Aug. 26, 1941. L. W. COOK 2,253,968

ELECTRIC SWITCH

Filed Nov. 8, 1939

Fig. 1.

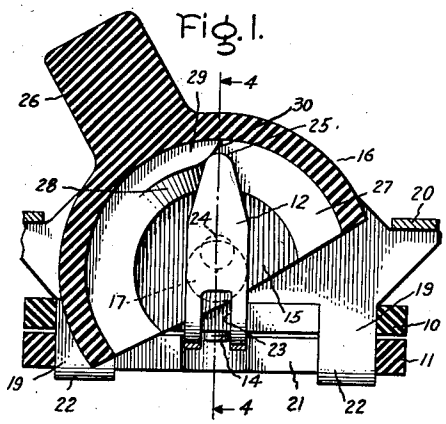


Fig. 4.

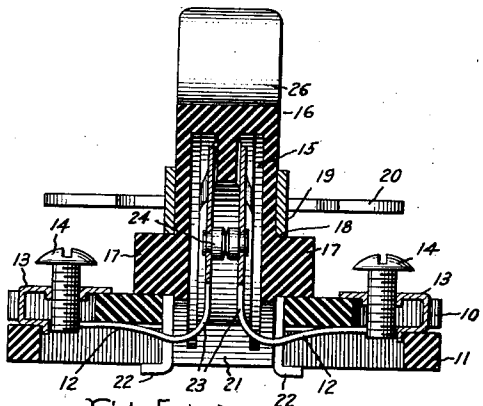


Fig. 5.

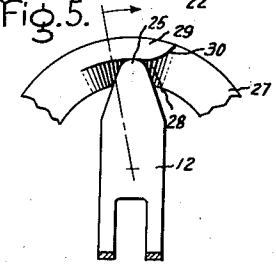


Fig. 2.

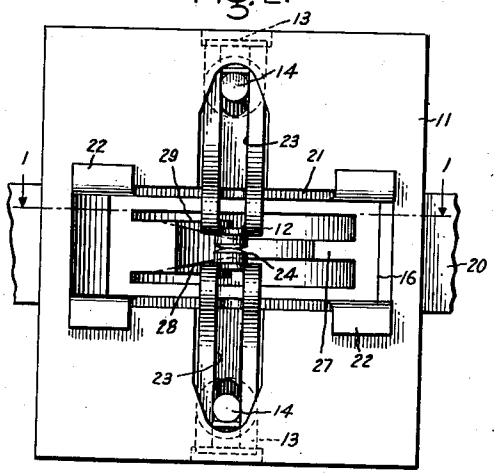


Fig. 6.

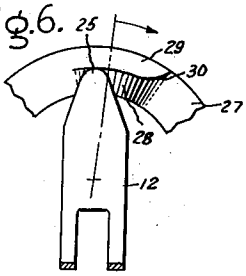


Fig. 7.

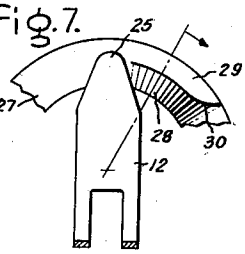
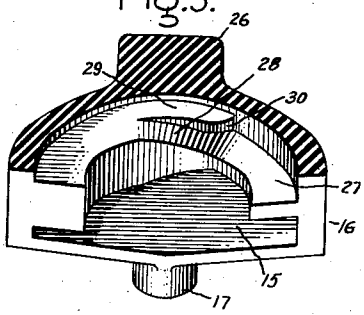


Fig. 3.



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Patented Aug. 26, 1941 2,253,968

UNITED STATES PATENT OFFICE

2,253,968

ELECTRIC SWITCH

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Application November 8, 1939, Serial No. 303,361

3 Claims. (Cl. 200—73)

My invention relates to electric switches and more particularly to switches for use with alternating currents.

It is an object of my invention to provide a switch of the type described so designed as to give a slow break and quick make of the contact mechanism thereby greatly increasing the life of the switch and contact members.

It is a further object of my invention to provide a switch of simplified construction having relatively few parts, such that it may be manufactured at low cost.

In the accompanying drawing, Fig. 1 is a sectional view through the switch; Fig. 2 is a plan view looking at the bottom of the switch; Fig. 3 is a perspective view of a portion of the switch operating mechanism; Fig. 4 is a sectional view along the line 4—4 of Fig. 1; and Figs. 5, 6, and 7 are diagrammatic views showing different positions of the switch mechanism.

Inasmuch as 60 cycle alternating currents, such as are in common use for house wiring systems, pass through zero points every 120th of a second, a pair of contacts in a switch need be opened only a minute amount depending upon the free path of the ionizing air to cause interruption of the currents. It has been found that .0007 inch is sufficient to prevent ionization of the air. This means that the initial rate of separation of the switch contacts may be relatively slow since they need be opened a distance of only .0007 inch in 120th of a second. Under such conditions the danger of restriking an arc after current zero will be minimized and the high temperature generated at the surfaces of arcing contacts will be eliminated minimizing contact wear. It is further desirable that the contacts be good heat conductors of relatively large area to radiate heat in those cases where the arc may restrike.

In making an alternating current circuit, however, the contacts should close very rapidly, since if closing is delayed the contacts may make over a small area thereby causing local heating which may fuse and damage the contacts. Moreover, it is desirable that the contacts close without any "bounce" which might cause the contacts to separate momentarily, thereby causing destructive arcing. In order to reduce the effects of the so-called "bounce" it is desirable to provide two movable contacts rather than a movable and a stationary one; this means that the amount of movement of each contact is reduced, effecting a corresponding reduction in the energy available to cause bounce.

The elements of my switch are so constructed and arranged as to open the contacts relatively slowly and at the same time provide for quick closing of them when the switch is moved to closed position.

Referring to the drawing, the body of my switch is composed of two plates 10 and 11 of insulating material, for example, sheet fiber, or the like. These plates are adapted to clamp between them the opposed flexible contact blades 12, the blades being provided with relatively rigid terminal plates 13 carrying screws 14 for receiving electric conductors. The contact blades extend beyond the planes of the plates and are located within a chamber or recess 15 in an operating member 16. For pivotally mounting the operating member there are opposite spindles 17 passing through openings 18 in the spaced legs 19 of a mounting strap 20. In order to hold the plates 10 and 11 and the operating member 16 in assembled position, the legs of the mounting strap extend through openings 21 in the plates and are then bent over the plate 11, as shown at 22 in Fig. 2, to clamp the elements together. Thus the plates are secured between the spindles 17 and the bent-over ends 22 of the legs. This means that no additional structural elements are required to assemble the switch; strap 20 is used in the customary manner for mounting the switch in a switch box of a wiring system.

It will be seen from Figs. 2 and 4 that the contacts 12 are formed of relatively thin flexible material such as spring bronze and that they are cut away for a portion of their length, as shown at 23, to increase their resiliency. Each blade is provided with a contact button 24 of relatively large area, which may be silver-coated for greater efficiency. The end of each blade is pointed and formed with a rounded tip 25 for engagement with the operating member 16.

Referring to Fig. 3, the operating member 16 is formed of insulating material, for example, a phenolic condensation product and filler, and is provided with a recess 15 as aforementioned and a handle 26. Within the recess 15 is a flange 27 which is narrower at one end and wide at the other, the narrow and wide portions being connected by a cam portion 28. A shoulder 29 forms a continuation of the wide portion of the flange, the shoulder being formed with a curved edge 30 adjacent the cam 28. It should be noted that the curved edge 30 varies in thickness due to the variation in thickness or width of the cam 28. While the perspective view of Fig. 3 illustrates the construction of the cam and shoulder on one side of the flange only, it will be apparent that

the other side is correspondingly formed since the operating member cooperates with and moves both blades simultaneously in a manner now to be described.

In assembled position the contact blades extend upwardly within the recess 15, one on each side of the flange 27, so that the flange is disposed between them. When the narrow portion of the flange is between the blades, the switch is in closed position with the buttons 24 engaging each other and the curved ends 25 of the blades engaging the curved edges 30 of the shoulders 29, as shown in Figs. 1 and 4. The thicknesses of the buttons 24 and flange 27 are so proportioned as to accomplish this result.

To open the switch the handle 26 is moved clockwise, looking at Fig. 1, so that the blades are separated by the cam surfaces 28. As soon as the blades are separated a minute distance the current through the switch will be interrupted since the alternating current passes through a zero point every 120th of a second. This means that the circuit is broken almost immediately simply by moving the cam surfaces and operating member through a small angle. Continued movement of the handle increases the distance between the contact members and positively prevents restriking of an arc. At the same time that the contact blades are separated by the cams 28, they are flexed or moved downwardly under the action of the curved edges 30 which engage the curved tips 25 of the contact blades and move them from the position shown in Fig. 1 to that shown in Fig. 5. As movement of the handle continues, the ends of the blades travel along the edges 30 to a point adjacent the ends of the edges, this position being shown by Fig. 6; at the same time separation of the blades is increased by the action of the cams 28. When the operating member has been moved to a position where the wide portion of the flange is between the blades, the tip ends of the blades slip off the edges 30 and the blades spring back upwardly to normal position, as shown by Fig. 7. The switch is now in fully opened position. This means that the contact buttons are separated the full distance of the width of the flange and the tip ends 25 of the blades rest above the planes of the edges 30 on the shoulders 29. The switch contacts have been gradually separated by the cam operating member; this gives the switch a smooth and positive action and one in which the contacts are opened relatively slowly.

To close the switch, the handle is moved counter-clockwise, looking at Fig. 7, so that the tip ends of the contact blades travel along the shoulders or flat cams 29 out of engagement with the edges 30. The contact blades remain spaced apart until the handle has almost reached the limit of its return travel when the blades drop off the shoulders 29 to effect a quick make of the circuit by engagement of the buttons 24, this position being shown by Fig. 1. During return movement of the handle the contact blades remain spaced apart a uniform distance maintained by the shoulders 29 and do not engage the edges 30. This is due to the fact that the resiliency of the contact blades maintains them in normal position above the edges 30. Since each contact blade moves only a small distance in dropping off the shoulder 29, the contacts meet without "bounce" and effect a single make of the circuit without destructive arcing. This means that the life of the contact buttons is greatly increased.

By my construction a switch is provided in which the contact mechanism is opened slowly and closed quickly to control an alternating current circuit without damage to the contact mechanism. Such an arrangement means that the switch structure may be greatly simplified since it is unnecessary to provide any form of spring actuated snap mechanism. While the contact blades have been illustrated as supported between two plates, it should be manifest that other arrangements of supporting means may be provided for without departing from the spirit of my invention. In some cases it may be desirable to employ a single flexible contact blade and a stationary contact although I prefer to use two movable contact blades.

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

1. In an electric switch, two flexible blades provided with cooperating contact surfaces, and an operating member having a cam surface and a shoulder adjoining each other to form a curved edge, said cam surface being disposed between said blades to separate them upon movement of said member in one direction to open an electric circuit through said contact surfaces, the ends of said contact blades engaging said curved edge and being flexed during movement of said member such that they are positioned in engagement with said shoulder upon completion of the movement, said blades moving along said shoulder and dropping off said edge to complete a circuit through said contact surfaces upon movement of said member in a reverse direction.

2. In an electric switch, opposed movable elements provided with cooperating contact surfaces, and an operating member having a cam surface and a flat shoulder adjoining each other, said member normally extending to a point between said elements, said cam surface being disposed between said movable elements to separate them upon movement of said operating member in one direction to effect a slow opening of said contact surfaces, the flat shoulder being disposed between said movable elements upon movement of said operating member in a reverse direction to effect a quick closure of said contact surfaces as they fall out of engagement with said shoulder.

3. In an electric switch, opposed flexible blades provided with cooperating contact surfaces, a pivoted operating member having a recess therein, said flexible blades extending into said recess, a cam surface and a shoulder adjoining each other formed on the periphery of the recess and normally depending to a point between said blades, said cam surface being disposed between said blades to separate them by movement of said operating member in one direction to open slowly said contact surfaces, the shoulder being disposed between said blades upon movement of said member in an opposite direction to close quickly said contact surfaces as said blades drop off said shoulder.

LEONARD W. COOK.