Dec. 23, 1924. 1,520,258

R. PENN

ELECTRIC SWITCH

Filed April 17, 1924

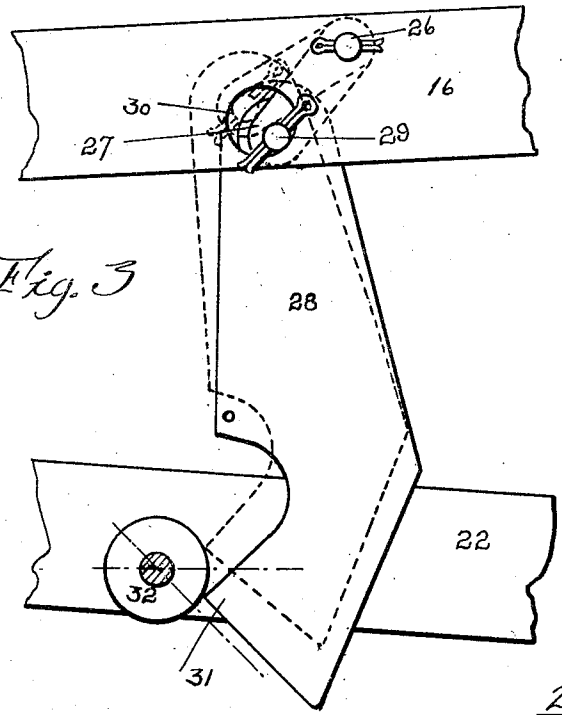


Fig. 3

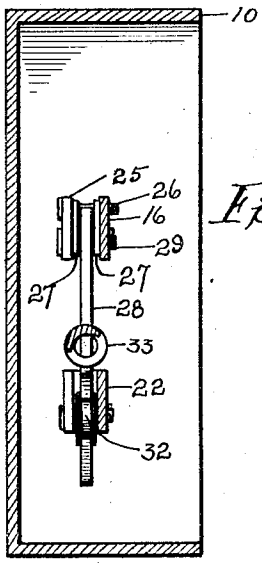


Fig. 2

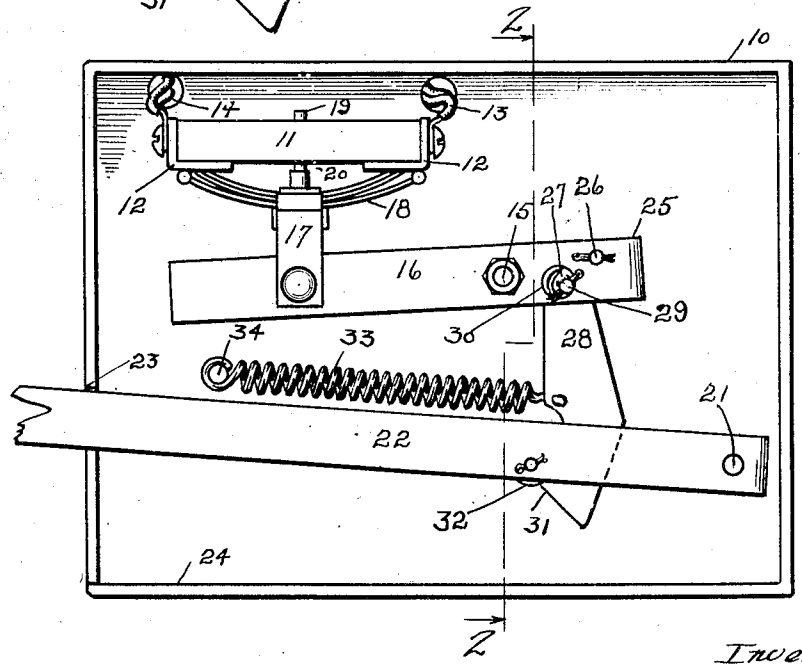


Fig 1

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UNITED STATES PATENT OFFICE.

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ELECTRIC SWITCH.

Application filed April 17, 1924. Serial No. 707,088.

To all whom it may concern:

Be it known that I, RALPH PENN, a citizen of the United States, and a resident of Des Moines, in the county of Polk and State of Iowa, have invented a certain new and useful Electric Switch, of which the following is a specification.

My invention relates to that class of electric switches designed to be operated by fluid pressure or the like.

The purpose of my invention is to provide a switch structure of the general class mentioned in which the switch is actuated by a slowly operating power and in which such mechanism is provided as will insure approximately instantaneous movement of the movable contact away from closed position.

Switches of this kind have been made in which a roller is carried past an angle faced apexed member (V-shaped) or the apexed member is carried past the roller, and the apexed member is held against the roller or its equivalent by means of a spring. In such a device, where the actuating member is operated by fluid pressure or the like, a difficulty has been experienced in that there is a possibility of the moving power operating the actuating member to move it to such position that the roller may be exactly at the apex of the V or angle-faced member and the movable contact point, then permitted to hover adjacent to the fixed contact point.

When this occurs, there is danger of arcing and of burning out the parts.

It is therefore the particular purpose of my invention to provide a structure whereby quick movement of the roller past the point of the apexed member or of the apexed member past the roller will be insured for thus enabling the angle faces to travel quickly along the roller without stopping at the apex when the switch is actuated during its opening movement.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which:

Figure 1 shows an elevation of a switch embodying my invention.

Figure 2 shows a transverse, detail, vertical sectional view taken on the line 2—2 of Figure 1; and

Figure 3 shows an enlarged, sectional, detail view of part of the switch mechanism.

In the accompanying drawings, I have shown my switch mechanism mounted upon a support or casing indicated by the reference character 10. Suitably supported on the casing or support 10 is an insulation block 11 on which are the fixed contact points or members 12.

It will, of course, be understood that the fixed contacts are connected by suitable current conducting wires 13 and 14 with a source of electrical energy and an electric motor or other device to be controlled.

The switch may be used in connection with a motor for operating a compressor for filling air tanks, such for instance, as are used in garages.

Pivoted as at 15 on the support 10 is a movable member 16, which carries at one end an arm or bracket 17. The bracket or arm 17 supports the plural leaf spring contact member 18, which is designed to coact with the contact members 12.

A guide rod 19 is slidably mounted in the block of insulation 11 and is provided with a shoulder 20, which limits the movement of the bracket or arm 17 toward the block of insulation 11 in such manner as to avoid imposing too much pressure on the spring contact element 18.

Pivoted on the support 10 as at 21 is an element 22, which might be called an actuating arm or bar. The element 22 projects from the casing or support 10 and may be connected in any suitable way at its outer end with a float, a pressure operated diaphragm or other actuating means.

The support 10 is provided with a shoulder 23, which limits the movement of the element 22 in one direction and with a flange 24 which limits such movement in the other direction.

My invention has to do largely with the means for connecting the elements 16 and 22 and for imparting movement from the element 22 to the element 16 for thereby operating the contact member 18 for opening and closing the switch.

However the element 22 is actuated, it is desirable that the relatively slow movement of the element 22 should serve to actuate

the movable switch member 18 with a very quick movement, when moving from closed to open position.

It is especially desirable that the beginning of that movement should be rapid.

For accomplishing these purposes, I have provided the following mechanism for connecting the elements 16 and 22.

In the form of the invention here illustrated, the element 16 is provided at its end opposite the bracket 17 and on the opposite side of the pivot 15 with a U-shaped portion or yoke 25 or some equivalent structure. Pivoted between the arms of the yoke 25 as at 26 is a link or a pair of links 27. The links 27 are pivoted to one end of an arm 28 by means of a pin 29.

The arms of the yoke 25 of the element 16 are provided with holes or the like 30 through which the ends of the pin 29 extend, as shown for instance in Figure 1.

In the arrangement of the parts shown in the drawings, the arm 28 hangs downwardly from the element 16 and is provided at its lower end with an angle-faced apexed member or portion 31 adjacent to the element 22. The element 22 carries an engaging member, such for instance as the roller 32 for coacting with the apexed member 31.

A coil spring 33 is fixed at one end as at 34 and is connected at its other end with the arm 28.

In the particular form of my invention here shown, the point of attachment of the spring 33 to the arm 28 is closer to the point of the apexed member 31 than it is to the pivot pin 29. The point of this attachment to the arm 28 should be such that the power exerted to cause the apexed member to travel along the roller is greater than the upward pull on the link 27 at the pin 29 before the beginning of the opening movement of the switch.

I have shown in the drawings a particular form in which my spring can be embodied for successful operation.

It will be seen from statements made hereafter that the details of structure may be considerably varied under different circumstances.

In the particular form of the invention here shown, the pin 29 is arranged between the pivot point 26 and the spring 33, and the spring 33 serves to draw the apexed member 31 into engagement with the roller 32 and to cause the angle faces of the apexed member 31 to travel on the roller 32.

The shoulder 20 on the guide 19 limits swinging movement of the element 16 in one direction and the pivot post 34 of the spring 33 serves to limit such swinging movement in the other direction.

Assuming that the switch is closed and the parts are in their positions shown in Figure 1, the roller 32 is above the point of the apexed member 31 and the spring 33 serves to pull the arm 28 against the roller 32 so that the tendency of said arm is to move downwardly from its position shown in Figure 1, with the upper angle face of the apexed member traveling along the roller 32.

There is also, of course, a spring tension pull by the arm 28 at its upper end on the links 27. The spring tends to swing the pivot point 29 toward a line drawn through the pivot 26 parallel with the direction of pull of the spring. The position assumed by the links 27 is somewhere between the line of pull on the links as above mentioned and the line of pull downwardly.

In any event, such draft on the links 27 imposes a downward pull on the right-hand end of the element 16 for thus holding the contact points in closed position, and then closing the circuit through the motor, not shown.

When the element 22 is actuated by pressure from a float, or any other means for swinging its left-hand end downwardly, it will be seen that the roller rides down the upper angle face of the apexed member 31 until it reaches the point of the apexed member. Here then is the danger point in the operation of switches of this kind.

If the roller should stand on such point, and the movable contact member should hover adjacent to the first contact members, an arc is likely to occur and the parts may be burned out.

It will be noted, however, that the pull of the spring 33 on the arm 28 has a tendency to swing the lower ends of the links 27 upwardly. This tendency is overcome prior to the time the roller 32 reaches the point of the apexed member, by the fact that the pull of the spring for drawing the upper angle face of the apexed member against the roller 32 is more than enough to overcome the tendency of the arm 28 to move upwardly.

When the roller 32 passes along the angle face of the apexed member 31, it will be obvious that the downward pull on the arm 28 will remain constant until the apex reaches the point of tangency between the angle face and the roller. It is also evident that from the moment the apex passes this said point of tangency, it will begin following the arc of the roller, and the downward pull on the arm 28 begins to decrease and would diminish to zero when the apex reached a point on the roller directly in line through the center of the roller, parallel with the pull of the spring 33.

However, after the apex of the arm 28 passes the point of tangency and the downward pull on the arm 28 begins to decrease, there comes a point where the upward pull exerted by the links 27 overcomes said downward pull, moving the arm 28 upwardly

with a very rapid movement and thereby carrying the point of the apexed member across the zero point on the roller almost instantaneously. This is one of the vital features of the invention. Any hesitation or stopping of the parts in the zero position is prevented, because as soon as the point of the apexed member crosses the roller, the spring 33 will cause the lower angle face of said apexed member to travel upwardly on the roller 32, whereupon the pin 29 will strike the upper wall of the holes 30, and the further upward movement of the arm 28 will swing the right-hand end of the element 16 upwardly for opening the switch.

When the element 22 is moved from its lower position for operating the switch toward closing movement, it is not so important to secure the accelerated movement of the point past the roller, because it is immaterial if the movable switch member hovers at the commencement of its closing movement.

It will thus be seen that I have provided a switch structure, which insures the quick relative movement of the roller and point at the commencement of the opening movement of the switch.

Considerable variation might be made in the construction and particular arrangement of the parts.

I have found it desirable to incline the links 27 from the pivot 26 toward the spring 33 as shown, largely because with this arrangement the tendency of the spring 33 to move the links 27 is greater when the links 27 are at their downward limit of swinging movement, than after they have swung to their upward limit of swinging movement. This is true because the nearer the links reach the line through the pivot 26 parallel with the spring pull on the arm 28, the less power does the spring 33 exert upon them to bring them into that line.

It thus follows that with the arrangement shown, the maximum tendency of the spring to swing the links from their position shown in Figure 1 upwardly is at the time when the switch is to be opened and the roller 32 reaches approximately the point of the apexed member, as hereinbefore more fully explained, and this is as it should be for then is the time when the quick movement over the point with relation to the roller should occur.

It is not necessary that the device should be made in such manner that the pin 29 strikes the element 16 during the downward movement of the links 27, but it is desirable that the pin 29 should strike the element 16 during the upward movement of the links 27, in order that quick and positive control may be had of the movement of the element 16 in its switch opening function.

I claim as my invention:

1. In an electric switch structure of the class described, a support, two elements pivotally mounted thereon, an arm, said arm and one of said elements having respectively an angle faced apexed member and an engaging member for coacting with each other, a link pivoted to said arm and the other of said elements for connecting them at spaced points on said link, and a spring for yieldingly holding said apexed member and engaging member in contact and for causing the arm to tend to swing said link for moving the arm in a direction for carrying the point of said apexed member across said engaging member.

2. In an electric switch structure of the class described, a support, two elements pivotally mounted thereon, an arm, said arm and one of said elements having respectively an angle-faced apexed member and a coacting engaging member, a spring fixed to said support and to said arm for holding the apexed member and engaging member in contact, a link pivoted to said arm and to the other of said elements and inclined from its pivot point on said other element relative to said spring, whereby the pull of the spring on said arm tends to swing said link for carrying the point of said apexed member across said engaging member, and means for limiting the pivotal movement of said elements.

Des Moines, Iowa, February 25, 1924.

RALPH PENN.