Feb. 27, 1940. J. R. CALDWELL 2,191,878

ELECTRIC SWITCH

Filed Sept. 21, 1939 2 Sheets-Sheet 1

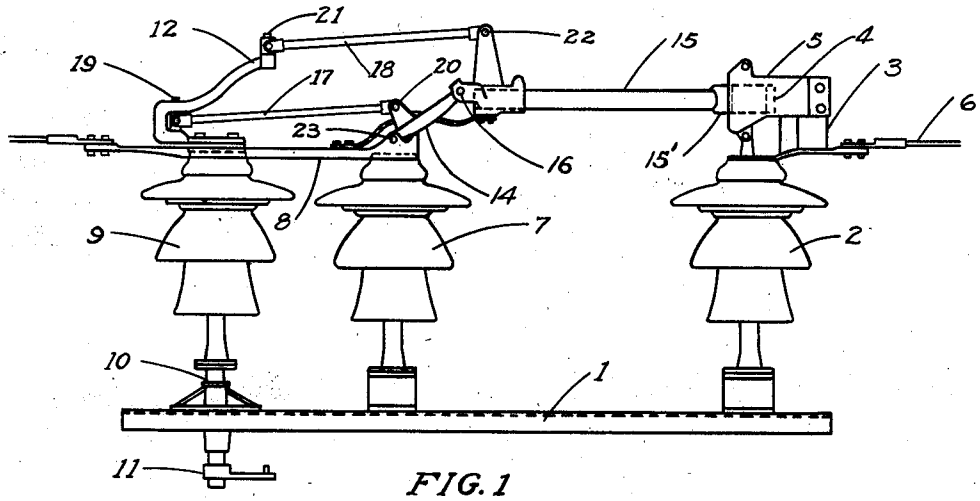


FIG. 1

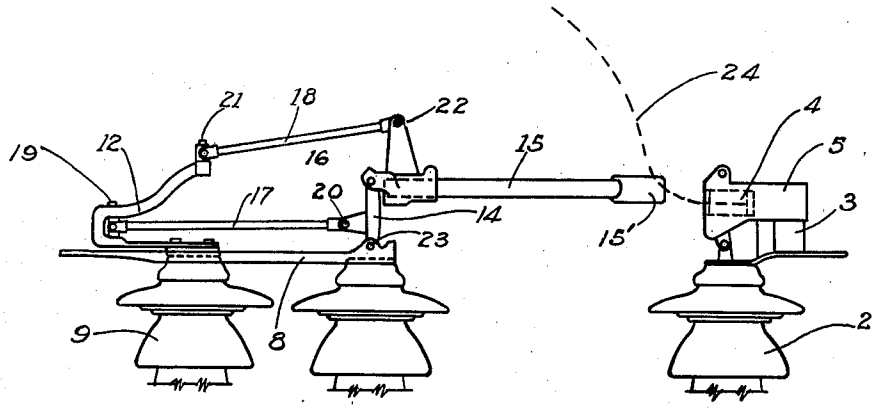


FIG. 2

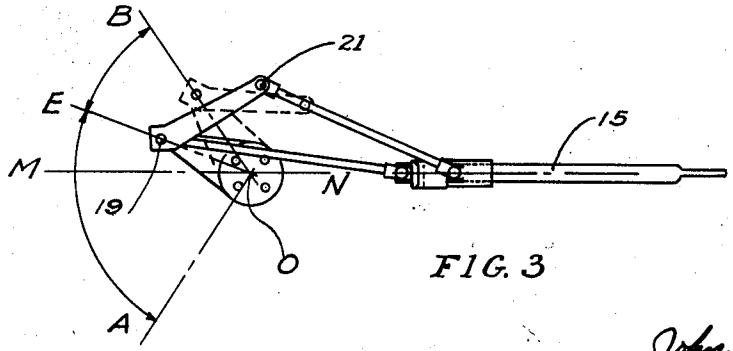


FIG. 3

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ELECTRIC SWITCH

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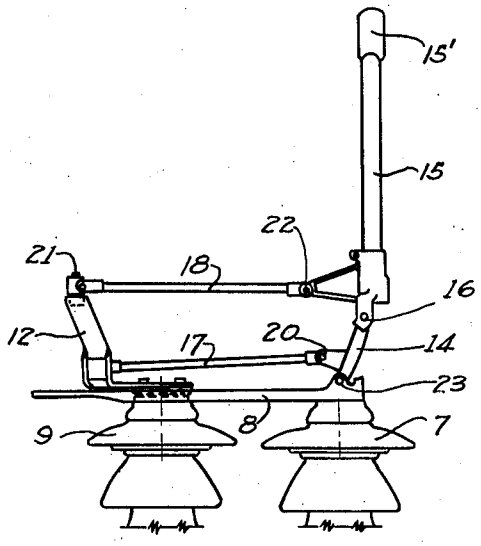


FIG. 4

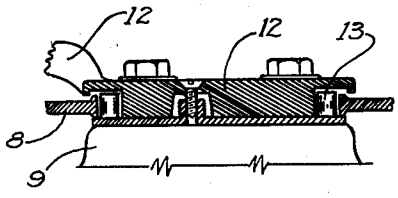


FIG 6

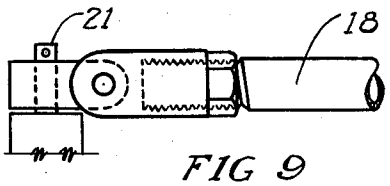


FIG 9

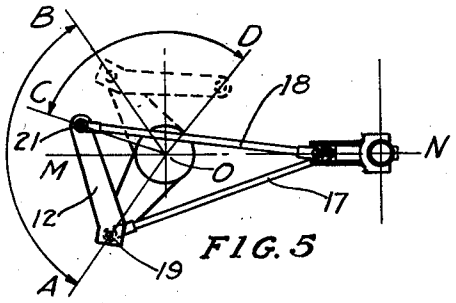


FIG. 5

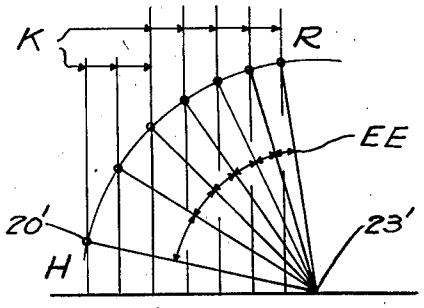


FIG. 8

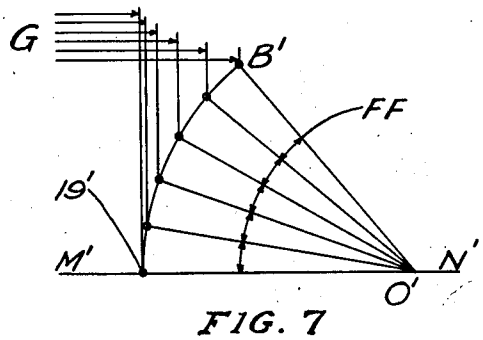


FIG. 7

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Patented Feb. 27, 1940

2,191,878

UNITED STATES PATENT OFFICE

2,191,878

ELECTRIC SWITCH

John R. Caldwell, Birmingham, Ala., assignor to Southern States Equipment Corporation, Birmingham, Ala.

Application September 21, 1939, Serial No. 295,935

6 Claims. (Cl. 200—48)

One purpose of this invention is to provide a simple high voltage switch mechanism which moves the switch blade longitudinally when it is near the closed-circuit position, which swings the blade in an arc about its hinge during other parts of its travel, and which gives smooth and positive control of the blade at all times. Other purposes will be evident from the following specification and claims.

One design of switch in which this invention is embodied is indicated in the drawings, in which Fig. 1 shows in elevation one unit of the switch in closed circuit position; Fig. 2 shows the blade-operating mechanism in partly open position; Fig. 4 shows the blade mechanism in fully open position; Fig. 3 shows a plan view of members which are shown in elevation in Fig. 2; Fig. 5 shows in plan view members which are shown in elevation in Fig. 4; Fig. 6 shows in cross section the top bearing of the rotating insulator; Figs. 7 and 8 are explanatory diagrams; and Fig. 9 shows a joint detail.

A suitable base 1 carries the insulator 2 upon which is held the metallic support 3 to which are attached the contact jaws 4, the protective cover 5 and the line conductor 6. Another insulator 7 rigidly supports the hinge base 8, and a third insulator 9 is rotatable in the bearing 10. The crank 11 provides a means to rotate the insulator 9.

The crank member 12 is solidly bolted to the insulator 9, and the roller bearings 13 help to support the member 8, while allowing free rotation of insulator 9 and the crank member 12. The member 8 serves to keep a uniform space between insulators 7 and 9. The hinge base 8 pivotally supports the rocker 14 to which is hinged the switch blade 15 by means of the pivot 16. Adjustable connecting rods 17 and 18 connect the pivot 19 with pivot 20 and the pivot 21 with pivot 22 as shown. There is a universal joint with a screw thread or other means of adjustment at each end of the rods 17 and 18, as shown in Fig. 9. The rocker 14 has wide bearings at each end for the pivot 23, so that as the pivot 16 moves through its arc of travel it has but little side play; this keeps the side motion of the end of the blade 15' within the desired limits.

Operation is as follows: When the switch is open the members are in the positions shown in Figs. 4 and 5. When the switch is being closed by rotation of the insulator 9, the members move towards the positions shown by Figs. 2 and 3. As the insulator 9 rotates, the pivot 19 first moves its position on the line AO to a position on the center line MN, thereby pulling the rod 17 backward, or away from insulator 2.

The rod 17 therefore, pulls the rocker 14 and its pivot 16 backward. At the same time the pivot 21 moves from a position on the line CO towards the line DO. Acting through rod 18 this moves the pivot 22 forward. The backward motion of pivot 16 combined with the forward motion of pivot 22 starts to swing the blade 15 towards the position shown in Fig. 2.

As the pivot 19 passes the center line MN its motion begins to have a forward component. This smoothly reverses the motion of the rocker 14 so that it now starts to carry the pivot 16 forward until the members reach the positions shown in Figs. 2 and 3.

Further rotation of insulator 9 now carries the member 12 from the position shown by full lines in Fig. 3 to the closed-switch position shown in Figs. 3 and 5 by dotted lines. During this part of the stroke the rods 17 and 18 carry pivots 20 and 22 both forward. Due to their positions on the arcs of rotation pivot 19 has a lesser forward component of motion than has pivot 21. Therefore pivot 20 does not move as much forward as does pivot 22. But pivot 16 is further from pivot 23 than is pivot 20, and, for a given motion of rocker 14, pivot 16 therefore moves further forward than does pivot 20. The net result of all these motions is that the blade tip 15' smoothly changes the direction of its motion, and it follows a curve substantially as shown by the dotted line 24, until the switch is in fully closed position as shown in Fig. 1.

In opening the switch, all motions are reversed, and so the swing end of the switch blade 15' follows substantially the same path whether the switch is opening or closing. At all times the blade is under control of the rotative insulator 9; and there is no jar nor severe strain on any member as the blade changes from an arcuate motion to a motion that is substantially longitudinal. This longitudinal motion of the switch blade when it is in contact with the jaws, greatly reduces the effort required to overcome friction between these members, as compared with the effort which would be required to lift the blade in an arcuate motion about a single pivot out of contact with the jaws, or to force the blade between the jaws during the reverse closing stroke. Furthermore, this horizontal motion allows the use of an effective housing above the jaws, and so greatly reduces the hazard of ice or sleet freezing the blade and jaws together,

thereby interfering with proper operation of the switch. The jaws 4 and the end of the blade 15' have vertical faces, and so proper electrical contact is obtained even though there may be considerable change in the relative vertical positions of these contact members.

Changes involved by changing a path of travel from one part of an arc to another, are indicated in Figs. 7 and 8. Fig. 7 shows that as the point 19' moves in steps of equal angularity FF along the arc M'B', there is a progressive increase in the forward motion components as indicated by G. A corresponding change occurs as the pivot 19 moves from the line MN to the line OB.

Fig. 8 shows that when a location 20' is moved in an arc HR about the point 23', successive steps with a uniform forward-motion component, K, will produce steps with an angularity of travel EE that progressively diminishes. A similar condition exists when the rod 17 moves the pivot 20 forward. As the forward motion of the rod 17 proceeds, the relative angular motion of the rocker 14 decreases progressively.

Similar changes in the relative travel of different members occur at other parts of the mechanism described, and the combination of these varies. The rods 17 and 18 are adjustable in length, and provide a means for adjusting the assembled unit so that the blade tip 15' will follow the desired path of travel.

One skilled in the art can readily make many modifications in the switch as here shown, without departing from the spirit and purpose of this invention, which is not limited to the design shown herein.

I claim:

1. In an electric switch two spaced insulated supports, contact means mounted on one of said supports, a single switch arm mounted by a double jointed hinge on the said other support and cooperable with the said contact means, a driving member rotatable about its axis and carrying two pivots which are spaced in fixed angular relation about the said axis, together with two linkages connecting the said pivots respectively to the said switch arm and to the said double jointed hinge, to operate the said switch arm in a combined arcuate and longitudinal path of travel.

2. In an electric switch, two spaced insulated supports, contact means mounted on one support, a single switch arm pivotally mounted on a rocker member which is pivotally mounted on the other support, a rotative insulator member supporting two pivots in fixed relation to the insulator axis, together with linkages connecting the two pivots respectively with the said switch arm and the said rocker member.

3. In an electric switch, two spaced supports mounted upon insulating means, contact means mounted upon one support, a rocker member mounted pivotally upon the other support and with its swing end extending away from the said insulating means, a single switch arm pivotally mounted upon the said swing end of the rocker member, means to operate the switch arm with an opening and with a closing movement together with means to move the said rocker member with two separate and opposite motions during each of the said operating movements of the switch arm.

4. In an electric switch, two spaced supports mounted upon insulating means, contact means upon one support, a rocker member pivotally mounted upon the other support, a single switch arm pivotally supported on the swing end of the rocker member and cooperable with the said contact member, together with a rotatable insulator, two pivot joints borne by the rotatable insulator in fixed angular relation thereto, and two links connecting the last said pivot joints with the said rocker and with the said switch arm.

5. In an electric switch, in combination, two spaced insulator supports, contact means on the first support, a rocker member pivotally mounted on the other support, a single switch arm pivotally mounted on the swing end of the said rocker member and cooperable with the said contact means, a rotative operating member carrying two spaced pivots members, together with two link members connecting the said two pivot members, respectively, with the said rocker member and with the said switch arm.

6. In an electric switch, a bell crank, a single switch arm pivotally mounted on the long arm of the bell crank, together with control members comprising a rotative insulator carrying two crank pivots held in fixed relation to the said insulator, a link between one of said pivots and the switch arm and a link between the second said pivot and the short arm of the bellcrank.

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