface, whereby said spring forces said roller to a position on said depressed surface.

7. In a switch-operating device, a switch-operating roller, a cam rotatable in either direction for actuating said roller, a spring for maintaining said roller in contact with said cam, raised and depressed surfaces on said cam for contacting with said roller, means intermediate and adjacent to said surfaces and movable by said roller to form an extension to said raised cam surface, said cam being movable to permit said roller to pass over said raised cam surface and said means to a position above said depressed surface, whereby said spring snaps said roller to a position on said depressed surface.

8. A switch-operating device comprising a switch-operating element, a cam associated with said element and rotatable in either direction, yielding means for maintaining said element in contact with said cam, raised and depressed surfaces on said cam for contacting with said element, a trigger movably mounted on said cam intermediate and adjacent to said surfaces, said cam being movable to permit said element to pass over said cam and said trigger to a position above said depressed surface, whereby said yielding means forces said element to a position on said depressed surface.

9. In a switch-operating device, a switch-operating element, an actuator for said element rotatable in either direction, said actuator comprising a raised cam surface and a depressed cam surface, said surfaces being connected by an inclined surface, means adjacent to said inclined surface movable to provide an extension to said raised surface, said actuator being movable to permit said switch-operating element to pass over said raised surface and said extension means, said

extension means supporting said switch-operating element in raised position beyond said inclined surface, thereby permitting said switch-operating element to drop upon said depressed cam surface.

10. In a switch-operating device, a switch-operating element, an actuator for said element rotatable in either direction, said actuator comprising a raised cam surface and a depressed cam surface, said surfaces being connected by an inclined surface, a cam pivoted adjacent to said inclined surface and providing an extension to said raised surface, said cam being movable to support said operating element in position above said inclined surface, whereby to permit a direct movement of said operating element toward said depressed cam surface.

11. In a switch-operating device, a switch-operating element, an actuator for said element rotatable in either direction, said actuator being provided with a raised surface, a depressed surface and an intermediate inclined surface, means adjacent to said inclined surface and adjustable to provide an extension to said raised surface, said actuator being movable to permit said switch-operating element to pass over said raised surface and said extension means to a position above said depressed surface, thereby preventing contact of said element with said inclined surface during opening of the switch.

In testimony whereof, I have hereunto subscribed my name this 11th day of December 1930.

PAUL L. VOLLMER.